



Application Form (Form I & Draft EIA Report)

For

Pudupalayam Limekankar & Limestone
Quarry – 22.96.0 Ha
(Greenfield Project)

at

S.F. No. 144/1A, 217/1A, 217/1C, 217/2, 217/3A, 217/3B, 217/4, 217/5, 217/6, 218/1, 219/1, 219/2A, 219/2B, 219/3A, 219/3B, 219/3C, 219/3D, 219/3E, 219/3F, 219/3G, 219/4A, 219/4B, 219/5A, 219/5B, 219/5C, 219/6, 219/8, 219/9, 220/1, 220/2A, 220/2B, 220/3A, 220/3B, 220/3C, 220/3D, 220/3E, 220/4, 220/5A, 220/5B, 220/6A, 220/6B, 220/7A, 220/7B, 220/8A, 220/8B, 220/9A, 220/9B, 220/9C, 220/10A, 220/10B, 220/11A, 220/11B, 221/1A & 221/15, Pudupalayam Village, Ariyalur Taluk, Ariyalur District, Tamil Nadu

Sector No. 1(a) (Sector No. 1 as per NABET)

Category of the Project: B1 Cluster Mining

Baseline Period: July, August & September 2020

Consultant

& Laboratory details:

Ecotech Labs Pvt Ltd,



No 48, 2nd Main road,
South extension Ram
nagar, Pallikaranai,
Chennai -600100.

Proponent details:

M/s. TamilNadu Cement

Corporation Limited

(A Government of TamilNadu

Undertaking)

5th Floor, Aavin Illam, No.3A,

Pasumpon Muthuramalingam

Salai, Nandanam,

Chennai-600035

From,

Date :

M/ s. Tamil Nadu Cement Corporation Limited
(A Government of Tamil Nadu Undertaking)
5th Floor, Aavin Illam, No.3A,
Pasumpon Muthuramalingam Salai,
Nandanam, Chennai-600035

To,

The District Environmental Engineer
Tamilnadu Pollution Control Board,
SF.No.4/ 326, Trichy Main Road,
Keelapalur Village, Ariyalur Taluk,
Ariyalur District - 621 707 .

Sir,

Sub: Request to conduct Public Hearing ⇒ Environmental Clearance for the Proposed Limekankar & Limestone quarry over an extent of 22.96 Ha at S. F. Nos. 144/ 1A, 217/ 1A, 217/ 1C, 217/ 2, 217/ 3A, 217/ 3B, 217/ 4, 217/ 5, 217/ 6, 218/ 1, 219/ 1, 219/ 2A, 219/ 2B, 219/ 3A, 219/ 3B, 219/ 3C, 219/ 3D, 219/ 3E, 219/ 3F, 219/ 3G, 219/ 4A, 219/ 4B, 219/ 5A, 219/ 5B, 219/ 5C, 219/ 6, 219/ 8, 219/ 9, 220/ 1, 220/ 2A, 220/ 2B, 220/ 3A, 220/ 3B, 220/ 3C, 220/ 3D, 220/ 3E, 220/ 4, 220/ 5A, 220/ 5B, 220/ 6A, 220/ 6B, 220/ 7A, 220/ 7B, 220/ 8A, 220/ 8B, 220/ 9A, 220/ 9B, 220/ 9C, 220/ 10A, 220/ 10B, 220/ 11A, 220/ 11B, 221/ 1A & 221/ 15, Pudupalayam Village, Ariyalur Taluk, Ariyalur District, Tamil Nadu ⇒ Regarding.

Ref: Letter No. SEIAA-TN/F. No. 7607/SEAC/ToR-797/2020 Dated: 21.10.2020.

Please find enclosed herewith the application of Draft EIA Report along with necessary enclosures towards seeking environmental clearance for Proposed Limekankar & Limestone quarry over an extent of 22.96 Ha at S. F. No. SF. No. 144/ 1A, 217/ 1A, 217/ 1C, 217/ 2, 217/ 3A, 217/ 3B, 217/ 4, 217/ 5, 217/ 6, 218/ 1, 219/ 1, 219/ 2A, 219/ 2B, 219/ 3A, 219/ 3B, 219/ 3C, 219/ 3D, 219/ 3E, 219/ 3F, 219/ 3G, 219/ 4A, 219/ 4B, 219/ 5A, 219/ 5B, 219/ 5C, 219/ 6, 219/ 8, 219/ 9, 220/ 1, 220/ 2A, 220/ 2B, 220/ 3A, 220/ 3B, 220/ 3C, 220/ 3D, 220/ 3E, 220/ 4, 220/ 5A, 220/ 5B, 220/ 6A, 220/ 6B, 220/ 7A, 220/ 7B, 220/ 8A, 220/ 8B, 220/ 9A, 220/ 9B, 220/ 9C, 220/ 10A, 220/ 10B, 220/ 11A, 220/ 11B, 221/ 1A & 221/ 15, Pudupalayam Village, Ariyalur Taluk, Ariyalur District, Tamil Nadu.

In this regard, we had obtained the Terms of Reference from State Environmental Impact Assessment Authority (SEIAA) Tamil Nadu, vide reference mentioned above for conducting EIA studies. We wish to inform that the draft EIA report complying with all the conditions mentioned in the ToR has been prepared and the copies of the same are enclosed with this letter. With

reference to the above, we kindly request the TNPCB to make the necessary arrangements for **conducting the Public hearing for the Proposed Limekankar & Limestone quarry**

With the above, we request the TNPCB to accept and process our application for conducting the Public Hearing at the earliest.

Thanking you

Yours Sincerely

Authorized Signatory

Enclosures: Draft EIA report

M/s. Tamil Nadu Cement Corporation Limited
(A Government of Tamil Nadu Undertaking)
Ariyalur Cements Factory,
Ariyalur District-621729
Tamil Nadu.

UNDERTAKING

We, M/s. Tamil Nadu Cement Corporation Limited undertaking that the Environmental Impact Assessment (EIA) Report for Proposed Limekankar & Limestone quarry over an extent of 22.96 Ha at S.F. No. 144/1A, 217/1A, 217/1C, 217/2, 217/3A, 217/3B, 217/4, 217/5, 217/6, 218/1, 219/1, 219/2A, 219/2B, 219/3A, 219/3B, 219/3C, 219/3D, 219/3E, 219/3F, 219/3G, 219/4A, 219/4B, 219/5A, 219/5B, 219/5C, 219/6, 219/8, 219/9, 220/1, 220/2A, 220/2B, 220/3A, 220/3B, 220/3C, 220/3D, 220/3E, 220/4, 220/5A, 220/5B, 220/6A, 220/6B, 220/7A, 220/7B, 220/8A, 220/8B, 220/9A, 220/9B, 220/9C, 220/10A, 220/10B, 220/11A, 220/11B, 221/1A & 221/15, Pudupalayam Village, Ariyalur Taluk, Ariyalur District, Tamil Nadu

State under project category B1 and Schedule S.No.1(a)

TOR issued by the State Expert Appraisal Committee, TN vide letter SEIAA-TN/F. No. 7607/SEAC/ToR-797/2020 Dated: 21.10.2020.

I, hereby assure that all the information and data provided in the EIA report is accurate, true and correct and owns responsibility for the same

Place :

Yours faithfully

Date :

M/s. Tamil Nadu Cement Corporation Limited

PLOT No.48A, 2nd Main Road,
Ram Nagar, South Extension,
Pallickarzanai, Chennai - 800 100
GST NO. 33AADCE1103A22H
PAN NO: AADCE6103A



Eco Tech Labs Pvt Ltd

Cell No. 98400 87542
Email : info@ecotechlabs.in
Website : www.ecotechlabs.in
CIN : U74900TN2014PTC094895

UNDERTAKING

I, Dr. A. Dhamodharan, Managing Director confirms that this EIA Report of Proposed Limekankar & Limestone quarry over an extent of 22.96 Ha at S.F. No. 144/1A, 217/1A, 217/1C, 217/2, 217/3A, 217/3B, 217/4, 217/5, 217/6, 218/1, 219/1, 219/2A, 219/2B, 219/3A, 219/3B, 219/3C, 219/3D, 219/3E, 219/3F, 219/3G, 219/4A, 219/4B, 219/5A, 219/5B, 219/5C, 219/6, 219/8, 219/9, 220/1, 220/2A, 220/2B, 220/3A, 220/3B, 220/3C, 220/3D, 220/3E, 220/4, 220/5A, 220/5B, 220/6A, 220/6B, 220/7A, 220/7B, 220/8A, 220/8B, 220/9A, 220/9B, 220/9C, 220/10A, 220/10B, 220/11A, 220/11B, 221/1A & 221/15, Pudupalayam Village, Ariyalur Taluk, Ariyalur District, Tamil Nadu State has been prepared at M/s. Ecotech Labs Pvt. Ltd., Chennai.

I also confirm that I shall be fully accountable for any miss-leading information mentioned in this Report.

Signature:

Name: Dr. A. Dhamodharan

Designation: Managing Director

Name of the EIA Consultant Organization: M/s. Ecotech Labs Pvt Ltd.,

Chennai. NABET Certificate No: NABET/EIA/2124/SA 0147

Date:

Place: Chennai

<i>Project</i>	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>Draft EIA Report</i>
<i>Project Proponent</i>	<i>M/ s TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)</i>	
<i>Project Location</i>	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

Declaration of Experts

Project	Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha	Draft EIA Report
Project Proponent	M/ s TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)	
Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	

Declaration by Experts contributing to the EIA of Proposed Pudupalayam Limekankar & Limestone Quarry ´ 22.96.0 Ha by M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking) at S.F. No. 144/1A, 217/1A, 217/1C, 217/2, 217/3A, 217/3B, 217/4, 217/5, 217/6, 218/1, 219/1, 219/2A, 219/2B, 219/3A, 219/3B, 219/3C, 219/3D, 219/3E, 219/3F, 219/3G, 219/4A, 219/4B, 219/5A, 219/5B, 219/5C, 219/6, 219/8, 219/9, 220/1, 220/2A, 220/2B, 220/3A, 220/3B, 220/3C, 220/3D, 220/3E, 220/4, 220/5A, 220/5B, 220/6A, 220/6B, 220/7A, 220/7B, 220/8A, 220/8B, 220/9A, 220/9B, 220/9C, 220/10A, 220/10B, 220/11A, 220/11B, 221/1A & 221/15, Pudupalayam Village, Ariyalur Taluk, Ariyalur District, Tamil Nadu.

I, hereby, certify that I was a part of the EIA team in the following capacity that developed the above EIA.

EIA Coordinator: Dr. A. Dhamodharan


Signature and Date:



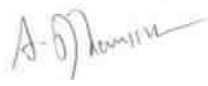
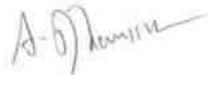

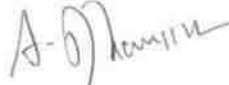
Period of involvement: February 2021 ´ till now

Contact information: M/s. Ecotech Labs Pvt Ltd.,






No. 48, 2nd Main road, Ram Nagar South Extension,
Pallikaranai

S. No	Functional areas	Name of the experts	Involvement (Period and task)	Signature and date
1	AP	Mrs. K. Vijayalakshmi	1. Selection of Baseline Monitoring stations based on the wind direction 2. Interpretation of Baseline data by comparing it with standards prescribed by CPCB against the type of area 3. Identification of sources of air pollution and suggesting mitigation measures to minimize impact Period: June 2020 – till now	



Project	Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha	Draft EIA Report
Project Proponent	M/ s TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)	
Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	

2	WP	Dr. A. Dhamodharan	<ol style="list-style-type: none"> 1. Selection of baseline Monitoring Locations for Ground water analysis and also identifying nearest surface water to be studied. 2. Interpretation of baseline data collected 3. Identification of impacts based on the baseline study conducted and also to the ground water and nearby surface water due to the proposed project 4. Preparation of suitable and appropriate mitigation plan. <p>Period: June 2020 – till now</p>	
3	SHW	Dr. A. Dhamodharan	<ol style="list-style-type: none"> 1. Identification of nature of solid waste generated 2. Categorization of the generated waste and estimating the quantity of waste to be generated based on the per capita basis. Identification of impacts of SHW on Environment 3. Suggesting suitable mitigation measures by recommending appropriate disposal method for each category of waste generated 4. Top soil and refuse management <p>Period: June 2020 – till now</p>	
4	SE	Mr. S. Pandian	<ol style="list-style-type: none"> 1. Primary data collection through the census questionnaire 2. Obtaining Secondary data from authenticated sources and incorporating the same in EIA report. 3. Impact assessment & proposing suitable mitigation plan 4. CSR budget allocation by discussing with the local body and allotting the same for need based activity. <p>Period: June 2020 – till now</p>	
5	EB	Dr. A. Dhamodharan	<ol style="list-style-type: none"> 1. Primary data collection through field survey and sheet observation for ecology and biodiversity 2. Secondary Collection through various authenticated sources 3. Prediction of anticipated impacts and suggesting appropriate mitigation measures. <p>Period: June 2020 – till now</p>	

Project	Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha	Draft EIA Report
Project Proponent	M/ s TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)	
Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	

6	HG	Dr. T. P. Natesan	<ol style="list-style-type: none"> 1. Study of existing surface drainage arrangements in the core and buffer zone, impact due to mining on these drainage courses and suggestion of mitigative measures 2. Determination of groundwater use pattern, development of rainwater harvesting program. 3. Storm water management through garland drainage system. <p>Period: June 2020 – till now</p>	
7	GEO	Dr. T. P. Natesan	<ol style="list-style-type: none"> 1. Field survey for assessing regional and local geology, aquifer distribution, Determination of groundwater use pattern, development of rainwater harvesting program. <p>Period: June 2020 – till now</p>	
8	SC	Dr. A. Dhamodharan	<ol style="list-style-type: none"> 1. Interpretation of baseline report 2. Identification of possible impacts on soil, prediction of soil conservation and suggesting suitable mitigation measures. <p>Period: June 2020 – till now</p>	
9	AQ	Mrs. K. Vijayalakshmi	<ol style="list-style-type: none"> 1. Collection of Meteorological data for the baseline study period 2. Plotting wind rose plot and thereby selecting the monitoring locations based on the wind pattern 3. Estimation of sources of air emissions and air quality modeling is done 4. Interpretation of the results obtained 5. Identification of the impacts and suggesting suitable mitigation measures. <p>Period: June 2020 – till now</p>	
10	NV	Mrs. Neha Singh	<ol style="list-style-type: none"> 1. Selection of monitoring locations 2. Interpretation of baseline data 3. Prediction of impacts due to noise pollution and suggestion of appropriate mitigation measures <p>Period: June 2020 – May 2021</p>	

Project	Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha	Draft EIA Report
Project Proponent	M/ s TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)	
Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	

11	LU	Dr. T. P. Natesan	<ol style="list-style-type: none"> 1. Collection of Remote sensing satellite data to study the land use pattern. 2. Primary field survey and limited field verification for land categorization in the study area 3. Preparation of Land use map using Satellite data for 10km radius around the project site. <p>Period: June 2020 – till now</p>	
12	RH	Mr. Pinaki Dasgupta	<ol style="list-style-type: none"> 1. Identification of the risk 2. Interpreting consequence contours 3. Suggesting risk mitigation measures <p>Period: June 2020 – Nov 2021</p>	

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

I, Dr. A. Dhamodharan, hereby, confirm that the above-mentioned experts prepared the EIA report of mining project at Pudupalayam Village, Ariyalur Taluk, Ariyalur District. I also confirm that the consultant organization shall be fully accountable for any misleading information mentioned in this statement.

Signature:



Name: Dr. A.Dhamodharan

Designation: EIA Coordinator

Name of the EIA consultant organization: M/s. Eco Tech Labs Private Limited

NABET Certificate No. & Issue Date: NABET/EIA/2124/SA 0147, Dated Jan. 19, 2022

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FORM 1

FORM - I**I. BASIC INFORMATION**

S. No.	Item	Details
1	Name of the project	Pudupalayam Limekankar & Limestone Quarry total extent of 22.96.0 Ha
2	S. no. in the schedule	1 (a) Mining of Minerals.
3	Proposed area	Area : 22.96.0 Ha Proposed Capacity of Limestone ROM : 1119000 Tonnes Proposed Capacity of Limekankar ROM : 191626 Tonnes for a period of five years.
4	New/Expansion/Modernization	New
5	Existing capacity/Area etc	Area : 22.96.0 Ha
6	Category of project i.e. 'A' or 'B'	Category - B1
7	Does it attract the general condition? If yes, please specify	No
8	Does it attract the specific condition? If yes, please specify	No
9	Location	Coordinates of the project Latitude: 11° 05' 34.95" to 11° 05' 50.96"N Longitude: 79° 08' 38.65" to 79° 09' 09.41"E
	Plot/Survey/Khasra No	144, 217/1A, 217/1C, 217/2, 217/3A, 217/3B, 217/4, 217/5, 217/6, 218/1, 219/1, 219/2A, 219/2B, 219/3A, 219/3B, 219/3C, 219/3D, 219/3E, 219/3F, 219/3G, 219/4A, 219/4B, 219/5A, 219/5B, 219/5C, 219/6, 219/8, 219/9, 220/1, 220/2A, 220/2B, 220/3A, 220/3B, 220/3C, 220/3D, 220/3E, 220/4, 220/5A, 220/5B, 220/6A, 220/6B, 220/7A, 220/7B, 220/8A, 220/8B, 220/9A, 220/9B, 220/9C, 220/10A, 220/10B, 220/11A, 220/11B, 221/1A & 221/15
	Village	Pudupalayam Village
	Taluk	Ariyalur
	District	Ariyalur
	State	Tamilnadu
10	Nearest railway station/airport along with distance in kms	Ariyalur Railway station - 10.76 Km NW Trichy Air Port - 60.6 Km NW
11	Nearest town, city, district headquarters along with distance in kms	Town - Ariyalur - 9.08 Km NW City - Ariyalur - 9.08 Km NW District - Ariyalur - 9.08 Km NW
12	Village Panchayats, Zilla	Village - Pudupalayam

S. No.	Item	Details
	Parishad, municipal corporation, local body (Complete postal addresses with telephone nos. to be given)	Panchayat - Pudupalayam Taluk - Ariyalur District - Ariyalur
13	Name of the applicant	Thiru.T.Ravichandran
14	Registered address	M/s Tamilnadu Cements Corporation Limited. (A Government of Tamilnadu Undertaking) 735, Anna Salai LLA Buildings, II Floor, Chennai- 600 002, Tamil Nadu.
15	Address for correspondence: Name Designation Address Pin code E-mail Telephone No. / Fax No.	Thiru.T.Ravichandran Deputy General manager M/s Tamilnadu Cements Corporation Limited. (A Government of Tamilnadu Undertaking) Ariyalur Cements Factory, Ariyalur District, Tamil Nadu. 621729 ari@tancem.com , acwmines@gamil.com 9123547311
16	Details of alternative sites examined, if any, Location of these sites should be shown on a topo sheet	There is no alternative site examined as the project site is specific.
17	Interlinked projects	There is no necessity for interlinked project
18	Whether separate application of interlinked project has been submitted?	As there is no inter linked projects, separate application is not applicable.
19	If yes, date of submission	Not applicable
20	If no, reason	There are no interlinked projects and the project quarrying of Limekankar & Limestone is specific to one site oriented.
21	Whether the proposal involves approval/clearance under: if yes, details of the same and their status to be given. (a) The forest (conservation) Act, 1980? (b) The wild life (Protection)	1.The quarry lease applied area is not classified under any forest land. 2.There is no wild life within 10 kms from the project site area under the Wildlife (protection) Act 1972. 3. Not applicable

S. No.	Item	Details
	Act, 1972? (c) The CRZ Notification 1991	
22	Whether there is any government order/policy relevant/relating to the site	The Proponent has obtained Precise area communication from Industries(MMA2) Department Secretariat, Chennai vide letter.3997/MMA.2/2019-1 dated 02.08.2019. Mining Plan was approved by The Indian Bureau of Mines, Chennai vide letter no. TN/ALR/LST&KNK/MP/2061.MDS dated 09.10.2019.
	Forest land involved (hectares)	No Forest land involved
24	Whether there is any litigation pending against the project and/or land in which the project is propose to be set up? a) Name of the Court b) Case No c) Orders/directions of the court, if any and its relevance with the proposed project	There is no litigation pending with court as against this project.

II. ACTIVITY

1. Construction, operation or decommissioning of the Project involving actions, which will cause physical changes in the locality (topography, land use, changes in water bodies etc.)

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with sources of information data
1.1	Permanent or temporary change in land use, land cover or topography including increase in intensity of land use (with respect to local land use plan)	No	The total Mining lease area is covering over an area of 22.96 Ha. The quarry lease area is flat horizontal land with surrounded by agricultural land. There are no drainage or nallah lies in the lease area.
1.2	Clearance of existing land, vegetation and buildings?	No	The area was already cleared partially during the earlier operations and now the clearance of any vegetation / structures

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with sources of information data
			does not arise.
1.3	Creation of new land uses?	No	No creation of new land use. After the mining activity up to the ultimate pit limit depth, the mining pit will be converted as a water reservoir for recharging the ground water table and it will be used for irrigation and pisciculture purpose.
1.4	Pre-construction investigations e.g. bore holes, soil testing ?	No	No investigations have been carried out for soil and water
1.5	Construction works?	Yes	Temporary Office building is constructed in lease hold area. First aid, sanitation & rest shelter is provided in office room. For drinking & water sprinkling bore well will be drilled.
1.6	Demolition Works?	No	The project does not involve any demolition works.
1.7	Temporary sites used for construction works or housing of construction workers?	No	As people in nearby villages will be employed, there is no necessity for housing facility or temporary sites.
1.8	Above ground buildings, structures or earthworks including linear structures, cut and fill or excavations	No	The proposed project is made exclusive for quarrying Limekankar and Limestone. The ultimate pit will be used as water reservoir.
1.9	Underground works including mining or tunneling?	No	Quarrying proposed is Open cast mechanised method. No underground mining is proposed.
1.10	Reclamation Works?	No	The Mining pit will be fenced by barbet wire to prohibit unauthorized entry and develop a green belt by plantation. After the mining activity up to the ultimate pit limit depth, the mining pit will be converted as a water reservoir for recharging the ground water table and it will be used for irrigation and pisciculture purpose.
1.11	Dredging?	No	There is no scope for dredging.
1.12	Offshore structures?	No	There is no such activity involved.
1.13	Production and manufacturing processes?	Yes	Opencast Mechanized method mining by using Mega Rock Breaker, Excavators for loading operations and tippers for transport of minerals from the project

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with sources of information data
			site to factory. Drilling and Blasting operation is proposed based on the rock formation
1.14	Facilities for storage of goods or materials?	No	Mines office along with separate facility for storage of goods or materials will be constructed before commencement of mining operations.
1.15	Facilities for treatment or disposal of solid waste or liquid effluents?	Yes	1) Solid Waste I) Top soil: Top soil so generated will be spread on the boundary and plantation will be done in such area where top soil will be spread on the boundary. II) Overburden: Overburden will be used for bund making at boundary of lease area. III) Rejects & Waste: As the whole productions along with rejects are saleable materials. Therefore no mineral reject or waste will requires their due management. 2) Liquid Effluent: Domestic effluent is expected to be generated.
1.16	Facilities for long term housing of operational workers?	No	No, there shall not be any facility for long term housing of the labors as all the labors will come from the nearby villages
1.17	New road, rail or sea traffic during construction or operation?	Yes	Construction traffic – NIL Operational Traffic – Yes, Haul road/Ramp will be constructed for mining activities so as to reach to the nearest tar road or regular haul road.
1.18	New road, rail, air waterborne or other transport infrastructure including new or altered routes and stations, ports, airports etc?	No	Not Applicable
1.19	Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements?	No	Not Applicable
1.20	New or diverted transmission lines or	No	The project doesn't involve diversion of transmission or pipe lines

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with sources of information data
	pipelines?		
1.21	Impoundment, damming, culverting, realignment or other changes to the hydrology of watercourses or aquifers?	No	There will be no impoundment, damming, culverting, realignment or other changes to the hydrology of watercourses or aquifers
1.22	Stream crossings?	No	There is no stream crossing within the proposed area
1.23	Abstraction or transfers of water from ground or surface waters?	No	The proposed quarrying activity doesn't involve any abstraction or transfers of water from ground or surface waters
1.24	Changes in water bodies or the land surface affecting drainage or run-off?	No	There is no and drainage nearby this area. After closure of mine the excavated area will be used as water reservoir.
1.25	Transport of personnel or materials for construction, operation or decommissioning?	No	The product of limestone is transported directly to TANCEM cement manufacturing factory.
1.26	Long-term dismantling or decommissioning which could have an impact on the environment?	No	No dismantling, Decommissioning or restoration works required or planned
1.27	Ongoing activity during decommissioning which could have an impact on the environment?	No	No such type of activities involved in the project
1.28	Influx of people to an area in either temporarily or permanently?	Yes	During operation of the quarry the nearby villagers will be given employment.
1.29	Introduction of alien species?	No	No introduction of any species is involved
1.30	Loss of native species or genetic diversity?	No	As a part of green belt development plan native species that are suitable to existing soil condition will be developed.
1.31	Any other actions?	No	Nil

2. Use of Natural resources for construction or operation of the Project (Such as land, water, materials or energy, especially any resources which are non-renewable or in short supply):

S. No.	Information/Checklist confirmation	Yes/ No	Details thereof (with approximate quantities / rates, wherever possible) with sources of information data
2.1	Land especially undeveloped or agricultural land (ha)	Yes	<p>The mining area of 22.96 Hectares is a patta land</p> <p>The proposed area is devoid of vegetation expect some few bushes and were previously seasonal agriculture were carried out.</p>
2.2	Water (expected source & competing users) Unit: KLD	Yes	<p>The project does not require huge amount water for quarry operation and total water requirement is 22.65 KLD</p> <p>Drinking Water : 0.65 KLD Dust Suppression : 11 KLD Green belt : 11 KLD Total : 22.65 KLD</p> <p>Water will be supplied from existing mine of TANCEM which is covered in Mining Lease G.O.No.344.</p>
2.3	Minerals (MT)	Yes	<p>Proposed Capacity of Limestone ROM :1119000 Tonnes Proposed Capacity of Limekankar ROM : 191626 Tonnes for a period of five years.</p>
2.4	Construction material – stone, aggregates, and / soil (expected source - cum)	Yes	The proposed project is a mining process and does not use any construction materials.
2.5	Forests and timber (source– MT)	No	--
2.6	Energy including electricity and fuels (source, competing users) Unit: fuel (litres/hour), energy (kVA)	Yes	<p>A) Electricity: for pumping of water and for administrative building & rest shelters. Sources of Electricity: TNEB B) Fossil Fuels: Diesel -Quantity of diesel will depend upon the usage of vehicle and mining machineries and level of achievement of estimated production and hence cannot be estimated. Sources of Diesel: Diesel will be outsourced from nearby diesel pumps.</p>
2.7	Any other natural resources (use appropriate standard units)	No	No other natural resource used

3. Use, storage, transport, handling or production of substances or materials which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health.

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with sources of information data
3.1	Use of substance or materials, which are hazardous (as per MSIHC rules) to human health or the environment (flora, fauna, and water supplies)	No	No hazardous materials used in this project.
3.2	Changes in occurrence of disease or affect disease vectors (e.g. insect or water borne diseases)	No	Not envisaged
3.3	Affect the welfare or people e.g. by changing living conditions?	No	Welfare of the people will get improved due to the employment generation activities of this project
3.4	Vulnerable groups of people who could be affected by the project e.g. hospital patient's children, the elderly etc.,	No	No effect envisaged as the civilization is too far from the mine area.
3.5	Any other causes	No	Not Applicable

4. Production of solid wastes during construction or operation or decommissioning (MT/ month)

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with sources of information data
4.1	Spoil, overburden or mine wastes	No	There is no mineral reject, the entire lease area consists of whole area deposit. Hence quantities of generation of mineral rejects in this area applied for mining lease does not arise The generation of topsoil during the present plan period will be temporarily dumped on the southwestern portion of the area and also utilized for Afforestation purposes.
4.2	Municipal waste (domestic and/or commercial wastes)	No	1) Commercial Wastes: There are no commercial arrangements which would

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with sources of information data
			generate any municipal waste. 2) Domestic Waste: Domestic effluent is expected to be generated from administrative buildings or rest shelters which will be treated through septic tank followed by soak pits.
4.3	Hazardous wastes (as per Hazardous Waste Management Rules)	No	The proposed quarrying of boulders will not produce any hazardous waste.
4.4	Other industrial process wastes	No	No industrial process is undertaken and no waste envisaged.
4.5	Surplus product	No	No Surplus product developed.
4.6	Sewage sludge or other sludge from effluent treatment	No	Neither effluent is generated nor treated in this quarry
4.7	Construction or demolition wastes	No	No construction or demolition wastes generated
4.8	Redundant machinery or equipment	No	No machinery is left redundant
4.9	Contaminated soils or other materials	No	There is no contaminated soil or other material noticed in the area
4.10	Agricultural wastes	No	No agricultural waste envisaged
4.11	Other solid wastes	Yes	No any other solid waste is expected during various stages of the project.

5. Release of pollutants or any hazardous, toxic or noxious substances to air (Kg/hr)

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with sources of information data
5.1	Emissions from combustion of fossil fuels from stationary or mobile sources	Yes	The emission of SO _x and NO _x may be due to use of diesel operated Tipper/Tractor etc. The better maintenance of equipment will help to reduce such emissions and maintain below permissible limit.
5.2	Emissions from production processes	Yes	Dust will be suppressed by water sprinkler.
5.3	Emissions from materials handling including storage	Yes	The emission of SO _x and NO _x may be due to use of diesel operated Tipper/Tractor etc. The

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with sources of information data
	or transport		better maintenance of equipment will help to reduce such emissions and maintain below permissible limit. The fugitive emission on haul road will be suppressed by water spray.
5.4	Emissions from construction activities including plant and equipment	No	No construction activities are planned.
5.5	Dust or odors from handling of materials including construction materials, sewage and waste.	Yes	No sewage will be generated from this project. There will be dust emission with in permissible limit during handling of overburden, transport by excavator and tippers which will be controlled by sprinkling water and wet drilling. The project will not have any odour, since it is removal of Blasted boulder only.
5.6	Emissions from incineration of waste	No	The limestone quarrying doesn't produce any hazardous waste
5.7	Emissions from burning of waste in open air (e.g. slash materials, construction debris)	No	No incineration of solid waste or materials
5.8	Emissions from any other sources	No	There is no emissions from other sources

6. Generation of Noise and Vibration, and Emissions of Light and Heat:

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with sources of information data
6.1	From operation of equipment e.g. engines, ventilation plant, crushers	Yes	There is likelihood of some increase in noise due to operational machinery like dumpers/ compressor/excavator/rock breaker, etc. which generates high level of noise at source ranges from 80-90 decibels.
6.2	From industrials or similar processes	No	There is no processing plant involved

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with sources of information data
6.3	From construction or demolition	No	No construction or demolition work envisaged.
6.4	From blasting or piling	No	No drilling & blasting is proposed
6.5	From construction or operational traffic	Yes	Noise generation will be from excavator and tippers. It should be maintained less than 85dB as prescribed by DGMS
6.6	From lighting or cooling systems	No	No lighting or cooling system required
6.7	From any other sources	No	Nil

7. Risks of contamination of land or water from releases of pollutants into the ground or into sewers, surface waters, groundwater, coastal waters or the sea:

S. No.	Information /Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with sources of information data
7.1	From handling, storage, use or spillage of hazardous materials	No	Not applicable, As the handled material does not contain any hazardous material.
7.2	From discharge of sewage or other effluents to water or the land (expected mode and place of discharge)	No	No sewage or disposal of effluents or waste
7.3	By deposition of pollutants emitted to air into the land or into water	No	No emission except fuel gases from the moving vehicles.
7.4	From any other sources	No	There is no other source
7.5	Is there a risk of long term build up of pollutants in the environment from these sources?	No	There is no scope for long term built up of pollutants in this project

8. Risk of accidents during construction or operation of the Project, which could affect human or the environment

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with sources of information data
8.1	From explosions, spillages,	No	As there is no spillage, fire, etc. required or

	fires etc from storage, handling, use or production of hazardous substances		expected. Moreover no hazardous substances are proposed to be used or produce during the various stages of mining.
8.2	From any other causes	No	Mines safety precautions will be followed while Quarrying. The labours will be provided with safety equipments. No unauthorized persons will be allowed inside the quarry while working in the quarry face.
8.3	Could the project be affected by natural disasters causing environmental damage (e.g. floods, earthquakes, landslides, cloudburst etc)?	No	Necessary precautions will be taken during the flood if arise and quarry operation will be stopped.

9. Factors which should be considered (such as consequential development) which could lead to environmental effects or the potential for cumulative impacts with other existing or planned activities in the locality

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with sources of information data
9.1	Lead to development of supporting facilities, ancillary development or development stimulated by the project which could have impact on the environment e.g.: <ul style="list-style-type: none"> • Supporting infrastructure (roads, power supply, waste or wastewater treatment, etc.) • Housing development • Extractive industries • Supply industries • Other 	Yes	The quarrying of Lime stone will not have any impact on Environment. No housing development or extractive industries or supply industries involved in this project
9.2	Lead to after use of the site, which could have impact on the environment	No	After excavation the excavated area will be used as water reservoir and this will enable to increase the ground water potentiality in the nearby areas.
9.3	Set a precedent for later	No	After complete excavation, the area will be

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with sources of information data
	developments		used as water reservoir
9.4	Have cumulative effects due to proximity to other existing or planned projects with similar effects	No	No such effects will occur

III. ENVIRONMENT SENSITIVITY

S. No.	Areas	Yes/No	Aerial distances (within 15 km.) Proposed project location boundary
1.	Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related values	No	There is no Ecological landscape, cultural or other related value within 10 Km aerial distance from the proposed area.
2.	Areas which are important or sensitive for ecological reasons – Wetlands, water courses or other water bodies, coastal zone, biospheres. Mountains, forests	Yes	Easwaran kovil Eri situated on the western side of the lease area and 50m safety provided
3.	Areas and by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration	No	--
4.	Inland, coastal, marine or underground waters	No	There are no Inland, coastal and marine or underground waters around the site within 15 Km aerial distance from project site.
5.	State, National boundaries	No	--
6.	Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas	No	--
7.	Defense installations	No	--
8.	Densely populated or built-	Yes	The area applied for mining lease lies in 9.08

S. No.	Areas	Yes/No	Aerial distances (within 15 km.) Proposed project location boundary																																	
	up area		km NW of Ariyalur and with a total population of 7.55 Lakhs																																	
9.	Areas occupied by sensitive man-made land uses (hospitals, schools, places of worship, community facilities)	Yes	<table><tr><th>S. No.</th><th>Places</th><th>Dist. From Project Site</th></tr><tr><td colspan="3">Schools & Colleges</td></tr><tr><td>1</td><td>Govt Engineering college, Ariyalur</td><td>6.24Km NE</td></tr><tr><td>2</td><td>SRM College of Edcation</td><td>9.60 Km NW</td></tr><tr><td>3</td><td>Govt Higher secondary school</td><td>9.70 Km NW</td></tr><tr><td>3</td><td>Nelli Andavar Institute of Technology</td><td>0.50 Km W</td></tr><tr><td>4</td><td>Aditya Brila Public school</td><td>2.35 Km N</td></tr><tr><td colspan="3">Hospitals</td></tr><tr><td>1</td><td>Ezhil Hospital</td><td>9.08 km NW</td></tr><tr><td>2</td><td>Ariyalur General hospital</td><td>10.5 Km NW</td></tr><tr><td>3</td><td>RR Hospital</td><td>9.55 Km NE</td></tr></table>	S. No.	Places	Dist. From Project Site	Schools & Colleges			1	Govt Engineering college, Ariyalur	6.24Km NE	2	SRM College of Edcation	9.60 Km NW	3	Govt Higher secondary school	9.70 Km NW	3	Nelli Andavar Institute of Technology	0.50 Km W	4	Aditya Brila Public school	2.35 Km N	Hospitals			1	Ezhil Hospital	9.08 km NW	2	Ariyalur General hospital	10.5 Km NW	3	RR Hospital	9.55 Km NE
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10.	Areas containing important, high quality or scarce resources (Groundwater / surface water resources, forestry, agriculture, fisheries, tourism, minerals)	No																																		
11.	Areas already subjected to pollution or environmental damage. (where existing legal standards are exceeded)	No	-																																	
12.	Areas susceptible to natural hazard which could cause the project to present environmental problems (earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions)	No	The project area falls under seismic zone (II) No earth quakes history found within 15 Km aerial distance from the project site. Adequate measures will be adopted to prevent flooding in the project site.																																	

UNDERTAKING

"I hereby undertake that the data and the information given in the application and enclosures are true to the best of my knowledge and belief and I am aware that if any part of the data and information submitted is found to be false or misleading at any stage, the project will be rejected and clearance given, if any, to the project will be revoked at our risk and cost."

Place : Ariyalur

Date :

Signature of the Applicant
TANCEM

DRAFT EIA REPORT

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>Draft EIA Report</i>
Project Proponent	<i>M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)</i>	
Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

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Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

1 Introduction

1.1 Preamble

Environment Impact Assessment (EIA) is a process used to identify the environmental, social & economic impacts of a project prior to decision making. It is a decision-making tool, which guides the project proponent in taking appropriate decisions for proposed projects. It aims to predict environmental impacts at an early stage of project planning and design, find ways and means to reduce adverse impacts, shape projects to suit the local environment and present the prediction options to the proponent. By using EIA, both environmental & economic benefits can be achieved. By considering environmental effects - prediction & mitigation, early benefits in project planning, protection of the environment, optimum utilization of resources, thus saving overall time & cost of the project. EIA also lessens conflicts by promoting community participation, informs project proponent, and helps to lay the base for environmentally sound projects.

The Ministry of Environment & Forests, Govt. of India, made environmental clearance (EC) for certain development projects mandatory through its notification of 27/01/1994 under the Environment Protection Act, 1986 and subsequently the MoEF came out with Environment Impact Notification, SO 1533(E), and dt.14/09/2006. It has been made mandatory to obtain environmental clearance for different kinds of developmental projects (Schedule-1 of notification). The proposed project falls under item 1(a) of the EIA notification, 2006.

1.2 General Information on Mining of Minerals

Minerals of Economic importance found in Ariyalur District are mainly Celestite, Limestone, Shale, Sandstone, Kankar and Phosphate nodules occur at various places in the district. Limestone of sedimentary origin has been found in Ariyalur and Sendurai Taluks.

The Limestone is cement grade to plus cement grade in quality and is used in the cement plants. Fireclay is used for the manufacture of floor tiles, stoneware pipes, fire bricks and in the chemical industry. Jayamkondam in Udayarpalayam Taluk is rich in Lignite, Oil and Gas reserves. Apart from the above major minerals the common use minor minerals viz., River sand, Laterite, Roughstone, Redgravel, Brickclay, pebbles, filling earth and Kankar are also found in this District. Internal trade of

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the district is developing on a large scale. Cement and limepowder are manufactured in Ariyalur. These products enter into the market in different parts of the country

1.3 Environmental Clearance

Notification dated 14th September 2006, vide S.O.1599(E), any project or activity specified in Category B. As per the Gazette Notification, dated 14th September 2006.

The proposed project is categorized under Category “B1” 1(a) (Cluster) - {Mining of Minerals} as the 500m radius area is more than 5 Ha including the mine lease area. Hence, the project will be considered at SEAC, Tamil Nadu.

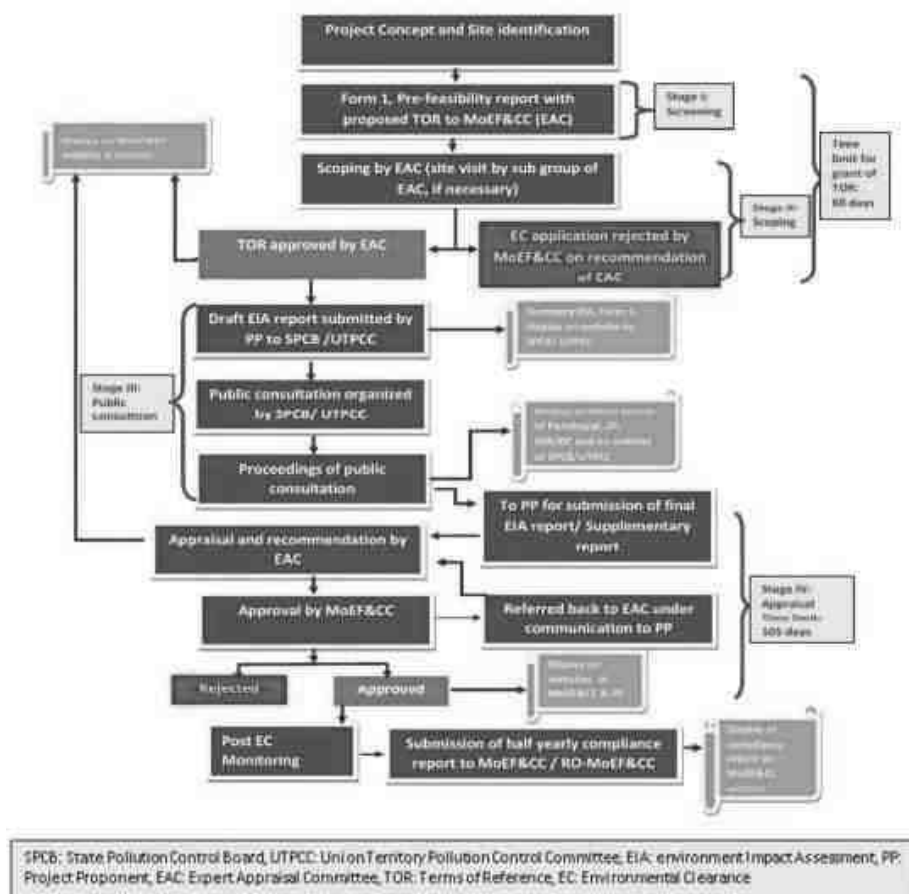


Figure 1-1 Environmental Clearance process

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1.4 Terms of Reference (ToR)

The terms of Reference has been issued by SEAC TN vide Letter No. SEIAA-TN/F. No. 7607/SEAC/ToR-797/2020 Dated: 21.10.2020. 18 additional ToR points were recommended by SEAC TN in addition to the Standard ToR Points. The replies for the same were addressed in this report

1.5 Post Environmental Clearance Monitoring

1.5.1 Methodology adopted

Post project monitoring will be carried out as per conditions stipulated in environmental clearance letter issued by SEIAA, consent issued by SPCB as well as according to CPCB guidelines. The lease area is considered as core zone and the area lying within 10 km radius from the lease boundary is considered as buffer zone, where some impacts may be observed on physical and biological environment. In the buffer zone slight impact may be observed and that too is occasional.

Table 1-1: Post Environmental Clearance Monitoring

S. No.	Description	Frequency of Monitoring
1.	Ambient Air Quality Monitoring	Quarterly/ Half Yearly
2.	Water level & Quality Monitoring	Quarterly/ Half Yearly
3.	Noise Level Monitoring	Quarterly/ Half Yearly
4.	Soil Quality Monitoring	Yearly
5.	Medical Check-up	Yearly

1.6 Generic Structure of the EIA Document

Chapter 1: Introduction: This chapter contains the general information on the mining of minerals, major sources of environmental impacts in respect of mining projects and details of environmental clearance process.

Chapter 2: Project Description: In this chapter the proponent should also furnish detailed description of the proposed project, such as the type of the project, need for the project, project location, layout, project activities during construction and operational phases, capacity of the project, project

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operation i.e., land availability, utilities (power and water supply) and infrastructure facilities such as roads, railways, housing and other requirements. If the project site is near a sensitive area it is to be mentioned clearly why an alternative site could not be considered. The project implementation schedule, estimated cost of development as well as operation etc should be also included.

Chapter 3: Analysis of Alternatives (Technology and Site): This chapter gives details of various alternatives both in respect of location of site and technologies to be deployed, in case the initial scoping exercise considers such a need.

Chapter 4: Description of Environment: This chapter should cover baseline data in the project area and study area.

Chapter 5: Impact Analysis and mitigation measures: This chapter describes the anticipated impacts on the environment and mitigation measures. The method of assessment of impacts including studies carried out, modelling techniques adopted to assess the impacts where pertinent should be elaborated in this chapter. It should give the details of the impacts on the baseline parameters, both during the construction and operational phases and suggests the mitigation measures to be implemented by the proponent.

Chapter 6: Environmental Monitoring Program: This chapter should cover the planned environmental monitoring program. It should also include the technical aspects of monitoring the effectiveness of mitigation measures.

Chapter 7: Additional Studies: This chapter should cover the details of the additional studies required in addition to those specified in the ToR and which are necessary to cater to more specific issues applicable to the particular project.

Chapter 8: Project Benefits: This chapter should cover the benefits accruing to the locality, neighbourhood, region and nation as a whole. It should bring out details of benefits by way of

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improvements in the physical infrastructure, social infrastructure, employment potential and other tangible benefits.

Chapter 9: Environmental Cost Benefit Analysis: This chapter should cover on Environmental Cost Benefit Analysis of the project.

Chapter 10: Environmental Management Plan: This chapter should comprehensively present the Environmental Management Plan (EMP), which includes the administrative and technical setup, summary matrix of EMP, the cost involved to implement the EMP, both during the construction and operational phase and provisions made towards the same in the cost estimates of project construction and operation. This chapter should also describe the proposed post-monitoring scheme as well as inter-organizational arrangements for effective implementation of the mitigation measures.

Chapter 11: Summary and Conclusions: This chapter gives the summary of the full EIA report condensed to ten A-4 size pages at the maximum. It should provide the overall justification for implementation of the project and should explain how the adverse effects have been mitigated.

Chapter 12: Disclosure of Consultants: This chapter should include the names of the consultants engaged with their brief resume and nature of consultancy rendered.

1.7 Details of Project Proponent

Project Proponent : M/s. Tamil Nadu Cements Corporation Limited
Status of the Proponent : Government
Proponent's Name & Address : M/s. Tamil Nadu Cements Corporation Limited
Deputy General Manager & Unit Head,
5th Floor, Aavin Illam,
No.3A, Pasumpon Muthuramalingam Salai,
Nandanam, Chennai– 600 035.

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Project Proponent	<i>M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)</i>	
Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

1.8 Brief Description of the Project

The applicant, M/s. Tamilnadu Cements Corporation Limited (TANCEM) is a public limited company (A Government of Tamilnadu undertaking). The organization is having very good knowledge and experience in Limekankar & Limestone mining in other Limestone area. M/s. Tamil Nadu Cements Corporation Limited (TANCEM), a wholly owned Government of Tamil Nadu undertaking. The company's main objective is production of cement and cement-based products and primarily caters to the needs of Government departments.

M/s. Tamil Nadu Cements Corporation Limited (TANCEM) applied for mining lease of Limekankar and Limestone in survey numbers – . 144/1A, 217/1A, 217/1C, 217/2, 217/3A, 217/3B, 217/4, 217/5, 217/6, 218/1, 219/1, 219/2A, 219/2B, 219/3A, 219/3B, 219/3C, 219/3D, 219/3E, 219/3F, 219/3G, 219/4A, 219/4B, 219/5A, 219/5B, 219/5C, 219/6, 219/8, 219/9, 220/1, 220/2A, 220/2B, 220/3A, 220/3B, 220/3C, 220/3D, 220/3E, 220/4, 220/5A, 220/5B, 220/6A, 220/6B, 220/7A, 220/7B, 220/8A, 220/8B, 220/9A, 220/9B, 220/9C, 220/10A, 220/10B, 220/11A, 220/11B, 221/1A & 221/15 in Pudupalayam Village, Ariyalur Taluk & District and Tamil Nadu State over an extent of 22.96.0 hectares in Patta Lands for a period of 10 years and 50 years respectively.

Precise Area Communication Letter was communicated vide Industries (MMA.2) Department, Secretariat, in Letter No. 3397/MMA.2/2019-1, Dated: 02.08.2019 for Preparation of Mining Plan and Obtaining Prior Environmental Clearance for Mining Limekankar and Limestone over an extent of 22.96.0 hectares for a period of 10 years and 50 years respectively.

1.9 Project Nature, Size & Location

As per EIA Notification, 2006 and its subsequent amendments (O.M vide No.F.No.L-11011/175/2018-IA-II(M) Govt of India MOEF&CC on December 12th 2018) project comes under category B1 cluster & schedule 1(a) under item 1.

Proposed proposal pertains to Limestone and Limekankar mining project. Excavators will be deployed for the formation of benches and loading. Rock breaker is proposed for development and production activities. No drilling and blasting is carried out. The project is located at Pudupalayam

<i>Project</i>	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>Draft EIA Report</i>
<i>Project Proponent</i>	<i>M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)</i>	
<i>Project Location</i>	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

Village, Ariyalur Taluk, Ariyalur District, Tamil Nadu. It is a plain terrain. The total allotted mine lease for the proposed project is 22.96.0 Ha with their maximum annual production capacity i.e. 1119000 Tonnes of Limestone and 191626 Tonnes of Limekankar to be mined for (Sixty months) Five years only.

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Project Proponent	<i>M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)</i>	
Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

2 Project Description

This chapter furnishes detailed description of the proposed project, such as the type of the project, need for the project, project location, layout, project activities during mining, capacity of the project, project operation i.e., land availability, utilities (power and water supply) and infrastructure facilities such as roads, railways, housing and other requirements. The project implementation schedule estimated cost for carrying out entire mining activity is included.

2.1 General

The applicant, M/s. Tamilnadu Cements Corporation Limited (TANCEM) is a public limited company (A Government of Tamilnadu undertaking). The organization is having very good knowledge and experience in Limekankar & Limestone mining in other Limestone area. M/s. Tamil Nadu Cements Corporation Limited (TANCEM), a wholly owned Government of Tamil Nadu undertaking. The company's main objective is 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 Taluks of Tamil Nadu State, which are sufficient to run the cement plants for decades to come. Limestone found in the region is a sedimentary rock type consisting chiefly (more than 50% by weight or by areal percentages under the microscope) of calcium carbonate, primarily in the form of the mineral calcite, and with or without magnesium carbonate; specifically a carbonate sedimentary rock containing more than 95% calcite and less than 5% dolomite. Common minor constituents include silica (chalcedony), feldspar, clays, pyrite, and siderite. Limestone formation is by either organic or inorganic processes, and may be detrital, chemical, oolitic, earthy, crystalline, or recrystallized; many are highly fossiliferous and clearly represent ancient shell banks or coral reefs.

Limestone includes chalk, calcarenite, coquina, and travertine, and they effervesce freely with any common acid. Limekankar are masses or layers of calcium carbonate, usually occurring in nodules, found in the older alluvium or stiff clay of the Indo-Gangetic plain or precipitated calcium carbonate in the form of cement in porous sediments or as a coating on pebbles. Limekankar is extensively used for producing

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Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

hydraulic lime. The nodules should have a blue grey fracture, free of any sand grains or mud sticking to them, and broken to pass a 12 mm gauge before being calcined.

M/s. Tamil Nadu Cements Corporation Limited (TANCEM) applied for mining lease of Limekankar and Limestone in survey numbers – . 144/1A, 217/1A, 217/1C, 217/2, 217/3A, 217/3B, 217/4, 217/5, 217/6, 218/1, 219/1, 219/2A, 219/2B, 219/3A, 219/3B, 219/3C, 219/3D, 219/3E, 219/3F, 219/3G, 219/4A, 219/4B, 219/5A, 219/5B, 219/5C, 219/6, 219/8, 219/9, 220/1, 220/2A, 220/2B, 220/3A, 220/3B, 220/3C, 220/3D, 220/3E, 220/4, 220/5A, 220/5B, 220/6A, 220/6B, 220/7A, 220/7B, 220/8A, 220/8B, 220/9A, 220/9B, 220/9C, 220/10A, 220/10B, 220/11A, 220/11B, 221/1A & 221/15 in Pudupalayam Village, Ariyalur Taluk & District and Tamil Nadu State over an extent of 22.96.0 hectares in Patta Lands for a period of 10 years and 50 years respectively.

Precise Area Communication Letter was communicated vide Industries (MMA.2) Department, Secretariat, in Letter No. 3397/MMA.2/2019-1, Dated: 02.08.2019 for Preparation of Mining Plan and Obtaining Prior Environmental Clearance for Mining Limekankar and Limestone over an extent of 22.96.0 hectares for a period of 10 years and 50 years respectively.

2.2 Type of the project:

As per EIA Notification, 2006 and its subsequent amendments (O.M vide No.F.No.L-11011/175/2018-IA-II(M) Govt of India MOEF&CC on December 12th 2018) project comes under category B1 cluster & schedule 1(a) under item 1. The project required to be appraised at state level by State Environment Impact Assessment Authority, Tamil Nadu. Environment Clearance study will involve preparation of draft EIA report on the basis of baseline & impact assessment study is carried out. Also, before appraisal, under 7(III) of EIA notification 2006, the project involves the Public Consultation and the same will be conducted under SPCB (TN) in Ariyalur District. The proceedings of the same will be incorporated in the Final EIA Report.

2.3 Need for the project:

India is the second largest producer of cement in the world. India has a lot of potential for development in the infrastructure and construction sector and the cement sector is expected to largely

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Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

benefit from it. Some of the recent initiatives, such as development of 98 smart cities, is expected to provide a major boost to the sector.

Aided by suitable Government foreign policies, several foreign players such as Lafarge-Holcim, Heidelberg Cement, and Vicat have invested in the country in the recent past. A significant factor which aids the growth of this sector is the ready availability of raw materials for making cement, such as limestone and coal. Higher government spending on infrastructure and housing will be a key growth driver for the industry. The government has placed significant emphasis on infrastructure development with the aim of making 100 smart cities,

The said project plays a significant role in the domestic as well as infrastructural market. Limestone and Limekankar are the key raw materials in the manufacturing process of Cement. The limestone of 307152 Tonnes/Annum and Limekankar 41344 Tonnes/Annum will be used to manufacture 226296.1 Tonnes/Annum of Cement. The manufacturing process of the cement is shown below.

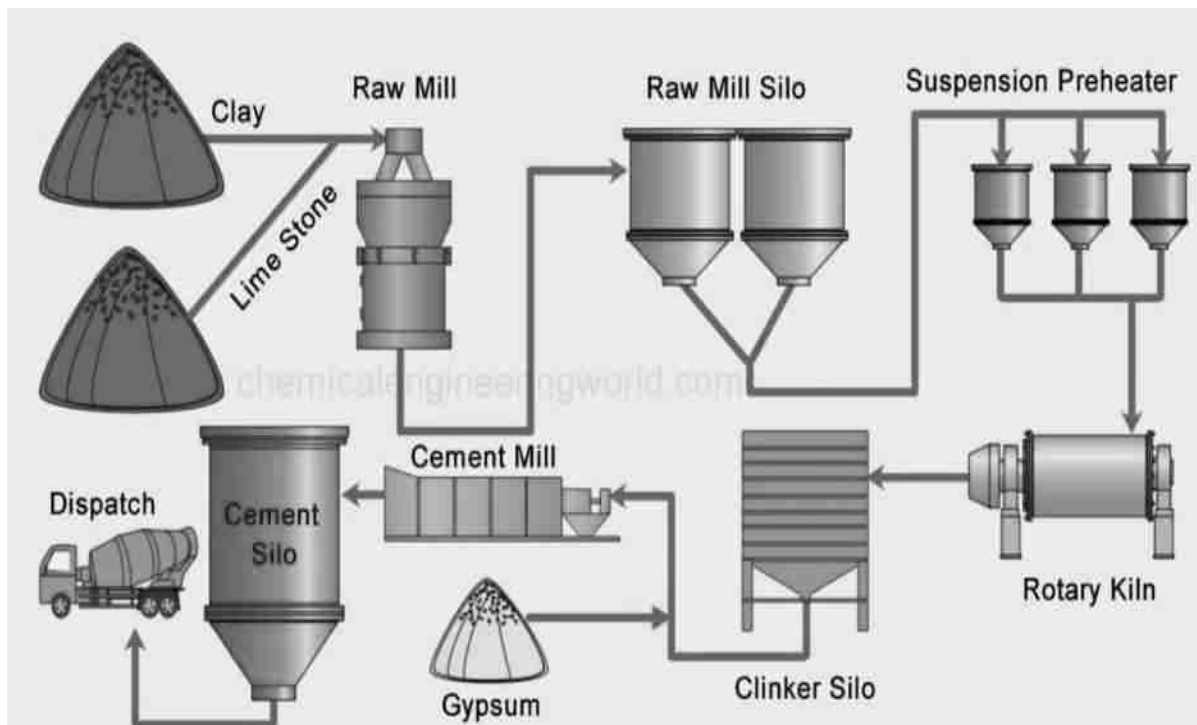


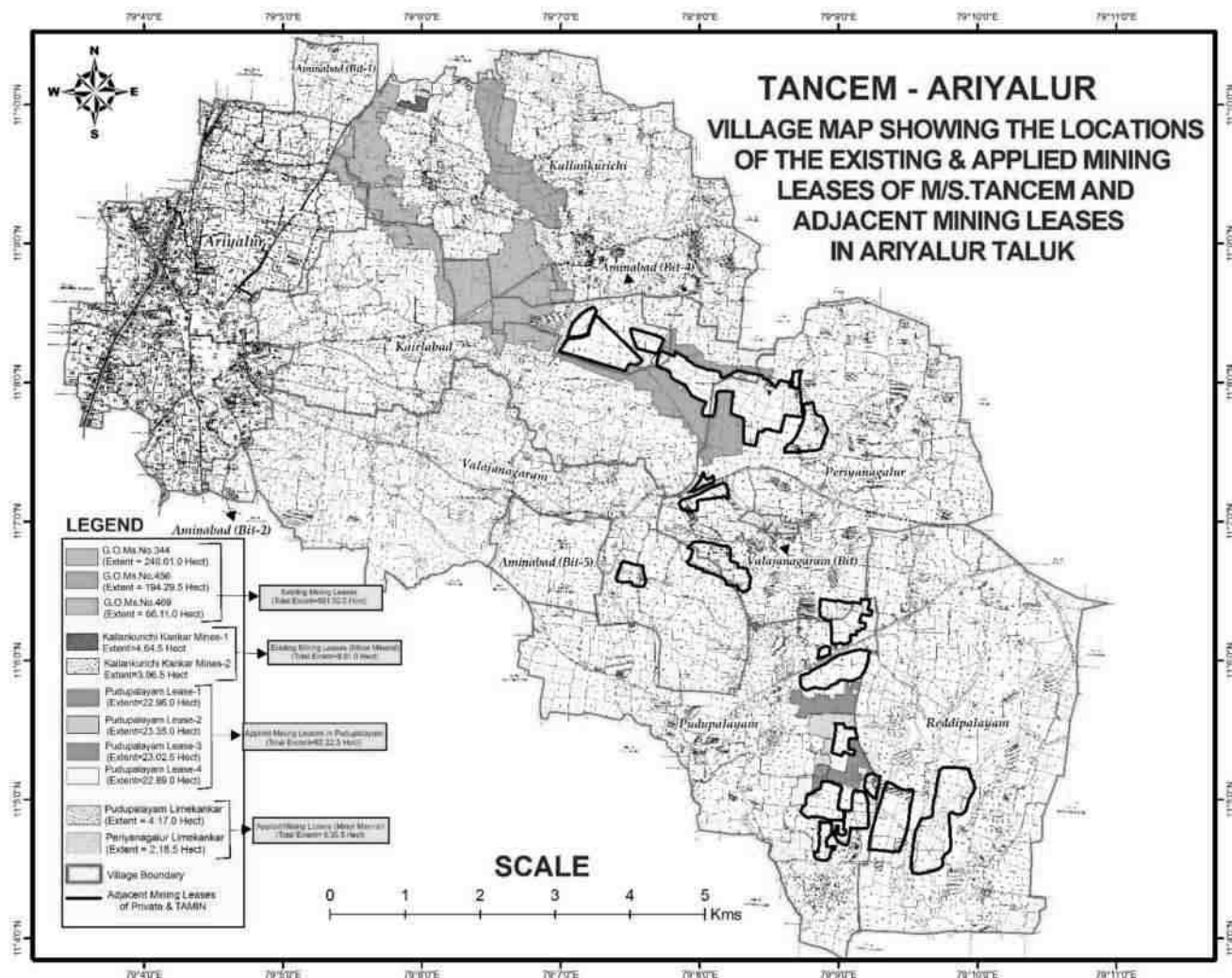
Figure 2.1 Manufacturing process of cement

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Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	

2.4 Brief Description of the project

The District is rich in mineral deposits. Celeste, Lime Stone, Shale, Sand Stone, Canker and Phosphate nodules occur at various places in the district. Limestone of sedimentary origin has been found in Ariyalur and Sendurai Taluks. The Limestone is cement grade to plus cement grade in quality and is used in the cement plants. The predominant mining of Limestone and Limekankar in the district is carried out by Chettinad Cements, Dalmia Cements, TAMIN, RAMCO, Venkateswara Cements, Ultratech Cements, India Cements & TANCEM.

The Village Map showing the Locations of the Existing and Applied Mining Leases in the Ariyalur District



Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>Draft EIA Report</i>
Project Proponent	<i>M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)</i>	
Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

Figure 2-2 Village Map showing the Locations of the Existing and Applied Mining Leases in the Ariyalur District

The mined out mineral will be transported to Ariyalur Cement Factory, which is located at 7.8km, NW from the mine lease boundary. The site connectivity to Ariyalur Cement Factory is shown below

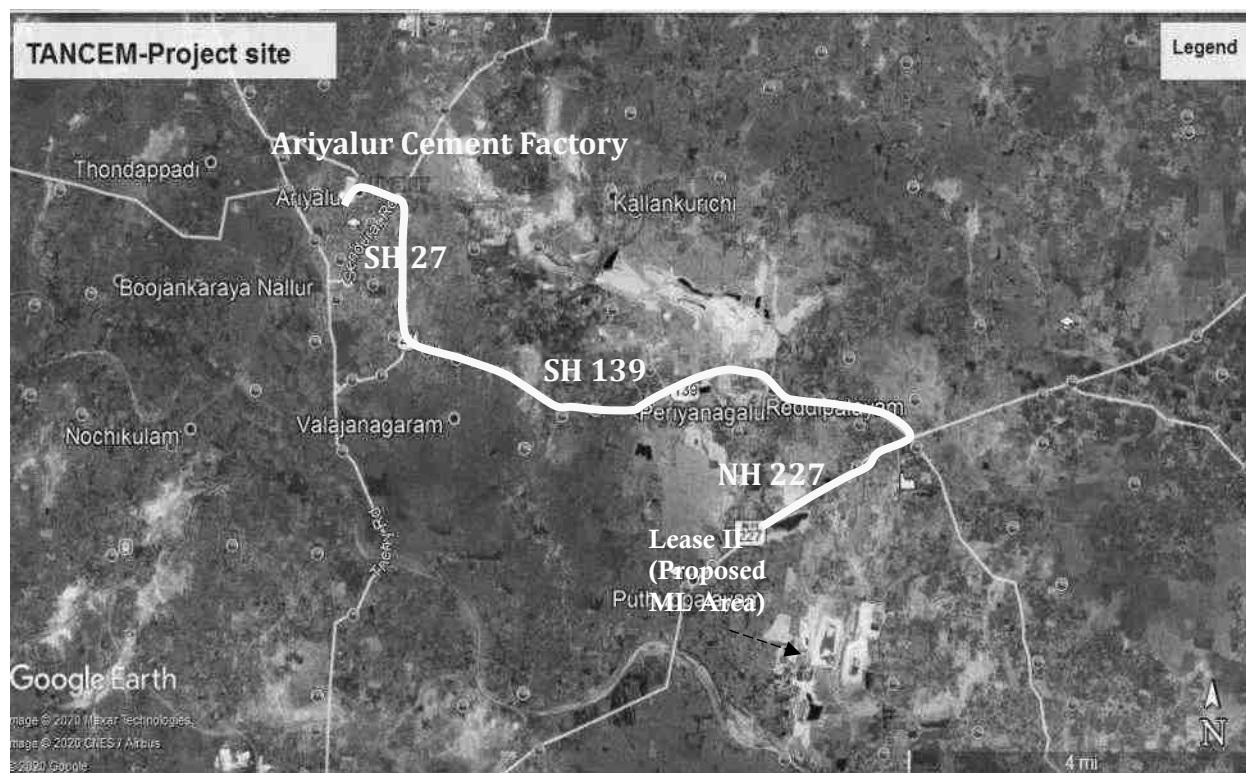


Figure 2-3 Site Connectivity to TANCEM, Ariyalur Cement Factory

The Photographs of TANCEM, Ariyalur Cement Factory is shown Below



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Figure 2-4 Photographs of the TANCEM, Ariyalur Cement Factory

The salient features of the project is listed below

Table 2-1 Salient Features of the Project

S. No.	Description	Details
1	Project Name	Pudupalayam Limekankar & Limestone Deposit
2	Proponent	M/s. TamilNadu Cement Corporation Limited
3	Mining Lease Area Extent	22.96.0 Ha
4	Location	144/1A, 217/1A, 217/1C, 217/2, 217/3A, 217/3B, 217/4, 217/5, 217/6, 218/1, 219/1, 219/2A, 219/2B, 219/3A, 219/3B, 219/3C, 219/3D, 219/3E, 219/3F, 219/3G, 219/4A, 219/4B, 219/5A, 219/5B, 219/5C, 219/6, 219/8, 219/9, 220/1, 220/2A, 220/2B, 220/3A, 220/3B, 220/3C, 220/3D, 220/3E, 220/4, 220/5A, 220/5B, 220/6A, 220/6B, 220/7A, 220/7B, 220/8A, 220/8B, 220/9A, 220/9B, 220/9C, 220/10A, 220/10B, 220/11A, 220/11B, 221/1A & 221/15, Pudupalayam Village, Ariyalur Taluk, Ariyalur District, Tamil Nadu.
5	Latitude	11°05'34.95" N to 11°05'50.96" N
6	Longitude	79°08'38.65" E to 79°09'09.41" E
7	Topography	Plain terrain
8	Site Elevation above MSL	≈55 m from above MSL
9	Topo sheet No.	58 M/04

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Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

10	Minerals of Mine	Limekankar & Limestone
11	Proposed production of Mine	<p>Limestone capacity of ROM: Geological Reserves : 17,68,310 Tones 5 years Production : 1119000 Tones</p> <p>Limekankar capacity of ROM Geological Reserves : 1,91,626 Tones 5 years Production : 191626 Tones</p>
12	Ultimate depth of Mining	17.75 m Below Ground Level (2m Top soil + 0.75 Limekankar + 15m Limestone)
13	Method of Mining	Opencast mechanized mining by using Mega Rock Breaker, Excavators for loading operations and tippers for transport of minerals from the project site to factory. Drilling and Blasting operation is based on the rock formation
14	Water demand	22.65 KLD
15	Source of water	Water will be supplied from existing mine of TANCEM which is covered in Mining Lease G.O. No. 344 and from nearby vendors.
16	Man power	13 Nos.
17	Mining Lease	Precise Area Communication Letter was communicated vide Industries (MMA.2) Department, Secretariat, in Letter No. 3397/MMA.2/2019-1, Dated: 02.08.2019
18	Mining Plan Approval	Mining Plan was approved by The Indian Bureau of Mines, Chennai vide letter no. TN/ALR/LST&KNK/MP/2061.MDS dated 09.10.2019.
20	Boundary Fencing	7.5m, 50m safety distance provided to the boundary, fencing will be provided.

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22	Ground water	The quarry operation is proposed up to a depth of 17.75 m below ground level. The water table is below 35 m from ground level which is observed from the nearby bore wells and wells. Hence the ground water will not be affected in any manner due to the quarrying operation during the entire lease period.
23	Habitations within 500m radius of Project Site	There is no Habitation within 500m radius
24	Drinking water	Water will be supplied from existing mine of TANCEM which is covered in Mining Lease G.O. No. 344 and from nearby vendors



Figure 2-5: Google Earth Image of the Project Site

Project	Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha	Draft EIA Report
Project Proponent	M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)	
Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	

2.4.1 Details of Quarry within 500m Radius – Cluster Mines

The mines within 500m radius from the project site is listed below

Table 2-2: Quarry within 500m Radius

S. No	Name of the the owner	Taluk & Village	S. F. Nos.	Extent (in Ha) & G.O.No.	Mineral	Lease period
Existing Mines						
1.	Tvl. Ramco Cements Ltd	Ariyalur & Pudupalayam	226/7 etc	4.83.0 GO (3D) 5 dated 04.01.1995	Limestone	16.06.1995 to 15.06.2015 Deemed to be extended upto 15.06.2035
2.	Tvl. Chettinad Cements Ltd	Ariyalur & Pudupalayam	207,208 etc	37.01.0 GO No. 27 dated 11.06.1989	Limestone	09.02.1989 to 08.02.2009 Deemed to be extended upto 08.02.2039
Proposed Mines						
1	Tvl. TANCEM	Ariyalur & Pudupalayam	144,217,218 etc	22.96.0	Limestone & Limekankar	-
2	Tvl. TANCEM	Ariyalur & Pudupalayam	229,230 etc	23.02.5	Limestone & Limekankar	-
3	Tvl. TANCEM	Ariyalur & Pudupalayam	221/1, 2A, etc	23.35.0	Limestone & Limekankar	-
Expired and abandoned Mines						
Nil						

2.4.2 Site Connectivity:

The site is connected to NH 227 (1.4m, N) through Nerinjikorai. Cement and limepowder are manufactured in Ariyalur. These products enter into the market in different parts of the country.

Project	Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha	Draft EIA Report
Project Proponent	M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)	
Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	

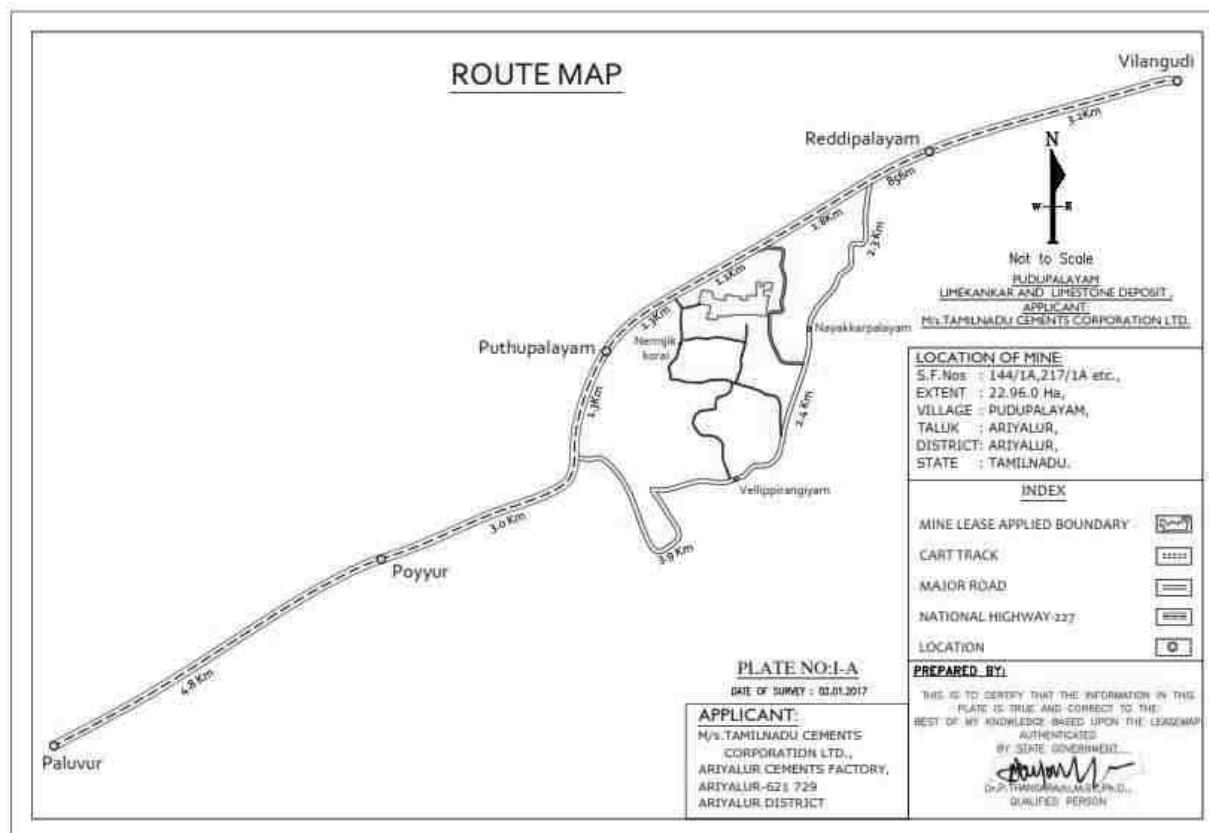


Figure 2-6 Site Connectivity

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>Draft EIA Report</i>
Project Proponent	<i>M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)</i>	
Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

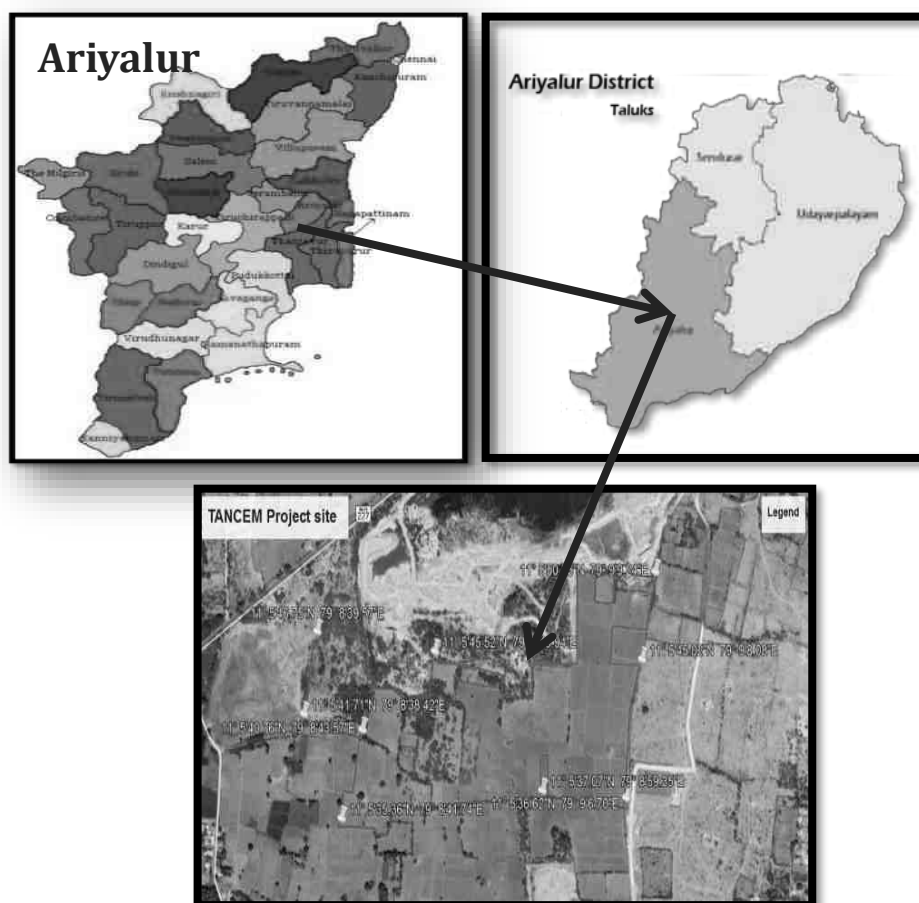


Figure 2-7: Location Map of the Project Site

2.5 Location Details:

Table 2-3: Location Details

S. No	Particulars	Details
1.	Latitude	11° 05' 34.95" to 11° 05' 50.96"N
2.	Longitude	79° 08' 38.65" to 79° 09' 09.41"E
3.	Site Elevation above MSL	56m from MSL
4.	Topography	Plain terrain
5.	Land use of the site	Patta Land
6.	Extent of lease area	22.96.0 Ha

Project	Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha	Draft EIA Report
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Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	



Figure 2-10: Coordinates of the project site

2.5.1 Site Photographs

The site photographs of the project site are as follows



Figure 2-21: Site Photographs

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>Draft EIA Report</i>
Project Proponent	<i>M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)</i>	
Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

2.5.2 Land Use Breakup of the Mine Lease Area

The area is a plain terrain. The altitude of the area is 55.0m above MSL. The area is sloping towards southeast. It is a dry land. Only seasonal cultivation is done in the surrounding area. In some areas, agriculture is done with lift irrigation. The main crops being cereals, pulses etc. The land use pattern in and around the mine have no adverse effect in the environment changes.

The land use pattern at the end of the lease period:

Table 2-4: Land use pattern

S. No	Land Use	Mine lease Area (Ha)
1	Mining	11.76.3
2	Dump	01.51.4
3	Office & Infrastructure	00.05.0
4	Mine Roads	00.10.0
5	Green Belt Development	03.10.9
6	Un utilized area	06.4.2
	Total	22.96.0

2.5.3 Human Settlement

There are no habitations within the radius of 500m. the nearby habitations are as follows

Table 2-5: Habitation

S. No.	Name of the Villages	Approximate Distance & Direction from Project Site (km)	Population
1	Reddipalayam	3.6 (NE)	4150
2	Periyathirukkonam	3.5 (SE)	2750
3	Pudupalayam	1.4 (SW)	3650
4	Periyanagalur	2.7 (N)	3600

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Project Proponent	M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)	
Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	

2.5.4 Village Map

The Pudupalayam Village map is given below

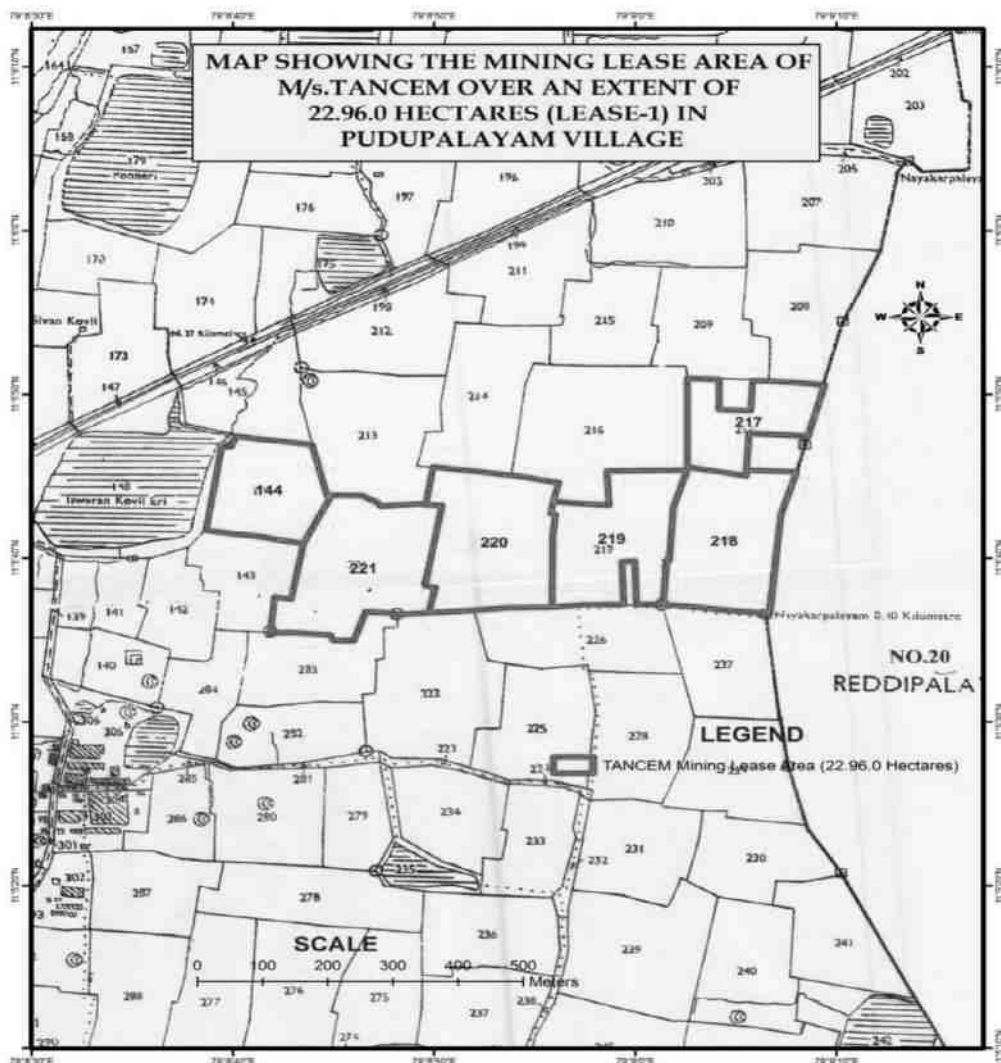


Figure 2-32: Pudupalayam Village map

2.6 Leasehold Area

The proposed Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha is a own patta land of M/s. TamilNadu Cement Corporation Limited. The lease area falls in S.F. No. 144/1A, 217/1A, 217/1C, 217/2, 217/3A, 217/3B, 217/4, 217/5, 217/6, 218/1, 219/1, 219/2A, 219/2B, 219/3A, 219/3B, 219/3C, 219/3D, 219/3E, 219/3F, 219/3G, 219/4A, 219/4B, 219/5A, 219/5B, 219/5C, 219/6, 219/8, 219/9, 220/1, 220/2A, 220/2B, 220/3A, 220/3B, 220/3C, 220/3D, 220/3E, 220/4,

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>Draft EIA Report</i>
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Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

220/5A, 220/5B, 220/6A, 220/6B, 220/7A, 220/7B, 220/8A, 220/8B, 220/9A, 220/9B, 220/9C, 220/10A, 220/10B, 220/11A, 220/11B, 221/1A & 221/15, Pudupalayam Village, Ariyalur Taluk, Ariyalur District, Tamil Nadu.. There is no reserve forest or protected forest land within the lease area. There is neither human settlement within 500m radius from the lease area.

2.7 Geology

The area around Ariyalur forms parts of the well-known cretaceous formation of Trichinopoly. The sedimentary formations of coralline limestone belongs to the cretaceous system and rest over archaean formations. The Limestone is creamy white in colour. Marine organisms such as shells, corals, microfossils, ammonites, Gryphea, crinoids formed them and foraminifera are composed chiefly of CaCO₃ with varying amounts of impurities such as sand, glauconite, ferruginous, phosphatic and bituminous matter.

The organic material rich in magnesium has given rise to magnesium bearing limestone in certain areas. The Limestone is hard, compact and amorphous in nature and indurated layers of limestone due to structural deformation and intense weathering. These organic limestones are basically marine sediments derived from rich coral-lime shells and other remains.

Topsoil:

The topsoil is black cotton soil. It occurs to a depth of 2m and lies over the limekankar formations.

Kankar:

Kankar has developed over the limestone extensively and ranges in thickness of 0.75 meters. The formation of Kankar is evidently due to the alternating wet and dry spells of tropical climate, which has caused leaching out of the clayey and siliceous portions in the top layer of limestone. Thus, though the Kankar is porous, pisolitic and red in colour due to dispersion of iron oxide, it analyses very high in calcium carbonate content (generally 85 to 95 per cent CaCO₃). The fragments of shells as well as cementing calcareous medium make the Kankar hard and difficult to break. The Kankar is at present being mined for manufactures slaked lime in country kilns for use in construction.

The following geological setup has been identified for these deposits of cretaceous age and the order of superposition is described.

Upper : Niniyur

Cretaceous age Middle : Ariyalur, Trichinopoly

Project	Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha	Draft EIA Report
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Lower : Uttatur

The area was surveyed in detail to prepare a Geological map in the scale of 1:2000 showing the various formations and attitude of the deposit. It is inferred that the Limekankar& Limestone mineral is of grade suitable for cement industries and in form single bed running N-S with Vertical dipping. Topsoil cover to a depth of 2.0m followed by 0.75m of Limekankar. Recovery of minerals is estimated as 100% of the total excavation of the ore body. The recovery percentage is based on the knowledge gained from the adjacent working mine in this region, by the field tests carried out in the lease area and analysis done in NABL Laboratories.

The physical attitude of the Limekankar& Limestone deposits is demarked as follows:

Strike length (m) : 586 (max)

Width (m) : 326 (max)

Depth (m) : 17.75m with an average of 2m Topsoil & 0.75m Limekankar

Strike direction : N – S

Dip amount and direction : Vertical dip

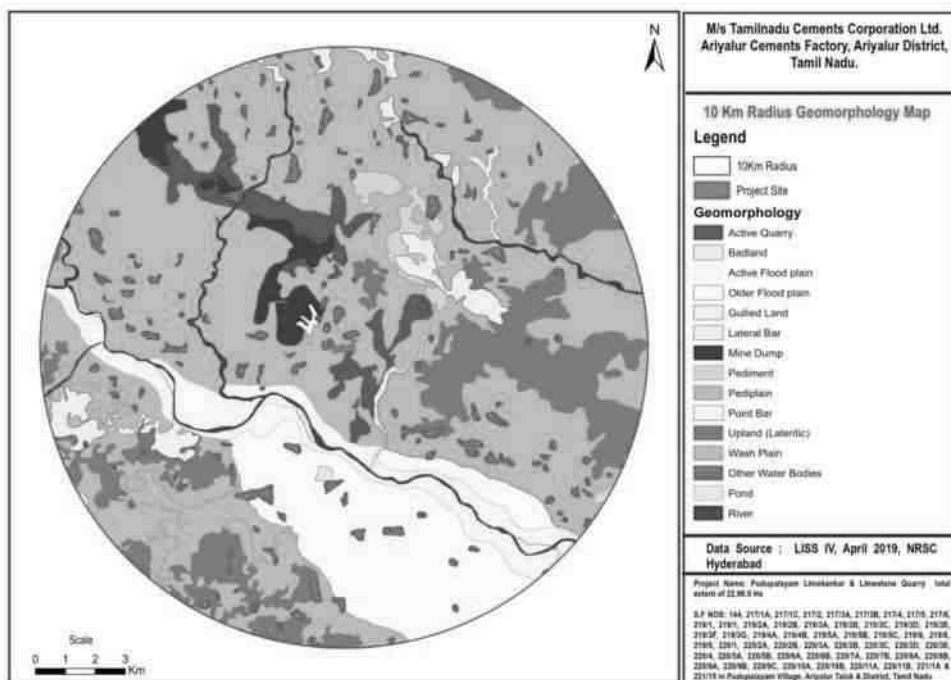


Figure 2-13: Geomorphology

The proposed project lies in the active quarry area.

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>Draft EIA Report</i>
Project Proponent	<i>M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)</i>	
Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

2.8 Quality of Reserves:

The mining lease area is of 22.96.0 Ha, with production capacity of 1119000 Ts of Limestone and 191626 Ts of Limekankar and 480420 Ts of topsoil for the period of Five Years. Due to significant role in the domestic as well as infrastructural market, making the mining of Stone along with associated minor minerals is economically viable.

Table 2-6: Details of Mining

S.No	Particulars	Details
1	Method of Mining	Open Cast mechanized
2	Geological Reserves	Limestone – 17,68,310 Tones Limekankar – 191626 Tones
3	Proposed Production	Limestone - 1119000 Tones Limekankar - 191626 Tones
4	Elevation Range of the Mine Site	56m MSL
5	Bench Height	One bench is proposed on the topsoil with 2.0m height and width with 45° slope. In Limekankar mineral one bench is proposed with 0.75m height and width with 60° slope.

2.9 Estimation of Reserves

Reserves are calculated based on the drilled core drills data, adjacent mine pit, nullah, vari and reservoir. Hence the deposit has been estimated upto 17.75m depth with an average of 2.0m topsoil and 0.75m Limekankar during the present mining plan period.

The estimation of mineral reserves is done by cross sections method. For Reserve calculation the length and width of the deposit is shown in the Geological plan & cross sections. (Attached as Annexure). Recovery of Limekankar & Limestone mineral is estimated as 100% of the total excavation of the ore body. The recovery percentage is based on the knowledge gained from the adjacent working mine in this belt and by the analysis done in NABL Laboratories. The bulk density has been reckoned as 2.0 for Limestone & 2.25 for Limekankar.

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>Draft EIA Report</i>
Project Proponent	<i>M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)</i>	
Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

As analyzed by NABL laboratories limestone which has more than 70% CaCO₃ is best suited for cement industries. More than 70% CaCO₃ Limekankar material is used for blending with limestone in these particular formations.

2.10 Geological Reserves

The geological reserves have been calculated based on the cross section method. Availability of Geological Resources is given below.

Table 2-1: Geological & Mineable Reserves

Descripti on	Section	ROM (Ts)	Limestone @100% Recovery (Ts)	ROM (Ts)	Limekankar @100% Recovery (Ts)	Topsoil (Ts)
Mineral Reserves	X8 Y8-CD	9288	9288	1863	1863	5880
	X9Y9-GH	160446	160446	14000	14000	37296
	X3Y3-IJ	94128	94128	21738	21738	55692
	X4Y4-IJ	60000	60000	26325	26325	65600
	X5Y5-IJ	242000	242000	21600	21600	52400
	X5Y5-KL	148320	148320	14588	14588	36848
	X6Y6-IJ	138800	138800	12825	12825	31600
	X6Y6-KL	139480	139480	13667	13667	34960
	X7Y7-IJ	304800	304800	28013	28013	68800
	X9Y9-IJ	471048	471048	37007	37007	91344
	Total	1768310	1768310	191626	191626	480420

Project	Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha	Draft EIA Report
Project Proponent	M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)	
Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	

2.11 Year wise Production Plan

The production of minerals for the next five years as per the mining plan is given Table

Table 2-8: Year wise Production Plan

Yearwise Production Details																	
Year	Section	Bench	Length in (m)	Width in (m)	Depth in (m)	Limestone				Limekankar				Topsoil	Location of advancement	Ore to Overburden ratio	
						Volume in (Cu.m.)	Bulk Density	ROM (Ts)	Limestone @ 100% Recovery (Ts)	Volume in (Cu.m.)	Bulk Density	ROM (Ts)	Limekankar @ 100% Recovery (Ts)				
I Year	X3Y3-JJ	I	119	117	2	27846	2	-	-	-	-	-	-	55692	West-East	1:1.06	
		II	113	114	0.75	-	-	-	-	9882	2.25	21738	21738	-			
		III	106	111	4	47064	2	84128	84128	-	-	-	-	-			
	X4Y4-JJ	I	164	100	2	32800	2	-	-	-	-	-	-	65800			
		II	156	100	0.75	-	-	-	-	11700	2.25	26325	26325	-			
		I	131	100	2	26200	2	-	-	-	-	-	-	52400			
	X5Y5-JJ	II	128	97	0.75	-	-	-	-	9312	2.25	20952	20952	-			
Total							94128	94128	-	-	69015	69015	173692				
II Year	X4Y4-JJ	III	150	100	2	30000	2	60000	60000	-	-	-	-	-	West-East	1:0.30	
	X5Y5-JJ	II	128	3	0.75	-	-	-	-	268	2.25	648	648	-			
		III	125	100	6	75000	2	150000	150000	-	-	-	-	-			
	X5Y5-KL	I	98	94	2	16424	2	-	-	-	-	-	-	36848			
		II	95	91	0.75	-	-	-	-	6484	2.25	14568	14568	-			
	X6Y6-JJ	III	92	88	6	46576	2	97152	97152	-	-	-	-	-			
		I	79	100	2	15800	2	-	-	-	-	-	-	31600			
	X6Y6-KL	II	76	97	0.75	-	-	-	-	5529	2.25	12440	12440	-			
		I	92	95	2	17480	2	-	-	-	-	-	-	34960			
	II	89	91	0.75	-	-	-	-	6074	2.25	13667	13667	-				
Total							307152	307152	-	-	41344	41344	103408				
III Year	X6Y6-JJ	II	76	3	0.75	-	-	-	-	171	2.25	385	385	-	West-East	1:0.21	
		III	73	100	6	43600	2	87600	87600	-	-	-	-	-			
	X6Y6-KL	III	86	88	6	45408	2	90816	90816	-	-	-	-	-			
		I	172	100	2	34400	2	-	-	-	-	-	-	68800			
	X7Y7-JJ	II	168	100	0.75	-	-	-	-	12450	2.25	28013	28013	-			
		III	100	100	6	60000	2	120000	120000	-	-	-	-	-			
Total							298416	298416	-	-	28397	28397	68800				
IV Year	X7Y7-JJ	III	60	100	6	36000	2	72000	72000	-	-	-	-	-	West-East	1:0.40	
		I	173	132	2	45672	2	-	-	-	-	-	-	91344			
	X8Y8-JJ	II	170	129	0.75	-	-	-	-	16448	2.25	37007	37007	-			
		III	80	126	6	60480	2	120960	120960	-	-	-	-	-			
	Total							192960	192960	-	-	37007	37007	91344			
V Year	X8Y8-JJ	III	87	132	6	66904	2	137808	137808	-	-	-	-	-	West-East	1:0.18	
	X9Y9-GH	I	126	74	2	18648	2	-	-	-	-	-	-	37296			
		II	122	68	0.75	-	-	-	-	6222	2.25	14000	14000	-			
	X8Y8-CD	III	119	62	6	44268	2	88536	88536	-	-	-	-	-		1:0.37	
		I	49	30	2	2940	2	-	-	-	-	-	-	5880			
		II	46	24	0.75	-	-	-	-	828	2.25	1863	1863	-			
		Total							226344	226344	-	-	15863	15863			43176
Grand Total										1119000	1119000	-	-	191626	191626	480420	

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Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	

Proposed Yearwise production - Summary

Year	Limestone		Limekankar		Topsoil (Ts)	Ore to Overburden Ratio
	Limestone ROM (Ts)	Limestone @ 100% Recovery (Ts)	Limekankar ROM (Ts)	Limekankar @ 100% Recovery (Ts)		
I year	94128	94128	69015	69015	173692	1;1.06
II Year	307152	307152	41344	41344	103408	1;0.30
III Year	298416	298416	28397	28397	68800	1;0.21
IV Year	192960	192960	37007	37007	91344	1;0.40
V Year	226344	226344	15863	15863	43176	1;0.18
Total	1119000	1119000	191626	191626	480420	1;0.37

The proposed year wise production plans are attached as **Annexure**.

he applicant has proposed to carry out 1119000 Ts of Limestone and 191626 Ts of Limekankar and 480420 Ts of topsoil for the period of Five Years.

2.12 Type of Mining

2.12.1 Method of Working:

Excavators will be deployed for the formation of benches and loading. Rock breaker is proposed for development & production activities. Neither drilling nor blasting is carried out.

One bench is proposed on the topsoil with 2.0m height and width with 45° slope. In Limekankar mineral one bench is proposed with 0.75m height and width with 60° slope. In Limestone mineral two benches are proposed with 6.0m height and 6m width and another one bench is proposed with 3.0m height and 3m with 60° slope. During the mining plan period, the mining operations are proposed to be carried out in the 1st year Northern side of Block-IV, 2nd and 3rd year is proposed in progress to southern side of the Block-IV, 4th year is proposed continuously Block IV, III & II and 5th year is proposed in northern side of Block-II and Block-I of the area applied for mining lease starting from Northern side of Block-IV and

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progress towards the Northern side of Block -I by open cast method with two benches are 6m bench height and 6m bench width and another one bench 3m bench height and 3m bench width for a limestone mineral upto a depth of 17.75mts with an average of 0.75m limekankar and 2.0m Topsoil from RL 55.0m to RL 46.25m.

2.12.2 Dump rehandling

It is a fresh mining lease applied area. Hence, re handling of waste dumps does not arise at present.

2.12.3 Machineries to be used

Type of machineries proposed for quarrying operation for the entire project is listed below.

Table 2-9: List of Machineries used

For Mining operation	<i>Hydraulic excavator attached with rock breaker – 2 Nos each of 0.6 Cum Bucket capacity.</i> Details Make – TATA Hitachi Motive power – Diesel and H.P – 900 <i>Taurus – 6 Nos. each with 20 tonnes capacity</i> Details Make – Leyland Motive power – Diesel and H.P – 90
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2.12.4 Disposal of waste

There is no Mineral reject, the entire lease area consists of whole area deposit. Hence quantities of generation of mineral rejects in this area applied for mining lease does not arise.

The existing waste dumps from the adjacent Mining lease are situated in the northern side of the area; presently sufficient area is proposed for working other than dumping area. Hence there is no proposal for re-handling the same during the present plan period.

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The generation of topsoil during the present plan period will be temporarily dumped on the Northwestern portion of the area and also utilized for Afforestation purposes. This aspect has been considered and accordingly Conceptual Mining Plan is drawn. The details of quantity of waste generation at the end of the mine life of the mine is details in Mining plan

2.12.5 Backfilling of voids

There is no proposal for backfilling the mined-out pit in this mining plan period.

2.12.6 Overburden

Topsoil & Limekankar is the overburden found in the area applied for mining lease.

2.13 Man Power Requirements

The manpower requirement to meet out the production Schedule and the machinery strength envisaged in the mining plan and to comply with the statutory provisions of the Mines Safety Regulations is as follows.

Table 2-20: Man Power Requirements

S. No.	Designation	Nos.
1.	Mines Manager	1
2.	Mines Engineer	1
3.	Geologist	1
4.	Mine Foreman	1
5.	Mines Office clerk (full time)	1
6.	Skilled Labour (Mate/Supervisor)	1
7.	Semi Skilled (Drivers & Operators)	5
8.	Unskilled Labours	2
	Total	13

No child less than 21 years will be entertained during quarrying operations.

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Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

2.14 Water Requirement

Total water requirement for the mining project is 22.65 KLD. The 90% water will be required for the suspension of dust and green belt development domestic water will be sourced from existing mine of TANCEM which is covered in Mining Lease G.O. No. 344 and from nearby vendors

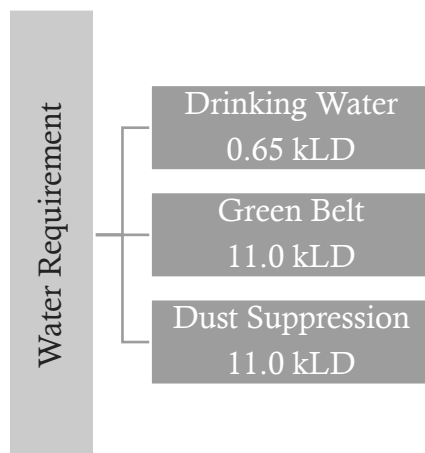


Figure 2-14: Water Balance Chart

Source of water from existing mine of TANCEM – Photographs



Figure 2-15 Source of water from existing mine of TANCEM

2.15 Project Implementation Schedule

The implementation schedule of the proposed Mine Lease of M/s. TamilNadu Cement Corporation Limited (22.96.0 ha) is as follows.

Project	Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha	Draft EIA Report
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MINING SCHEDULE					
Activity	June-22	Jun-23	Jun-24	Jun-25	Jun-26
Site Clearance					
Excavation - Top Soil Removal/Overburden					
I Year Production - (94128 Ts of Limestone & 69015 Ts of Limekankar)					
II Year Production - (307152 Ts - Limestone & 41344 Ts - Limekankar)					
III Year Production - (298416 Ts - Limestone & 28397 Ts - Limekankar)					
IV Year Production - (192960 Ts - Limestone & 37007 Ts - Limekankar)					
V Year Production - (226344 Ts - Limestone & 15863 Ts - Limekankar)					

Figure 2-46: Mining Schedule

2.16 Project Cost

a. Project Cost/Investment Cost

S.No.	Description	Cost (Rs)
1.	Land Cost	1,53,83,200
2.	Operational Cost	Limestone - 45,44,55,670 Limekankhar - 4,92,47,882
3.	EMP Cost	19,00,000
Total		52,13,78,739

b. CER Activity

S. No.	CER Activity	CER 2% of the project cost (Rs in Crores)
1.	Provision of basic amenities such as Drinking water, Hygienic Toilets facilities, Furniture's and Solar Lights to Government school in Pudupalayam Village	1,04,19,735
Total		1,04,19,735

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3. Description of the Environment

3.1 General

The method of mining for extracting Limekankar and Limestone quarry is required to be selected in such a manner to ensure sustainable development. Mining activities invariably affect the existing environmental status of the site. It has both adverse and beneficial effects. 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 and sustainable resource extraction.

To understand the existing environmental scenario, Baseline data helps in identification, prediction and evaluation of impacts in Environmental Impact assessment. Through field study, baseline data are collected considering various factors of the project. This includes-

- Physical- the area, the soil properties, the geological characteristics, the topography, etc
- Chemical- water, air, noise and soil pollution levels, etc.
- Biological- the biodiversity of the area, types of flora and fauna, species richness, species distribution, types of ecosystems, presence, or absence of endangered species and/or sensitive ecosystems etc.
- Socioeconomic- demography, social structure, economic conditions, developmental capabilities, displacement of locals, etc.

Study Area:

The study area for the mining projects is as follows:

- Mine lease area as the “core zone”
- A study area of 5km radius from the project boundary is designated as buffer Zone and for the study of Socio-economic status, Ecology & Biodiversity & Land use, 10 km radius from the boundary limits of the mine lease area has been selected.

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We have obtained Terms of Reference from SEIAA vide Letter No. SEIAA – TN/F. No 7607/SEAC/ToR- 797/2020 dated 21.10.2020. The baseline monitoring is carried out in July – September 2020 and the analysis is briefed in the EIA report. The proponent has engaged M/s. Ecotech Labs Pvt. Ltd for carrying out the existing baseline study.

Instruments Used

The following instruments were used at the site for baseline data collection.

1. Respirable Dust Sampler with attachment for gaseous Pollutants, Envirotech PM 460, APM411.
2. Fine Particulate Matter (FPM) Sampler, APM 550
3. Sound Level Meter Model SL-4010
4. 2000 series watchdog automatic weathering monitoring station

3.2 Baseline Data Collection Period:

The baseline data is collected in accordance with the CPCB Guidelines. The Baseline study is carried out from July – September 2020.

3.3 Frequency of Monitoring

Table 2-3 Frequency of Sampling and Analysis

Attributes	Sampling	Frequency
Air environment – Meteorological (wind speed, wind direction, rainfall, humidity, temperature)	Project site	1 hourly continuous
Air environment – Pollutants PM 10 PM 2.5 SO ₂ NO _x Lead in PM	5 locations	24 hourly twice a week 4 hourly. Twice a week, One non-monsoon season 8 hourly, twice a week 24 hourly, twice a week
Noise	5 locations	24 hourly Once in 5 locations

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Water (Ground water) pH, Temperature, Turbidity, Magnesium Hardness, Total Alkalinity, Chloride, Sulphate, Fluoride, Nitrate, Sodium, Potassium, Salinity, Total nitrogen, Total Coliforms, Fecal Coliforms	5 locations	Once in 5 locations
Water (surface water) pH, Temperature, Turbidity, Magnesium Hardness, Total Alkalinity, Chloride, Sulphate, Fluoride, Nitrate, Sodium, Potassium, Salinity, Total nitrogen, Total Coliforms, Fecal Coliforms	Sample from nearby lakes/river	One-time Sampling
Soil (Organic matter, Texture, pH, Electrical Conductivity, Permeability, Water holding capacity, Porosity)	5 locations	Once in 5 locations
Ecology and biodiversity Study	Study area covering 10 km radius	One-time Sampling
Socio- Economic study (Population, Literacy Level, employment, Infrastructure like school, hospitals & commercial establishments)	Villages around 10 km radius	One-time Sampling

3.4 Secondary data Collection

Apart from the primary data, Secondary data is also used for the collection; collation; synthesis and interpretation

- Flora & Faunal Study
- Land use study
- Demography and socio-economic analysis
- Meteorological data, from Indian Meteorological Department (IMD)

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3.5 Study area details

Table 2-4 Study area details

S. No	Description	Details	Source
1.	Project Location	Survey number 144/1A, 217/1A, 217/1C, 217/2, 217/3A, 217/3B, 217/4, 217/5, 217/6, 218/1, 219/1, 219/2A, 219/2B, 219/3A, 219/3B, 219/3C, 219/3D, 219/3E, 219/3F, 219/3G, 219/4A, 219/4B, 219/5A, 219/5B, 219/5C, 219/6, 219/8, 219/9, 220/1, 220/2A, 220/2B, 220/3A, 220/3B, 220/3C, 220/3D, 220/3E, 220/4, 220/5A, 220/5B, 220/6A, 220/6B, 220/7A, 220/7B, 220/8A, 220/8B, 220/9A, 220/9B, 220/9C, 220/10A, 220/10B, 220/11A, 220/11B, 221/1A & 221/15, Pudupalayam Village, Ariyalur Taluk, Ariyalur District, Tamil Nadu.	Field Study
2.	Latitude & Longitude	11° 05' 34.95" to 11° 05' 50.96"N 79° 08' 38.65" to 79° 09' 09.41"E	Topo Sheet
3.	Topo Sheet No.	58M/04	Survey of India Toposheet
4.	Mine Lease Area	22.96.0 Ha	--
Demography in the study area (as per Census 2011)			
5.	Total Population	754,894	Census Survey of India
6.	Total Number of Households	196810	
7.	Maximum Temperature (°C)	33.7°C	IMD
8.	Minimum Temperature (°C)	24.2°C	
9.	Ecological Sensitive Areas - Wetlands, watercourses or other waterbodies, coastal zone,	Easwaran Eri – 0.27 Km W	Survey of India Toposheet

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	biospheres, mountains, forests		
10.	Densely Populated area	Reddipalayam (3.6 km, NE)	
11.	Areas occupied by sensitive man-made land uses (hospitals, schools, places of worship, community facilities)	Nearest Place of worship: Karupasamy Temple Ayyanar Temple	Google Earth/ Field study

3.6 Site Connectivity:

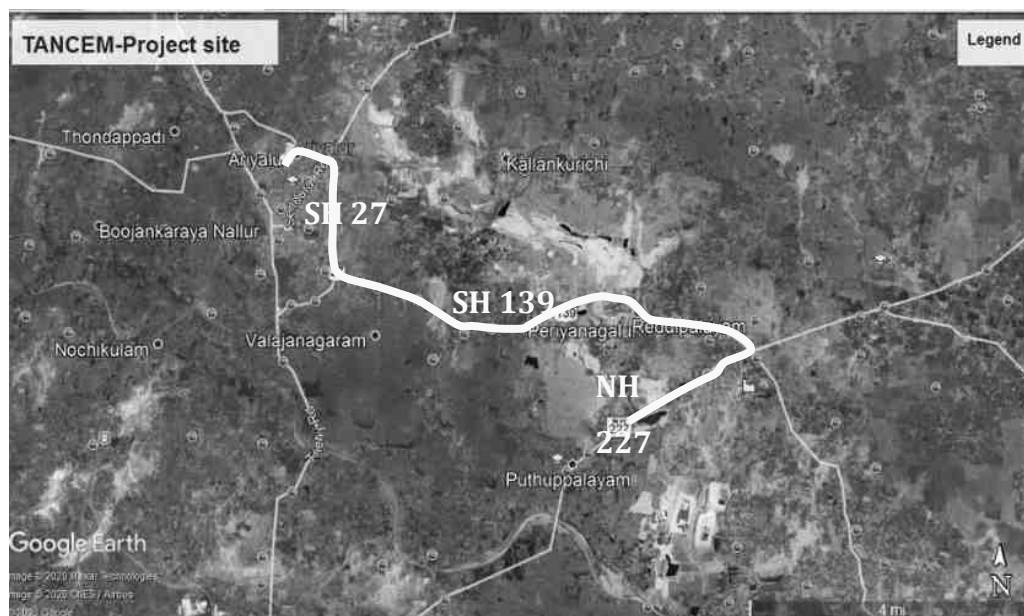


Figure 2-5 Site Connectivity

The site is well connected to NH 227 (Tiruchy – Chidambaram) & from Ariyalur, the connectivity to the site is through Ariyalur Muttavancheri - Govindaputhur Road and Kurinchinatham Road .

3.7 Land use Analysis

3.7.1 Land Use Classification

Land Use / Land Cover - Land Use refers to man's activity and the various uses, which are carried on land. Land Cover refers to natural vegetation, water bodies, rock/soil, artificial cover and

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others, resulting due to land transformation. The present Land Use/Land Classification map is developed with following objectives. The main objective of the study is to classify the different land use within 10 km from the project boundary.

3.7.2 Methodology

Information of land use and land cover is important for many planning and management activities concerning the surface of the earth (Agarwal and Garg, 2000). Land use refers to man's activities on land, which are directly related to land (Anderson et al., 1976). The land use and the land cover determine the infiltration capacity. Barren surfaces are poor retainers of water as compared to grasslands and forests, which not only hold water for longer periods on the surface, but at the same time allow it to percolate down.

The terms 'land use' and 'land cover' (LULC) are often used to describe maps that provide information about the types of features found on the earth's surface (land cover) and the human activity that is associated with them (land use). Satellite remote sensing is being used for determining different types of land use classes as it provides a means of assessing a large area with limited time and resources. However, satellite images do not record land cover details directly and they are measured based on the solar energy reflected from each area on the land. The amount of multi spectral energy in multi wavelengths depends on the type of material at the earth's surface and the objective is to associate particular land cover with each of these reflected energies, which is achieved using either visual or digital interpretation. In the present study the task is to study in detail the land use and land cover in and around the project site. The study envisages different LULC around the proposed project area and the procedure adopted is as below

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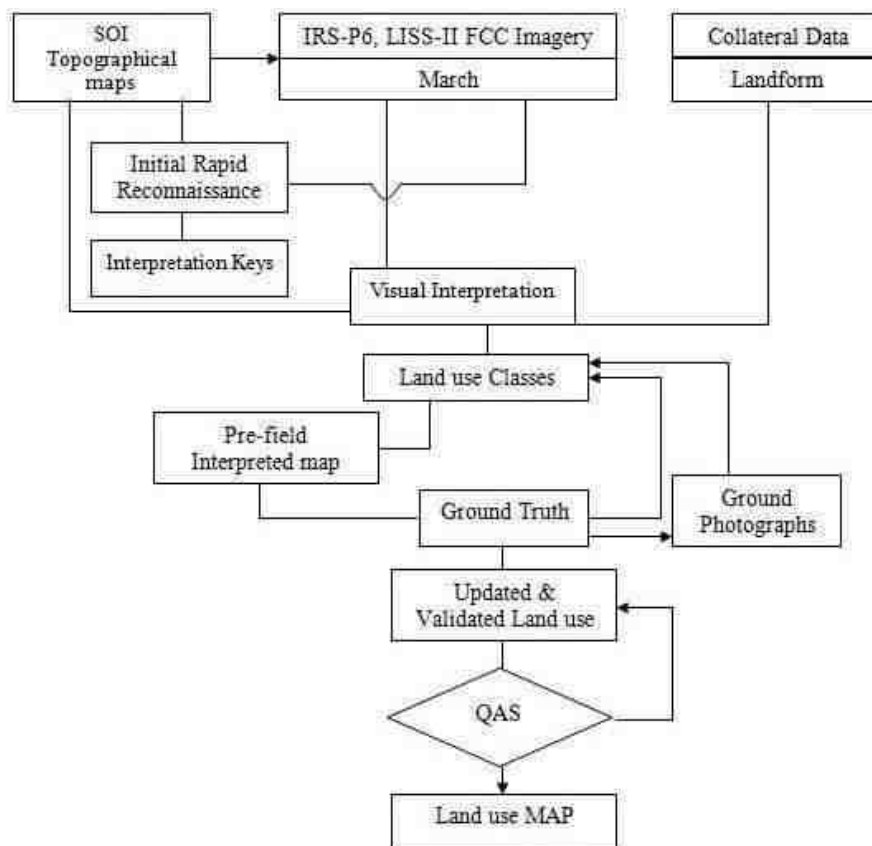


Figure 2-6 Flow Chart showing Methodology of Land use mapping

3.7.3 Satellite Data

IRS Resourcesat-2 LISS-III multispectral satellite data of 05th March 2016 was utilized for the present study. Details of satellite data is given below. The rectification of imagery was carried out on to bring the digital data on the earth coordinate system by means of ground control point (GCP) assignments/SOI topo sheets.

3.7.4 Scale of mapping

Considering the user defined scale of mapping, 1:50000 IRS-P6, LISS-III data on 1:50000 Scale was used for Land use / Land cover mapping of 10 km radius for proposed site. The description of the land use categories for 10 km radius and the statistics are given for 10 km radius.

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3.7.5 Interpretation Technique

Standard on screen visual interpretation procedure was followed. The various Land use / Land cover classes interpreted along with the SOI topographical maps during the initial rapid reconnaissance of the study area. The physiognomic expressions conceived by image elements of color, tone, texture, size, shape, pattern, shadow, location and associated features are used to interpret the FCC imagery. Image interpretation keys were developed for each of the LU/LC classes in terms of image elements.

February 2016 FCC imagery (Digital data) of the study area was interpreted for the relevant land use classes. On screen visual interpretation coupled with supervised image classification techniques are used to prepare the land use classification.

1. Digitisation of the study area (10 km radius from the proposed site) from the topo maps
2. In the present study the IRS –P6 satellite image and SOI topo sheets of 47-F/01,02,03 have been procured and interpreted using the ERDAS imaging and ARC-GIS soft ware adopting the necessary interpretation techniques.
3. Satellite data interpretation and vectorisation of the resulting units
4. Adopting the available guidelines from manual of LULC mapping using Satellite imagery (NRSA, 1989)
5. Field checking and ground truth validation
6. Composition of final LULC map

The LULC Classification has been done at three levels where level -I being the broad classification about the land covers that is Built-up land, agriculture land, waste land, wet lands, and water bodies. These are followed by level –II where built-up land is divided into towns/cities as well villages. The Agriculture land is divided into different classes such as cropland, Fallow, Plantation, while wastelands are broadly divided into, Land with scrub and without Scrub and Mining and Industrial wasteland. The wetlands are classified into inland wetlands, coastal wetlands and islands. The water bodies are classified further into River/stream, Canal, Tanks and bay. In the present study level II classification

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has been undertaken. The SOI Topo map is presented in Annexure and Satellite imagery of 10 km radius from the project site is presented Annexure

3.7.6 Field Verification

Field verification involved collection, verification and record of the different surface features that create specific spectral signatures / image expressions on FCC. In the study area, doubtful areas identified in course of interpretation of imagery is systematically listed and transferred on to the corresponding SOI topographical maps for ground verification. In addition to these, traverse routes were planned with reference to SOI topographical maps to verify interpreted LU/LC classes in such a manner that all the different classes are covered by at least 5 sampling areas, evenly distributed in the area. Ground truth details involving LU/LC classes and other ancillary information about crop growth stage, exposed soils, landform, nature and type of land degradation are recorded and the different land use classes are taken the Land use map is presented in Annexure

3.8 Description of the Land Use / land cover classes

3.8.1 Built-up land

It is defined as an area of human settlements composed of houses, commercial complex, transport, communication lines, utilities, services, places of worships, recreational areas, industries etc. Depending upon the nature and type of utilities and size of habitations, residential areas can be aggregated into villages, towns and cities. All the man-made construction covering land belongs to this category.

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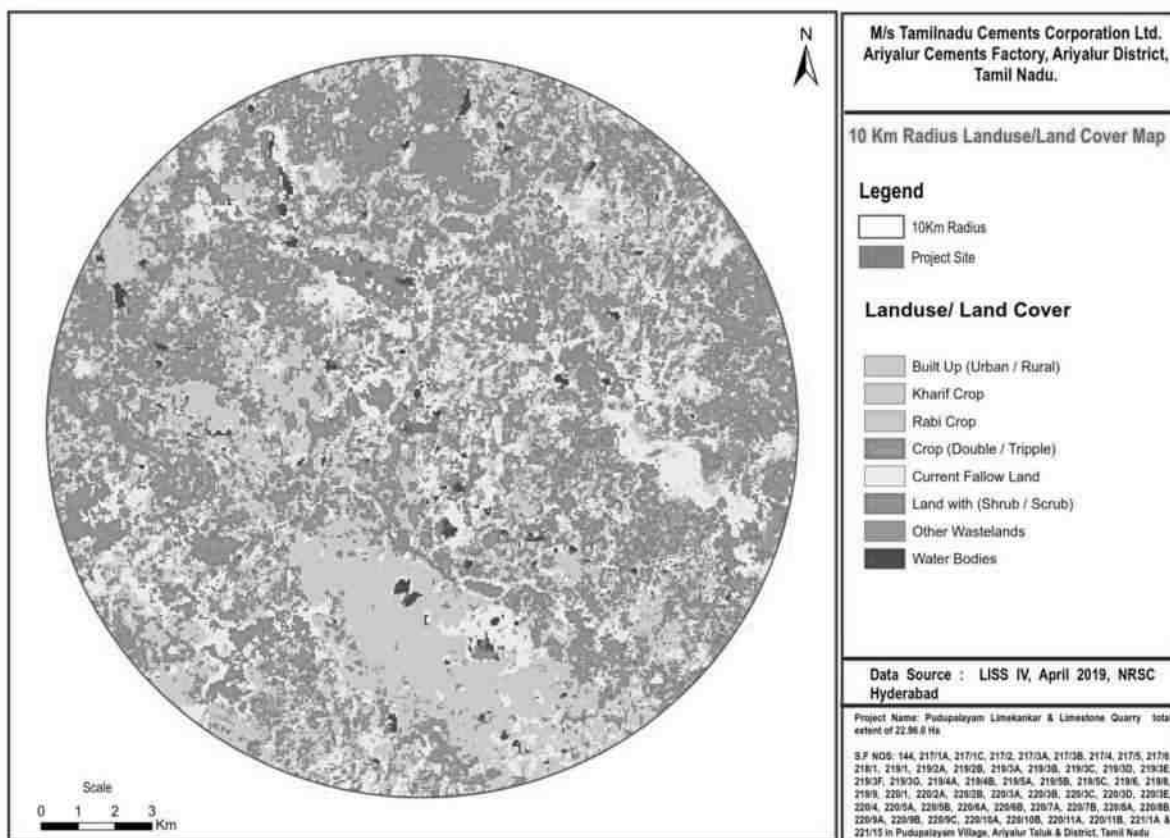


Figure 2-7 Land use classes around 10 km radius from the project site

Different Land use classes around 10 km radius from the project site

3.8.2 Agricultural land

This category includes the land utilized for crops, vegetables, fodder and fruits. Existing cropland and current fallows are included in this category.

It is described as an area under agricultural tree crops, planted adopting certain agricultural management techniques. The Agricultural land in 10 km radius from the proposed project site is as follows.

Of all the agricultural lands, Crop land occupies maximum area within 10 km radius.

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3.8.3 Wastelands

Wastelands are the degraded or under utilized lands most of which could be brought under productive use with proper soil and water management practices. Wasteland results from various environmental and human factors.

The study reveals that the following major land use in the study area of 10 km radius from the project boundary

- Crop land (81 %) occupies majority of the area.
- About 8.38 % is built up area land used for various developmental activities.
- Maruthaiyar river stream is flowing at a distance of 2km from the southern boundary of the project site.
- The surface water body occupies about 4.58% of the study area.

3.9 Water Environment

3.9.1 Contour & Drainage

The project site is 56m AMSL. The drainage pattern within in the 5 km of the project site is dendritic.

Ariyalur district has been carved out of Perambalur district and is bounded by the districts of Cuddalore in the north and north-east, Nagapattinam in the east, Thanjavur in the south and south-east, Tiruchirapalli in the south-west and Perambalur in the west.

The district lies between 10°53'00" to 11°26'00" Northern latitude and 78°56'00" to 79°31'00" Eastern longitude and has an areal extent of 1,944 sq.km.

Ariyalur district forms parts of Vellar and Cauvery Rivers basins. The major river in the district is Kollidam. The sub-basins are Ellar, Kallar, Swedanadhi, Koneri, Elunur, Periyavari –Anaivari, Ilaiyur, Udaiyar Palayam and Mamdaiyar.

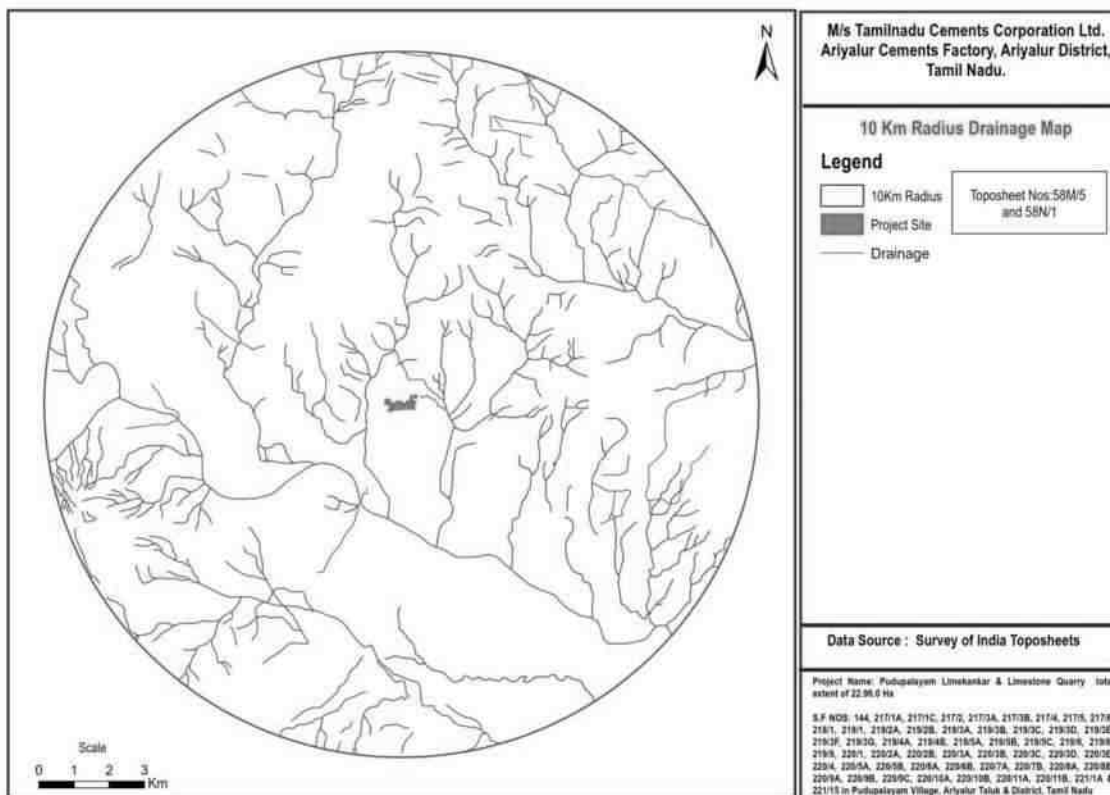
Cauvery River fringes the southern boundary of the district. River Vellar drains in the northern part and River Marudaiyar flowing in the south confluences with R.Coleroon as a tributary.

Drainage

All these rivers are ephemeral in nature. The area is studded with numerous tanks that serve as the source of drinking water and also their surplus feeds adjoining tanks. The drainage pattern is dentritic

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in sedimentary tract and dentritic to trellis in crystalline area.



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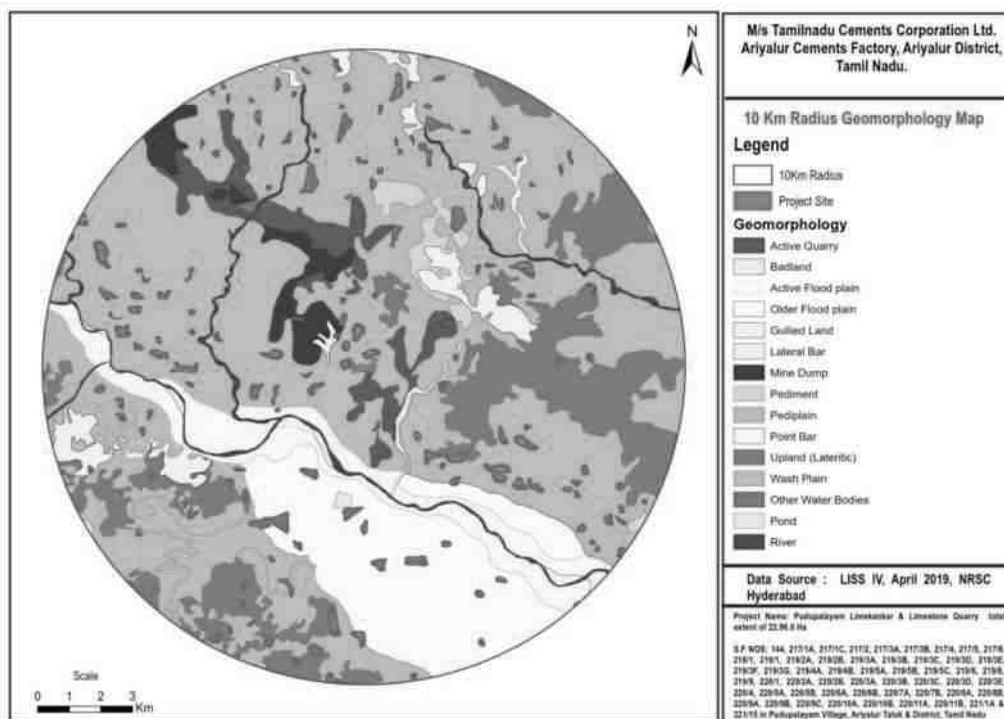


Figure 2-9 Geomorphology within 10 km from the project site

3.9.3 Geology:

The Cretaceous Formation of the Ariyalur area (Ariyalur District, Tamil Nadu) is one of the best developed sedimentary sequences in South India. The Cretaceous system of Cauvery Basin consists of shallow marine sequence with a rich fauna succession of Albian–Maastrichtian. Blanford (1862) was the first to work on the stratigraphy of this formation and he divided the litho-units into three groups: Uttatur Trichinopoly and Ariyalur. These three groups are largely disconformable and occasionally unconformable at places.

The geology and the stratigraphy of this area are accounted by many workers (Rama Rao, 1956; Ramanathan, 1968; Banerji, 1972, Sastri et al, 1972; ONGC, 1977; Sundaram and Rao, 1979 & 1986; Ramasamy and Banerji, 1991; Banerji et al, 1996; Gonvindan et al, 1996). Ramasamy and Banerji (1991) have revised the stratigraphic framework of the exposed Pre-Ariyalur sequence based on detailed lithological and petrographical variations. Banerji et al., (1996) have redefined the Uttatur Group and identified within it four distinct formations comprising reefoidal bodies, sandy clay, coarse sand bar and

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gypsiferous silty clay units. Madavaraju (1996) has presented a detailed geochemical and petro graphical account of Ariyalur Group of sediments and Kallamedu Formation is the youngest unit of this group.

Further REE distribution and its importance in establishing anoxic/oxic conditions in lime rich Kallankurichi Formation was attempted by Madavaraju and Ramasamy(1999). The sedimentary rocks of Cretaceous – Palaeocene age are well developed in the Ariyalur area, which consist both clastic and carbonate facies. The diversity of fauna is very large in the vast sedimentary basin that has attracted the attention of geologists

not only from India but also from foreign countries.

Sastry et al., (1972) have further divided the Ariyalur Group into four formations mainly based on lithological changes and characteristic faunal content:

- i) Sillakudi
- ii) Kallankurichi
- iii) Ottakoil and
- iv) Kallamedu Formations.

This classification has been followed by various workers of varied interests.

Kallamedu Formation (Late Maastrichtian) is the youngest formation of the Ariyalur Group and it exhibits large variation in lithology. The exposed area looks like a badland topography with sparse vegetation. Excavation at favourable spots in Kallamedu Formation has yielded a number of well-preserved skeletal parts of Carnosaurs (Yadagiri and Ayyasami, 1987).

The lithological association of this formation includes sandstone, siltstone, calcareous sandstone, silty shale and thin band of limestone. The sandstone and siltstone are well exposed in the nala sections near north of Kallamedu village. Govindan et al. (1996) have assigned Maastrichtian age for the continental deposits of the Kallamedu Formation. Kallamedu Formation is overlain by the Niniyur Formation of Early Paleocene age.

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The late Cretaceous sediments are exposed in the western part of the study area and classified into Uttatur, Trichinopoly and Ariyalur formations with a maximum thickness of 900 m, 600 m and 1500 m, respectively. The Uttatur formation consists of reefoidal limestone and minor sandstone, with rich faunal assemblages. Conglomerates and quartzites are also found to occur in the Uttatur group of rocks.

These rocks are exposed only in Trichirapalli area where they are overlying Gondwana and Dalmiapuram formations. The sub-surface equivalent of the Uttathur formation is devoid of reefoidal elements. The Trichinopoly formation, unconformably overlying the Uttatur formation, comprises conglomerate, pebbly sandstone as well as gritty calcareous sandstone with bands of claystone, gypseous claystone, sandy limestone, shelly limestone and clayey limestone with abundant fauna. They are exposed in Ariyalur, Vridhachalam and Pondicherry areas. The rocks are mainly greenish grey, friable clayey sandstone, fossiliferous argillaceous limestone and sandstone.

The lower part of Ariyalur formation is highly fossiliferous while the upper is largely unfossiliferous.

i) Evolution of Cauvery Basin – The Cretaceous–Paleogene sections of Cauvery Basin are closely related to the rifting and drifting phases of peninsular India. The basement is characterized by structural highs and lows, these being evidenced by strong tectonic activity affecting the basin since its inception. Two major tectonic and sedimentary phases are deciphered.

The first is taphrogenic rifting and associated block movements along the dominant NE-SW trend during Late Jurassic, resulting in morphotectonic humps and deep slopes. The second phase signifies coastal progradational/deltaic sedimentation through a series of marine transgression and regression in response to the oscillatory tectonic movements.

During Paleocene, the basin continued to tilt towards east and depocentres consequently shifted. Cauvery Basin comprises of depressions separated from one another by subsurface ridges; these structural elements extend into the offshore area.

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The structural elements from north south are,

- (1) Ariyalur Pondicherry depression,
- (2) Kumbakonam–Madnam-Shiyali ridge,
- (3) Tanjore Tranquibar–Nagapattinam depression,
- (4) Pattukottai– Mannargudi ridge,
- (5) Ramnad–Palk Bay depression & (6) Mandapam–Delft ridge.

The first marine transgression occurred during the close of Late Jurassic. The marine environments of sedimentation continued till Cretaceous although a series of minor transgressions and regressions. A major regression occurred during the close of Cretaceous.

The basin underwent an easterly tilt and the depocentres shifted due east prior to marine transgression during the beginning of Paleogene. The evolution of Cauvery Basin is largely controlled by dominant trends in the Precambrian crystalline basement as is evident from the similarity between the alignment of the basinal structural elements and the major trends in the adjoining peninsular shield. The NE-SW Eastern Ghats trends are by far the most dominant and taphrogenic movements along these basement trends resulted in a series of elongated depressions that were separated from one another by intra-depression ridges.

A general stratigraphic succession and the various formations are described below:

Order of Super position:

AGE ROCKFORMATION

Recent - Topsoil & Limekankar

-----Unconformities-----

Cretaceous Shell & Coral limestone

Archaen - (Boulders of charnockites)

Project site falls in Denudational Origin- Pediment Pediplain Complex.

The area around Ariyalur forms parts of the well-known cretaceous formation of Trichinopoly. The sedimentary formations of coralline limestone belong to the cretaceous system and rest over archaean formations. The Limestone is creamy white in colour. Marine organisms such as shells, corals, microfossils, ammonites, Gryphea, crinoids formed them and foraminifera are composed chiefly of

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CaCO with varying amounts of impurities such as sand, glauconite, ferruginous, phosphatic and bituminous matter.

The organic material rich in magnesium has given rise to magnesium bearing limestone in certain areas. The Limestone is hard, compact and amorphous in nature and indurated layers of limestone due to structural deformation and intense weathering. These organic limestones are basically marine sediments derived from rich coral-lime shells and other remains.

Topsoil:

The topsoil is black cotton soil. It occurs to a depth of 2m and lies over the limekankar formations.

Kankar:

Kankar has developed over the limestone extensively and ranges in thickness of 0.75 meters. The formation of Kankar is evidently due to the alternating wet and dry spells of tropical climate, which has caused leaching out of the clayey and siliceous portions in the top layer of limestone. Thus though the Kankar is prous, pisolitic and red in colour due to dispersion of iron oxide, it analyses very high in calcium carbonate content (generally 85 to 95 per cent CaCO). The fragments of shells as well as cementing calcareous medium make the Kankar hard and difficult to break. The Kankar is at present being mined for manufactures slaked lime in country kilns for use in construction.

The following geological setup has been identified for these deposits of cretaceous age and the order of superposition is described.

Upper : Niniyur
Cretaceous age Middle : Ariyalur, Trichinopoly
Lower : Uttatur

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Alluvial Formations

In the river alluvium ground water occurs under water table condition. The maximum thickness is 37 m and the average thickness of the aquifer is approximately 12 to 15 m. These formations are porous and permeable, which have good water bearing zones.

Tertiary formation

Tertiary formations are mainly Cuddalore Sand stone, mottled ferrugeneous clays and pebbles. The ground water occurs in semi-confined conditions and confined conditions with good ground water potentials in these aquifers. The Specific Capacity in the Tertiary formations ranges from 40 to 1627 lpm/m/dd.

Cretaceous formations

Cretaceous formations comprises white Sandy Lime stones and Sand stones with fossils, Calcareous mottled Sand stones with fossils, Shell Lime stones, Clays, Sand stones with fossils, Basal Lime stone, Clays and Sandy beds with fossils. Ground water in the sandy clay lenses and fine sands underlain by white and black clay beds constitutes phreatic aquifers in the depth range 10.0 to 15.0 m below ground level. Phreatic aquifers in the limestone are more potential. The Specific Capacity in the cretaceous formation ranges from 18.77 to 90.66 lpm/m/dd.

Hard Rock formations

Hard rock formations include Charnockites, Granites and Gneisses traversed by Quartz and Pegmatite veins. Ground water occurs under water table conditions in weathered mantle and semi-confined conditions in fractured zones depend on the joints, fracture and its development.

Pre-monsoon water level: The Depth to Water Level during pre-monsoon (May2006) ranges from 1.10 to 8.55 m bgl. In major part of the district the depth to water level during pre-monsoon is in the range of >2 – 5 m bgl. (Plate – III).

Post-monsoon water level: The Depth to Water Level during post-monsoon (Jan2007) ranges from 1.10 to 6.78 m bgl. Almost in entire district, depth to water level during post-monsoon is in the range of >2 – 5 m bgl, except some isolated patches (PlateIV).

Long term Fluctuation (1998-2007) indicates rise in water levels is in the range of 0.0027 to 0.16 m/year. The fall in water level ranges between 0.05 and 0.07 m/year.

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Aquifer Parameters:

In the Cretaceous formation Transmissivity is 234 m² /day and storativity is in the order of 3.527x10-4

Transmissivity ranges from 620 to 1455 m² /day and storativity ranges from 3.29 to 7.74 x 10-5 in Tertiary formation.

Groundwater development in 6 Blocks viz., Andimadam, Ariyalur, Jayankondan, Sendurai, T.Palur and Thirumanur are moderate and categorized as Safe blocks. Cuddalore Sand stone occurring in these blocks may be developed by deeper Tube wells down to a depth of more than 150 m. The expected yield range is 2.5 to 30 lps.

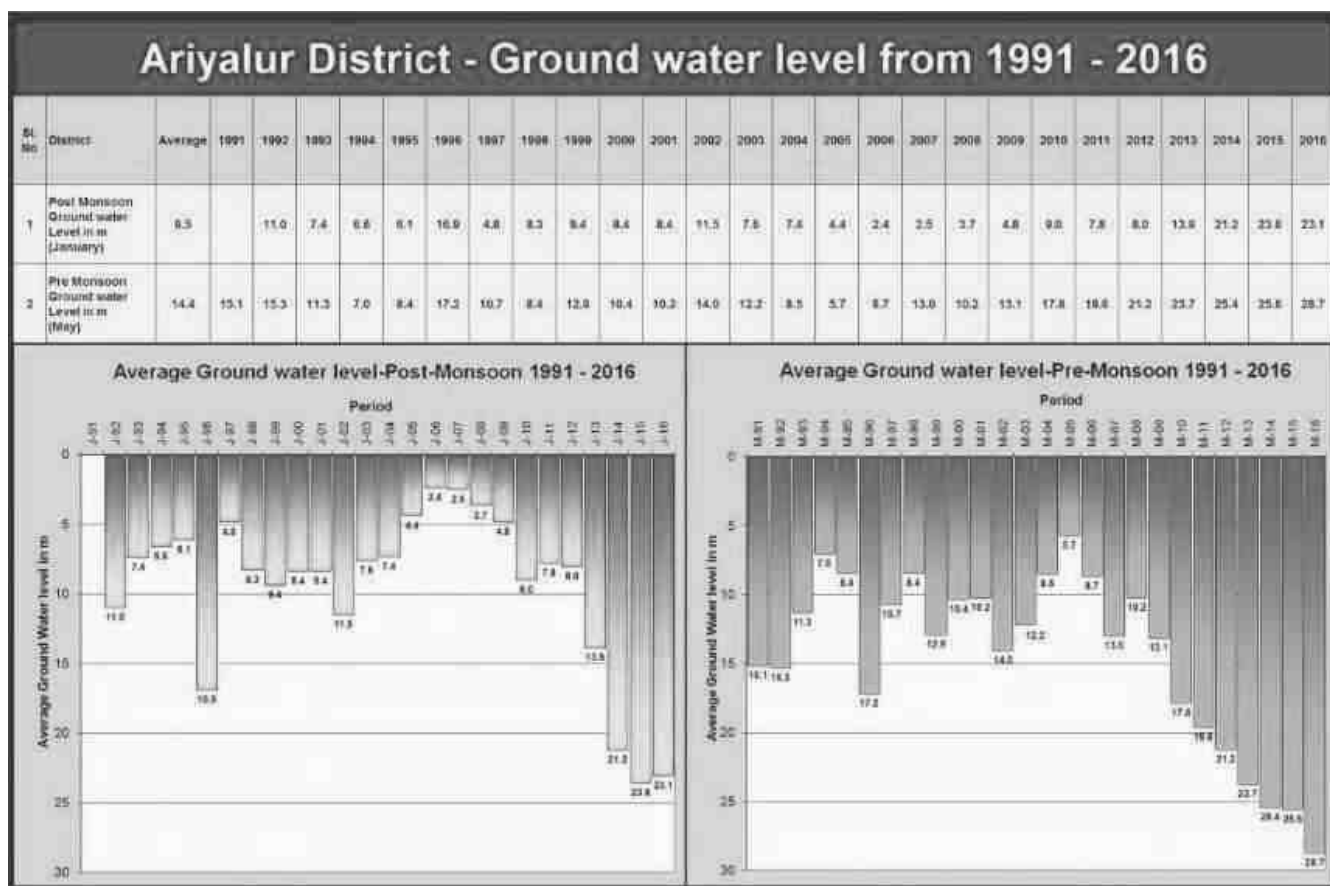


Figure 2-11 Ariyalur District – GW Level from 1991-2016

Depth of ground water Level & Ground water prospects

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The project falls under Ariyalur Block, which is categorized as Safe Zone (Less than 70%) as per Annexure to G. O (Ms) No. 161, Public Works (R2) Department, Dated: 23.10.2019, where the eligibility for the extraction of groundwater, extraction will be permitted only in Safe/Semi critical and Non metro area for residential development where there is no any provision of piped water supply by Local body.)

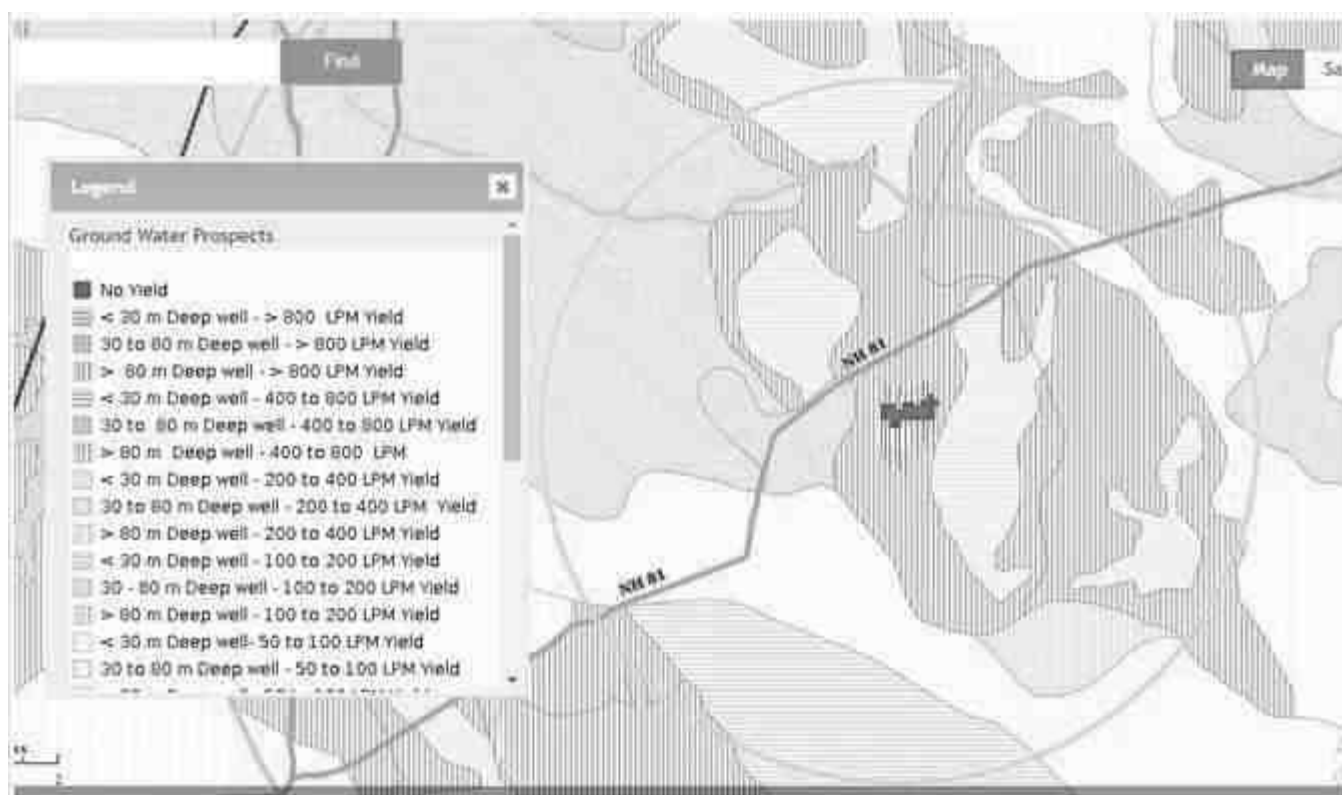


Figure 2-12 Ground water prospects within 5 km radius of the project site

3.9.5 Ground water quality monitoring

Ground water quality monitoring is done in the following locations and analysis will be done for physical, chemical & Biological parameters.

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Table 2-5 Ground water Quality Analysis

Environmental Parameters: <i>Ground water Quality Analysis</i>	
Monitoring Period	July – September 2020
Design Criteria	Based on the Environmental settings in the study area
Monitoring Locations	Project Site – GW 1 Near Marudhaiyar River– GW 2 Nerinjikorai, W – GW 3 Reddipalayam, N- GW 4 Near Chettinad cement mines – GW5
Methodology	Water Samples were collected in 5 Litre fresh cans as per IS 3025 Part I and transported to the laboratory in Iceboxes
Frequency of Monitoring	Once in a season

Sampling Procedure

Quality of ground water was compared with IS: 10500: 1991 (Reaffirmed 1993 With Amendment NO -3 July 2010) for drinking purposes. Water samples were collected as Grab sample from five sampling locations in a 5-liter plastic jerry can and 250 ml sterilized clean glass/pet bottle for complete physico-chemical and bacteriological tests respectively. The samples were analyzed as per standard procedure / method given in IS: 3025 (Revised Part) and standard method for examination of water and wastewater Ed. 21st, published jointly by APHA.

S.No	Parameters	Test Method
1	pH (at 25°C)	IS:3025(P -11)1983 RA: 2012
2	Electrical Conductivity	IS:3025(P -14) 2013
3	Colour	IS:3025 (P -4)1983 RA: 2012
4	Turbidity	IS:3025(P -10)1984 RA: 2012
5	Total Dissolved Solids	APHA 22 nd Edn.2012-2540-C
6	Total Suspended Solids	IS:3025(P-17)-1984 RA:2012
7	Total Hardness as CaCO ₃	APHA 22 nd Edn.2012-2340-C
8	Calcium as Ca	APHA 22 nd Edn.2012-3500 Ca-B
9	Magnesium as Mg	APHA 22 nd Edn.2012-3500 Mg-B
10	Chloride as Cl	IS:3025(P -32)-1988 RA: 2014
11	Sulphate as SO ₄	APHA 22 nd Edn.2012-4500 SO ₄ ⁻ -E
12	Total Alkalinity as CaCO ₃	APHA 22 nd Edn.2012-2320-B

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13	Iron as Fe	IS:3025(P -53):2003 RA: 2014
14	Silica as SiO ₂	IS:3025(P -35)1988 RA: 2014
15	Fluoride as F	APHA 22 nd Edn.2012-4500-F-D
16	Nitrate as NO ₃	IS:3025(P -34):1988 RA: 2014
17	Sodium as Na	IS:3025(P -45):1993 RA: 2014
18	Potassium as K	IS:3025(P -45):1993 RA: 2014
19	Coliform	IS:1622:1981:RA:2014
20	E.coli	IS:1622:1981:RA:2014

Table 2-6 Ground water sampling results

S. no	Parameters	Units	Project Site	Near Marudhaiyur	Nerinjikorai	Reddipalayam	Chettinad cement mines
1	pH (at 25°C)	-	7.10	7.26	6.94	6.68	7.44
2	Electrical Conductivity	µS/cm	980	1327	1010	2019	1139
3	Color	Hazen Unit	1.0	1.0	1.0	1.0	1.0
4	Turbidity	NTU	BQL(LO Q:1)	BQL(LOQ:1)	BQL(LOQ:1)	BQL(LOQ:1)	BQL(LOQ:1)
5	Total Dissolved Solids	mg/L	597	862	650	1330	716
6	Total Suspended Solids	mg/L	BQL(LO Q:2)	BQL(LOQ:2)	BQL(LOQ:2)	BQL(LOQ:2)	BQL(LOQ:2)
7	Total Hardness as CaCO ₃	mg/L	200	270	400	850	250
8	Calcium Hardness as CaCO ₃	mg/L	130	130	280	400	110
9	Magnesium Hardness as CaCO ₃	mg/L	70	140	120	450	140
10	Calcium as Ca	mg/L	52	52	112	160	44
11	Magnesium as Mg	mg/L	17	34	29	109	34
12	Chloride as Cl	mg/L	73	160	107	325	73
13	Sulphate as SO ₄	mg/L	79	269	142	120	107

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14	Total Alkalinity as CaCO ₃	mg/L	507	355	409	720	662
15	Iron as Fe	mg/L	BQL(LO Q:0.1)	BQL(LOQ:0.1)	BQL(LOQ:0.1)	BQL(LOQ:0.1)	BQL(LOQ:0.1)
16	Silica as SiO ₂	mg/L	22	10.3	16.5	10.4	15.2
17	Fluoride as F	mg/L	BQL(LO Q:0.2)	BQL(LOQ:0.2)	BQL(LOQ:0.2)	BQL(LOQ:0.2)	BQL(LOQ:0.2)
18	Nitrate as NO ₃	mg/L	29.6	22.5	9.20	23.5	20.8
19	Potassium as K	mg/L	4.20	6.06	4.99	14.6	4.15
20	Sodium as Na	mg/L	68.0	148	97	296	65
21	Ecoil	mg/L	<2	<2	14	<2	500
22	Coliform	mg/L	<2	9	110	7	1600

Interpretation of results:

Physical parameters of water:

The basic physical parameters of water include

Colour:

Value observed (True/ Apparent Color): 1 Hazel unit in GW1, GW2 and GW3. 5 Hazel unit in GW4 and GW5.

Acceptable and permissible limits: 5 Hazel units and 15 Hazel units respectively. The value in the project site is as less than the acceptable limits prescribed by IS 10500: 2012 (referred as “Standards” from herein).

Odour:

The water is odourless. As per the standards, the odour and taste should be agreeable.

pH:

Value observed: 6.68 – 7.44.

Acceptable and permissible limits: 6.5-8.5. The pH value is the measure of acid – base equilibrium. The value of pH in the project site clearly indicates that water is neutral in nature.

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Turbidity:

Value observed: BQL in GW 1, GW2 and GW3; 2 and 5.2 NTU in GW 4 and GW 5.

Acceptable and permissible limits: 1 NTU & 5 NTU respectively. The value of turbidity generally indicates the presence of phytoplanktons and other sediments. The value in the project site indicates the water is less turbid and no any physical treatment is required to treat the turbidity of the water.

Total Dissolved Solids:

Value observed: 597 – 1330 mg/l.

Acceptable and permissible limits: 500 mg/L and 2000 mg/L respectively.

The TDS is the presence of the inorganic salts and small amounts of organic matter present in the water. This is mainly due to the result of surface runoff as the cations and anions in the top soil is carried away by the water. As per the Guidelines of WHO, if the value of TDS is greater than 1200 mg/L, it is designated as unacceptable. The value of TDS is found to be within the limits.

Chemical parameters of water:

The chemical parameters of the drinking water include

Calcium:

Value observed: 44 – 160 mg/L.

Acceptable and permissible limits: 75 mg/L and 200 mg/L respectively.

Calcium is the essential macronutrient. The value of the calcium is higher than the prescribed permissible standards. The higher level of calcium may cause hardening in domestic equipment and will also reduce the detergent efficiency. Higher levels of calcium will lead to constipation, gas, and bloating. Apart from that, extra calcium may also increase the risk of kidney stones. If the calcium deposit in blood is high, it may lead to hypercalcemia. The value of calcium is found to be within the limits.

Magnesium:

Value observed: 17 - 109 mg/L.

Acceptable and permissible limits: 30 mg/L and 100 mg/L respectively.

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The value of Magnesium in the project site is higher than acceptable limit and less than the permissible limit. The increase in the level of magnesium will cause diarrhea and vomiting in children. The value of magnesium is found to be within the limits.

Chloride

Value observed: 73 - 325 mg/L.

Acceptable and permissible limits: 250 mg/L and 1000 mg/L respectively.

The chloride level in the project site is greater than the permissible limit. If the level of chloride is more, it may cause galvanic and pitting corrosion, increases level of metals. It imparts bitter taste to the water. The value of chloride is found to be within the limits

Total Alkalinity as CaCo₃:

Value observed in project site: 355 - 720mg/L.

Acceptable and permissible limits: 200 mg/L and 600 mg/L respectively.

Total Alkalinity is the measure of the concentration of all alkaline substances dissolved in the water which includes carbonates, bicarbonates and hydroxides. The value of the total alkalinity is slightly greater in the project site, which will impart soda taste to the water.

Hardness:

Value observed in project site: 200 - 850 mg/L.

Acceptable and permissible limits: 200 mg/L and 600 mg/L respectively.

The value of Hardness in the project site is higher than permissible limit. The increase in the level of hardness may cause corrosion and scaling problems, increased soap consumption and it also contributes to the salty taste of water.

Biological parameters of water:

The biological parameters of water includes

E- Coli & Coliform

Value observed in project site: <2 mpn/500ml – e-coli

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17 mpn/1600ml – Coliforms

The E- coli and coliform shall not be detectable in any 100 ml sample as per the drinking water standards IS 10500:2012.

E- coli is one of the fecal coliform bacteria. The presence of this indicates the water is feacally contaminated. Without treatment, when consumed, will have water borne diseases like cholera, typhoid and diarrhea.

3.9.6 Surface Water Analysis

Surface water samples were taken from Marudaiyar River and Eleri Lake. The results are summarized below.

3.9.7 Surface Water Quality Monitoring



Table 2-7 surface water sample results

Parameters	Unit	River Marudaiyar	Eleri Lake
pH (at 25°C)	-	7.8	7.59
Electrical Conductivity	μS/cm	2450	211

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Colour	Hazen Unit	35	5.0
Turbidity	NTU	62.5	2.0
Total Dissolved Solids	mg/L	1558	135
Total Suspended Solids	mg/L	68.7	3.8
Total Hardness as CaCO ₃	mg/L	700	80
Calcium Hardness as CaCO ₃	mg/L	379	54.9
Magnesium Hardness as CaCO ₃	mg/L	321	24.7
Calcium as Ca	mg/L	152	22
Magnesium as Mg	mg/L	78	6.0
Chloride as Cl	mg/L	345	18
Sulphate as SO ₄	mg/L	644	32.0
Total Alkalinity as CaCO ₃	mg/L	282	103
Iron as Fe	mg/L	8.59	.319
Silica as SiO ₂	mg/L	5.02	2.01
Fluoride as F	mg/L	0.35	0.29
Nitrate as NO ₃	mg/L	18.5	4.95
Potassium as K	mg/L	14.2	1.20
Sodium as Na	mg/L	285	14.64
Total Kjeldahl Nitrogen as N	mg/L	2.49	1.10
Biochemical oxygen Demand @ 27c	mg/L	BQL(LOQ:2)	BQL(LOQ:2)
Chemical Oxygen Demand	mg/L	8.01	6.20
Dissolved Oxygen	mg/L	5.27	5.50
Ecoil	mg/L	11	14
Coliform	mg/L	27	130

Inference: The surface water quality is compared with the CPCB Water Quality Criteria against A, B, C, D & E class of water. From the test result, it is found that the both the water does not fit Class A (Drinking Water Source without conventional treatment but after disinfection). But they can be used for outdoor bathing as it meets the requirements shown for class B water.

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3.10 Climatology & Meteorology:

Climate and meteorology of a place can play an important role in the implementation of any developmental project. Meteorology is also the key to understand local air quality as there is an essential relationship between meteorology and atmospheric dispersion involving wind in the broadest sense of the term.

The year may broadly be divided into four seasons:

Winter season	:	January to February
Summer season	:	March to May
Monsoon season	:	July to September
Post-monsoon season	:	October to December

i) Climate

Like the rest of the state, Ariyalur experiences hot weather between April and July and is relatively cooler in December and January. The area exhibits a subtropical climate and the temperature that goes up to 42°C in summer and falls down to 27°C in December – January. The wind direction is NE-SW and vice-versa. Average annual rainfall is about 1071.4 mm in monsoon season..

ii) Temperature

The average daily temperature ranges from a maximum of 33.7 °C to a minimum of 24.2 °C

Rainfall:

The historical rainfall data of past years is collected. The maximum rainfall is observed in November, 2018 with a rainfall of 297 mm.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	R/F	R/F	R/F	R/F	R/F	R/F	R/F	R/F	R/F	R/F	R/F	R/F
2014	0	1	0	0	128.5	9	80.5	93.3	25.8	182.6	90.4	88
2015	4.5	0	0.5	42.7	66.8	40.2	125.2	51.2	46.6	153.1	372.2	155.9

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2016	0	0	0	0	89.4	28.2	91.2	141.9	57.5	61.9	30.2	36.4
2017	108.3	0	18.5	0	25.2	98.9	58.3	192.5	199.7	140.7	206.2	144.8
2018	25.8	0	4.5	1.2	46.5	96.5	25	74.3	22.6	200.2	297.9	20.2

Source: Customized Rainfall Information System (CRIS), Hydromet Division, GOI

iii) Relative humidity

The district enjoys a subtropical climate. The period from April to July is generally hot and dry. The weather is pleasant during the period from November to January. Usually mornings are more humid than afternoons. The relative humidity is on an average between 65 and 85% in the mornings. Humidity in the afternoons is generally between 40 and 70.

iv) Wind Speed:

Wind speed was in the range of 2 Km/hr to 20 Km/hr. The wind speed was almost close to each other during the whole study period.

The site-specific meteorological data for the study period July to September 2020) is presented below. The maximum and minimum values for all the parameters except wind speed and wind direction are presented below.

Metrological Data

The meteorological data – Temperature, rainfall, Wind Speed, Wind direction are recorded through AWS by setting it up in the site.

v) Wind Rose Diagram

The wind rose denotes a class of diagrams designed to display the distribution of wind direction at a given location over a period of time. Wind roses are also useful as they project a large quantity of data in a simple graphical plot.

The wind speed & wind direction data are taken and wind rose is plotted for July to September 2020. The wind rose is plotted using WR Plot. The predominant wind direction is from NW.

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Table 2-8 Meteorological data for July 2020

Date	Max Temp (°C)	Min Temp (°C)	Wind Speed (mps)
01.07.2020	35.5	26.9	1.7
02.07.2020	33.8	26.8	2.3
03.07.2020	34.1	26.7	1.9
04.07.2020	35.3	27.9	2.8
05.07.2020	37.1	27.6	2.9
06.07.2020	36.3	28.3	4.7
07.07.2020	34.7	28.5	6.2
08.07.2020	32.7	28.8	5.5
09.07.2020	33.0	25.8	5.7
10.07.2020	32.1	27.3	4.5
11.07.2020	33.6	27.9	5.7
12.07.2020	34.7	27.7	6.0
13.07.2020	34.4	28.3	5.6
14.07.2020	35.0	28.5	5.5
15.07.2020	32.0	28.1	5.8
16.07.2020	33.0	28.1	6.2
17.07.2020	34.6	27.3	6.9
18.07.2020	35.1	28.2	6.5
19.07.2020	33.6	28.0	5.5
20.07.2020	34.1	28.2	6.5
21.07.2020	34.6	28.0	6.1
22.07.2020	35.9	28.2	5.9
23.07.2020	35.5	28.4	4.0
24.07.2020	35.1	28.6	4.8
25.07.2020	37.0	28.9	3.6
26.07.2020	36.3	28.5	4.1
27.07.2020	35.6	28.5	4.0
28.07.2020	36.4	28.3	3.2
29.07.2020	36.0	28.3	2.8
30.07.2020	36.5	29.5	3.2
31.07.2020	36.1	28.5	4.4

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Table 2-9 Meteorological data for August 2020

Date	Max Temp (°C)	Min Temp (°C)	Wind Speed (mps)
01.08.2020	35.7	27.9	3.9
02.08.2020	36.1	27.6	2.9
03.08.2020	34.7	28.0	4.3
04.08.2020	35.4	28.0	3.8
05.08.2020	35.6	28.0	4.1
06.08.2020	35.9	28.1	6
07.08.2020	35.2	27.4	5.2
08.08.2020	35.0	26.4	5.1
09.08.2020	33.7	26.7	4
10.08.2020	34.9	26.5	3.7
11.08.2020	31.8	27.3	5.2
12.08.2020	34.0	28.0	5.2
13.08.2020	35.4	26.7	5.1
14.08.2020	34.8	26.1	5.2
15.08.2020	33.2	26.5	6.0
16.08.2020	34.3	27.2	7.3
17.08.2020	34.7	27.7	6.2
18.08.2020	34.6	27.9	6.5
19.08.2020	34.7	28.0	6.1
20.08.2020	35.3	28.0	5.7
21.08.2020	36.4	28.1	5.6
22.08.2020	36.4	27.9	3.3
23.08.2020	36.4	28.9	3.0
24.08.2020	33.6	28.3	2.4
25.08.2020	34.9	27.7	2.6
26.08.2020	35.1	27.1	2.5
27.08.2020	34.8	26.9	3.7
28.08.2020	34.1	26.8	3.5
29.08.2020	34.2	27.3	3.3
30.08.2020	35.3	27.4	2.6
31.08.2020	34.0	26.9	3.0

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Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

Table 2-10 Meteorological data for September 2020

Date	Max Temp (°C)	Min Temp (°C)	Wind Speed (mps)
01.09.2020	34.7	27.1	2.2
02.09.2020	34.2	28.0	2.2
03.09.2020	35.0	28.1	2.2
04.09.2020	35.4	28.1	2.1
05.09.2020	36.0	28.9	2.5
06.09.2020	36.0	27.9	3.7
07.09.2020	36.0	27.7	4.8
08.09.2020	36.4	27.4	2.8
09.09.2020	34.0	27.6	1.2
10.09.2020	33.5	26.4	1.2
11.09.2020	35.5	27.0	1.8
12.09.2020	35.6	28.8	1.6
13.09.2020	35.1	27.5	1.3
14.09.2020	31.5	26.5	1.2
15.09.2020	32.5	27.0	1.6
16.09.2020	32.8	26.7	2
17.09.2020	33.3	26.5	3.3
18.09.2020	34.3	26.7	3
19.09.2020	32.6	27.0	3.5
20.09.2020	34.7	26.9	3.4
21.09.2020	34.7	27.5	2.3
22.09.2020	35.8	27.8	3.0
23.09.2020	35.4	27.9	1.9
24.09.2020	32.0	26.6	1.8
25.09.2020	34.5	26.5	1.4
26.09.2020	34.3	27.2	1.8
27.09.2020	33.4	26.5	1.7
28.09.2020	31.7	25.3	1.3
29.09.2020	32.2	26.1	1.4
30.09.2020	33.4	25.3	2.1

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>Draft EIA Report</i>
Project Proponent	<i>M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)</i>	
Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

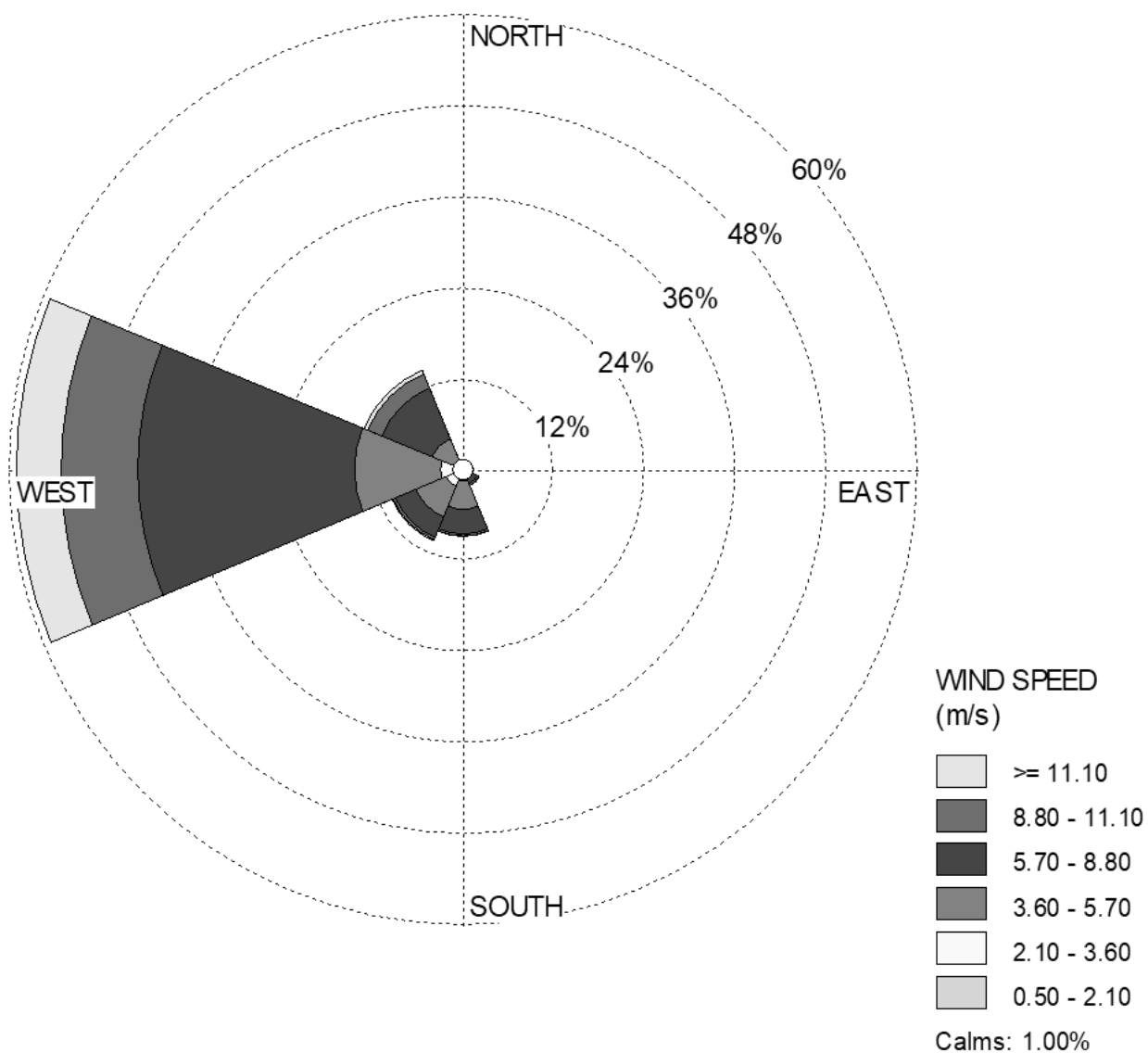


Figure 2-13 Windrose

Project	Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha	Draft EIA Report
Project Proponent	M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)	
Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	

Selection of Sampling Locations:

Four Monitoring locations along with the project site is selected based on Wind Direction & Wind Speed. All the monitoring locations are chosen in the downwind direction.

3.11 Ambient Air Quality

Environmental Parameters: Ambient Air			
Monitoring Period	July - September 2020		
Design Criteria	The monitoring stations are selected based on factors like topography/terrain, prevailing meteorological conditions like predominant wind direction (July - September 2020), etc, play a vital role in selection of air sampling stations. Based on these criteria, 5 air sampling stations were selected in the area as shown below.		
Monitoring Locations	Location & Code	Distance (km)	Direction
	Project Site -AAQ 1	-	-
	Near Nerinjikkorai Veliperingyam Road, E	0.36	E
	Near Ariyalur Muttuvancheri Govindapuram Road, E	4.18	E
	Near Pudupalyam, W	4.5	N
	Periyanagalur, N	4.8	W
Methodology	Respirable Particulate Matter (PM10) - Gravimetric (IS 5182: Part 23:2006) Particulate Matter PM2.5 - Gravimetric (Fine particulate matter) Sulphur Dioxide - Calorimetric (West & Gaeke Method) (IS 5182: Part 02: 2001) Nitrogen Dioxide - Calorimetric (Modified Jacob & Hocheiser Method) (IS 5182: Part 06:2006)		
Frequency of Monitoring	2 days in a week, 4 weeks in a month for 3 months in a season.		

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Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

3.11.1 Ambient Air Quality Monitoring Photographs



Figure 2-14 Site Monitoring Photographs – Ambient Air Quality Monitoring

3.11.2 Ambient Air Quality: Results & Discussion

The test results of the ambient air quality monitored in project site and other four locations in the downwind direction is summarized below

Project	Pudupalayam Limekankar & Limestone Quarry -22.96.0 Ha	Draft EIA Report
Project Proponent	M/s. Tamilnadu Cements Corporation Limited (A Government of TamilNadu Undertaking)	
Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District, Tamil Nadu	

Code	Location	PM 10 ($\mu\text{g}/\text{m}^3$)				PM 2.5 ($\mu\text{g}/\text{m}^3$)				SO2 ($\mu\text{g}/\text{m}^3$)				NOx ($\mu\text{g}/\text{m}^3$)			
		Min	Max	Avg	98 percentile	Min	Max	Avg	98 percentile	Min	Max	Avg	98 percentile	Min	Max	Avg	98 percentile
AAQ 1	Project Site	30	44	39.0	43.54	15	22	19.2	22	5	10	7.3	9.54	10	18	13.3	17.54
AAQ 2	Near Nerinjikkorai Veliperingyam Road, E	47	52	49.7	51.54	23	26	24.7	26	9	14	11.6	13.54	18	24	21.5	24
AAQ 3	Near Ariyalur Muttuvancheri Govindapuram Road, E	51	58	53.8	58	23	29	26.0	29	13	17	15.0	17	16	34	30.3	33.54
AAQ 4	Near Pudupalyam, W	37	45	41.0	44.54	17	23	19.6	22.54	8	12	10.1	12	15	20	17.3	19.54
AAQ 5	Periyanagalur, N	38	43	40.1	43	17	21	19.2	21	7	11	8.7	10.54	15	19	17.0	19
NAAQ Standards - Residential Area		100 ($\mu\text{g}/\text{m}^3$)				60($\mu\text{g}/\text{m}^3$)				80 ($\mu\text{g}/\text{m}^3$)				80 ($\mu\text{g}/\text{m}^3$)			

Table 2-11 Ambient Air Quality

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>Draft EIA Report</i>
Project Proponent	<i>M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)</i>	
Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

3.11.3 Interpretation of ambient air quality:

To assess the impact, AAQ were monitored in project site and four locations in the downwind direction.

Observation:

The Maximum value of PM₁₀ (58 (µg/m³), PM_{2.5} (29 (µg/m³), NO_x (34 (µg/m³), Sox (17 (µg/m³) is observed in AAQ 3 - Near Ariyalur Muttavancheri Govindaputhur Road, E.

Inference:

The monitoring results for PM₁₀, PM_{2.5}, NO_x and SO_x were found to be high in Near Ariyalur Muttavancheri Govindaputhur Road, (E).

PM 10 & PM 2.5:

The main source of ***PM 10 and PM 2.5*** is the dust emission and soot. The proposed mine lease area is located nearer to the **RAMCO Cements, India Cements, Ultratech Cements & Chettinad Cements** where the mining activities is in progress. Hence due to the progressive mining activities in the area, the values of ***PM 10 and PM 2.5*** are pronounced to be more in AAQ 3. In addition to that, the small collector roads near the monitoring locations are found to be mud road, which is unpaved leaving a way to dust emission.

NO_x:

The major source of NO_x is due to combustion of fossil fuels. The highest value is observed in AAQ 3 as the monitoring location is near Ariyalur Muttavancheri Govindaputhur Road, (E). Parivallal Higher Secondary School is found near to the monitoring Location where the movement of School Buses and use of Public and Private transport for commutation of the students will be more contributing to NO_x emission. Apart from that, this road forms the route for transporting the mined out minerals from the mine to the corresponding factories. The monitoring location (AAQ3) is completely surrounded by Shri Ayyanar Temple, Sri Balathandayuthapani Temple, Karupusamy Temple, Adimaraitha Maayiyaaman Temple and the access road for these temples is through Ariyalur Muttavancheri Govindaputhur Road.

SO_x:

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>Draft EIA Report</i>
Project Proponent	<i>M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)</i>	
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The main source of SO_x is Burning of fossil fuels such as coal, oil and natural gas. The project site is surrounded by cluster of mines which are in operation, where there is a usage of fuel for the operation of machineries which is contributing to the higher values of SO_x. The observed values are all well within the Standards prescribed by NAAQ.

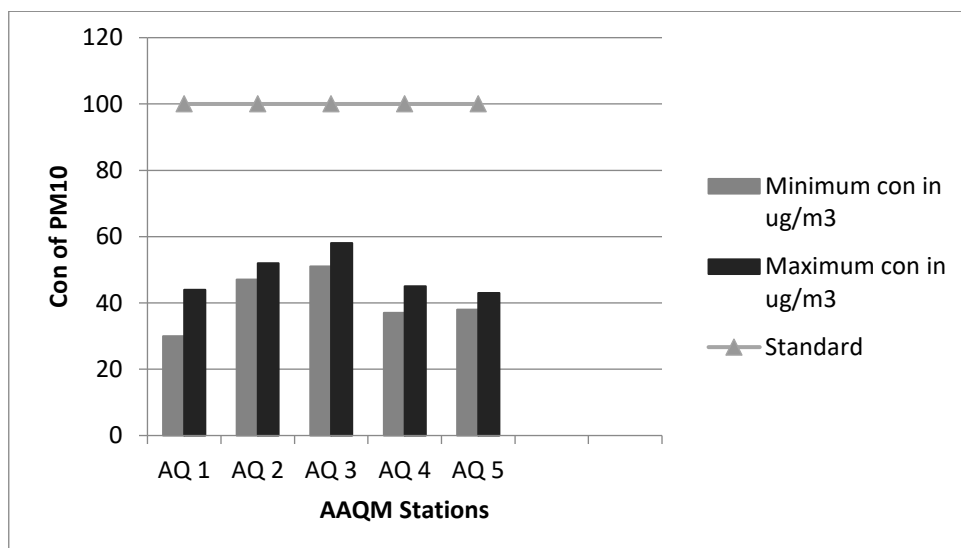


Figure 2-15 Concentration of PM 10

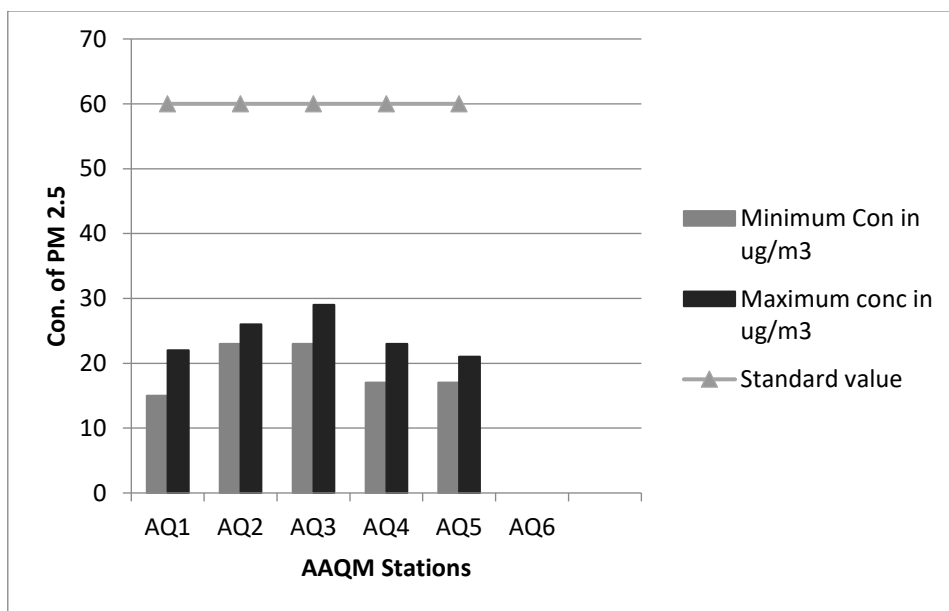


Figure 2-16 Concentration of PM 2.5

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>Draft EIA Report</i>
Project Proponent	<i>M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)</i>	
Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

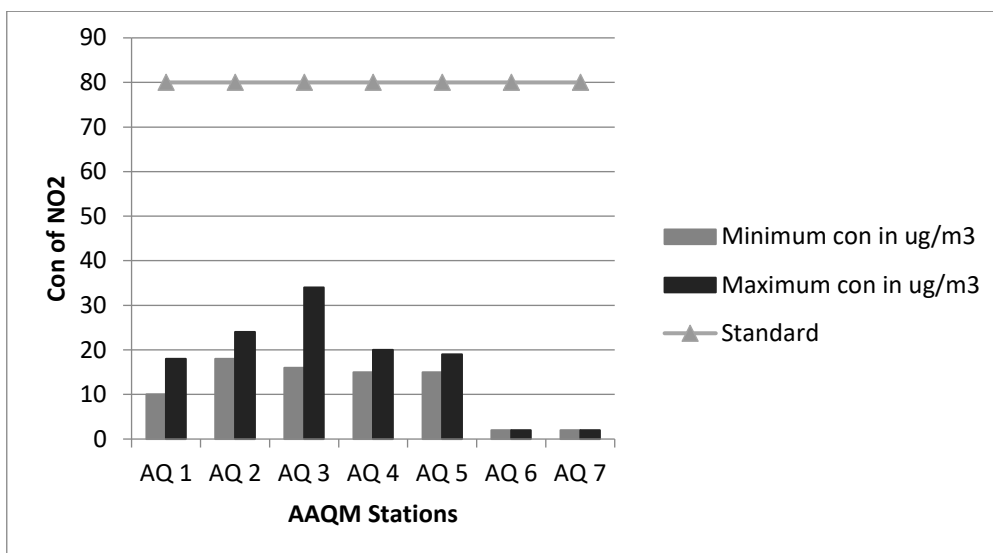


Figure 2-17 Concentration of NO_x

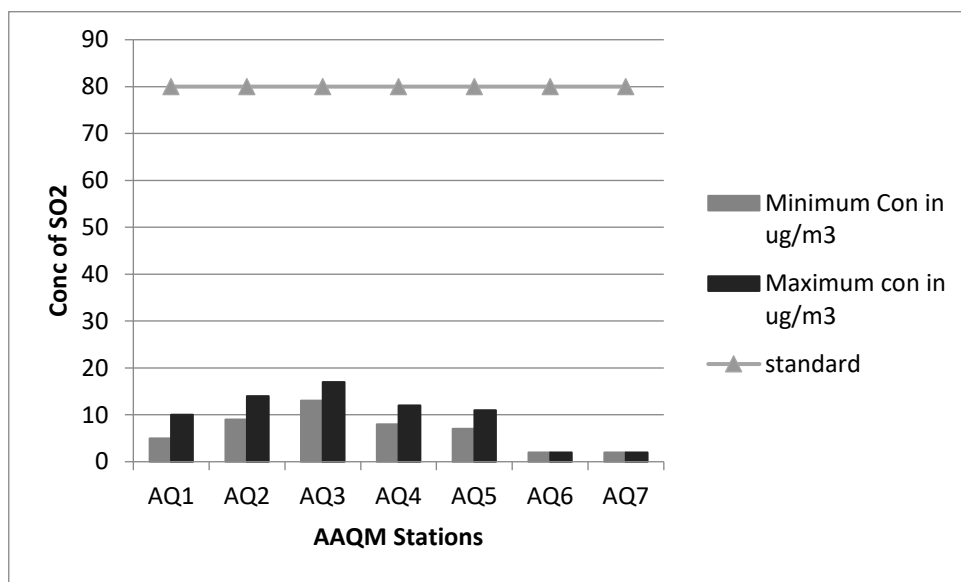


Figure 2-18 Concentration of SO₂

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>Draft EIA Report</i>
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Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

3.12 Noise Environment:

Table 2-12 Noise Analysis

Environmental Parameters: Noise Analysis	
Monitoring Period	July – September 2020
Design Criteria	Based on the Sensitivity of the area
Monitoring Locations	Project Site -N1 Near Puthupalayam Ariyalur Road, E – N2 Near NH 227-N3 Near Brila Cements – N4 Nerinjikorai, SE– N5
Methodology	Noise level measurements were taken at the selected locations using noise level meter both during day and night time. Noise level measurements were taken continuously for 24 hours at hourly intervals
Frequency of Monitoring	Noise samples were collected from 5 locations - Once in a season

Ambient Noise Levels are monitored in the chosen 5 Locations including the project Site and the monitoring results are summarized below

3.12.1 Noise Monitoring Photographs



Figure 2-19 Site Monitoring Photographs – Ambient Noise Level

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>Draft EIA Report</i>
Project Proponent	<i>M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)</i>	
Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

3.12.2 Day Noise Level (Leq day)

Table 2-13 Day Noise Level (Leq day)

Location	Leq day in dB(A)		
	Max	Min	Average
Project Site -N1	49	46	47
Near Puthupalayam-Ariyalur Road N2	47	43	45
Near NH 227 N3	47	42	44
Near Birla Cements N4	58	51	55
Nerinjikorai N5	47	43	45

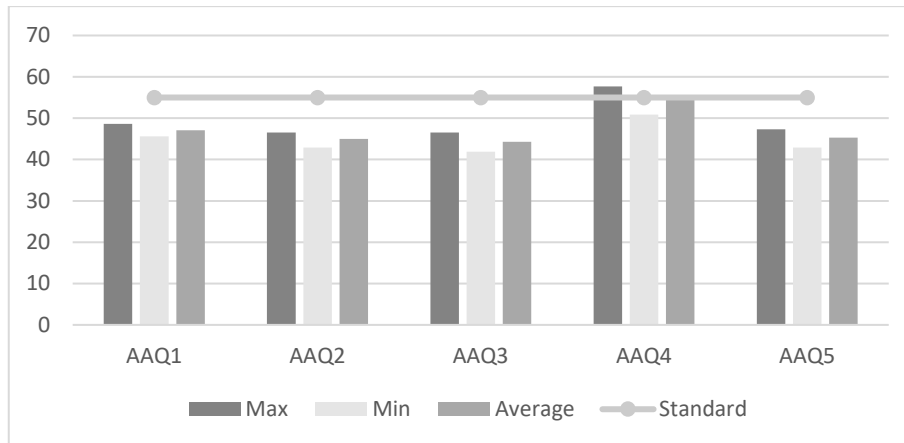


Figure 2-20 Day Noise Level (Leq day)

3.12.3 Night Noise Level (Leq Night)

Table 2-14 Night Noise Level (Leq Night)

Location	Leq Night in dB(A)		
	Max	Min	Average
Project Site -N1	43	41	42
Near Puthupalayam-Ariyalur Road N2	42	40	41
Near NH 227 N3	40	39	39
Near Birla Cements N4	48	45	46
Nerinjikorai N5	43	37	41

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>Draft EIA Report</i>
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Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

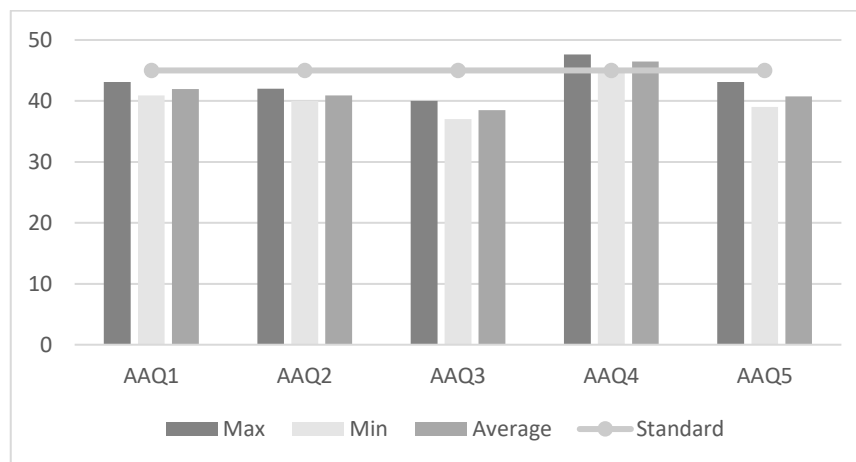


Figure 2-21 Night Noise Level (Leq Night)

Observation:

The maximum Day noise was found to be 58 dB(A) in Near Birla Cements and the night noise was found to be 48 dB(A) Near Birla Cements – N4. The minimum Day Noise and Night noise were 42 dB(A) in N2, N3 & N5 and 37 dB(A) in Nerinjikorai.

Inference:

The maximum day noise in the project site is due to the blasting and drilling activities in the adjacent mines, which are very close to the proposed mine lease area. The maximum night noise is observed in Near Birla Cements N4, where the movement of vehicles will be more.

The minimum Noise level during day time is observed in N2, N3 & N5 and minimum Noise level during night time is 42 dB(A), which is observed in Near Birla Cements.

The observed values are all well within the Standards prescribed by CPCB.

3.13 Soil Environment

Soil environment is studied for 5km radius from the project site. The 5 km radius image shows that the soil is affected by both Sheet and Gully Erosion. Sheet erosion is the uniform removal of soil in thin layers, and it occurs when soil particles are carried evenly over the soil surface by rainwater that does not infiltrate into the ground. Gully erosion is the removal of soil along drainage lines by surface water runoff. Unless steps are taken to stabilise the disturbance, gullies will continue to move by headward erosion or by slumping of the side walls.

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Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

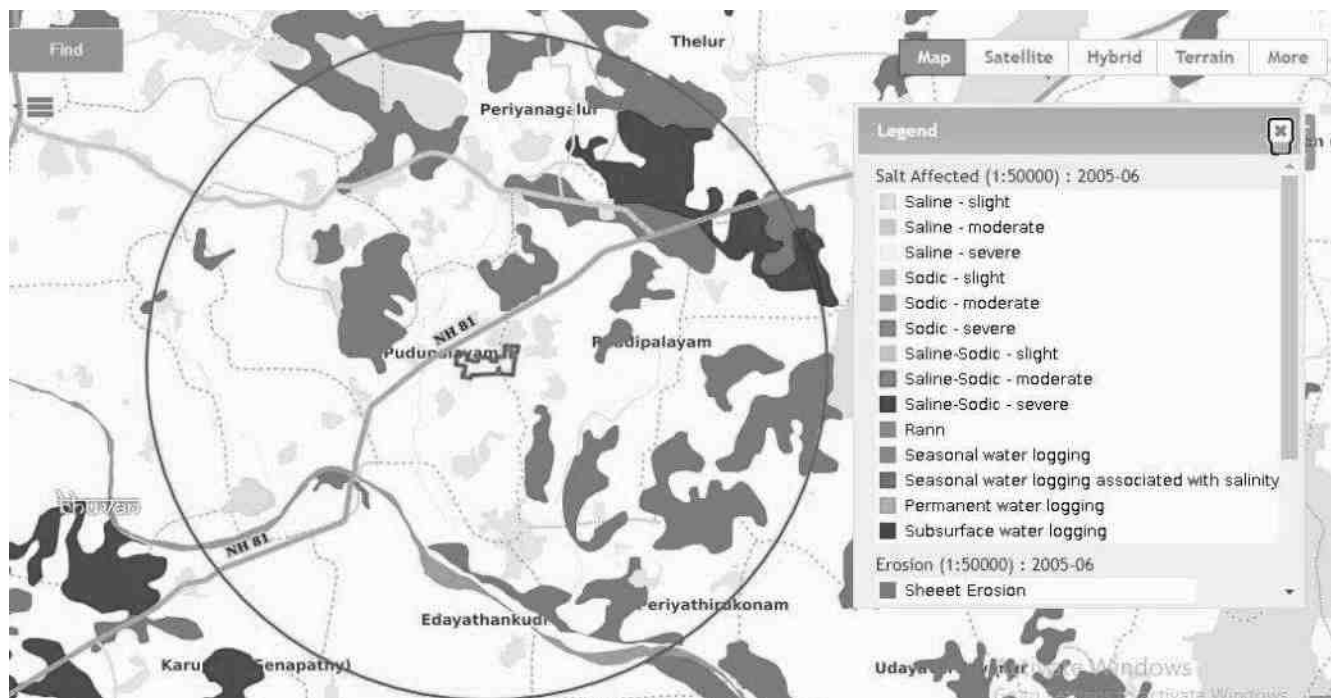


Figure 2-22 Soil Erosion & salinity pattern within 5 km radius of the project site

The saline nature of the soil is studied around 5km radius of the project site. From the study, it is revealed only the area near Pallakirushnapuram is slightly saline.

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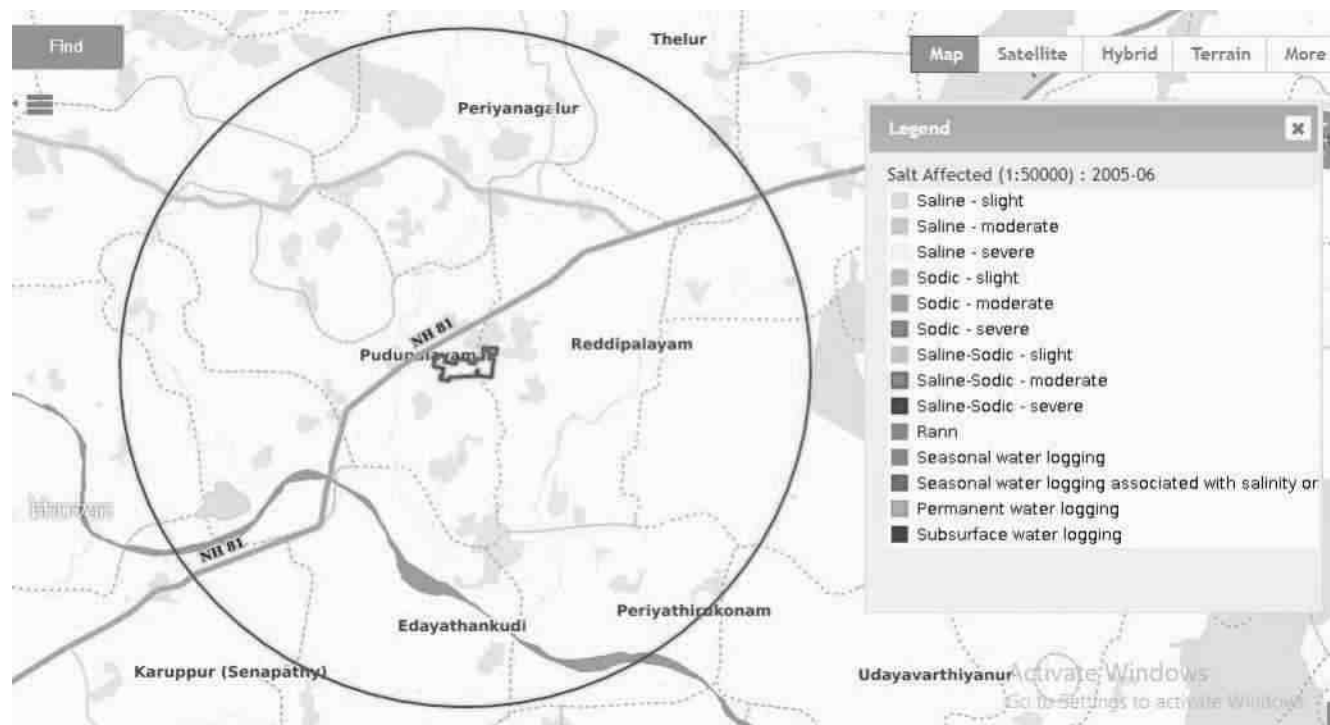


Figure 2-23 Soil & Lithology map around 5 km radius of the project site

3.13.1 Baseline Data:

The present study of the soil quality establishes the baseline characteristics which will help in future in identifying the incremental concentrations if any, due to the operation Phase of the proposed project. The sampling locations have been identified with the following objectives:

- To determine the impact of proposed project on soil characteristics and
- To determine the impact on soils more importantly from agricultural productivity point of view.

Table 2-15 Soil Quality Analysis

Environmental Parameters: Soil Quality Analysis	
Monitoring Period	July – September 2020
Design Criteria	Based on the environmental settings of the study area
Monitoring Locations	Project Site – SQ 1

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>Draft EIA Report</i>
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Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

	Near Marudhaiyar River – SQ 2 Nerinjikorai, W – SQ 3 Reddiapalayam, N – SQ4 Near Chettinad Cement Mines – SQ5
Methodology	Composite soil samples using sampling augers and field capacity apparatus
Frequency of Monitoring	Soil samples were collected from 5 locations Once in a season

To assess the soil quality of the study area, 5 monitoring stations were selected and the results are summarized below

Table 2-16 Soil Quality Analysis

S.No	Parameters	Units	Project Site	Marudhaiyar Near	Nerinjikorai	Reddiapalaya m	Near Chettinad cement Mines
1	pH (at 25°C)	-	7.1	7.65	7.49	7.52	7.59
2	Electrical Conductivity	mS/cm	0.89	0.89	0.987	0.87	0.68
3	Water Holding Capacity	ml/l	5.1	8.8	8.5	3.5	9.5
4	Bulk Density	g/cm ³	1.162	1.1276	1.1472	1.1297	1.1595
5	Calcium as Ca	mg/kg	24.5	22.0	76.2	76.0	25.4
6	Sodium as Na	mg/kg	421	355	365	188	218
7	Potassium as K	mg/kg	20.1	18.9	18.2	43.1	10.7
8	Organic matter	%	1.33	0.32	0.09	0.08	1.34
9	Magnesium as Mg	mg/kg	8.59	9.6	10.2	8.70	7.28
10	Total Nitrogen	%	0.032	0.032	0.030	0.024	0.025
11	Available Phosphorous	mg/kg	460	385	230	235	260
12	Sand	%	26.6	23.5	22	56	20.0

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>Draft EIA Report</i>
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13	Clay	%	55.2	64	64	16	70.0
14	Silt	%	18.2	12.5	14	28	10.0
15	Cation Exchange Capacity	meq/100g	8.2	7.88	8.22	8.70	9.02
16	SAR	meq/kg	19.2	15.8	15.1	7.85	9.97
17	Silicon	%	0.67	0.48	0.5	0.90	0.60
18	Chloride	mg/kg	30.8	37.2	135	130	39.0
19	Total Soluble Sulphates	mg/kg	266	208	262	273	279
20	Zinc	mg/kg	21.2	20.8	19.5	18.8	19.4

Physical Properties:

Regular cultivation practices increase the bulk density of soils thus inducing compaction. This results in reduction in water percolation rate and penetration of roots through soils. The soils with low bulk density have favorable physical conditions whereas those with high bulk density exhibit poor physical conditions for agriculture crops. The bulk density of the soil in the study area ranged between 1.1297 to 1.162 g/cc which indicates favorable physical condition for plant growth. The water holding capacity was found in the range of 5.1 ml/1 to 9.5 ml/1.

Chemical Properties:

Chemical characteristics of soils include pH, exchangeable cations and fertility status in the form of NPK values and organic matter. The value of the pH is slightly alkaline and it ranges from 6.98 to 7.65. The soil in Pallakirushnapuram is slightly saline in nature, which challenges because they tend to have very poor structure which limits or prevents water infiltration and drainage. The organic matter varies from 0.07 to 0.33 mg/kg, which indicates the soil is unfertile. Hence the soil is not suitable for cropping and the depth of ground water table in the area is 35m, which also adds as an adding factor to it.

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3.14 Ecology and Biodiversity

Ecology and Biodiversity is studied for 10 km radius around the project site. Project site and 5 km around the project site is considered as core zone and from 5 km to 10 km radius, it is considered as buffer zone.

- Primary field survey is carried out for the assessment of flora and fauna in the core zone
- Secondary data from Journals/Literature were studied and compiled to understand the species present in the buffer zone

3.14.1 Methods available for floral analysis:

Plot Sampling Methods

- Quadrat – 2D shape (e.g. square or rectangle, or other shape) used as a sampling unit
- Transect
 - **Line transects** feature only a length dimension, usually defined by a tape stretched across the area to be sampled.
 - **Belt transects** have a width as well as length.
 - **Pace-transects** are established when the observer strides along an imaginary line across the sample site, and uses their foot placement to determine specific sampling points.

Plot less Sampling Methods

- Closest individual method - Distance is measured from each random point to the nearest individual.
- Nearest neighbour method - Distance is measured from an individual to its nearest neighbour.
- Random pairs method - Distance is measured from one individual to another on the opposite side of the sample point.
- Point-centered quarter (PCQ) method - Distance is measured from the sampling point to the nearest individual in each quadrat.

3.14.2 Tools Used

1. Nails,
2. String/Ropes,
3. Paper,
4. Pen,
5. Tape,
6. Hammer
7. GPS

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Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

8. Camera

9. Binocular

3.14.3 Field study& Methodology adopted:

To assess the suitability of the methodology, random field survey was done. Field survey was conducted around 5 km radius from the project site and five locations were chosen based on the species density. Quadrat method along with the recording of seasonality and timing is chosen for the proposed study as compared to other sampling methods, because they are relatively simple to use. Quadrat plots are uniform in size and shape and distributed randomly throughout the sample area, which makes the study design straightforward. They are also one of the most affordable techniques because they require very few materials.

Table 2-17 Field study

S. No	Location	Latitude	Longitude	No of Quadrates		
				Trees (10m x 10m)	Shrubs (5m x 5m)	Herbs & grasses (1m x 1m)
1.	Project Site	11° 5'22.87"N	79° 8'55.23"E	1	4	5
2.	Near Marudhaiyar River (S)	11° 3'47.14"N	79° 8'56.52"E	1	4	5
3.	Pudupalayam (W)	11° 5'18.34"N	79° 7'58.40"E	1	4	5
4.	Kaatuppiringiyam (N)	11° 6'48.44"N	79° 8'32.35"E	1	4	5
5.	Periyathirukkonam (E)	11° 3'59.19"N	79°10'30.48"E	1	4	5

3.14.4 Study outcome:

Phyto sociological parameters, such as ***Density, Frequency, Basal Area, Abundance and Importance Value Index*** of individual species (Trees) were determined in randomly placed quadrates of different sizes in the study area. Relative frequency, relative basal area and relative density were calculated and the sum of these three represented Importance Value Index (IVI) for various species. For shrubs, herbs and grasses, ***Density, Frequency, Relative Density & Relative Frequency*** were found.

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>Draft EIA Report</i>
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Sample plots were selected in such a way to get maximum representation of different types of vegetation and plots were laid out in different part of the study area of 2 km radius. Analysis of the vegetation will help in determining the relative importance of each species in the study area and to reveal if any economically valuable species is threatened in the process.

Table 2-18 Calculation of Density, Frequency (%), Dominance, Relative Density, Relative Frequency, Relative Dominance & Important Value Index

Parameters	Formula
Density	Total No. of individuals of species/ Total No. of Quadrats used in sampling
Frequency (%)	(Total No. of Quadrats in which species occur/ Total No. of Quadrats studied) * 100
Dominance	Total Basal Area /Total area sampled
Abundance	Total No. of individuals of species/ No. of Quadrats in which they occur
Relative Density	(Total No. of individuals of species/Sum of all individuals of all species) * 100
Relative Frequency	(Total No. of Quadrats in which species occur/ Total No. of Quadrats occupied by all species) * 100
Relative Dominance	Dominance of a given species/Total Dominance of all species
Important Value Index	Relative Density + Relative Frequency + Relative Dominance

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Table 2-19 Tree Species in the core Zone

S. No.	Scientific Name	Local Name	Total No. of species	Total of Quadrants with species	Total No. of Quadrants	Density	Frequency (%)	Abundance	Dominance	Relative Density	Relative Frequency	Relative Dominance	IVI	IUCN Conservation Status
1	Ficus Carica	Athi Maram	2	2	6	0.33	33.33	1	0.28	1.68	2.17	4.45	8.31	Least Concern
2	Cassia siamea	ManjalKonrai	3	2	6	0.50	33.33	1.5	0.07	2.52	2.17	1.11	5.81	Least Concern
3	Acacia nilotica	Karuvelai	4	4	6	0.67	66.67	1	0.28	3.36	4.35	4.45	12.16	Least Concern
4	Bambusa vulgaris	Moongil	4	4	6	0.67	66.67	1	0.50	3.36	4.35	7.92	15.63	Not assessed
5	Anacardium occidentale	Cashew	1	1	6	0.17	16.67	1	0.44	0.84	1.09	6.96	8.88	Not assessed
6	Alstonia scholaris	Elilaipalai	2	2	6	0.33	33.33	1	0.27	1.68	2.17	4.31	8.16	Least Concern
7	Psidium guajava	Guava	3	3	6	0.50	50.00	1	0.23	2.52	3.26	3.61	9.39	Not assessed
8	Aegle marmelos	Vilvam	1	1	6	0.17	16.67	1	0.16	0.84	1.09	2.50	4.43	Not assessed
9	Causuarina equisetifolia	Savukku	2	2	6	0.33	33.33	1	0.21	1.68	2.17	3.34	7.20	Not assessed
10	Albizia amara	Wunja	1	1	6	0.17	16.67	1	0.20	0.84	1.09	3.22	5.14	Not assessed
11	Cocos nucifera	Thennai	10	6	6	1.67	100.00	1.67	0.15	8.40	6.52	2.39	17.32	Not assessed
12	Artocarpus heterophyllus	Palaa	2	2	6	0.33	33.33	1	0.18	1.68	2.17	2.85	6.70	Not assessed
13	Bombax ceiba	Sittan	4	4	6	0.67	66.67	1	0.08	3.36	4.35	1.27	8.98	Not assessed
14	Azadirachta indica	Veppam	17	6	6	2.83	100.00	2.83	0.13	14.29	6.52	1.98	22.79	Not assessed

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15	Delonix regia	Cemmayir-Konrai	1	1	6	0.17	16.67	1	0.21	0.84	1.09	3.34	5.27	Least Concern
16	Delonix elata	Perungondrai	1	1	6	0.17	16.67	1	0.17	0.84	1.09	2.62	4.54	Least Concern
17	Dalbergia sissoo	Shisham	1	1	6	0.17	16.67	1	0.15	0.84	1.09	2.29	4.21	Not assessed
18	Ficus benghalensis	Alai	2	2	6	0.33	33.33	1	0.08	1.68	2.17	1.19	5.04	Not assessed
19	Annona squamosa	Sitapalam	1	1	6	0.17	16.67	1	0.23	0.84	1.09	3.61	5.53	Not assessed
20	Pithecellobium dulce	Kodukapuli	1	1	6	0.17	16.67	1	0.14	0.84	1.09	2.18	4.11	Not assessed
21	Ficus religiosa	Arasa maram	3	3	6	0.50	50.00	1	0.09	2.52	3.26	1.35	7.13	Not assessed
22	Couroupita guianensis	Nagalingam	5	3	6	0.83	50.00	1.67	0.14	4.20	3.26	2.18	9.64	Not assessed
23	Musa paradise	Vaazhai	3	3	6	0.50	50.00	1	0.08	2.52	3.26	1.19	6.97	Not assessed
24	Prosopis juliflora	Vaelikaruvai	3	3	6	0.50	50.00	1	0.21	2.52	3.26	3.34	9.13	Not assessed
25	Mangifera indica	Mamaram	7	6	6	1.17	100.00	1.166667	0.07	5.88	6.52	1.11	13.52	Data insufficient
26	Mimusops elengi	Magizham	2	2	6	0.33	33.33	1	0.18	1.68	2.17	2.85	6.70	Not assessed
27	Morinda pubescens	Nuna	6	6	6	1.00	100.00	1	0.24	5.04	6.52	3.74	15.31	Not assessed
28	Thespesia populnea	Poovarasam	3	3	6	0.50	50.00	1	0.15	2.52	3.26	2.39	8.18	Not assessed
29	Tectona grandis	Thekku	3	3	6	0.50	50.00	1	0.12	2.52	3.26	1.88	7.66	Not assessed
30	Tamarindus indica	Puli	10	6	6	1.67	100.00	1.666667	0.20	8.40	6.52	3.09	18.02	Not assessed
31	Syzygium cumini	naval	5	1	6	0.83	16.67	5	0.11	4.20	1.09	1.79	7.07	Not assessed
32	Carica papaya	Papaya	3	3	6	0.50	50.00	1	0.09	2.52	3.26	1.43	7.21	Not assessed
33	Ziziphus mauritiana	Elandai	1	1	6	0.17	16.67	1	0.28	0.84	1.09	4.45	6.38	Not assessed
34	Citrus medica	Elumichai	2	2	6	0.33	33.33	1	0.23	1.68	2.17	3.61	7.46	Not assessed
Total			119	92					6.35					

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Table 2-20 Shrubs in the Core Zone

S. No.	Scientific Name	Local Name	Total No. of species	Total of Quadrants with species	Total No. of Quadrants	Density	Frequency (%)	Abundance	Relative Density	Relative Frequency	IUCN Conservation Status
1	Jatropagossypifolia	Kaatamanaku	28	17	24	1.17	0.71	1.65	14.43	17.17	Not Assessed
2	Lantana trifolia	Shrub verbana	10	3	24	0.42	0.13	3.33	5.15	3.03	Not Assessed
3	Robiniapseudoacacia	Black locust	17	5	24	0.71	0.21	3.4	8.76	5.05	Least Concern
4	Lantana camara	Unnichedi	9	6	24	0.38	0.25	1.5	4.64	6.06	Not Assessed
5	Calotropis gigantea	Erukam	14	12	24	0.58	0.50	1.17	7.22	12.12	Not Assessed
6	Stachytarphaeurticifolia	Rat tail	15	9	24	0.63	0.38	1.67	7.73	9.09	Not Assessed
7	Datura metal	Ummattangani	5	4	24	0.21	0.17	1.25	2.58	4.04	Not Assessed
8	Hibiscus rosa sinensis	Sembaruthi	3	2	24	0.13	0.08	1.5	1.55	2.02	Not Assessed
9	Tabernaemontanadivaricata	Crepe Jasmine	3	3	24	0.13	0.13	1	1.55	3.03	Not Assessed
10	Chloromolaena odorata	Venapacha	9	6	24	0.38	0.25	1.5	4.64	6.06	Least Concern
11	Euphorbia geniculata	Amman Pacharisi	3	3	24	0.13	0.13	1	1.55	3.03	Not Assessed
12	Catharanthus roseus	Nithyakalyani	3	3	24	0.13	0.13	1	1.55	3.03	Not Assessed
13	Woodfordiafruticosa	Velakkai	3	3	24	0.13	0.13	1	1.55	3.03	Least Concern
14	Morindapubescens	Mannanunai	2	2	24	0.08	0.08	1	1.03	2.02	Not Assessed
15	Acalypha indica	Kuppaimeni	20	8	24	0.83	0.33	2.5	10.31	8.08	Not Assessed
16	Parthenium hysterophorous	Vishapoondur	50	13	24	2.08	0.54	3.85	25.77	13.13	Not Assessed

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Table 2-21 Herbs & Grasses in the core zone

S. No.	Scientific Name	Local Name	Total No. of species	Total of Quadrants with species	Total No. of Quadrants	Density	Frequency (%)	Abundance	Relative Density	Relative Frequency	IUCN Conservation status
1	Plumbago zeylanica	Chittiramoolam	3	3	30	0.10	0.10	1	1.19	3.23	Not assessed
2	Mimosa pudica	Thottacherungi	6	5	30	0.20	0.17	1.2	2.38	5.38	Least concern
3	Sida acuta	Malaidangi	10	3	30	0.33	0.10	3.33	3.97	3.23	Not assessed
4	Scrophularia nodosa	Sarakkothini	15	7	30	0.50	0.23	2.14	5.95	7.53	Not assessed
5	Helicteresisora	Valampuri	2	2	30	0.07	0.07	1	0.79	2.15	Not assessed
6	Cynodondactylon	Arugu	12	6	30	0.40	0.20	2	4.76	6.45	Not assessed
7	Sporobolus fertilis	Giant Parramatta Grass	9	4	30	0.30	0.13	2.25	3.57	4.30	Not assessed
8	Viburnum dentatum	Viburnum	5	5	30	0.17	0.17	1	1.98	5.38	Least concern
9	Heraculem spondylium	Hog Weed	20	10	30	0.67	0.33	2	7.94	10.75	Not assessed
10	Laportea canadensis	Peruganchori	30	20	30	1.00	0.67	1.5	11.90	21.51	Not assessed
11	Euphorbia hirta	Amman Pacharisi	5	4	30	0.17	0.13	1.25	1.98	4.30	Not assessed
12	Tridax procumbens	Vettukaayathalai	5	4	30	0.17	0.13	1.25	1.98	4.30	Not assessed
13	Tephrosia purpurea	Kavali	20	4	30	0.67	0.13	5	7.94	4.30	Not assessed
14	Sida cordifolia	Maanikham	45	4	30	1.50	0.13	11.25	17.86	4.30	Not assessed
15	Tridax procumbens	Cuminipachai	15	4	30	0.50	0.13	3.75	5.95	4.30	Not assessed
16	Ruellia strepens	Grandinayagam	25	4	30	0.83	0.13	6.25	9.92	4.30	Not assessed
17	Senna occidentalis	Nattamsakarai	25	4	30	0.83	0.13	6.25	9.92	4.30	Not assessed

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3.14.5 Calculation of species diversity by Shannon – wiener Index, Evenness and richness by Margalef:

Biodiversity index is a quantitative measure that reflects how many different type 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 biodiversity index increases both when the number of types increases and when evenness increases. For a given number of type of species, the value of a biodiversity index is maximized when all type of species are equally abundant. Interpretation of Vegetation results in the study area is given below.

Table 2-22 Calculation of species diversity

Description	Formula
Species diversity – Shannon – Wiener Index	$H = -\sum [(p_i) * \ln(p_i)]$ Where p_i : Proportion of total sample represented by species i : number of individuals of species i / total number of samples
Evenness	H/H_{max} $H_{max} = \ln(s)$ = maximum diversity possible S =No. of species
Species Richness by Margalef	$RI = S-1/\ln N$ Where S = Total Number of species in the community N = Total Number of individuals of all species in the community

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3.14.6 Calculation of species diversity by Shannon – wiener Index, Evenness and richness by Margalef for trees

i. Species Diversity

Scientific Name	Common Name	No. of Species	Pi	ln (Pi)	Pi x ln (Pi)
Ficus Carica	Athi Maram	2	0.017857	-4.02535	-0.07188
Cassia siamea	ManjalKonrai	2	0.017857	-4.02535	-0.07188
Acacia nilotica	Karuvelai	4	0.035714	-3.3322	-0.11901
Bambusa vulgaris	Moongil	4	0.035714	-3.3322	-0.11901
Anacardium occidentale	Cashew	2	0.017857	-4.02535	-0.07188
Alstonia scholaris	Elilaipalai	2	0.017857	-4.02535	-0.07188
Psidium guajava	Guava	3	0.026786	-3.61989	-0.09696
Aegle marmelos	Vilvam	1	0.008929	-4.7185	-0.04213
Causuarina equisetifolia	Savukku	2	0.017857	-4.02535	-0.07188
Albizia amara	Wunja	1	0.008929	-4.7185	-0.04213
Cocos nucifera	Thennai	15	0.133929	-2.01045	-0.26926
Artocarpus heterophyllus	Palaa	2	0.017857	-4.02535	-0.07188
Bombax ceiba	Sittan	4	0.035714	-3.3322	-0.11901
Azadirachta indica	Veppam	10	0.089286	-2.41591	-0.21571
Delonix regia	Cemmayir-Konrai	1	0.008929	-4.7185	-0.04213
Delonix elata	Perungondrai	1	0.008929	-4.7185	-0.04213
Dalbergia sissoo	Shisham	1	0.008929	-4.7185	-0.04213
Ficus benghalensis	Alai	2	0.017857	-4.02535	-0.07188
Annona squamosa	Sitapalam	1	0.008929	-4.7185	-0.04213
Pithecellobium dulce	Kodukapuli	1	0.008929	-4.7185	-0.04213
Ficus religiosa	Arasa maram	3	0.026786	-3.61989	-0.09696
Couroupita guianensis	Nagalingam	5	0.044643	-3.10906	-0.1388
Musa paradise	Vaazhai	3	0.026786	-3.61989	-0.09696
Prosopis juliflora	Vaelikaruvai	3	0.026786	-3.61989	-0.09696
Mangifera indica	Mamaram	8	0.071429	-2.63906	-0.1885
Mimusops elengi	Magizham	2	0.017857	-4.02535	-0.07188
Morinda pubescens	Nuna	6	0.053571	-2.92674	-0.15679
Thespesia populnea	Poovarasam	3	0.026786	-3.61989	-0.09696
Tectona grandis	Thekku	3	0.026786	-3.61989	-0.09696
Tamarindus indica	Puli	8	0.071429	-2.63906	-0.1885
Syzygium cumini	naval	1	0.008929	-4.7185	-0.04213
Carica papaya	Papaya	3	0.026786	-3.61989	-0.09696
Ziziphus mauritiana	Elandai	1	0.008929	-4.7185	-0.04213
Citrus medica	Elumichai	2	0.017857	-4.02535	-0.07188
Total		112			-3.22

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H (Shannon Diversity Index) =1.76

Shrubs

Scientific Name	Common Name	No. of Species	Pi	ln (Pi)	Pi x ln (Pi)
Jatropagossypifolia	Kaatamanaku	28	0.14433	-1.93565	-0.27937
Lantana trifolia	Shrub verbana	10	0.051546	-2.96527	-0.15285
Robiniapseudoacacia	Black locust	17	0.087629	-2.43464	-0.21335
Lantana camara	Unnichi	9	0.046392	-3.07063	-0.14245
Calotropis gigantea	Erukam	14	0.072165	-2.6288	-0.18971
Stachytarphaeurticifolia	Rat tail	15	0.07732	-2.55981	-0.19792
Datura metal	Ummattangani	5	0.025773	-3.65842	-0.09429
Hibiscus rosa sinensis	Sembaruthi	3	0.015464	-4.16925	-0.06447
Tabernaemontana divaricata	Crepe Jasmine	3	0.015464	-4.16925	-0.06447
Chloromolaena odorata	Venapacha	9	0.046392	-3.07063	-0.14245
Euphorbia geniculata	Amman Pacharisi	3	0.015464	-4.16925	-0.06447
Catharanthus roseus	Nithyakalyani	3	0.015464	-4.16925	-0.06447
Woodfordia fruticosa	Velakkai	3	0.015464	-4.16925	-0.06447
Morinda pubescens	Mannanunai	2	0.010309	-4.57471	-0.04716
Acalypha indica	Kuppaimeni	20	0.103093	-2.27213	-0.23424
Parthenium hysterophorus	Vishapoondur	50	0.257732	-1.35584	-0.34944
		194			-2.3656

H (Shannon Diversity Index) =1.97

Herbs

Scientific Name	Common Name	No. of Species	Pi	ln (Pi)	Pi x ln (Pi)
Plumbago zeylanica	Chittiramoolam	3	0.011905	-4.43082	-0.05275
Mimosa pudica	Thottacherungi	6	0.02381	-3.73767	-0.08899
Sida acuta	Malaidangi	10	0.039683	-3.22684	-0.12805
Scrophularia nodosa	Sarakkothini	15	0.059524	-2.82138	-0.16794
Helicteres isora	Valampuri	2	0.007937	-4.83628	-0.03838
Cynodon dactylon	Arugu	12	0.047619	-3.04452	-0.14498
Sporobolus fertilis	Giant Parramatta Grass	9	0.035714	-3.3322	-0.11901

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Viburnum dentatum	Viburnum	5	0.019841	-3.91999	-0.07778
Heraculem spondylium	Hog Weed	20	0.079365	-2.5337	-0.20109
Laportea canadensis	Peruganchori	30	0.119048	-2.12823	-0.25336
Euphorbia hirta	Amman Pacharisi	5	0.019841	-3.91999	-0.07778
Tridax procumbens	Vettukaayathalai	5	0.019841	-3.91999	-0.07778
Tephrosia purpurea	Kavali	20	0.079365	-2.5337	-0.20109
Sida cordifolia	Maanikham	45	0.178571	-1.72277	-0.30764
Tridax procumbens	Cuminipachai	15	0.059524	-2.82138	-0.16794
Ruellia strepens	Grandinayagam	25	0.099206	-2.31055	-0.22922
Senna occidentalis	Nattamsakarai	25	0.099206	-2.31055	-0.22922
		252			-2.56298

H (Shannon Diversity Index) =2.39

i. Evenness

Details	H	Hmax	Evenness	Species Richness (Margalef)
Trees	3.22	3.5	0.9	7
Shrubs	2.36	2.77	0.85	2.84
Herbs	2.56	2.83	0.9	2.89

From the above, it can be interpreted that herb community has higher diversity. While the tree 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.

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3.14.7 Frequency Pattern

To understand the frequency pattern, the observed frequency is compared with the Raunkiaer's frequency. Any deviation from Raunkiaer's frequency implies disturbed community.

Classes of species in a community and normal value of class according to Raunkiaer

Table 2-23 Frequency Pattern

Class	Frequency (%)	Normal Value in the class
A	1-20	53
B	21-40	14
C	41-60	9
D	61-80	8
E	81-100	16

Where $A > B > C > D > E$

Raunkiaer's class for the observed species

S. No.	Scientific Name	Local Name	Frequency (%)	Class as per Raunkiaer's Law
1.	Ficus Carica	Athi Maram	33.33	B
2.	Cassia siamea	ManjalKonrai	33.33	B
3.	Acacia nilotica	Karuvelai	66.67	D
4.	Bambusa vulgaris	Moongil	66.67	D
5.	Anacardium occidentale	Cashew	33.33	B
6.	Alstonia scholaris	Elilaipalai	33.33	B
7.	Psidium guajava	Guava	50.00	C
8.	Aegle marmelos	Vilvam	16.67	A
9.	Causuarina equisetifolia	Savukku	33.33	B
10.	Albizia amara	Wunja	16.67	A
11.	Cocos nucifera	Thennai	100	E
12.	Artocarpus heterophyllus	Palaa	33.33	B
13.	Bombax ceiba	Sittan	66.67	D
14.	Azadirachta indica	Veppam	100	E
15.	Delonix regia	Cemmayir-Konrai	16.67	A
16.	Delonix elata	Perungondrai	16.67	A
17.	Dalbergia sissoo	Shisham	16.67	A

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18.	Ficus benghalensis	Alai	33.33	B
19.	Annona squamosa	Sitapalam	16.67	A
20.	Pithecellobium dulce	Kodukapuli	16.67	A
21.	Ficus religiosa	Arasa maram	50.00	C
22.	Couroupita guianensis	Nagalingam	50.00	C
23.	Musa paradise	Vaazhai	50.00	C
24.	Prosopis juliflora	Vaelikaruvai	50.00	C
25.	Mangifera indica	Mamaram	100	E
26.	Mimusops elengi	Magizham	33.33	B
27.	Morinda pubescens	Nuna	100	E
28.	Thespesia populnea	Poovarasam	50.00	C
29.	Tectona grandis	Thekku	50.00	C
30.	Tamarindus indica	Puli	100	E
31.	Syzygium cumini	naval	16.67	A
32.	Carica papaya	Papaya	50.00	C
33.	Ziziphus mauritiana	Elandai	16.67	A
34.	Citrus medica	Elumichai	33.33	B

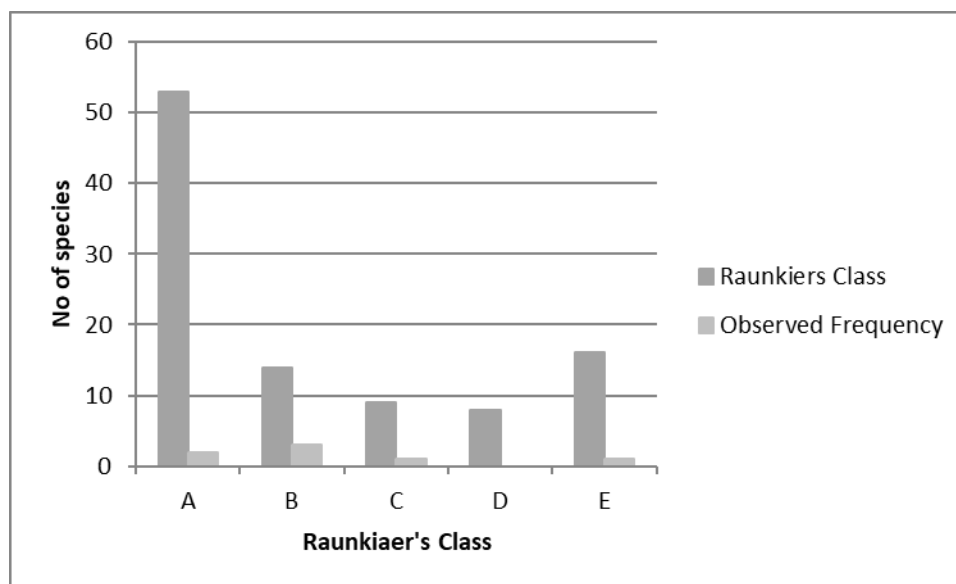


Figure 2-24 Raunkiaer's class for the observed species

Interpretation: The observed frequency is $A < B > C > D < E$, which does not follow Raunkiaer's Distribution Frequency and hence the ecology is disturbed.

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3.14.8 Floral study in the Buffer Zone:

Economically important Flora of the study area

Agricultural crops: Paddy, Maize are the main crop grown. Different fruits like Banana, papaya, mangoes, guava and vegetables like brinjal, drumsticks, onion, Coriander also grown by the local people.

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.

Rare and endangered floral species: There are no rare or endangered or threatened (RET) species of in the study area. During the vegetation survey, there are no any species which are endangered or threatened under IUCN (International Union for Conservation of Nature and Natural resources) guidelines.

Secondary Data Analysis

The secondary source of data were taken from International Journal for the proposed study. “Floristic inventory recorded from Nagamangalam Ayyannar Sacred groves from Ariyalur district, Tamil Nadu” data is taken as reference for substantiating the primary data.

Note: The species observed during primary survey were highlighted in yellow colour

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S.No.	Botanical Names	Family	Habit
1	<i>Arceuthobium</i> (L.) Desf. <i>Indica</i> (Benth.) Brongn.	Mimosaceae	Tree
2	<i>Asclepias tuberosa</i> (L.) Guss.	Rubiaceae	Herb
3	<i>Asclepias tuberosa</i> (L.) A. L. Juss.	Asclepiadaceae	Tree
4	<i>Albizia lebbekii</i> (L.f.) Wangerm.	Albizaceae	Tree
5	<i>Antennaria diaphanica</i> (L.) Kuntze	Lamiaceae	Herb
6	<i>Asparagus racemosus</i> Willd.	Asparagus	Climbing herb
7	<i>Asplenium nidus</i> (L.) L.	Rubiaceae	Tree
8	<i>Asplenium nidus</i> A. Juss.	Meliaceae	Tree
9	<i>Asplenium nidus</i> Lam.	Selaginaceae	Tree
10	<i>Asplenium nidus</i> L.	Nyctaginaceae	Herb
11	<i>Asplenium nidus</i> (L.) Desf.	Cappariaceae	Shrub
12	<i>Asplenium nidus</i> L.	Apocynaceae	Shrub
13	<i>Asplenium nidus</i> (Vahl) Masson	Rubiaceae	Shrub
14	<i>Asplenium nidus</i> L.	Lauraceae	Climbing herb
15	<i>Asplenium nidus</i> (Thunb.) T. & G.	Rubiaceae	Shrub
16	<i>Asplenium nidus</i> L. var. <i>indica</i> (Roth) Hillebr. ex DC. (Fatman)	Meliaceae	Climbing herb
17	<i>Asplenium nidus</i> L.	Vitaceae	Climbing shrub
18	<i>Asplenium nidus</i> (Willd.) Rostk.	Rubiaceae	Shrub
19	<i>Asplenium nidus</i> L.	Cuscutaceae	Herb
20	<i>Asplenium nidus</i> (L.) Diels	Cucurbitaceae	Climbing herb
21	<i>Asplenium nidus</i> L.	Rubiaceae	Herb
22	<i>Asplenium nidus</i> L.	Convolvulaceae	Climbing herb
23	<i>Asplenium nidus</i> L.	Convolvulaceae	Herb
24	<i>Asplenium nidus</i> (Lour.) DC.	Cappariaceae	Tree
25	<i>Asplenium nidus</i> Gussone	Hypoxidaceae	Herb
26	<i>Asplenium nidus</i> Herb.	Convolvulaceae	Climbing herb
27	<i>Asplenium nidus</i> (Roth) Ait.	Vitaceae	Climbing herb
28	<i>Asplenium nidus</i> (L.) Fenzl	Pontederiaceae	Herb
29	<i>Asplenium nidus</i> L.	Cyperaceae	Herb
30	<i>Asplenium nidus</i> (L.f.) Ertter	Laciniaceae	Tree
31	<i>Asplenium nidus</i> L. Kuntze ex DC.	Ebenaceae	Tree
32	<i>Asplenium nidus</i> (Wight & Arn.) Pax & Hoffm.	Euphorbiaceae	Tree
33	<i>Asplenium nidus</i> L. f.	Convolvulaceae	Herb
34	<i>Asplenium nidus</i> L.	Moraceae	Tree
35	<i>Asplenium nidus</i> L.	Moraceae	Tree
36	<i>Asplenium nidus</i> L.	Moraceae	Tree
37	<i>Asplenium nidus</i> sp.	Cyperaceae	Herb
38	<i>Asplenium nidus</i> (Burm.) Merr.	Flacourtiaceae	Tree
39	<i>Asplenium nidus</i> L.	Liliaceae	Climbing herb
40	<i>Asplenium nidus</i> (Roxb.) DC.	Rubiaceae	Shrub
41	<i>Asplenium nidus</i> Willd.	Hemiparasitaceae	Tree
42	<i>Asplenium nidus</i> sp.	Orchidaceae	Herb
43	<i>Asplenium nidus</i> (L.f.) Arn.	Rubiaceae	Herb
44	<i>Asplenium nidus</i> L.	Rubiaceae	Herb
45	<i>Asplenium nidus</i> (L.) R. Br. var. <i>indica</i>	Parasitaceae	Climbing herb
46	<i>Asplenium nidus</i> (L.) Kuntze	Malpighiaceae	Shrub
47	<i>Asplenium nidus</i> (Roxb.) Planchon	Ulmaceae	Tree
48	<i>Asplenium nidus</i> L.	Linaceae	Tree
49	<i>Asplenium nidus</i> (L.) F. Muell.	Vitaceae	Herb
50	<i>Asplenium nidus</i> (L.) Poir.	Lamiaceae	Herb
51	<i>Asplenium nidus</i> (L.) R. Br.	Apocynaceae	Climbing shrub

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52	<i>Indigofera arguta</i> (L.) M. Vahl. ex DC.	Fabaceae	Herb
53	<i>Indigofera tinctoria</i> L.	Fabaceae	Herb
54	<i>Indonostella echinoides</i> (L.) Sreenadh.	Acanthaceae	Herb
55	<i>Jasminum angustifolium</i> (L.) Willd.	Oleaceae	Climbing herb
56	<i>Justicia glauca</i> Rottler	Acanthaceae	Herb
57	<i>Justicia simplex</i> D. Don	Acanthaceae	Herb
58	<i>Justicia tranquebariensis</i> L.f.	Acanthaceae	Herb
59	<i>Lepidodermis reticulata</i> (Roxb.) Wight & Arn.	Asclepiadaceae	Climbing herb
60	<i>Lonicera axillaris</i> (Willd.) Link.	Lamiaceae	Herb
61	<i>Mollugo peruviana</i> L.	Molluginaceae	Herb
62	<i>Morinda pubescens</i> L.f. Smith var. <i>pubescens</i>	Rubiaceae	Tree
63	<i>Mulberry longifolia</i> (Gaertn.) March.	Loganiaceae	Tree
64	<i>Olea scandens</i> Roxb.	Oleaceae	Tree
65	<i>Oreocarya dilleni</i> (Ker. Gies.) Haw.	Celastraceae	Shrub
66	<i>Oryzaphan ibroyanensis</i> (Roxb.) Steud.	Lamiaceae	Herb
67	<i>Pearsonia vulgaris</i> Willd.	Malvaceae	Herb
68	<i>Pedicularis minor</i> L.	Pedaliaceae	Herb
69	<i>Persea indica</i> (Forst.) C. Christ.	Asclepiadaceae	Climbing herb
70	<i>Phoradendron zeylanicum</i> L.	Phoradendraceae	Shrub
71	<i>Pongamia pinnata</i> (L.) Pierre.	Fabaceae	Tree
72	<i>Scaevola leucopyrea</i> (Willd.) Muell. Arg.	Euphorbiaceae	Shrub
73	<i>Sesuvium portulacastrum</i> L.	Lythraceae	Tree
74	<i>Tournefortia bicolor</i> (L.) Lam.	Rubiaceae	Climbing shrub
75	<i>Tribulus terrestris</i> L.	Zygophyllaceae	Herb
76	<i>Ziziphus maurandia</i> Lam. var. <i>maurandia</i>	Rhamnaceae	Shrub
77	<i>Zornia gibbosa</i> Spreng.	Fabaceae	Herb

Source: Floristic Inventory on Nagamangalam Ayyanaar Sacred Grove at Ariyalur District, Tamil Nadu (*Int. J. Modn. Res. Revs. Volume 4, Issue 6, pp 1172-1176, June, 2016*)

3.14.9 Faunal Communities

Both direct and indirect observation methods were used to survey the fauna.

- Point Survey Method: Observations were made in each site for 15 minutes duration.
- Road Side Counts: The observer traveled by motor vehicles from site to site, all sightings were recorded (this was done both in the day and night time). An index of abundance of each species was also established.
- Pellet and Track Counts: All possible animal tracks and pellets were identified and recorded (South Wood, 1978).

Additionally, survey of relevant literature was also done to consolidate the list of fauna distributed in the buffer zone.

Based on the Wildlife Protection Act, 1972 (WPA 1972, Anonymous. 1991, Upadhyay 1995, Chaturvedi and Chaturvedi 1996) species were short-listed as Schedule II or I and considered

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herein as endangered species. Species listed in Ghosh (1994) are considered as Indian Red List species.

Methodology Adopted:

Point Survey method was adopted for this development project where observations were made in each site for 15 minutes duration (10 times).

Study in the core zone:

Point Survey method was adopted for the study within 2 km radius and the following species were observed

Study in the core Zone

Mammals: No wild mammalian species was directly sighted during the field survey. Discussion with local villagers located around the study area also could not confirm presence of any wild animal in that area. Three striped Palm Squirrel, Common Indian Hare, Common mongoose, Common Mouse etc were observed during primary survey.

Avifauna: Since birds are considered to be the indicators for monitoring and understanding human impacts on ecological systems (Lawton, 1996) attempt was made to gather quantitative data on the avifauna by walk through survey within the entire study area and surrounding areas. From the primary survey, a total of 26 species of avifauna were identified and recorded in the study area. The diversity of avifauna from this region was found to be quite high and encouraging.

The list of fauna species found in the study area is mentioned in Table below.

Table 2-24 List of fauna species

Scientific Name	Common Name	Schedule of wild life protection act	IUCN conservation status
Mammals			
Funambulus pennanti	Palm Squirrel	IV	Least Concern
Mus rattus	Indian rat	IV	Not listed
Bandicota bengalensis	Indian mole rat	IV	Least Concern

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Funambulus palmarum	Three stripped palm squirrel	IV	Least Concern
Herestes edwardsii	Common Mangoose	IV	Not listed
Mus musculus	Common Mouse	IV	Least Concern
Bandicota indica	Rat	IV	Least Concern
Lepus nigricollis	Indian Hare	IV	Least Concern
Felis catus	Cat	Not listed	Not listed
Canis lupus familiaris	Indian dog	Not listed	Not listed
Bos Indicus	Indian Cow	Not listed	Not listed
Bubalus bubalis	Buffalo	I	Not listed
Sus scrofa domesticus	Domestic pig	Not listed	Not listed
Birds			
Milvus migrans	Black kite	IV	Least concern
Saxicoloides fulicatus	Indian Robin	IV	Least concern
Pycnonotus cafer	Red vented Bulbul	IV	Least concern
Phragamaticola aedon	Thick billed warbler	IV	Least concern
Pericrocotus cinnamomeus	Small Minivet	IV	Least concern
Eudynamys scolopaceus	Koel	IV	Least concern
Psittacula krameni	Rose ringed parakeet	IV	Least concern
Dicrurus marcocercus	Black drongo	IV	Least concern
Columba livia	Rock pigeon	IV	Least concern
Corvus splendens	House crow	IV	Least concern
Alcedo atthis	Small blue kingfisher	IV	Least concern
Cuculus canorus	Common Cukoo	IV	Least concern
Reptiles & Amphibians			
Chameleon zeylanicum	Chameleon	IV	Not listed
Calotes versicolor	Common garden lizard	II	Not listed

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Bungarus caeruleus	Common krait	IV	Not listed
Ophisops leschenaultia	Snake eyed lizard	--	Not listed
Bufo melanostictus	Toad	IV	Least concern
Ptyas mucosa	Rat snakes	IV	Least concern
Hemidactylus sp.	House lizard	--	Not listed
Butterflies			
Danaus chrysippus	Plain Tiger	--	Not listed
Papilio demoleus	Common lime	--	Not listed
Euploea core	Common crow	--	Least concern
Danaus genutia	Common tiger	--	Not listed
Eurema brigitta	Small grass yellow	--	Least concern

List of Bird Species observed during the survey

Scientific Name	Common Name	Schedule of wild life protection act	IUCN conservati on status	Timing	Observed Month
Bubulcus ibis	Cattle Egret	IV	Least Concern	Morning	August
Vanellus indicus	Red-Wattled Lapwing	IV	Least Concern	Morning	September
Columba livia	Blue Rock Pigeon	-		Morning	July
Microfus affinis	House swift	-	Common	Morning	September
Coracias benghalensis	Indian Roller	IV	Least Concern	Evening	July
Merops orinetai	Common bee eater	IV	Least Concern	Evening	July
Psittacula krameri	Rose Ringed Parakeet	IV	Least Concern	Seen in morning & evening multiple times	3 months
Eudynamis scolopaceus	Koel	IV	Common, Resident	Seen in morning &	3 months

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				evening multiple times	
Aredeola grayii	Indian Pond Heron	IV	Least Concern	Evening	August
Acridotheres ginginianus	Bank Myna	IV	Least Concern	Seen in morning & evening multiple times	3 months
Astur badius	Shikra	IV	Resident	Morning	August
Sturnus pagodarum	Brahminy Starling	IV	Least Concern	Evening	August
Pavo cristatus	Peafowl	I	Least Concern	Observed during evening time	3 months
Corvus splendens	Common Crow	V	Least Concern	Seen in morning & evening multiple times	3 months
Passer domesticus	House Sparrow	IV	Common, Resident	Seen in morning & evening multiple times	3 months
Pycnonotus cafer	Red- Vented Bulbul	IV	Common	Evening	August
Egretta garzetta	Little Egret	IV	Common	Evening	September
Corvus corax	Common Raven	V	Least Concern	Seen in morning & evening multiple times	3 months
Acridotheres tristicus	Common myna	IV	Common	Seen in the noon and evening	3 months
Alcedo atthis	Common kingfisher	IV	Common	Morning	September
Athene brama	Spotted Owlet	IV	Common, Resident	Spotted during night	September
Bubo bubo	Indian great horned owl	IV	Common	Spotted during night	September

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Caprimulgus asiaticus	Common Indian jar	IV	Common	Evening	September
Cinnyris asiatica	Purple sunbird	IV	Least Concern	Morning	July
Columbus livibus	Pigeon	IV	Common	Seen in morning & evening multiple times	3 months
Copsychus saularis	Magpie robin	IV	Common	Evening	July
Cuculus varius	Common-Hawk Cuckoo	IV	Common, Resident	Evening	July
Cypsiurus parvus	Palm Swift	IV	Common, Resident	Evening	July
Dendrocitta vagabunda	Indian Tree pie	IV	Common, Resident	Morning	July
Dicrurus longicaudatus	Grey drongo	IV	Resident	Morning	July
Dicrurus macrocerus	Black Drongo	IV	Common, Resident	Morning	July
Dissemurus paradiseus	Rackete tailed drongo	IV	Resident	Morning	July
Francolinus pondicerianus	Grey Partridge	IV	Common, Resident	Evening	September
Galerida malabarica	Malabar crested lark	IV	Resident	Evening	September
Gallus gallus	Red jungle fowl	IV	Resident	Evening	July
Haliastur Indus	Brahmny kite	IV	Common	Evening	September
Hierococys varius	Common hawk cuckoo	IV	Common	Evening	July
Lobvanelia indicus	Redwattled lapwing	IV	Resident	Morning	July, August
Lonchura malacca	Blackheade d Munia	IV	Common, Resident	Morning	July
Megalaima merulinus	Indian cuckoo	IV	Common	Evening	July, August
Milyus migrans	Common kite	IV	Common	Evening	July

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Mirafra erythroptera	Red winged Bushlark	IV	Common, Resident	Morning	August
Phalacrocorax carbo	Cormorant	IV	Common, Resident	Morning	September
Quills contronix	Grey quail	IV	Common	Seen in morning & evening multiple times	3 months
Saxicoloides fulicata	Indian Robin	IV	Common, Resident	Morning	September
Tchitrea paradisi	Paradise Flycatcher	IV	Common	Morning	July, August
Temenuchus pagodarum	Brahmny myna	IV	Common	Seen in morning & evening multiple times	3 months
Tephrodornis pondiceraianus	Common wood shrike	IV	Common	Evening	July
Uroloncha striata	Spotted munia	IV	Common	Morning	August

Validation of Primary Data

List of avifauna in the Karaivetti Bird Sanctuary of Ariyalur District is studied through ENVIS Newsletter on wetland ecosystems including inland wetlands

Note: The species observed during the primary survey is highlighted with yellow colour

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Table 1. Avifauna Checklist of Karaivetti Bird Sanctuary

S. No	Order	Family	Common Name	Scientific Name	Migratory Status	IUCN Status	February	May
1	Anseriformes	Anatidae	Bar-headed Goose	<i>Anser indicus</i>	WM	LC	X	-
2			Cotton Pygmy-goose	<i>Nettion coromandelianus</i>	RE	LC	X	-
3			Garganey	<i>Anas querquedula</i>	WM	LC	X	-
4			Northern Shoveler	<i>Anas chryseata</i>	WM	LC	X	-
5			Indian Spot-billed Duck	<i>Anas poecilorhynchos</i>	RE	LC	X	X
6			Northern Pintail	<i>Anas acuta</i>	WM	LC	X	-
7			Tufted Duck	<i>Aythya fuligula</i>	WM	LC	X	-
8	Galliformes	Phasianidae	Grey Francolin	<i>Francolinus pondicerianus</i>	RE	LC	X	X
9			Indian Peafowl	<i>Pavo cristatus</i>	RE	LC	X	X
10	Podicipediformes	Podicipedidae	Little Grebe	<i>Tachybaptus ruficollis</i>	RE	LC	X	-
11	Phoenicopteriformes	Phoenicopteridae	Flamingo sp.	<i>Phoenicopterus sp.</i>	WM	NT	X	-
12	Ciconiiformes	Ciconiidae	Asian Openbill	<i>Anastomus oscitans</i>	RE	LC	X	X
13			Painted Stork	<i>Mycteria leucocephala</i>	LM	NT	-	X
14	Suliformes	Anhingidae	Oriental Darter	<i>Anhinga melanogaster</i>	RE	NT	X	-
15		Phalacrocoracidae	Great Cormorant	<i>Phalacrocorax carbo</i>	LM	LC	X	-
16			Indian Cormorant	<i>Phalacrocorax fuscicollis</i>	RE	LC	X	-
17		Phalacrocoracidae	Little Cormorant	<i>Phalacrocorax niger</i>	RE	LC	X	X
18	Pelecaniformes	Pelecanidae	Spot-billed Pelican	<i>Pelecanus philippensis</i>	LM	NT	-	X
19		Ardeidae	Grey Heron	<i>Ardea cinerea</i>	LM	LC	X	X
20			Purple Heron	<i>Ardea purpurea</i>	RE	LC	X	X
21			Great Egret	<i>Casmerodius albus</i>	RE	LC	X	-
22			Intermediate Egret	<i>Mesophaps intermedia</i>	RE	LC	X	X
23			Little Egret	<i>Egretta garzetta</i>	RE	LC	X	X
24			Cattle Egret	<i>Bubulcus ibis</i>	RE	LC	X	X
25			Indian Pond Heron	<i>Ardeola grayii</i>	RE	LC	X	X
26			Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>	RE	LC	X	-
27		Threskiornithidae	Glossy Ibis	<i>Plegadis falcinellus</i>	LM	LC	-	X
28			Black-headed Ibis	<i>Threskiornis melanocephalus</i>	RE	NT	X	X
29	Accipitriformes	Accipitridae	Shikra	<i>Accipiter badius</i>	RE	LC	X	X
30			Black Kite	<i>Elanus migrans</i>	RE	LC	X	X

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31	Accipitriformes	Accipitridae	Brahmany Kite	<i>Haliastur indus</i>	RE	LC	X	-
32	Gruiformes	Rallidae	White-bellied Waterhen	<i>Amuramorus phoenicurus</i>	RE	LC	-	X
33			Grey-headed Swamphen	<i>Porphyrio porphyrio</i>	RE	LC	X	-
34			Barren Coot	<i>Fulica atra</i>	RE	LC	X	-
35	Charadriiformes	Recurvirostridae	Black-winged Stilt	<i>Himantopus himantopus</i>	LM	LC	X	X
36		Charadriidae	Red-tailed Lark	<i>Amelurus indicus</i>	RE	LC	X	X
37			Little Ringed Plover	<i>Charadrius dubius</i>	RE	LC	X	-
38		Jaculiidae	Plumbeous-tailed Jacana	<i>Hydrophasianus chirurgus</i>	RE	LC	X	-
39		Scolopacidae	Common Snipe	<i>Gallinago gallinago</i>	WM	LC	X	-
40			Common Sandpiper	<i>Actitis hypoleucos</i>	WM	LC	X	-
41			Green Sandpiper	<i>Tringa ochropus</i>	WM	LC	X	-
42			Wood Sandpiper	<i>Tringa glareola</i>	WM	LC	X	-
43			Marsh Sandpiper	<i>Tringa stagnatilis</i>	WM	LC	X	-
44		Laridae	Caspian Tern	<i>Hydroprogne caspia</i>	WM	LC	X	-
45			Whiskered Tern	<i>Chlidonias hybridus</i>	WM	LC	X	-
46			Indian River Tern	<i>Sterna sumatrana</i>	WM	NT	X	-
47	Columbiformes	Columbidae	Common Pigeon	<i>Columba livia</i>	RE	LC	X	-
48			Eurasian Collared Dove	<i>Streptopelia decaocto</i>	RE	LC	X	-
49			Spotted Dove	<i>Streptopelia chinensis</i>	RE	LC	X	X
50			Laughing Dove	<i>Streptopelia senegalensis</i>	RE	LC	X	X
51	Cuculiformes	Cuculidae	Greater Coucal	<i>Centropus sinensis</i>	RE	LC	X	X
52			Pied Cuckoo	<i>Clamator jacobinus</i>	RE	LC	X	-
53			Blue-faced Malkoha	<i>Rhipidura viridifrons</i>	RE	LC	X	X
54			Asian Koel	<i>Eudynamis scolopacea</i>	RE	LC	X	X
55			Common Hawk Cuckoo	<i>Hierocorys varius</i>	RE	LC	X	-
56	Bucconiformes	Upulidae	Burnian Hoopoe	<i>Upupa epops</i>	RE	LC	X	-
57	Apodiformes	Apodidae	Asian Palm Swift	<i>Cypselurus balasorensis</i>	RE	LC	X	X
58	Coraciiformes	Alcedinidae	Common Kingfisher	<i>Alcedo atthis</i>	RE	LC	X	-
59			White-throated Kingfisher	<i>Halcyon asyensis</i>	RE	LC	X	X
60		Meropidae	Pied Kingfisher	<i>Ceryle rudis</i>	RE	LC	X	X
61			Green Bee-eater	<i>Meropis orientalis</i>	RE	LC	X	X
62			Blue-tailed Bee-eater	<i>Meropis philippina</i>	WM	LC	X	-
63	Piciformes	Megapodidae	Coppersmith Barbet	<i>Megalaima haemaphysalis</i>	RE	LC	X	-
64	Falconiformes	Falconidae	Peregrine Falcon	<i>Falco peregrinus</i>	WM	LC	X	-
65	Corneliiformes	Coraciidae	Indian Roller	<i>Coccyzus bengalensis</i>	RE	LC	X	X
66	Psittaciformes	Psittacidae	Rose-ringed Parakeet	<i>Pittacula krameri</i>	RE	LC	X	X
67	Passeriformes	Laniidae	Brown Shrike	<i>Lanius cristatus</i>	WM	LC	X	-
68			Bry-backed Shrike	<i>Lanius varius</i>	RE	LC	X	-
69		Duculidae	Black Drongo	<i>Ducula macrocerus</i>	RE	LC	X	X
70			Rufous Treepie	<i>Dendrocitta vagabunda</i>	RE	LC	X	X
71		Corvidae	House Crow	<i>Corvus splendens</i>	RE	LC	X	X
72			Large-billed Crow	<i>Corvus macrorhynchos culmatus</i>	RE	LC	X	X
73			Ashy-crowned Sparrow Lark	<i>Eremophila grisea</i>	RE	LC	-	X
74		Alaudidae	Jerdon's Bushlark	<i>Merula affinis</i>	RE	LC	X	X
75			Barn Swallow	<i>Hirundo rustica</i>	LM	LC	X	-
76		Pycnonotidae	Red-vented Bulbul	<i>Pycnonotus cafer</i>	RE	LC	X	X
77			White-browed Bulbul	<i>Pycnonotus latipes</i>	RE	LC	X	-
78		Acrocephalidae	Hyacinth Reed Warbler	<i>Acrocephalus domesticus</i>	WM	LC	X	-
79			Chloronotus Reed Warbler	<i>Acrocephalus stenoreus</i>	WM	LC	X	-

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S. No	Order	Family	Common Name	Scientific Name	Migratory Status	IUCN Status	February	May
80	Passeriformes	Cisticolidae	Zitting Cisticola	<i>Cisticola juncidis</i>	RE	LC	X	-
81			Common Tailorbird	<i>Orthotomus sutorius</i>	RE	LC	X	X
82			Ashy Prinia	<i>Prinia sociata</i>	RE	LC	-	X
83			Plain Prinia	<i>Prinia inornata</i>	RE	LC	X	X
84		Leiothrichidae	Yellow-billed Babbler	<i>Turdoides affinis</i>	RE	LC	X	X
85		Muscicapidae	Indian Robin	<i>Saccoloides fuscatus</i>	RE	LC	X	X
86			Pied Bushchat	<i>Sarcola caprata</i>	RE	LC	X	X
87		Sturnidae	Ring Starling	<i>Passer roseus</i>	WM	LC	X	-
88			Brahmany Starling	<i>Sturnia pagodarum</i>	RE	LC	X	-
89			Common Myna	<i>Acridothera tristis</i>	RE	LC	X	X
90		Nectarinidae	Purple-rumped Sunbird	<i>Leptocoma zeylonica</i>	RE	LC	X	X
91			Purple Sunbird	<i>Cinnyris asiaticus</i>	RE	LC	X	X
92			Long-billed Sunbird	<i>Cinnyris lunatus</i>	RE	LC	X	-
93		Motacillidae	Western Yellow Wagtail	<i>Motacilla flava</i>	WM	LC	X	-
94			Citrine Wagtail	<i>Motacilla citreola</i>	WM	LC	X	-
95			White-browed Wagtail	<i>Motacilla madagascariensis</i>	RE	LC	X	X
96			Paddyfield Pipit	<i>Aythya rufipes</i>	RE	LC	X	X
97		Falconidae	Chestnut-shouldered Petronia	<i>Gymnoris xanthocollis</i>	RE	LC	X	-
98		Ploceidae	Streaked Weever	<i>Ploceus munyar</i>	RE	LC	X	-

RE – Resident, LM – Local Migrant, WM – Winter Migrant

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3.15 Demography and Socio Economics

The demography survey study is done within 10km from the project site. The population, Household, Sex ratio, Literacy rate, SC, ST details for all the villages in the study area is listed below:

Blocks	Population	Area(Sq.km)	Sex Ratio		Literacy Rate		SC	ST
			Male	Female	Male	Female		
Ariyalur	136519	326.82	68538	67981	49365	37206	30473	968
Thirumanur	119290	349.65	58478	60812	41939	34234	24970	249
Jayankondam	164842	343.81	81672	83170	60007	48649	41801	3689
T.palur	103978	309.45	51758	52220	36566	28124	24285	2133
Andimadam	118374	289.43	58884	59490	42805	33732	21814	2339
Sendurai	111891	314.82	55373	56518	38900	29077	32887	1344
Total	754894	1933.98	374703	380191	269582	211022	176230	10722

Source: Census of India, 2011

Occupation: Ariyalur is a marketing and service town for the surrounding areas. Big industrial houses like Birlas (UltraTech Cement), India Cements, Dalmia Cement, Madras Cement have their cement units here. Tamil Nadu government's TANCEM factory is in Ariyalur and is the first factory to establish the cement production in ariyalur.

Sugar cane is grown as a major commercial crop. One private sugar factory near Keelapalur is functioning in the district with a capacity of crushing 3,000 Tonnes per day. One of the main crops in Ariyalur district is cashew. The pre-dominate soil in the district is red sanding with scattered Packers of black soil. This town consists mainly of glade soil. The soil in the district is best suited for raising dry crops. Rice also grown in some places.

Industrial details in the district is listed below:

Small Scale Industries: 383

Factories : 40

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The major occupation during field survey is observed to be mining and Agriculture. The same activity is observed till Ariyalur which is located at 8km distance from the project site in Northwestern direction.

Source: District Handbook – 2018-2019

Socio-economic survey methodology

Purposive sampling methods were used for selecting respondents (male and female) for household survey. For official information of village, Gram Panchyat member has been chosen. Structured questionnaire was used for survey. For group discussion, Panchyat bhavan, Aanganwadi bhavan, community halls were used. Out of total 15 villages, 5 villages (25%) were surveyed for which selection criteria is based on proximity to the project site and area with dense and scarce populations were chosen.

The villages chosen for primary study area

- Reddipalayam
- Pudupalayam
- Periyathirukkonam
- Siruvalur
- Edayathangudi

10 households were surveyed in each village and the collective response are summarized below

3.15.1 Salient features in the study area:

House pattern: It is notable that nearly 60% of the houses were kachcha at survey area.

Employment: Main occupation of the people in the study area was labour work and agriculture and some other business. The labours were getting daily wage in the range of Rs.200-450, depending on type of work involved.

Fuel: Most of the villagers use fire woods and LPG for cooking purpose

Main Crops: The principal crops grown in agricultural farm were Cashew, Mango, Banana, Tapioca, Tomato, Brinjal, Bhendi, Onion, Turmeric, Chillies

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Migration: During survey, it was found that local population were migrating for employment purpose. Since due to the presence of various industrial units, migration from other places were also noted.

Sanitation: More than 70% of the households were having toilet facilities in their houses. Drainage system was maintained in the study area.

Drinking Water Facilities: Ground water is the major source of drinking water in the villages wherein hand pumps, tap water and dug wells are installed.

Education Facilities: Most of the villages had education facilities in the form of Anganwadi and Primary Schools. Higher education facilities were available in the range of 5-10 km. Colleges and other diploma courses were available at district place.

Transportation Facility: For transportation purpose Auto, Public and Private Bus services were available. Transportation facilities were frequently available in the study area and connecting major cities. Private vehicles like Bicycles & Motor Cycles were mostly used by villagers for transportation purpose

3.15.2 Key Socio economic Indicator

The consolidated report of the primary study revealing the exact scenario prevailing in the area based on the survey conducted in the 10 houses each in 5 villages (Total of 50 Houses) is listed below

S. No	Indicator	Percentage/Nos.
1	People below age 18	38
2	People age limit above 18	62
3	Literates	52
4	Illiterates	48
5	% of people employeeed in company	26
6	% of people self employed	37
7	% of people seasonally employed	14
8	% of people unemployed	23
9	% of houses covered with LPG Cooking gas	80
10	% of houses covered with toilet facility	70
11	% of houses covered with piped water supply	60

Awareness and Opinion about the project

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- The respondents all the villages are aware about this project.
- Since most of the respondents were about the project, some of the people welcomed this project for the employment opportunity but they need commitment that, only local people should be hired for the work. Some fear that water level in the region will decrease due to mine and associated activities.
- The skill based employment should be given to the local people.
- Road accident may increase due to Mine transport and associated activities.

Expectation from the project

- Local employment
- Plantation at nearby areas and ensure their survival rate.
- Increase educational facility in Govt. School and promote vocational & higher educational institute.

3.15.3 Other Infrastructural Facilities Available in the District

(Source: District Handbook – 2018-2019)

Drinking Water facility: The project falls under Ariyalur Block

Source of water in Ariyalur Block: Dug well, Filter point & Tube well

Dug Wells: In Ariyalur Block, the total number of dug wells is 858

Tube wells: 819 Tube wells are available

River: The River flowing through the Ariyalur District is Kollidam River

The communication details of the district is furnished below

Telephone:

- No. of Telephones in use : 31070
- No. of Telephones Exchanges : 64
- No. of Public calls with STD /ISD : 351

Post Office: 281 POs are there in the Ariyalur District

Transport Facility of the District:

Railway Stations: 11

Registered Motor Vehicles

Commercial – 739 Nos.

Non-Commercial – 11234 Nos.

Banking Sector: 353 Cooperative Societies & Banks are available in the District.

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4. Anticipated Environmental Impacts & Mitigation Measures

This chapter describes the anticipated impacts on the environment and mitigation measures. The method of assessment of impacts including studies carried out, modeling techniques adopted to assess the impacts where pertinent should be elaborated in this chapter. It should give the details of the impacts on the baseline parameters, both during the construction and operational phases and suggests the mitigation measures to be implemented by the proponent.

4.1 Introduction

An environmental impact is defined as any change to the environment, whether adverse or beneficial, resulting from a facility's activities, products, or services. The anticipation of the possible & potential Environmental impact due to the proposed project is a key step in EIA. Based on the impacts assessed, appropriate mitigation measures should be adopted to maintain the environment with less or no damage.

Environmental Impacts can be group into Primary impacts & Secondary Impacts.

Primary Impacts: These impacts are directly attributed by the project.

Secondary Impacts: These are those which are induced by primary impacts and include the associated investments and changed patterns of the social and economic activities by the action.

Assessment of impacts is done for the following Environmental Parameters:

- Land Environment
- Water Environment
- Air Environment
- Noise Environment
- Biological Environment
- Socio Economic Environment

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4.2 Land Environment

Aspect	Impact	Mitigation Measures																			
<i>Mining of Limekankar and Limestone</i>	The proposed 22.96.0 Ha mine in Pudupalayam mines Limekankar and Limestone quarry of 1119000 Tones and 191626 Tones respectively. The quarry operation is proposed to carry out with conventional open cast mechanized mining Limekankar mineral one bench is proposed with 0.75m height and width with 60° slope and for Limestone mineral two benches are proposed with 6m height and 6m width and another one bench is proposed with 3m height and 3m with 60°slope. At the end of 5 years, mining lease area will be converted into ultimate pit of	The proposed project site is prone to gully erosion and sheet erosion and gully erosion (Source: Bhuvan) .In order to prevent erosion, thick vegetation will be provided along the safety distance on the mine lease area in the following way. <ul style="list-style-type: none">- 3 Tier planatation will be done.- Herbs and shrubs will be planted alternatively between two thick canopy trees.- Tree species like Neem, Magizham, Tamarind, Elandhai and Vilvam will be planted along the roads, outer periphery of the mining area which will enhances the binding property of the soil.- In addition, garland drainage of 1m x 1m will be provided to avoid storm water run- off affecting the mine lease area thereby preventing the erosion.- It is proposed to improve the affected land wherever possible for better land use, to support vegetation and creation of water																			
	<table><tr><th rowspan="2">Dimensions</th><th colspan="3">Ultimate pit dimension</th></tr><tr><th>Present size of pit</th><th>Size of pit after first five years</th><th>Ultimate pit dimension at end of life of the mine</th></tr><tr><td>Length (m)</td><td>-</td><td>652</td><td>652</td></tr><tr><td>Width (m)</td><td>-</td><td>358</td><td>358</td></tr><tr><td>Depth (m)</td><td>-</td><td>8.75</td><td>17.75</td></tr></table>	Dimensions	Ultimate pit dimension			Present size of pit	Size of pit after first five years	Ultimate pit dimension at end of life of the mine	Length (m)	-	652	652	Width (m)	-	358	358	Depth (m)	-	8.75	17.75	
	Dimensions		Ultimate pit dimension																		
		Present size of pit	Size of pit after first five years	Ultimate pit dimension at end of life of the mine																	
	Length (m)	-	652	652																	
	Width (m)	-	358	358																	
Depth (m)	-	8.75	17.75																		

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	<p>This may lead to soil erosion, degradation and resource loss.</p> <p>The main impact of open cast mining on land-use is land degradation. The land is bound to be excavated for mining of Limekankar and Limestone .</p> <p>Impact on soil of the study area will be minimal as there are no wastewater generated, heavy metal infusion, stack emissions.</p> <p>Impact due to transformation of terrain characteristics over the large area results in soil degradation.</p> <p>Solid waste will be generated from the mining activity as there will be refuse also generation of domestic waste. If it not properly managed, may cause odor and health problem to the workers.</p>	<p>reservoir in the ultimate pit after quarrying.</p> <p>The overburden (Topsoil) present upto a depth of 2m BGL (Quantity 480420 MT) will be stocked in the Block III and the same will be used for Afforestation to be done along the safety distance.</p> <p>The source of dust generation is majorly due to loading & unloading of the mined out mineral, the impact will be mitigated by water sprinkling regularly.</p> <p>The proposed mining activity is carried out in almost plain terrain where the contour level difference is 2m.</p> <p>After removal of minerals, undulating portion will be created. Excavated area or ultimate pit at the end of the mine period will be converted into water reservoir. Three tier tree belts will be planted along the safety distance.</p> <p>The 100% recovery is achieved by extracting the entire mineable reserve. Hence there will be no refuse generation</p>
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		due to the mining activity. Apart from that, a very meagre quantity of domestic waste will be generated in the project, which will be handed over to the local body on daily basis.
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4.3 Water Environment

Aspect	Impact	Mitigation Measures
<i>Loading and unloading, Transportation of the excavated mineral.</i>	<p>The mining in the area may cause ground water contamination due to intersection of the water table and mine runoff.</p> <p>The ground water depletion may occur due to mining activity.</p>	<p>The water table will not be intersected during mining, as the ultimate depth is limited upto 17.75 meter below the ground level, whereas the ground water table is at 38m below the ground level. The municipal wastewater will be disposed into septic tanks of 5 cum and soak pit. No chemicals consisting of toxic elements will be used for carrying out mining activity.</p> <p>The ground water table is at a depth of 38m BGL, the mining operation will not affect the aquifer. The ultimate pit at the end of the mining operation will be used for rainwater storage, the stored water will be used for green belt development and further the stored water will be used for domestic purposes (other than drinking) after proper treatment and after confirming to best designated usage stipulated by CPCB.</p>

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	Improper management of Domestic wastewater in the Mine lease may create unhygienic conditions in the site thereby causing health impacts to the labors	Provision of urinals/Latrines along with septic tank followed by soak pit arrangement will be provided in the Mine Lease area for the proper management of wastewater
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4.4 Air Environment

Aspect	Impact	Mitigation Measures
<i>Loading and unloading, Transportation of the excavated mineral.</i>	<p><i>Impacts during Operation Phase</i> During mining operation, fugitive dust and other air pollutants like particulate matter (PM10 & PM 2.5) will be generated.</p> <p>The main source of pollutants arises due to drilling and blasting. 1 No of Tipper will be used for loading and unloading, 1 No of Excavator(0.90 m³ bucket capacity(with rock breaker attachment) will be used for excavation of the mineral which contributes to the generation of fugitive dust. In addition, blasting will be done using explosives leading to the generation of dust.</p> <p><u><i>Effect on Human</i></u></p>	<p><i>Mitigation Measures during Operation Phase</i> It is proposed to plant 3450 Nos of local species (with 50 Nos each year) along the haul roads, outer periphery within the lease area to prevent the impact of dust in consultation with Forest department for the plantation of trees (Neem, Magizham, Tamarind, Elandhai and Vilvam) in two tier to combat air pollution and with herbs (Nerium) in between the tree species.</p> <p>Planning transportation routes of the mined out mineral, so as to reach the nearest paved roads (an approach road) by shortest route connecting to NH 227.</p> <p>Alternatively, graveled road may be constructed between mine lease area and nearest paved road connectivity. The speed of trucks plying on the haul road will be limited to 20km/hr to avoid</p>

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	<ul style="list-style-type: none"> Adverse effect on human health of working labourers and neighboring villagers like effect on breathing and respiratory system, damage to lung tissue, influenza or asthma. Dust generation due to loading and unloading of mineral and due to transportation can also affect the workers as well as nearby villagers. <p><u>Effect on Plants</u></p> <ul style="list-style-type: none"> Stomatal index may be minimized due to dust deposit on leaf. 	<p>generation of dust.</p> <p>The trucks will be covered by tarpaulin.</p> <p>Overloading will be avoided.</p> <p>Personal Protective Equipments (PPEs) like eye goggles, dust mask, leather gloves, safety shoes & boots will be provided to the workers engaged at dust generation points like excavation and loading points.</p> <p>1 kLD of water will be proposed for sprinkling on unpaved roads to avoid dust generation during transportation.</p>
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The mathematical model used for predictions on air quality impact in the present study is AERMOD View 9.9.0.

S. NO.	Description	Symbol	Quantity
1.	Moisture Content (%)	M	5
2.	Silt Content (%)	s	8
3.	Wind Speed (m/s)	u	3
4.	Production (Tons/Day)		746

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5.	No. of excavator on site		2
6.	Average Speed of tipper on haul road (kmph)	S	25
7.	Weight of fully loaded truck (tons)	W	26
8.	Number of Tippers per day		47
9.	Distance travelled after loading per tipper per day (km)	VKT	3
10.	No of Working Days in Year		300
11.	Working Hours per day (hrs)		8
12.	Open Pit Area (Sq.m)	Aa	228200
13.	Mist spraying Control Efficiency during excavation, Loading/Unloading and Haulage (%)	η	97.20%
14.	Average time between spray application (hours)	t	2
15.	Spray Application rate (litres/ m ²)	k	4
16.	Evaporation rate of sprayed water (mm/hr)	p	1.2
17.	Vehicle traffic in Haul road (vehicles /hr)	r	6

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Emission Factors for uncontrolled mining

Activity	Emission Factor		References	
Topsoil handling	Bulldozing	15.048 kg PM ₁₀ / Hr excavation	<i>USEPA (2008)</i>	<i>Jose I. Huertas & Dumar A. Camacho & Maria E. Huertas, Standardized emissions inventory methodology for open-pit mining areas, Environmental Science Pollution Research, 2012.</i>
	Loading	2.3237E-04 kg PM ₁₀ / average time between spray application	<i>USEPA (2006a)</i>	
	Haulage	0.69718 kg PM ₁₀ /VKT	<i>USEPA (2006a)</i> <i>Cowherd (1988)</i>	
Limestone stone mining	Wet drilling	8.00E-5 lbs PM ₁₀ / Ton produce	<i>EPA. August, 2004. Section 11.19.2, Crushed Stone Processing and Pulverized Mineral Processing. In: Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, Fifth Edition, AP-42. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Research Triangle Park, North Carolina.</i>	
	Loading	1.00E-4 lbs PM ₁₀ / Ton produce		

Sources for mining operations are typically classified under open pit area source and line volume source. The onsite activities like excavation, wet drilling, bulldozing, and loading facilitated by machinery like hydraulic excavators, jack hammer connected to

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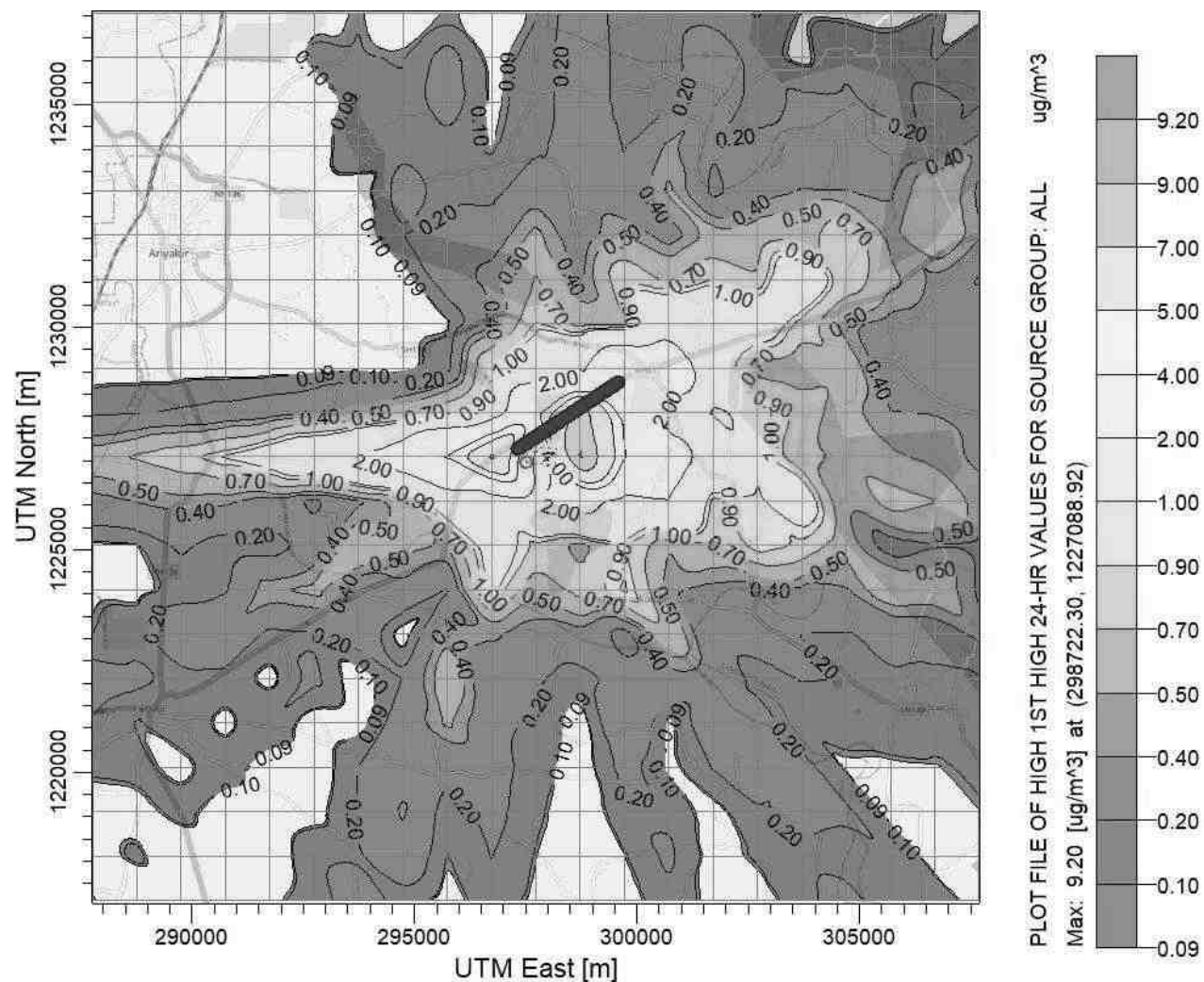
compressor, are all considered under open pit source. The haulage from site to the needy crushers and clients is considered under line volume source. The machineries installed onsite that contribute to gaseous emissions are:

1. Hydraulic excavator (700kW power rating)- 2nos.
2. Portable Compressors - (290 psi, 300HP)- 2nos.
3. Tipper - (20T Capacity)

Table 4-1 Controlled emission calculation (24H- average modeling inputs)

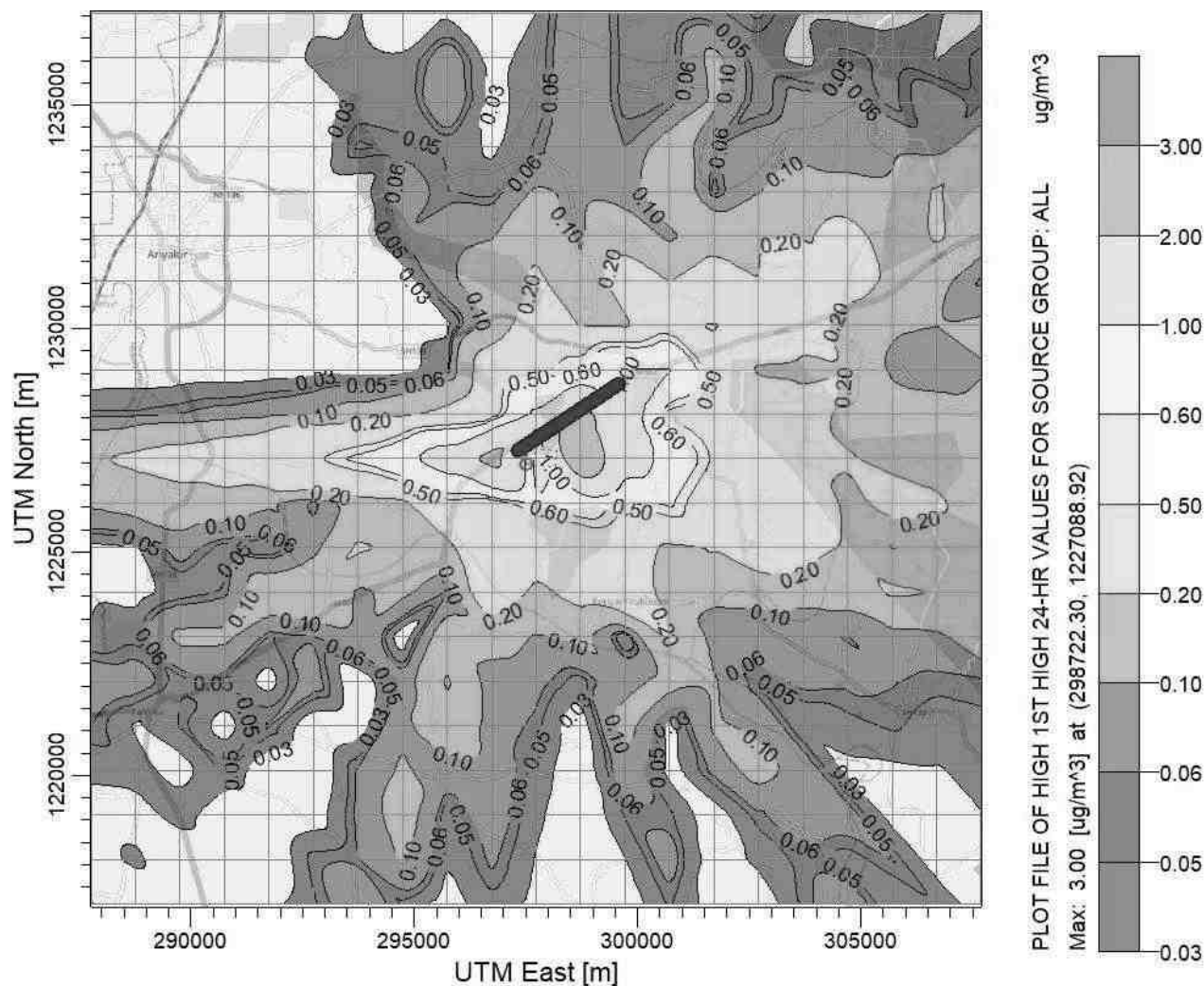
Activity		Source Type	Emissions (g/s)				
			TSPM	PM₁₀	PM_{2.5}	NO_x	CO
Haulage		Line volume	0.1243	0.03515	0.0210	0.0876 (from tipper)	0.0528 (from tipper)
Topsoil handling	Bulldozing	0.1174 0.000522 0.000653	0.0389	0.0233	0.0248 (from excavator)	0.2171 (from excavator)	0.4342 (from excavator)
Limestone mining	Wet drilling		0.000104	0.000062	0.00522 (from compressor)	0.00113 (from compressor)	0.00226 (from compressor)
	Loading		0.000131	0.000078	-	-	-

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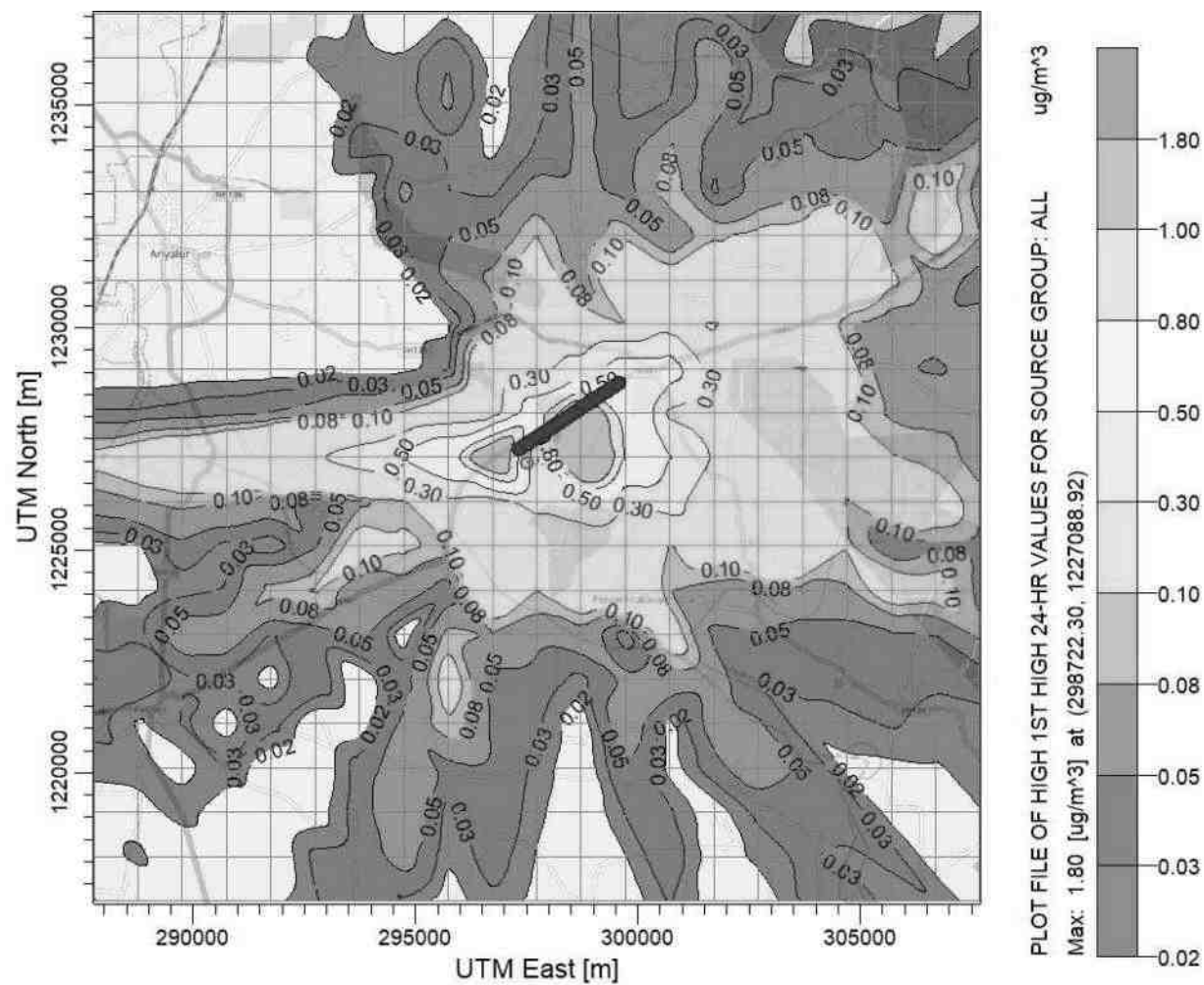
Predicted 24-Hrs GLC of Particulate matter TSPM within 10 km Radius of the Study Area

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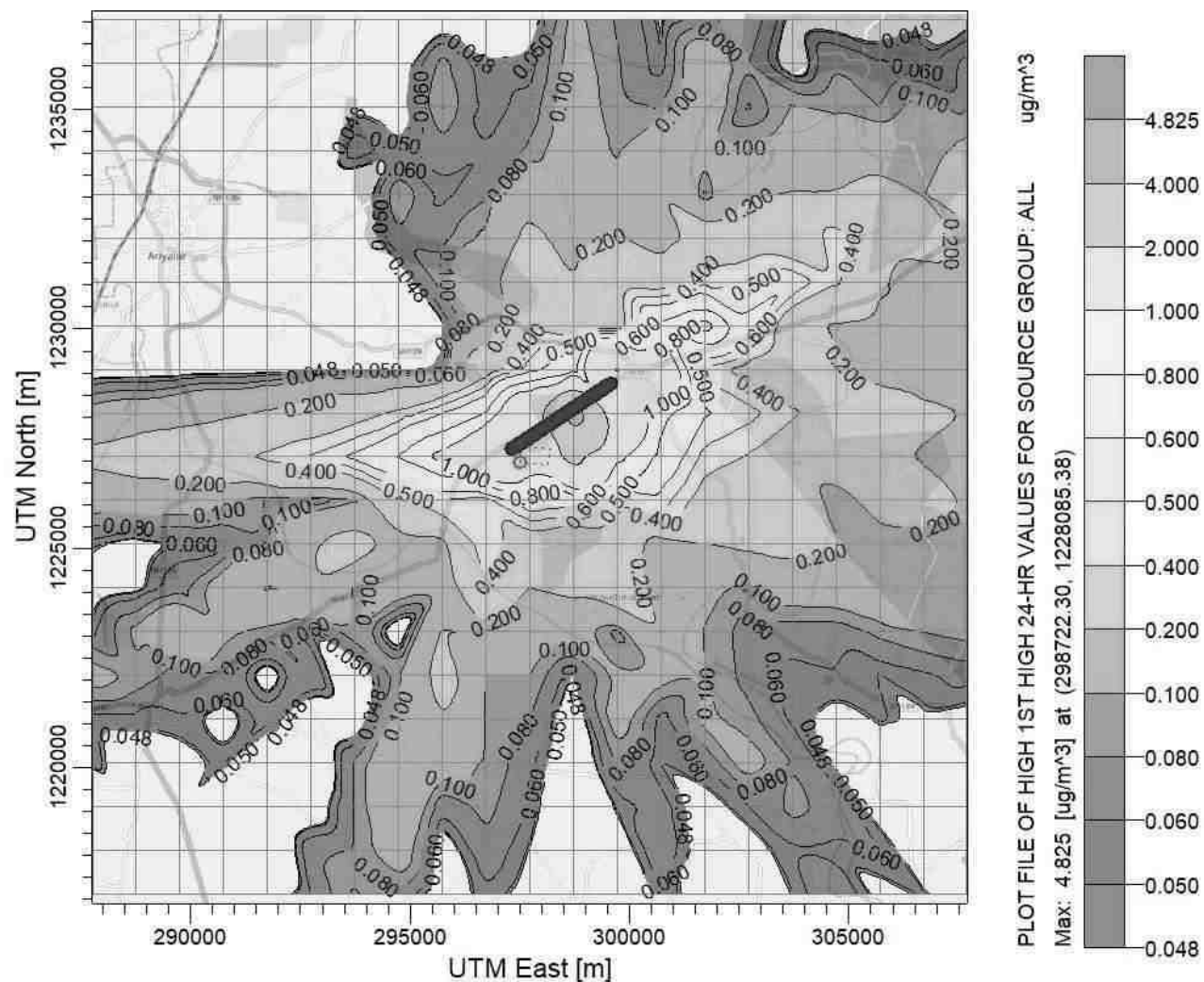
Predicted 24-Hrs GLC of PM10 within 10 km Radius of the Study Area

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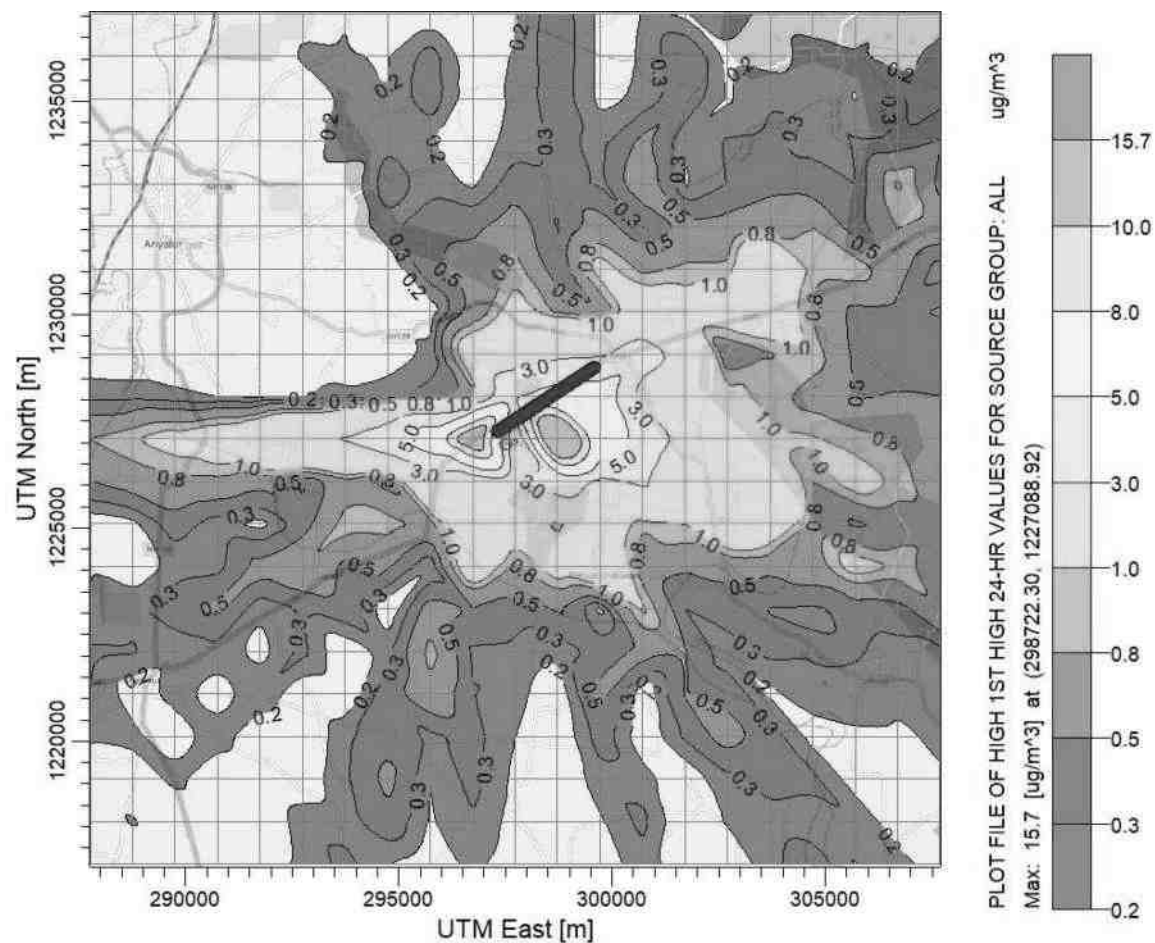
Predicted 24-Hrs GLC of PM2.5 within 10 km Radius of the Study Area

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Predicted 24-Hrs GLC of NOX within 10 km Radius of the Study Area

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Predicted 24-Hrs GLC of CO within 10 km Radius of the Study Area

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4.5 Noise Environment

Aspect	Impact	Mitigation Measures
<i>Loading and unloading, Transportation of the excavated mineral.</i>	<p>Usage of Equipments (Excavator – 82 dBA, Tipper - , Jack Hammer), Machinery and trucks used for transportation will generate noise.</p> <p>Noise from the machinery can cause hypertension, high stress level, hearing loss, sleep disturbance etc due to prolonged exposure.</p> <p>Number of vehicles will be increased due to the proposed mining activity hence vehicle may collide which may result in unwanted sound and can also cause impact on human health like breathing and respiratory system, damage to lung tissue, influenza or asthma.</p>	<ul style="list-style-type: none"> • The machinery will be maintained in good running condition so that noise will be reduced to minimum possible level. • Awareness will be imparted to the workers once in six months about the permissible noise level and effect of maximum exposure to those levels. Adequate silencers will be provided in all the diesel engines of vehicles. • It will be ensured that all transportation vehicles carry a valid PUC Certificates. • Speed of trucks entering or leaving the mine will be limited to moderate speed (20km/hr) to prevent undue noise from empty vehicles. <p>The noise generated by the machinery will be reduced by proper lubrication of the machinery and other equipments.</p> <ul style="list-style-type: none"> • It is proposed to plant 3450 Nos. of local species (Neem, Mandharai, Athi, Ashoka and Villam) to reduce the impact of noise in the study area. The development of green belts around the periphery of the

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		<p>mine will be implemented to attenuate noise.</p> <ul style="list-style-type: none"> • The trucks will be diverted on two roads and a District road to avoid traffic congestion. • Health checkup camps will be organized once in six month. • Use of personal protective devices i.e., earmuffs and earplugs by workers, who are working in high noise generating areas. • Provision of quiet areas, where employees can get relief from workplace noise.
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4.6 Biological Environment

Aspect	Impacts	Mitigation Measures
Site Clearance	Loss of habitat due to site clearance which may lead to ecological disturbance.	The proposed mining lease is already a barren land hence no site clearance is required. Only few shrubs and herbslike parthenium sp., prosopis juliflora were present.

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Planting of trees	Development of afforestation in the mine lease area will have a positive impact as the land was initially a barren.	7.5m safety distance will be provided all along the boundary of the mine lease area and safety distance of 50m in the western side due to the presence of adjoining odai. This will attract avifauna thus enhancing the existing ecological environment.
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4.7 Socio Econommic Environment

Aspect	Impact	Mitigation Measures
Proposed implementation of Mining activity	Land acquisition for the implementation of the project may result in loss of assets, which in return will make the PAP to shift, losing their normal routine and livelihood	The proposed project is a own patta land of <i>TANCEM</i> and the land is vacant where there are no human settlement within 500m radius. Hence the project does not involve Rehabilitation and resettlement
Loading and Transportation of the mined out mineral	The mining activities may cause dust emission, noise pollution thereby causing disturbance to the local habitat	No human activity is envisaged near the project site. The nearest human settlement is observed in, which is 1km away from the project site.
Grazing and Rearing activities in the nearby villages	The Grazing and rearing of local animals like Sheep, Goat and cows is observed in the nearby villages, which may be affected due to the project as the movement of the vehicles may affect/injure the animals	It is proposed to use graveled road and nearest paved road and preferred not to use unpaved roads. In addition to that, the speed of trucks will be limited to 20km/hr to avoid any accidents
Employment opportunity	The project will improve the livelihood of the local people	After the development of the proposed mine, it will improve the livelihood of local people and also provide the direct and

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		indirect employment opportunities. The rough stone and gravel for the infrastructural development in the area will be made available from the local markets at reasonably lower price.
Corporate Environmental Responsibility	The proposed project will help in natural resource augmentation & Community resource development	As a part of CER, 2% of the project cost i.e, Rs. 1,04,19,735 will be allocated. The detailed agenda, which is to be executed, has been framed. The salient features of the programme are as follows: Road Plantation, Fencing, Drainage, Fencing, Lighting

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4.8 Other Impacts

S. No	Aspect	Impact	Mitigation measure
1.	Risk due to the proposed mining	Accidents may occur in the mine area	Proper PPE kit (Safety jacket, Helmet, Safety Shoes, Gloves) etc will be provided to each and every employee in the mine lease concerning the safety of each labor
2.	Screening of Labors	Labors will be checked for health condition before employing them in mining activity	All the labors will be checked and screened for health before employing them After employing them, periodical medical checkups will be held once in every six months

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5 ANALYSIS OF ALTERNATIVES

5.1 General

Analysis of alternative is a significant aspect in planning and designing any project. Cost benefit analysis should be work out along with other parameters while choosing an alternative in such a way that the production is maximum and the mining operation is environment friendly and cost effective. The mine plan and mine closure plan has been approved by the Indian Bureau of Mines, Chennai prior to submission of the Form-1 and PFR.

The terms of Reference has been issued by SEAC TN vide Letter No. SEIAA-TN/F. No. 7607/SEAC/ToR-797/2020 Dated: 21.10.2020. The study for alternative analysis involves in-depth examination of site and technology.

5.2 Analysis for Alternative Sites and Mining Technology

5.2.1.1 Alternative Site

The proposed project is the mining of Limekankar and Limestone is proposed after prospecting the area. In other words, these can be implemented in the mineral available zone.

5.2.1.2 Alternative Technology

The open cast mining could be manual/semi-mechanized/mechanized depending upon the geological and topographical setup of the mineral (ROM) to be won and the daily/annual targeted production

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Table 5-25: Alternative for Technology and other Parameters

Sr. No.	Particular	Alternative Option 1	Alternative Option 2	Remarks
1.	Technology	Opencast semi mechanized mining	Opencast mechanized mining	Opencast mechanized mining is preferred
2.	Employment	Local employment.	Outsource employment	Local employment is preferred Benefits: Provides employment to local people along with financial benefits No residential building/ housing is required.
3.	Labour transportation	Public transport	Private transport	Local labors will be deployed from Pudupalayam, Periyanaagalur & Periyathirukkonam so they will either reach mine site by bicycle or by foot. Benefits: Cost of transportation of labors will be negligible
4.	Material transportation	Public transport	Private transport	Material will be transported through trucks/trolleys on the contract basis Benefits: It will give indirect employment.
5.	Water	Existing TANCCEM Mine	Ground water	Water will be supplied from existing mine of TANCCEM which is covered in Mining Lease G.O. No. 344 and from nearby vendors.

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6 Environmental Monitoring Program

6.1 General:

This chapter covers the planned environmental monitoring program. It also includes the technical aspects of monitoring the effectiveness of mitigation measures.

Monitoring is important to measure the efficiency of control measures. Post project monitoring of environmental parameters is of key importance to assess the status of environment. The monitoring program will serve as an indicator for identifying environmental degradation due to operation of the project and help in selection of appropriate mitigation measures to safeguard the environment.

Regular monitoring is as important as control of pollution since the efficacy of control measures can only be determined by monitoring. The project proponent has awarded **M/s. Ecotech Labs Pvt Ltd** for carrying out the post project environmental monitoring (PPM) and timely compliance report submission to various regulatory authorities.

Therefore, regular monitoring programme of the environmental parameters is essential to take into account the changes in the environmental quality. The objectives of monitoring are to:-

- Verify effectiveness of planning decisions;
- Measure effectiveness of operational procedures;
- Confirm statutory and corporate compliance; and
- Identify unexpected changes.

Table 6-1: Environmental Monitoring Programme

Parameters	Sampling	Frequency	Location
Air environment – Pollutants PM 10 PM 2.5 SO ₂ NO _x Lead in PM	5 locations	24 hourly twice a week 4 hourly. Twice a week, One non monsoon season 8 hourly, twice a week 24 hourly, twice a week	Project Site, Near Nerinjikkorai Veliperingyam Road, Near Ariyalur Muttavancheri Govindaputhur Road, Periyanagalur, Pudupalyam

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Noise	5 locations	24 hourly Once in 5 locations	Project Site, Near Pudupalayam Ariyalur Road, Near NH 227, Near Birla Cements Nerinjikorai
Water (Ground water) <ul style="list-style-type: none"> pH Temperature Turbidity Magnesium Hardness Total Alkalinity Chloride Sulphate Fluoride Nitrate Sodium Potassium Salinity Total nitrogen Total Coliforms Fecal Coliforms 	5 locations	Once in 5 locations	Project Site, Near Marudhaiyar River, Nerinjikorai, Periyanaalur, Near Chettinad cement Mines
Water (surface water) <ul style="list-style-type: none"> pH Temperature Turbidity Magnesium Hardness Total Alkalinity Chloride Sulphate Fluoride 	Sample from nearby lakes/river	One time Sampling	Marudhaiyar River & Eleri Lake

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<ul style="list-style-type: none"> • Nitrate • Sodium • Potassium • Salinity • Total nitrogen • Total Coliforms • Fecal Coliforms 			
Soil (Organic matter, Texture, pH, Electrical Conductivity, Permeability, Water holding capacity, Porosity)	5 locations	Once in 5 locations	Project Site, Near Marudhaiyar River, Nerinjikorai, PeriyanaGalur, Near Chettinad cement Mines
Ecology and biodiversity Study	Study area covering 5 km radius	One time Sampling	
Socio- Economic study (Population, Literacy Level, employment, Infrastructure like school, hospitals & commercial establishments)	Villages around 5 km radius	One time Sampling	

Table 6-2: Monitoring Schedule during Mining

S. No.	Attributes	Parameters	Frequency	Location
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1.	Ambient Air Quality at Mine Site & Fugitive Dust Sampling	PM 10 PM 2.5 SO ₂ NO _x	Once in a Month	Project Site
2.	Ground water Quality	Drinking Water Parameters, As per IS - 10500: 2012	Half yearly	Project Site
3.	Surface Water Quality	Class will be assessed as per the CPCB Guidelines	Half yearly	Project Site
4.	Soil Quality	(Organic matter, Texture, pH, Electrical Conductivity, Permeability, Water holding capacity, Porosity)	Half yearly	Project Site
5.	Noise Level Monitoring	Noise level in dB(A) Quarterly/half yearly	Half yearly	Project Site

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7 Additional Studies

7.1 General

This chapter covers the details of the additional studies viz. Risk assessment, Disaster Management, Public Hearing, Rehabilitation and resettlement

7.2 Public Hearing:

As the proposed mining project falls under 1(a), Category B1 – Cluster Mining (which includes the mines as specified in the 500m radius DD Letter)

Hence under 7(III) of EIA notification 2006 and its subsequent amendments, the project involves the Public Consultation and the same will be conducted under SPCB (TN) in Ariyalur District. The proceedings of the same will be incorporated in the Final EIA Report

7.3 Risk assessment:

For any industry to be successful, it should meet not only the production requirements, but also maintain the highest safety standards for all concerned. The industry has to identify the hazards, assess the associated risks and bring the risks to tolerable level on a continuous basis.

Mining is a hazardous operation and consists of considerable environmental, health and safety risk to miners. Safety risk assessment is the systematic identification of potential hazards in workplace as a first step to controlling the possible risk involved. Unsafe conditions in mines lead to a number of accidents and cause loss and injury to human lives, damage to property, interruption in production etc. Risk Assessment is a systematic method of identifying and analyzing the hazards associated with an activity and establishing a level of risk for each hazard.

The hazards cannot be completely eliminated, and thus there is a need to define and estimate an accident risk level possible to be presented either in quantitative or qualitative way. Because of the existing hazards of mining as an activity and the complexity of mining machinery and equipment and the associated systems, procedures and methods, it is not possible to be naturally safe. Regardless of how well the machinery or methods are designed, there will always be potential for serious accidents. It is not possible for an external agency to ensure the safety of an organization such as a mining company nor of the machinery or methods it uses.

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Risk Assessment tools are used to help to prevent major hazards in mining industry, e.g., fire, explosion, wind-blast, outbursts, spontaneous combustion, roof instability, chemical and hazardous substances, etc., from injuring miners. The structured process associated with risk assessment helps to characterize the major hazards and evaluate engineering, management and work process factors that impact how a mine mitigates its highest risk. The degree of success is influenced by the existing risk management culture at the mining operation, identification of risk, the design of the risk assessment, the risk management, the character of the risk assessment process, the extent of the existing controls, and the quality of the new ideas.

7.3.1 Need for Risk Assessment

- Identify hazards—something with the potential to cause harm,
- Assess the likelihood, or probability, of harm arising from the hazard,
- Assess the severity of harm resulting from realization of the hazard,
- Combine assessments of likelihood and severity to produce an assessment of risk and
- Use the assessment of risk as an aid to decision making.

7.3.2 Objectives of Risk Assessment

- Identifying hazardous activities
- Assessment of risk level and severity in different operations
- Identification of control measures
- Setting monitoring process
- Reduce the impact of mishaps of all kinds
- Reduce the inherent potential for major accidents.

7.3.3 Different terminologies associated with Risk Assessment

Following are some of the important terminologies involved in hazard identification and risk analysis:

Harm: Physical injury or damage to the health of peoples either directly or indirectly as a result of damage to property or to the environment.

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Hazard: Hazard is a situation that poses a level of threat to life, health, property or environment. Most hazards are dormant with only a theoretical risk of harm however once a hazard becomes active it can create emergency situation.

Hazardous Situation: A circumstance in which a person is exposed to a hazard

Hazardous Event: A hazardous situation which results in harm

Accident: An accident is a specific, unidentifiable, unexpected, unusual and unintended external action which occurs in a particular time and place with no apparent and deliberate cause but with marked effect.

Risk: Risk concerns the deviation of one or more results of one or more future events from their expected value.

Tolerable Risk: Risk which is accepted in a given context based on the current values of society.

Protective Measure: The combination of risk reduction strategies taken to achieve at least the tolerable risk. Protective measures include risk reduction by inherent safety, protective devices, and personal protective equipment, information for use and installation and training.

Severity: Severity is used for the degree of something undesirable

7.3.4 Different forms of Injury

- Serious Bodily Injury means any injury which involves the permanent loss of any part or section of the body or the permanent loss of sight or hearing or any permanent physical incapability or the fracture of any bone or one or more joint or bone of any phalanges of hand or foot.
- Reportable Injury means any injury other than any serious bodily injury, which involves the enforced absence of injured person from work for a period of 72 hours or more.
- Minor Injury means any injury which results in enforced absence from work of the person exceeding 24hrs and less than 72 hours.

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7.3.5 Type of Hazard Identification and Risk Analysis

There are three types of hazard identification and risk assessments:

- Baseline Hazard Identification and Risk Analysis,
- Issue-based Hazard Identification and Risk Analysis and
- Continuous Hazard Identification and Risk Analysis.

They are all inter-related and form an integral part of a management system. A brief description of each of the three types of Hazard Identification and Risk Analysis is given below:

Baseline Hazard Identification and Risk Analysis:

The purpose of conducting a baseline HIRA is to establish a risk profile or setoff risk profiles. It is used to priorities action programmes for issue-based risk assessments.

Issue-based Hazard Identification and Risk Analysis:

The purpose of conducting an issue-based HIRA is to conduct a detailed assessment study that will result in the development of action plans for the treatment of significant risk.

Continuous Hazard Identification and Risk Analysis:

The purpose of conducting continuous Hazard Identification and Risk Analysis is to:

- Identify Operational health and safety hazards with the purpose of immediately treating significant risks.
- Gather information to feed back to issue-based Hazard Identification and Risk Analysis.
- Gather information to feed back to baseline Hazard Identification and Risk Analysis.

The different steps of risk assessment procedure are as given below:

STEP 1: HAZARD IDENTIFICATION:

The purpose of hazard identification is to identify and develop a list of hazards for each job in the organization that are reasonably likely to expose people to injury, illness or disease if

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not effectively controlled. Workers can then be informed of these hazards and controls put in place to protect workers prior to them being exposed to the actual hazard.

STEP 2: RISK ASSESSMENT:

Risk assessment is the process used to determine the likelihood that people exposed to injury, illness or disease in the workplace arising from any situation identified during the hazard identification process prior to consideration or implementation of control measures. Risk occurs when a person is exposed to a hazard. Risk is the likelihood that exposure to a hazard will lead to injury or health issues. It is a measure of probability and potential severity of harm or loss.

STEP 3: RISK CONTROL:

Risk control is the process used to identify, develop, implement and continually review all practicable measures for eliminating or reducing the likelihood of an injury, illness or diseases in the workplace.

STEP 4: IMPLEMENTATION OF RISK CONTROLS:

All hazards that have been assessed should be dealt in order of priority in one or more of the following hierarchy of controls.

The most effective methods of control are:

1. Elimination of hazards
2. Substitute something safer
3. Use engineering/design controls
4. Use administrative controls such as safe work procedures
5. Protect the workers i.e. by ensuring competence through supervision and training, etc.

Each measure must have a designated person and date assigned for the implementation of controls. This ensures that all required safety measures will be completed.

7.3.6 Risk Analysis

The risk assessment portion of the process involves three levels of site evaluation:

- 1) Initial Site Evaluation,
- 2) Detailed Site Evaluation,

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3) Priority Site Investigations and Recommendations.

The risk assessment criteria used for all levels of site evaluation take into account two basic factors:

- The existing site conditions,
- The level of the travelling public's exposure to those conditions.

The Initial Site Evaluation and Detailed Site Evaluation both apply weighted criteria to the existing information and information obtained from one site visit. The Initial Site Evaluation subdivides the initial inventory listing of sites into 5 risk assessment site groups. The Detailed Site Evaluation risk assessment is then performed on each of the three highest risks site groups in order of the group priority level of risk. The result of the Detailed Site Evaluation process is a prioritized listing of the sites within each of the three highest risk site groups.

Risk analysis is done for:

- Forecasting any unwanted situation
- Estimating damage potential of such situation
- Decision making to control such situation
- Evaluating effectiveness of control measures

7.4 Disaster Management Plan:

7.4.1 Objective

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. For effective implementation of the disaster management plan, it should be widely circulated and personnel training through rehearsals/drills. 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:

- Effect the rescue and medical treatment of casualties;
- Safeguard other people;
- Minimize damage to property and the environment;

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- Initially contain and ultimately bring the incident under control;
- Identify any dead;
- Provide for the needs of relatives;
- Provide authoritative information to the news media;
- 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 effect, it is to optimize operational efficiency to rescue rehabilitation and render medical help and to restore normalcy.

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 coordinator's 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.

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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 coordinator's. Simultaneously, the emergency warning system would be activated on the instructions of the site controller.

EMERGENCY RESPONSIBILITIES:

The responsibilities of the key personnel are appended below:

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;
- Controls 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;
- Gives a public statement if necessary;

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- Keeps record of chronological events and prepares an investigation report and preserves evidence; and
- On completion of On Site Emergency and restoration of normalcy, declares all clear and orders for all clear warning.

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 casualties;
- 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.

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;

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- 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;
- Arranges for safety equipment for the members of this team;
- Decides which paths the evacuated workers should follow; and
- Maintains law and order in the area, and if necessary seeks the help of police.

Emergency Coordinator – Medical, Mutual Aid, Transport and Communication. In the event of failure of electric supply and thereby internal telephone, sets up communication point and establishes contact with the Emergency Control Center (ECC).

- Organizes medical treatment to the injured and if necessary will shift the injured to nearby hospitals;
- Mobilizes extra medical help from outside, if necessary;
- Keeps a list of qualified first aiders of the mines and seek their assistance;
- Maintains first aid and medical emergency requirements;
- Makes sure that all safety equipment are made available to the emergency team;
- Assists Site Controller with necessary data and to coordinate the emergency activities;
- Assists Site Controller in updating emergency plan, organizing mock drills verification of inventory of emergency facilities and furnishing report to Site Controller;
- Maintains liaison with Civil Administration;
- Ensure availability of canteen facilities and maintenance of rehabilitation center;
- He will be in liaison with Site Controller/Incident Controller;

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- Ensure transportation facility;
- Ensures availability of necessary cash for rescue/rehabilitation and emergency expenditure;
- Controls rehabilitation of affected areas on discontinuation of emergency; and
- Makes available diesel/petrol for transport vehicles engaged in emergency operation.

Emergency Coordinator – Essential Services:

- He would assist Site Controller and Incident Controller;
- Maintains essential services like Diesel Generator, Water, Fire Water, power supply for lighting;
- Gives necessary instructions regarding emergency electrical supply, isolation of certain sections etc. to shift in-charge and electricians; and
- Ensures availability of adequate quantities of protective equipment and other emergency materials, spares etc.

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.

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;

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- 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.

Assembly Point:

Number of assembly 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.

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.

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Fire Fighting Facilities:

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

Location of Wind Sock:

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

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.

First aid facilities would be augmented. Names of medical personnel, medical facilities in the area would be prepared and updated. Necessary specific medicines for emergency treatment of burns patients and for those affected by toxicity would be maintained.

Breathing apparatus and other emergency medical equipment would be provided and maintained. The help of nearby industrial management's in this regard would taken on mutual support basis.

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.

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.

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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

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.

In the event of an emergency developing into an offsite emergency, local authority and District emergency Authority (normally the Collector) would be appraised and under his supervision, the Off Site Disaster Management Plan would be exercised. For this purpose, the facilities that are available locally, i.e. medical, transport, personnel, rescue accommodation, voluntary organizations etc. would be mustered. Necessary rehearsals and training in the form of mock drills should be organized.

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.

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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.

Thiru.T.Ravichandran, Dy. General Manager (Technical) & Unit Head is in charge for disaster management and monitors all activities related to disaster management/risk assessment in case of any such situations.

The name and postal address of the person who is in charge for disaster management is as under:

Name : Thiru.T.Ravichandran, Dy. General Manager

(Technical) & Unit Head,

Address : M/s Tamilnadu Cements Corporation Limited

(A Government of Tamilnadu Undertaking)

Ariyalur Cements Factory,

Ariyalur District.

Tamil Nadu.

Telephone Number : 04329 228531

Fax : 04329 228776

Email : ari@tancem.com, acwmines@gamil.com

Care and maintenance during temporary discontinuance:

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

- Notice to be served to all concerned authority.
- The mining pit area shall be covered by temporary fencing.
- Watchman will be posted round the clock to prevent any unauthorized or inadvertent entry of public.
- Works on stabilization of dumps to provided vegetal cover would be taken up.
- Construction of garland or retaining walls around the dumps will be attempted.

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

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

7.5 Natural Resource Conservation

There are no natural resources within the premises. The conservation strategies for energy will be followed in the proposed mine lease area. The pollutants of the mine will be minimized by adopting appropriate mitigation measures as mentioned Chapter 5 to prevent the effects on nearest water bodies (Nakkankuzhi Eri - Western side adjoining to the project site). No surface runoff from the project site will be let into the Eri.

7.6 Reclamation and Rehabilitation:

It is a fresh mining lease applied area. Reclamation and rehabilitation will be carried out at the end of the life of the mine. The mined out pit is proposed to be used as small reservoir for storing much needed rainwater at the end of the life of the mine when the mine reaches its ultimate pit limit. Since the surrounding areas are dry and experiences low rainfall, any amount of storage of water will be beneficial for recharging the groundwater in the adjacent areas. Along the permanent roads and vacant places, afforestation is being carried out at present. Before closure of the mine, a parapet wall will be constructed to prevent inadvertent entry of cattle and human beings. A watchman (Security guard) will be posted around the clock to prevent inherent entry of public and cattle which are growing in and around the area

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8 Project Benefits

8.1 General

This chapter covers the benefits accruing to the locality, neighborhood, region and nation as a whole. It brings out the details of benefits by way of improvements in the physical infrastructure, social infrastructure, employment potential and other tangible benefits.

8.2 Physical Benefits

The opening of the proposed project will enhance the following physical infrastructure facilities in the adjoining areas:

- a. Market:** Generating useful economical resource for construction. Due to demand supply chain, excavated mineral Limestone & Limekankar will sold in the market in the affordable price.
- b. Infrastructure:** The excavated Limestone & Limekankar will be used as raw material for TANCEM cement factory.
- c. Enhancement of Green Cover & Green Belt Development:** As a part of reclamation plan, native tree species will be planted along the safety boundary of the mine lease area. A suitable combination of trees that can grow fast and also have good leaf cover will be adopted to develop the green belt. It is proposed to plant 3450 numbers of native species along with some fruit bearing and medicinal trees during the mining plan period.

8.3 Social Benefits

The mining in the area will create rural employment. During site visit, it has been observed that the economic conditions of the villages in the study area is quite normal. After the development of the proposed mine, it will improve the livelihood of local people and also provide the indirect employment opportunities. The Limestone & Limekankar for the infrastructural development in the area will be made available from the local markets at reasonably lower price.

As a part of CER, 2% of the project cost i.e., Rs. 1,04,19,735 will be allocated. The detailed agenda, which is to be executed has been framed. The salient features of the programme are as follows:

- Creation of community assets (infrastructure) like provision for drinking water, construction of sanitary facility to Government School, Pudupalayam

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8.4 Project Cost Budget:

Table 8-1: Budget for the proposed project

S.No.	Description	Cost (Rs)
1.	Land Cost	1,53,83,200
2.	Operational Cost	Limestone - 45,44,55,670 Limekankhar - 4,92,47,882
3.	EMP Cost	19,00,000
Total		52,13,78,739

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9 Environmental Management Plan

9.1 Introduction

This chapter comprehensively presents the Environmental Management Plan (EMP), which includes the administrative and technical setup, summary matrix of EMP, the cost involved to implement the EMP, during various Mining activities and provisions made towards the same in the cost estimates of project. This chapter describes the proposed monitoring scheme as well as inter-organizational arrangements for effective implementation of the mitigation measures.

9.2 Subsidence

Mining will be carried out by opencast semi mechanized mining method wet drilling & mining plan approved by The Indian Bureau of Mines, Chennai. Subsidence/slope failures are not envisaged because there are no loose strata overlying the deposit (mineral to be excavated). The bench height will be average 6m. The individual bench slope has been proposed to be kept at 60° from horizontal, while the ultimate pit slope has been kept 45° from horizontal. Moreover, all safety standards/ safeguards will be implemented as per guidelines prescribed by Director General of Mines Safety.

9.3 Mine Drainage

Minimum and maximum depth of water table based on observations from nearby wells and water bodies:

The area receives rains only during North-East monsoon. The average annual rainfall in and around this area is 1071.4mm. There would not be any serious problem due to inundation. The water table is found at a depth of 35m in rainy season and at 38m in summer. The depth of water table fluctuation is verified by observing the water levels in the above seasons in the nearby wells.

Since the water table is below 35m, the mining activity will not have any impact on drainage. However, in the rainy season, there may be seepage of water. To pump-out the seepage and rain water, a 5 HP Diesel Pump will be kept ready. This pump will be provided at the deepest level (sump) of the working face to collect the water. Suitable earthen bunds will be formed around the area to protect the entry of rain water from outside.

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Maximum and minimum depth of Workings

It is a fresh applied area for Mining Lease. It is proposed to carry out the mining operations to a depth of about only 17.75m from RL 55.0m to RL 46.25m. The water table in this area is found at the depth of 35m during rainy seasons.

Depth of the pit at present (maximum) : Nil

Average Depth proposed during the mining plan period : 17.75m [from RL 55.0m to RL 46.25m]

Quantity and quality of water likely to be encountered, the pumping arrangements and places where the mine water is finally proposed to be discharged:

The mining operation for the mining plan period is proposed to restrict well above the water table. Hence, the water is not likely to encounter during the course of mining operations. The water table is found at the depth of 35m in the rainy season and 38m in the summer. The water table fluctuation is verified by observing the water level in the nearby wells.

Arrangements for arresting solid wash off

The rain water flow towards catchment area is not flowing through the area applied for mining lease as garland drains are proposed to be constructed around the area applied for mining lease. Hence, solid wash off will not occur.

9.3.1 Drainage

The study area is part of Marudaiyar – Ariyalur mini watershed of Ariyalur district which represents a part of coastal sedimentary plains and river basin is mainly composed of Cretaceous, Tertiary and Quaternary formation which includes calcareous sandstones, shell limestones and alluvium.

The lease applied area exhibits almost plain topography with gentle slope towards south side. The altitude of the area is 55m Above MSL. Geomorphologically the area is divided into alluvial plains, buried pediments, low and cretaceous and lineaments. The drainage pattern of the area is mostly controlled by the structural features. Radial and dentritic to sub-dentritic patterns are recognized in this district among the different drainage patterns and associated features.

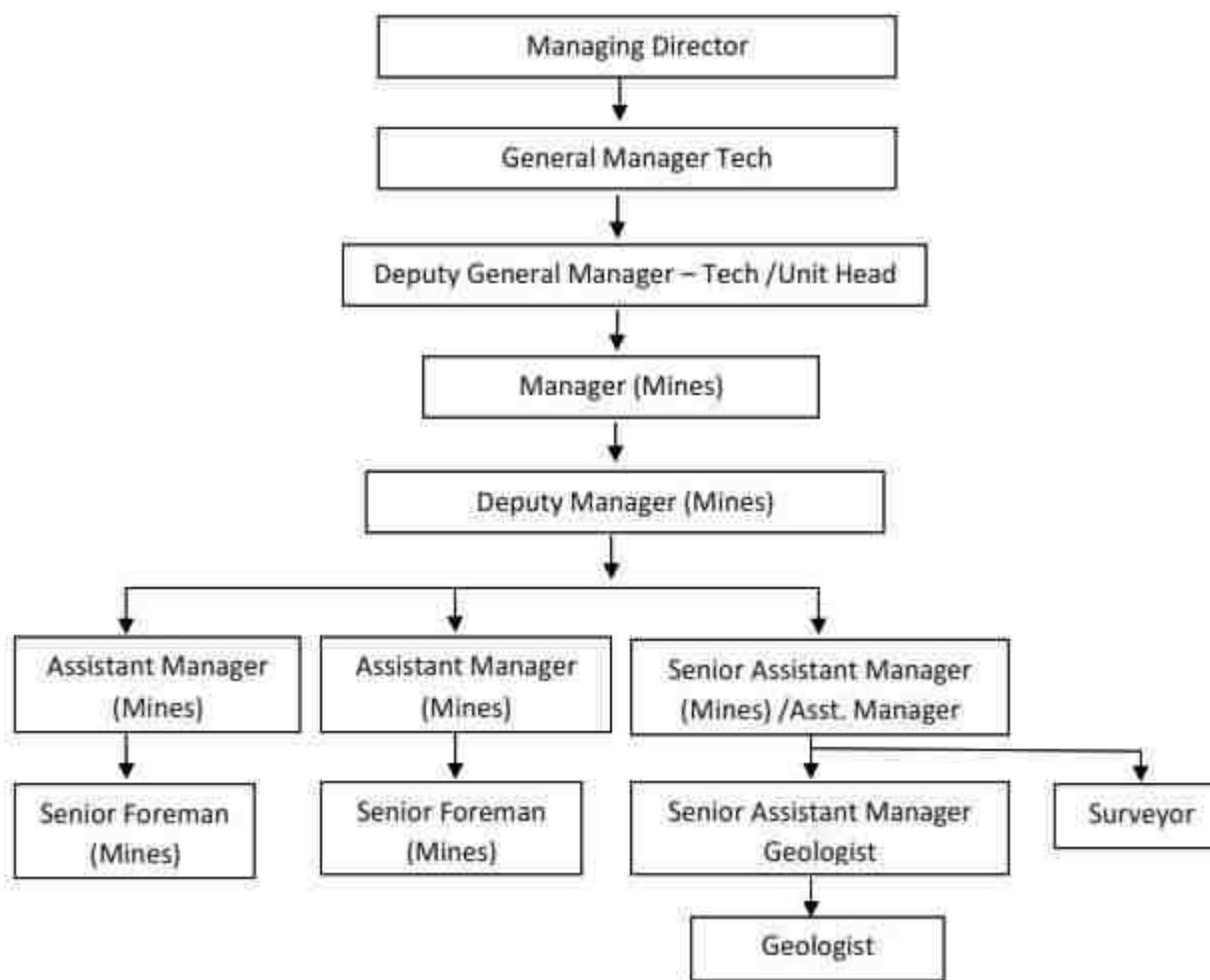
Water table is found at a depth of 38m during summer and 35m during rainy season which is observed from the existing borehole in Nerinjikorai village.

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9.3.2 Administrative and Technical Setup

The Environment Management Plan (EMP) will consist of all mitigation measures for each component of the environment due to the activities increased during mining operation to minimize adverse environmental impacts resulting from the activities of the project.

To carry out the above activities, M/s. TamilNadu Cement Corporation Limited will work in association with M/s. Ecotech Labs Pvt Ltd.



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Table 9-1: Impacts and mitigation measures

S. no	Impacts on Environment	Activity / Aspect	Anticipated impacts	Mitigation measures	Budgetary Allocation
1.	Air	Fugitive Emission	During mining operation, fugitive dust and other air pollutants like particulate matter (PM10 & PM 2.5) will be generated.	<ul style="list-style-type: none"> Planting of trees along the safety distance of the Mine Lease Area Water will be sprinkled in the site as dust suppression measure. 	<p>Rs.4,90,000</p> <p>Rs.3,50,000</p>
2.	Water	Wastewater Generation	Improper management of Domestic wastewater in the Mine lease may create unhygienic conditions in the site thereby causing health impacts to the labors	<ul style="list-style-type: none"> Provision of urinals/Latrines along with septic tank followed by soak pit arrangement will be provided in the Mine Lease area for the proper management of wastewater 	Rs.1,00,000
3.	Noise	Mining activities like drilling, blasting, loading and transportation	Noise from the machinery can cause hypertension, high stress level, hearing loss, sleep disturbance etc due to prolonged exposure. Apart from Mining activities like drilling, blasting may generate noise	<ul style="list-style-type: none"> Use of personal protective devices i.e., earmuffs and earplugs by workers, who are working in high noise generating areas 	Rs.50,000

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4.	Land	Improper management of Storm water Runoff	Storm water Runoff may result in Soil Erosion	<ul style="list-style-type: none"> Garland drainage of 1m x 1m will be provided to avoid storm water run- off. 	Rs.1,00,000
4.	Social Responsibility	Mining workers	Unhygienic site sanitation facilities may cause health damage to workers.	<p>The objective is to ensure health and safety of the workers with effective provisions for the basic facilities of sanitation, drinking water, safety of equipments or machinery etc. The following will be done in the site</p> <ul style="list-style-type: none"> ✓ By complying with the safety procedures, norms and guidelines (as applicable) as outlined in the National Building Code of India, Bureau of Indian Standards. ✓ Provide adequate number of decentralized latrines and urinals ✓ Providing Septic tank along with Soak pit arrangement ✓ Providing First Aid room, conducting frequent health checkups to labor and conducting free medical camps 	<p>Rs.50,000</p> <p>Rs.50,000</p> <p>Rs.1,00,000</p> <p>Rs.36,000</p>

Project	Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha	Draft EIA Report
Project Proponent	M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)	
Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	

				<ul style="list-style-type: none"> ✓ Providing safety helmet, Gloves, Jacket & Boots ✓ Providing measures to prevent fires. Fire fighting extinguishers and buckets of sand will be provided in the construction site 	Rs.1,00,000
6.	Building materials resource conservation	Building Material consumption	Use of farfetched construction materials than the locally available construction materials may lead to over exploitation of natural resources & increase in carbon footprint.	<ul style="list-style-type: none"> • Use of locally available construction materials. 	

Table 9-2: Budgetary Allocation for EMP during Mining

S. No	Description	Budgetary Allocation (Rs.)
1.	EMP COST	
i.	Drinking water facility for Labourers	1,05,000
ii.	Sanitary Maintenance	1,00,000
iii.	Safety Kits	1,00,000
iv.	Water Sprinkling	1,50,000
v.	Afforestation, Plantation & Maintenance	4,90,000

<i>Project</i>	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>Draft EIA Report</i>
<i>Project Proponent</i>	<i>M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)</i>	
<i>Project Location</i>	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

2.	Environmental Monitoring		
	i.	Air Quality Monitoring	2,50,000
	ii.	Water Quality Monitoring (Bore well water)	2,50,000
	iii.	Soil sample Analysis – 1 Location	2,50,000
	iv.	Noise Monitoring	2,50,000
Total Cost			10,00,000

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>Draft EIA Report</i>
Project Proponent	<i>M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)</i>	
Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

10 Summary & Conclusion

This chapter summarizes the overall justification for implementation of the project and explains how the potential impacts are mitigated.

10.1 Introduction

Pudupalyam Limekankar & Limestone is a cluster of six mining project. The individual mine lease area is 22.96.0 Ha of Limekankar & Limestone Quarry located at S.F No : 144/1A, 217/1A, 217/1C, 217/2, 217/3A, 217/3B, 217/4, 217/5, 217/6, 218/1, 219/1, 219/2A, 219/2B, 219/3A, 219/3B, 219/3C, 219/3D, 219/3E, 219/3F, 219/3G, 219/4A, 219/4B, 219/5A, 219/5B, 219/5C, 219/6, 219/8, 219/9, 220/1, 220/2A, 220/2B, 220/3A, 220/3B, 220/3C, 220/3D, 220/3E, 220/4, 220/5A, 220/5B, 220/6A, 220/6B, 220/7A, 220/7B, 220/8A, 220/8B, 220/9A, 220/9B, 220/9C, 220/10A, 220/10B, 220/11A, 220/11B, 221/1A & 221/15, Pudupalayam Village, Ariyalur Taluk, Ariyalur District. The area lies in the latitude of 11°05'34.95" N to 11°05'50.96" N and longitude of 79°08'38.65" E to 79°09'09.41" E. The area is marked in the survey of India Topo sheet No. 58 M/04.

10.2 Project Overview

Table 9-3: Project Overview

Particulars	Details
Location	144/1A, 217/1A, 217/1C, 217/2, 217/3A, 217/3B, 217/4, 217/5, 217/6, 218/1, 219/1, 219/2A, 219/2B, 219/3A, 219/3B, 219/3C, 219/3D, 219/3E, 219/3F, 219/3G, 219/4A, 219/4B, 219/5A, 219/5B, 219/5C, 219/6, 219/8, 219/9, 220/1, 220/2A, 220/2B, 220/3A, 220/3B, 220/3C, 220/3D, 220/3E, 220/4, 220/5A, 220/5B, 220/6A, 220/6B, 220/7A, 220/7B, 220/8A, 220/8B, 220/9A, 220/9B, 220/9C, 220/10A, 220/10B, 220/11A, 220/11B, 221/1A & 221/15, Pudupalayam Village, Ariyalur Taluk, Ariyalur District, Tamil Nadu.

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>Draft EIA Report</i>
Project Proponent	<i>M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)</i>	
Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

Geographical Coordinates	11°5'36.55"N	79°8'48.16"E
	11°5'36.57"N	79°9'96.69"E
	11°5'11.82"N	79°9'2.74"E
	11°5'41.68"N	79°8'49.50"E
Type of project	1(a) Mining of Minerals, Category B2	
Topo Sheet No.	58 M/04	
Mine Lease Area	22.96.0 Ha	
Elevation above msl	≈55 m from above MSL	
Ecological Sensitive Areas - Wetlands, watercourses or other waterbodies, coastal zone, biospheres, mountains, forests	❖ Easwaran kovil Eri (0.27Km, W) ❖ Ponneri (0.95 Km N) ❖ Marudhaiyar River (2.18 Km, SW) ❖ Eleri Village Lake (6.2 km, S) ❖ Kurinji Lake (8.50 km, NW)	
Densely Populated area	Reddipalayam (3.6 km, NE)	
Areas occupied by sensitive man-made land uses (hospitals, schools, places of worship, community facilities)	Nearest Place of worship: Vinayagar Temple (670km, W) Sengamalaiyar Andavar temple (1.22 km, NW) AG Church (8 km, NW) Ariyalur Mosque (8.8 km, NW)	
Nearest Road	NH 227(Trichy Main Road, 1.4 km, North)	
Nearest Highway	NH 227(Trichy Main Road, 1.4 km, North)	
Nearest Railway Station	Ariyalur Railway Station (10.76 km, NW)	
Project cost	Rs. 52,13,78,739	
Minerals of Mine	Limekankar & Limestone	
Proposed production of Mine	Proposed capacity of Limestone: 1119000 Tones	
	Proposed capacity of Limekankar: 191626 Tones	
Ultimate depth of Mining	35m below ground level	
Method of Mining	Open cast, mechanized mining	
Water demand	22.65 KLD	

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>Draft EIA Report</i>
Project Proponent	<i>M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)</i>	
Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

Source of water	Water will be supplied from existing mine of TANCEM which is covered in Mining Lease G.O. No. 344 and from nearby vendors.
Man power	13 Nos.
Mining Lease	Precise Area Communication Letter was communicated vide Industries (MMA.2) Department, Secretariat, in Letter No. 3397/MMA.2/2019-1, Dated: 02.08.2019
Mining Plan Approval	Mining Plan was approved by The In Bureau of Mines, Chennai vide letter TN/ALR/LST&KNK/MP/2061.MDS d 09.10.2019.
Boundary Fencing	7.5m, 50m safety distance provided to boundary, fencing will be provided.
Ground water	Post Monsoon ground water is 5m, Pre-Monsoon is 7.4 m Source: TWAD BOARD
Habitations within 500m radius of the Project Site	There is no Habitation within 500m radius
Drinking water	Water will be supplied from existing mine of TANCEM which is covered in Mining Lease G.O. No. 344 and from nearby vendors.

10.3 Justification of the proposed project

India is the second largest producer of cement in the world. India has a lot of potential for development in the infrastructure and construction sector and the cement sector is expected to largely benefit from it. Some of the recent initiatives, such as development of 98 smart cities, is expected to provide a major boost to the sector.

Aided by suitable Government foreign policies, several foreign players such as Lafarge-Holcim, Heidelberg Cement, and Vicat have invested in the country in the recent past. A significant factor which aids the growth of this sector is the ready availability of raw materials for making cement, such as limestone and coal. Higher government spending on infrastructure and housing will be a key growth driver for the industry. The government has

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>Draft EIA Report</i>
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Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

placed significant emphasis on infrastructure development with the aim of making 100 smart cities,

The said project plays a significant role in the domestic as well as infrastructural market. Limestone and Limekankar are the key raw materials in the manufacturing process of Cement. The limestone and Limekankar of 307152 Tonnes/Annum and 41344 Tonnes/Annum will be used to manufacture 226296.1 Tonnes/Annum of Cement.

Table 9-4: Anticipate Impacts & Appropriate Mitigation Measures

S. No	Potential Impact	Mitigation Measure
1	The main impact in the air environment is dust emission during various mining activities such drilling, blasting, excavation, loading and transportation. The dust emission may affect the quality of ambient air in the and around the mine area. The increased emission may cause respiratory & Cardiovascular problems in human health	Proper mitigation measures like water sprinkling on haul roads will be adopted to control dust emissions. To control the emissions regular preventive maintenance of equipments will be carried out on contractual basis. Plantation will be carried out along approach roads & mine premises.
2	Waste water will be generated due to mining activity and from other domestic activities. These may contaminate the ground water leading to ground water. The mining activity may affect the ground water table	No waste water will be generated from the mining activity of minor minerals as the project only involves lifting of over burden from mine site. The wastewater generated from the domestic activity will be disposed off safely through the proposed septic tank Mining will not intersect ground water table. Hence the water table will

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>Draft EIA Report</i>
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Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

		not be impacted due to the proposed project
3	Noise will be generated in the mine area during various mining activities such as blasting, drilling, excavation. During transportation of the mined out mineral, there may be noise generation due to the movement of vehicles. This may impact the health condition of the workers by creating headache	<p>Periodical monitoring of noise will be done.</p> <p>No other equipments except the transportation vehicles and Excavator (as & when required) for loading will be allowed at site.</p> <p>Noise generated by these equipments shall be intermittent and does not cause much adverse impact.</p> <p>Plantation will be carried out along approach roads. The plantation minimizes propagation of noise and also arrest dust.</p>
4	Solid waste will be generated from the mining activity as there will be refuse after 95% recovery and also generation of domestic waste	<p>The 100% recovery is achieved by extracting the entire mineable reserve.</p> <p>Hence there will be no refuse generation due to the mining activity.</p> <p>Apart from that, a very meagre quantity of domestic waste will be generated in the project, which will be handed over to the local body on daily basis.</p>
5	During mining activities, there are chances of workers getting health issues or may be prone to accidents	Dust masks will be provided as additional personal protection equipment to the workers working in the dust prone area.

<i>Project</i>	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>Draft EIA Report</i>
<i>Project Proponent</i>	<i>M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)</i>	
<i>Project Location</i>	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

		<p>Periodical trainings will be conducted to create awareness about the occupational health hazards due to activities like blasting, drilling, excavation</p> <p>Workers health related problem if any, will be properly addressed.</p>
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Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>Draft EIA Report</i>
Project Proponent	<i>M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)</i>	
Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

11 Disclosure of Consultant

11.1 Introduction

This chapter presents the details of the environmental consultants engaged, their background and the brief description of the key personnel involved in the project. Specific studies on the mining project have been carried out by engaging engineers/experts of Ecotech Labs Pvt. Ltd, Chennai. Ecotech Labs Pvt. Ltd (ETL), Chennai is NABET accredited consultancy organization. ETL is equipped with in-house, spacious laboratory, accredited by NABL (National Accreditation Board for Testing & Calibration Laboratories), Department of Science & Technology, Government of India and MoEF & CC.

11.2 Eco Tech Labs Pvt. Ltd – Environment Consultant

Eco Tech Labs Pvt. Ltd is a multi-disciplinary testing and research laboratory in India. Eco Tech labs provides high quality services in environmental consultancy, engineering solution, chemical and microbiological laboratory analysis of food, water and environment (Air, Water, Soil) with highest accuracy.

11.2.1 The Quality policy

- We, at Eco Tech Labs Pvt. Ltd. engaged in providing Environmental consulting services and we are committed to strengthen our capabilities in all areas of our operations in line with customer requirements & expectations, applicable legal requirements & stakeholders expectations.
- We are committed to establish and maintain Quality Management System (QMS) for continual improvement in processes and Services
- We are committed to provide customized solutions in realistic, time bound and cost effective to achieve highest degree of customer satisfaction and Environmental improvement.
- We shall establish, maintain & periodically review our documented management systems, objectives and performance in consultation with our employees and prevailing best practices.

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>Draft EIA Report</i>
Project Proponent	<i>M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking)</i>	
Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

- Effective communication of organization's policy and objectives to employees and seeking feedbacks from all our employees and concerned stakeholders for continual improvement.

11.2.2 Company Profile

Eco Tech Labs Pvt. Ltd. (formerly Eco Tech Consultants) was established in the year 2013. we offer environmental consultancy & Laboratory services for various residential, commercial & industrial development projects.

We provide high quality services in environmental consultancy, engineering solution, chemical and microbiological laboratory analysis of food, water and environment(AIR, WATER, SOIL) with highest Accuracy.

We are one of the largest Food Testing Lab in India, accredited by NABL as per ISO/IEC 17025 for chemical and biological testing of food, beverages and agricultural products. Eco Tech Labs is the partner you can trust for this critical service. With our experience, expertise and cutting-edge facilities, you can minimise the risk of microbiological contamination, protect your customers and your brand and ensure that you fully comply with all relevant food safety regulations.

We are now one of the leading solution provider in the field of environmental consultancy comprising of Impact assessment studies, laboratory services & all statutory clearances.

Our team has a decadal experience in the field of environmental technical consultancy and have successfully obtained all required statutory clearances from State Level Impact Assessment Authority(SEIAA), Pollution Control Boards in the region of South India & also from Ministry of Environment & Forest (MoEF).

ANNEXURE I
TOR AND ITS COMPLIANCE

(Kc)



Thiru. K.V. GIRIDHAR, I.F.S.,
MEMBER SECRETARY

STATE LEVEL ENVIRONMENT IMPACT
ASSESSMENT AUTHORITY – TAMIL NADU

3rd Floor, Panagal Maaligai,
No.1, Jeenis Road, Saidapet,
Chennai-15.

Phone No.044-24359973
Fax No. 044-24359975

v hpt 31/10/2020 (mines)
31/10/2020

TERMS OF REFERENCE (ToR)

Lr No.SEIAA-TN/F.No.7607/SEAC/ToR-797/2020 Dated: 21.10.2020

To

Thiru. T. Ravichandran,
Deputy General Manager & Unit Head,
M/s. Tamil Nadu Cements Corporation Limited,
Ariyalur Cement Factory,
Ariyalur Taluk,
Ariyalur District – 621 729.



Sir / Madam,

Sub: SEIAA, Tamil Nadu – Terms of Reference (ToR) for the Proposed Limekankar & Limestone Quarry Project over an extent of 22.96.0Ha at S.F.Nos. 144, 217/1A, 217/1C, 217/2, 217/3A, 217/3B, 217/4, 217/5, 217/6, 218/1, 219/1, 219/2A, 219/2B, 219/3A, 219/3B, 219/3C, 219/3D, 219/3E, 219/3F, 219/3G, 219/4A, 219/4B, 219/5A, 219/5B, 219/5C, 219/6, 219/8, 219/9, 220/1, 220/2A, 220/2B, 220/3A, 220/3B, 220/3C, 220/3D, 220/3E, 220/4, 220/5A, 220/5B, 220/6A, 220/6B, 220/7A, 220/7B, 220/8A, 220/8B, 220/9A, 220/9B, 220/9C, 220/10A, 220/10B, 220/11A, 220/11B, 221/1A and 221/15 in Pudupalayam Village, Ariyalur Taluk, Ariyalur District, Tamil Nadu by M/s. Tamil Nadu Cements Corporation Limited under project category – “B1” and Schedule S.No. 1(a) – ToR issued along with Public Hearing – preparation of EIA report – Regarding.

Ref: 1. Online proposal No.SIA/TN/MIN/53658/2020 Dated: 06.06.2020
2. Your application submitted for Terms of Reference dated: 22.06.2020

MEMBER SECRETARY
SEIAA-TN



3. Minutes of the 165th SEAC Meeting held on 22.07.2020
4. Minutes of the 174th SEAC Meeting held on 12.09.2020
5. Minutes of the 403rd SEIAA Meeting held on 13.10.2020

Kindly refer to your proposal submitted to the State Level Impact Assessment Authority for Terms of Reference.

The proponent, M/s. Tamil Nadu Cements Corporation Limited has submitted application for ToR on 22.06.2020, in Form-I, Pre- Feasibility report for the Limekankar & Limestone Quarry quarry lease over an extent of 22.96.0Ha at S.F.Nos. 144, 217/1A, 217/1C, 217/2, 217/3A, 217/3B, 217/4, 217/5, 217/6, 218/1, 219/1, 219/2A, 219/2B, 219/3A, 219/3B, 219/3C, 219/3D, 219/3E, 219/3F, 219/3G, 219/4A, 219/4B, 219/5A, 219/5B, 219/5C, 219/6, 219/8, 219/9, 220/1, 220/2A, 220/2B, 220/3A, 220/3B, 220/3C, 220/3D, 220/3E, 220/4, 220/5A, 220/5B, 220/6A, 220/6B, 220/7A, 220/7B, 220/8A, 220/8B, 220/9A, 220/9B, 220/9C, 220/10A, 220/10B, 220/11A, 220/11B, 221/1A and 221/15 in Pudupalayam Village, Ariyalur Taluk, Ariyalur District, Tamil Nadu.

Discussion by SEAC and the Remarks:-

The proposal was placed in the 174th SEAC Meeting held on 12.09.2020. Based on the presentation made and documents furnished by the project proponent, the SEAC decided to recommend the proposal for the grant of Terms of Reference (ToR) to SEIAA with Public Hearing, subject to the following specific conditions in addition to the points mentioned in the standard terms of reference for conducting environment impact assessment study for non-coal mining projects and information to be included in EIA/EMP report issued by the MoEF&CC.

1. The project proponent shall furnish the contour map of the water table detailing the number of wells located around the site and impacts on the wells due to mining activity.
2. The project proponent shall conduct the hydro-geological study through reputed Government institution to evaluate the cumulative impact of proposed mining activity along with the nearby mines on the groundwater table, agriculture activity, and water bodies such as rivers, tanks, canals, ponds etc. located nearby by the proposed mining area.
3. The project proponent shall furnish the details on number of groundwater pumping wells, open wells within the radius of 1 km along with the water levels in both monsoon and non-monsoon seasons. The project proponent would also collect the data of water table level in this area during both monsoon and non-monsoon seasons from the PWD / TWAD.




MEMBER SECRETARY
SEIAA-TN

4. The project proponent shall conduct the Cumulative impact study on the Agricultural area due to Mining, Crushers and other activities around the site area.
5. The details of surrounding well and the cumulative impact on the ground water shall be part of EIA study.
6. The Socio-economic impact assessment due to the project needs to be carried out within 10km of the buffer zone from the mines.
7. A detailed report on the green belt development already undertaken is to be furnished. They also need to submit the proposal for green belt activities for the proposed mine(s).
8. CER activities should be carried out taking into consideration the requirement of the local habitants available within the buffer zone as per Office Memorandum of MoEF & CC dated 01.05.2018.
9. A Detailed mining closure plan for the proposed project shall be submitted.
10. A detail report on the safety and health aspects of the workers and for the surrounding habitants during operation of mining for drilling and blasting shall be submitted.
11. The recommendation for the issue Terms of Reference is subject to the outcome of the Hon'ble NGT, Principal Bench, New Delhi in O.A No.186 of 2016 (M.A.No.350/2016) and O.A. No.200/2016 and O.A.No.580/2016 (M.A.No.1182/2016) and O.A.No.102/2017 and O.A.No.404/2016 (M.A.No. 758/2016, M.A.No.920/2016, M.A.No.1122/2016, M.A.No.12/2017 & M.A. No. 843/2017) and O.A.No.405/2016 and O.A.No.520 of 2016 (M.A.No. 981 /2016, M.A.No.982/2016 & M.A.No.384/2017).
12. Details of the lithology of the mining lease area shall be furnished.
13. A study shall be conducted on the number of trees (name of the species, age) present in the mining lease applied area and how, its management during mining activity.

Discussion by SEIAA and the Remarks:-

The proposal was placed before the 403rd SEIAA Meeting held on 13.10.2020. After detailed discussion the Authority decided to grant Terms of Reference with public hearing for the preparation of EIA Report with additional ToR as recommended by SEAC and subject to General conditions in addition to the following conditions:

1. Details of study on social impact, including livelihood of local people.
2. A specific study should include impact on flora & fauna, disturbance to migratory pattern of animals.




MEMBER SECRETARY
SEIAA-TN

3. Reserve funds should be earmarked for proper closure plan.
4. A detailed plan on plastic waste management shall be furnished. Further, the proponent should strictly comply with, Tamil Nadu Government Order (Ms) No.84 Environment and forests (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. In this connection, the project proponent has to furnish the action plan.
5. A detailed post-COVID health management plan for workers as per ICMR and MHA guidelines or the State Govt. guideline may be followed and report shall be furnished.

A. 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.
- 2) A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.
- 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.
- 4) All corner 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).
- 5) Information should be provided in Survey of India Topo sheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.
- 6) Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.
- 7) It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with



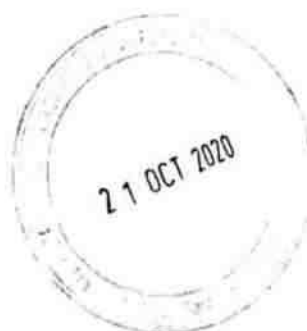
description of the prescribed operating process/procedures to bring into focus any infringement/deviation/ violation of the environmental or forest norms/ conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the EIA Report.

- 8) Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.
- 9) The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained in the EIA such as waste generation etc. should be for the life of the mine / lease period.
- 10) Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.
- 11) Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be given.
- 12) 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.
- 13) Status of forestry clearance for the broken up area and virgin forestland involved in the Project including deposition of Net Present Value (NPV) and Compensatory Afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.
- 14) Implementation status of recognition of forest rights under the Scheduled Tribes and other

Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.


- 15) The vegetation in the RF / PF areas in the study area, with necessary details, should be given.
- 16) A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly, detailed mitigative measures required, should be worked out with cost implications and submitted.
- 17) Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/ Elephant Reserves/(existing as well as proposed), if any, within 10 km of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished.
- 18) A detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan along with budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.
- 19) 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 Department should be secured and furnished to the effect that the proposed mining activities could be considered.
- 20) Similarly, for Coastal Projects, a CRZ map duly authenticated by one of the authorized agencies demarcating LTL, HTL, CRZ area, location of the mine lease with respect to 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).
- 21) R&R Plan/compensation details for the Project Affected People (PAP) should be furnished.


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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.

- 22) One season (non-monsoon) [i.e. March-May (Summer Season); October-December (post monsoon season) ; December-February (winter season)] primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.
- 23) Air quality modeling 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 modeling 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.
- 24) The water requirement for the Project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.
- 25) Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.
- 26) Description of water conservation measures proposed to be adopted in the Project should be


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- given. Details of rainwater harvesting proposed in the Project, if any, should be provided.
- 27) Impact of the Project on the water quality, both surface and groundwater, should be assessed and necessary safeguard measures, if any required, should be provided.
- 28) Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished. The Report inter-alia, shall include details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should also be obtained and copy furnished.
- 29) Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed, if any, and the impact of the same on the hydrology should be brought out.
- 30) Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and bgl. A schematic diagram may also be provided for the same.
- 31) A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.
- 32) Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered. Project Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.
- 33) Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.




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- 34) Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA report.
- 35) Occupational Health Impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.
- 36) Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.
- 37) Measures of socio economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.
- 38) 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.
- 39) Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.
- 40) Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.
- 41) The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.
- 42) A Disaster management Plan shall be prepared and included in the EIA/EMP Report.
- 43) Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.
- 44) Besides the above, the below mentioned general points are also to be followed:-
 - a) Executive Summary of the EIA/EMP Report
 - b) All documents to be properly referenced with index and continuous page numbering.
 - c) Where data are presented in the Report especially in Tables, the period in which the data


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- were collected and the sources should be indicated.
- d) Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF&CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project.
 - e) Where the documents provided are in a language other than English, an English translation should be provided.
 - f) The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.
 - g) While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issued by MoEF&CC vide O.M. No. J-11013/41/2006-LA.II(I) dated 4th August, 2009, which are available on the website of this Ministry, should be followed.
 - h) Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF&CC with reasons for such changes and permission should be sought, as the ToR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation.
 - i) As per the circular no. J-11011/618/2010-LA.II(I) dated 30.5.2012, certified report of the status of compliance of the conditions stipulated in the Environment Clearance for the existing operations of the project should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.
 - j) The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit and external dumps, if any, clearly showing the land features of the adjoining area.

In addition to the above, the following shall be furnished:-

The Executive summary of the EIA/EMP report in about 8-10 pages should be prepared incorporating the information on following points:

1. Project name and location (Village, District, State, Industrial Estate (if applicable)).
2. Process description in brief, specifically indicating the gaseous emission, liquid effluent and




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- solid and hazardous wastes.
3. Measures for mitigating the impact on the environment and mode of discharge or disposal.
 4. Capital cost of the project, estimated time of completion.
 5. The proponent shall furnish the contour map of the water table detailing the number of wells located around the site and impacts on the wells due to mining activity.
 6. A detailed study of the lithology of the mining lease area shall be furnished.
 7. Details of village map, "A" register and FMB sketch shall be furnished.
 8. Detailed mining closure plan for the proposed project approved by the Geology of Mining department shall be submitted along with EIA report.
 9. Obtain a letter /certificate from the Assistant Director of Geology and Mining standing that there is no other Minerals/resources like sand in the quarrying area within the approved depth of mining and below depth of mining and the same shall be furnished in the EIA report.
 10. EIA report should strictly follow the Environmental Impact Assessment Guidance Manual for Mining of Minerals published February 2010.
 11. Detail plan on rehabilitation and reclamation carried out for the stabilization and restoration of the mined areas.
 12. The EIA study report shall include the surrounding mining activity, if any.
 13. Modeling study for Air, Water and noise shall be carried out in this field and incremental increase in the above study shall be substantiated with mitigation measures.
 14. A study on the geological resources available shall be carried out and reported.
 15. A specific study on agriculture & livelihood shall be carried out and reported.
 16. Impact of soil erosion, soil physical chemical and biological property changes may be assumed.
 17. Site selected for the project - Nature of land - Agricultural (single/double crop), barren, Govt./ private land, status of is acquisition, nearby (in 2-3 km.) water body, population, within 10km other industries, forest , eco-sensitive zones, accessibility, (note - in case of industrial estate this information may not be necessary)
 18. Baseline environmental data - air quality, surface and ground water quality, soil characteristic, flora and fauna, socio-economic condition of the nearby population
 19. Identification of hazards in handling, processing and storage of hazardous material and safety system provided to mitigate the risk.



20. Likely impact of the project on air, water, land, flora-fauna and nearby population
21. Emergency preparedness plan in case of natural or in plant emergencies
22. Issues raised during public hearing (if applicable) and response given
23. CER plan with proposed expenditure.
24. Occupational Health Measures
25. Post project monitoring plan
26. The project proponent shall carry out detailed hydro geological study through institutions NABET Accredited agencies.
27. A detailed report on the green belt development already undertaken is to be furnished and also submit the proposal for green belt activities.
28. The proponent shall propose the suitable control measure to control the fugitive emissions during the operations of the mines.
29. A specific study should include impact on flora & fauna, disturbance to migratory pattern of animals.
30. Reserve funds should be earmarked for proper closure plan.
31. A detailed plan on plastic waste management shall be furnished. Further, the proponent should strictly comply with, Tamil Nadu Government Order (Ms) No.84 Environment and forests (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. In this connection, the project proponent has to furnish the action plan.

Besides the above, the below mentioned general points should also be followed:-

- a. A note confirming compliance of the TOR, with cross referencing of the relevant sections / pages of the EIA report should be provided.
- b. All documents may be properly referenced with index, page numbers and continuous page numbering.
- c. Where data are presented in the report especially in tables, the period in which the data were collected and the sources should be indicated.
- d. While preparing the EIA report, the instructions for the proponents and instructions for the consultants issued by MoEF & CC vide O.M. No. J-11013/41/2006-LA.II (I) dated 4th August, 2009, which are available on the website of this Ministry should also be followed.



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e. The consultants involved in the preparation of EIA/EMP report after accreditation with Quality Council of India (QCI)/National Accreditation Board of Education and Training (NABET) would need to include a certificate in this regard in the EIA/EMP reports prepared by them and data provided by other organization/Laboratories including their status of approvals etc. In this regard circular no F. No.J-11013/77/2004-IA-II(I) dated 2nd December, 2009, 18th March 2010, 28th May 2010, 28th June 2010, 31st December 2010 & 30th September 2011 posted on the Ministry's website <http://www.moef.nic.in/> may be referred.

- After preparing the EIA (as per the generic structure prescribed in Appendix-III of the EIA Notification, 2006) covering the above mentioned points, the proponent will take further necessary action for obtaining environmental clearance in accordance with the procedure prescribed under the EIA Notification, 2006.
- The final EIA report shall be submitted to the SEIAA, Tamil Nadu for obtaining Environmental Clearance
- The TORs prescribed shall be valid for a period of three years from the date of issue, for submission of the EIA/EMP report as per OMNo.J-11013/41/2006-IA-II(I)(part) dated 29th August, 2017.

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Copy to:

1. The Additional Chief Secretary to Government, Environment & Forests Department, Govt. of Tamil Nadu, Fort St. George, Chennai - 9.
2. The Chairman, Central Pollution Control Board, Parivesh Bhavan, CBD Cum-Office Complex, East Arjun Nagar, New Delhi 110032.
3. The Member Secretary, Tamil Nadu Pollution Control Board, 76, Mount Salai, Guindy, Chennai-600 032.
4. The APCCF (C), Regional Office, MoEF & CC (SZ), 34, HEPC Building, 1st & 2nd Floor, Cathedral Garden Road, Nungambakkam, Chennai -34.
5. Monitoring Cell, IA Division, Ministry of Environment, Forests & CC, Paryavaran Bhavan, CGO Complex, New Delhi 110003



6. The District Collector, Ariyalur District
7. Stock File.

Project	Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha	ToR Points
Project Proponent	M/s. Tamilnadu Cements Corporation Limited	
Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	

COMPLIANCE OF TOR CONDITIONS

Point wise compliance of TOR points issued by SEIAA,TN vide letter No. SEIAA-TN /F.No.7607/SEAC/TOR-797/2020 Dated 21.10.2020 for Mining of Limestone and Limekankar Over an Extent of 22.96.0 Ha in 144/1A, 217/1A, 217/1C, 217/2, 217/3A, 217/3B, 217/4, 217/5, 217/6, 218/1, 219/1, 219/2A, 219/2B, 219/3A, 219/3B, 219/3C, 219/3D, 219/3E, 219/3F, 219/3G, 219/4A, 219/4B, 219/5A, 219/5B, 219/5C, 219/6, 219/8, 219/9, 220/1, 220/2A, 220/2B, 220/3A, 220/3B, 220/3C, 220/3D, 220/3E, 220/4, 220/5A, 220/5B, 220/6A, 220/6B, 220/7A, 220/7B, 220/8A, 220/8B, 220/9A, 220/9B, 220/9C, 220/10A, 220/10B, 220/11A, 220/11B, 221/1A & 221/15, Pudupalayam Village, Ariyalur Taluk, Ariyalur District, Tamil Nadu

ToR Ref.	Description	Response	Page Ref. in EIA Report
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.	<p>This is a fresh mining project of Limestone and Limekankar</p> <p>The Proponent has obtained The Precise Area Communication Letter No. 3997/MMA.2/2019-1, dated 02.08.2019 issued by Government of Tamil Nadu Industries (MMA.2) Department, Secretariat. As area is being exploited for the first time hence Year-wise production details since 1994 and before 1994 are not relevant or applicable.</p> <p>Proposed Production of limestone and Limekankar for five years is proposed in the EIA/EMP in chapter no-2.</p>	Chapter-2
2.	A copy of document in support of the fact that the Proponent is the rightful lessee of the mine should be given.	The mine lease area of 22.96.0 Ha for the mining of limestone and Limekankar is approved by The Indian Bureau of Mines, Chennai Letter No.TN/ALR/LST&KNK/MP/2061.M DS dated 09.10.2019	Annexure-III
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.	<p>All the documents i.e. Mining Plan, EIA, and public hearing are compatible with each other in terms of ML area production levels, waste generation and its management and mining technology are compatible with one another.</p> <p>The mining plan of the project site has been submitted to Indian Bureau of Mines, Chennai</p>	Annexure-IV

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>ToR Points</i>
Project Proponent	<i>M/s. Tamilnadu Cements Corporation Limited</i>	
Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

4.	All corner coordinates of the mine lease area, superimposed on a High Resolution Imagery/toposheet 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).	Details of coordinates of all corner of proposed mining lease area have been incorporated in Chapter 2 of EIA/ EMP Report.	Chapter- II
5.	Information should be provided in Survey of India Topo sheet in 1:50,000 scale indicating geological map of the area, important water bodies, streams and rivers and soil characteristics	Topo map enclosed as Annexure-II	Annexure-II
6.	Details about the land proposed for mining activities should be given with information as to whether conforms to the land use policy of the state; land diversion for mining should have approval from State land use board or the concerned authority	Details about the land proposed for mining activities should be given Chapter 2.	Chapter-2
7.	It should be clearly stated whether the proponent company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/ violation of the environmental or forest norms/ conditions? The hierarchical system or administrative order of the	Noted.	

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>ToR Points</i>
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Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

	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.		
8.	Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.	It is an open cast mechanised mining project. No blasting and drilling involved. It is proposed to mine through rock breakers.	Chapter-2
9.	The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained in the EIA such as waste generation etc should be for the life of the mine / lease period.	Study area comprises of 10 km radius from the mine lease boundary is considered for land use, Soil, Ecology & Biodiversity and Socio economic study.	
10.	Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of	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 has been prepared and incorporated in Chapter-3 of EIA/ EMP Report. There is no wildlife sanctuary and national park, migratory routes of fauna in the study area.	Chapter-3

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>ToR Points</i>
Project Proponent	<i>M/s. Tamilnadu Cements Corporation Limited</i>	
Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

	change of land use should be given.	.	
11.	Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be given.	The top soil & over burden was removed already during the earlier quarrying operations and further removal of over burden does not arises.	Chapter-2
12.	A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.	The proposed mining lease area is not falling under forest land.	
13.	Status of forestry clearance for the broken up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.	The proposed mining lease area is not falling under forest land.	

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>ToR Points</i>
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Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

14.	Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.	Not Applicable. There is no involvement of forest land in the project area.	
15.	The vegetation in the RF / PF areas in the study area, with necessary details, should be given.	Details of flora have been discussed in Chapter-3 of the EIA/EMP Report.	Chapter-3
16.	A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly detailed mitigative measures required, should be worked out with cost implications and submitted.	There is no Wildlife Sanctuary, within 10 km radius of the mining lease area.	
17.	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 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	There is no National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Tiger/Elephant Reserves/Critically Polluted areas within 10 km radius of the mining lease area. Only Karaivetti Bird Sanctuary is found at a distance of 15.53km (SW) from the mine lease area.	
18.	A detailed biological study of the	Details biological study (flora & fauna) within 10 km radius of the project site have	Chapter 3

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>ToR Points</i>
Project Proponent	<i>M/s. Tamilnadu Cements Corporation Limited</i>	
Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

	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.	been incorporated in Chapter-3 of EIA/ EMP Report. All care will be taken for protection of flora & fauna, if any in the lease hold area.	
19.	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.	The proposed mining lease area is not falling under forest land.	
20.	Similarly, for coastal projects, A CRZ map duly authenticated by one of the authorized	There is no Coastal Zone within 15km radius of the project site.	

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>ToR Points</i>
Project Proponent	<i>M/s. Tamilnadu Cements Corporation Limited</i>	
Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

	agencies 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)		
21.	<p>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</p> <p>Village including their R&R and socio-economic aspects should be discussed in the report.</p>	There is no Rehabilitation and resettlement involved. Land is classified as Patta land.	

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>ToR Points</i>
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Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

22.	<p>One season (non-monsoon) and (Summer Season), (Post monsoon) primary baseline data on ambient air quality 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.</p> <p>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.</p>	<p>Baseline data collected during Pre-Monsoon Season (July – September 2020) has been incorporated in EIA/EMP report.</p> <p>Site Specific metrological data has been collected and incorporated in EIA/EMP report.</p> <p>The key plan of monitoring station has been discussed in Chapter-3. Locations of the monitoring stations have been selected keeping in view the pre-dominant downwind direction and location of the sensitive receptors and also that they represent whole of the study area.</p>	Chapter 3
23.	<p>Air quality modeling 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.</p> <p>The details of the model used and input parameters used for modeling should be provided.</p>	<p>Air quality modeling & Impact of Air quality has been incorporated in Chapter-4 of EIA/EMP report.</p> <p>Transportation of mineral during operation of mines will be done by road & NH 227 through dumpers and the impact of movement of vehicles are incorporated in EIA/EMP report.</p>	Chapter-4

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	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 predominant wind direction may also be indicated on the map.	Air modeling result furnished in chapter-4	
24.	The water requirement for the Project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.	Total water requirement: 22.65 KLD Dust Suppression: 11.00LD Domestic Purpose: 0.65 KLD Plantation :0.5 KLD Greenbelt : 11.0KLD Water will be supplied from existing mine of TANCEM which is covered in Mining Lease G.O. No. 344 and from nearby vendors	Chapter-2
25.	Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.	Not Applicable Water will be supplied from existing mine of TANCEM which is covered in Mining Lease G.O. No. 344	Chapter-2
26.	Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.	At the last stage of mining operation, almost complete area will be worked to restore the land to its optimum reclamation for future use as water reservoir.	Chapter 4
27.	Impact of the project on the water quality, both surface and groundwater should be assessed and necessary safeguard measures, if any required, should be provided.	Impact of the project on the water quality & its mitigation measures has been incorporated in Chapter-4 of EIA/EMP report.	Chapter 4
28.	Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this	Maximum working depth: 17.75 m BGL The water table is below 55m to 60m from ground level which is observed from the nearby bore wells and the data obtained from the existing government and private	Annexure 7

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	<p>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.</p>	<p>boreholes.</p> <p>So mine working will not be intersecting the ground water table.</p> <p>Hydrogeological study report attached as Annexure VII.</p>	
29.	<p>Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed, if any, and the impact of the same on the hydrology should be brought out.</p>	<p>There is no stream passing through the lease area.</p>	
30.	<p>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.</p>	<p>Highest elevation: 55 AMSL Depth: 35m Below Ground Water Level</p>	Chapter-2
31.	<p>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</p>	<p>Green Belt Development plan will be provided along the periphery of the project site in the safety distance.</p>	

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	the species to be planted. 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 pollution		
32.	Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling	Impact on local transport infrastructure due to the project has been assessed. There shall not be much impact on local transport. Traffic density from the proposed mining activity has been incorporated in EIA/EMP report.	Chapter-4
33.	Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA report.	Adequate infrastructure & other facilities will be provided to the mine workers. Details are given in chapter-2 of EIA/EMP	Chapter-2
34.	Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA report.	Conceptual post mining land use and Reclamation and restoration sectional plates are given in Mining Plan followed by Scheme of mining.	Mining plates Annexure-IV
35.	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre- placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project in the mining area may be detailed	Suitable measure will be adopted to minimize occupational health impacts of the project. The project shall have positive impact on local environment. Details are given in chapter-7 of EIA/EMP.	Chapter-7

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36.	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.	Suitable measure will be adopted to minimize occupational health impacts of the project.	Chapter-7
37.	Measures of socio economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.	CSR Activity details are incorporated in Chapter 2 of the draft EIA report	Chapter 2
38.	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.	Environment Management Plan has been described in detail in Chapter-9 of the EIA/EMP Report.	Chapter-9
39.	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.	The Public hearing / Consultation is yet to be conducted.	
40.	Details of litigation pending against the project, if any, with direction /order passed by any	Not applicable No. litigation is pending against the project in any court.	

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	Court of Law against the project should be given.				
41.	The cost of the project (capital cost and recurring cost) as well as the cost towards implementation of EMP should clearly be spelt out.	S.No.	Description	Cost	Chapter-8
		1	Land Cost	1,53,83,200	
		2	Operational cost	50,37,03,552	
		3	EMP Cost	19,00,000	
			Total	52,13,78,739	
42.	Disaster Management Plan	Disaster Management and Risk Assessment has been incorporated in Chapter-7			Chapter-7
43.	Benefits of the project if the project is implemented should be spelt out. The benefits of the project shall clearly indicate environmental, social economic ,employment potential etc.	Benefits of the project has incorporated			Chapter-8
44	Besides the above, the below mentioned general points are also to be followed:				
(a)	Executive Summary of the EIA/EMP report	Executive Summary of EIA Report is given along with the EIA report			
(b)	All documents to be properly referenced with index and continuous page numbering.	Complied			
(c)	Where data are presented in the report especially in tables, the period in which the data were collected and the sources should be indicated.	Complied			
(e)	Where the documents provided are in a language other than English, an English translation should be provided.	Complied			
(f)	The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.	The complete questionnaire has be prepared			

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(g)	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 also be followed.	The EIA report has been prepared and complying with the circular issued by MoEF vide O.M. No. J-11013/41/2006-IA.II(I) dated 4th August, 2009.	
(h)	Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF 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	There are no changes in prepared EIA as per submitted Form-1 & PFR	
	As per the circular no. J- 11011/618/2010-IA.II(I) dated 30.5.2012, report on 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.	Will be complied after grant environment clearance form SEIAA, Tamilnadu	
	The EIA report should also include (i) surface plan of the area indicating contours of main topographic features,	All Sectional Plates of Quarry is enclosed in Mining Plan. -Annexure-IV	

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	drainage and mining area, (ii) geological maps and sections (iii) sections of mine pit and external dumps, if any clearly showing the features of the adjoining area.		
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Additional ToR Compliance

- 1. The project proponent shall furnish the contour map of the water table detailing the number of wells located around the site and impacts on the wells due to mining activity**

The contour map of the water table detailing the number of wells located around the site will be submitted in the final EIA report.

- 2. The project proponent shall conduct Hydrogeological study through reputed Government institution to evaluate the cumulative impact of proposed mining activity along with the nearby mines on the ground water table, agricultural activity, and water bodies such as rivers, tanks, canals, ponds located nearby the proposed mining area.**

Hydrogeological study to evaluate the cumulative impact of proposed mining activity along with the nearby mines on the ground water table, agricultural activity, and water bodies such as rivers, tanks, canals, ponds located nearby the proposed mining area and the hydrogeological study report has been attached as an Annexure 7.

- 3. The project proponent shall furnish the details on number of groundwater pumping wells, open wells within the radius of 1km along with the water levels in both monsoon and non-monsoon seasons. The project proponent would also collect the data of water table level in this area during both monsoon and non-monsoon seasons from the PWD/TWAD.**

The details on number of groundwater pumping wells, open wells within the radius of 1km along with the water levels in both monsoon and non-monsoon seasons will be submitted in the final EIA Report.

- 4. The Project proponent shall conduct the cumulative impact study on the Agriculture area due to mining, crushers, and other activities around the site area.**

The proposed mine lease area is own patta land of TANCEM and no agricultural activity is practiced in the lease area. But agricultural lands are found near the project site. Fencing will be provided around the project site. The major pollutant arising from the mining activity is the Fugitive Dust and particulate Matter emission and post mining, the impact will arise due to the transportation of the mined out mineral to Ariyalur Cement Factory which will be through NH 227. The mined out minerals will reach NH 227 through the mud road (2km Stretch), which is completely unpaved. Hence the emission will be more and to combat the dust, water sprinkling will be done in the mining area and adjacent mud road at regular intervals. In addition to that, avenue plantation by choosing the carbon sequestration native tree species that are tolerant to dust will be planted on either side of the mud road. Tippers for carrying out the mined out mineral will be completely covered to avoid the spillage and dust emission during transit.

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5. The details of surrounding well and the cumulative impact on the ground water shall be part of EIA study.

The maximum mining depth for the four leases is 17.75m from the GL and the water table is found to be 55m BGL. Hence the proposed mining activity will not affect the ground water table. The Hydrogeological study report has been attached as Annexure-7.

6. The socio economic assessment due to the project needs to be carried out within 10km of the buffer zones from the mines.

The demography survey study is done within 10km from the project site. The population, Household, Sex ratio, Literacy rate, SC, ST details for all the villages in the study area is listed below:

Demographic study around 10km from the project site

List of Villages	HouseHold	Population	Male	Female	Literacy Rate	SC	ST	Total worker
Kadugur	866	3217	1627	1627	1893	493	1	1977
Ayanathur	654	2445	1263	1182	1484	362	0	1264
Kilimangalam	818	2926	1481	1445	1777	640	0	1451
Kavanur	841	3242	1634	1608	1790	594	11	1808
Periyanaalalur	1041	3538	1762	1776	1975	692	0	1805
Thealur	1094	4215	2136	2079	2407	794	4	2077
Reddipalayam	1125	4126	2095	2031	2457	516	5	1946
Pudupalayam	922	3535	1750	1785	2009	1072	3	1691
Edayathangudi	604	2191	1135	1056	1261	109	81	1321
Karuppur	1239	4773	2385	2388	2680	1031	120	2716
Periyathirukkonam	718	2708	1320	1388	1639	593	0	1565
Alanduraiyarkattalai	544	2106	1090	1016	1685	427	0	967
Amenabath	170	654	315	339	349	122	0	243
Siruvallur	594	2155	1043	1112	1261	453	0	1125
Govindapuram	1242	4996	2502	2494	3260	1347	0	2399

Source: Census of India, 2011

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Since the data is taken from Census Survey of India, 2011, population projection is found to increase by 8.5% since last survey based on the data released by ***World Bank, United States Census Bureau.***

Occupation: Ariyalur is a marketing and service town for the surrounding areas. Big industrial houses like Birlas (UltraTech Cement), India Cements, Dalmia Cement, Madras Cement have their cement units here. Tamil Nadu government's TANCEM factory is in Ariyalur and is the first factory to establish the cement production in ariyalur.

Sugar cane is grown as a major commercial crop. One private sugar factory near Keelapalur is functioning in the district with a capacity of crushing 3,000 Tonnes per day. One of the main crops in Ariyalur district is cashew. The pre-dominate soil in the district is red sanding with scattered Packers of black soil. This town consists mainly of glade soil. The soil in the district is best suited for raising dry crops. Rice also grown in some places.

Industrial details in the district is listed below:

Small Scale Industries: 383

Factories : 40

The major occupation during field survey is observed to be mining and Agriculture. The same activity is observed till Ariyalur which is located at 8km distance from the project site in Northwestern direction.

Source: District Handbook – 2018-2019

Socio-economic survey methodology

Purposive sampling methods were used for selecting respondents (male and female) for household survey. For official information of village, Gram Panchyat member has been chosen. Structured questionnaire was used for survey. For group discussion, Panchyat bhavan, Aanganwadi bhavan, community halls were used. Out of total 15 villages, 5 villages (25%) were surveyed for which selection criteria is based on proximity to the project site and area with dense and scarce populations were chosen.

The villages chosen for primary study area

- Reddipalayam
- Pudupalayam
- Periyathirukkonam
- Siruvalur
- Edayathangudi

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10 households were surveyed in each village and the collective response are summarized below

Salient features in the study area:

House pattern: It is notable that nearly 60% of the houses were kachcha at survey area.

Employment: Main occupation of the people in the study area was labour work and agriculture and some other business. The labours were getting daily wage in the range of Rs.200-450, depending on type of work involved.

Fuel: Most of the villagers use fire woods and LPG for cooking purpose

Main Crops: The principal crops grown in agricultural farm were Cashew, Mango, Banana, Tapioca, Tomato, Brinjal, Bhendi, Onion, Turmeric, Chillies

Migration: During survey, it was found that local population were migrating for employment purpose. Since due to the presence of various industrial units, migration from other places were also noted.

Sanitation: More than 70% of the households were having toilet facilities in their houses. Drainage system was maintained in the study area.

Drinking Water Facilities: Ground water is the major source of drinking water in the villages wherein hand pumps, tap water and dug wells are installed.

Education Facilities: Most of the villages had education facilities in the form of Anganwadi and Primary Schools. Higher education facilities were available in the range of 5-10 km. Colleges and other diploma courses were available at district place.

Transportation Facility: For transportation purpose Auto, Public and Private Bus services were available. Transportation facilities were frequently available in the study area and connecting major cities. Private vehicles like Bicycles & Motor Cycles were mostly used by villagers for transportation purpose

Key Socio economic Indicator

The consolidated report of the primary study revealing the exact scenario prevailing in the area based on the survey conducted in the 10 houses each in 5 villages (Total of 50 Houses) is listed below

S. No	Indicator	Percentage/Nos.
1	People below age 18	38
2	People age limit above 18	62
3	Literates	52
4	Illiterates	48

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5	% of people employed in company	26
6	% of people self employed	37
7	% of people seasonally employed	14
8	% of people unemployed	23
9	% of houses covered with LPG Cooking gas	80
10	% of houses covered with toilet facility	70
11	% of houses covered with piped water supply	60

Awareness and Opinion about the project

- The respondents all the villages are aware about this project.
- Since most of the respondents were about the project, some of the people welcomed this project for the employment opportunity but they need commitment that, only local people should be hired for the work. Some fear that water level in the region will decrease due to mine and associated activities.
- The skill based employment should be given to the local people.
- Road accident may increase due to Mine transport and associated activities.

Expectation from the project

- Local employment
- Plantation at nearby areas and ensure their survival rate.
- Increase educational facility in Govt. School and promote vocational & higher educational institute.

Other Infrastructural Facilities Available in the District

(Source: District Handbook – 2018-2019)

Drinking Water facility: The project falls under Ariyalur Block

Source of water in Ariyalur Block: Dug well, Filter point & Tube well

Dug Wells: In Ariyalur Block, the total number of dug wells is 858

Tube wells: 819 Tube wells are available

River: The River flowing through the Ariyalur District is Kollidam River

The communication details of the district is furnished below

Telephone:

- No. of Telephones in use : 31070

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- No.of Telephones Exchanges : 64
 - No.of Public calls with STD /ISD : 351
- Post Office:** 281 POs are there in the Ariyalur District

Transport Facility of the District:

Railway Stations: 11

Registered Motor Vehicles

Commercial – 739 Nos.

Non-Commercial – 11234 Nos.

Banking Sector: 353 Cooperative Societies & Banks are available in the District.

7. A detailed report on the greenbelt development already undertaken is to be furnished. They also need to submit the proposal for greenbelt activities for the proposed mines.

It is a fresh quarry. 11.44 Ha is allotted for greenbelt development. Greenbelt development plan is enclosed as Annexure.

The development of greenbelt will be done in the peripheral buffer zone of the mine area. Green belt has been recommended as one of the major component of environmental Management plan, which will improve ecology, environment and quality of the surrounding area. Local trees like, Neem, Pungan etc will be planted along the safety distance with interval 5m. The rate of survival expected to be 80% in this area.

Year	Name of species	Place of planted	Spacing	Survival
I	Neem/Pungam	East	5m	80%
II	Arasu/Naval	South	5m	80%
III	Poovarasu/Pungam	North	5m	80%
IV	Naval/Pungam	South	5m	80%
V	Neem/Pungam	West	5m	80%

8. CER activities should be carried out taking in to consideration the requirement of the local habitants available within the buffer zone as per Office Memorandum of MoEF & CC dated 01.05.2018.

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As a part of CER, 2% of the project cost i.e., Rs. 65,58,687 will be allocated and the CER Proposal is enclosed Annexure-X.

9. A detailed mine closure plan for the proposed project shall be furnished.

Mine Closure Plan approved by The Indian Bureau of Mines, Chennai is attached as Annexure XI.

10. A detailed report on the safety and health aspects of the workers and for the surrounding habitants during operation of mining for drilling and blasting shall be submitted.

- ❖ All the labors will be checked and screened for health before employing them. After employing them, periodical medical checkups will be held once in every six months.
- ❖ Proper PPE kit (Safety jacket, Helmet, Safety Shoes, Gloves) etc. will be provided to every employee in the mine lease concerning the safety of each labor
- ❖ Alarm system in the form of Siren will be engaged in the project site to caution the blasting activity. In addition to that, the blasting activity will be scheduled at particular time – 4.30 P.M to 5.30 P.M (or whenever required) so that the employees will be aware of the activity.
- ❖ Smoking will be banned in the site and sign boards will be displayed in various places at site. Details are given in chapter-7.

11. The recommendation for the issue of Terms of Reference is subject to the of 2016 (M.A.No.350/2016) and O.A. No. 200/2016 and O. A. No. 580/2016 (M.A. No.1182/2016) and O.A.No.520 of 2016 (M.A.No.981/2016, M.A.No.982/2016 & M.A.No.384/2017).

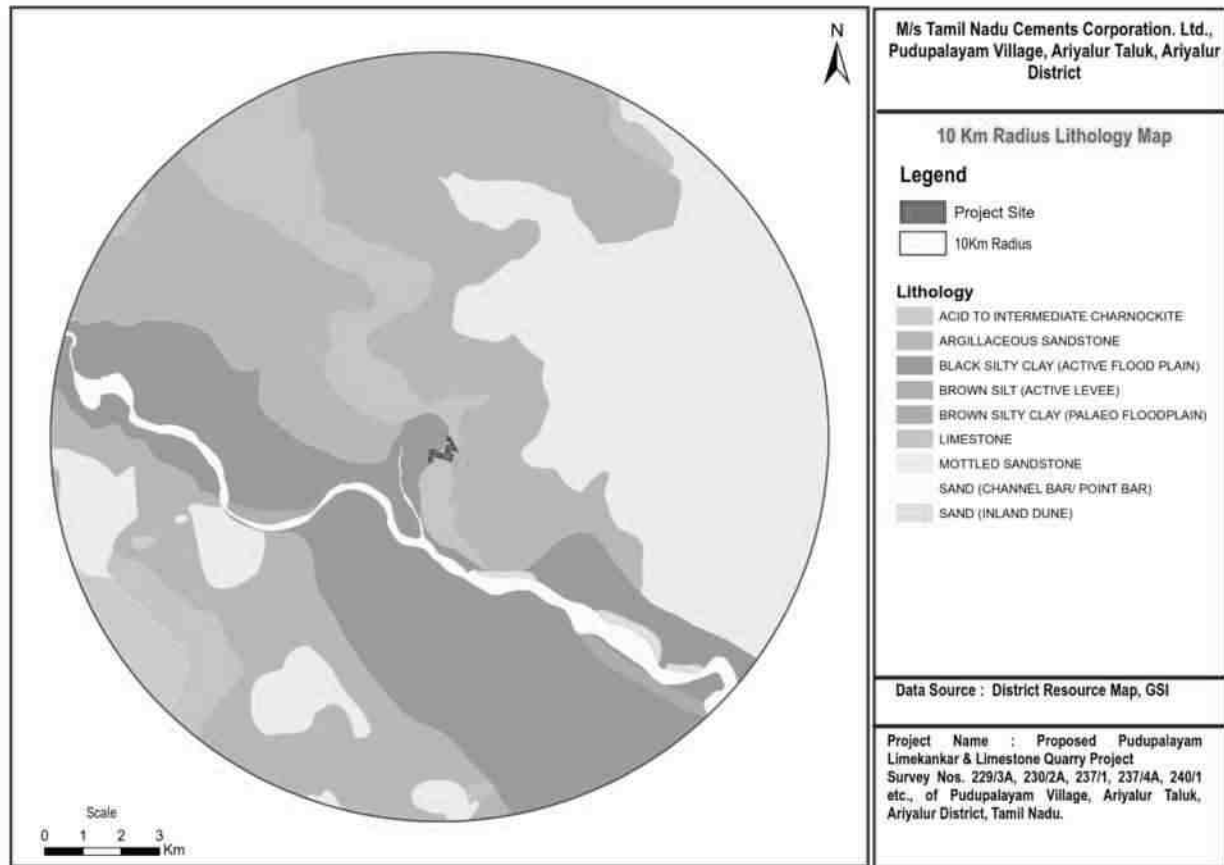
Noted and will be complied.

12. Details of the lithology of the mining lease area shall be furnished.

Ariyalur district has an undulating topography, characterized by low mounds and broad valleys. Hill ranges belonging to Pachaimalai Hills occupy the northwestern part of the district, where the terrain is rugged. The ground elevation ranges from 100 to 1015 m amsl. The region slop is towards east. Denudational, structural and fluvial processes mainly control the geomorphic evolution of the area. Mainly the varying resistance of geological formations to those processes has governed the evolution of various landforms. Various land forms occurring in the area such as structural hills, erosional plains, residual hills rolling uplands

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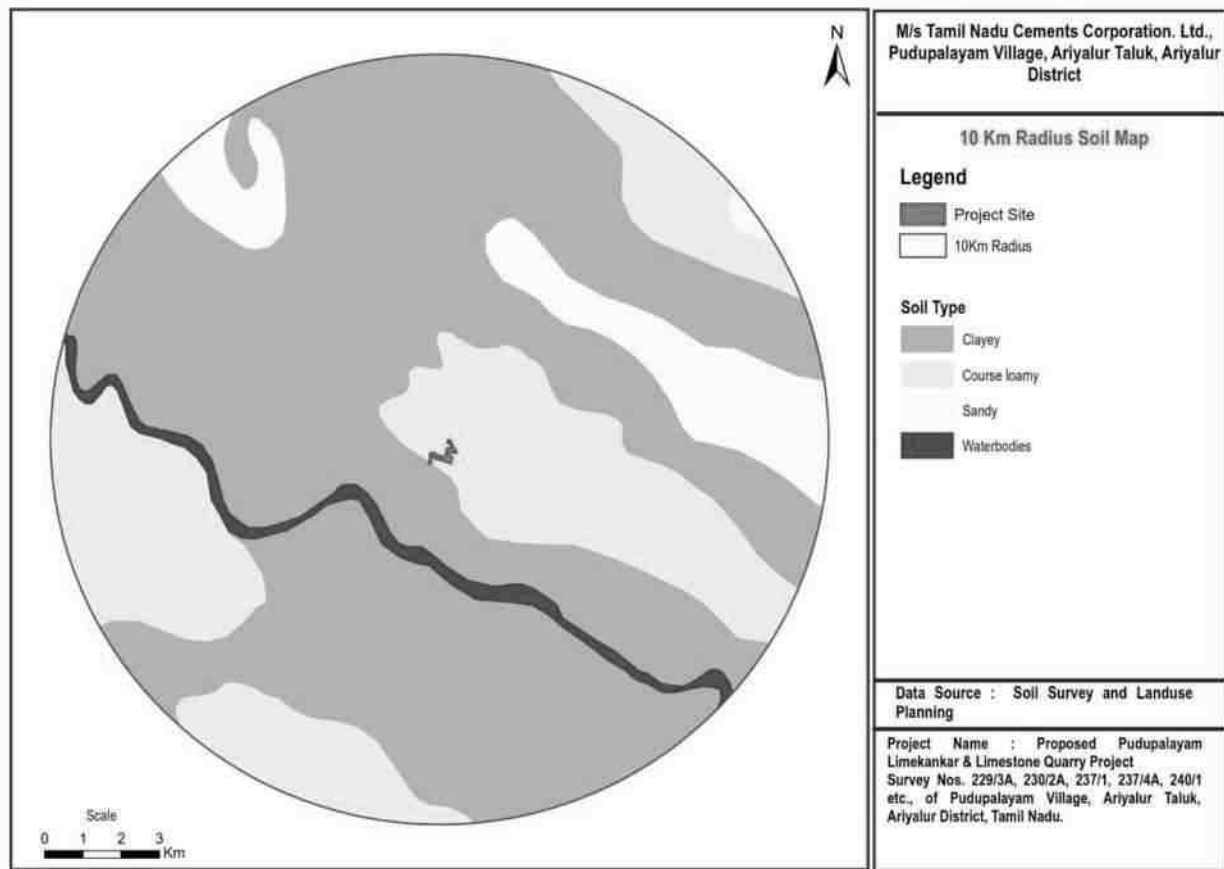
and pediments of different facies belonging to the denudational and structural land forms. Fluvial landforms caused by the activity of Cauvery, Marudayar and Vellar river systems, include younger flood plains, older flood plains and buried pediments.



Lithology around the 10km radius reveals that lease area is rich in limestone. Mine lease area is surrounded by Black silt clay. Silt is a granular material of a size between sand and clay soil. They are normally quite fertile and supports a wide range of plants. It does not have water holding capacity and it should be combined with other soils to be benefit in the farm. Argillaceous minerals are minerals containing substantial amounts of clay-like components. Argillaceous components are fine-grained (less than 2 μm) aluminosilicates, and more particularly clay minerals such as kaolinite, montmorillonite-smectite, illite, and chlorite.

Soil types of the area are more important since it is the main criteria for greenbelt developemnt and in the recharge of ground water. Ariyalur district has distribution of 30% blacksoil, 70% alluvial soil.

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Project Proponent	M/s. Tamilnadu Cements Corporation Limited	
Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	



Coarse loamy soil is present in the lease area. Loam soils generally contain more nutrients, moisture, and humus than sandy soils, have better drainage and infiltration of water and air than silt and clay-rich soils, and are easier to till than clay soils. Loam soils are best for plant growth because sand, silt, and clay together provide desirable characteristics.

The Limekankar & Limestone deposit in this area is dipping vertical and the average depth of the workings in the pit at the five year will be 17.75 meters with an average of 2.0m Topsoil and 0.75m Limekankar. The mined out pit is proposed to be used as small reservoir for storing much needed rainwater at the end of the life of the mine when the mine reaches its ultimate pit limit.

11.44 ha of lease area will be developed as a greenbelt during mining. Loamy soil enhances the growth of the plants during the mine period.

13. A study shall be conducted on the number of trees (name of the species, age) present in the mining lease applied area and how they will be managed during mining activity.

Project	Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha	ToR Points
Project Proponent	M/s. Tamilnadu Cements Corporation Limited	
Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	

The mines within 500m radius from the project site is listed below

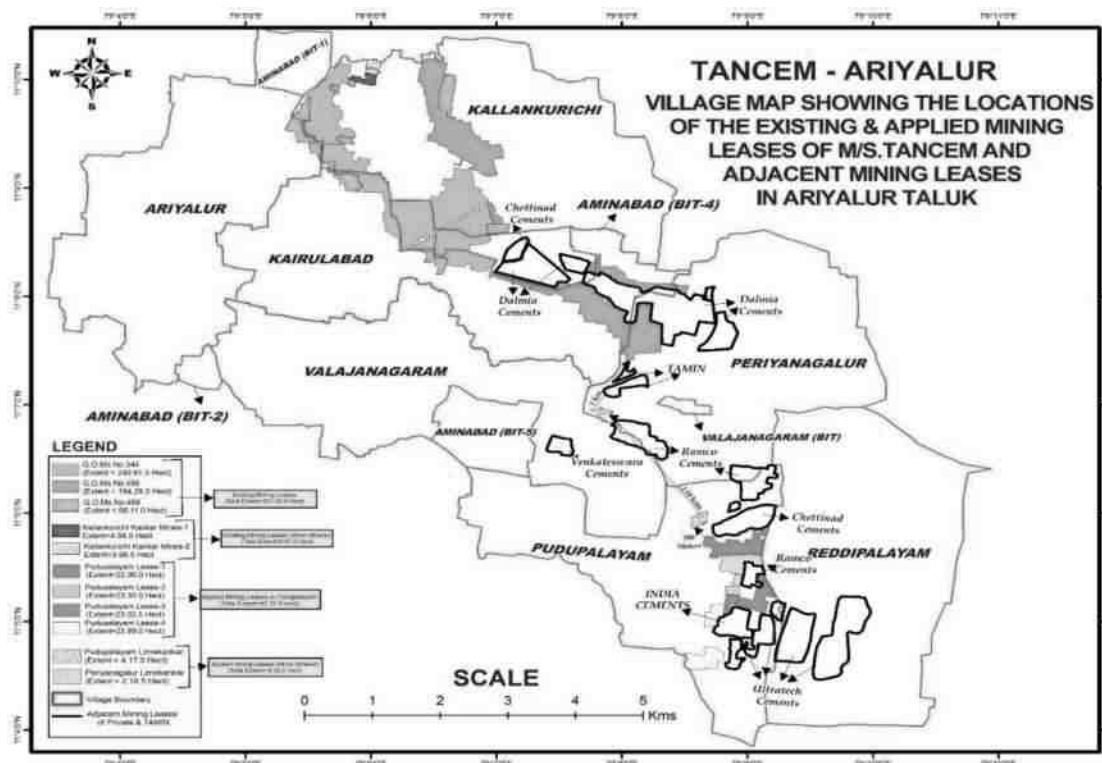
Existing Quarry

S. No.	Name of the applicant	Village & Taluk	S. F. No.	Extent (Ha)	Lease Period
1.	Tvl. Ramco Cements Ltd	Ariyalur & Pudupalayam	226/7	4.83.0	16.06.1995 to 15.06.2015 Deemed to be extended upto 15.06.2035
2	Tvl. India Cements Pvt Ltd	Ariyalur & Pudupalayam	265, 266 etc	29.29.5	09.02.1989 to 08.02.2009 Deemed to be extended upto 08.02.2039
3	M/s. Ultratech Cements	Ariyalur & Reddipalayam	337/1, 337/2 etc.,	43.40.0	25.04.2006 to 24.04.2036 Deemed to be extended upto 24.04.2056
4	M/s. Ultratech Cements	Ariyalur, Pudupalayam & Reddipalayam	242, 243/1A, 243/1B etc	32.64.5	03.03.2006 To 02.03.2026 Deemed to be extended upto 02.03.2056
5	M/s. Ultratech Cements	Ariyalur & Pudupalayam	264,268	50.45.5	06.01.1987 To 05.01.2007 Deemed to be extended upto 05.01.2037

Proposed Quarry

S. No.	Name of the applicant	Village & Taluk	S. F. No.	Extent	Lease Period
1	Tvl.TANCEM	Ariyalur & Pudupalayam	144/1A,217/1A, 1B etc	22.96.0	50 Years
2	Tvl.TANCEM	Ariyalur & Pudupalayam	229/3A,230 etc	23.02.5	50 Years
3	Tvl.TANCEM	Ariyalur & Pudupalayam	350,351 etc	22.89.0	50 Years
4	Tvl.TANCEM	Ariyalur & Pudupalayam	221/1, 2A etc	23.35.0	50 Years

Project	Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha	ToR Points
Project Proponent	M/s. Tamilnadu Cements Corporation Limited	
Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	



As the mine lease area is rich in major mineral limestone and limekankar, it is surrounded by other Government and private mines. There are no agricultural activities nearby the site. Only shrubs, thorny bushes and few trees were present. The list of tree species within 500m radius is given below.

S. No	Name	Age (in Approximation)	Dimension (width x height)
1	Coconut tree	8	0.3m*10m
2	Banyan Tree	10	5 m*15m
3	Palm Tree	12	1m*25m
4	Neem Tree	15	0.8 m*15m
5	Golden shower	9	1.2 m*12m
6	Indian almond	10	1m*5m

14. Details of study on social impact, including livelihood of local people.

Detailed study on socio impact of local people is discussed on Additional ToR point No.6.

15. A specific study should include impact on flora, fauna, disturbance to migratory pattern of animals.

A detailed study of Ecology and Biodiversity of Flora, Fauna is discussed in Chapter 3 from Page number 82-107.

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>ToR Points</i>
Project Proponent	<i>M/s. Tamilnadu Cements Corporation Limited</i>	
Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

16. Reserve funds should be earmarked for proper closure plan.

Funds will be provided for proper closure plan as per the Mining plan approved by IBM, Chennai.

17. A detailed plan on plastic waste management shall be furnished. Further, the proponent should strictly comply with, Tamil Nadu Government Order (Ms) No.84 Environmental and Forest (EC.2) Department dated 25.06.2018 regarding ban on one time use and throwaway plastics irrespective of thickness with effect from 01.01.2019 under Environmental (Protection) Act, 1986. The project proponent has to furnish the action plan.

Noted and will be complied.

18. A detailed post COVID Health Management plan for workers as per ICMR and MHA Guidelines or the State Govt. guidelines may be followed, and the report shall be furnished.

Site Entry

1. Screening will be in Place for all entrants
2. The Temperature Check will be in Place for all entrants with usage of approved Digital thermometer
3. All the entrants will be provided with required COVID-19 PPE (Gloves, Masks, Eye Protection)
4. Toolbox/Safety Instructions/ Awareness will be briefed on daily basis.

Workplace

1. Social distancing will be maintained and ensured at workplace minimum of six feet will be maintained
2. Awareness Signages will be provided at workplace.
3. Re-Usable materials/ tools, tackles will be disinfected frequently.
4. frequently touched surfaces in the workplace, such as workstations, countertops, and door handles will be cleaned frequently
5. Disposable wipes will be provided to workers so that commonly used surfaces (for example, doorknobs, keyboards, remote controls, desks) can be wiped down by workers.

Material/ Stores:

1. Materials entering the site will be kept idle, for the stipulated period

Project	<i>Pudupalayam Limekankar & Limestone Quarry – 22.96.0 Ha</i>	<i>ToR Points</i>
Project Proponent	<i>M/s. Tamilnadu Cements Corporation Limited</i>	
Project Location	<i>Pudupalayam Village, Ariyalur Taluk, Ariyalur District</i>	

2. All vehicles & machinery entering the premise will be disinfected

Mess:

1. Cooks are provided with PPEs and required awareness
2. Groceries purchased will be taken care of disinfection
3. social distancing will be maintained at dining area
4. dishes, utensils will be properly cleaned

Toilets:

1. Toilets will be cleaned for every 4 hours
2. full PPEs will be provided for the Janitors
3. Alcohol-based disinfectant will be utilized

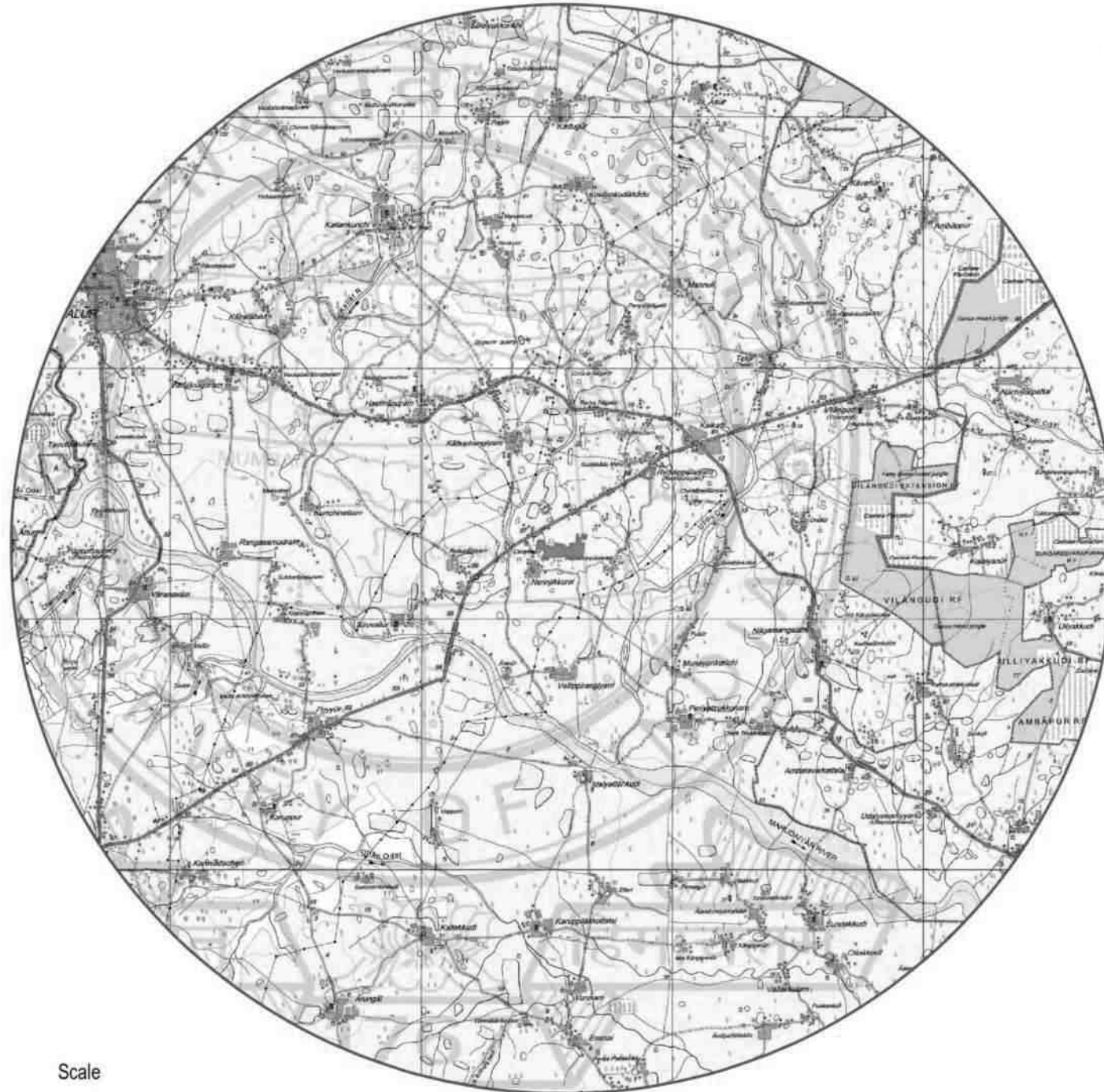
Quarantine facility

1. If any of the labour or working personnel is screened with fever, cold or any other symptoms of covid 19, will be first separated from the other worker communities and testing arrangement will be done, until the results comes the particular person will be separated and will be kept in quarantine room provided in the site
2. Once the results is negative he will be treated for normal fever and allowed to work after 7 days, in case of positive he will send to COVID 19 treatment with intimation to the local body officials

Restriction of new work force from Hotspot location identified by the State and central government.

1. New set of construction labourers from identified hotspot location will be restricted
2. Transportation of labour will be mostly restricted and maximum work force will be instructed to stay inside to prevent the external contamination.

ANNEXURE II
TOPO MAP ' 10KM RADIUS



**M/s Tamilnadu Cements Corporation Ltd.
Ariyalur Cements Factory, Ariyalur District,
Tamil Nadu.**

10 Km Radius Topographic Map

Legend

10Km Radius

Project Site

Toposheet Nos: 58M/5
and 58N/1

Express highway; with toll; with bridge; with distance stone	
Roads, metalled; according to importance	
Roads, double cartway; according to importance	
Unmetalled road, Cart-track, Pack-track with pass, Foot-path	
Stream; with track in bed; unlined, Canal	
Dam; masonry or rock-filled, earthwork, Weir	
River; dry with water channel; with island & rocks, Tidal river	
Submerged rocks, Shoal, Swamp, Floods	
Wells: lined; unlined, Tube-well, Spring, Tanks: perennial; dry	
Embankments: road or rail; line, Broken ground	
Railways, broad gauge; double; single with station; under constn	
Railways, other gauge; double; single with distance stone; do.	
Mineral line or tramway, Kin, 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, Chattri, Church, Mosque, Dargah, Tomb, Graves	
Lighthouse, Lightship, Buoys: lighted; unlighted, Anchorage	
Mine: Vine on hills, Grass, Scrub	
Palm; palmyra; other, Plantain, Canebrake, Bamboo, Other trees	
Areas: cultivated; wooded, Surveyed tree	
Boundary, International	
state: demarcated; undemarcated	
Boundary pillars: surveyed; unlocated	
Heights, triangulation: station; point; approximate	
Benchmark: geodetic; tertiary, canal	
Post office, Telegraph office, Overhead tank	
Rest house or inspection bungalow, Circuit house, Police station	
Camping ground, Forest: reserved; protected	
Spaced names: administrative; locality or tribal	
Hospital, Dispensary, Veterinary, Hospital / Dispensary	
Aerodrome, Helipad, Tourist site	
Power line: with pylons surveyed; with poles unsurveyed	

Data Source : Survey of India Toposheets

Project Name: Pudupalayam Limekankar & Limestone Quarry total extent of 22.96.0 Ha

S.F NOS: 144, 217/1A, 217/1C, 217/2, 217/3A, 217/3B, 217/4, 217/5, 217/6, 218/1, 219/1, 219/2A, 219/2B, 219/3A, 219/3B, 219/3C, 219/3D, 219/3E, 219/3F, 219/3G, 219/4A, 219/4B, 219/5A, 219/5B, 219/5C, 219/6, 219/8, 219/9, 220/1, 220/2A, 220/2B, 220/3A, 220/3B, 220/3C, 220/3D, 220/3E, 220/4, 220/5A, 220/5B, 220/6A, 220/6B, 220/7A, 220/7B, 220/8A, 220/8B, 220/9A, 220/9B, 220/9C, 220/10A, 220/10B, 220/11A, 220/11B, 221/1A & 221/15 in Pudupalayam Village, Ariyalur Taluk & District, Tamil Nadu

Scale

0 1 2 3 Km

ANNEXURE III
MINING PLAN APPROVAL LETTER

(A) a

SPEED POST

GOVERNMENT OF INDIA
MINISTRY OF MINES
INDIAN BUREAU OF MINES
OFFICE OF THE REGIONAL CONTROLLER OF MINES

Telephone no.: 24914461/1570
Telefax no. 044-24911295
Email ID: ro.chennai@ibm.gov.in/rcomchennai@yahoo.co.in

C-4-A Rajaji Bhavan
CGO complex, Besant Nagar
Chennai - 600 090.

No. TN/ALR//LST&KNK/MP/2061.MDS

Dated : 09/10/2019

✓ To :
M/s. Tamilnadu Cements Corporation Ltd.
(A Government of Tamilnadu Undertaking)
Ariyalur Cement Factory
Ariyalur District.

Sub. : Approval of Mining Plan (including Progressive Mine Closure Plan) for Pudupalayam Lime Kankar & Limestone deposit over 22.96.0 Ha. in S.F. Nos. 144, 217/IA, IC, 2, etc., in Pudupalayam Village, Ariyalur Taluk, Ariyalur District, Tamilnadu submitted under rule 13 of MCR, 2016.

Ref. : Your letter no. TANCEM/CO/MINES/ACW/BG/PDPM-I/2019 dated 30.09.2019.

Sir,

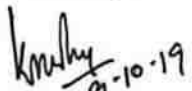
In exercise of the powers delegated to me under Rule 16 of Minerals (Other than Atomic & Hydro Carbon Energy Minerals) Concession Rules, 2016 vide Gazette Notification No. S.O. 1857(E) dated 18.5.2016 issued by the Controller General, Indian Bureau of Mines under F.No. T-43004/CGBM/MM(DR)/2015, I hereby approve the above said Mining Plan for **Lime Kankar and Limestone** mineral. This approval is subject to the following conditions.

- 1) That the 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 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, 1960, Environment Protection Act, 1986 and the rules made there under.
- 3) That this Mining Plan (including Progressive Mine Closure Plan) is approved without prejudice to any other order or direction from any court of competent jurisdiction.
- 4) The details of execution of the lease by the State Government whenever such an order is passed may be intimated to the Regional Controller of Mines, Indian Bureau of Mines, Chennai.
- 5) 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.
- 6) The Provisions made under MM(D&R) Act, 2015 (Amended) and Rules made thereunder shall be complied with.
- 7) 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.
- 8) The execution of Mining Plan shall be subjected to vacation of prohibitory orders / notices, if any.
- 9) 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.

- 10) 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.
- 11) If anything is found to be concealed as required by the Mines Act in the contents of Mining Plan and proposal for rectification has not been made, the approval shall be deemed to have been withdrawn with immediate effect.
- 12) Yearly report as required under Rule 26(2) of MCDR,2017 setting 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, Indian Bureau of Mines, Chennai.
- 13) The validity period of the financial assurance should commensurate from the date of execution of mining lease deed for the plan period and the same should be submitted to this office.
- 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.

Yours faithfully,

Encl. Copy of approved Mining Plan
(including Progressive Mine Closure Plan)


(V. Jaya Krishna Babu)
Regional Controller of Mines

Copy for information to :

1. Sri P. Thangaraju, QP, M/s. Geo Exploration & Mining Solutions, Old No. 260-B, New No. 17, Advaita Ashram Road, Alagapuram, Salem – 636 004.
2. The Commissioner of Geology & Mining, Government of Tamil Nadu, Industrial Estate, Guindy, Chennai – 600 032 along with a copy of approved mining plan.

Encl : As above.


(V. Jaya Krishna Babu)
Regional Controller of Mines

ANNEXURE IV
MINING PLAN REPORT AND PLATES

MINING PLAN & PROGRESSIVE MINE CLOSURE PLAN FOR PUDUPALAYAM LIME KANKAR & LIMESTONE DEPOSIT

(PUBLIC SECTOR – A GOVERNMENT OF TAMILNADU UNDERTAKING /
"A" CATEGORY/ NON-FOREST / PATTALANDS / CAPTIVE USE)

SUBMITTED UNDER RULE 13 OF MCR, 2016 AND RULE 23 OF MCDR, 2017

Registration Number under Rule 45: IBM/7446/2011, dated 29.12.2011



LOCATION OF THE AREA

EXTENT : 22.96.0 ha.
S.F.NOs. : 144, 217/1A, 1C, 2, 3A, 3B, etc.,
VILLAGE : PUDUPALAYAM
TALUK : ARIYALUR
DISTRICT : ARIYALUR
STATE : TAMILNADU

MINE OWNER/APPLICANT

M/S. TAMILNADU CEMENTS CORPORATION LIMITED,
(A Government of Tamilnadu Undertaking)
Ariyalur Cement Factory,
Ariyalur District.

PREPARED BY

Dr. P. Thangaraju, M.Sc., Ph.D.,
Qualified Person

M/s. Geo Exploration and Mining Solutions,
Old.No.260-B, New No: 17,
Advaitha Ashram Road, Alagapuram, Salem – 636 004.
Cell: 94433 56539.
E-mail: geothangam@gmail.com

[VOLUME –I –TEXT & ANNEXURES]

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**MINING PLAN AND PROGRESSIVE MINE CLOSURE PLAN
FOR PUDUPALAYAM LIME KANKAR & LIMESTONE DEPOSIT**

OVER AN EXTENT OF 22.96.0 Ha IN S. F. NOS. 144, 217/1A, 217/1C, 217/2, 217/3A, 217/3B, 217/4, 217/5, 217/6, 218/1, 219/1, 219/2A, 219/2B, 219/3A, 219/3B, 219/3C, 219/3D, 219/3E, 219/3F, 219/3G, 219/4A, 219/4B, 219/5A, 219/5B, 219/5C, 219/6, 219/8, 219/9, 220/1, 220/2A, 220/2B, 220/3A, 220/3B, 220/3C, 220/3D, 220/3E, 220/4, 220/5A, 220/5B, 220/6A, 220/6B, 220/7A, 220/7B, 220/8A, 220/8B, 220/9A, 220/9B, 220/9C, 220/10A, 220/10B, 220/11A, 220/11B, 221/1A & 221/15 IN PUDUPALAYAM VILLAGE, ARIYALUR TALUK, ARIYALUR DISTRICT, TAMILNADU STATE.

(PUBLIC SECTOR – A GOVERNMENT OF TAMILNADU UNDERTAKING / "A" CATEGORY /
NON-FOREST / PATTA LANDS / CAPTIVE USE)

SUBMITTED UNDER RULE 13 OF MCR, 2016 AND RULE 23 OF MCDR, 2017

Registration Number under Rule 45: IBM/7446/2011, dated 29.12.2011

INTRODUCTION:

This Mining Plan and Progressive Mine Closure Plan for fresh grant of mining lease for Pudupalayam Limekankar & Limestone Deposit, over an extent of 22.96.0 hectares in S.F. Nos: 144/1A, 217/1A, etc., in Pudupalayam Village, Ariyalur Taluk, Ariyalur District, Tamilnadu State, has been prepared for M/s. Tamilnadu Cements Corporation Limited (A Government of Tamilnadu Undertaking).

Name and address of the Nominated Owner:

Name	:	Tmt. D.Sabitha, I.A.S., Additional Chief Secretary/ CMD, M/s Tamilnadu Cements Corporation Limited., (A Government of Tamilnadu Undertaking)
Regd. office Address	:	735, Anna Salai, LLA Buildings, II Floor, Chennai- 600 002, Tamil Nadu.
Telephone Number	:	044 28525461, 28525471
Email	:	md@tancem.com, co@tancem.com

Name and address of the Authorized Signatory:

Name	:	Thiru.T.Ravichandran, Dy. General Manager (Technical) & Unit Head,
Address	:	M/s Tamilnadu Cements Corporation Limited., (A Government of Tamilnadu Undertaking) Ariyalur Cements Factory, Ariyalur District, Tamil Nadu.
Telephone Number	:	04329 228531
Fax	:	04329 228776
Email	:	ari@tancem.com, acwmines@gamil.com

Copy of ID proof of Authorized Signatory is enclosed as Annexure No. VII.

M/s. Tamilnadu Cements Corporation Limited (TANCEM)

The applicant, M/s. Tamilnadu Cements Corporation Limited (TANCEM) is a public limited company (A Government of Tamilnadu undertaking) Tmt. D.Sabitha, I.A.S., is the Chairman and Managing Director of the Company, having its Registered Office at 735, Anna Salai, LLA Buildings, II Floor, Chennai- 600 002.

Thiru.T.Ravichandran, Dy. General Manager, (Technical) & Unit Head and he is the Authorized Signatory. The organization is having very good knowledge and experience in Limekankar & Limestone mining in other Limestone area. Copy of Certificate of Incorporation, Certificate for Commencement of Business and Copy of Board resolution & List of Board of Directors are enclosed as Annexure No.VI, VIA, VIB & VIC.

M/s. Tamil Nadu Cements Corporation Limited (TANCEM), a wholly owned Government of Tamil Nadu undertaking. The company's main objective is 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 Taluks of Tamil Nadu State, which are sufficient to run the cement plants for decades to come.

Limestone found in the region is a sedimentary rock type consisting chiefly (more than 50% by weight or by areal percentages under the microscope) of calcium carbonate, primarily in the form of the mineral calcite, and with or without magnesium carbonate; specifically a carbonate sedimentary rock containing more than 95% calcite and less than 5% dolomite. Common minor constituents include silica (chalcedony), feldspar, clays, pyrite, and siderite. Limestone formation is by either organic or inorganic processes, and may be detrital, chemical, oolitic, earthy, crystalline, or recrystallized; many are highly fossiliferous and clearly represent ancient shell banks or coral reefs. Limestone includes chalk, calcarenite, coquina, and travertine, and they effervesce freely with any common acid.

Kankar or kunkur is a sedimentological term derived from Hindi. Limekankar are masses or layers of calcium carbonate, usually occurring in nodules, found in the older alluvium or stiff clay of the Indo-Gangetic plain or precipitated calcium carbonate in the form of cement in porous sediments or as a coating on pebbles. Limekankar is extensively used for producing hydraulic lime. The nodules should have a blue grey fracture, free of any sand grains or mud sticking to them, and broken to pass a 12 mm gauge before being calcined.

M/s. Tamil Nadu Cements Corporation Limited (TANCEM) applied for mining lease of Limekankar and Limestone in survey numbers – 144, 217/1A, 1B, 1C, 2, 3A, 3B, 4, 5, 6 & 7, 218/1, 219/1, 2A, 2B, 3A, 3B, 3C, 3D, 3E, 3F, 3G, 4A, 4B, 5A, 5B, 5C, 6, 7, 8 & 9, 220/1, 2A, 2B, 3A, 3B, 3C, 3D, 3E, 4, 5A, 5B, 6A, 6B, 7A, 7B, 8A, 8B, 9A, 9B, 9C, 10A, 10B, 11A & 11B, 221/1A & 15 in Pudupalayam Village, Ariyalur Taluk & District and Tamil Nadu State over an extent of 23.95.5 hectares in Patta Lands for a period of 30 years.

Precise Area Communication Letter was communicated vide Industries (MMA.2) Department, Secretariat, in Letter No. 3997/MMA.2/2019-1 Dated: 02.08.2019 for Preparation of Mining Plan and Obtaining Prior Environmental Clearance for Mining Limekankar and Limestone over an extent of 22.96.0 hectares for a period of 10 years and 50 years respectively, by deleting 0.99.5 hectares of Government lands was issued to the applicant for submission of approved mining plan for the execution of mining lease which is enclosed as Annexure No. II.

The applied area are not compact and contiguous, hence request for relaxation under section 6 (1) (C) of The Mines and Minerals (Development & Regulation) Act, 1957 was made and considered in view of huge requirement of limestone for their cement factory and also in interest of Mineral Conservation.

The precise area was recommended for preparation of Mining Plan in compliance with the following conditions stipulated by the Director of Geology and Mining:-

- a. As per Rule 5 of Mineral (Mining by Government Company) Rules, 2015 Tvl. TANCEM Shall pay an amount to the state Government equivalent to a percentage of the Royalty paid in terms of the Second Schedule to the Act as notified by the central Government in each case.
- b. Since the Applied area is not compact and contiguous, the relaxation of the state Government under sections 6(1) (C) Of MMDR Act, 1957 is granted.
- c. The applicant company shall provide a safety distance of 50 meters to the detailed channel situated in the Southern side in S.F.No.144/1A and for the Easwaran Kovil eri situated on the Western side in S.F.No.148.
- d. The applicant company shall provide a safety distance of 50 meters to the vari course passing form north to south in S.F.No.145/1.
- e. The applicant company shall provide a safety distance of 50 meters to the High-tension power line to be newly erected along the eastern boundary of S.F.No.218.
- f. The applicant company shall provide and maintain safety distance of 7.5 meters to the adjoining patta lands.
- g. As Per section 5 (2) (b) of MMDR Act, 1957 duly approved mining plan from the competent authority has to be submitted before the grant of lease.
- h. Environmental Clearance shall be obtained from the competent Authority before the grant of mining lease.
- i. The applicant company shall obtain necessary clearance from the Tamil Nadu Pollution Control Board before the commencement of mining operations.
- j. The applicant company shall submit latest mining due clearance certificate before the execution of lease deed.

The applicant ensures that all conditions stipulated in the precise area communication letter will be complied before the execution of lease deed and maintained during the course of Mining operations.

Hence, This Mining Plan is prepared under **Rule 13** of Minerals (Other than Atomic and Hydro Carbons Energy Minerals) Concession Rules, 2016 and Progressive Mine Closure Plan is Prepared under **Rule 23** of Mineral Conservation and Development Rules, 2017 and submitted to **Indian Bureau of Mines, Chennai** for approval under **Rule 16** of Minerals (Other than Atomic and Hydro Carbons Energy Minerals) Concession Rules, 2016.

Proposed Production Level

The anticipated annual production of Limekankar & Limestone would be about 2,23,800 Ts Limestone and 38,325 Ts Limekankar for the first five year plan period.

Category & Method of Mining

The mining operation is proposed to be carried out by "A Category" Method. Excavators will be deployed for the formation of benches and loading. Rock breaker is proposed for development and production activities. No drilling and blasting is carried out.

Particulars of number of state wise leases already held by the Applicant:

Details of other mining lease held by the Company are given below.

Table – 1

Sl. No	Mining lease Govt. Order & Date	Area in Ha	Location	Type of mineral	Working/ Non-Working	Status of approval of MP/MS	Date of execution & Date of expiry	Remarks
1	871/MMD2, 20.08.1990	420.25.0	Virudhunagar	Limestone	Non-Working	TN/TNL/MP/L ST/1122-SZ 10.02.2004	04.02.1998	Renewal application submitted
2	215 ind, 18.09.1995	180.83.0	Virudhunagar	Limestone	Non-Working	TN/VDN/LST/MS/74/SZ, 13.03.2005	01.03.1989 & 23.11.2013	-
3.	427 ind, 19.03.1980	268.80.0	Virudhunagar	Limestone	Non-Working	TN/VDN/LST/MS/74/SZ, 13.03.2005	08.06.2001	Renewal application submitted
4.	3(D) 107 ind, 11.07.1997	7.55.5	Tirunelveli	Limestone	Non-Working	TN/TNL/MP/L ST-149/SZ, 18.05.2006	30.12.2004	Renewal application submitted
5.	344, 10.03.1980	240.61.5	Ariyalur	Limestone	Non-Working	TN/PBR/MS/L ST-1257-SZ, 19.01.2001	26.04.2001	Renewal application submitted
6.	456, 16.05.1985	194.29.5	Ariyalur	Limestone	Non-Working	TN/PBR/LST/MS-86-SZ, 29.03.2001	12.11.2005	Renewal application submitted
7.	469, 21.05.1985	66.11.5	Ariyalur	Limestone	Non-Working	TN/PBR/LST/MS-86-SZ, 29.03.2001	12.11.2005	Renewal application submitted
8.	624, 23.09.1998	110.68.5	Ariyalur	Limestone	Working	TN/TCR/MP/L ST-916-SZ, 18.10.2000	13.07.2001	-
9.	409/ind, 12.10.1993	6.61.5	Cuddalore	Clay	Non-Working	TN/SA/FC-15-SZ, 25.02.1991	April 1994 & March 2013	Renewal application submitted
10.	198/ind, 26.12.1986	12.30.0	Ariyalur	Clay	Non-Working	TN/TCR/FC/M S-108-MDS, 04.07.2001	Oct 1986 & March 2006	Renewal application submitted
11.	729/ind, Dated 19.07.1980	24.32.5	Pandapuli	Limestone	Non-Working	TN/TNL/LST/MS-1206-MDS, 19.05.2015	14.08.1969 & 13.08.1999	Renewal application submitted
12.	G.O.(2D) 23	4.64.5	Ariyalur	Limekankar	Working	1341/MM10/2 018/LK/Ari, Dtd: 18.04.2018	08.03.2019 & 07.03.2029	-
13.	G.O.(2D) 24	3.96.5	Ariyalur	Limekankar	Working	1342/MM10/2 018/LK/Ari, Dtd: 18.04.2018	08.03.2019 & 07.03.2029	-
14.	6983/MMC.2 /2018-1, Dtd: 29.06.2018	2.18.5	Ariyalur	Limekankar	Fresh Lease applied	Mining Plan under preparation	10 Years	-
15.	6977/MMC.2 /2018-1, Dated:29.06.2018	4.17.0	Ariyalur	Limekankar	Fresh Lease applied	Mining Plan under preparation	10 Years	-

16.	3996/MMA.. 2/2019-1, Dated:02.08. 2019	22.89.0	Ariyalur	Limekankar & Limestone	Fresh Lease applied	Mining Plan & PMCP under preparation	50 Years & 10 years	-
17.	3995/MMA.2 /2019-1, Dated:02.08. 2019	23.02.5	Ariyalur	Limekankar & Limestone	Fresh Lease applied	Mining Plan & PMCP under preparation	50 Years & 10 years	-
18.	3392/MMA.. 2/2019-1, Dated:02.08. 2019	23.35.0	Ariyalur	Limekankar & Limestone	Fresh Lease applied	Mining Plan & PMCP under preparation	50 Years & 10 years	-
	Total	1616.61.5						

1.0 GENERAL:**a) Name of applicant /lessee/Rule 45 registration no.:**

Name of the applicant : M/s Tamilnadu Cements Corporation Limited.,
(A Government of Tamilnadu Undertaking)
[Tmt.D.Sabitha, I.A.S., Chairman and Managing Director]

Regd. office Address : 735, Anna Salai,
LLA Buildings, II Floor,
Chennai- 600 002,
State : Tamil Nadu
Pin code : 600 002
Telephone : 044 28525461, 28525471
Fax : 044 28523991

Email id. : md@tancem.com, co@tancem.com

Rule 45 registration no. : **IBM/7446/2011, dated 29.12.2011.**

Name and address of the Authorized Signatory:

Name : Thiru.T.Ravichandran, Dy. General Manager
(Technical) & Unit Head,
Address : M/s Tamilnadu Cements Corporation Limited.,
(A Government of Tamilnadu Undertaking)
Ariyalur Cements Factory,
Ariyalur District.
Tamil Nadu.
Telephone Number : 04329 228531
Fax : 04329 228776
Email : ari@tancem.com, acwmines@gamil.com
Copy of ID proof of Authorized Signatory is enclosed as Annexure No. VII.

b) Status of applicant/lessee:

The applicant, M/s. Tamilnadu Cements Corporation Limited (TANCER) is a public limited company (A Government of Tamilnadu undertaking) Tmt.D.Sabitha, I.A.S., Chairman and Managing Director of the Company having its Registered Office at 735, Anna Salai, LLA Buildings, II Floor, Chennai- 600 002.

Thiru.T.Ravichandran, Dy. General Manager, (Technical) & Unit Head and he is the Authorized Signatory. The organization is having very good knowledge and experience in Limekankar & Limestone mining for more than 4 decades in other Limestone area. Copy of Certificate of Incorporation, Certificate for Commencement of Business and Copy of Board resolution & List of Board of Directors are enclosed as Annexure No.VI, VIA, VIB & VIC.

The company is engaged in the manufacture of cement and primarily caters to the needs of Government Departments. Apart from this mining lease applied area, the Company also holds mining leases in the Ariyalur, Cuddalore Districts of Tamil Nadu and the details of the same are listed below in table.

Details of the directors of the company:

Table-2

S. No.	Name of the Director	Address	Designation
1.	Tmt. D.Sabitha, IAS.,	Additional Chief Secretary /CMD, Tamilnadu Cements Corporation Ltd., Chennai-600 002.	Chairman and Managing Director
2.	Thiru.N.Muruganandam, IAS.,	Principal Secretary to Government, Industries Department, Secretariat, Chennai -600 009.	Director
3.	Thiru.E.Saravanel Raj, IAS.,	Director, Geology & Mining, Guindy, Chennai-32	Director
4.	Dr.C.N.Maheswaran, IAS.,	Managing Director, TWAD Board, Chepauk, Chennai-600 005.	Director
5.	Thiru.M.A.Siddique, IAS.,	Secretary to Government, Finance (Expenditure) Department, Secretariat, Chennai -600 009.	Director
6.	Thiru.K.Balasubramaniam, IAS.,	Deputy Secretary to Government, Industries Department, Secretariat, Chennai - 600 009.	Director
7.	K.Baskaran, IAS.,	Director, Rural Development and Panchayat Raj Department, Chennai.	Director
8.	Thiru.P.Krishnamurthi	1B, SuvarnaLok, 34, Malony Road T.Nagar, Chennai 600 017.	Director
9.	Thiru.R.Jayasingh,	Engineer in Chief (Buildings) CE (Buildings), Public Works Department, Chepauk, Chennai-5.	Director
10.	Thiru.T.Velmurugan,	Director (Generation) Tamilnadu Electricity Board, 10th Floor, Eastern Wing, 144, Anna Salai, Chennai -600 002.	Director
11.	Dr.G.Natarajan	288, TTK Road, Alwarpet, Chennai-18	Director

c) Mineral(s) which is / are included in the prospecting license (For Fresh grant):

Not applicable.

d) Mineral(s) which is / are included in the letter of Intent / lease deed:

Not applicable.

e) Mineral(s) which is the applicant /lessee intends to mine:

The applicant intends to mine Limekankar & Limestone.

f) Period for which the mining area is required:

10 years for Limekankar & 50 years for Limestone.

g) Name of Recognized Person under rule 15 of MCR,2016 or a Person employed under clause (c) of Sub rule (1) of rule 55 of MCDR, 2017(Applicable for Review of Mining only) preparing Mining Plan:

Name : Dr.P.Thangaraju, M.Sc., Ph.D.,
Qualified Person
Address : Old.No.260-B, New No: 17,
Advaitha Ashram Road, Alagapuram,
Salem – 636 004.
Tele Fax : 0427- 2431989 (Office)
Cell Phone Nos. : 94433 56539 & 94422 78601

2.0 LOCATION AND ACCESSIBILITY:

a) Lease Details (Existing Mine):

Name of the deposit : Pudupalayam Limekankar & Limestone Deposit
Lat/long of boundary point : N 11° 05' 34.95" to N 11° 05' 50.96"
E 79° 08' 38.65" to E 79° 09' 09.41"
Date of grant of lease : Fresh Applied area for Mining Lease.
Period/Expiry Date : Fresh Applied area for Mining Lease.
Name of the applicant : M/s Tamilnadu Cements Corporation Limited,
(A Government of Tamilnadu Undertaking)
[Tmt. D.Sabitha, I.A.S., Chairman and Managing Director]
Address : 735, Anna Salai,
LLA Buildings, II Floor,
Chennai- 600 002,
State : Tamil Nadu
Pin code : 600 002
Telephone : 044 28525461, 28525471
Fax : 044 28523991
Email id. : md@tancem.com, co@tancem.com
Rule 45 registration no. : **IBM/7446/2011, dated 29.12.2011**

The letter from the Government of Tamilnadu, Industries (MMA-2) Department, vide Letter No: 3997/MMA.2/2019-1 Dated: 02.08.2019 was issued to the applicant for submission of approved mining plan for the execution of mining lease which is enclosed as Annexure No. II.

Hence, This Mining Plan is prepared under **Rule 13** of Minerals (Other than Atomic and Hydro Carbons Energy Minerals) Concession Rules, 2016 and Progressive Mine Closure Plan is Prepared under **Rule 23** of Mineral Conservation and Development Rules, 2017 and submitted to **Indian Bureau of Mines, Chennai** for approval.

Table-3

b) Details of applied /lease area with location map (fresh area /mine):

Forest		Non-forest	
Forest (specify)	Area (ha) Nil	i). Waste land ✓ ii).Grazing land iii).Agriculture land iv).Other (specify)	Area (ha) 22.96.0 Ha.

Table-4

Table 4				
District & State	Village & Taluk	Land Classification	Survey No.	Extent (in Hect)
Ariyalur & Tamilnadu	Pudupalayam & Ariyalur	Own Patta land	144	2.86.0
			217/1A	0.27.5
			217/1C	1.08.0
			217/2	0.11.5
			217/3A	0.05.0
			217/3B	0.07.0
			217/4	0.10.0
			217/5	0.33.0
			217/6	0.30.0
			218/1	4.31.5
			219/1	0.32.5
			219/2A	0.39.0
			219/2B	0.05.0
			219/3A	0.14.0
			219/3B	0.11.0
			219/3C	0.09.0
			219/3D	0.29.0
			219/3E	0.14.0
			219/3F	0.07.5
			219/3G	0.25.0
			219/4A	0.13.0
			219/4B	0.12.5
			219/5A	0.13.0
			219/5B	0.91.0
			219/5C	0.10.0
			219/6	0.30.0
			219/8	0.18.0
			219/9	0.19.0
			220/1	0.56.5
			220/2A	0.33.0
			220/2B	0.04.0
			220/3A	0.20.0
			220/3B	0.01.5
			220/3C	0.26.5
			220/3D	0.02.0
			220/3E	0.10.0
			220/4	0.18.0
			220/5A	0.14.0
			220/5B	0.16.0
			220/6A	0.13.0
			220/6B	0.16.0
			220/7A	0.03.5
			220/7B	0.18.0
			220/8A	0.09.0
			220/8B	0.05.5
			220/9A	0.18.0
			220/9B	0.13.5
			220/9C	0.26.0
			220/10A	0.82.0
			220/10B	0.14.5
			220/11A	0.45.0
			220/11B	0.14.0
			221/1A	4.60.0
			221/15	0.14.5
Total				22.96.0 ha

Whether the area falls under Coastal Regulation Zone(CRZ)?

Not applicable.

Existence of public road/railway line, if any nearby and approximate distance:

The area applied for Mining lease is at a distance of about 1.3 kms Southwest of Pudupalayam Village. Pudupalayam Village is located at a distance of about 9.0 km Southeast of Ariyalur District.

The area applied for Mining lease lies 0.12km Southeast of Trichy – Chidambaram (NH - 277) National Highway Road.

Table – 5

S.No	Particulars	Location	Direction	Approximate Distance in Km
1	Nearest Post office	Siruvalur	SW	2
2	Nearest Town(D.H)	Ariyalur	NW	10
3	Nearest Police Station	Thelur	NE	5
4	Nearest Govt. Hospital	Poyyur	SW	5.2
5	Nearest School	Reddipalayam	NE	3.2
6	Nearest DSP Office	Ariyalur	NW	10
7	Nearest Railway Station	Ariyalur	NW	10
8	Nearest Airport	Trichy	SW	60
9	Nearest Seaport	Chennai	NE	260

Please refer Location plan (Plate No.I), Route Map (Plate No.IA), Key plan (Plate No.IB)

Drinking Water, rest shed, store room, public convenience and mines office are proposed to be constructed in temporary semi permanent structure within the area applied for Mining lease. Please refer Plate No. VI.

Toposheet No. with latitude & longitude of all corner boundary point/pillar:

The Area falls in Toposheet no.58 M/04 of Geological Survey of India.

Table-6

BOUNDARY CO-ORDINATES on WGS-84 from SW Corner					
Point Id.	Latitude	Longitude	Point Id.	Latitude	Longitude
BP 1	11° 05' 35.41"N	79° 08' 41.84"E	BP 28	11° 05' 49.01"N	79° 09' 05.73"E
BP 2	11° 05' 37.60"N	79° 08' 42.07"E	BP 29	11° 05' 50.84"N	79° 09' 05.83"E
BP 3	11° 05' 37.51"N	79° 08' 42.89"E	BP 30	11° 05' 50.81"N	79° 09' 06.71"E
BP 4	11° 05' 40.87"N	79° 08' 43.50"E	BP 31	11° 05' 50.57"N	79° 09' 09.41"E
BP 5	11° 05' 41.29"N	79° 08' 41.32"E	BP 32	11° 05' 47.41"N	79° 09' 08.58"E
BP 6	11° 05' 41.68"N	79° 08' 38.65"E	BP 33	11° 05' 47.64"N	79° 09' 05.65"E
BP 7	11° 05' 46.72"N	79° 08' 39.43"E	BP 34	11° 05' 45.36"N	79° 09' 05.52"E
BP 8	11° 05' 46.82"N	79° 08' 39.92"E	BP 35	11° 05' 45.24"N	79° 09' 08.01"E
BP 9	11° 05' 47.42"N	79° 08' 40.15"E	BP 36	11° 05' 42.62"N	79° 09' 07.22"E
BP 10	11° 05' 46.91"N	79° 08' 43.92"E	BP 37	11° 05' 36.56"N	79° 09' 06.69"E
BP 11	11° 05' 43.82"N	79° 08' 44.67"E	BP 38	11° 05' 37.18"N	79° 09' 01.37"E
BP 12	11° 05' 43.80"N	79° 08' 46.44"E	BP 39	11° 05' 37.17"N	79° 09' 00.06"E
BP 13	11° 05' 43.34"N	79° 08' 47.26"E	BP 40	11° 05' 39.80"N	79° 08' 59.97"E
BP 14	11° 05' 43.15"N	79° 08' 47.32"E	BP 41	11° 05' 39.76"N	79° 08' 59.34"E
BP 15	11° 05' 43.31"N	79° 08' 49.30"E	BP 42	11° 05' 37.17"N	79° 08' 59.42"E
BP 16	11° 05' 43.26"N	79° 08' 49.58"E	BP 43	11° 05' 37.15"N	79° 08' 57.30"E
BP 17	11° 05' 45.56"N	79° 08' 49.95"E	BP 44	11° 05' 36.98"N	79° 08' 55.86"E
BP 18	11° 05' 45.05"N	79° 08' 53.88"E	BP 45	11° 05' 36.96"N	79° 08' 53.69"E
BP 19	11° 05' 44.59"N	79° 08' 56.18"E	BP 46	11° 05' 36.63"N	79° 08' 49.73"E
BP 20	11° 05' 43.44"N	79° 08' 55.92"E	BP 47	11° 05' 36.55"N	79° 08' 48.16"E
BP 21	11° 05' 43.31"N	79° 08' 57.28"E	BP 48	11° 05' 36.56"N	79° 08' 48.08"E
BP 22	11° 05' 43.22"N	79° 08' 58.69"E	BP 49	11° 05' 36.60"N	79° 08' 48.06"E
BP 23	11° 05' 45.29"N	79° 08' 58.58"E	BP 50	11° 05' 36.70"N	79° 08' 46.59"E
BP 24	11° 05' 45.35"N	79° 09' 02.58"E	BP 51	11° 05' 34.95"N	79° 08' 46.00"E
BP 25	11° 05' 50.96"N	79° 09' 02.59"E	BP 52	11° 05' 34.96"N	79° 08' 45.00"E
BP 26	11° 05' 50.90"N	79° 09' 04.17"E	BP 53	11° 05' 35.32"N	79° 08' 44.82"E
BP 27	11° 05' 49.07"N	79° 09' 04.15"E	BP 54	11° 05' 35.45"N	79° 08' 42.85"E

Please refer Mine Lease Plan - Plate No.II.

c) Attach a general location map showing area and access routes. It is preferred that the area be marked on a Survey of India topographical map or a cadastral map or forest map as the case may be. However, if none of these are available, the area may be shown on an administrative map:

Please refer Location plan (Plate No.I)

3.0 DETAILS OF APPROVED MINING PLAN / SCHEME OF MINING (if any):

3.1. Date and reference of earlier approved MP/SOM:

It is a fresh mining lease applied area.

The letter from the Government of Tamilnadu, Industries (MMA-2) Department, vide Letter No: 3997/MMA.2/2019-1 Dated: 02.08.2019 was issued to the applicant for submission of approved mining plan for the execution of mining lease which is enclosed as Annexure No. II.

Hence, This Mining Plan is prepared under **Rule 13** of Minerals (Other than Atomic and Hydro Carbons Energy Minerals) Concession Rules, 2016 and Progressive Mine Closure Plan is Prepared under **Rule 23** of Mineral Conservation and Development Rules, 2017 and submitted to **Indian Bureau of Mines, Chennai** for approval.

3.2. Details of last modifications if any (for the previous approved period) of approved MP/SOM, indicating date of approval, reason for modification:

Not Applicable.

3.3. Give review of earlier approved proposal (if any) in respect of exploration, excavation, reclamation etc.:

i. Exploration:

i). Primary data:

The area has been already regionally explored by Geological Survey of India (1985), State Department of Geology and Mining (1993).

ii). Secondary data:

For preparing this mining plan, detailed studies were carried out based on the Diamond Drills in the mining lease applied area. The occurrence and distribution of the mineral of clearly visible based on the exploration work carried out by the State Department of Geology and Mining in the years 1984 & 1994.

The diamond drills (Phase-III & Phase-V) logging datas are furnished below:

Table-7

No. of Diamond drills	Depth of Diamond drills (m)	Depth of deposition	Strata
PD/4-2	6.75	55.00m – 53.00m	Topsoil
		53.00m – 52.25m	Kankar
		52.25m – 48.25m	Limestone
PPM-4	12.75	55.00m – 53.00m	Topsoil
		53.00m – 52.25m	Kankar
		52.25m – 42.25m	Limestone
PPM-13	12.75	55.00m – 53.00m	Topsoil
		53.00m – 52.25m	Kankar
		52.25m – 42.25m	Limestone
PPM-19	17.75	55.00m – 53.00m	Topsoil
		53.00m – 52.25m	Kankar
		52.25m – 37.25m	Limestone
PD/4-3	12.75	55.00m – 53.00m	Topsoil
		53.00m – 52.25m	Kankar
		52.25m – 42.25m	Limestone
PD/4-4	14.75	55.00m – 53.00m	Topsoil
		53.00m – 52.25m	Kankar
		52.25m – 40.25m	Limestone

Locations of drilled core drills are marked in the geological plan and sections and year wise plan and sections (Refer Plate No.IV, VA & VA1).

Copy of the Exploration report, chemical analysis report & Bore hole map are enclosed as Annexure Nos.IV & IVA.

Based on the Diamond drills made in the applied area all the datas required for exploration studies were carried out related to G1, E1 & F1 axis as per United Nations Framework Classification System to calculating reserves and resources and to arrive UNFC 111 category.

Reserves are calculated based on the drilled core drills data, adjacent mine pit nullah, vari and reservoir. Hence the deposit has been estimated upto 17.75m depth with an average of 2.0m topsoil and 0.75m Limekankar during the present mining plan period.

Table-8

Depth of estimation of the reserves and resources during the Mining plan period:

17.75m [2.0m Topsoil + 0.75m Limekankar + 15m Limestone (proved 111)]	Northeast & East
17.75m [2.0m Topsoil + 0.75m Limekankar + 10m Limestone (proved 111) + 3m Limestone (probable 222)]	Centre
17.75m [2.0m Topsoil + 0.75m Limekankar + 15m Limestone (probable 222)]	Southeast, Northwest, West, South & Southwest

Proposed to be carried out:

As per the UNFC guidelines, the applicant has proposed to carry out the exploration program during the first year 23 Core drills (PBh-1 to PBh-23) of 60m depth each of the mining plan period after the grant of mining lease. Now in this mining plan the reserves are calculated based on the old Diamond drills made in the area applied for Mining lease. After carrying out the exploration studies in the first year of the mining plan period the exact resource and reserves as per the UNFC norms will be calculated and the same will be discussed in detail in the modified mining plan. Details of the proposed exploration program are given in Table No.12.

3.4. Give status of compliance of violations pointed out by IBM:

It is a fresh mining lease applied area.

3.5. Indicate and give details of any suspension /closure/ prohibitory order issued by any Government agency under any rule or Court of law:

Not applicable.

3.6. In case the MP/SOM is submitted under rules 9 and 10 of the MCDR'88 or under rule 22(6) of the MCR'1960 for approval of modification, specify reason and justification for modification under these rules:

Not applicable.

PART – A**1.0 GEOLOGY AND EXPLORATION:****a) Briefly describe the topography, drainage pattern, vegetation, climate, rainfall data of the area applied/mining lease area:****Topography:**

The core zone i.e. the area applied for mining lease is of sedimentary terrain. The topography of the area is almost plain topography with gentle gradient towards south. The lease area will be altered due to mining activities by formation of benches towards the inner faces and proposed mine pit is well above the ground water table levels. Thus, the mining will bring change in the local topography of the lease applied area.

Physiography:

Physiography is another term for physical geography; it is the study of physical features of the earth's surface. Ariyalur District lies in the inland without coastal lines of Tamil Nadu. It is situated between 10°50'0"N to 11°30'0" of the Northern Latitude and 79°0'0" and 79°30'0" of the Eastern Longitude.

Ariyalur district consist of 2 Revenue Divisions and contains 3 Taluks and 6 Blocks. Ariyalur is a town and district headquarters of Ariyalur district in the state of Tamil Nadu and it is rich in limestone resources, it is surrounded with five cement factory and two sugar factories. It is the Smallest District Headquarters in Tamil Nadu. The town is located at a distance of 310 km from the state capital Chennai.

Ariyalur was a part of the erstwhile Trichinopoly District until India's independence in 1947 and Tiruchirappalli district until 1995, Perambalur district until 2007 and subsequently a part of the newly formed Ariyalur district. The town is a part of the fertile Cauvery Delta and the major profession in the town is agriculture.

The area is surrounded by Dry barren and agriculture lands on the western side; other limestone mining pits on the North, East and Southern side. Marudhaiyar river at a distance of 1.6km South.

The district headquarters Ariyalur is about 11km North west side from the project area. The topography of the area is almost plain topography with gentle towards South.

In general, the district has an undulating topography, characterized by low mounds and broad valleys. Hill ranges belonging to Pachaimalai Hills occupy the northwestern part of the district, where the terrain is rugged. The ground elevation ranges from 100 to 1015 m amsl. The region slop is towards east. Denudational, structural and fluvial processes mainly control the geomorphic evolution of the area. Mainly the varying resistance of geological formations to those processes has governed the evolution of various landforms. Various land forms occurring in the area such as structural hills, erosional plains, residual hills rolling uplands and pediments of different facies belonging to the denudational and structural land forms. Fluvial landforms caused by the activity of Cauvery, Marudayar and Vellar river systems, include younger flood plains, older flood plains and buried pediments.

Agriculture continues to be the most predominant sector of this district economy, as 70 percent of the population is engaged in Agriculture and allied activities for their livelihood. The district has as an area of 1933.38sq.km with a gross cropped area of around 1.118 lakhs Ha. The Ariyalur District has a Geographical area of 1,93,338 Hectares of which the net area cropped is 1,11,874 Hectares (64.70%), out of which about 45136Ha are irrigated and about 66,738 Ha are rain fed. A total of 32,933 hectares (8.92%) are kept as fallow lands. The lands put to non-agricultural purposes occupy 43,953 (11.91%) hectares.

The cultivable wastelands of 7,742 (2.10%) hectares can be brought in to agricultural uses by suitable measures. The River Cauvery tributary irrigates about 10,389Ha. In Thirumanur, T.Palur and Jayankondam Block.

The area is almost plain terrain. The general drainage pattern of the area is of sub-dendritic and dentritic pattern. Only seasonal cultivation is done. In some areas agriculture is done with lift irrigation. The main crops are groundnut, paddy and Turmeric, etc. There is no thick vegetation. Water table is found at a depth of 38m during summer and 35m during rainy season. The area exhibits a tropical climate and the temperature goes upto 42°C in summer and falls down to 27°C in December – January. The wind direction is NE-SW and vice-versa. Average annual rainfall is about 1071.4 mm in monsoon season.

Drainage pattern:

The study area is part of Marudaiyar – Ariyalur mini watershed of Ariyalur district which represents a part of coastal sedimentary plains and river basin is mainly composed of Cretaceous, Tertiary and Quaternary formation which includes calcareous sandstones, shell limestones and alluvium.

The lease applied area exhibits almost plain topography with gentle slope towards south side. The altitude of the area is 55m Above MSL.

Geomorphologically the area is divided into alluvial plains, buried pediments, low and cretaceous and lineaments. The drainage pattern of the area is mostly controlled by the structural features. Radial and dentritic to sub-dentritic patterns are recognized in this district among the different drainage patterns and associated features.

Water table is found at a depth of 38m during summer and 35m during rainy season which is observed from the existing borehole in Nerinjikorai village.

Vegetation:

The proposed area is devoid of vegetation except some few bushes and were previously seasonal agriculture were carried out.

Climate and Rainfall:

The area exhibits a subtropical climate and the temperature that goes upto 42°C in summer and falls down to 27°C in December – January. The wind direction is NE-SW and vice-versa. Average annual rainfall is about 1071.4 mm in monsoon season.

b) Brief descriptions of Regional Geology with reference to location of lease/applied area:

The Cretaceous Formation of the Ariyalur area (Ariyalur District, Tamil Nadu) is one of the best developed sedimentary sequences in South India. The Cretaceous system of Cauvery Basin consists of shallow marine sequence with a rich faunal succession of Albian–Maastrichtian. Blanford (1862) was the first to work on the stratigraphy of this formation and he divided the litho-units into three groups: Uttatur, Trichinopoly and Ariyalur. These three groups are largely disconformable and occasionally unconformable at places.

The geology and the stratigraphy of this area are accounted by many workers (Rama Rao, 1956; Ramanathan, 1968; Banerji, 1972, Sastri et al, 1972; ONGC, 1977; Sundaram and Rao, 1979 & 1986; Ramasamy and Banerji, 1991; Banerji et al, 1996; Govindan et al, 1996). Ramasamy and Banerji (1991) have revised the stratigraphic framework of the exposed Pre-Ariyalur sequence based on detailed lithological and petrographical variations. Banerji et al., (1996) have redefined the Uttatur Group and identified within it four distinct formations comprising reefoidal bodies, sandy clay, coarse sand bar and gypsiferous silty clay units. Madavaraju (1996) has presented a detailed geochemical and petrographical account of Ariyalur Group of sediments and Kallamedu Formation is the youngest unit of this group.

Further REE distribution and its importance in establishing anoxic/oxic conditions in lime rich Kallankurichi Formation was attempted by Madavaraju and Ramasamy (1999). The sedimentary rocks of Cretaceous – Palaeocene age are well developed in the Ariyalur area, which consist both clastic and carbonate facies. The diversity of fauna is very large in the vast sedimentary basin that has attracted the attention of geologists not only from India but also from foreign countries.

Sastry et al., (1972) have further divided the Ariyalur Group into four formations mainly based on lithological changes and characteristic faunal content:

- i) Sillakudi
- ii) Kallankurichi
- iii) Ottakoil and
- iv) Kallamedu Formations.

This classification has been followed by various workers of varied interests. Kallamedu Formation (Late Maastrichtian) is the youngest formation of the Ariyalur Group and it exhibits large variation in lithology. The exposed area looks like a badland topography with sparse vegetation. Excavation at favourable spots in Kallamedu Formation has yielded a number of well-preserved skeletal parts of Carnosaurs (Yadagiri and Ayyasami, 1987).

The lithological association of this formation includes sandstone, siltstone, calcareous sandstone, silty shale and thin band of limestone. The sandstone and siltstone are well exposed in the nala sections near north of Kallamedu village. Govindan et al. (1996) have assigned Maastrichtian age for the continental deposits of the Kallamedu Formation. Kallamedu Formation is overlain by the Niniyur Formation of Early Paleocene age.

The late Cretaceous sediments are exposed in the western part of the study area and classified into Uttatur, Trichinopoly and Ariyalur formations with a maximum thickness of 900 m, 600 m and 1500 m, respectively. The Uttatur formation consists of reefoidal limestone and minor sandstone, with rich faunal assemblages. Conglomerates and quartzites are also found to occur in the Uttatur group of rocks.

These rocks are exposed only in Trichirapalli area where they are overlying Gondwana and Dalmiapuram formations. The sub-surface equivalent of the Uttatur formation is devoid of reefoidal elements. The Trichinopoly formation, unconformably overlying the Uttatur formation, comprises conglomerate, pebbly sandstone as well as gritty calcareous sandstone with bands of claystone, gypseous claystone, sandy limestone, shelly limestone and clayey limestone with abundant fauna. They are exposed in Ariyalur, Vridhachalam and Pondicherry areas. The rocks are mainly greenish grey, friable clayey sandstone, fossiliferous argillaceous limestone and sandstone.

The lower part of Ariyalur formation is highly fossiliferous while the upper is largely unfossiliferous.

i) Evolution of Cauvery Basin – The Cretaceous–Paleogene sections of Cauvery Basin are closely related to the rifting and drifting phases of peninsular India. The basement is characterized by structural highs and lows, these being evidenced by strong tectonic activity affecting the basin since its inception. Two major tectonic and sedimentary phases are deciphered.

The first is taphrogenic rifting and associated block movements along the dominant NE-SW trend during Late Jurassic, resulting in morphotectonic humps and deep slopes. The second phase signifies coastal progradational/deltaic sedimentation through a series of marine transgression and regression in response to the oscillatory tectonic movements.

During Paleocene, the basin continued to tilt towards east and depocentres consequently shifted. Cauvery Basin comprises of depressions separated from one another by subsurface ridges; these structural elements extend into the offshore area. The structural elements from north-south are,

- (1) Ariyalur Pondicherry depression,
- (2) Kumbakonam–Madnam-Shiyali ridge,
- (3) Tanjore Tranquibar–Nagapattinam depression,
- (4) Pattukottai– Mannargudi ridge,
- (5) Ramnad–Palk Bay depression &
- (6) Mandapam–Delft ridge.

The first marine transgression occurred during the close of Late Jurassic. The marine environments of sedimentation continued till Cretaceous although a series of minor transgressions and regressions. A major regression occurred during the close of Cretaceous.

The basin underwent an easterly tilt and the depocentres shifted due east prior to marine transgression during the beginning of Paleogene. The evolution of Cauvery Basin is largely controlled by dominant trends in the Precambrian crystalline basement as is evident from the similarity between the alignment of the basinal structural elements and the major trends in the adjoining peninsular shield. The NE-SW Eastern Ghats trends are by far the most dominant and taphrogenic movements along these basement trends resulted in a series of elongated depressions that were separated from one another by intra-depression ridges.

Lithostratigraphic Classification Blanford (1862) has classified the Cretaceous sediments of Cauvery Basin into: Uttatur plant beds, Uttatur and Trichinopoly Groups. Krishnan (1943) classified the Cretaceous sections into four stages: Uttatur (Cenomanian to Uppermost Albian), Trichinopoly (Mid-Cenomanian to Mid-Turonian), Ariyalur (Maastrichtian to Mid-Cenomanian) and Niniyur (Danian to Maastrichtian).

Ramanathan (1968) has divided the Upper Jurassic to Cretaceous sections of Cauvery Basin into three formations: Upper Gondwana (Bathonian to Neocomian), Uttatur (Barremian to Albian) and Trichinopoly (Turonian to Upper Cenomanian). Nair (1974) introduced two groups for the Cretaceous sections: Ariyalur for Maastrichtian age and Uttatur for the rest part of the Cretaceous age. Sundaram and Rao (1976) proposed three groups for Cretaceous of Cauvery Basin: Uttatur, Trichinopoly and Ariyalur. Govindan (1998) compiled the outcrop and sub-crop sediments are proposed the sediments classification.

A general stratigraphic succession and the various formations are described below:

Order of Super position		
AGE		ROCKFORMATION
Recent	-	Topsoil & Limekankar
-----Unconformities-----		
Cretaceous		Shell & Coral limestone
Archaen	-	(Boulders of charnockites)

c) Detailed description of geology of the lease area such as shape and size of the mineral/ore deposit, disposition various litho-units indicating structural features if any etc. (Applicable for Mining Plan for grant & renewal and not for Scheme of Mining/Modifications in the approved mining plan/scheme of Mining):

The area around Ariyalur forms parts of the well-known cretaceous formation of Trichinopoly.

The sedimentary formations of coralline limestone belongs to the cretaceous system and rest over archaean formations. The Limestone is creamy white in colour. Marine organisms such as shells, corals, microfossils, ammonites, Gryphea, crinoids formed them and foraminifera are composed chiefly of CaCO_3 with varying amounts of impurities such as sand, glauconite, ferruginous, phosphatic and bituminous matter.

The organic material rich in magnesium has given rise to magnesium bearing limestone in certain areas. The Limestone is hard, compact and amorphous in nature and indurated layers of limestone due to structural deformation and intense weathering. These organic limestones are basically marine sediments derived from rich coral-lime shells and other remains.

Topsoil:

The topsoil is black cotton soil. It occurs to a depth of 2m and lies over the limekankar formations.

Kankar:

Kankar has developed over the limestone extensively and ranges in thickness of 0.75 meters. The formation of Kankar is evidently due to the alternating wet and dry spells of tropical climate, which has caused leaching out of the clayey and siliceous portions in the top layer of limestone. Thus though the Kankar is prous, pisolitic and red in colour due to dispersion of iron oxide, it analyses very high in calcium carbonate content (generally 85 to 95 per cent CaCO_3). The fragments of shells as well as cementing calcareous medium make the Kankar hard and difficult to break. The Kankar is at present being mined for manufactures slaked lime in country kilns for use in construction.

The following geological setup has been identified for these deposits of cretaceous age and the order of superposition is described.

	Upper :	Niniyur
Cretaceous age	Middle :	Ariyalur, Trichinopoly
	Lower :	Uttatur

The area was surveyed in detail to prepare a Geological map in the scale of 1:2000 showing the various formations and attitude of the deposit. It is inferred that the Limekankar & Limestone mineral is of grade suitable for cement industries and in form single bed running N-S with Vertical dipping. Topsoil cover to a depth of 2.0m followed by 0.75m of Limekankar. Recovery of minerals is estimated as 100% of the total excavation of the ore body. The recovery percentage is based on the knowledge gained from the adjacent working mine in this region, by the field tests carried out in the lease area and analysis done in NABL Laboratories.

The physical attitude of the Limekankar & Limestone deposits is demarked as follows:

Strike length (m)	: 864 (max)
Width (m)	: 430 (max)
Depth (m)	: 17.75m with an average of 2m Topsoil & 0.75m Limekankar
Strike direction	: N – S
Dip amount and direction	: Vertical dip

d) Name of prospecting /exploration agency:

The Geological Survey of India and Tamilnadu State Mines and Geology Department have already carried out regional exploration studies, regional mapping of all the mineral deposits of Tamilnadu.

Name and Address of the Agency:

- (i) State Geological Department,
O/o.The Director of Geology and Mining,
Thiru Ve Ka Industrial Estate,
Guindy, Chennai.
- (ii) Geological Survey of India,
27, Jawaharlal Nehru Road,
Kolkata – 700 016.

e) Details of prospecting/exploration already carried out:

(i) Number of pits and trenches indicating dimensions, spacing etc along and across the strike/foliation with reference to geological plan:

Nil.

(ii) Number of boreholes indicating type (Core/RC/DTH), diameter, spacing, inclination, Collar level, depth etc with standard borehole logs duly marking on geological plan/sections:

Table-9

Diamond Drill No	Type	Diameter	Spacing	inclination	Strike/foliation
6nos. of Diamond Drills (PD/-4-2, PPM-4, PPM-13, PPM-19, PD/4-3 & PD/4-4)	Core drill	49 mm	100m grid interval	Vertical	N- S

(iii) Details of samples analysis:**Grade of Limekankar & Limestone:**

Samples were collected from the drilled core drills for NABL laboratory for testing and analysis and to find out the chemical and physical properties of the minerals, it indicates that the Limekankar & Limestone is white in color and bulk density is 2.25 & 2.0 respectively and massive in nature. Based on chemical analysis, it is inferred that the grade continues to be cement grade.

The average analysis of the Limekankar & Limestone is given below:

Table-10

Parameter	LIMESTONE	LIMEKANKAR
	Composition %	Composition %
Calcium Oxides (CaO)	49.28	46.26
Magnesium Oxides (MgO)	0.52	0.44
Iron (Fe ₂ O ₃)	1.06	0.95
Alumina as (Al ₂ O ₃)	1.35	1.35
Silica (SiO ₂)	9.61	13.99
Loss of Ignition (LOI)	37.89	36.95
Calcium as CaCO ₃	87.98	82.58
Magnesium as MgCO ₃	1.09	0.92
Lime saturation Factor	1.89	1.03

As analyzed by NABL laboratories limestone which has more than 70% CaCO₃ is best suited for cement industries. More than 70% CaCO₃ Limekankar material is used for blending with limestone in these particular formations. Chemical analysis report of the Limekankar & Limestone is enclosed as Annexure No – V & VA.

(iv) Expenditure incurred in various prospecting operations:

Total expenditure incurred for the exploration already carried out is given below:

Table-11

Total length of the hole/pit shaft :	upto 17.75 metres depth. [6 Core Drills – upto 17.75 metres (maximum)] from existing surface level. PPM-4 – 12.75m PPM-13 –12.75m PPM-19 –17.75m PD/4-3 –12.75m PD/4-2 –6.75m PD/4-4 –14.75m Total meterage – 77.5m
Total operating expenditure incurred :	Core drills – Rs. 1200/m (avg) (77.5m x Rs. 1200) = Rs.93,000/-

f) The surface plan of the lease area may be prepared on a scale of 1: 1000 or 1: 2000 with contour interval of maximum of 10 m depending upon the topography and size of the area duly marked by grid lines showing all features indicated under Rule 32(1)(a) of MCDR 2017:

Please refer to the Surface Plan - Plate No. III.

g) For preparation of geological plan, surface plan prepared on a scale of 1: 1000 or 1: 2000 scale specified under para 1.0 (f) of Part A of the format may be taken as the base plan. The details of exploration already carried out along with supporting data for existence of mineral, locations proposed exploration, various litho-units along with structural features, mineralized/ore zone with grade variation if any may be marked on the geological plan along with other features indicated under Rule 32 (1)(b) of MCDR 2017:

The area applied for Mining lease is a plain terrain. The Geological plan and sections were prepared in 1:2000 scale considering all the geological parameters of the formation including the strike of the formation. This geological plan is based on the surface plan, which was prepared in 1:2000 scale with help of total station survey instrument and relevant software. Please refer to the surface plan and geological plan in Plate No. III & IV.

h) Geological sections may be prepared on natural scale of geological plan at suitable interval across the lease area from boundary to boundary:

The longitudinal and traverse section of the Limekankar & Limestone is clearly marked in the geological plan and sections (Plate Nos.IV & IVA) and yearwise development and production plans (Plate Nos.VA to VE1), the proposed production for the first five years are also marked with dimensions and different colours for the easy understanding.

i) Broadly indicate the future programme of exploration with due justification (duly marking on Geological plan year wise location in different colours) taking into consideration the future tentative excavation programme planned in first five years:

To confirm the characteristics features of Limekankar & Limestone bed and to find out the further depth persistence of the mineralization, twenty three core drills (Pbh1-Pbh23) for the first year of Mining Plan period (i.e. after the grant of mining lease) of 60m depth each are proposed from the existing floor level @ 100m grid interval, for future exploration during the plan period.

Table-12

Year	No. of boreholes (Core / RC/ DTH)	Grid Interval	Total meterage	No. of Pits dimensions and volume	No. of Trenches dimensions and volume
1 st year	23 nos. [Core drills] – each 60m (d)	100m	Core drill of depth 60m each (23 X 60m =1380m	-	-

Locations of the proposed core drills are marked in the geological plan and yearwise plan (Refer Plate No.IV & VA).

j) Reserves and Resources as per UNFC with respect to the threshold value notified by IBM may be furnished in a tabular form as given below: (Area explored under different level of exploration may be marked on the geological plan and UNFC code for area considered for different categories of reserve/resources estimation may also be marked on geological cross sections):

The grade of the Limekankar & Limestone is of only one grade i.e. cement grade.

Reassessed Mineral Reserves and Resources as per UNFC System as on 05.08.2019

Table-13

Summary of Reserves & Resources

Description	Section	ROM (Ts)	Limestone @ 100% Recovery (Ts)	ROM (Ts)	Limekankar @ 100% Recovery (Ts)	Topsoil (Ts)
A. Mineral Reserves (111)	X8Y8-CD	9288	9288	1863	1863	5880
	X9Y9-GH	160446	160446	14000	14000	37296
	X3Y3-IJ	94128	94128	21738	21738	55692
	X4Y4-IJ	60000	60000	26325	26325	65600
	X5Y5-IJ	242000	242000	21600	21600	52400
	X5Y5-KL	148320	148320	14588	14588	36848
	X6Y6-IJ	138800	138800	12825	12825	31600
	X6Y6-KL	139480	139480	13667	13667	34960
	X7Y7-IJ	304800	304800	28013	28013	68800
	X9Y9-IJ	471048	471048	37007	37007	91344
	Total	1768310	1768310	191626	191626	480420
B. Mineral Resources (222)		2894176	2894176	92715	92715	219768
C. Mineral Resources locked up in benches (221)		331704	331704	-	-	-
D. Mineral resources locked up in 7.5m & 50m safety distance	222	1151864	1151864	58413	58413	138460
	221	296296	296296	23046	23046	54628
	Total	1448160	1448160	81459	81459	193088

Please refer Geological Plan & Sections - Plate Nos. IV & IVA.

k) Furnish detailed calculation of reserves/resources section wise (When the mine is fully mechanized and deposit is of complex nature with variation of size, shape of mineralized zones, grade due to intrusion within ore zone etc, an attempt may be made to estimate reserves/resources by slice plan method). In case of deposits where underground mining is proposed, reserve/resources may be estimated by level plan method, as applicable, as per the proposed mining parameters:

Reserves are calculated based on the drilled core drills data, adjacent mine pit nullah, vari and reservoir. Hence the deposit has been estimated upto 17.75m depth with an average of 2.0m topsoil and 0.75m Limekankar during the present mining plan period.

The estimation of mineral reserves is done by cross sections method. For Reserve calculation the length and width of the deposit is shown in the Geological plan & cross sections. (Please Ref. IV & IVA). Recovery of Limekankar & Limestone mineral is estimated as 100% of the total excavation of the ore body. The recovery percentage is based on the knowledge gained from the adjacent working mine in this belt and by the analysis done in NABL Laboratories. The bulk density has been reckoned as 2.0 for Limestone & 2.25 for Limekankar.

As analyzed by NABL laboratories limestone which has more than 70% CaCO_3 is best suited for cement industries. More than 70% CaCO_3 Limekankar material is used for blending with limestone in these particular formations. Chemical analysis report of the Limekankar & Limestone is enclosed as Annexure Nos. V & VA.

Table-14

Depth of estimation of the reserves and resources during the Mining plan period:

17.75m [2.0m Topsoil + 0.75m Limekankar + 15m Limestone (proved 111)]	Northeast & East
17.75m [2.0m Topsoil + 0.75m Limekankar + 10m Limestone (proved 111) + 3m Limestone (probable 222)]	Centre
17.75m [2.0m Topsoil + 0.75m Limekankar + 15m Limestone (probable 222)]	Southeast, Northwest, West, South & Southwest

Reassessed Mineral Reserves and Resources as per UNFC System as on 05.08.2019

Table-15

A. Mineral Reserves (111)

Section	Bench	Length in (m)	Width in (m)	Depth in (m)	Limestone				Limekankar				Topsoil (Ts)
					Volume in (Cu.m.)	Bulk Density	ROM (Ts)	Limestone @ 100% Recovery (Ts)	Volume in (Cu.m.)	Bulk Density	ROM (Ts)	Limekankar @ 100% Recovery (Ts)	
X8Y8-CD	I	49	30	2	2940	2	-	-	-	-	-	-	5880
	II	46	24	0.75	-	-	-	-	828	2.25	1863	1863	-
	III	43	18	6	4644	2	9288	9288	-	-	-	-	-
	Total						9288	9288	828	-	1863	1863	5880
X9Y9-GH	I	126	74	2	18648	2	-	-	-	-	-	-	37296
	II	122	68	0.75	-	-	-	-	6222	2.25	14000	14000	-
	III	119	62	6	44268	2	88536	88536	-	-	-	-	-
	IV	110	43	6	28380	2	56760	56760	-	-	-	-	-
	V	101	25	3	7575	2	15150	15150	-	-	-	-	-
	Total						160446	160446	-	-	14000	14000	37296
X3Y3-IJ	I	119	117	2	27846	2	-	-	-	-	-	-	55692
	II	113	114	0.75	-	-	-	-	9662	2.25	21738	21738	-
	III	106	111	4	47064	2	94128	94128	-	-	-	-	-
	Total						94128	94128	-	-	21738	21738	55692
X4Y4-IJ	I	164	100	2	32800	2	-	-	-	-	-	-	65600
	II	156	100	0.75	-	-	-	-	11700	2.25	26325	26325	-
	III	150	100	2	30000	2	60000	60000	-	-	-	-	-
	Total						60000	60000	-	-	26325	26325	65600
X5Y5-IJ	I	131	100	2	26200	2	-	-	-	-	-	-	52400
	II	128	100	0.75	-	-	-	-	9600	2.25	21600	21600	-
	III	125	100	6	75000	2	150000	150000	-	-	-	-	-
	IV	115	100	4	46000	2	92000	92000	-	-	-	-	-
	Total						242000	242000	-	-	21600	21600	52400

X5Y5-KL	I	98	94	2	18424	2	-	-	-	-	-	-	36848
	II	95	91	0.75	-	-	-	-	6484	2.25	14588	14588	-
	III	92	88	6	48576	2	97152	97152	-	-	-	-	-
	IV	82	78	4	25584	2	51168	51168	-	-	-	-	-
	Total						148320	148320	-	-	14588	14588	36848
X6Y6-IJ	I	79	100	2	15800	2	-	-	-	-	-	-	31600
	II	76	100	0.75	-	-	-	-	5700	2.25	12825	12825	-
	III	73	100	6	43800	2	87600	87600	-	-	-	-	-
	IV	64	100	4	25600	2	51200	51200	-	-	-	-	-
	Total						138800	138800	-	-	12825	12825	31600
X6Y6-KL	I	92	95	2	17480	2	-	-	-	-	-	-	34960
	II	89	91	0.75	-	-	-	-	6074	2.25	13667	13667	-
	III	86	88	6	45408	2	90816	90816	-	-	-	-	-
	IV	77	79	4	24332	2	48664	48664	-	-	-	-	-
	Total						139480	139480	-	-	13667	13667	34960
X7Y7-IJ	I	172	100	2	34400	2	-	-	-	-	-	-	68800
	II	166	100	0.75	-	-	-	-	12450	2.25	28013	28013	-
	III	160	100	6	96000	2	192000	192000	-	-	-	-	-
	IV	141	100	4	56400	2	112800	112800	-	-	-	-	-
	Total						304800	304800	-	-	28013	28013	68800
X9Y9-IJ	I	173	132	2	45672	2	-	-	-	-	-	-	91344
	II	170	129	0.75	-	-	-	-	16448	2.25	37007	37007	-
	III	167	126	6	126252	2	252504	252504	-	-	-	-	-
	IV	157	116	6	109272	2	218544	218544	-	-	-	-	-
	Total						471048	471048	-	-	37007	37007	91344
Grand Total							1768310	1768310	-	-	191626	191626	480420

Table-16

B. Mineral Resources (222)

Section	Bench	Length in (m)	Width in (m)	Depth in (m)	Limestone				Limekankar				Topsoil (Ts)
					Volume in (Cu.m.)	Bulk Density	ROM (Ts)	Limestone @ 100% Recovery (Ts)	Volume in (Cu.m.)	Bulk Density	ROM (Ts)	Limekankar @ 100% Recovery (Ts)	
XY-AB	I	117	96	2	22464	2	-	-	-	-	-	-	44928
	II	117	96	0.75	-	-	-	-	8424	2.25	18954	18954	-
	III	117	96	6	67392	2	134784	134784	-	-	-	-	-
	IV	117	96	6	67392	2	134784	134784	-	-	-	-	-
	V	117	96	3	33696	2	67392	67392	-	-	-	-	-
Total							336960	336960	-	-	18954	18954	44928
X10Y10-EF	I	85	88	2	14960	2	-	-	-	-	-	-	29920
	II	85	88	0.75	-	-	-	-	5610	2.25	12623	12623	-
	III	85	88	6	44880	2	89760	89760	-	-	-	-	-
	IV	85	88	6	44880	2	89760	89760	-	-	-	-	-
	V	85	88	3	22440	2	44880	44880	-	-	-	-	-
Total							224400	224400	-	-	12623	12623	29920
X2Y2-KL	I	135	94	2	25380	2	-	-	-	-	-	-	50760
	II	135	94	0.75	-	-	-	-	9518	2.25	21414	21414	-
	III	135	94	6	76140	2	152280	152280	-	-	-	-	-
	IV	135	94	6	76140	2	152280	152280	-	-	-	-	-
	V	135	94	3	38070	2	76140	76140	-	-	-	-	-
Total							380700	380700	-	-	21414	21414	50760
X3Y3-IJ	III	129	89	2	22962	2	45924	45924	-	-	-	-	-
	IV	129	89	6	68886	2	137772	137772	-	-	-	-	-
	V	129	89	3	34443	2	68886	68886	-	-	-	-	-
Total							252582	252582	-	-	21414	21414	50760
X3Y3-KL	I	65	89	2	11570	2	-	-	-	-	-	-	23140
	II	65	89	0.75	-	-	-	-	4339	2.25	9762	9762	-
	III	65	89	6	34710	2	69420	69420	-	-	-	-	-
	IV	65	89	6	34710	2	69420	69420	-	-	-	-	-
	V	65	89	3	17355	2	34710	34710	-	-	-	-	-
Total							173550	173550	-	-	9762	9762	23140
X4Y4-IJ	III	100	89	4	35600	2	71200	71200	-	-	-	-	-
	IV	100	89	6	53400	2	106800	106800	-	-	-	-	-
	V	100	89	3	26700	2	53400	53400	-	-	-	-	-
Total							231400	231400	-	-	-	-	-
X4Y4-KL	I	85	105	2	17850	2	-	-	-	-	-	-	35700
	II	85	105	0.75	-	-	-	-	6694	2.25	15061	15061	-

	III	85	105	6	53550	2	107100	107100	-	-	-	-	-
	IV	85	105	6	53550	2	107100	107100	-	-	-	-	-
	V	85	105	3	26775	2	53550	53550	-	-	-	-	-
	Total						267750	267750	-	-	15061	15061	35700
X5Y5-IJ	IV	140	100	2	28000	2	56000	56000	-	-	-	-	-
	V	140	100	3	42000	2	84000	84000	-	-	-	-	-
	Total						140000	140000	-	-	-	-	-
X5Y5-KL	IV	106	95	2	20140	2	40280	40280	-	-	-	-	-
	V	106	95	3	30210	2	60420	60420	-	-	-	-	-
	Total						100700	100700	-	-	-	-	-
X6Y6-IJ	IV	88	100	2	17600	2	35200	35200	-	-	-	-	-
	V	88	100	3	26400	2	52800	52800	-	-	-	-	-
	Total						88000	88000	-	-	-	-	-
X6Y6-KL	IV	101	103	2	20806	2	41612	41612	-	-	-	-	-
	V	101	103	3	31209	2	62418	62418	-	-	-	-	-
	Total						104030	104030	-	-	-	-	-
X7Y7-IJ	IV	182	100	2	36400	2	72800	72800	-	-	-	-	-
	V	182	100	3	54600	2	109200	109200	-	-	-	-	-
	Total						182000	182000	-	-	-	-	-
X7Y7-MN	I	61	70	2	8540	2	-	-	-	-	-	-	17080
	II	61	70	0.75	-	-	-	-	3203	2.25	7206	7206	-
	III	61	70	6	25620	2	51240	51240	-	-	-	-	-
	IV	61	70	6	25620	2	51240	51240	-	-	-	-	-
	V	61	70	3	12810	2	25620	25620	-	-	-	-	-
	Total						128100	128100	-	-	7206	7206	17080
X9Y9-IJ	V	174	141	3	73602	2	147204	147204	-	-	-	-	-
	Total						147204	147204					
X9Y9-MN	I	60	76	2	9120	2	-	-	-	-	-	-	18240
	II	60	76	0.75	-	-	-	-	3420	2.25	7695	7695	-
	III	60	76	6	27360	2	54720	54720	-	-	-	-	-
	IV	60	76	6	27360	2	54720	54720	-	-	-	-	-
	V	60	76	3	13680	2	27360	27360	-	-	-	-	-
	Total						136800	136800	-	-	7695	7695	18240
Grand Total							2894176	2894176	-	-	92715	92715	219768

Table-17

C. Mineral Resources locked up in benches (221)								
Section	Bench	Perimeter Length(m)	Width(m)	Depth(m)	Volume (cum)	Bulk Density	ROM (Ts)	Limestone @ 100% Recovery (Ts)
X3Y3-IJ	II	320	7	4	8960	2	17920	17920
X4Y4-IJ	II	300	7	2	4200	2	8400	8400
X5Y5-IJ	II	214	7	6	8988	2	17976	17976
	III	218	17	4	14824	2	29648	29648
X6Y6-IJ	II	170	7	6	7140	2	14280	14280
	III	148	17	4	10064	2	20128	20128
X6Y6-KL	II	100	7	6	4200	2	8400	8400
	III	100	17	4	6800	2	13600	13600
X7Y7-IJ	II	288	7	6	12096	2	24192	24192
	III	299	17	4	20332	2	40664	40664
X8Y8-CD	II	125	7	6	5250	2	10500	10500
X9Y9-GH	II	287	7	6	12054	2	24108	24108
	III	264	17	4	17952	2	35904	35904
X9Y9-IJ	II	316	7	6	13272	2	26544	26544
	III	290	17	4	19720	2	39440	39440
Total							331704	331704

Table-18

D. Mineral resources locked up in 7.5m & 50m safety distance (222)											
Section	Area Sq.m	Depth in (m)	Limestone				Limekankar				Topsoil (Ts)
			Volume in (Cu.m.)	Bulk Density	ROM (Ts)	Limestone @ 100% Recovery (Ts)	Volume in (Cu.m.)	Bulk Density	ROM (Ts)	Limekankar @ 100% Recovery (Ts)	
-	34615	2	69230	2	-	-	-	-	-	-	138460
	34615	0.75	-	-	-	-	25961	2.25	58413	58413	-
	34615	15	519225	2	1038450	1038450	-	-	-	-	-
	Total				1038450	1038450	-	-	58413	58413	138460
X3Y3-IJ	846	11	9306	2	18612	18612	-	-	-	-	-
	Total				18612	18612	-	-	-	-	-
X4Y4-IJ	798	13	10374	2	20748	20748	-	-	-	-	-
	Total				20748	20748	-	-	-	-	-

X5Y5-IJ	1098	5	5490	2	10980	10980	-	-	-	-	-
	Total				10980	10980	-	-	-	-	-
X5Y5-KL	600	5	3000	2	6000	6000	-	-	-	-	-
	Total				6000	6000	-	-	-	-	-
X6Y6-IJ	1256	5	6280	2	12560	12560	-	-	-	-	-
	Total				12560	12560	-	-	-	-	-
X6Y6-KL	1485	5	7425	2	14850	14850	-	-	-	-	-
	Total				14850	14850	-	-	-	-	-
X7Y7-IJ	750	5	3750	2	7500	7500	-	-	-	-	-
	Total				7500	7500	-	-	-	-	-
X9Y9-IJ	3694	3	11082	2	22164	22164	-	-	-	-	-
	Total				22164	22164	-	-	-	-	-
Grand Total					1151864	1151864			58413	58413	138460

Table-19

D. Mineral resources locked up in 7.5m & 50m safety distance (221)											
Section	Area Sq.m	Depth in (m)	Limestone				Limekankar				Topsoil (Ts)
			Volume in (Cu.m.)	Bulk Density	ROM (Ts)	Limestone @ 100% Recovery (Ts)	Volume in (Cu.m.)	Bulk Density	ROM (Ts)	Limekankar @ 100% Recovery (Ts)	
X3Y3-IJ	846	2	1692	2	-	-	-	-	-	-	3384
	846	0.75	-	-	-	-	635	2.25	1428	1428	-
	846	4	3384	2	6768	6768	-	-	-	-	-
	Total				6768	6768	-	-	1428	1428	3384
X4Y4-IJ	798	2	1596	2	-	-	-	-	-	-	3192
	798	0.75	-	-	-	-	599	2.25	1347	1347	-
	798	2	1596	2	3192	3192	-	-	-	-	-
	Total				3192	3192	-	-	1347	1347	3192
X5Y5-IJ	1098	2	2196	2	-	-	-	-	-	-	4392
	1098	0.75	-	-	-	-	824	2.25	1853	1853	-
	1098	10	10980	2	21960	21960	-	-	-	-	-
	Total				21960	21960	-	-	1853	1853	4392
X5Y5-KL	600	2	1200	2	-	-	-	-	-	-	2400
	600	0.75	-	-	-	-	450	2.25	1013	1013	-
	600	10	6000	2	12000	12000	-	-	-	-	-
	Total				12000	12000	-	-	1013	1013	2400
X6Y6-IJ	1256	2	2512	2	-	-	-	-	-	-	5024
	1256	0.75	-	-	-	-	942	2.25	2120	2120	-

		1256	10	12560	2	25120	25120	-	-	-	-	-
		Total				25120	25120	-	-	2120	2120	5024
X6Y6-KL		1485	2	2970	2	-	-	-	-	-	-	5940
		1485	0.75	-	-	-	-	1114	2.25	2506	2506	-
		1485	10	14850	2	29700	29700	-	-	-	-	-
		Total				29700	29700	-	-	2506	2506	5940
X7Y7-IJ		750	2	1500	2	-	-	-	-	-	-	3000
		750	0.75	-	-	-	-	563	2.25	1266	1266	-
		750	10	7500	2	15000	15000	-	-	-	-	-
		Total				15000	15000	-	-	1266	1266	3000
X8Y8-CD		686	2	1372	2	-	-	-	-	-	-	2744
		686	0.75	-	-	-	-	515	2.25	1158	1158	-
		686	15	10290	2	20580	20580	-	-	-	-	-
		Total				20580	20580	-	-	1158	1158	2744
X9Y9-CD		424	2	848	2	-	-	-	-	-	-	1696
		424	0.75	-	-	-	-	318	2.25	716	716	-
		424	15	6360	2	12720	12720	-	-	-	-	-
		Total				12720	12720	-	-	716	716	1696
X9Y9-GH		2020	2	4040	2	-	-	-	-	-	-	8080
		2020	0.75	-	-	-	-	1515	2.25	3409	3409	-
		2020	15	30300	2	60600	60600	-	-	-	-	-
		Total				60600	60600	-	-	3409	3409	8080
X9Y9-IJ		3694	2	7388	2	-	-	-	-	-	-	14776
		3694	0.75	-	-	-	-	2771	2.25	6234	6234	-
		3694	12	44328	2	88656	88656	-	-	-	-	-
		Total				88656	88656	-	-	6234	6234	14776
Grand Total						296296	296296	-	-	23046	23046	54628

Table-20

Summary of Reserves & Resources

Description	Section	ROM (Ts)	Limestone @ 100% Recovery (Ts)	ROM (Ts)	Limekankar @ 100% Recovery (Ts)	Topsoil (Ts)
A. Mineral Reserves (111)	X8Y8-CD	9288	9288	1863	1863	5880
	X9Y9-GH	160446	160446	14000	14000	37296
	X3Y3-IJ	94128	94128	21738	21738	55692
	X4Y4-IJ	60000	60000	26325	26325	65600
	X5Y5-IJ	242000	242000	21600	21600	52400
	X5Y5-KL	148320	148320	14588	14588	36848
	X6Y6-IJ	138800	138800	12825	12825	31600
	X6Y6-KL	139480	139480	13667	13667	34960
	X7Y7-IJ	304800	304800	28013	28013	68800
	X9Y9-IJ	471048	471048	37007	37007	91344
Total		1768310	1768310	191626	191626	480420
B. Mineral Resources (222)		2894176	2894176	92715	92715	219768
C. Mineral Resources locked up in benches (221)		331704	331704	-	-	-
D. Mineral resources locked up in 7.5m & 50m safety distance	222	1151864	1151864	58413	58413	138460
	221	296296	296296	23046	23046	54628
	Total	1448160	1448160	81459	81459	193088

The Mineral reserves still available in this mine would be 17,68,310 tonnes of Limestone, 1,91,626 tonnes of Limekankar.

I) Mineral Reserves/Resources:

Mineral Resources: (Mineral resources may be estimated purely based on level of exploration, with reference to the threshold value of minerals declared by IBM)

Table-21

Level of exploration	Resources in Million tons		Grade
	Limestone	Limekankar	
G1 – Detailed exploration	2.396	0.215	Cement grade
G2 – General Exploration	4.046	0.151	-
G3 – Prospecting	-	-	-
G4 – Reconnaissance	-	-	-

Table-22

	UNFC code	Quantity in million tons		Grade
		Limestone	Limekankar	
A.Total Mineral Reserve				
Proved Mineral Reserve	111	1.768	0.192	Cement grade
Probable Mineral Reserve	121 and 122	-	-	-
B.Total Remaining Resources				
Feasibility mineral Resource	211	-	-	-
Prefeasibility mineral resource	221 and 222	4.674	0.174	Cement grade
Measured mineral resource	331	-	-	-
Indicated mineral resource	332	-	-	-
Inferred mineral resource	333	-	-	-
Reconnaissance mineral resource	334	-	-	-
Total Reserves + Resources		6.442	0.366	Cement grade

2.0 MINING:**A. OPEN CAST MINING:****a) Briefly describe the existing as well as proposed method for excavation with all design parameters indicating on plans /sections:**

The mining operations are proposed to be carried out by "A Category" Method. Excavators will be deployed for the formation of benches and loading. Rock breaker is proposed for development & production activities. Neither drilling nor blasting is carried out.

One bench is proposed on the topsoil with 2.0m height and width with 45° slope.

In Limekankar mineral one bench is proposed with 0.75m height and width with 60° slope.

In Limestone mineral two benches are proposed with 6m height and 6m width and another one bench is proposed with 3m height and 3m with 60° slope.

During the mining plan period, the mining operations are proposed to be carried out in the North, Centre & Eastern portion of the area applied for Mining lease starting from West and progress towards the Eastern side by open cast method with 6m bench height and 6m bench width for a limestone mineral upto a depth of 8.75mts with an average of 0.75m limekankar and 2.0m Topsoil from RL 55.0m to RL 46.25m. Please refer Plate Nos. VA to VE1.

The proposed average annual production Limestone will be 2,23,800 tonnes and Limekankar will be 38,325 tonnes with 300 working days in a year.

The applicant assures to carry out the detailed Exploration as per the UNFC Norms in the first year of Mining Plan period itself (i.e. after the grant of mining lease). If the Resource & Reserves are enhanced considerably, a modified mining plan will be prepared and submitted to IBM for subsequent clearance & approval.

The topsoil generated is proposed to be dumped in the Southwestern side of the area applied for Mining lease and also will be utilized for afforestation purposes.

Proper footpaths and haul roads are provided wherever necessary for easy access of men. Haul roads for movement of tippers with crossing platforms are provided to conform to statutory standards.

Adequate safety precautions have been taken as per MMR, 1961 to safeguard the nearby residence. Moreover, no drilling and no blasting operation is adopted since the applicant has proposed to use rock breaker.

Afforestation is proposed on the north, east, south & western side of the 7.5m & 50m boundary barrier.

If there is any change in the system of mining, the same will be intimated to Indian Bureau of Mines and the mining plan will be suitably modified for subsequent clearance and approval.

The year wise production and development schedule proposed for the present mining plan period under (UNFC 111) is tabulated below:

Table-23

Yearwise Production Details																
Year	Section	Bench	Length in (m)	Width in (m)	Depth in (m)	Limestone				Limekankar				Topsoil	Location of advancement	Ore to Overburden ratio
						Volume in (Cu.m.)	Bulk Density	ROM (Ts)	Limestone @ 100% Recovery (Ts)	Volume in (Cu.m.)	Bulk Density	ROM (Ts)	Limekankar @ 100% Recovery (Ts)			
I Year	X3Y3-IJ	I	119	117	2	27846	2	-	-	-	-	-	-	55692	West-East	1;1.06
		II	113	114	0.75	-	-	-	-	9662	2.25	21738	21738	-		
		III	106	111	4	47064	2	94128	94128	-	-	-	-	-		
	X4Y4-IJ	I	164	100	2	32800	2	-	-	-	-	-	-	65600		
		II	156	100	0.75	-	-	-	-	11700	2.25	26325	26325	-		
	X5Y5-IJ	I	131	100	2	26200	2	-	-	-	-	-	-	52400		
		II	128	97	0.75	-	-	-	-	9312	2.25	20952	20952	-		
		Total						94128	94128	-	-	69015	69015	173692		
II Year	X4Y4-IJ	III	150	100	2	30000	2	60000	60000	-	-	-	-	-		1;0.30
	X5Y5-IJ	II	128	3	0.75	-	-	-	-	288	2.25	648	648	-		
		III	125	100	6	75000	2	150000	150000	-	-	-	-	-		
	X5Y5-KL	I	98	94	2	18424	2	-	-	-	-	-	-	36848		
		II	95	91	0.75	-	-	-	-	6484	2.25	14588	14588	-		
		III	92	88	6	48576	2	97152	97152	-	-	-	-	-		
	X6Y6-IJ	I	79	100	2	15800	2	-	-	-	-	-	-	31600		
		II	76	97	0.75	-	-	-	-	5529	2.25	12440	12440	-		
	X6Y6-KL	I	92	95	2	17480	2	-	-	-	-	-	-	34960		
		II	89	91	0.75	-	-	-	-	6074	2.25	13667	13667	-		
Total							307152	307152	-	-	41344	41344	103408			
III Year	X6Y6-IJ	II	76	3	0.75	-	-	-	-	171	2.25	385	385	-		1;0.21
		III	73	100	6	43800	2	87600	87600	-	-	-	-	-		
	X6Y6-KL	III	86	88	6	45408	2	90816	90816	-	-	-	-	-		
		I	172	100	2	34400	2	-	-	-	-	-	-	68800		
	X7Y7-IJ	II	166	100	0.75	-	-	-	-	12450	2.25	28013	28013	-		
		III	100	100	6	60000	2	120000	120000	-	-	-	-	-		
		Total						298416	298416	-	-	28397	28397	68800		
IV Year	X7Y7-IJ	III	60	100	6	36000	2	72000	72000	-	-	-	-	-	1;0.40	
	X9Y9-IJ	I	173	132	2	45672	2	-	-	-	-	-	-	91344		
		II	170	129	0.75	-	-	-	-	16448	2.25	37007	37007	-		
		III	80	126	6	60480	2	120960	120960	-	-	-	-	-		
		Total						192960	192960	-	-	37007	37007	91344		
V Year	X9Y9-IJ	III	87	132	6	68904	2	137808	137808	-	-	-	-	-	1;0.18	
	X9Y9-GH	I	126	74	2	18648	2	-	-	-	-	-	-	37296		
		II	122	68	0.75	-	-	-	-	6222	2.25	14000	14000	-		

	X8Y8-CD	III	119	62	6	44268	2	88536	88536	-	-	-	-	-		
		I	49	30	2	2940	2	-	-	-	-	-	-	5880		
		II	46	24	0.75	-	-	-	-	828	2.25	1863	1863	-		
		Total						226344	226344	-	-	15863	15863	43176		
Grand Total								1119000	1119000	-	-	191626	191626	480420		1;0.37

Table-24
Summary of Yearwise [1 st year to 5 th year]

Year	Limestone		Limekankar		Topsoil (Ts)	Ore to Overburden ratio
	ROM (Ts)	Limestone @ 100% Recovery (Ts)	ROM (Ts)	Limekankar @ 100% Recovery (Ts)		
I Year	94128	94128	69015	69015	173692	1;1.06
II Year	307152	307152	41344	41344	103408	1;0.30
III Year	298416	298416	28397	28397	68800	1;0.21
IV Year	192960	192960	37007	37007	91344	1;0.40
V Year	226344	226344	15863	15863	43176	1;0.18
Total	1119000	1119000	191626	191626	480420	1;0.37

b) Indicate year-wise tentative Excavation in Cubic Meters indicating development, ROM, pit wise as in table below:

I. Insitu Tentative Excavation:

Table-25

Year	Pit No.	Total tentative excavation (cum)		Topsoil (cum)	SB/IB (cum)	ROM in (cum)		Ore to Overburden ratio
		Limestone	Limekankar			Recoverable Reserves @100% of Limestone	Limekankar @ 100% Recovery	
1	2	3	4	5	6	7	8	9
I Year	-	47064	30674	86846	-	47064	30674	1;1.06
II Year		153576	18375	51704	-	153576	18375	1;0.30
III Year		149208	12621	34400	-	149208	12621	1;0.21
IV Year		96480	16448	45672	-	96480	16448	1;0.40
V Year		113172	7050	21588	-	113172	7050	1;0.18
Total		559500	85167	240210	-	559500	85167	1;0.37

II. Dump rehandling (for the purpose of recovery of mineral):

Estimated available material (Cum):

Table-26

Dump Identification / No.	Yearwise handling (Cum)	Estimated recovery of saleable Material (Cum)	Reject (Cum)
Nil	Nil	Nil	Nil

It is a fresh mining lease applied area. Hence, re-handling of waste dumps does not arise at present.

c) Enclose Individual year wise development plans and sections showing pit layouts, dumps, stacks of mineral reject, if any, etc in case of 'A' category mines. Composite development plans showing pit layouts, dumps, stacks of mineral reject, if any, etc. and year wise sections in case of 'B' category mines:

Please refer Plate Nos. VA to VE1.

d) Describe briefly giving salient features of the proposed method of working indicating Category of mine:

The mining operations are proposed to be carried out by "A Category" Method. Excavators will be deployed for the formation of benches and loading. Rock breaker is proposed for development & production activities. Neither drilling nor blasting is carried out.

Please refer to the yearwise production and development plan and section (Plate Nos. VA to VE1).

Extent of Mechanization:

Excavators are proposed for the formation of benches and loading. Rock breaker is proposed for development activities.

Table - 27

Type	Nos.	Bucket capacity in Cu.m	Make	Motive Power	H.P.
Hydraulic excavator attached with rock breaker	2	0.6 CUM	TATA Hitachi	Diesel	900

Table - 28

Type	Nos.	Size/Capacity	Make	Motive power	H.P
Taurus	6	20 tonnes	Leyland	Diesel	90

A list of mining machinery under use/proposed along with projected norms of performance/output for individual main items of equipment/machinery.

Mining is by "A" Category Method. Machinery is deployed for mining of Limekankar & Limestone for mine development and bench formation, only Taurus of 20 tonnes capacity are used for transporting the ROM from the pit head to the plant and to the yard.

e) Describe briefly the layout of mine workings, pit road layout, the layout of faces and sites for disposal of overburden/waste along with ground preparation prior to disposal of waste, reject etc. A reference to the plans and sections may be given. UPL or ultimate size of the pit is to be shown for identification of the suitable dumping site:

Layout of mine workings:

Land utilization proposed to be carried out for first five years is given below:

Table-29

S.No	Description	Present Area (Ha)	Additional Area required during the Mining Plan Period (Ha) [I st year to V th year]	Area at the end of mining plan period (Ha)
1	Mining	Nil	11.76.3	11.76.3
2.	Dump	Nil	01.51.4	01.51.4
3.	Office & infrastructure	Nil	00.05.0	00.05.0
4.	Processing plant	Nil	-	-
5.	Mineral stack processing yard	Nil	-	-
6.	Sub grade mineral stacks	Nil	-	-
7.	Mine roads	Nil	00.10.0	00.10.0
8.	Areas under plantation	Nil	03.10.9	03.10.9
9.	Un utilized area	22.96.0	06.42.4	06.42.4
10.	Total	22.96.0	22.96.0	22.96.0

Layout of mine workings, for first five year is shown in Plate No VI.

f) Conceptual Mine planning upto the end of lease period taking into consideration the present available reserves and resources describing the excavation, recovery of ROM, Disposal of waste, backfilling of voids, reclamation and rehabilitation showing on a plan with few relevant sections:

ii. Exploration:

i). Primary data:

The area has been already regionally explored by Geological Survey of India (1985), State Department of Geology and Mining (1993).

ii). Secondary data:

For preparing this mining plan, detailed studies were carried out based on the Diamond Drills in the mining lease applied area. The occurrence and distribution of the mineral of clearly visible based on the exploration work carried out by the State Department of Geology and Mining in the years 1984 & 1994.

The diamond drills (Phase-III & Phase-V) logging datas are furnished below:

Table-30

No. of Diamond drills	Depth of Diamond drills (m)	Depth of deposition	Strata
PD/4-2	6.75	55.00m – 53.00m	Topsoil
		53.00m – 52.25m	Kankar
		52.25m – 48.25m	Limestone
PPM-4	12.75	55.00m – 53.00m	Topsoil
		53.00m – 52.25m	Kankar
		52.25m – 42.25m	Limestone
PPM-13	12.75	55.00m – 53.00m	Topsoil
		53.00m – 52.25m	Kankar
		52.25m – 42.25m	Limestone
PPM-19	17.75	55.00m – 53.00m	Topsoil
		53.00m – 52.25m	Kankar
		52.25m – 37.25m	Limestone
PD/4-3	12.75	55.00m – 53.00m	Topsoil
		53.00m – 52.25m	Kankar
		52.25m – 42.25m	Limestone
PD/4-4	14.75	55.00m – 53.00m	Topsoil
		53.00m – 52.25m	Kankar
		52.25m – 40.25m	Limestone

Locations of drilled core drills are marked in the geological plan and sections and year wise plan and sections (Refer Plate No.IV, VA & VA1).

Copy of the Exploration report, chemical analysis report & Bore hole map are enclosed as Annexure Nos.IV & IVA.

Based on the Diamond drills made in the applied area all the datas required for exploration studies were carried out related to G1, E1 & F1 axis as per United Nations Framework Classification System to calculating reserves and resources and to arrive UNFC 111 category.

Reserves are calculated based on the drilled core drills data, adjacent mine pit nullah, vari and reservoir. Hence the deposit has been estimated upto 17.75m depth with an average of 2.0m topsoil and 0.75m Limekankar during the present mining plan period.

Table-31

Depth of estimation of the reserves and resources during the Mining plan period:

17.75m [2.0m Topsoil + 0.75m Limekankar + 15m Limestone (proved 111)]	Northeast & East
17.75m [2.0m Topsoil + 0.75m Limekankar + 10m Limestone (proved 111) + 3m Limestone (probable 222)]	Centre
17.75m [2.0m Topsoil + 0.75m Limekankar + 15m Limestone (probable 222)]	Southeast, Northwest, West, South & Southwest

Proposed to be carried out:

As per the UNFC guidelines, the applicant has proposed to carry out the exploration program during the first year 23 Core drills (PBh-1 to PBh-23) of the mining plan period after the grant of mining lease. Now in this mining plan the reserves are calculated based on the old Diamond drills made in the area applied for Mining lease. After carrying out the exploration studies in the first year of the mining plan period the exact resource and reserves as per the UNFC norms will be calculated and the same will be discussed in detail in the modified mining plan.

During the mining plan period, the mining operations are proposed to be carried out in the North, Centre & Eastern portion of the area applied for Mining lease starting from West and progress towards the Eastern side by open cast method with 6m bench height and 6m bench width for a limestone mineral upto a depth of 8.75mts with an average of 0.75m limekankar and 2.0m Topsoil from RL 55.0m to RL 46.25m. Please refer plate nos. VA to VE1.

i) Recovery of ROM:

The area applied for Mining lease consists of 22.96.0 Ha, after leaving 7.5m, 10m & 50m boundary barrier only 10.33.2 Ha could be mined. Out of this only 11.76.3Ha is proposed for an optimum depth of maximum 8.75m from RL 55.0m to RL 46.25m has been taken into consideration for the utilization of the mineral in the mining plan period, keeping in the view of mineral conservation, preservation and development. Anticipating the market demand this present quantity of exploitation is proposed during the present mining plan period.

Table-32

Available mineral reserves ROM		Limestone	Limekankar
UNFC 111 (re-assessed on 05.08.2019)		1768310 Ts	191626 Ts
Proposed annual production ROM		223800 Ts	38325 Ts
Anticipated life of the mine		1768310 / 223800	191626 / 38325
		7.9 years	5.0 years
No. of working days in a year		300 Days	
Average Monthly production Minerals		223800/12	38325/12
		18650	3193.8
Anticipated Daily production of Minerals		18650/25	3193.8/25
		746 Ts	127.75 Ts
No. of working hours per day		8.00 AM to 5.00 PM with 1 hour lunch interval (12 Pm To 1 Pm)	
Total no. of labours to be engaged		13	
OMS	Daily production of Minerals	746 Ts	127.75 Ts
	No. of workers	13	13
OMS =		57.38 Ts	9.83 Ts

Geological plans and sections:

Geological plan and sections in the scale of 1:2000 was prepared based on the surface plan (which was carried out with help of total station survey 1:2000 scale) to attribute all the geological parameters. Please refer plate Nos. IV & IVA for geological plan and sections.

The ultimate pit dimensions will be as under:

Table -33

Dimensions	Present size of pit	Size of pit after first five years	Ultimate pit dimensions at the end of life of the mine
Length (m)	-	652 (max)	652 (max)
Width (m)	-	358 (max)	358 (max)
Depth (m)	-	8.75 (max)	17.75 (max)

Please refer Plate Nos. IX & IXA.

ii) Disposal of waste:

There is no mineral reject, the entire lease area consists of whole area deposit. Hence quantities of generation of mineral rejects in this area applied for mining lease does not arise.

The generation of topsoil during the present plan period will be temporarily dumped on the southwestern portion of the area and also utilized for Afforestation purposes. This aspect has been considered and accordingly Conceptual Mining Plan is drawn.

Proposed generation of waste for First Five Years:

Table-34

Year	Limestone	Limekankar	Topsoil (Ts)	Ore to Overburden ratio
	ROM (Ts)	ROM (Ts)		
I Year	94128	69015	173692	1;1.06
II Year	307152	41344	103408	1;0.30
III Year	298416	28397	68800	1;0.21
IV Year	192960	37007	91344	1;0.40
V Year	226344	15863	43176	1;0.18
Total	1119000	191626	480420	1;0.37

Dimension of the waste dumps during the present mining plan period:*Dimension of the dumps at the end of the I Year:*

Table-35

Proposed Topsoil Temporary Dump	128m X 126m X 5.38m(h)	Southwest
---------------------------------	------------------------	-----------

Dimension of the dumps at the end of the II Year:

Table-36

Proposed Topsoil Temporary Dump	128m X 126m X 8.59m(h)	Southwest
---------------------------------	------------------------	-----------

Dimension of the dumps at the end of the III Year:

Table-37

Proposed Topsoil Temporary Dump	128m X 126m X 10.72m(h)	Southwest
---------------------------------	-------------------------	-----------

Dimension of the dumps at the end of the IV Year:

Table-38

Proposed Topsoil Temporary Dump	128m X 126m X 13.55m(h)	Southwest
---------------------------------	-------------------------	-----------

Dimension of the dumps at the end of the V Year:

Table-39

Proposed Topsoil Temporary Dump	128m X 126m X 14.89m(h)	Southwest
---------------------------------	-------------------------	-----------

The quantities of generation of wastes at the end of the mine life of the mine:

Table-40

Category	Limestone ROM (Ts)	Limekankar ROM (Ts)	Top Soil (Ts)
Proved 111	1768310	191626	480420

There is no mineral reject, the entire lease area consists of whole area deposit. Hence quantities of generation of mineral rejects in this area applied for mining lease does not arise. The generation of topsoil during the present plan period will be temporarily dumped on the southwestern portion of the area and also utilized for Afforestation purposes.

Dimension of dumps during the end of the life of the mine:

Table-41

Proposed Topsoil Temporary Dump	128m X 126m X 14.89m(h)	Southwest
---------------------------------	-------------------------	-----------

The waste does not consists any toxic substance in the form of solid, liquid and gas.

iii) Backfilling of voids:

There is no proposal for backfilling the mined out pit in this mining plan period.

iv) Reclamation and rehabilitation:

It is a fresh mining lease applied area. Reclamation and rehabilitation will be carried out at the end of the life of the mine. The mined out pit is proposed to be used as small reservoir for storing much needed rainwater at the end of the life of the mine when the mine reaches its ultimate pit limit. Since the surrounding areas are dry and experiences low rainfall, any amount of storage of water will be beneficial for recharging the groundwater in the adjacent areas. These proposals are only tentative.

B. UNDERGROUND MINING:

Not applicable.

3.0 MINE DRAINAGE:***a) Minimum and maximum depth of water table based on observations from nearby wells and water bodies:***

The area receives rains only during North-East monsoon. The average annual rainfall in and around this area is 1071.4mm. There would not be any serious problem due to inundation. The water table is found at a depth of 35m in rainy season and at 38m in summer. The depth of water table fluctuation is verified by observing the water levels in the above seasons in the nearby wells.

Since the water table is below 35m, the mining activity will not have any impact on drainage. However, in the rainy season, there may be seepage of water. To pump-out the seepage and rain water, a 5 HP Diesel Pump will be kept ready. This pump will be provided at the deepest level (sump) of the working face to collect the water. Suitable earthen bunds will be formed around the area to protect the entry of rain water from outside.

d) Indicate maximum and minimum depth of Workings:

It is a fresh applied area for Mining Lease. It is proposed to carry out the mining operations to a depth of about only 8.75m from RL 55.0m to RL 46.25m. The water table in this area is found at the depth of 35m during rainy seasons.

Depth of the pit at present (maximum) : Nil

Average Depth proposed during the mining plan period : 8.75m [from RL 55.0m to RL 46.25m]

e) Quantity and quality of water likely to be encountered, the pumping arrangements and places where the mine water is finally proposed to be discharged:

The mining operation for the mining plan period is proposed to restrict well above the water table. Hence, the water is not likely to encounter during the course of mining operations. The water table is found at the depth of 35m in the rainy season and 38m in the summer. The water table fluctuation is verified by observing the water level in the nearby wells.

d) Describe regional and local drainage pattern. Also indicate annual rain fall, catchments area, and likely quantity of rain water to flow through the lease area, arrangement for arresting solid wash off etc.:

The rain water flow towards catchment area is not flowing through the area applied for Mining lease as garland drains are proposed to be constructed around the area applied for Mining lease. Hence, solid wash off will not occur.

4.0 STACKING OF MINERAL REJECT /SUB GRADE MATERIAL AND DISPOSAL OF WASTE:

a) Indicate briefly the nature and quantity of top soil, overburden / waste and Mineral Reject to be disposed off:

(i) Nature and quality of Topsoil:

The topsoil is black cotton soil. It occurs to a depth of 2m. About 4,80,420 Ts of topsoil would be generated during the present plan period is proposed to be dumped on the Southwestern portion of the lease applied area and also utilized for afforestation purposes.

(ii) Nature of Overburden:

Topsoil & Limekankar is the overburden found in the area applied for Mining lease.

(iii) Mineral waste likely to be generated during the mining plan period:

There is no Mineral reject, the entire lease area consists of whole area deposit. Hence quantities of generation of mineral rejects in this area applied for mining lease does not arise.

The generation of topsoil during the present plan period will be temporarily dumped on the southwestern portion of the area and also utilized for Afforestation purposes.

Table-41A

Year	Topsoil (cum)		Mineral rejects (cum)			
	Reuse / spreading	Storage	Backfilling	Storage	Blending	Beneficial
I Year	86846	-	-	-	-	-
II Year	51704	-	-	-	-	-
III Year	34400	-	-	-	-	-
IV Year	45672	-	-	-	-	-
V Year	21588	-	-	-	-	-
Total	240210	-	-	-	-	-

b) The proposed dumping ground within the lease area be proved for presence or absence of mineral and be outside the UPL unless simultaneous backfilling is proposed or purely temporary dumping for a short period is proposed in mineralized area with technical constraints & justification:

It is a fresh lease applied area for mining lease. Hence, re-handling of waste dumps does not arise at present.

c) Attach a note indicating the manner of disposal of waste, configuration and sequence of year wise build up of dumps along with the proposals for protective measures:

There is no generation of Mineral reject during present plan period. The topsoil generated during the present plan period will be loaded into the proposed temporary dump area. The slope of the dump is always maintained below 30°. Proper haul roads and slopes are maintained in the dump for the transportation of vehicles. The proposed year wise dumps are marked in the year wise development production plan Plate Nos. VA to VE.

5.0 USE OF MINERAL AND MINERAL REJECT:-**a) Describe briefly the requirement of end-use industry specifically in terms of physical and chemical composition:**

The entire mined out Limekankar & Limestone is of uniform grade suitable for cement industries and is proposed to be utilized as raw material for cement manufacturing in the company's own captive plant which is located at Ariyalur District which is at a distance of about 10-15km from the applied area. No sub-grade mineral is encountered.

Operating Cost:

Table-42

S.No.	Particulars	Cost of production Per ton
1.	Labour charges	Rs.65
2.	Royalty paid to Mines & Geology	Rs.80
3.	Taxes (NMET & TCS)	Rs.3.2
4.	District Mineral Foundation (DMF)	Rs.24
5.	Excavation expenses	Rs.35
6.	Transport from mine head to Stockyard (loading & unloading)	Rs.40
7.	Miscellaneous and over heads	Rs.10
	Total	Rs.257.2

The cost of production is Rs. 257/ton. Hence, the mining is economically viable at present market conditions.

Plant details:

The company has set up a cement plant at Ariyalur District, Tamil Nadu. The cement plant is located at a distance of about 3.0km Northeast of Ariyalur. The plant is well connected by road with major towns and cities.

Limestone being the main raw material, the Company acquired and reserved enough limestone bearing lands in and around Ariyalur and Alangulam which are sufficient to run the cement plants.

The installed capacity of the Ariyalur cement unit is 5 lakh tonnes per annum. It is a modern dry process plant. TANCEM is modernising the capacity of Ariyalur Works from 5 lakh tones per annum to 15 lakh tones per annum.

b) Give brief requirement of intermediate industries involved in upgradation of mineral before its end-use:

No up gradation is done.

c) Give detail requirements for other industries, captive consumption, export, associated industrial use etc.:

It is not exported to any foreign countries. The entire mined out Limekankar & Limestone is of cement grade and is proposed to be utilized for manufacturing of cement in the company's own captive plant.

d) Indicate precise physical and chemical specification stipulated by buyers:

Limekankar & Limestone is not for sale. The mined Limekankar & Limestone is proposed to be used for the own plant in located at a distance of about 10-15km from the applied area.

e) Give details of processes adopted to upgrade the ROM to suit the user requirements:

No up gradation is done.

6.0 PROCESSING OF ROM AND MINERAL REJECT:

The mined out Limekankar & Limestone will be utilized completely for its captive plant. No processing is involved.

7.0 OTHER:

Describe briefly the following:

a) Site services:

Infrastructure facilities in the form of office, storeroom, first aid room, restroom, toilet etc. are proposed to be constructed in temporary semi permanent structure within the area applied for mining lease. Please refer Plate No. VI.

b) Employment potential:

The details of proposed employment are given below.

Most of the workers in this area are agricultural workers. Mining is done here as a seasonal occupation. Mining is proposed to be carried out by opencast method. 300 days in a year are assumed as effective working days.

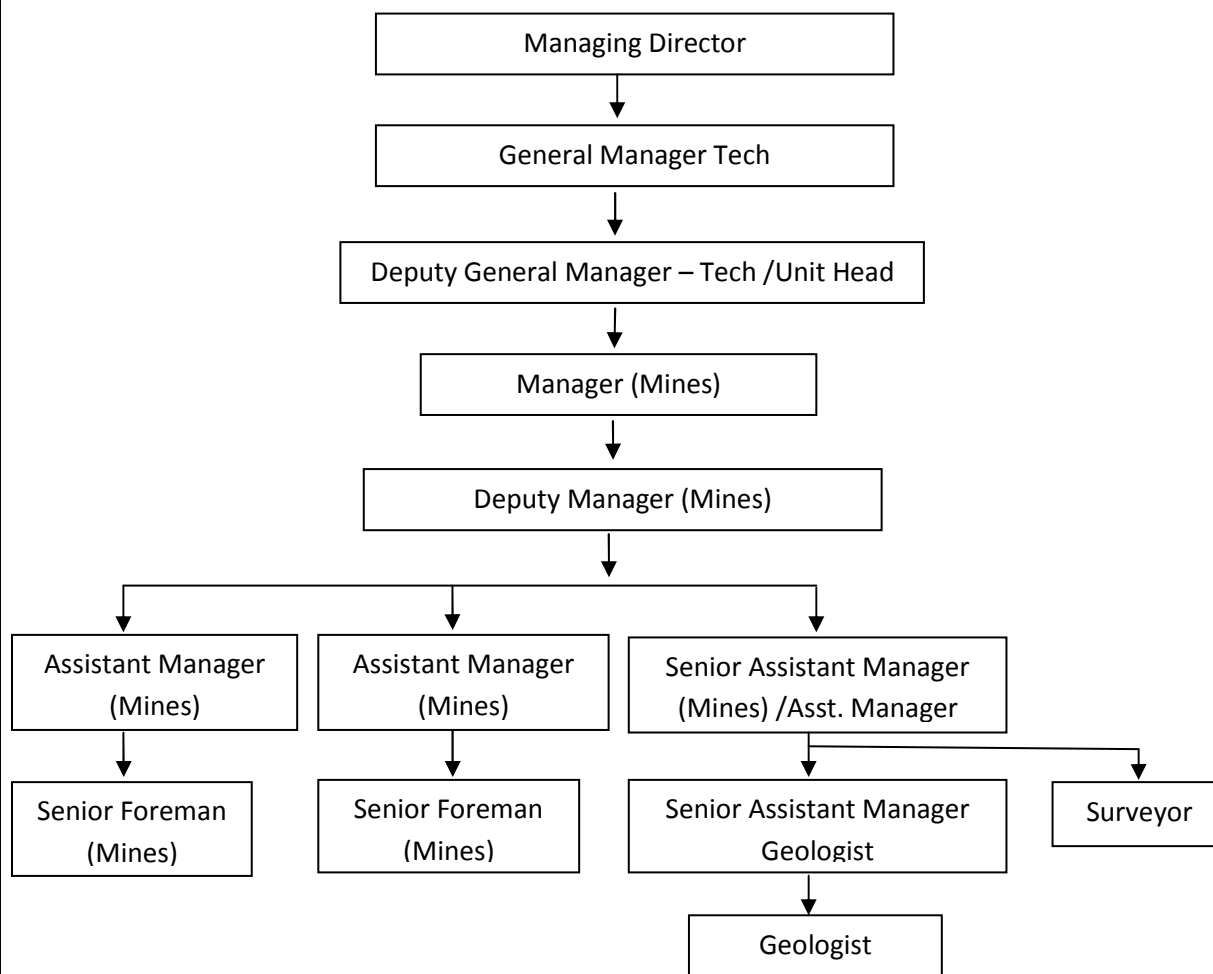
Table -43

Proposed Employment position		Additional requirements during the MP period
Mines Manager	1	-
Mining engineer	1	-
Geologist	1	-
Mine Foreman	1	-
Mines Office Clerk(full time)	1	-
Skilled Labour (Mate/Supervisor)	1	-
Semi-Skilled (Drivers & Operators)	5	-
Un skilled Labour	2	-
Total	13	-

The proposed output per man shift:

Table-44

Description		Limestone		Limekankar	
Average Mineral Production expected per year for the first five years		223800Ts		38325Ts	
No. of days likely to be worked		300 days			
Average Mineral production per day under UNFC 111 for insitu deposit		746 Ts		127.75 Ts	
OMS =	Daily Production in Ts	746	= 57.38 Ts	127.75	= 9.83 Ts
	No. of Workers	13		13	

ORGANISATION CHART**8.0 PROGRESSIVE MINE CLOSURE PLAN UNDER RULE 23 OF MCDR'2017:**

8.1 Environment Base line information: Attach a note on the status of baseline information with regard to the following:

(i) Existing Land Use Pattern:

The area is a plain terrain. The altitude of the area is 55.0m above MSL. The area is sloping towards southeast.

It is a dry land. Only seasonal cultivation is done in the surrounding area. In some areas, agriculture is done with lift irrigation. The main crops being cereals, pulses etc. The land use pattern in and around the mine have no adverse effect in the environment changes. An Environment Management Plan will be prepared if required.

The present land use pattern is as under:

Table -45

S.No	Description	Present Area (Ha)
1	Mining	Nil
2.	Dump	Nil
3.	Office & infrastructure	Nil
4.	Processing plant	Nil
5.	Mineral stack processing yard	Nil
6.	Sub grade mineral stacks	Nil
7.	Mine roads	Nil
8.	Areas under plantation	Nil
9.	Un utilized area	22.96.0
10.	Total	22.96.0

(ii) Water Regime:

The water table is found at 35m in rainy season and 38m in dry season the area receives rainfall during north-east monsoon, the average being 1071.4mm. The topsoil cover is to an average thickness of about 2.0m and is not fertile enough to sustain seasonal crops.

There will be no effluent discharge from mine. The Limekankar & Limestone mineral consisting of no chemical effluent and toxic elements. Eswaran Kovil Eri and vari are situated on the western side of the applied area 50m safety distance has been maintained. There is no other major Nullah, lake, reservoir or river nearby. The water is found to be potable and good for drinking which is available in the nearby community wells. Water samples are collected and analyzed as per statutory norms of IBM.

(iii) Air Quality:

Mining is proposed to be carried out with opencast method. Excavators are deployed for the formation of benches and loading. Rock breaker is proposed for development activities. Neither drilling nor blasting is proposed. The generation of the dust will be suppressed by means of water sprinkler from water tanker and the quantity of water requirement for this purpose is 5 KLD. The generation of dust during the course of drilling will be suppressed at source by means of wet drilling or dust extractors. The periodical environmental monitoring test has been proposed to carry out by the NABL laboratory.

(iv) Noise Level & Vibration Levels (Due To Blasting):

The noise producing sources are the tipper that will move from mine face to dump yards and excavator, rock breaker. But these noises will be only at intermittent period. The prevailing noise levels are well within standards prescribed. The workers and staff working near the mines will be exposed to noise levels is only minimal, during mining operation. There will be no noise pollution created. No drilling and blasting is proposed. Hence, the ground vibration will be minimal and well within the prescribed standards. Besides, ground vibration will be carried out as per the statutory standards.

(v) Flora and Fauna:

There is no thick vegetation except some bushes here and there and no existence of fauna.

(vi) Climatic Conditions:

The area exhibits a subtropical climate and the temperature that goes upto 42⁰C in summer and falls down to 27⁰C in December – January. The wind direction is NE-SW and vice-versa.

(vii) Human Settlement:

Basic amenities and local administrative office are found in Pudupalayam Village which is about 1.3kms Southwest from the area applied for Mining lease. The villages depend upon seasonal vegetation and most of the people are employed. The details regarding nearest hamlets and their population along with distance and direction from the area applied for Mining lease is furnished below:

Table -46

Sl. No.	Name of Hamlets	Distance in Km	Population	Direction
1	Reddipalayam	3.2	4150	NE
2	Periyathirukkonam	3.5	2750	SE
3	Pudupalayam	1.3	3650	SW
4	Periyanaalur	2.5	3600	N

(viii) Public Building, Places of worship and Monuments:

There are no Public Buildings or Places or National Monuments near the area.

(ix) Indicate any sanctuary is located in the vicinity of leasehold:

There are no sanctuaries near the area.

8.2 Impact Assessment: Attach an Environmental Impact Assessment Statement describing the impact of mining and beneficiation on environment on the following:

Mining in this area does not produce any harmful effluent, which will affect the atmosphere or water regime. However, the important factors in the Environment impact assessment statement include the following discussed below.

(i) Land area indicating the area likely to be degraded due to quarrying, dumping, roads, workshop, processing plant, tailing pond/dam, township etc.:

The area is a plain terrain surrounded by dry lands, there is no thick vegetation or population in and around the mine.

The present and post mining land use pattern is as under:

Table-47

S.No	Description	Present Area (Ha)	Additional Area required during the Mining Period (Ha) [I st year to V th year]	Area at the end of life of the mine (Ha)
1	Mining	Nil	11.76.3	11.76.3
2.	Dump	Nil	01.51.4	01.51.4
3.	Office & infrastructure	Nil	00.05.0	00.05.0
4.	Processing plant	Nil	-	-
5.	Mineral stack processing yard	Nil	-	-
6.	Sub grade mineral stacks	Nil	-	-
7.	Mine roads	Nil	00.10.0	00.10.0
8.	Areas under plantation	Nil	03.10.9	03.10.9
9.	Un utilized area	22.96.0	06.42.4	06.42.4
10.	Total	22.96.0	22.96.0	22.96.0

(ii) Air quality:

Mining is proposed to be carried out with opencast method. Excavators are deployed for the formation of benches and loading. Rock breaker is proposed for development activities. Neither drilling nor blasting is proposed. The generation of the dust will be suppressed by means of water sprinkler from water tanker and the quantity of water requirement for this purpose is 5 KLD. The generation of dust during the course of drilling will be suppressed at source by means of wet drilling or dust extractors. The periodical environmental monitoring test has been proposed to carry out by the NABL laboratory.

(iii) Water quality:

Ground water in this area and the surrounding wells are potable and within the drinking water standards.

(iv) & (v). Noise Level & Vibration Levels (Due To Blasting):

Excavator is proposed for the formation of benches and loading. Rock breaker is proposed for development activities. The noise producing sources are the tipper that will move from mine face to dump yards and back and excavators. But these noises will be only at intermittent period. The prevailing noise levels are well within standards prescribed.

The workers and staff working near the mines will be exposed to noise levels is only minimal, during mining operation. There will be no noise pollution created. Neither drilling nor blasting is carried out. Hence, the ground vibration will be minimal and well within the prescribed standards. Besides, ground vibration will be carried out as per the statutory standards.

vi) Water regime:

Eswaran Kovil Eri and vari are situated on the western side of the applied area 50m safety distance has been maintained. There is no other major Nullah, lake, reservoir or river nearby. Mining operation will not produce any toxic effluent in the form of liquid. There will be no chance for ground water pollution. Mining will not reach such a depth whereas no depression in water table will be created. Hence, the impact will be nil.

vii) Acid mine drainage:

Does not arise.

viii) Surface subsidence:

Not Applicable.

ix) Socio-economics:

The entire mine lease area lies within the revenue wasteland; the project does not involve any loss of agriculture land. Some of the impacts would be directly beneficial to the socio-economic environment due to proposed employment potential.

The beneficial impacts due to the activities in the region would be:

- ✓ Employment Potential for persons in the various categories as skilled/semi-skilled/unskilled for carrying out mining activities. Preference in employment shall be given to the locals.
- ✓ The mining machinery owned by the locals shall be also deployed.
- ✓ Indirect employment in transport sector.
- ✓ Amelioration of the general living standards of local persons employed in mining activities.

- ✓ Improvement in the economic growth in the region by way of additional mineral availability.
- ✓ Various activities, such as livelihood and entrepreneurship through providing training in self-employment and empowering women through education and training and promoting their SHG (Self Helping Group), taken under corporate social responsibility initiative will have a positive impact on socio economic fabric of the area.
- ✓ Benefit to the State and the Central governments through financial revenues by way of royalty, GST etc. from this project directly and indirectly.

The adverse impacts on socio-economic environment due to mining activities in the region will be:

- ✓ Dust will affect to the local air environment and this dust will settle down on nearby agricultural fields and will affect the productivity of the land and increase in respiratory problems.
- ✓ Soil erosion and loss of fertility etc.
- ✓ There may be some conflict of utilization of local resources between project proponent and local communities.
- ✓ Contamination of soil and air due to mining.

Increased use of existing public infrastructure i.e. road due to vehicular traffic involved in transportation of minerals may cause congestion on roads. However, the state highway and the national highways in the district in general have been designed keeping in view the futuristic vehicular traffic.

x) Historical monuments etc.:

There is no wild life or bird sanctuary or no reserve or any protected social forest closer to the area. There is no public building, places of worship or archaeological or national monuments near the area. There is no permanent building or structures near the area. No drilling and blasting is proposed. Hence, question of damage due to blasting or any other cause does not arise.

8.3 Progressive reclamation Plan:

8.3.1. Mined-Out Land:

- | | |
|---|--------------|
| a) Area covered by pits | : Nil |
| b) Additional Area to be covered in first five years
of the mining plan period | : 11.76.3 Ha |

Reclamation:

The Limekankar & Limestone deposit in this area is dipping vertical and the average depth of the workings in the pit at the five year will be 8.75 meters with an average of 2.0m Topsoil and 0.75m Limekankar. The mined out pit is proposed to be used as small reservoir for storing much needed rainwater at the end of the life of the mine when the mine reaches its ultimate pit limit. Since the surrounding areas are dry and experiences low rainfall, any amount of storage of water will be beneficial for recharging the groundwater in the adjacent areas. These proposals are only tentative.

The ultimate pit size and pit boundary of the area are shown in the conceptual mining plan and conceptual mining plan cross section.

Along the permanent roads and vacant places, afforestation is being carried out at present. Before closure of the mine, a parapet wall will be constructed to prevent inadvertent entry of cattle and human beings..

A watchman (Security guard) will be posted around the clock to prevent inherent entry of public and cattle which are growing in and around the area.

8.3.2 Topsoil Management:

The topsoil is black cotton soil. It occurs to a depth of 2.0m. The generation of topsoil during the present plan period will be temporarily dumped on the southwestern portion of the area and also utilized for Afforestation purposes.

8.3.3 Tailings Dam Management:

There is no chemical beneficiation plant for processing the mineral using water and hence, the question of tailing dam management does arise.

8.3.4 Acid mine drainage, if any and its mitigative measures.

Does not arise.

8.3.5 Surface subsidence mitigation measures through backfilling of mine voids or by any other means and its monitoring mechanism:

The information on protective measures for reclamation and rehabilitation works during the period [1st year]:

Summary of Yearwise Proposal

Table-48

Items	Details	Proposed	Actual	Remarks
Dump Management	Area afforested (ha)	Afforestation is not proposed on the Dump	Not carried out	Since it is an active dump. Hence the afforestation is not proposed on the dump
	No of saplings planted			
	Cumulative no of plants			
	Cost including watch and care during the year			
Management of worked out benches	Area available for rehabilitation (ha)	Rehabilitation an afforestation is not proposed on the worked out benches	Not carried out	In the present plan period only the depth will be enhanced. Hence the worked out benches used for movement of men and machineries. After the mine reached it ultimate pit limit, the worked out benches will be reclaimed and re-habitation will be carried out.
	Afforestation done(ha)			
	No of saplings planted in the year			
	Cumulative no of plants			
	Any other method of rehabilitation (specify)			
	Cost including watch and care during the year			
Reclamation and Rehabilitation by backfilling	Void available for Backfilling (L x B x D) pit wise /slope wise	There is no proposal for reclamation and rehabilitation	Not carried out	Backfilling, reclamation and rehabilitation is not proposed in the present plan period. It will be carried out at the end of the life of the mine when the mine reaches its ultimate pit limit.
	Void filled by waste /tailings			
	Afforestation on the backfilled area			
	Rehabilitation by making water reservoir			
	Any other means (specify)			
Rehabili-tation of waste land within lease	Area available (ha)	0.62.18 ha	Will be Carried out as per proposal	Afforestation cost Rs.69,000/-
	Area rehabilitated	0.62.18 ha – 690 Neem saplings		
	Method of rehabilitation	Green Belt Development (Afforestation)		
Others (specify)	-	-	-	-

Environmental monitoring (core zone & buffer zone)

Table-49

Air quality (Rs. / sample)	Water quality (Rs. / sample)	Noise (Rs. / area)	Ground vibration (Rs. / area)
2500	2500	2500	2500

The information on protective measures for reclamation and rehabilitation works during the period [2nd year]:**Summary of Yearwise Proposal**

Table- 50

Items	Details	Proposed	Actual	Remarks
Dump Management	Area afforested (ha)	Afforestation is not proposed on the Dump	Not carried out	Since it is an active dump. Hence the afforestation is not proposed on the dump
	No of saplings planted			
	Cumulative no of plants			
	Cost including watch and care during the year			
Management of worked out benches	Area available for rehabilitation (ha)	Rehabilitation an afforestation is not proposed on the worked out benches	Not carried out	In the present plan period only the depth will be enhanced. Hence the worked out benches used for movement of men and machineries. After the mine reached it ultimate pit limit, the worked out benches will be reclaimed and re-habitation will be carried out.
	Afforestation done(ha)			
	No of saplings planted in the year			
	Cumulative no of plants			
	Any other method of rehabilitation (specify)			
	Cost including watch and care during the year			
Reclamation and Rehabili-tation by backfilling	Void available for Backfilling (L x B x D) pit wise /stope wise	There is no proposal for reclamation and rehabilitation	Not carried out	Backfilling, reclamation and rehabilitation is not proposed in the present plan period. It will be carried out at the end of the life of the mine when the mine reaches its ultimate pit limit.
	Void filled by waste /tailings			
	Afforestation on the backfilled area			
	Rehabilitation by making water reservoir			
	Any other means (specify)			
Rehabili-tation of waste land within lease	Area available (ha)	0.62.18 ha	Will be Carried out as per proposal	Afforestation cost Rs.69,000/-
	Area rehabilitated	0.62.18 ha – 690 Neem saplings		
	Method of rehabilitation	Green Belt Development (Afforestation)		
Others (specify)	-	-	-	-

Environmental monitoring (core zone & buffer zone)

Table-51

Air quality (Rs. / sample)	Water quality (Rs. / sample)	Noise (Rs. / area)	Ground vibration (Rs. / area)
2500	2500	2500	2500

The information on protective measures for reclamation and rehabilitation works during the period [3rd year]:**Summary of Yearwise Proposal**

Table-52

Items	Details	Proposed	Actual	Remarks
Dump Management	Area afforested (ha)	Afforestation is not proposed on the Dump	Not carried out	Since it is an active dump. Hence the afforestation is not proposed on the dump
	No of saplings planted			
	Cumulative no of plants			
	Cost including watch and care during the year			
Management of worked out benches	Area available for rehabilitation (ha)	Rehabilitation an afforestation is not proposed on the worked out benches	Not carried out	In the present plan period only the depth will be enhanced. Hence the worked out benches used for movement of men and machineries. After the mine reached it ultimate pit limit, the worked out benches will be reclaimed and re-habitation will be carried out.
	Afforestation done(ha)			
	No of saplings planted in the year			
	Cumulative no of plants			
	Any other method of rehabilitation (specify)			
	Cost including watch and care during the year			
Reclamation and Rehabilitation by backfilling	Void available for Backfilling (L x B x D) pit wise /stope wise	There is no proposal for reclamation and rehabilitation	Not carried out	Backfilling, reclamation and rehabilitation is not proposed in the present plan period. It will be carried out at the end of the life of the mine when the mine reaches its ultimate pit limit.
	Void filled by waste /tailings			
	Afforestation on the backfilled area			
	Rehabilitation by making water reservoir			
	Any other means (specify)			
Rehabili-tation of waste land within lease	Area available (ha)	0.62.18 ha	Will be Carried out as per proposal	Afforestation cost Rs.69,000/-
	Area rehabilitated	0.62.18 ha – 690 Neem saplings		
	Method of rehabilitation	Green Belt Development (Afforestation)		
Others (specify)	-	-	-	-

Environmental monitoring (core zone & buffer zone)

Table-53

Air quality (Rs. / sample)	Water quality (Rs. / sample)	Noise (Rs. / area)	Ground vibration (Rs. / area)
2500	2500	2500	2500

The information on protective measures for reclamation and rehabilitation works during the period [4th year]:**Summary of Yearwise Proposal**

Table-54

Items	Details	Proposed	Actual	Remarks
Dump Management	Area afforested (ha)	Afforestation is not proposed on the Dump	Not carried out	Since it is an active dump. Hence the afforestation is not proposed on the dump
	No of saplings planted			
	Cumulative no of plants			
	Cost including watch and care during the year			
Management of worked out benches	Area available for rehabilitation (ha)	Rehabilitation an afforestation is not proposed on the worked out benches	Not carried out	In the present plan period only the depth will be enhanced. Hence the worked out benches used for movement of men and machineries. After the mine reached it ultimate pit limit, the worked out benches will be reclaimed and re-habitation will be carried out.
	Afforestation done(ha)			
	No of saplings planted in the year			
	Cumulative no of plants			
	Any other method of rehabilitation (specify)			
	Cost including watch and care during the year			
Reclamation and Rehabilitation by backfilling	Void available for Backfilling (L x B x D) pit wise /stope wise	There is no proposal for reclamation and rehabilitation	Not carried out	Backfilling, reclamation and rehabilitation is not proposed in the present plan period. It will be carried out at the end of the life of the mine when the mine reaches its ultimate pit limit.
	Void filled by waste /tailings			
	Afforestation on the backfilled area			
	Rehabilitation by making water reservoir			
	Any other means (specify)			
Rehabili-tation of waste land within lease	Area available (ha)	0.62.18 ha	Will be Carried out as per proposal	Afforestation cost Rs.69,000/-
	Area rehabilitated	0.62.18 ha – 690 Neem saplings		
	Method of rehabilitation	Green Belt Development (Afforestation)		
Others (specify)	-	-	-	-

Environmental monitoring (core zone & buffer zone)

Table-55

Air quality (Rs. / sample)	Water quality (Rs. / sample)	Noise (Rs. / area)	Ground vibration (Rs. / area)
2500	2500	2500	2500

The information on protective measures for reclamation and rehabilitation works during the period [5th year]:**Summary of Yearwise Proposal**

Table-56

Items	Details	Proposed	Actual	Remarks
Dump Management	Area afforested (ha)	Afforestation is not proposed on the Dump	Not carried out	Since it is an active dump. Hence the afforestation is not proposed on the dump
	No of saplings planted			
	Cumulative no of plants			
	Cost including watch and care during the year			
Management of worked out benches	Area available for rehabilitation (ha)	Rehabilitation an afforestation is not proposed on the worked out benches	Not carried out	In the present plan period only the depth will be enhanced. Hence the worked out benches used for movement of men and machineries. After the mine reached it ultimate pit limit, the worked out benches will be reclaimed and re-habitation will be carried out.
	Afforestation done(ha)			
	No of saplings planted in the year			
	Cumulative no of plants			
	Any other method of rehabilitation (specify)			
	Cost including watch and care during the year			
Reclamation and Rehabilitation by backfilling	Void available for Backfilling (L x B x D) pit wise /slope wise	There is no proposal for reclamation and rehabilitation	Not carried out	Backfilling, reclamation and rehabilitation is not proposed in the present plan period. It will be carried out at the end of the life of the mine when the mine reaches its ultimate pit limit.
	Void filled by waste /tailings			
	Afforestation on the backfilled area			
	Rehabilitation by making water reservoir			
	Any other means (specify)			
Rehabili-tation of waste land within lease	Area available (ha)	0.62.18 ha	Will be Carried out as per proposal	Afforestation cost Rs.69,000/-
	Area rehabilitated	0.62.18 ha – 690 Neem saplings		
	Method of rehabilitation	Green Belt Development (Afforestation)		
Others (specify)	-	-	-	-

Environmental monitoring (core zone & buffer zone)

Table-57

Air quality (Rs. / sample)	Water quality (Rs. / sample)	Noise (Rs. / area)	Ground vibration (Rs. / area)
2500	2500	2500	2500

Summary of information on target and achievement proposals as per Rule 23(E)2 made of protective measures undertaken for environmental protection during the period [1st to 5th year]:

Table-58

ITEMS		DETAILS		AREA (Ha)	QUANTITY	EXPENDITURE (Rs.)
				Proposal	Proposal	Proposal
A)	Reclamation & Rehabilitation of mined out area	Backfilling, reclamation and rehabilitation is not proposed in the present plan period. It will be carried out at the end of the life of the mine when the mine reaches its ultimate pit limit.				
B)	Stabilisation & Rehabilitation of dumps	There is no proposal for Stabilisation & Rehabilitation of dumps				
C)	Rehabilitation of barren area within lease	i)	Afforestation (Green land building on boundary barrier)	3.10.9ha	3450 saplings	Rs.3,45,000/-
		ii)	Others - watchman	Nil		

Table-59

Air quality (Rs. / sample)	Water quality (Rs. / sample)	Noise (Rs. / area)	Ground vibration (Rs. / area)
12500 x 4 (Core+ buffer zone)	12500 x 4 (Core+ buffer zone)	12500 x 4 (Core+ buffer zone)	12500x 4 (Core+ buffer zone)

Table-60

Year	Air Quality Sampling (Rs.)	Water Quality Sampling (Rs.)	Noise Monitoring (Rs.)	Ground vibration test (Rs.)	Total (Rs.)
I Year	50,000	50,000	50,000	50,000	2,00,000
II Year	50,000	50,000	50,000	50,000	2,00,000
III Year	50,000	50,000	50,000	50,000	2,00,000
IV Year	50,000	50,000	50,000	50,000	2,00,000
V Year	50,000	50,000	50,000	50,000	2,00,000
Total	2,50,000	2,50,000	2,50,000	2,50,000	10,00,000

Budget Provision for the present mining plan period

Afforestation cost	=	Rs. 3,45,000/-
Air Quality Sampling	=	Rs. 2,50,000/-
Water Quality Sampling	=	Rs. 2,50,000/-
Noise Monitoring	=	Rs. 2,50,000/-
Ground vibration test	=	Rs. 2,50,000/-
Total Cost	=	Rs.13,45,000/-

Disaster Management and Risk Assessment:

RISK ASSESSMENT:

INTRODUCTION –

For any industry to be successful, it should meet not only the production requirements, but also maintain the highest safety standards for all concerned. The industry has to identify the hazards, assess the associated risks and bring the risks to tolerable level on a continuous basis.

Mining is a hazardous operation and consists of considerable environmental, health and safety risk to miners. Safety risk assessment is the systematic identification of potential hazards in workplace as a first step to controlling the possible risk involved. Unsafe conditions in mines lead to a number of accidents and cause loss and injury to human lives, damage to property, interruption in production etc.

Risk Assessment is a systematic method of identifying and analyzing the hazards associated with an activity and establishing a level of risk for each hazard.

The hazards cannot be completely eliminated, and thus there is a need to define and estimate an accident risk level possible to be presented either in quantitative or qualitative way.

Because of the existing hazards of mining as an activity and the complexity of mining machinery and equipment and the associated systems, procedures and methods, it is not possible to be naturally safe. Regardless of how well the machinery or methods are designed, there will always be potential for serious accidents. It is not possible for an external agency to ensure the safety of an organization such as a mining company nor of the machinery or methods it uses.

Risk Assessment tools are used to help to prevent major hazards in mining industry, e.g., fire, explosion, wind-blast, outbursts, spontaneous combustion, roof instability, chemical and hazardous substances, etc., from injuring miners. The structured process associated with risk assessment helps to characterize the major hazards and evaluate engineering, management and work process factors that impact how a mine mitigates its highest risk. The degree of success is influenced by the existing risk management culture at the mining operation, identification of risk, the design of the risk assessment, the risk management, the character of the risk assessment process, the extent of the existing controls, and the quality of the new ideas.

NEED FOR RISK ASSESSMENT:

- Identify hazards—something with the potential to cause harm,
- Assess the likelihood, or probability, of harm arising from the hazard,
- Assess the severity of harm resulting from realization of the hazard,
- Combine assessments of likelihood and severity to produce an assessment of risk and
- Use the assessment of risk as an aid to decision making.

OBJECTIVES OF RISK ASSESSMENT:

- Identifying hazardous activities
- Assessment of risk level and severity in different operations
- Identification of control measures
- Setting monitoring process
- Reduce the impact of mishaps of all kinds
- Reduce the inherent potential for major accidents.

DIFFERENT TERMINOLOGIES ASSOCIATED WITH RISK ASSESSMENT:

Following are some of the important terminologies involved in hazard identification and risk analysis:

Harm: Physical injury or damage to the health of peoples either directly or indirectly as a result of damage to property or to the environment.

Hazard: Hazard is a situation that poses a level of threat to life, health, property or environment. Most hazards are dormant with only a theoretical risk of harm however once a hazard becomes active it can create emergency situation.

Hazardous Situation: A circumstance in which a person is exposed to a hazard

Hazardous Event: A hazardous situation which results in harm

Accident: An accident is a specific, unidentifiable, unexpected, unusual and unintended external action which occurs in a particular time and place with no apparent and deliberate cause but with marked effect.

Risk: Risk concerns the deviation of one or more results of one or more future events from their expected value.

Tolerable Risk: Risk which is accepted in a given context based on the current values of society.

Protective Measure: The combination of risk reduction strategies taken to achieve at least the tolerable risk. Protective measures include risk reduction by inherent safety, protective devices, and personal protective equipment, information for use and installation and training.

Severity: Severity is used for the degree of something undesirable.

DIFFERENT FORMS OF INJURY:

- Serious Bodily Injury means any injury which involves the permanent loss of any part or section of the body or the permanent loss of sight or hearing or any permanent physical incapability or the fracture of any bone or one or more joint or bone of any phalanges of hand or foot.
- Reportable Injury means any injury other than any serious bodily injury, which involves the enforced absence of injured person from work for a period of 72 hours or more.
- Minor Injury means any injury which results in enforced absence from work of the person exceeding 24hrs and less than 72 hours.

Risk Analysis: A systematic use of available information to determine how often specified events may occur and the magnitude of their likely consequences.

Risk Assessment: The process used to determine risk management priorities by evaluating and comparing the level of risk against predetermined standards, target risk levels or other criteria.

Risk Treatment: Selection and implementation of appropriate options for dealing with risk.

TYPES OF HAZARD IDENTIFICATION AND RISK ANALYSIS:

There are three types of hazard identification and risk assessments:

- Baseline Hazard Identification and Risk Analysis,
- Issue-based Hazard Identification and Risk Analysis and
- Continuous Hazard Identification and Risk Analysis.

They are all inter-related and form an integral part of a management system. A brief description of each of the three types of Hazard Identification and Risk Analysis is given below:

Baseline Hazard Identification and Risk Analysis:

The purpose of conducting a baseline HIRA is to establish a risk profile or setoff risk profiles. It is used to priorities action programmes for issue-based risk assessments.

Issue-based Hazard Identification and Risk Analysis:

The purpose of conducting an issue-based HIRA is to conduct a detailed assessment study that will result in the development of action plans for the treatment of significant risk.

Continuous Hazard Identification and Risk Analysis:

The purpose of conducting continuous Hazard Identification and Risk Analysis is to:

- Identify Operational health and safety hazards with the purpose of immediately treating significant risks.
- Gather information to feed back to issue-based Hazard Identification and Risk Analysis.
- Gather information to feed back to baseline Hazard Identification and Risk Analysis.

The different steps of risk assessment procedure are as given below:

STEP 1: HAZARD IDENTIFICATION:

The purpose of hazard identification is to identify and develop a list of hazards for each job in the organization that are reasonably likely to expose people to injury, illness or disease if not effectively controlled. Workers can then be informed of these hazards and controls put in place to protect workers prior to them being exposed to the actual hazard.

STEP 2: RISK ASSESSMENT:

Risk assessment is the process used to determine the likelihood that people exposed to injury, illness or disease in the workplace arising from any situation identified during the hazard identification process prior to consideration or implementation of control measures.

Risk occurs when a person is exposed to a hazard. Risk is the likelihood that exposure to a hazard will lead to injury or health issues. It is a measure of probability and potential severity of harm or loss.

STEP 3: RISK CONTROL:

Risk control is the process used to identify, develop, implement and continually review all practicable measures for eliminating or reducing the likelihood of an injury, illness or diseases in the workplace.

STEP 4: IMPLEMENTATION OF RISK CONTROLS:

All hazards that have been assessed should be dealt in order of priority in one or more of the following hierarchy of controls.

The most effective methods of control are:

1. Elimination of hazards
2. Substitute something safer
3. Use engineering/design controls
4. Use administrative controls such as safe work procedures
5. Protect the workers i.e. by ensuring competence through supervision and training, etc.

Each measure must have a designated person and date assigned for the implementation of controls. This ensures that all required safety measures will be completed.

STEP 5: MONITOR AND REVIEW:

Hazard identification, risk assessment and control are an on-going process. Therefore regularly review the effectiveness of your hazard assessment and control measures. Make sure that you undertake a hazard and risk assessment when there is change to the workplace including when work systems, tools, machinery or equipment changes. Provide additional supervision when the new employees with reduced skill levels or knowledge are introduced to the workplace.

RISK ANALYSIS:

The risk assessment portion of the process involves three levels of site evaluation:

- 1) Initial Site Evaluation,
- 2) Detailed Site Evaluation,
- 3) Priority Site Investigations and Recommendations.

The risk assessment criteria used for all levels of site evaluation take into account two basic factors:

- The existing site conditions,
- The level of the travelling public's exposure to those conditions.

The Initial Site Evaluation and Detailed Site Evaluation both apply weighted criteria to the existing information and information obtained from one site visit. The Initial Site Evaluation subdivides the initial inventory listing of sites into 5 risk assessment site groups. The Detailed Site Evaluation risk assessment is then performed on each of the three highest risks site groups in order of the group priority level of risk. The result of the Detailed Site Evaluation process is a prioritized listing of the sites within each of the three highest risk site groups.

Risk analysis is done for:

- Forecasting any unwanted situation
- Estimating damage potential of such situation
- Decision making to control such situation
- Evaluating effectiveness of control measures

DISASTER MANAGEMENT PLAN:**OBJECTIVE:**

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. For effective implementation of the disaster management plan, it should be widely circulated and personnel training through rehearsals/drills. 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:

- Effect the 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;
- Identify any dead;
- Provide for the needs of relatives;
- Provide authoritative information to the news media;
- 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 effect, it is to optimize operational efficiency to rescue rehabilitation and render medical help and to restore normalcy.

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 coordinator's 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.

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 coordinator's. Simultaneously, the emergency warning system would be activated on the instructions of the site controller.

EMERGENCY RESPONSIBILITIES:

The responsibilities of the key personnel are appended below:

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;

- Controls 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;
- Gives a public statement if necessary;
- Keeps record of chronological events and prepares an investigation report and preserves evidence; and
- On completion of On Site Emergency and restoration of normalcy, declares all clear and orders for all clear warning.

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.

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;
- Arranges for safety equipment for the members of this team;
- Decides which paths the evacuated workers should follow; and
- Maintains law and order in the area, and if necessary seeks the help of police.

Emergency Coordinator – Medical, Mutual Aid, Transport and Communication

In the event of failure of electric supply and thereby internal telephone, sets up communication point and establishes contact with the Emergency Control Center (ECC).

- Organizes medical treatment to the injured and if necessary will shift the injured to nearby hospitals;
- Mobilizes extra medical help from outside, if necessary;
- Keeps a list of qualified first aiders of the mines and seek their assistance;
- Maintains first aid and medical emergency requirements;
- Makes sure that all safety equipment are made available to the emergency team;
- Assists Site Controller with necessary data and to coordinate the emergency activities;
- Assists Site Controller in updating emergency plan, organizing mock drills verification of inventory of emergency facilities and furnishing report to Site Controller;
- Maintains liaison with Civil Administration;
- Ensure availability of canteen facilities and maintenance of rehabilitation center;
- He will be in liaison with Site Controller/Incident Controller;
- Ensure transportation facility;
- Ensures availability of necessary cash for rescue/rehabilitation and emergency expenditure;
- Controls rehabilitation of affected areas on discontinuation of emergency; and
- Makes available diesel/petrol for transport vehicles engaged in emergency operation.

Emergency Coordinator – Essential Services:

- He would assist Site Controller and Incident Controller;
- Maintains essential services like Diesel Generator, Water, Fire Water, power supply for lighting;
- Gives necessary instructions regarding emergency electrical supply, isolation of certain sections etc. to shift in-charge and electricians; and
- Ensures availability of adequate quantities of protective equipment and other emergency materials, spares etc.

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.

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.

Assembly Point:

Number of assembly 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.

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.

Fire Fighting Facilities:

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

Location of Wind Sock:

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

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.

First aid facilities would be augmented. Names of medical personnel, medical facilities in the area would be prepared and updated. Necessary specific medicines for emergency treatment of burns patients and for those affected by toxicity would be maintained.

Breathing apparatus and other emergency medical equipment would be provided and maintained. The help of nearby industrial management's in this regard would taken on mutual support basis.

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.

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

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.

In the event of an emergency developing into an offsite emergency, local authority and District emergency Authority (normally the Collector) would be appraised and under his supervision, the Off Site Disaster Management Plan would be exercised. For this purpose, the facilities that are available locally, i.e. medical, transport, personnel, rescue accommodation, voluntary organizations etc. would be mustered. Necessary rehearsals and training in the form of mock drills should be organized.

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.

Thiru.T.Ravichandran, Dy. General Manager (Technical) & Unit Head is in charge for disaster management and monitors all activities related to disaster management/risk assessment in case of any such situations.

The name and postal address of the person who is in charge for disaster management is as under.

Name	:	Thiru.T.Ravichandran, Dy. General Manager (Technical) & Unit Head,
Address	:	M/s Tamilnadu Cements Corporation Limited (A Government of Tamilnadu Undertaking) Ariyalur Cements Factory, Ariyalur District. Tamil Nadu.
Telephone Number	:	04329 228531
Fax	:	04329 228776
Email	:	ari@tancem.com, acwmines@gamil.com

Care and maintenance during temporary discontinuance:

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

- Notice to be served to all concerned authority.
- The mining pit area shall be covered by temporary fencing.
- Watchman will be posted round the clock to prevent any unauthorized or inadvertent entry of public.
- Works on stabilization of dumps to provided vegetal cover would be taken up.
- Construction of garland or retaining walls around the dumps will be attempted.
- Watering of plants in the afforested area will be considered.
- All safety precautions shall be taken care off as per rule.

Financial Assurance:

Table indicating the break-up of areas in the area applied for Mining Lease for calculation of Financial Assurance under Rule 27 of MCDR-2017:

Table-61

Sl. No.	Head	Area put on use at start of Plan (ha)	Additional requirement during this plan period(ha)	Total Area (ha)	Area considered as fully reclaimed & rehabilitated (ha)	Net area considered for calculation (ha)
1.	Area under mining	Nil	11.76.3	11.76.3	-	11.76.3
2.	Storage for top soil	Nil	01.51.4	01.51.4	-	01.51.4
3.	Waste dump site	Nil	-	-	-	-
4.	Mineral storage	Nil	-	-	-	-
5.	Infrastructure – workshop, administrative building etc.	Nil	00.05.0	00.05.0	-	00.05.0
		Nil	-	-	-	-
		Nil	-	-	-	-
		Nil	-	-	-	-
6.	Roads	Nil	00.10.0	00.10.0	-	00.10.0
7.	Railways	Nil	-	-	-	-
8.	Green Belt	Nil	03.10.9	03.10.9	-	03.10.9
9.	Tailing pond	Nil	-	-	-	-
10.	Effluent Treatment Plant	Nil	-	-	-	-
11.	Mineral Separation Plant	Nil	-	-	-	-
12.	Township area	Nil	-	-	-	-
13.	Others to specify	Nil	-	-	-	-
Grand total		Nil	16.53.6	16.53.6	-	16.53.6

The mining lease area put to use for mining and allied activities is about 16.53.6 Ha. The financial assurance for 16.53.6 hectares at the rate of Rs. 3,00,000/- per ha works out to Rs. 49,60,800/-.

Hence, the financial assurance in the form of Bank Guarantee for Rs. 49,60,800/- (Rupees Forty nine lakhs sixty thousand and eight hundred only) is enclosed as Annexure No. IX.

Certificate:

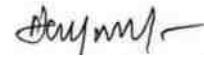
The above mentioned actions have been taken to be stated clearly in the mine closure plan. A certificate duly signed by the applicant to the effect that said closure plan complies all statutory rules, regulations, orders made by the Central or State Government, statutory organisations, court etc. have been taken into consideration and wherever any specific permission is required the applicant will approach the concerned authorities. The lessee may also give an undertaking to the effect that all the measures proposed in this closure plan will be implemented in a time bound manner as proposed.

Plan and Sections:

The Following plans and sections are enclosed.

1. Location plan (Plate No.I)
2. Route Map (Plate No.IA)
3. Key plan (Plate No.IB)
4. Mine lease Plan (Plate No.II)
5. Surface plan (Plate No.III)
6. Geological plan and Sections (Plate Nos.IV & IVA)
7. Year wise development & production plan and sections (Plate Nos.VA – VE1)
8. Mine layout, land use and afforestation plan (Plate No.VI)
9. Financial Area Assurance Plan. (Plate No.VII)
10. Environment plan (Plate No.VIII)
11. Conceptual plan and sections (Plate Nos.IX & IXA)

Signature of the Qualified Person



Dr.P.Thangaraju, M.Sc., Ph.D.,

Place: Salem

Date: 25.09.2019



தமிழ்நாடு சீமெண்ட் கழகம்

(தமிழ்நாடு அரசு நிறுவனம்)

TAMILNADU CEMENTS CORPORATION LIMITED
(A Government of Tamilnadu Undertaking)

அரியலூர் சீமெண்ட் ஆலை, அரியலூர் - 621 729 , அரியலூர் மாவட்டம், தமிழ்நாடு.

Ariyalur Cement Factory, Ariyalur - 621 729, Ariyalur District, Tamilnadu

Grams : TANCEM, ARIYALUR, website : www.tancem.com

E-mail : ari@tancem.com

Ref:

Date :

PART-B

9.0 Certificates/ Undertakings/Consents

A. CONSENT LETTER/ UNDERTAKING/ CERTIFICATE FROM THE APPLICANT

M/s. Tamilnadu Cements Corporation Ltd.,
(A Government of Tamilnadu Undertaking)
Ariyalur Cement Factory,
Ariyalur District.

1. The Mining Plan in respect of Pudupalayam Limekankar & Limestone deposit over an area of 22.96.0Ha, in Pudupalayam Village, Siruvalur Post Office, Ariyalur District, Tamilnadu, under Rule 13 of MCR 2016 & 23 of MCDR, 2017 has been prepared by Dr. P. Thangaraju, M.Sc., Ph.D.,

This is to request the Regional Controller of Mines, Indian Bureau of Mines Chennai, to make any further correspondence regarding any correction of the Mining Plan with the said Qualified Person at his address below:

Dr. P. Thangaraju, M.Sc., Ph.D.,
Old.No.260-B, New No: 17,
Advaltha Ashram Road, Alagapuram,
Salem - 636 004.

We hereby undertake that all modification/updating as made in the said Mining Plan by the said Qualified Person may be deemed to have been made with our knowledge and consent and shall be acceptable on us and binding in all respects.

2. It is certified that the CCOM Circular No-2/2010 will be implemented and complied with when any authorized agency is approved by the State Government.

Regd.Office : Second Floor, L.L.A.Buildings, P.B.No.5205,735,AnnaSalai,Chennai - 600 002

Grams : TANCEM Phone: 28525461, 28525471 Telex:041-6080 Fax: 044-28523991

E-mail : md@tancem.com co@tancem.com Website : www.tancem.com

Area code : 033, TIN: 33460640087 Dt 1-4-95 GSTN : 33AABCT1819J1ZH



தமிழ்நாடு சீமெண்ட் கழகம்

(தமிழ்நாடு அரசு நிறுவனம்)

TAMILNADU CEMENTS CORPORATION LIMITED

(A Government of Tamilnadu Undertaking)

அரியலூர் சீமெண்ட் ஆலை, அரியலூர் - 621 729, அரியலூர் மாவட்டம், தமிழ்நாடு.

Ariyalur Cement Factory, Ariyalur - 621 729, Ariyalur District, Tamilnadu

Grams : TANCEM, ARIYALUR, website : www.tancem.com

E-mail : ari@tancem.com

Ref:

Date :

3.

It is certified that the Progressive Mine Closure Plan of Pudupalayam Limekankar & Limestone deposit of M/s. Tamilnadu Cements Corporation Ltd., over an area of 22.96.0Ha. complies with all Statutory rules, Regulations, Orders made by the Central or State Government, Statuary organization, court etc. which have been taken into consideration and wherever any specific permission is required the applicant will approach the concerned authorities.

The information furnished in the Progressive Mine Closure Plan is true and correct to the best of our knowledge and records.

4.

"The provisions of Mines Act, Rules and Regulations made there under have been observed in the Mining Plan over an area of 22.96.0Ha in Ariyalur District in Tamilnadu State belonging to Pudupalayam Limekankar & Limestone deposit, and where specific permissions are required, the applicant will approach the D.G.M.S. Further, standards prescribed by D.G.M.S. in respect of miners' health will be strictly implemented".

5.

I T.Ravichandran, Deputy General Manager (Technical)/Unit Head and Authorized signatory of M/s. Tamilnadu Cements Corporation Ltd., of the fresh applied area for Mining Lease vide Precise area communication letter No. 3997/MMA.2/2019-1, dated: 02.08.2019 for a period fifty Years for Limestone and twenty years for Limekankar the Mining Lease in Pudupalayam Village, Ariyalur Taluk, Ariyalur District, Tamil Nadu State, over an extent of 22.96.0Ha for Limestone & Limekankar mineral hereby undertake that no matter is pending against the said lease/ applied mining lease area on the following issues.

- a) Issues related to illegal mining with State Government.
- b) Royalty and revision matter with the State Government.
- c) Safety & Environment issues of General Public Concern.
- d) Public interest litigation (PIL) and court cases, etc.

If anything is found wrong in the declaration and found incorrect during the period of document, suitable action may be initiated including withdrawal of the approval of the document.

Signature of the Applicant
For M/s. Tamilnadu Cements Corporation Ltd.,

T. Ravichandran

(Deputy General Manager (Technical)/Unit Head & Authorized Signatory)

Place: Ariyalur

Date : 06.08.2019

Regd. Office : Second Floor, L.L.A. Buildings, P.B.No.5205,735, AnnaSalai, Chennai - 600 002

Grams : TANCEM Phone: 28525461, 28525471 Telex:041-6080 Fax: 044-28523991

E-mail : md@tancem.com co@tancem.com Website : www.tancem.com

Area code : 033, TIN: 33460640087 Dt 1-4-95 GSTN : 33AABCT1819J1ZH

Dr. P. Thangaraju, M.Sc., Ph.D.,

Old.No.260-B, New No: 17,

Advaitha Ashram Road, Alagapuram,

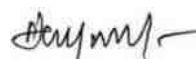
Salem – 636 004.

CERTIFICATE FROM THE QUALIFIED PERSON

The provisions of the Mineral Conservation and Development Rules, 2017 have been observed in the preparation of the Mining Plan for Pudupalayam Limekankar & Limestone Deposit over an area of 22.96.0 Ha of M/s. Tamilnadu Cements Corporation Ltd. (A Government of Tamilnadu Undertaking), in Pandapuli Village, Siruvalur Post Office, Ariyalur District of Tamilnadu State and whenever specific permission are required, the applicant will approach the concerned authorities of Indian bureau of Mines.

The information furnished in the Mining Plan is true and corrected to the best of our Knowledge.

Signature of the Qualified Person



Dr. P. Thangaraju, M.Sc., Ph.D.,

Place: Salem

Date: 25.09.2019

ANNEXURE-I

PRE-FEASIBILITY REPORT OF PUDUPALAYAM LIMEKANKAR AND LIMESTONE DEPOSIT**PREAMBLE:**

This abstract of pre-feasibility report is prepared for fresh grant of mining lease for Pudupalayam Limekankar & Limestone Deposit, over an extent of 22.96.0 hectares in S.F. Nos: 144/1A, 217/1A, etc., in Pudupalayam Village, Ariyalur Taluk, Ariyalur District, Tamilnadu State, of M/s. Tamilnadu Cements Corporation Limited (A Government of Tamilnadu Undertaking), Ariyalur Cements Factory, Ariyalur District, to estimate the resources and reserves of Limekankar & Limestone Deposit in patta lands by U.N.F.C system for the letter from the Government of Tamilnadu Industries (MMA-2) Department, Letter No. 3997/MMA.2/2019-1 Dated: 02.08.2019. Please refer Annexure No.II.

Lease Particulars:

The letter from the Industries (MMA.2) Department, Secretariat, Chennai-600 009 for relaxation under section 6 (1) (C) of the Mines and Minerals (Development and Regulation) Act, 1957 vide Letter No. 3997/MMA.2/2019-1 Dated: 02.08.2019 was issued to the applicant for submission of approved mining plan for the execution of mining lease which is enclosed as Annexure II with the certain conditions.

All the parameters were considered while preparing this mining plan and progressive mine closure plan to comply the conditions imposed by the Govt. of Tamilnadu.

Hence, this Mining Plan is prepared now for submission to Indian Bureau of Mines for approval under Rule 13 of MCR, 2016 and Rule 23 of MCDR, 2017.

The mining operation is proposed to be carried out by "A Category" Method. Excavators will be deployed for the formation of benches and loading. Rock breaker is proposed for development activities. No drilling and blasting is carried out.

1.0 General Mine Description:**Name and address of the applicant:**

Name of the applicant : M/s Tamilnadu Cements Corporation Limited.,
(A Government of Tamilnadu Undertaking)
[Tmt.D.Sabitha, I.A.S., Chairman and Managing Director]

Regd. office Address : 735, Anna Salai,
LLA Buildings, II Floor,
Chennai- 600 002,

State : Tamil Nadu

Pin code : 600 002

Telephone : 044 28525461, 28525471

Fax : 044 28523991

Email id. : md@tancem.com, co@tancem.com

Rule 45 registration no. : **IBM/7446/2011, dated 29.12.2011**

Name and address of the Authorized Signatory:

Name : Thiru.T.Ravichandran, Dy. General Manager
(Technical) & Unit Head,

Address : M/s Tamilnadu Cements Corporation Limited.,
(A Government of Tamilnadu Undertaking)
Ariyalur Cements Factory,
Ariyalur District.
Tamil Nadu.

Telephone Number : 04329 228531

Fax : 04329 228776

Email : ari@tancem.com, acwmines@gamil.com

Copy of ID proof of Authorized Signatory is enclosed as Annexure No. VII.

Status of the applicant:

The applicant, M/s. Tamilnadu Cements Corporation Limited (TANCEM) is a public limited company (A Government of Tamilnadu undertaking) Tmt.D.Sabitha, I.A.S., Chairman and Managing Director of the Company having its Registered Office at 735, Anna Salai, LLA Buildings, II Floor, Chennai- 600 002.

Thiru.T.Ravichandran, Dy. General Manager, (Technical) & Unit Head and he is the Authorized Signatory. The organization is having very good knowledge and experience in Limestone & Limekanakar mining for more than 4 decades in other Limestone area. Copy of Certificate of Incorporation, Certificate for Commencement of Business and Copy of Board resolution & List of Board of Directors are enclosed as Annexure Nos.VI, VIA, VIB & VIC.

The company is engaged in the manufacture of cement and primarily caters to the needs of Government Departments. Apart from this lease applied area for mining lease, the Company also holds mining leases in the Ariyalur, Cuddalore Districts of Tamil Nadu and the details of the same are listed below in table.

Details of the directors of the company:

Table-1

S. No.	Name of the Director	Address	Designation
1.	Tmt. D.Sabitha, IAS.,	Additional Chief Secretary /CMD, Tamilnadu Cements Corporation Ltd., Chennai-600 002.	Chairman and Managing Director
2.	Thiru.N.Muruganandam, IAS.,	Principal Secretary to Government, Industries Department, Secretariat, Chennai -600 009.	Director
3.	Thiru.E.Saravanavel Raj, IAS.,	Director, Geology & Mining, Guindy, Chennai-32	Director
4.	Dr.C.N.Maheswaran, IAS.,	Managing Director, TWAD Board, Chepauk, Chennai-600 005.	Director
5.	Thiru.M.A.Siddique, IAS.,	Secretary to Government., Finance (Expenditure) Department, Secretariat, Chennai -600 009.	Director
6.	Thiru.K.Balasubramaniam, IAS.,	Deputy Secretary to Government, Industries Department, Secretariat, Chennai - 600 009.	Director
7.	K.Baskaran, IAS.,	Director, Rural Development and Panchayat Raj Department, Chennai.	Director
8.	Thiru.P.Krishnamurthi	1B, SuvarnaLok, 34, Malony Road T.Nagar, Chennai 600 017.	Director
9.	Thiru.R.Jayasingh,	Engineer in Chief (Buildings) CE (Buildings), Public Works Department, Chepauk, Chennai-5.	Director
10.	Thiru.T.Velmurugan,	Director (Generation) Tamilnadu Electricity Board, 10th Floor, Eastern Wing,144, Anna Salai, Chennai -600 002.	Director
11.	Dr.G.Natarajan	288, TTK Road, Alwarpet, Chennai-18	Director

2.0 Exploration:

i). Primary data:

The area has been already regionally explored by Geological Survey of India (1985), State Department of Geology and Mining (1993).

ii). Secondary data:

For preparing this mining plan, detailed studies were carried out based on the Diamond Drills in the lease applied area for mining lease. The occurrence and distribution of the mineral of clearly visible by the exploration work carried out.

The diamond drills (Phase-III & Phase-V) logging datas are furnished below:

Table-2

No. of Diamond drills	Depth of Diamond drills (m)	Depth of deposition	Strata
PD/4-2	6.75	55.00m – 53.00m	Topsoil
		53.00m – 52.25m	Kankar
		52.25m – 48.25m	Limestone
PPM-4	12.75	55.00m – 53.00m	Topsoil
		53.00m – 52.25m	Kankar
		52.25m – 42.25m	Limestone
PPM-13	12.75	55.00m – 53.00m	Topsoil
		53.00m – 52.25m	Kankar
		52.25m – 42.25m	Limestone
PPM-19	17.75	55.00m – 53.00m	Topsoil
		53.00m – 52.25m	Kankar
		52.25m – 37.25m	Limestone
PD/4-3	12.75	55.00m – 53.00m	Topsoil
		53.00m – 52.25m	Kankar
		52.25m – 42.25m	Limestone
PD/4-4	14.75	55.00m – 53.00m	Topsoil
		53.00m – 52.25m	Kankar
		52.25m – 40.25m	Limestone

Locations of drilled core drills are marked in the geological plan and sections and year wise plan and sections (Refer Plate No.IV, VA & VA1).

Copy of the Exploration report, chemical analysis report & Bore hole map are enclosed as Annexure Nos.IV & IVA.

Based on the Diamond drills made in the applied area all the datas required for exploration studies were carried out related to G1, E1 & F1 axis as per United Nations Framework Classification System to calculating reserves and resources and to arrive UNFC 111 category.

Reserves are calculated based on the drilled core drills data, adjacent mine pit nullah, vari and reservoir. Hence the deposit has been estimated upto 17.75m depth with an average of 2.0m topsoil and 0.75m Limekankar during the present mining plan period.

Table-3

Depth of estimation of the reserves and resources during the Mining plan period:

17.75m [2.0m Topsoil + 0.75m Limekankar + 15m Limestone (proved 111)]	Northeast & East
17.75m [2.0m Topsoil + 0.75m Limekankar + 10m Limestone (proved 111) + 3m Limestone (probable 222)]	Centre
17.75m [2.0m Topsoil + 0.75m Limekankar + 15m Limestone (probable 222)]	Southeast, Northwest, West, South & Southwest

Proposed to be carried out:

As per the UNFC guidelines, the applicant has proposed to carry out the exploration program during the first year 23 Core drills (PBh-1 to PBh-23) of the mining plan period after the grant of mining lease. Now in this mining plan the reserves are calculated based on the old Diamond drills made in the area applied for Mining lease. After carrying out the exploration studies in the first year of the mining plan period the exact resource and reserves as per the UNFC norms will be calculated and the same will be discussed in detail in the modified mining plan.

a. Geological Mapping (Topographical and Contour map in 1: 1000 Scale):

The area was surveyed in detail by total station survey instrument with relevant station software to prepare a geological map in the scale of 1:2000 showing the various formations, attitude of the deposits and the reserve position. It is inferred that the Limekankar & Limestone mineral is of cement grade and in form of bed running N – S with Vertical dip.

The physical attitude of the Limekankar & Limestone deposits is demarked as follows:

Strike length (m)	: 864 (max)
Width (m)	: 430 (max)
Depth (m)	: 17.75m with an average of 0.75m Limekankar & 2m Topsoil
Strike direction	: N – S
Dip amount and direction	: Vertical dip

b. Geo-physical prospecting in the way of vertical electrical sounding:

Geophysical survey in the form of vertical electrical sounding (VES), has been conducted in the area applied for Mining lease to assess the lateral variations, vertical in homogeneities and the sub surface geology with respect to the availability of resources and reserves of Limekankar & Limestone deposits.

c. Geo-chemical prospecting:

One representative sample for Limekankar & Limestone and from the Drilled core drills were collected and correlated. After cone and quartering the mineral samples were collected for chemical analysis and physical properties.

Grade of Limekankar & Limestone:

Samples were collected from the drilled core drills for NABL laboratory for testing and analysis and to find out the chemical and physical properties of the minerals, it indicates that the Limekankar & Limestone is white in color and bulk density is 2.25 & 2.0 respectively and massive in nature. Based on chemical analysis, it is inferred that the grade continues to be cement grade.

The average analysis of the Limekankar & Limestone is given below:

Table-4

LIMESTONE		LIMEKANKAR
Parameter	Composition %	Composition %
Calcium Oxides (CaO)	49.28	46.26
Magnesium Oxides (MgO)	0.52	0.44
Iron (Fe ₂ O ₃)	1.06	0.95
Alumina as (Al ₂ O ₃)	1.35	1.35
Silica (SiO ₂)	9.61	13.99
Loss of Ignition (LOI)	37.89	36.95
Calcium as CaCO ₃	87.98	82.58
Magnesium as MgCO ₃	1.09	0.92
Lime saturation Factor	1.89	1.03

As analyzed by NABL laboratories limestone which has more than 70% CaCO₃ is best suited for cement industries. More than 70% CaCO₃ Limekankar material is used for blending with limestone in these particular formations. Chemical analysis report of the Limekankar & Limestone is enclosed as Annexure Nos. V & VA.

d. Technological prospecting:

The deposit is a uniform grade. Based on the six diamond drills all the datas required for technological prospecting were carried out to ascertain the attitude, grade and petrological settings of the formations.

The diamond drills in the area applied for mining lease is about 17-20m depth. Based on the six diamond drills all the datas required for exploration studies were carried out related to G1, E1 & F1 axis as per United Nations Framework Classification System. The deposit is of 17.75m with an average of 2.0m Topsoil and 0.75m Limekankar is considered for calculating the reserves under proved category by based on the drilled core drills.

i).Pitting:

It is a fresh lease applied area for mining lease. As discussed above, diamond drills in the area applied for Mining lease evidences sufficient datas required for the occurrence and distribution of Limekankar & Limestone.

ii).Trenching:

As discussed above, the area applied for Mining lease evidences sufficient datas required for the occurrence and distribution of Limekankar & Limestone. No trenching is proposed during the present plan period.

iii) Drilling:

Twenty three core drills (Pbh1- Pbh23) for the first year of Mining Plan period (i.e. after the grant of mining lease) of 60m depth each are proposed from the existing floor level @ 100m grid interval, for future exploration during the plan period. The proposed exploration program is given in the following table.

Table-5

Year	No. of boreholes (Core / RC/ DTH)	Grid Interval	Total meterage	No. of Pits dimensions and volume	No. of Trenches dimensions and volume
1 st year	23 nos. [Core drills] – each 60m (d)	100m	Core drill of depth 60m each (23 X 60m =1380m	-	-

Locations of the proposed core drills are marked in the geological plan and yearwise plan (Refer Plate No.IV & VA).

3.0 Reserves Assessment:

The U.N.F.C consists of three-dimensional system with the following three axes.

1. GEOLOGICAL Axis (G1- Detailed exploration)
2. FEASIBILITY Axis (F1- Feasibility Study)
3. ECONOMIC Axis (E1- Economics)

The reserves and resources under UNFC system of classification, is DESCRIBED IN DETAIL IN ANNEXURE 1A.

4.0 Production Schedule:

The year wise production and development schedule proposed for the present mining plan period under (UNFC 111) is tabulated below.

Table-6

Yearwise Production Details																
Year	Section	Bench	Length in (m)	Width in (m)	Depth in (m)	Limestone				Limekankar				Topsoil	Location of advancement	Ore to Overburden ratio
						Volume in (Cu.m.)	Bulk Density	ROM (Ts)	Limestone @ 100% Recovery (Ts)	Volume in (Cu.m.)	Bulk Density	ROM (Ts)	Limekankar @ 100% Recovery (Ts)			
I Year	X3Y3-IJ	I	119	117	2	27846	2	-	-	-	-	-	-	55692	West-East	1;1.06
		II	113	114	0.75	-	-	-	-	9662	2.25	21738	21738	-		
		III	106	111	4	47064	2	94128	94128	-	-	-	-	-		
	X4Y4-IJ	I	164	100	2	32800	2	-	-	-	-	-	-	65600		
		II	156	100	0.75	-	-	-	-	11700	2.25	26325	26325	-		
	X5Y5-IJ	I	131	100	2	26200	2	-	-	-	-	-	-	52400		
		II	128	97	0.75	-	-	-	-	9312	2.25	20952	20952	-		
		Total						94128	94128	-	-	69015	69015	173692		
II Year	X4Y4-IJ	III	150	100	2	30000	2	60000	60000	-	-	-	-	-		1;0.30
	X5Y5-IJ	II	128	3	0.75	-	-	-	-	288	2.25	648	648	-		
		III	125	100	6	75000	2	150000	150000	-	-	-	-	-		
	X5Y5-KL	I	98	94	2	18424	2	-	-	-	-	-	-	36848		
		II	95	91	0.75	-	-	-	-	6484	2.25	14588	14588	-		
		III	92	88	6	48576	2	97152	97152	-	-	-	-	-		
	X6Y6-IJ	I	79	100	2	15800	2	-	-	-	-	-	-	31600		
		II	76	97	0.75	-	-	-	-	5529	2.25	12440	12440	-		
	X6Y6-KL	I	92	95	2	17480	2	-	-	-	-	-	-	34960		
		II	89	91	0.75	-	-	-	-	6074	2.25	13667	13667	-		
	Total							307152	307152	-	-	41344	41344	103408		
III Year	X6Y6-IJ	II	76	3	0.75	-	-	-	-	171	2.25	385	385	-	1;0.21	
		III	73	100	6	43800	2	87600	87600	-	-	-	-	-		
	X6Y6-KL	III	86	88	6	45408	2	90816	90816	-	-	-	-	-		
		I	172	100	2	34400	2	-	-	-	-	-	-	68800		
	X7Y7-IJ	II	166	100	0.75	-	-	-	-	12450	2.25	28013	28013	-		
		III	100	100	6	60000	2	120000	120000	-	-	-	-	-		
	Total							298416	298416	-	-	28397	28397	68800		
IV Year	X7Y7-IJ	III	60	100	6	36000	2	72000	72000	-	-	-	-	-	1;0.40	
	X9Y9-IJ	I	173	132	2	45672	2	-	-	-	-	-	-	91344		
		II	170	129	0.75	-	-	-	-	16448	2.25	37007	37007	-		
		III	80	126	6	60480	2	120960	120960	-	-	-	-	-		
		Total						192960	192960	-	-	37007	37007	91344		

V Year	X9Y9-IJ	III	87	132	6	68904	2	137808	137808	-	-	-	-	-	1;0.18
	X9Y9-GH	I	126	74	2	18648	2	-	-	-	-	-	-	37296	
		II	122	68	0.75	-	-	-	-	6222	2.25	14000	14000	-	
		III	119	62	6	44268	2	88536	88536	-	-	-	-	-	
	X8Y8-CD	I	49	30	2	2940	2	-	-	-	-	-	-	5880	
		II	46	24	0.75	-	-	-	-	828	2.25	1863	1863	-	
		Total							226344	226344	-	-	15863	15863	
Grand Total							1119000	1119000	-	-	191626	191626	480420	1;0.37	

Table-7

Summary of Yearwise [1 st year to 5 th year]

Year	Limestone		Limekankar		Topsoil (Ts)	Ore to Overburden ratio
	ROM (Ts)	Limestone @ 100% Recovery (Ts)	ROM (Ts)	Limekankar @ 100% Recovery (Ts)		
I Year	94128	94128	69015	69015	173692	1;1.06
II Year	307152	307152	41344	41344	103408	1;0.30
III Year	298416	298416	28397	28397	68800	1;0.21
IV Year	192960	192960	37007	37007	91344	1;0.40
V Year	226344	226344	15863	15863	43176	1;0.18
Total	1119000	1119000	191626	191626	480420	1;0.37

5.0 Mining Method:

The mining operations are proposed to be carried out by "A Category" Method. The mining operations are proposed to be carried out by "A Category" Method. Excavators will be deployed for the formation of benches and loading. Rock breaker is proposed for development & production activities. Neither drilling nor blasting is carried out.

One bench is proposed on the topsoil with 2.0m height and width with 45° slope.

In Limekankar mineral one bench is proposed with 0.75m height and width with 60° slope.

In Limestone mineral two benches are proposed with 6m height and 6m width and another one bench is proposed with 3m height and 3m with 60° slope.

During the mining plan period, the mining operations are proposed to be carried out in the North, Centre & Eastern portion of the area applied for Mining lease starting from West and progress towards the Eastern side by open cast method with 6m bench height and 6m bench width for a limestone mineral upto a depth of 8.75mts with an average of 0.75m limekankar and 2.0m Topsoil from RL 55.0m to RL 46.25m. Please refer Plate Nos. VA to VE1.

The proposed average annual production Limestone will be 2,23,800 tonnes and Limekankar will be 38,325 tonnes with 300 working days in a year.

The applicant assures to carry out the detailed Exploration as per the UNFC Norms in the first year of Mining Plan period itself (i.e. after the grant of mining lease). If the Resource & Reserves are enhanced considerably, a modified mining plan will be prepared and submitted to IBM for subsequent clearance & approval.

The topsoil generated is proposed to be dumped in the Southwestern side of the area applied for Mining lease and also will be utilized for afforestation purposes.

Proper footpaths and haul roads are provided wherever necessary for easy access of men. Haul roads for movement of tippers with crossing platforms are provided to conform to statutory standards.

Adequate safety precautions have been taken as per MMR, 1961 to safeguard the nearby residence. Moreover, no drilling and no blasting operation is adopted since the applicant has proposed to use rock breaker.

Afforestation is proposed on the north, east, south & western side of the 7.5m & 50m boundary barrier.

If there is any change in the system of mining, the same will be intimated to Indian Bureau of Mines and the mining plan will be suitably modified for subsequent clearance and approval.

6.0 Mineral Beneficiation:

The applicant has no beneficiation plant as such. Hence no beneficiation is proposed to be done in the mine.

7.0 Marketing Type:

The entire mined out Limekankar & Limestone is of uniform grade suitable for cement industries and is proposed to be utilized as raw material for cement manufacturing in the company's own captive plant which is located at Ariyalur District which is at a distance of about 10-15km from the applied area. No sub-grade mineral is encountered.

Operating Cost:

Table-8

S.No.	Particulars	Cost of production Per ton
1.	Labour charges	Rs.65
2.	Royalty paid to Mines & Geology	Rs.80
3.	Taxes (NMET & TCS)	Rs.3.2
4.	District Mineral Foundation (DMF)	Rs.24
5.	Excavation expenses	Rs.35
6.	Transport from mine head to Stockyard (loading & unloading)	Rs.40
7.	Miscellaneous and over heads	Rs.10
	Total	Rs.257.2

The cost of production is Rs. 257/ton. Hence, the mining is economically viable at present market conditions.

8.0 Infrastructure:

The area applied for Mining lease is at a distance of about 1.3 kms Southwest of Pudupalayam Village. Pudupalayam Village is located at a distance of about 9.0 km Southeast of Ariyalur District.

The area applied for Mining lease lies 0.12km Southeast of Trichy – Chidambaran (NH - 277) National Highway Road.

Table – 9

S.No	Particulars	Location	Direction	Approximate Distance in Km
1	Nearest Post office	Siruvalur	SW	2
2	Nearest Town(D.H)	Ariyalur	NW	10
3	Nearest Police Station	Thelur	NE	5
4	Nearest Govt. Hospital	Poyyur	SW	5.2
5	Nearest School	Reddipalayam	NE	3.2
6	Nearest DSP Office	Ariyalur	NW	10
7	Nearest Railway Station	Ariyalur	NW	10
8	Nearest Airport	Trichy	SW	60
9	Nearest Seaport	Chennai	NE	260

Please refer Location plan (Plate No.I), Route Map (Plate No.IA), Key plan (Plate No.IB)

Drinking Water, rest shed, store room, public convenience and mines office are proposed to be constructed in temporary semi permanent structure within the area applied for mining lease. Please refer Plate No. VI.

9.0 ENVIRONMENTAL REQUIREMENTS:

(i) Environmental impact assessment (EIA) studies/environmental (EMP)

a) Base Line Information:

The area is a plain terrain. The altitude of the area is 55.0m above MSL. The area is sloping towards southeast.

There is no Public Building, Places of Worship, National Monuments or Places of Archaeological interest near the area within 2km radius. The general drainage pattern of the area is dendritic pattern.

b) Environment impact assessment/statement:

The mining operation does not cause any impact to the forest or agricultural land. It does not produce any harmful effluent in the form of gas or liquid. There is no generation of waste. No beneficiation is done for Limekankar & Limestone mineral. As such mining operation will have minimal impact on environment both biotic and abiotic.

c) Existing land use pattern :

The area is a plain terrain. The altitude of the area is 55.0m above MSL. The area is sloping towards southeast.

It is a dry land. Only seasonal cultivation is done in the surrounding area. In some areas, agriculture is done with lift irrigation. The main crops being cereals, pulses etc. The land use pattern in and around the mine have no adverse effect in the environment changes. An Environment Management Plan will be prepared if required.

d) Air Quality:

Mining is proposed to be carried out with opencast method. Excavators are deployed for the formation of benches and loading. Rock breaker is proposed for development activities. Neither drilling nor blasting is proposed. The generation of the dust will be suppressed by means of water sprinkler from water tanker and the quantity of water requirement for this purpose is 5 KLD. The generation of dust during the course of drilling will be suppressed at source by means of wet drilling or dust extractors. The periodical environmental monitoring test has been proposed to carry out by the NABL laboratory.

e) Water quality:

Ground water in this area and the surrounding wells are potable and within the drinking water standards.

f) Historical and Monuments:

There are no Public Buildings or Places or National Monuments near the area.

g) Noise Level & Ground Vibration:

The noise producing sources are the tipper that will move from mine face to dump yards and excavator, rock breaker. But these noises will be only at intermittent period. The prevailing noise levels are well within standards prescribed. The workers and staff working near the mines will be exposed to noise levels is only minimal, during mining operation. There will be no noise pollution created. No drilling and blasting is proposed. Hence, the ground vibration will be minimal and well within the prescribed standards. Besides, ground vibration will be carried out as per the statutory standards.

h) Water regime:

The water table is found at 35m in rainy season and 38m in dry season the area receives rainfall during north-east monsoon, the average being 1071.4mm. The topsoil covers upto a depth of 2.0m and followed by 0.75m thickness of limekankar and is not fertile enough to sustain seasonal crops.

There will be no effluent discharge from mine. The Limekankar & Limestone mineral consisting of no chemical effluent and toxic elements. There is no generation of waste. There is no Nullah, lake, reservoir or river nearby. The water is found to be potable and good for drinking which is available in the nearby community wells. Water samples are collected and analyzed as per statutory norms of IBM.

i) Socio-economics:

The entire mine lease area lies within the revenue wasteland; the project does not involve any loss of agriculture land. Some of the impacts would be directly beneficial to the socio-economic environment due to proposed employment potential.

The beneficial impacts due to the activities in the region would be:

- ✓ Employment Potential for persons in the various categories as skilled/semi-skilled/unskilled for carrying out mining activities. Preference in employment shall be given to the locals.
- ✓ The mining machinery owned by the locals shall be also deployed.
- ✓ Indirect employment in transport sector.
- ✓ Amelioration of the general living standards of local persons employed in mining activities.
- ✓ Improvement in the economic growth in the region by way of additional mineral availability.
- ✓ Various activities, such as livelihood and entrepreneurship through providing training in self-employment and empowering women through education and training and promoting their SHG (Self Helping Group), taken under corporate social responsibility initiative will have a positive impact on socio economic fabric of the area.
- ✓ Benefit to the State and the Central governments through financial revenues by way of royalty, GST etc. from this project directly and indirectly.

The adverse impacts on socio-economic environment due to mining activities in the region will be:

- ✓ Dust will affect to the local air environment and this dust will settle down on nearby agricultural fields and will affect the productivity of the land and increase in respiratory problems.
- ✓ Soil erosion and loss of fertility etc.
- ✓ There may be some conflict of utilization of local resources between project proponent and local communities.
- ✓ Contamination of soil and air due to mining.

Increased use of existing public infrastructure i.e. road due to vehicular traffic involved in transportation of minerals may cause congestion on roads. However, the state highway and the national highways in the district in general have been designed keeping in view the futuristic vehicular traffic.

(ii) Environment Management Plan:

(i) Temporary storage and utilization of topsoil:

The topsoil is black cotton soil. It occurs to a depth of 2m. About 4,80,420 Ts of topsoil would be generated during the present plan period is proposed to be dumped on the Southwestern portion of the lease applied area and also utilized for afforestation purposes.

Abandonment of mines:

It is a fresh lease applied area for mining lease and lease is yet to be granted.

(ii) Year wise proposal for reclamation of land affected by mining activities during and at the end of mining lease:

The Mining is proposed to a depth of 8.75m. It is a fresh lease applied area for mining lease. Reclamation and rehabilitation will be carried out at the end of the life of the mine. The mined out pit is proposed to be used as small reservoir for storing much needed rainwater at the end of the life of the mine when the mine reaches its ultimate pit limit. Since the surrounding areas are dry and experiences low rainfall, any amount of storage of water will be beneficial for recharging the groundwater in the adjacent areas. These proposals are only tentative.

(iii) Programme of afforestation:

During the mining plan period it is proposed on the 7.5m & 50m boundary barrier to plant 690 neem saplings every year on the north, east, south & western side of the area applied for mining lease. The plantation is shown in the table below.

Table-10

Year	Area to be covered (ha)	No of saplings	Type of saplings	Location	Space between saplings	Survival rate %
I Year	0.62.18	690	Neem	north, east, south & western side of the 7.5m & 50m boundary barrier of the area applied for mining lease	3mx3m	80%
II Year	0.62.18	690			3mx3m	80%
III Year	0.62.18	690			3mx3m	80%
IV Year	0.62.18	690			3mx3m	80%
V Year	0.62.18	690			3mx3m	80%

Please refer Mine layout & Environmental Plan (Plate No:VI & VIII)

(iv) Stabilization and vegetation of dumps:

The dump will be stabilized in such a manner that the slopes are always maintained below 30°. These dumps will be cleared and utilized for backfilling the mined out pit at the end of the life of the mine when the mine reaches its ultimate pit limit. Afforestation is proposed in the 7.5m & 50m boundary barrier on the north, east, south & western side of the area applied for mining lease. Nearly 3.10.9 ha is proposed for afforestation during the present plan period.

(V) Treatment and disposal of waste from mine:

Since mining operation does not generate any harmful waste, question of treatment does not arise.

(vi) Measures for adverse effects of mining on water regime:

There will be no toxic effluent generated due to mining operation in the form of solid liquid or gas. The water table in the area applied for Mining lease is around 35-38m below the ground level, hence the water table will not encounter during the course of mining activity. There will be seepage of ground water during the rainy season, the same will be pumped out with the help of 5HP motor pumps when there is a considerable accumulation of seepage water. Periodically water samples will be collected and analyzed as per statutory norms of IBM.

(vii) Protective measures for ground vibrations/air blast caused by blasting:
A vibration in the area is likely to be created by excavator, tippers, rock breakers and movement of transport vehicles.

Due to operation and movement machinery and allied equipment and transport vehicles, effects of noise generation will be slightly felt in the core zone, being the mining area, though such sources are of intermittent nature, in order to maintain the noise level within permissible limits, sufficient measures will be undertaken. This protects the workers and staff from higher noise levels. By adopting suitable control measures as listed below, the impact in buffer zone from the mine area will be kept at minimum level.

The various control measures are:

- a) Row of trees with thick flora will be planned to act as acoustic barriers along the roadside and mine periphery.
- b) Proper preventive maintenance schedules will be drawn and implemented for machinery and other machinery to eliminate noise as far as possible.
- c) In order to reduce vibration, machines will be kept in balanced and properly aligned conditions.
- d) Ear muffs/ear plugs will be provided to workers at noise prone zone.
- e) A noise data maintained for all noise prone activities and noise exposure records of the workers.

10.0 Legal Features:

The area applied for Mining lease is a patta land and it is not covered under forest of any category and the applicant has surface right over the area applied for Mining lease.

Tribal issues, national monuments, etc,

There are no tribal habitants in and around the mine site, the populations are mostly agricultural based and it is only seasonal. There is no Public Building, Places of Worship, National Monuments or Places of Archaeological interest near the area within 2km radius.

11.0 Economic Evaluation:

The cost of land/Ha is Rs. 6,70,000 X 22.96.0 ha. = 1,53,83,200/-

The total cost production/ton is Rs. 257.

Total Mineral reserves (proved 111) @ 100% recovery of Limestone will be **17,68,310 Ts.**

Total Mineral reserves (proved 111) @ 100% recovery of Limekankar will be **1,91,626 Ts.**

The entire mined Limekankar & Limestone is proposed to be used for the own plant in located at a distance of about 10-15km from the applied area. No sub-grade mineral is encountered.

Costing:

EMP Cost during the mining plan period:

EMP & Environmental Monitoring	-	Rs. 1000000/-
Social Measures	-	Rs. 300000/-
Occupational Health & safety measures	-	Rs. 200000/-
Green belt development and others	-	Rs. 400000/-

Operating Cost:

Table-11

S.No.	Particulars	Cost of production Per ton
1.	Labour charges	Rs.65
2.	Royalty paid to Mines & Geology	Rs.80
3.	Taxes (NMET & TCS)	Rs.3.2
4.	District Mineral Foundation (DMF)	Rs.24
5.	Excavation expenses	Rs.35
6.	Transport from mine head to Stockyard (loading & unloading)	Rs.40
7.	Miscellaneous and over heads	Rs.10
	Total	Rs.257.2

Signature of the Qualified Person



Dr.P.Thangaraju, M.Sc., Ph.D.,

Place: Salem

Date: 25.09.2019

ANNEXURE-IA

RESOURCES AND RESERVES BY UNFC SYSTEM

THE RESERVES AND RESOURCES WERE ASSESSED BASED ON THE UNITED NATIONS FRAME WORK CLASSIFICATIONS AS AMENDED IN THE MINERAL CONSERVATION AND DEVELOPMENT RULES (SECOND AMENDMENT) RULE 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.

- In order to implement UNFC System, Mineral Deposits are classified into **SEVEN** types and accordingly exploration norms/field guidance have been formulated to assign different level of Geological codes.
- The Seven types of deposit classification proposed in UNFC is intended to assist in finding reasonable degree of detail of exploration of mineral deposits by providing clear definitions of individual categories of reserves/resources according to the criteria accepted.

I. STRATIFORM, STRATA BOUND AND TABULAR DEPOSITS OF REGULAR HABIT

Characteristics of deposits

Of irregular habit and/or with faults of large measures, shear zones, solution cavities, irregular erosion and weathering (oxidation) features, partings and bifurcations, igneous intrusive, facies changes, etc.

Principal kinds of minerals

Coal seams, lignite beds, iron ore formations and cappings, manganese horizons in sedimentary limestone and **sedimentary limestone** sequences, thick bauxite cappings, regional chromite lodes in large ultramafics, **limestone**, dolomite, barites, gypsum, evaporates including potash and salt belts, chalk and fireclay, fullers earth, gold in banded iron formation, platinum group of elements in chromite or in chromite bearing rocks and molybdenum in shear – controlled zones.

UNFC IN A NUTSHELL

UNFC designed as an umbrella system, which is internationally applicable and acceptable to harmonize existing different terminologies and definitions by using 3 Digit numerical codification system. This has resulted improvements in the comparability of mineral statistics and ultimately facilitate National Mineral Inventory, international trade and provide efficient link between market economy.

The U.N.F.C consists of three-dimensional system with the following three axes.

1. GEOLOGICAL Axis (G1- Detailed exploration)
2. FEASIBILITY Axis (F1- Feasibility Study)
3. ECONOMIC Axis (E1- Economics)

GEOLOGICAL AXIS (G1)

(Detailed Exploration)

The applicant with his consultant geological team carried out the detailed exploration to ascertain the reserves and resources and all the parameters required under UNFC System.

1.0 Geological survey:

(i) Mapping a) coal - 1:5000 b) For other minerals - 1:1000 or larger scale: GEOLOGICAL MAPPING (1:1000 Scale)

The geological mapping deals with surface geology; existing features of vegetation cover, soil cover etc. such as study of the detailed geological mapping in the scale of 1:2,000 has been prepared.

(ii) Topography:

The Toposheet map is correlated with the mapping carried out by the applicant consultant geological team in the local map scale 1:2000 with help of total station survey and relevant software, to prepare the Topographical cum geological plan of Pudupalayam Limekankar & Limestone Deposit (S.F.Nos. 144/1A, 217/1A, etc., 22.96.0Ha.) Ariyalur Taluk, Ariyalur District. This map reflects the topographical features, geological features and surface features of the area such as surface exposures, structural features, drilled core drills, contour of the area. Please refer plate No.III (Surface plan) and Plate Nos. IV & IVA. (Geological plan and sections).

2.0 Geochemical survey:

Detailed litho geochemical analysis:

Samples were collected from diamond drills and they are mixed thoroughly and a representative sample is taken by the process of coning and quartering and the same was analyzed. Based on the analysis it is inferred that the grade is found to be of cement grade. The analysis report from NABL laboratory is enclosed in Annexure Nos.V & VA.

Grade of Limekankar & Limestone:

Samples were collected from the drilled core drills for NABL laboratory for testing and analysis and to find out the chemical and physical properties of the minerals, it indicates that the Limekankar & Limestone is white in color and bulk density is 2.25 & 2.0 respectively and massive in nature. Based on chemical analysis, it is inferred that the grade continues to be cement grade.

The average analysis of the Limekankar & Limestone is given below:

Table-1

LIMESTONE		Limekankar
Parameter	Composition %	Composition %
Calcium Oxides (CaO)	49.28	46.26
Magnesium Oxides (MgO)	0.52	0.44
Iron (Fe ₂ O ₃)	1.06	0.95
Alumina as (Al ₂ O ₃)	1.35	1.35
Silica (SiO ₂)	9.61	13.99
Loss of Ignition (LOI)	37.89	36.95
Calcium as CaCO ₃	87.98	82.58
Magnesium as MgCO ₃	1.09	0.92
Lime saturation Factor	1.89	1.03

As analyzed by NABL laboratories limestone which has more than 70% CaCO₃ is best suited for cement industries. More than 70% CaCO₃ Limekankar material is used for blending with limestone in these particular formations. Chemical analysis report of the Limekankar & Limestone is enclosed as Annexure Nos. V & VA.

3.0 Geophysical survey:

Detailed borehole geophysical survey:

Geophysical survey in the form of vertical electrical sounding (VES), has been conducted in the area applied for Mining lease to assess the lateral variations, vertical in homogeneities and the sub surface geology with respect to the availability of resources and reserves of the Limekankar & Limestone deposits.

4.0 Technological:

(i) Pitting:

It is a fresh lease applied area for mining lease. As discussed above, diamond drills in the area applied for Mining lease evidences sufficient datas required for the occurrence and distribution of Limekankar & Limestone.

(ii) Trenching:

As discussed above, the area applied for Mining lease evidences sufficient datas required for the occurrence and distribution of Limekankar and Limestone. No trenching is proposed during the present plan period.

(iii) Drilling:

Twenty three core drills (Pbh1- Pbh23) for the first year of Mining Plan period (i.e. after the grant of mining lease) of 60m depth each are proposed from the existing floor level @ 100m grid interval, for future exploration during the plan period. The proposed exploration program is given in the following table.

Table-2

Year	No. of boreholes (Core / RC/ DTH)	Grid Interval	Total meterage	No. of Pits dimensions and volume	No. of Trenches dimensions and volume
1 st year	23 nos. [Core drills] – each 60m (d)	100m	Core drill of depth 60m each (23 X 60m =1380m	-	-

Locations of the proposed core drills are marked in the geological plan and yearwise plan (Refer Plate No.IV & VA).

(iv) Sampling - Core and sludge, pits samples for grade analysis or beneficiation, bulk samples for laboratory scale / pilot plant investigation:

Sampling technique:

Sampling is done to ascertain the grade of mineral values that vary in proportion from one place to another. One single sample taken from one part of the ore body generally does not provide a representative picture of the grade of the entire ore body. A large number of well-spaced samples are required for ascertaining the average grade with an acceptable amount of accuracy. Normally, no amount of sampling will give a truly representative picture of the ore body. There is always some degree of error between the actual value and the value computed from the samples.

The aim of sampling is only to reduce the error to the minimum possible level.

In addition to know the grade of the ore, sampling also reveals the pattern of mineralization within the ore body. A systematic mine sampling program can demarcate the richer and leaner ore portions. Similarly, the limits of mineralization towards both the hanging and footwall contacts can also be precisely defined by careful sampling.

Sampling is also necessary to determine the processing and extractability characteristics of the mineral. For this purpose, bulk/grab representative/simulated samples representing the quality and type of material to be treated is collected.

More than 10 samplings were collected in the drilled core drills to ascertain the quality of Minerals. All the samples collected from the drilled core holes were packed carefully and taken to the investigation site office.

These samples are gathered to for (Coning and Quartering which is as follows).

First the material is thoroughly mixed then it is heaped by pouring the material at one single point which will ultimately be the center of the heap for this it will be helpful if a tall peg is fixed into the plate on which sampling is done, so that the material is always poured down all round the top of the peg to obtain uniform distribution when all the material is heaped top of the cone is flattened gently by a plate. Then the top is divided into four quarters as shown. Now, the opposite quarters are scooped out and rejected. The remaining portion represents approximately one-half of the original samples. (A basic technique used for sampling).

Again it is passed through control sorting, mixing. The balance available sample is analyzed from NABL laboratory for calculating the parameters required for mineral assemblages. This sampling technique was adopted to find out the concentration of calcium carbonate in the sedimentary Limekankar & limestone deposit.

The average analysis of the Limekankar & Limestone is given below:

Table-3

LIMESTONE		Limekankar
Parameter	Composition %	Composition %
Calcium Oxides (CaO)	49.28	46.26
Magnesium Oxides (MgO)	0.52	0.44
Iron (Fe ₂ O ₃)	1.06	0.95
Alumina as (Al ₂ O ₃)	1.35	1.35
Silica (SiO ₂)	9.61	13.99
Loss of Ignition (LOI)	37.89	36.95
Calcium as CaCO ₃	87.98	82.58
Magnesium as MgCO ₃	1.09	0.92
Lime saturation Factor	1.89	1.03

Hence, this Limekankar & limestone is quite suitable for Cement Industries. The analysis report from NABL laboratory is enclosed in Annexure Nos. V & VA.

Beneficiation:

The applicant has no beneficiation plant as such. Hence no beneficiation is proposed to be done in the mine.

Pilot plant:

The entire mined out Limekankar & limestone is of uniform grade suitable for cement industries and is proposed to be utilized as raw material for cement manufacturing in the company's own captive plant which is located at Ariyalur District which is at a distance of about 10-15km from the applied area. No sub-grade mineral is encountered.

(v) Collection of abiotic geo- environmental data – its further refining and analysis:

The applicant consulting geological team carried out the abiotic environmental data like collecting of flora and identify the fauna around the lease applied area for mining lease, besides also conducting the geo hydrological studies, water analysis, air quality monitoring etc., which is required for the environmental management plan and environmental impact assessment (This chapter is discuss in detail in pre-feasibility report which is enclosed Annexure No.I).

5.0 Petrographic:

Study of petrographic characters of rock and study of useful minerals:

The rock formation in the area is of sedimentary formations represented by cretaceous. The sedimentary formations of coralline limestone belongs to the cretaceous system and rest over archaean formations. Marine organisms such as shells, corals, crinoids formed them and foraminifera are composed chiefly of CaCO_3 with varying amounts of impurities such as sand, glauconite, ferrugeneous, phosphatic and bituminous matter.

6.0 Geostatistical analysis of borehole data thickness of ore waste encountered in holes, assay values of samples if considered necessary:

More than 10 samplings were collected in the drilled core drills to ascertain the quality and grade of Limekankar & Limestone and based on the analysis it was inferred that the limestone is of cement grade. With the data analyzed from the drilled core drills, the depth of the mineralization has been proved upto 17.75m depth with an average of 2.0m Topsoil, 0.75m limekankar from RL 55.0m to RL 37.25m

As per the UNFC guidelines, the applicant has proposed to carry out the exploration program during the first year 23 Core drills (PBh-1 to PBh-23) of the mining plan period after the grant of mining lease. Now in this mining plan the reserves are calculated based on the old Diamond drills made in the area applied for Mining lease. After carrying out the exploration studies in the first year of the mining plan period the exact resource and reserves as per the UNFC norms will be calculated and the same will be discussed in detail in the modified mining plan.

FEASIBILITY AXIS

F1

(Feasibility Study)

1.0 Geology:

Geology of area and project, detailed exploration, closed spaced drilling; ore body modeling, bulk samples for beneficiation, geotechnical and ground water & surface waters studies:

The area around Ariyalur forms parts of the well-known cretaceous formation of Trichinopoly.

The sedimentary formations of coralline limestone belongs to the cretaceous system and rest over archaean formations. The Limestone is creamy white in colour. Marine organisms such as shells, corals, microfossils, ammonites, Gryphea, crinoids formed them and foraminifera are composed chiefly of CaCO_3 with varying amounts of impurities such as sand, glauconite, ferruginous, phosphatic and bituminous matter. The organic material rich in magnesium has given rise to magnesium bearing limestone in certain areas. The Limestone is hard, compact and amorphous in nature and indurated layers of limestone due to structural deformation and intense weathering. These organic limestones are basically marine sediments derived from rich coral-lime shells and other remains.

Topsoil:

The topsoil is black cotton soil. It occurs to a depth of 2m and lies over the limekankar formations.

Kankar:

Kankar has developed over the limestone extensively and ranges in thickness of 0.75 meters. The formation of Kankar is evidently due to the alternating wet and dry spells of tropical climate, which has caused leaching out of the clayey and siliceous portions in the top layer of limestone. Thus though the Kankar is prous, pisolitic and red in colour due to dispersion of iron oxide, it analyses very high in calcium carbonate content (generally 85 to 95 per cent CaCO_3). The fragments of shells as well as cementing calcareous medium make the Kankar hard and difficult to break. The Kankar is at present being mined for manufactures slaked lime in country kilns for use in construction.

The following geological setup has been identified for these deposits of cretaceous age and the order of superposition is described.

	Upper :	Niniyur
Cretaceous age	Middle :	Ariyalur, Trichinopoly
	Lower :	Uttatur

The area was surveyed in detail to prepare a Geological map in the scale of 1:2000 showing the various formations and attitude of the deposit. It is inferred that the Limekankar & Limestone mineral is of grade suitable for cement industries and in form single bed running N-S with Vertical dipping. Topsoil cover to a depth of 2.0m followed by 0.75m of Limekankar. Recovery of minerals is estimated as 100% of the total excavation of the ore body. The recovery percentage is based on the knowledge gained from the adjacent working mine in this region, by the field tests carried out in the lease area and analysis done in NABL Laboratories.

The physical attitude of the Limekankar & Limestone deposits is demarked as follows:

Strike length (m)	: 864 (max)
Width (m)	: 430 (max)
Depth (m)	: 17.75m with an average of 2m Topsoil & 0.75m Limekankar
Strike direction	: N – S
Dip amount and direction	: Vertical dip

Ground water & surface waters studies:

The area is dry for most part of the year and receives rainfall during the northeast and southwest monsoon season. The average annual rainfall is 1071.4mm. There are no major monsoon river courses in the area. Water table is found at a depth of 38m during summer and 35m during rainy season. The maximum depth proposed for mining is 8.75mts with an average of 2.0m topsoil from RL 55.0m to RL 46.25m, hence the water table will not encounter during the course of mining activity.

There will be seepage of ground water during the rainy season; the same will be pumped out with the help of 5HP motor pumps when there is a considerable accumulation of seepage water. Periodically water samples will be collected and analyzed as per statutory norms of IBM.

2.0 Mining:

Methods with special emphasis on detailed geotechnical test work/site characterization studies, safely measures; mining plan, mine recoveries and efficiency with variability due to structural complexities like close folds and faults; detailed estimates of manpower:

The mining operations are proposed to be carried out by "A Category" Method. Excavators will be deployed for the formation of benches and loading. Rock breaker is proposed for development & production activities. Neither drilling nor blasting is carried out.

One bench is proposed on the topsoil with 2.0m height and width with 45° slope.

In Limekankar mineral one bench is proposed with 0.75m height and width with 60° slope.

In Limestone mineral two benches are proposed with 6m height and 6m width and another one bench is proposed with 3m height and 3m with 60° slope.

During the mining plan period, the mining operations are proposed to be carried out in the North, Centre & Eastern portion of the area applied for Mining lease starting from West and progress towards the Eastern side by open cast method with 6m bench height and 6m bench width for a limestone mineral upto a depth of 8.75mts with an average of 0.75m limekankar and 2.0m Topsoil from RL 55.0m to RL 46.25m. Please refer Plate Nos. VA to VE1.

The proposed average annual production Limestone will be 2,23,800 tonnes and Limekankar will be 38,325 tonnes with 300 working days in a year.

The applicant assures to carry out the detailed Exploration as per the UNFC Norms in the first year of Mining Plan period itself (i.e. after the grant of mining lease). If the Resource & Reserves are enhanced considerably, a modified mining plan will be prepared and submitted to IBM for subsequent clearance & approval.

The topsoil generated is proposed to be dumped in the Southwestern side of the area applied for Mining lease and also will be utilized for afforestation purposes.

Proper footpaths and haul roads are provided wherever necessary for easy access of men. Haul roads for movement of tippers with crossing platforms are provided to conform to statutory standards.

Adequate safety precautions have been taken as per MMR, 1961 to safeguard the nearby residence. Moreover, no drilling and no blasting operation is adopted since the applicant has proposed to use rock breaker.

Afforestation is proposed on the north, east, south & western side of the 7.5m & 50m boundary barrier.

If there is any change in the system of mining, the same will be intimated to Indian Bureau of Mines and the mining plan will be suitably modified for subsequent clearance and approval.

3.0 Environmental:

(i) Environmental impact assessment (EIA) studies/environmental (EMP) including socio-economic impacts:

Please refer chapter no.9.0 Annexure No. I.

(ii) Rehabilitation of project affected persons, and waste disposal/ reclamation: detailed land use data:

Topsoil:-

The topsoil is black cotton soil. It occurs to a depth of 2m. About 4,80,420 Ts of topsoil would be generated during the present plan period is proposed to be dumped on the Southwestern portion of the lease applied area and also utilized for afforestation purposes.

Mined Waste:

There is no Mineral reject, the entire lease area consists of whole area deposit. Hence quantities of generation of mineral rejects in this area applied for mining lease does not arise.

The generation of topsoil during the present plan period will be temporarily dumped on the southwestern portion of the area and also utilized for Afforestation purposes. This aspect has been considered and accordingly Conceptual Mining Plan is drawn.

Proposed generation of waste for First Five Years:

Table-4

Year	Limestone	Limekankar	Topsoil (Ts)	Ore to Overburden ratio
	ROM (Ts)	ROM (Ts)		
I Year	94128	69015	173692	1;1.06
II Year	307152	41344	103408	1;0.30
III Year	298416	28397	68800	1;0.21
IV Year	192960	37007	91344	1;0.40
V Year	226344	15863	43176	1;0.18
Total	1119000	191626	480420	1;0.37

The quantities of generation of wastes at the end of the mine life of the mine

Table – 5

Category	Limestone ROM (Ts)	Limekankar ROM (Ts)	Top Soil (Ts)
Proved 111	1768310	191626	480420

Manner of disposal of waste:

There is no generation of Mineral reject. Hence Manner of disposal of waste does not arise. The topsoil will be loaded manually into tippers and occasionally by excavators and dumped in respective places ear-marked for the same. The dumps will be given steps if necessary.

Stabilization of dumps:

- i) Periodically sprinkling/spraying water on roads leading from working face to waste dumps, so that these areas are always kept wet to prevent emission of air borne dust.
- ii) The waste dumps have been maintained at the angle of 30° slope to prevent sliding.
- iii) The height and width of the waste dump will be maintained.

Dimension of the waste dumps during the present mining plan period

Dimension of the dumps at the end of the I Year:

Table-6

Proposed Topsoil Temporary Dump	128m X 126m X 5.38m(h)	Southwest
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Dimension of the dumps at the end of the II Year:

Table-7

Proposed Topsoil Temporary Dump	128m X 126m X 8.59m(h)	Southwest
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Dimension of the dumps at the end of the III Year:

Table-8

Proposed Topsoil Temporary Dump	128m X 126m X 10.72m(h)	Southwest
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Dimension of the dumps at the end of the IV Year:

Table-9

Proposed Topsoil Temporary Dump	128m X 126m X 13.55m(h)	Southwest
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Dimension of the dumps at the end of the V Year:

Table-10

Proposed Topsoil Temporary Dump	128m X 126m X 14.89m(h)	Southwest
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4.0 Processing:

Details of proven pilot plant scale/ industrial scale investigations, appended with layout design, equipment list fuel/power consumption, specification for product/by-product, disposal of tailings, effluent and future remedial measures:

The entire mined out Limekankar & Limestone is of uniform grade suitable for cement industries and is proposed to be utilized as raw material for cement manufacturing in the company's own captive plant which is located at Ariyalur District which is at a distance of about 10-15km from the applied area. No sub-grade mineral is encountered.

5.0 Infrastructure and services and construction activities: Full details:

The area applied for Mining lease is at a distance of about 1.3 kms Southwest of Pudupalayam Village. Pudupalayam Village is located at a distance of about 9.0 km Southeast of Ariyalur District.

The area applied for Mining lease lies 0.12km Southeast of Trichy – Chidambaran (NH - 277) National Highway Road.

Table – 11

S.No	Particulars	Location	Direction	Approximate Distance in Km
1	Nearest Post office	Siruvalur	SW	2
2	Nearest Town(D.H)	Ariyalur	NW	10
3	Nearest Police Station	Thelur	NE	5
4	Nearest Govt. Hospital	Poyyur	SW	5.2
5	Nearest School	Reddipalayam	NE	3.2
6	Nearest DSP Office	Ariyalur	NW	10
7	Nearest Railway Station	Ariyalur	NW	10
8	Nearest Airport	Trichy	SW	60
9	Nearest Seaport	Chennai	NE	260

Please refer Location plan (Plate No.I), Route Map (Plate No.IA), Key plan (Plate No.IB)

Drinking Water, rest shed, store room, public convenience and mines office are proposed to be constructed in temporary semi permanent structure within the area applied for mining lease. Please refer Plate No. VI.

6.0 Costing:

Detailed breakup of capital and operating costs details of working capital:

Since it is an opencast mining, hire HEMM, spades, axes, showels and semi skilled labours are the only capital investment which is around Rs.15,00,000/- and the working capital may not exceed Rs. 15,00,000/-.

7.0 Marketing:

Overview, specific market aspects:

The entire mined out Limekankar & Limestone is of uniform grade suitable for cement industries and is proposed to be utilized as raw material for cement manufacturing in the company's own captive plant which is located at Ariyalur District which is at a distance of about 10-15km from the applied area. No sub-grade mineral is encountered.

8.0 Economic viability:

Cash flow forecast, inflation effects, sensitivity studies:

The entire mined out Limekankar & Limestone is of uniform grade suitable for cement industries and is proposed to be utilized as raw material for cement manufacturing in the company's own captive plant which is located at Ariyalur District which is at a distance of about 10-15km from the applied area. No sub-grade mineral is encountered.

Costing:

EMP Cost during the mining plan period:

EMP & Environmental Monitoring	-	Rs. 1000000/-
Social Measures	-	Rs. 300000/-
Occupational Health & safety measures	-	Rs. 200000/-
Green belt development and others	-	Rs. 400000/-

Operating Cost:

Table-12

S.No.	Particulars	Cost of production Per ton
1.	Labour charges	Rs.65
2.	Royalty paid to Mines & Geology	Rs.80
3.	Taxes (NMET & TCS)	Rs.3.2
4.	District Mineral Foundation (DMF)	Rs.24
5.	Excavation expenses	Rs.35
6.	Transport from mine head to Stockyard (loading & unloading)	Rs.40
7.	Miscellaneous and over heads	Rs.10
	Total	Rs.257.2

9.0 Other factors:

Statutory provisions (labour, land, mining, taxation etc).

Since the lease applied area for mining lease falls on the backward village of Ariyalur District where the agricultural activities mainly depend upon the rainfall plenty of labours and land is available. The mining is proposed to be carried out by "A" Category method. The taxes for the wages and mineral will be paid as per government norms.

By carefully analyzing the feasibility axis the exploitation of Limekankar and Limestone deposit is economically viable at present market scenario.

ECONOMIC AXIS

E1

(Economic)

1.0 Detailed exploration:

i). Primary data:

The area has been already regionally explored by Geological Survey of India (1985), State Department of Geology and Mining (1993).

ii). Secondary data:

For preparing this mining plan, detailed studies were carried out based on the Diamond Drills in the mining lease applied area. The occurrence and distribution of the mineral of clearly visible based on the exploration work carried out by the State Department of Geology and Mining in the years 1984 & 1994.

The diamond drills (Phase-III & Phase-V) logging datas are furnished below:

Table-13

No. of Diamond drills	Depth of Diamond drills (m)	Depth of deposition	Strata
PD/4-2	6.75	55.00m – 53.00m	Topsoil
		53.00m – 52.25m	Kankar
		52.25m – 48.25m	Limestone
PPM-4	12.75	55.00m – 53.00m	Topsoil
		53.00m – 52.25m	Kankar
		52.25m – 42.25m	Limestone
PPM-13	12.75	55.00m – 53.00m	Topsoil
		53.00m – 52.25m	Kankar
		52.25m – 42.25m	Limestone
PPM-19	17.75	55.00m – 53.00m	Topsoil
		53.00m – 52.25m	Kankar
		52.25m – 37.25m	Limestone
PD/4-3	12.75	55.00m – 53.00m	Topsoil
		53.00m – 52.25m	Kankar
		52.25m – 42.25m	Limestone
PD/4-4	14.75	55.00m – 53.00m	Topsoil
		53.00m – 52.25m	Kankar
		52.25m – 40.25m	Limestone

Locations of drilled core drills are marked in the geological plan and sections and year wise plan and sections (Refer Plate No.IV, VA & VA1).

Copy of the Exploration report, chemical analysis report & Bore hole map are enclosed as Annexure Nos.IV & IVA.

Based on the Diamond drills made in the applied area all the datas required for exploration studies were carried out related to G1, E1 & F1 axis as per United Nations Framework Classification System to calculating reserves and resources and to arrive UNFC 111 category.

Reserves are calculated based on the drilled core drills data, adjacent mine pit nullah, vari and reservoir. Hence the deposit has been estimated upto 17.75m depth with an average of 2.0m topsoil and 0.75m Limekankar during the present mining plan period.

Table-14

Depth of estimation of the reserves and resources during the Mining plan period.

17.75m [2.0m Topsoil + 0.75m Limekankar + 15m Limestone (proved 111)]	Northeast & East
17.75m [2.0m Topsoil + 0.75m Limekankar + 10m Limestone (proved 111) + 3m Limestone (probable 222)]	Centre
17.75m [2.0m Topsoil + 0.75m Limekankar + 15m Limestone (probable 222)]	Southeast, Northwest, West, South & Southwest

Proposed to be carried out:

As per the UNFC guidelines, the applicant has proposed to carry out the exploration program during the first year 23 Core drills (PBh-1 to PBh-23) of 60m depth each of the mining plan period after the grant of mining lease. Now in this mining plan the reserves are calculated based on the old Diamond drills made in the area applied for Mining lease. After carrying out the exploration studies in the first year of the mining plan period the exact resource and reserves as per the UNFC norms will be calculated and the same will be discussed in detail in the modified mining plan.

a. Geological Mapping (Topographical and Contour map in 1: 1000 Scale)

The area was surveyed in detail by total station survey instrument with relevant station software to prepare a geological map in the scale of 1:2000 showing the various formations, attitude of the deposits and the reserve position. It is inferred that the Limekankar & Limestone mineral is of cement grade and in form bed running N – S with Vertical dip.

The physical attitude of the Limekankar & Limestone deposits is demarked as follows:

Strike length (m)	: 864 (max)
Width (m)	: 430 (max)
Depth (m)	: 17.75m with an average of 0.75m Limekankar & 2m Topsoil
Strike direction	: N – S
Dip amount and direction	: Vertical dip

b. Geo-physical prospecting in the way of vertical electrical sounding:

Geophysical survey in the form of vertical electrical sounding (VES), has been conducted in the area applied for Mining lease to assess the lateral variations, vertical in homogeneities and the sub surface geology with respect to the availability of resources and reserves of Limekankar and Limestone deposits.

c. Geo-chemical prospecting:

One representative sample for Limekankar and Limestone from the Drilled core drills were collected and correlated. After cone and quartering the mineral samples were collected for chemical analysis and physical properties.

Grade of Limekankar & Limestone:

Samples were collected from the drilled core drills for NABL laboratory for testing and analysis and to find out the chemical and physical properties of the minerals, it indicates that the Limekankar & Limestone is white in color and bulk density is 2.25 & 2.0 respectively and massive in nature. Based on chemical analysis, it is inferred that the grade continues to be cement grade.

The average analysis of the Limekankar & Limestone is given below:

Table-15

LIMESTONE		Limekankar
Parameter	Composition %	Composition %
Calcium Oxides (CaO)	49.28	46.26
Magnesium Oxides (MgO)	0.52	0.44
Iron (Fe ₂ O ₃)	1.06	0.95
Alumina as (Al ₂ O ₃)	1.35	1.35
Silica (SiO ₂)	9.61	13.99
Loss of Ignition (LOI)	37.89	36.95
Calcium as CaCO ₃	87.98	82.58
Magnesium as MgCO ₃	1.09	0.92
Lime saturation Factor	1.89	1.03

As analyzed by NABL laboratories limestone which has more than 70% CaCO₃ is best suited for cement industries. More than 70% CaCO₃ Limekankar material is used for blending with limestone in these particular formations. Chemical analysis report of the Limekankar & Limestone is enclosed as Annexure Nos. V & VA.

d. Technological prospecting:

The deposit is a small with uniform grade. Based on the eight diamond drills all the datas required for technological prospecting were carried out to ascertain the attitude, grade and petrological settings of the formations.

The diamond drills in the area applied for Mining lease is about 15-16m depth. Based on the six diamond drills all the datas required for exploration studies were carried out related to G1, E1 & F1 axis as per United Nations Framework Classification System. The deposit is of 17.75m with an average of 2.0m topsoil and 0.75m Limekankar is considered for calculating the reserves under proved category by based on the drilled core holes.

i). Pitting:

It is a fresh lease applied area for mining lease. As discussed above, diamond drills in the area applied for Mining lease evidences sufficient datas required for the occurrence and distribution of Limekankar & Limestone.

ii). Trenching:

As discussed above, the area applied for Mining lease evidences sufficient datas required for the occurrence and distribution of Limekankar & Limestone. No trenching is proposed during the present plan period.

iii) Drilling:

Twenty three core drills (Pbh1- Pbh23) for the first year of Mining Plan period (i.e. after the grant of mining lease) of 60m depth each are proposed from the existing floor level @ 100m grid interval, for future exploration during the plan period. The proposed exploration program is given in the following table.

Table-16

Year	No. of boreholes (Core / RC/ DTH)	Grid Interval	Total meterage	No. of Pits dimensions and volume	No. of Trenches dimensions and volume
1 st year	23 nos. [Core drills] – each 60m (d)	100m	Core drill of depth 60m each (23 X 60m =1380m	-	-

Locations of the proposed core drills are marked in the geological plan and yearwise plan (Refer Plate No.IV & VA).

2.0 Mining report /mining plan / working mines:

The mining operations are proposed to be carried out by “A Category” Method. Excavators will be deployed for the formation of benches and loading. Rock breaker is proposed for development & production activities. Neither drilling nor blasting is carried out.

One bench is proposed on the topsoil with 2.0m height and width with 45° slope.

In Limekankar mineral one bench is proposed with 0.75m height and width with 60° slope.

In Limestone mineral two benches are proposed with 6m height and 6m width and another one bench is proposed with 3m height and 3m with 60° slope.

During the mining plan period, the mining operations are proposed to be carried out in the North, Centre & Eastern portion of the area applied for Mining lease starting from West and progress towards the Eastern side by open cast method with 6m bench height and 6m bench width for a limestone mineral upto a depth of 8.75mts with an average of 0.75m limekankar and 2.0m Topsoil from RL 55.0m to RL 46.25m. Please refer Plate Nos. VA to VE1.

The proposed average annual production Limestone will be 2,23,800 tonnes and Limekankar will be 38,325 tonnes with 300 working days in a year.

The applicant assures to carry out the detailed Exploration as per the UNFC Norms in the first year of Mining Plan period itself (i.e. after the grant of mining lease). If the Resource & Reserves are enhanced considerably, a modified mining plan will be prepared and submitted to IBM for subsequent clearance & approval.

The topsoil generated is proposed to be dumped in the Southwestern side of the area applied for Mining lease and also will be utilized for afforestation purposes.

Proper footpaths and haul roads are provided wherever necessary for easy access of men. Haul roads for movement of tippers with crossing platforms are provided to conform to statutory standards.

Adequate safety precautions have been taken as per MMR, 1961 to safeguard the nearby residence. Moreover, no drilling and no blasting operation is adopted since the applicant has proposed to use rock breaker.

Afforestation is proposed on the north, east, south & western side of the 7.5m & 50m boundary barrier.

If there is any change in the system of mining, the same will be intimated to Indian Bureau of Mines and the mining plan will be suitably modified for subsequent clearance and approval.

3.0 Specific end-use grades of reserves (above economic cut-off grade):

The entire mined out Limekankar & Limestone is of uniform grade suitable for cement industries and is proposed to be utilized as raw material for cement manufacturing in the company's own captive plant which is located at Ariyalur District which is at a distance of about 10-15km from the applied area. No sub-grade mineral is encountered.

Grade of Limekankar & Limestone :

Samples were collected from the drilled core drills for NABL laboratory for testing and analysis and to find out the chemical and physical properties of the minerals, it indicates that the Limekankar & Limestone is white in color and bulk density is 2.25 & 2.0 respectively and massive in nature. Based on chemical analysis, it is inferred that the grade continues to be cement grade.

The average analysis of the Limekankar & Limestone is given below:

Table-17

LIMESTONE		Limekankar
Parameter	Composition %	Composition %
Calcium Oxides (CaO)	49.28	46.26
Magnesium Oxides (MgO)	0.52	0.44
Iron (Fe ₂ O ₃)	1.06	0.95
Alumina as (Al ₂ O ₃)	1.35	1.35
Silica (SiO ₂)	9.61	13.99
Loss of Ignition (LOI)	37.89	36.95
Calcium as CaCO ₃	87.98	82.58
Magnesium as MgCO ₃	1.09	0.92
Lime saturation Factor	1.89	1.03

The reserve above cutoff grade is tabulated below:

MINERAL RESERVE & LIFE OF THE MINE:

The mineral reserve is calculated by cross section method.

Table-18

Depth of estimation of the reserves and resources during the Mining plan period:

17.75m [2.0m Topsoil + 0.75m Limekankar + 15m Limestone (proved 111)]	Northeast & East
17.75m [2.0m Topsoil + 0.75m Limekankar + 10m Limestone (proved 111) + 3m Limestone (probable 222)]	Centre
17.75m [2.0m Topsoil + 0.75m Limekankar + 15m Limestone (probable 222)]	Southeast, Northwest, West, South & Southwest

Reassessed Mineral Reserves and Resources as per UNFC System as on 05.08.2019

Table-19

A. Mineral Reserves (111)

Section	Bench	Length in (m)	Width in (m)	Depth in (m)	Limestone				Limekankar				Topsoil (Ts)
					Volume in (Cu.m.)	Bulk Density	ROM (Ts)	Limestone @ 100% Recovery (Ts)	Volume in (Cu.m.)	Bulk Density	ROM (Ts)	Limekankar @ 100% Recovery (Ts)	
X8Y8-CD	I	49	30	2	2940	2	-	-	-	-	-	-	5880
	II	46	24	0.75	-	-	-	-	828	2.25	1863	1863	-
	III	43	18	6	4644	2	9288	9288	-	-	-	-	-
	Total						9288	9288	828	-	1863	1863	5880
X9Y9-GH	I	126	74	2	18648	2	-	-	-	-	-	-	37296
	II	122	68	0.75	-	-	-	-	6222	2.25	14000	14000	-
	III	119	62	6	44268	2	88536	88536	-	-	-	-	-
	IV	110	43	6	28380	2	56760	56760	-	-	-	-	-
	V	101	25	3	7575	2	15150	15150	-	-	-	-	-
	Total						160446	160446	-	-	14000	14000	37296
X3Y3-IJ	I	119	117	2	27846	2	-	-	-	-	-	-	55692
	II	113	114	0.75	-	-	-	-	9662	2.25	21738	21738	-
	III	106	111	4	47064	2	94128	94128	-	-	-	-	-
	Total						94128	94128	-	-	21738	21738	55692
X4Y4-IJ	I	164	100	2	32800	2	-	-	-	-	-	-	65600
	II	156	100	0.75	-	-	-	-	11700	2.25	26325	26325	-
	III	150	100	2	30000	2	60000	60000	-	-	-	-	-
	Total						60000	60000	-	-	26325	26325	65600
X5Y5-IJ	I	131	100	2	26200	2	-	-	-	-	-	-	52400
	II	128	100	0.75	-	-	-	-	9600	2.25	21600	21600	-
	III	125	100	6	75000	2	150000	150000	-	-	-	-	-
	IV	115	100	4	46000	2	92000	92000	-	-	-	-	-
	Total						242000	242000	-	-	21600	21600	52400
X5Y5-KL	I	98	94	2	18424	2	-	-	-	-	-	-	36848
	II	95	91	0.75	-	-	-	-	6484	2.25	14588	14588	-
	III	92	88	6	48576	2	97152	97152	-	-	-	-	-
	IV	82	78	4	25584	2	51168	51168	-	-	-	-	-
	Total						148320	148320	-	-	14588	14588	36848
X6Y6-IJ	I	79	100	2	15800	2	-	-	-	-	-	-	31600
	II	76	100	0.75	-	-	-	-	5700	2.25	12825	12825	-
	III	73	100	6	43800	2	87600	87600	-	-	-	-	-
	IV	64	100	4	25600	2	51200	51200	-	-	-	-	-

	Total						138800	138800	-	-	12825	12825	31600
X6Y6-KL	I	92	95	2	17480	2	-	-	-	-	-	-	34960
	II	89	91	0.75	-	-	-	-	6074	2.25	13667	13667	-
	III	86	88	6	45408	2	90816	90816	-	-	-	-	-
	IV	77	79	4	24332	2	48664	48664	-	-	-	-	-
	Total						139480	139480	-	-	13667	13667	34960
X7Y7-IJ	I	172	100	2	34400	2	-	-	-	-	-	-	68800
	II	166	100	0.75	-	-	-	-	12450	2.25	28013	28013	-
	III	160	100	6	96000	2	192000	192000	-	-	-	-	-
	IV	141	100	4	56400	2	112800	112800	-	-	-	-	-
	Total						304800	304800	-	-	28013	28013	68800
X9Y9-IJ	I	173	132	2	45672	2	-	-	-	-	-	-	91344
	II	170	129	0.75	-	-	-	-	16448	2.25	37007	37007	-
	III	167	126	6	126252	2	252504	252504	-	-	-	-	-
	IV	157	116	6	109272	2	218544	218544	-	-	-	-	-
	Total						471048	471048	-	-	37007	37007	91344
Grand Total							1768310	1768310	-	-	191626	191626	480420

Table-20

B. Mineral Resources (222)

Section	Bench	Length in (m)	Width in (m)	Depth in (m)	Limestone				Limekankar				Topsoil (Ts)
					Volume in (Cu.m.)	Bulk Density	ROM (Ts)	Limestone @ 100% Recovery (Ts)	Volume in (Cu.m.)	Bulk Density	ROM (Ts)	Limekankar @ 100% Recovery (Ts)	
XY-AB	I	117	96	2	22464	2	-	-	-	-	-	-	44928
	II	117	96	0.75	-	-	-	-	8424	2.25	18954	18954	-
	III	117	96	6	67392	2	134784	134784	-	-	-	-	-
	IV	117	96	6	67392	2	134784	134784	-	-	-	-	-
	V	117	96	3	33696	2	67392	67392	-	-	-	-	-
	Total						336960	336960	-	-	18954	18954	44928
X10Y10-EF	I	85	88	2	14960	2	-	-	-	-	-	-	29920
	II	85	88	0.75	-	-	-	-	5610	2.25	12623	12623	-
	III	85	88	6	44880	2	89760	89760	-	-	-	-	-
	IV	85	88	6	44880	2	89760	89760	-	-	-	-	-
	V	85	88	3	22440	2	44880	44880	-	-	-	-	-
	Total						224400	224400	-	-	12623	12623	29920
X2Y2-KL	I	135	94	2	25380	2	-	-	-	-	-	-	50760
	II	135	94	0.75	-	-	-	-	9518	2.25	21414	21414	-
	III	135	94	6	76140	2	152280	152280	-	-	-	-	-
	IV	135	94	6	76140	2	152280	152280	-	-	-	-	-

	V	135	94	3	38070	2	76140	76140	-	-	-	-	-
	Total						380700	380700	-	-	21414	21414	50760
X3Y3-IJ	III	129	89	2	22962	2	45924	45924	-	-	-	-	-
	IV	129	89	6	68886	2	137772	137772	-	-	-	-	-
	V	129	89	3	34443	2	68886	68886	-	-	-	-	-
	Total						252582	252582	-	-	21414	21414	50760
X3Y3-KL	I	65	89	2	11570	2	-	-	-	-	-	-	23140
	II	65	89	0.75	-	-	-	-	4339	2.25	9762	9762	-
	III	65	89	6	34710	2	69420	69420	-	-	-	-	-
	IV	65	89	6	34710	2	69420	69420	-	-	-	-	-
	V	65	89	3	17355	2	34710	34710	-	-	-	-	-
	Total						173550	173550	-	-	9762	9762	23140
X4Y4-IJ	III	100	89	4	35600	2	71200	71200	-	-	-	-	-
	IV	100	89	6	53400	2	106800	106800	-	-	-	-	-
	V	100	89	3	26700	2	53400	53400	-	-	-	-	-
	Total						231400	231400	-	-	-	-	-
X4Y4-KL	I	85	105	2	17850	2	-	-	-	-	-	-	35700
	II	85	105	0.75	-	-	-	-	6694	2.25	15061	15061	-
	III	85	105	6	53550	2	107100	107100	-	-	-	-	-
	IV	85	105	6	53550	2	107100	107100	-	-	-	-	-
	V	85	105	3	26775	2	53550	53550	-	-	-	-	-
	Total						267750	267750	-	-	15061	15061	35700
X5Y5-IJ	IV	140	100	2	28000	2	56000	56000	-	-	-	-	-
	V	140	100	3	42000	2	84000	84000	-	-	-	-	-
	Total						140000	140000	-	-	-	-	-
X5Y5-KL	IV	106	95	2	20140	2	40280	40280	-	-	-	-	-
	V	106	95	3	30210	2	60420	60420	-	-	-	-	-
	Total						100700	100700	-	-	-	-	-
X6Y6-IJ	IV	88	100	2	17600	2	35200	35200	-	-	-	-	-
	V	88	100	3	26400	2	52800	52800	-	-	-	-	-
	Total						88000	88000	-	-	-	-	-
X6Y6-KL	IV	101	103	2	20806	2	41612	41612	-	-	-	-	-
	V	101	103	3	31209	2	62418	62418	-	-	-	-	-
	Total						104030	104030	-	-	-	-	-
X7Y7-IJ	IV	182	100	2	36400	2	72800	72800	-	-	-	-	-
	V	182	100	3	54600	2	109200	109200	-	-	-	-	-
	Total						182000	182000	-	-	-	-	-
X7Y7-MN	I	61	70	2	8540	2	-	-	-	-	-	-	17080
	II	61	70	0.75	-	-	-	-	3203	2.25	7206	7206	-
	III	61	70	6	25620	2	51240	51240	-	-	-	-	-
	IV	61	70	6	25620	2	51240	51240	-	-	-	-	-

	V	61	70	3	12810	2	25620	25620	-	-	-	-	-
	Total						128100	128100	-	-	7206	7206	17080
X9Y9-IJ	V	174	141	3	73602	2	147204	147204	-	-	-	-	-
	Total						147204	147204					
X9Y9-MN	I	60	76	2	9120	2	-	-	-	-	-	-	18240
	II	60	76	0.75	-	-	-	-	3420	2.25	7695	7695	-
	III	60	76	6	27360	2	54720	54720	-	-	-	-	-
	IV	60	76	6	27360	2	54720	54720	-	-	-	-	-
	V	60	76	3	13680	2	27360	27360	-	-	-	-	-
	Total						136800	136800	-	-	7695	7695	18240
Grand Total							2894176	2894176	-	-	92715	92715	219768

Table-21

C. Mineral Resources locked up in benches (221)								
Section	Bench	Perimeter Length(m)	Width(m)	Depth(m)	Volume (cum)	Bulk Density	ROM (Ts)	Limestone @ 100% Recovery (Ts)
X3Y3-IJ	II	320	7	4	8960	2	17920	17920
X4Y4-IJ	II	300	7	2	4200	2	8400	8400
X5Y5-IJ	II	214	7	6	8988	2	17976	17976
	III	218	17	4	14824	2	29648	29648
X6Y6-IJ	II	170	7	6	7140	2	14280	14280
	III	148	17	4	10064	2	20128	20128
X6Y6-KL	II	100	7	6	4200	2	8400	8400
	III	100	17	4	6800	2	13600	13600
X7Y7-IJ	II	288	7	6	12096	2	24192	24192
	III	299	17	4	20332	2	40664	40664
X8Y8-CD	II	125	7	6	5250	2	10500	10500
X9Y9-GH	II	287	7	6	12054	2	24108	24108
	III	264	17	4	17952	2	35904	35904
X9Y9-IJ	II	316	7	6	13272	2	26544	26544
	III	290	17	4	19720	2	39440	39440
Total							331704	331704

Table-22

D. Mineral resources locked up in 7.5m & 50m safety distance (222)											
Section	Area Sq.m	Depth in (m)	Limestone				Limekankar				Topsoil (Ts)
			Volume in (Cu.m.)	Bulk Density	ROM (Ts)	Limestone @ 100% Recovery (Ts)	Volume in (Cu.m.)	Bulk Density	ROM (Ts)	Limekankar @ 100% Recovery (Ts)	
-	34615	2	69230	2	-	-	-	-	-	-	138460
	34615	0.75	-	-	-	-	25961	2.25	58413	58413	-
	34615	15	519225	2	1038450	1038450	-	-	-	-	-
	Total				1038450	1038450	-	-	58413	58413	138460
X3Y3-IJ	846	11	9306	2	18612	18612	-	-	-	-	-
	Total				18612	18612	-	-	-	-	-
X4Y4-IJ	798	13	10374	2	20748	20748	-	-	-	-	-
	Total				20748	20748	-	-	-	-	-
X5Y5-IJ	1098	5	5490	2	10980	10980	-	-	-	-	-
	Total				10980	10980	-	-	-	-	-
X5Y5-KL	600	5	3000	2	6000	6000	-	-	-	-	-
	Total				6000	6000	-	-	-	-	-
X6Y6-IJ	1256	5	6280	2	12560	12560	-	-	-	-	-
	Total				12560	12560	-	-	-	-	-
X6Y6-KL	1485	5	7425	2	14850	14850	-	-	-	-	-
	Total				14850	14850	-	-	-	-	-
X7Y7-IJ	750	5	3750	2	7500	7500	-	-	-	-	-
	Total				7500	7500	-	-	-	-	-
X9Y9-IJ	3694	3	11082	2	22164	22164	-	-	-	-	-
	Total				22164	22164	-	-	-	-	-
Grand Total					1151864	1151864			58413	58413	138460

Table-23

D. Mineral resources locked up in 7.5m & 50m safety distance (221)											
Section	Area Sq.m	Depth in (m)	Limestone				Limekankar				Topsoil (Ts)
			Volume in (Cu.m.)	Bulk Density	ROM (Ts)	Limestone @ 100% Recovery (Ts)	Volume in (Cu.m.)	Bulk Density	ROM (Ts)	Limekankar @ 100% Recovery (Ts)	
X3Y3-IJ	846	2	1692	2	-	-	-	-	-	-	3384
	846	0.75	-	-	-	-	635	2.25	1428	1428	-
	846	4	3384	2	6768	6768	-	-	-	-	-
	Total				6768	6768	-	-	1428	1428	3384
X4Y4-IJ	798	2	1596	2	-	-	-	-	-	-	3192
	798	0.75	-	-	-	-	599	2.25	1347	1347	-
	798	2	1596	2	3192	3192	-	-	-	-	-
	Total				3192	3192	-	-	1347	1347	3192
X5Y5-IJ	1098	2	2196	2	-	-	-	-	-	-	4392
	1098	0.75	-	-	-	-	824	2.25	1853	1853	-
	1098	10	10980	2	21960	21960	-	-	-	-	-
	Total				21960	21960	-	-	1853	1853	4392
X5Y5-KL	600	2	1200	2	-	-	-	-	-	-	2400
	600	0.75	-	-	-	-	450	2.25	1013	1013	-
	600	10	6000	2	12000	12000	-	-	-	-	-
	Total				12000	12000	-	-	1013	1013	2400
X6Y6-IJ	1256	2	2512	2	-	-	-	-	-	-	5024
	1256	0.75	-	-	-	-	942	2.25	2120	2120	-
	1256	10	12560	2	25120	25120	-	-	-	-	-
	Total				25120	25120	-	-	2120	2120	5024
X6Y6-KL	1485	2	2970	2	-	-	-	-	-	-	5940
	1485	0.75	-	-	-	-	1114	2.25	2506	2506	-
	1485	10	14850	2	29700	29700	-	-	-	-	-
	Total				29700	29700	-	-	2506	2506	5940
X7Y7-IJ	750	2	1500	2	-	-	-	-	-	-	3000
	750	0.75	-	-	-	-	563	2.25	1266	1266	-
	750	10	7500	2	15000	15000	-	-	-	-	-
	Total				15000	15000	-	-	1266	1266	3000
X8Y8-CD	686	2	1372	2	-	-	-	-	-	-	2744
	686	0.75	-	-	-	-	515	2.25	1158	1158	-
	686	15	10290	2	20580	20580	-	-	-	-	-
	Total				20580	20580	-	-	1158	1158	2744

X9Y9-CD	424	2	848	2	-	-	-	-	-	-	1696
	424	0.75	-	-	-	-	318	2.25	716	716	-
	424	15	6360	2	12720	12720	-	-	-	-	-
	Total				12720	12720	-	-	716	716	1696
X9Y9-GH	2020	2	4040	2	-	-	-	-	-	-	8080
	2020	0.75	-	-	-	-	1515	2.25	3409	3409	-
	2020	15	30300	2	60600	60600	-	-	-	-	-
	Total				60600	60600	-	-	3409	3409	8080
X9Y9-IJ	3694	2	7388	2	-	-	-	-	-	-	14776
	3694	0.75	-	-	-	-	2771	2.25	6234	6234	-
	3694	12	44328	2	88656	88656	-	-	-	-	-
	Total				88656	88656	-	-	6234	6234	14776
Grand Total					296296	296296	-	-	23046	23046	54628

Table-24						
Summary of Reserves & Resources						
Description	Section	ROM (Ts)	Limestone @ 100% Recovery (Ts)	ROM (Ts)	Limekankar @ 100% Recovery (Ts)	Topsoil (Ts)
A. Mineral Reserves (111)	X8Y8-CD	9288	9288	1863	1863	5880
	X9Y9-GH	160446	160446	14000	14000	37296
	X3Y3-IJ	94128	94128	21738	21738	55692
	X4Y4-IJ	60000	60000	26325	26325	65600
	X5Y5-IJ	242000	242000	21600	21600	52400
	X5Y5-KL	148320	148320	14588	14588	36848
	X6Y6-IJ	138800	138800	12825	12825	31600
	X6Y6-KL	139480	139480	13667	13667	34960
	X7Y7-IJ	304800	304800	28013	28013	68800
	X9Y9-IJ	471048	471048	37007	37007	91344
	Total	1768310	1768310	191626	191626	480420
B. Mineral Resources (222)		2894176	2894176	92715	92715	219768
C. Mineral Resources locked up in benches (221)		331704	331704	-	-	-
D. Mineral resources locked up in 7.5m & 50m safety distance	222	1151864	1151864	58413	58413	138460
	221	296296	296296	23046	23046	54628
	Total	1448160	1448160	81459	81459	193088

The Mineral reserves still available in this mine would be 17,68,310 tonnes of Limestone, 1,91,626 tonnes of Limekankar.

Anticipated life of the mine:

Mineral reserves ROM

Table-25

Available mineral reserves ROM	Limestone	Limekankar
UNFC 111 (re-assessed on 05.08.2019)	1768310 Ts	191626 Ts
Proposed annual production ROM	223800 Ts	38325 Ts
Anticipated life of the mine	1768310 / 223800	191626 / 38325
	7.9 years	5.0 years

After obtaining necessary permission under Regulation 111(3) of MCR, 1961, Limestone in the boundary barrier will be exploited up to the lease boundary line to extend the life of the mine.

4.0 Specific knowledge of forest/non-forest and other land use data:

The lease applied area is a patta land. The area does not fall in the forest of any category. Therefore the applicant has got surface rights over the lease applied area.

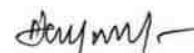
The present and post mining land use pattern is given as under

Table -26

S.No	Description	Present Area (Ha)	Additional Area required during the Mining Plan Period (Ha) [I st year to V th year]	Area at the end of mining plan period (Ha)
1	Mining	Nil	11.76.3	11.76.3
2.	Dump	Nil	01.51.4	01.51.4
3.	Office & infrastructure	Nil	00.05.0	00.05.0
4.	Processing plant	Nil	-	-
5.	Mineral stack processing yard	Nil	-	-
6.	Sub grade mineral stacks	Nil	-	-
7.	Mine roads	Nil	00.10.0	00.10.0
8.	Areas under plantation	Nil	03.10.9	03.10.9
9.	Un utilized area	22.96.0	06.42.4	06.42.4
10.	Total	22.96.0	22.96.0	22.96.0

The based on the economical axis it is inferred that the mine is economical viable to exploit Limekankar & Limestone deposit at present market scenario.

Signature of the Qualified Person



Dr.P.Thangaraju, M.Sc., Ph.D.,

Place: Salem

Date: 25.09.2019

ANNEXURE-IB

**Name of the Applicant: M/s Tamilnadu Cements Corporation Limited,
(A Government of Tamilnadu Undertaking)**

Name of the Deposit : Pudupalayam Limekankar & Limestone Deposit

Extent : 22.96.0 Ha

S.F.Nos. : 144/1A, 217/1A, etc.,

Village : Pudupalayam

Taluk : Ariyalur

District : Ariyalur



Topographical view of the lease applied area



Lease applied area covering Boundary Pillar

ANNEXURE-II



Industries (MMA2) Department,
Secretariat, Chennai – 600 009.

Letter No.3997/MMA.2/2019-1 Dated: 02.08.2019

From
Thiru. N. Muruganandam, I.A.S.,
Principal Secretary to Government

To
The Additional Chief Secretary /
Chairman and Managing Director,
Tamil Nadu Cements Corporation Ltd.,
Chennai-2.

Sir,

Sub: Industries – Mines and Minerals – Major & Minor
Mineral – Mining Lease Application of Tvl. Tamil
Nadu Cements Corporation Ltd for Mining limestone
and limekankar in S.F.Nos.144/1A, 217/1A etc., –
Pudupalayam Village – Ariyalur Taluk and District –
Over an extent of 22.96.0 hectares of patta lands-
Precise Area – Communicated – Approved Mining
Plan and Environment Clearance Certificate –
Requested – Regarding.

- Ref:-
1. Mining lease application of Tamil Nadu Cements Corporation Ltd, dated 18.05.2018.
 2. From the District Collector, Ariyalur Letter Rc.No.133/G&M/2018, dated 22.3.2019.
 3. From the Director of Geology and Mining Lr.Rc.2000/MM1/2019, dated 29.03.2019.

I am directed to invite your attention to the reference first cited wherein you have applied for grant of Mining lease for Mining Limestone & Limekankar over an extent of 22.96.0 hectares of patta lands in S.F.No. 144/1A, 217/1A etc., in Pudupalayam Village, Ariyalur Taluk of Ariyalur District for a period of 30 years. The Director of Geology and Mining and District Collector, Ariyalur have recommended an area of 22.96.0 hectares for Mining limestone and limekankar for a period of 50 years and 10 years respectively, in accordance with the reservation made by the State Government under Rule 58 of Mineral Concession Rules, 1960 in favour of Tvl. TANCEM vide G.O.(Ms) No.921, Industries (M2) Department, dated 25.8.1986. The above area of 22.96.0 Hects. of patta lands

[P.T.O]

is not compact and contiguous. Hence, you have requested for relaxation under section 6 (1)(c) of the Mines and Minerals (Development and Regulation) Act, 1957 in view of huge requirement of limestone for your Cement factory and also in the interest of Mineral Conservation.

2. In view of the justification put forth, the State Government have decided to relax section 6(1)(c) of Mines and Minerals (Development and Regulation) Act, 1957.

3. The applicant Company is directed to obtain and furnish an approved mining plan from the competent authority for the above said precise area of 22.96.0 Hectares for mining limestone for a period of 50 years as well as limekankar for a period of 10 years in Pudupalayam Village, Ariyalur Taluk and District, in compliance with the following conditions stipulated by the Director of Geology and Mining.

- a) As per Rule 5 of Mineral (Mining by Government Company) Rules, 2015, Tvl. TANCEM shall pay an amount to the State Government equivalent to a percentage of the Royalty paid in terms of the Second Schedule to the Act as notified by the Central Government in each case
- b) Since, the applied area is not compact and contiguous, the relaxation under section 6(1)(c) of MMDR Act, 1957, is granted.
- c) The applicant Company shall provide a safety distance of 50 meters to the detailed channel situated in the Southern side in S.F.No.144/1A and for the Easwaran Kovil eri situated on the Western side in S.F.No.148.
- d) The applicant Company shall provide a safety distance of 50 meters to the vari course passing from North to South in S.F.No.145/1.
- e) The applicant Company shall provide a safety distance of 50 meters to the High tension power line to be newly erected along the eastern boundary of S.F.No.218.
- f) The applicant Company shall provide and maintain safety distance of 7.5 meters to the adjoining patta lands.
- g) As per Section 5 (2) (b) of Mines and Minerals (Development & Regulation) Act, 1957, duly approved Mining Plan from the competent authority has to be submitted before the grant of lease.
- h) Environmental Clearance shall be obtained from the competent authority before the grant of mining lease.
- i) The applicant company shall obtain necessary clearance from the Tamil Nadu Pollution Control Board before the commencement of mining operations.
- j) The applicant company shall submit latest mining due clearance certificate before the execution of lease deed.

[P.T.O]

4. The estimation of mineral reserves of Limestone and limekankar are as follows:-

SL.No	Details	Limestone	Limekankar
(i)	Total area applied for	22.96.0 Hect.	22.96.0 Hect.
(ii)	Area for safety distance	3.90.0 hecets.	3.90.0 hecets.
(iii)	Area available for exploitation	22.96.0 - 3.90.0 = 19.06.0 hecets., or 190600 square metres	22.96.0 - 3.90.0 = 19.06.0 hecets., or 190600 square metres
(iv)	Average depth of persistence	15.00 metres	0.75 metres
(v)	Percentage of recovery	100%	100%
(vi)	Inferred reserves of Minerals	Area x Depth x Specific Gravity of mineral	
		190600 x 15.00 x 2.0 = 57,18,000 M.Ts	190600 x 0.75 x 2.25 = 3,21,638 M.Ts
(vii)	Grade of Mineral	Suitable for cement manufacturing	Suitable for cement manufacturing

Yours faithfully,

P. J. S. S.

for Principal Secretary to Government.

B.R.
2.8.19

Copy to:-

The Director of Geology and Mining,
Guindy, Chennai-32.

The District Collector,
Ariyalur.

Tvl. Tamil Nadu Cements
Corporation Limited (TANCEM)
Ariyalur Cement Factory,
Ariyalur District.
SF / SC.

ANNEXURE-IIA

**TAMILNADU CEMENTS CORPORATION LIMITED,
ARIYALUR CEMENT WORKS,
ARIYALUR**

**NEW MINING LEASE APPLICATION
IN
PUDUPALAYAM VILLAGE,
ARIYALUR TALUK & DISTRICT,**

Extent : 23.95.5 Hectares

Mineral : Limestone



**Name of the Applicant: M/s. Tancem, Ariyalur Cement Works,
Ariyalur.**

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தமிழ்நாடு சீமெண்ட் கழகம்

(தமிழ்நாடு அரசு நிறுவனம்)

TAMILNADU CEMENTS CORPORATION LIMITED

(A Government of Tamilnadu Undertaking)

அரியலூர் சீமெண்ட் ஆலை, அரியலூர் - 621 729 , அரியலூர் மாவட்டம், தமிழ்நாடு.

Ariyalur Cement Factory, Ariyalur - 621 729, Ariyalur District, Tamilnadu

Grams : TANCEM, ARIYALUR, website : www.tancem.com

E-mail : ari@tancem.com

Ref:

Tancem/ACW/Geo/100(3)/2018

Date :

Date: 15.05.2018

The District Collector,
Collectorate Office,
Ariyalur.

Respected Madam,

Sub: Tancem-Ariyalur Cement Works-Ariyalur-Mines and
Minerals-Mining Lease application for limestone-Over an Extent
of 23.95.5 Hectares-in-Pudupalayam Village, Ariyalur Taluk and
District - Application submitted-Reg.

We are submitting herewith a Mining Lease application in Form-I in triplicate along
with the following copies of the documents for limestone Mineral over an extent of 23.95.5
Hectares in S.F.No. 144, 217, 218, 219, 220, 221 in Pudupalayam village, Ariyalur Taluk and
District.

The Documents enclosed are:

1. Form-I
2. Treasury challans
3. Undertaking for 'No Mining Due clearance Certificate'
4. Undertaking for 'Income Tax clearance Certificate'
5. Affidavit for mining leases held by TANCEM
6. Article of Memorandum
7. Certificate of Incorporation
8. List of Board of Directors
9. Copy of Board's resolution (Power of Attorney)
10. Geological Report
11. Land Schedules
12. Copy of Patta/Chitta
13. Copy of 'A' Register
14. Copy of Adangal
15. Index Plan
16. Village Plan
17. Geological Plan
18. FMB sketches
19. Mining Scheme

Page 1 of 2

Regd. Office : Second Floor, L.L.A. Buildings, P.B.No.5205,735, AnnaSalai, Chennai - 600 002

Grams : TANCEM Phone: 28525461, 28525471 Telex:041-6080 Fax: 044-28523991

E-mail : md@tancem.com co@tancem.com Website : www.tancem.com

Area code : 033, TIN: 33460640087 Dt 1-4-95 GSTN : 33AABCT1819J1ZH



தமிழ்நாடு சீமெண்ட் கழகம்

(தமிழ்நாடு அரசு நிறுவனம்)

TAMILNADU CEMENTS CORPORATION LIMITED

(A Government of Tamilnadu Undertaking)

அரியலூர் சிமெண்ட் ஆலை, அரியலூர் - 621 729 , அரியலூர் மாவட்டம், தமிழ்நாடு.

Ariyalur Cement Factory, Ariyalur - 621 729, Ariyalur District, Tamilnadu

Grams : TANCEM, ARIYALUR, website : www.tancem.com

E-mail : ari@tancem.com

Ref:


Date :

We request the District Collector to kindly recommend and forward our application to the Government for grant of mining lease in favour of TANCEM.

We also request the District Collector to kindly acknowledge receipt of the application.

Thanking you,

Yours faithfully,
For Tamilnadu Cements Corpn Ltd.,
Ariyalur Works


Dy. General Manager (Tech)
/Unit Head

UNIT HEAD
TAMILNADU CEMENTS CORPN LTD.,
ARIYALUR WORKS
ARIYALUR - 621 729

Page 2 of 2

Regd. Office : Second Floor, L.L.A. Buildings, P.B.No.5205,735,AnnaSalai,Chennai - 600 002

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தமிழ்நாடு சீமெண்ட் கழகம்

(தமிழ்நாடு அரசு நிறுவனம்)

TAMILNADU CEMENTS CORPORATION LIMITED

(A Government of Tamilnadu Undertaking)

அரியலூர் சீமெண்ட் ஆலை, அரியலூர் - 621 729 , அரியலூர் மாவட்டம், தமிழ்நாடு.

Ariyalur Cement Factory, Ariyalur - 621 729, Ariyalur District, Tamilnadu

Grams : TANCEM, ARIYALUR, website : www.tancem.com

E-mail : ari@tancem.com

Ref:

Date:

ADDITIONAL INFORMATION FOR CONSIDERATION OF FRESH PROPOSAL (NEW MINING LEASE APPLICATION)

Tamilnadu Cements Corporation Limited (TANCEM) is a wholly owned Government of Tamilnadu Undertaking, started business from 1st April 1976. Tancem has two cement units which is located at Alangulam and Ariyalur. Limestone being the main raw materials, the company acquired and reserved enough limestone bearing lands in and around Alangulam and Ariyalur.

During the year 2002, Tancem applied for New Mining Lease over an extent of 100.86.0 Hectares at Pudhupalayam village, Ariyalur Taluk and District and the lease application was returned by the Ministry of Mines, Government of India for want of State Government's clarification on relaxation under 6(1) (b) of the Mines and Minerals (Development & Regulation) Amendment Act, 2015 was enacted by the Government of India. Under the Amendment Act stimulates that section 10A (1) all application received prior to the date of commencement of the Mines and Minerals (Development & Regulation) Amendment Act, 2015, Shall become ineligible. However, for Government Company or Corporation, sections 17 were inserted for reserved area.

At this juncture, it is highlighted that about 519.68.0 Hectares of lands reserved for Tancem under G.O.No.921 dt 25-08-1986 in which applied area of 23.95.5 Hectares is covered in Pudupalayam village.

In view of the above, we request authority concerned to kindly consider this proposal by invoking section 17 of MMDR Amendment Act, 2015 in favour of Tancem, Ariyalur Cement Works.


MINES MANAGER,
TAMILNADU CEMENT CORPORATION LTD.
ARIYALUR CEMENT WORKS
ARIYALUR - 621 729

Regd. Office : Second Floor, L.L.A. Buildings, P.B.No.5205,735, Anna Salai, Chennai - 600 002

Grams : TANCEM Phone: 28525461, 28525471 Telex: 041-6080 Fax: 044-28523991

E-mail : md@tancem.com co@tancem.com Website : www.tancem.com

Area code : 033, TIN: 33460640087 Dt 1-4-95 GSTN : 33AABCT1819J1ZH

FORM - I
(To be submitted in Triplicate)

Received
at (Place)
on (Date)
Initial of Receiving Officer.

Government of

APPLICATION FOR MINING LEASE
(Sec Rule 22 (1) of the Mineral
Concession Rules 1960)
Dated the
Day of 2018

To
The Principal Secretary to Government,
Industries Department,
Fort St. George,
CHENNAI - 600 009.

THROUGH : The District Collector, ARIYALUR.

Sir,

- 1) We request that a Mining Lease under the Mineral Concession Rules, 1960 may be granted to us.
- 2) A sum of Rs.2,500/- and Rs.1,000/- being the fees in respect of this application and Preliminary expenses respectively payable under Sub rule (3) of rule 22 of the said rule have been deposited (vide S.B.I. Challan No.5/78/SBI and 6/78/SBI dated 13.04.2018.
- 3) The required particulars are given below.

i)	Name of the applicant with complete address, status of the applicant	Tamilnadu Cements Corporation. Ltd. Ariyalur Cement Works, II Floor, L.L.A. Buildings, 735 Anna Salai, Chennai - 600 002.
----	--	--

Public Limited Company
Incorporated under the
Companies Act, 1956.

ii)	Is the applicant a private Public Sector Undertaking Individual/co-operative/ Firm/association/private company/public company/ public sector undertaking/ joint sector undertaking or any other.	A Government of Tamilnadu undertaking.
-----	--	---

...1...

iii) In case the applicant is,	
(a) An individual, his nationality, qualifications and experience relating to mining.	Not applicable
(b) A company, an attested copy of the certificate of registration of the company shall be enclosed	Government of Tamilnadu undertaking, incorporated under the Companies Act, 1956 Certificate of Incorporation No: 11-02-1976-7081/1976. An attested copy of the certificate of registration of the company is enclosed.
(c) Omitted	
(d) Firm or Association, the nationality of all the partners of the company shall be enclosed	All the Board of Directors is an Indian. All the shares are held by Tamilnadu government (List of Board of Directors is enclosed). Government of Tamilnadu undertaking, incorporated under the Companies Act, 1956. Certificate of incorporation 11-02-1976 - 7081/1976 Place of Incorporation :Chennai A copy of Certificate of incorporation is enclosed.
(e) A Co-operative the nationality of non Indian Members if any along with place of registration and a copy of the certificate of registration.	Not applicable.
iv) Profession or nature of business of applicant	Manufacture and Marketing of different grades of Portland Cements, Asbestos sheets, Asbestos Cement High Pressure Pipes and Stoneware pipes.
v) Particulars of documents appended.	
Documents	Reference
(a) Mining dues clearance Certificate	
Or	
(b) Affidavit in lieu of Mining Dues Clearance Certificate, subject to the production of mining lease dues, clearance certificate within the period of ninety days of making application.	Affidavit enclosed. Mining dues Clearance Certificate will be submitted within 90 days.
(c) Affidavit when not holding any mining lease.	Not applicable. Since TANCEM is holding Mining leases for limestone in Ariyalur, Virudhunagar and Tirunelveli Districts.

(d) Affidavit that up-to-date Income Tax returns as prescribed under the Income Tax Act, 1961 and that the Tax due including the tax on account of self- assessment has been paid					Affidavit enclosed. Tax due Certificate will be submitted later.		
vi) Mineral or Minerals which the applicant intends to mine					LIMESTONE		
vii) Period for which mining lease is required					30 years (Thirty years)		
viii) Extend of the area for which mining lease is required					23.95.5 Hectares. (or) 59.17 Acres.		
ix) Details of the area in respect of which Mining Lease is required							
District	Taluk	Village	Khasara No.	Plot No.	Extent		
					Patta Lands	Poramboke Lands	Total
					Hec.Are.	Hec.Are.	Hec.Are.
Ariyalur	Ariyalur	Pudupalayam	Details are given in the enclosed Annexure		23.95.5	---	23.95.5
			Total		23.95.5	---	23.95.5
x) Brief description of the areas with particular reference to the following							
(a) Does the applicant have surface rights over the area for which he is making an application for grant of Mining lease.					Yes. TANCEM have surface right over the area for which applied for grant of mining lease and relevant record of patta, chitta, copy of "A" register and adangal are enclosed.		
(b) If not, has he obtained the consent of the owner and the occupier of the land for undertaking mining operation, If so the consent of the owner and occupier of the land be obtained in writing and be filed.					Not applicable.		
xi) (a) The situation of the area in respect of natural features such as streams or lakes.					Plans attached		
b) In the case of village areas, the name of the village the khasara number, the area in hectares of each field or part thereof applied for.					Details of the village with khasara numbers, extent in hectares for each field are given in the enclosed Annexures.		
(c) In case the area applied for is under forest, then the following particulars be given.							

(1) Forest division, Block and Range.	Area applied for Mining lease is not under Forest area, hence it is not applicable.
(2) Legal status of the forest (namely reserved, protected, unclassified etc.)	
(3) Whether it forms part of a National Park of Wildlife Sanctuary.	
(4) Type and extent of vegetation in the area	
(5) For areas where no forest maps or cadastral maps, are available, a sketch plan should be submitted on scale showing the area applied for together with boundary, if any of any other existing mining lease or prospecting license area, if the area applied for has any common point or line with the boundaries of existing prospecting license or mining lease areas.	
xii) The area applied for should be marked on plans as detailed below.	
a) In case a cadastral map of the area is available, the area on this map should be marked showing the name of	The area applied for lease is marked on cadastral map (Village revenue plan) colour washed for patta and poramboke lands on each field and copies are enclosed.
b) In the case of forest maps the area should be marked on the map showing the range and felling series.	Not applicable.
c) In case neither cadastral nor forest maps are available, the areas should be marked on a sketch plan drawn to scales showing on this plans all important surface and natural features, the dimensions of the lines, forming the boundary of the area and the bearing and distance of all corner points from any important, prominent and fixed point or points.	Since Revenue village plans are submitted with area applied for and clearly, demarcated, this is not applicable.
xiii) Particulars of the area mineral-wise in each state duly supported by an affidavit for which the applicant or any persons joint in interest with him.	
a) Already hold under mining lease.	Details are given in the enclosed Annexure.

b) has already applied for but not granted.	An application for limestone over an extent of 1485.86 acres in Valajanagaram etc. villages in Ariyalur Taluk, Ariyalur District submitted on 24-11-86. We have also submitted an application for limestone over an extent of 145.54.5 hectares in Kairalabad etc. village of Ariyalur Taluk, Ariyalur District on 15-02-1995.
c) Being applied for simultaneously	Nil
xiv) Nature of joint in interest, if any	Nil
xv) a) Does the applicant hold a prospecting license over the area mentioned at (xi) above? If so, give its number and date of grant and the date when it is due to expire.	Does not hold prospecting license.
b) Has the applicant carried out the prospecting operations over the area held under prospecting license and sent his report to the State Government, as required by rule 16 of the Mineral Concession Rules, 1960? If not, state reasons for not doing so.	Detailed Geological exploration work was carried by the State Directorate of Geology and Mining, Government of Tamilnadu as requested by TANCEM.
xvi) Broad parameters of the mineral/ore/bodies	
a) Strike length, average width and dip	Length of the deposit 200 to 250 Mtrs. width 200 to 600 Mtrs. dip 2 to 3° towards East.
b) Wall rocks on hanging and foot wall sides	Arenaceous limestone and sandstone.
c) Whether area is considerably disturbed geologically or is comparatively free of geological disturbance? (copy of geological map of the area is to be attached)	The area is not geologically disturbed; free of disturbance. It is a simple deposit of sedimentary nature of marine origin. A copy of Geological map is enclosed.
d) Reserves assessed with their grade(s) Chemical analysis reports of representative samples are to be attached.	2.3 million tonnes of limestone having total carbonate 80% and above and magnesia less than 1%. Suitable for cement manufacture. Chemical analysis reports of samples are attached with Geological reports.
e) Whether the area is virgin? If not, the extent to which it has already been worked. In case there are old workings, their locations are to be shown on the geological map of the area.	Applied area is virgin, but adjacent side there are 2 working pits available. The old working and their locations are shown on the geological map.

xvii) Broad parameters of the mines	
a) Proposed date commencement of the mining operations.	Immediately after execution of mining lease deed. Probably-2019
b) Proposed rate of mineral production during the first 5 year (year wise)	I Year 1.0 Lakh tonnes. II Year 1.0 Lakh tonnes. III Year 1.0 Lakh tonnes. IV Year 1.0 Lakh tonnes. V Year 1.0 Lakh tonnes.
c) Proposed rate of mineral production when mines fully developed.	1.0 lakh tonnes per year.
d) Anticipated life of the mines	23 Years at the present rated capacity of Ariyalur Cement Works. As proposed if the capacity of the plant is increased, life of the mine will be reduced.
e) Proposed method of mining (Underground or opencast)	Opencast working
i) If underground, the method of approach to the deposit mineral/ore. Whether through inclines or shafts.	Not applicable
ii) If opencast, the overburden to ore ratio and overall pit slope.	1:0.9
f) Nature of the land chosen for dumping overburden/waste and tailings (that is type of land whether agriculture, grazing land, barren, saline land etc.) and whether proposed site has been shown on the mine working plan. Give also the extent of area in hectares set apart for dumping of waste failings.	Barren lands are shown on the mine working plan. 10 Hectares are earmarked for dumping soil and reject waste rocks.
xviii) A report giving the details of prospecting carried out in the area together with assessment of the ore reserves, geological plans, results of chemical analysis of the representative sample and boreholes and logs.	A copy of the geological report jointly prepared by the State Directorate of Geology and Mining and TANCEM is enclosed.
xix) Manner in which the mineral raised is to be utilized	
a) i) If for captive use, the location of plant and industry	For captive use, Limestone will be supplied to the existing cement plant having a capacity of 5 Lacks Tones /Annum and new expansion plant with a capacity of 1.0 Million Tones/Annum, which will be commissioned at the end of 2018.

ii) For sale of indigenous consumption	Limestone as such will not be sold to other consumers & finished product cement will be sold indigenously.
b) If for exports to foreign countries indicate.	
i) Names of the countries to which it is likely to be exported where the mine is being set up on 100% export oriented or tied up basis.	Not applicable
ii) Whether mineral will be exported in raw form or after processing. Also indicate the stage of processing, whether intermediate stage or final stage of the end product.	No
c) If it is to be used within the country, indicate	No
i) The industry/industries in which it would be used.	As a raw material to manufacture of Portland cement in a major Tancem Cement Factory already established at Ariyalur and it is under production.
ii) Whether it will be supplied in raw form or after processing (crushing /grinding/ beneficiation/ calcining)	It will be supplied in the raw form.
iii) Whether it would need upgradation and if so whether it is proposed to set up beneficiation plant. Also indicate the capacity of such plant and the time by which it would be set up.	Does not need any beneficiation plant.
d) In case of coal, or other high bulk minerals/ores details of existing available and additional transport facility, if any, required	Limestone will be moved by tippers on road to the cement plant from the mines. Rail movement not required.
xx) Name, qualification and experience of the Technical personnel available for supervising the mines.	<p>TANCEM have a team of qualified and well experienced Geologist and Mining Engineers for mining of limestone in a systematic and scientific way.</p> <p>S. PRASAD, Geologist with 6 years of experience in mineral exploration and mining activities.</p> <p>K. SENTHILKUMAR, Ist Class Mines Manager's Certificate of Competency issued by the D.G.M.S.- Experience over 7 years.</p> <p>Three A.M (Mines) and sufficient supporting Officers who are professionally qualified and experienced for mining activities are working in TANCEM.</p>

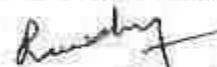
xi) i) Financial resources of the applicant	Financed by Tamilnadu Government and Tamilnadu Cements Corporation Ltd. Public Sector undertaking of Tamilnadu Government. Finance is not a constraints for development of Mines and in investment for mining equipments.
ii) Anticipated yearly financial investment during the course of mine construction and aggregate investment upto the stage of commencement of commercial production.	Rs. One crore per year during the initial stages and it may go up to an investment of Rs. Three crores for heavy earth moving machineries at the final stage of the mine production.
xxii) a) Nature of waste water (e.g) whether acidic, if so, expected PH value.	Soft water. PH 7
b) The applicant form should be accompanied by statement of the salient features of the Scheme of Mining. This should be generally on the lines of the "Project at a glance" given in a mining feasibility report including features relating to the protection of environment.	Mining Scheme enclosed

We do hereby declare that the particulars furnished above are correct and we are ready to furnish any other details including accurate plans and security deposit, as may be required by you.

Place : Ariyalur

Date :

yours faithfully,
for Tamilnadu Cements Corpn. Ltd.,


* Signature of the Applicant

UNIT HEAD
TAMILNADU CEMENTS CORPN. LTD.,
ARIYALUR WORKS,
ARIYALUR - 621 728

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தமிழ்நாடு தமில்நாடு TAMILNADU

5156 50
10.5.2018

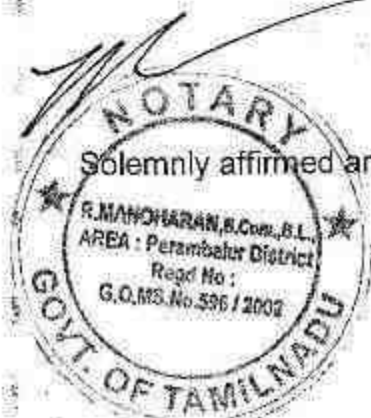
ச. வேழவேந்தன், மு. தி. வ.
உரிமம் எண். 2/2000
M.P. கோவில் தெரு,
செவியலூர், தமிழ்நாடு

AFFIDAVIT FOR NO MINING DUES

I, T. RAVICHANDRAN, S/o. A. Thangavel, aged 51 years, working as Deputy General Manager (Tech) / Unit Head of M/s. Tamilnadu Cements Corporation Limited, Ariyalur Cement Works, a Government of Tamilnadu undertaking company incorporated under the Companies Act, 1956 (Act 1 of 1956) and having its Registered Office Tamilnadu Cements Corporation Ltd., L.L.A Building, IInd floor, 735, Anna Salai, Chennai- 600 002 in Tamilnadu, India, do hereby solemnly affirm and state that, as per the Government Order, Tvl. TANCEM will remit all the statutory payments related to mining operations and other mining dues, if any, in respect of National Mineral Exploration Trust (NMET) and District Mineral Foundation (DMF) before execution of Mining Lease Deed.

For Tamilnadu Cements Corporation Ltd,
Ariyalur unit

Dy. General Manager (Tech) / Unit Head



Solemnly affirmed and signed before me on at Ariyalur.

R. MANOHARAN, B.Com., B.L.
Advocate & Notary Public,
34, Periya Aranmani Street,
ARIYALUR - 621 704,
Perambalur Dist





தமிழ்நாடு தமில்நாடு TAMILNADU

AL 938905

4460
26.4.2018

S. Solomon

S. சோழசுந்தரன், கு.நா.வ.

உரிமம் எண். 2/2000

M.P. கோவில்லித்தூர்

அரியலூர், தமிழ்நாடு



AFFIDAVIT FOR INCOME TAX CLEARANCE CERTIFICATE

I, T. RAVICHANDRAN, S/o. A. Thangavel aged 51 years, working as Deputy General Manager (Tech)/Unit Head of M/s. Tamilnadu Cements Corporation Limited, Ariyalur Cement Works, a Government of Tamilnadu undertaking company incorporated under the Companies Act, 1956 (Act 1 of 1956) and having it's Registered office Tamilnadu Cements Corporation Ltd., L.L.A Building, 11th floor, 735, Anna Salai, Chennai- 600 002 in Tamilnadu, India, do hereby solemnly affirm and state that, we

- (i) Filed upto date Income Tax return
- (ii) Paid the Income Tax assessed on us
- (iii) Paid the Income Tax on the basis of the self assessment as provided in the Income Tax Act, 1961 (Central Act 43 of 1961) or any other later instructions of the Central Government.

For Tamilnadu Cements Corporation Ltd,
Ariyalur unit



Solemnly affirmed and signed before me on at Ariyalur.

Dy. General Manager (Tech)
Unit Head

GENERAL MANAGER,
TAMILNADU CEMENTS CORPN. LTD.
ARIYALUR WORKS,
ARIYALUR-621 729

R. MANOHARAN, B.Com., B.L.
Advocate & Notary Public,
54, Periya Aranmani Street,
ARIYALUR - 621 704,
Perambalur Dist.



தமிழ்நாடு தமிலநாடு TAMILNADU
461 50
26-4-2018

938964
2/2000
M.P. 05/05/2000
சாதிக்கப்பட்டிருக்கிறது
சாதிக்கப்பட்டிருக்கிறது
சாதிக்கப்பட்டிருக்கிறது

AFFIDAVIT

I, T.RAVICHANDRAN, S/o. A. Thangavel, aged about 51 years, working as Deputy General Manager (Tech)/Unit Head of M/s. Tamilnadu Cements Corporation Limited, Ariyalur Cement Works, a company incorporated under the Companies Act, 1956 (Act 1 of 1956) and having its Registered Office Tamilnadu Cements Corporation Ltd, LLA Building, IInd floor, 735, Anna salai, Chennai- 600002 in Tamilnadu do thereby solemnly affirm for and on behalf of the said company that the company is running two cement Units in Tamilnadu with an installed capacity of 1500 TPD at Ariyalur, Ariyalur District and 1200 TPD at Alangulam, Virudhunagar District. The mineral wise lease particulars are as follows.

For Tamilnadu Cements Corporation Ltd,
Ariyalur Unit

[Signature]
Dy. General Manager(Tech)/
Dy. GENERAL MANAGER,
TAMILNADU CEMENTS CORPN. LTD.
ARIYALUR-621 729



[Signature]
K. MANOHARAN, B.Com, B.L.
Advocate & Notary Public,
34, Periya Arammani Street,
ARIYALUR - 621 704,

TANCEM : ARIYALUR WORKS : ARIYALUR
ANNEXURE - I

Regarding Mining Lease:

Description	Extent	Mineral
(a) Already under Mining Lease	3738.25 Acres (or) 1513.46.0 Hect.	Limestone
(b) Area applied for but not Granted	37.12 Acres (or) 15.03.0 Hect.	Limekankar
(c) Being applied for simultaneously	Nil	Nil

(Signature)

MANAGER MINES

(Signature)
UNIT HEAD



TANCEM - ARIYALUR WORKS - ARIYALUR
ANNEXURE - II

Already held under Mining Leases for Ariyalur Unit.

S.No	G.O.No. & Date	Name of the Village	District	Extent in Hect	Minerals
1.	G.O.Ms.No.344 Dt. 10-03-1980	Kallankurichi Ameenabad Kairulabad	Ariyalur	146.45.0 61.38.0 32.78.5 <u>240.61.5</u>	Limestone
2.	G.O.Ms.No.456 Dt. 16-05-1985	Periyanaalur Ameenabad Kairulabad Kallankurichi	Ariyalur	31.70.0 3.86.0 71.96.0 80.77.0 <u>194.29.0</u>	Limestone
3.	G.O.Ms.No.469 Dt. 21-05-1985	Kurumbanchavadi Ameenabad Kallankurichi Kairulabad	Ariyalur	10.16.0 8.49.0 32.48.0 14.98.0 <u>66.11.0</u>	Limestone
4.	G.O.Ms.No.624 Dt. 23-09-1998	Anandavadi	Ariyalur	110.68.5	Limestone
	Grand Total	1510.91 Acres (or) 611.70 Hectares.			



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TANCEM : ARIYALUR WORKS : ARIYALUR
ANNEXURE - III

Already held under Mining Leases for Alangulam Unit.

S.No	G.O.No. & Date	Name of the Village	District	Extent in Hect	Minerals
1.	871/MMD2 Dt.20-08-1990	Lakshmipuram Gopalapuram Vadakarai	Virudhunagar	233.99.5 176.56.0 <u>9.69.5</u> <u>420.25.0</u>	Limestone
2.	595/Ind Dt.03-04-1972	Alangulam Lakshmipuram	Virudhunagar	179.19.5 <u>1.63.5</u> <u>180.83.0</u>	Limestone
3.	427/Ind Dt.19-03-1980	Alangulam Pernaickenpatti Duraisampuram Edirkottai Naranapuram Lakshmipuram	Virudhunagar	113.50.0 57.62.5 3.80.5 76.20.0 11.51.0 <u>6.16.0</u> <u>268.80.0</u>	Limestone
4.	729/Ind Dt.19-07-1980	Pandapalli	Tirunelveli	24.32.5	Limestone
5.	G.O.3D No.107/Ind Dt.11-07-1997	Pandapalli Thenmalai	Tirunelveli	4.91.5 <u>2.64.0</u> <u>7.55.5</u>	Limestone
Grand Total.				901.76.0 (or) 2227.35	

(Signature)



(Signature)

TANCEM : ARIYALUR WORKS : ARIYALUR
ANNEXURE - III

Area applied for mining lease but not yet granted

S.No	District	Taluk	Villages	Survey No.	Extent (In Hect)	Mineral
1	Ariyalur	Ariyalur	Kallankurichi	Part of 11,12 & 13	4.64.0	Lime Kankar
2	Ariyalur	Ariyalur	Kallankurichi	Part of 8,13	4.64.5	Lime Kankar
3	Ariyalur	Ariyalur	Pudupalayam	Part of 173, 174 & 175	4.23.5	Lime Kankar
4	Ariyalur	Ariyalur	Periyaganalur	298/1,299	2.18.5	Lime Kankar

(Signature)

Manager (mines)



(Signature)
Unit Head

AS

DETAILS OF LANDS APPLIED FOR NEW MINING LEASE IN
PUDUPALAYAM VILLAGE

VILLAGE NAME : PUDUPALAYAM
VILLAGE No. : 47

TALUK : ARIYALUR
DISTRICT: ARIYALUR

S.No	Survey No.	Sub Division No	Extent (Hec. Ares)	Total
1.	144	-	2.86.0	2.86.0
2	217	1A	0.27.5	3.15.5
		1B	0.27.5 ✓	
		1C	1.08.0	
		2	0.11.5	
		3A	0.05.0	
		3B	0.07.0	
		4	0.10.0	
		5	0.33.0	
		6	0.30.0	
		7	0.56.0 ✓	
3	218	1	4.31.5	4.31.5
4	219	1	0.32.5	4.08.5
		2A	0.39.0	
		2B	0.05.0	
		3A	0.14.0	
		3B	0.11.0	
		3C	0.09.0	
		3D	0.29.0	
		3E	0.14.0	
		3F	0.07.5	
		3G	0.25.0	
		4A	0.13.0	
		4B	0.12.5	
		5A	0.13.0	
		5B	0.91.0	
		5C	0.10.0	
		6	0.30.0	
		7	0.16.0 ✓	
		8	0.18.0	
		9	0.19.0	

23.95.5
0.99.5
20.96.0

0.27.5
0.56.0
0.16.0
5.99.5

1 of 2



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5	220	1	0.56.5	4.79.5
		2A	0.33.0	
		2B	0.04.0	
		3A	0.20.0	
		3B	0.01.5	
		3C	0.26.5	
		3D	0.02.0	
		3E	0.10.0	
		4	0.18.0	
		5A	0.14.0	
		5B	0.16.0	
		6A	0.13.0	
		6B	0.16.0	
		7A	0.03.5	
		7B	0.18.0	
		8A	0.09.0	
		8B	0.05.5	
		9A	0.18.0	
		9B	0.13.5	
		9C	0.26.0	
		10A	0.82.0	
		10B	0.14.5	
		11A	0.45.0	
		11B	0.14.0	
6	221	1A	4.60.0	4.74.5
		15	0.14.5	
		TOTAL	23.95.5	23.95.5



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ANNEXURE-III

1. The first step is to identify the problem or question that needs to be answered.

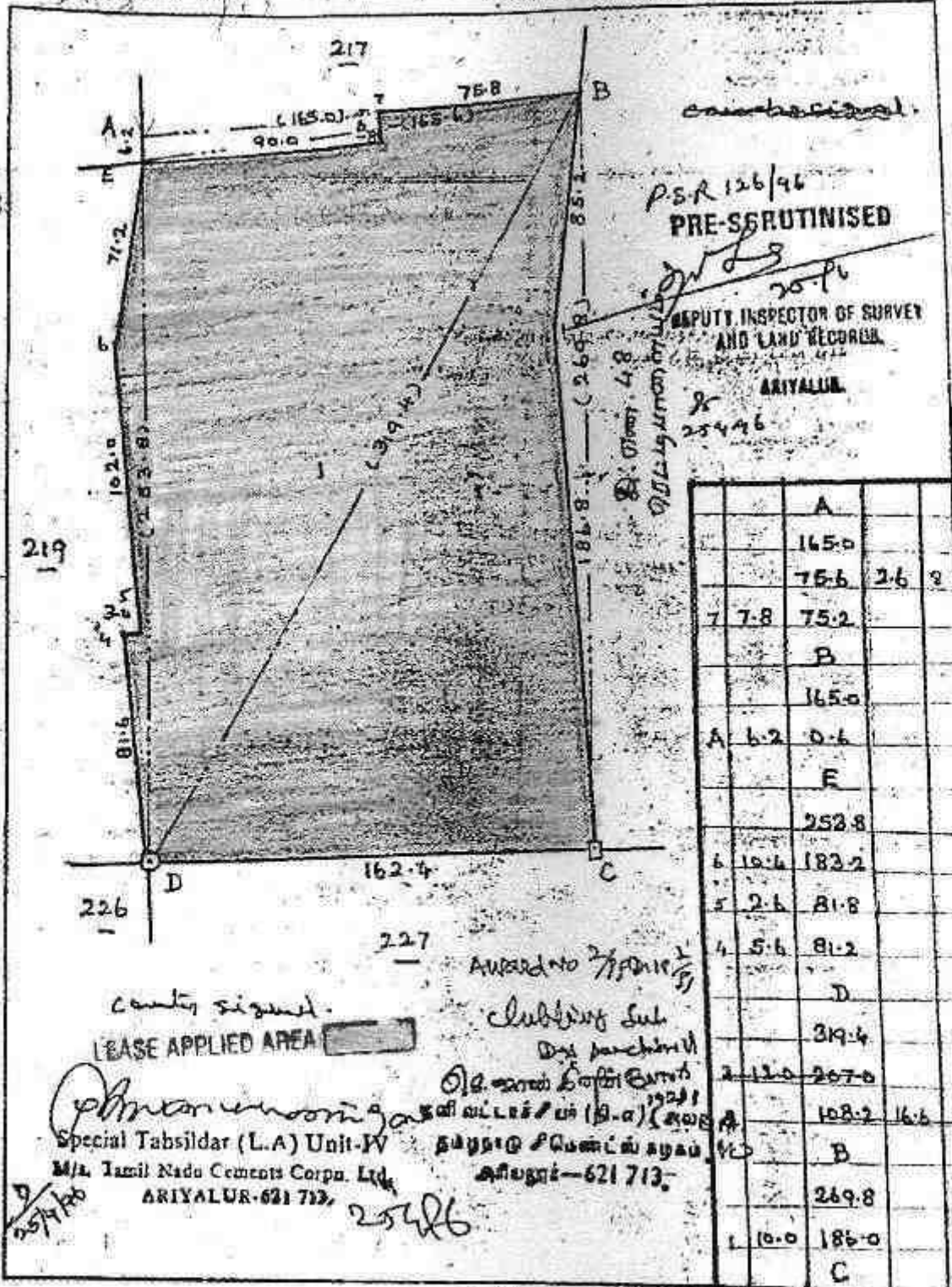
207-076
BULESIA INSECTOR OF SURVEY (L.A.)
DISTRICT CLIMATE COMPARISON
ARIZONA CEMENT WORKS
ARIZONA

396

Original

Station 49
 TCR 69/1488 dt 19.2.89
 43/11/1000000 116
 4 31 5

218
 219



LEASE APPLIED AREA

Special Tahsildar (L.A) Unit-IV
 M/A. Tamil Nadu Cements Corpn. Ltd.
 ARIYALUR-621 713

Clubbing Sub
 Old. Survey Officer
 1929
 621 713

2000 181.2

SPL. SUB-INSPECTOR OF SURVEY CL.
 TAMILNADU CEMENT CORPORATION
 ARIYALUR CEMENT WORKS
 ARIYALUR.

PATTA LAND APPLIED FOR MINING LEASE.

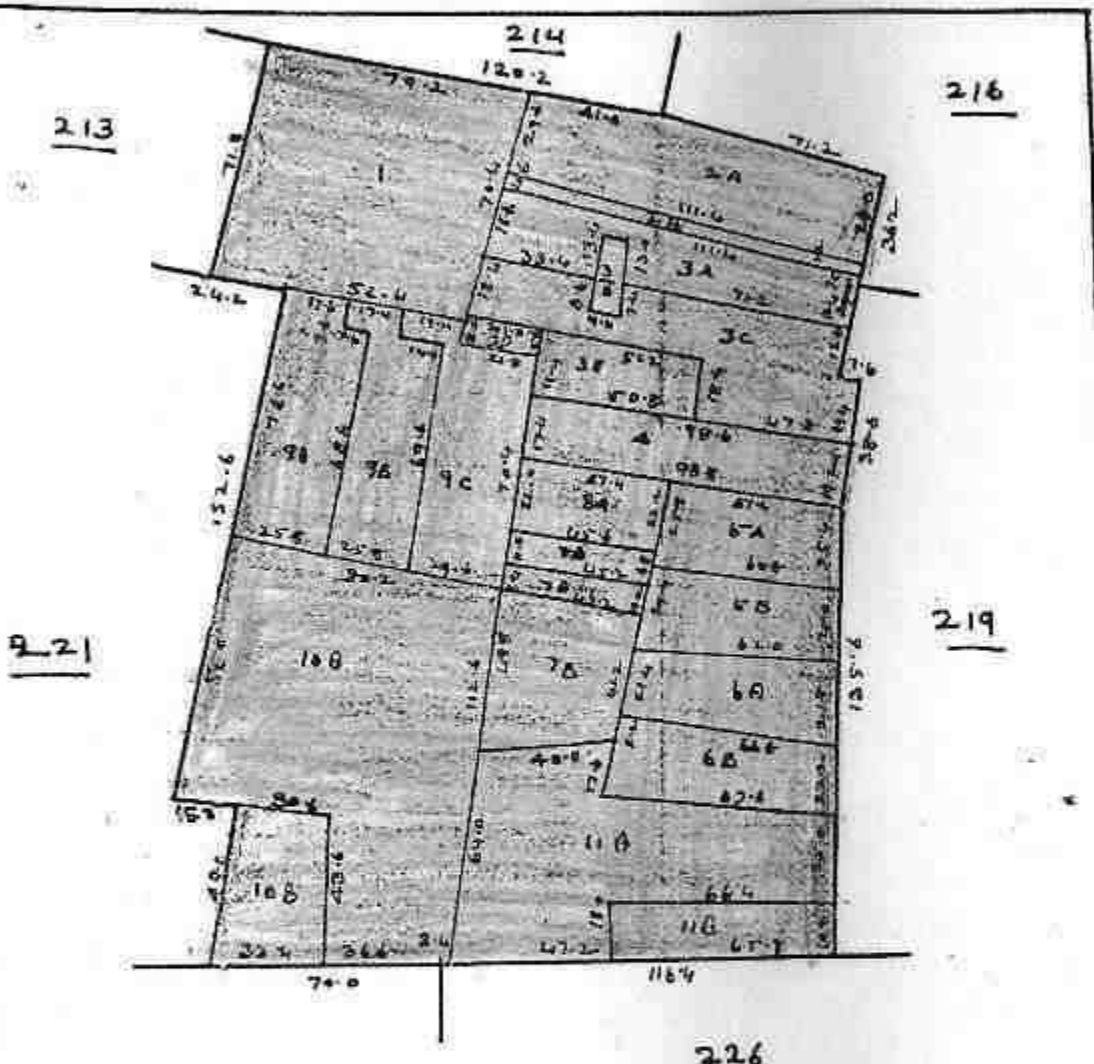
151

DISTRICT: }
TALUK: } Arizalun

Village { no. 49 118
name. Indupalayam

Field no 220

Area. 4.795



LEASE APPLIED AREA



Patta land applied for mining lease

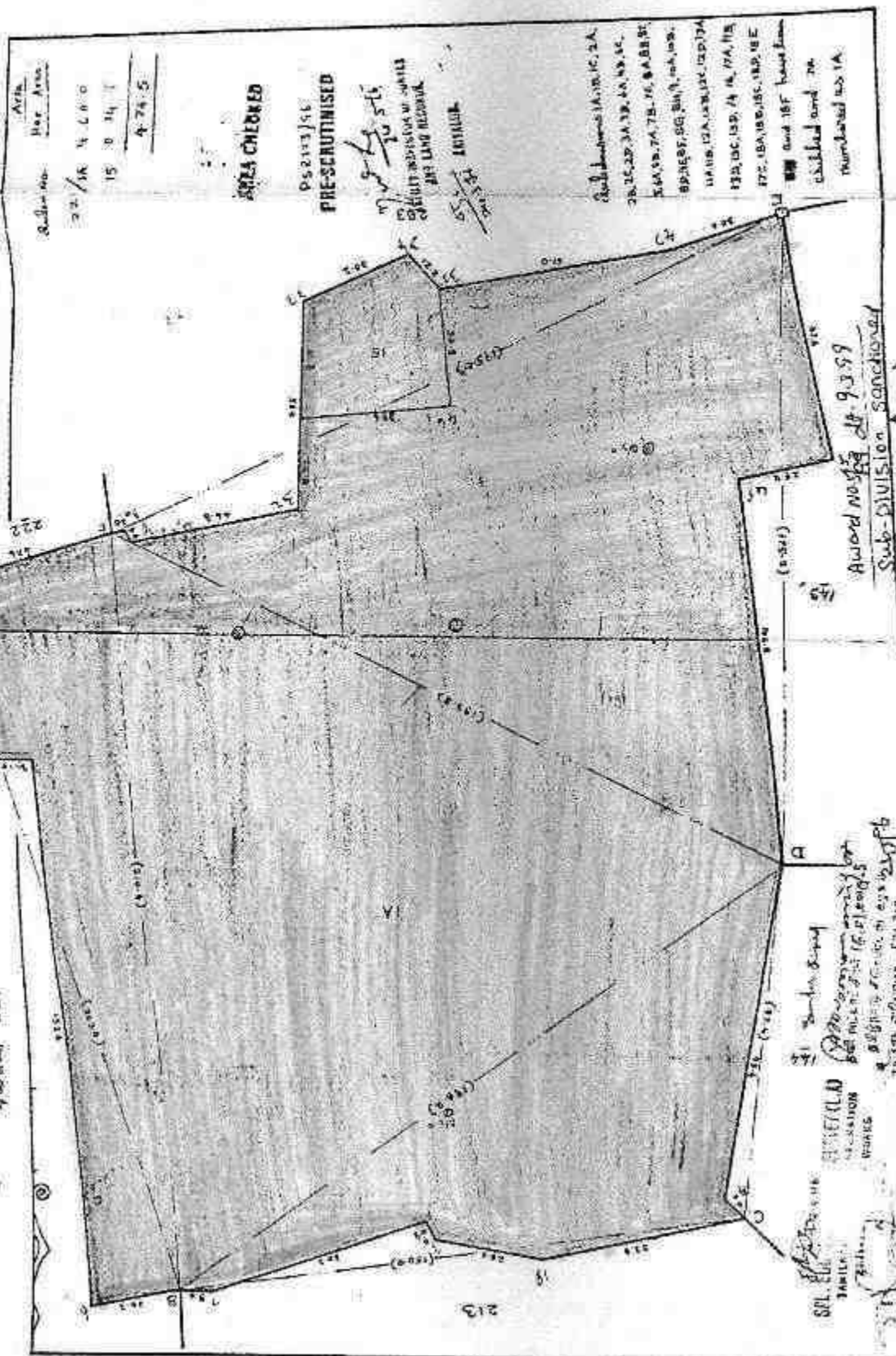
TRUE COPY OF F.M.B. SKETCH

SCALE-1:2000

Lawidess
3.15

TK-8485/1008

220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300
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Duration: 1000 = 1000 A.D.
PATTI LAND APPLIED FOR
MINING LEASE

IMAGE APPLIED AREA

ANNEXURE-III A



தமிழக அரசு

வருவாய்த் துறை

நில உரிமை விபரங்கள் : இ. எண் 10(1) பிரிவு

மாவட்டம் : அரியலூர்

வட்டம் : அரியலூர்

வருவாய் கிராமம் : புதுப்பாளையம்

பட்டா எண் : 1739

உரிமையாளர்கள் பெயர்

1. அரியலூர் ... தமிழ்நாடு சிமெண்ட் கழகம்

		நன்செய்		புன்செய்		மற்றவை	
		பரப்பு	தீர்வை	பரப்பு	தீர்வை	பரப்பு	தீர்வை
புல எண்	உட்பிரிவு	ஹெக்ட - ஏர்	ரூ - பை	ஹெக்ட - ஏர்	ரூ - பை	ஹெக்ட - ஏர்	ரூ - பை
161	6	0 - 1.50	0.17	--	--	--	--
162	20B	0 - 2.00	0.22	--	--	--	--
161	10	0 - 1.00	0.13	--	--	--	--
161	11	0 - 3.00	0.31	--	--	--	--
161	12	0 - 3.00	0.31	--	--	--	--
161	13	0 - 5.50	0.61	--	--	--	--
161	14	0 - 4.00	0.41	--	--	--	--
161	15	0 - 4.50	0.48	--	--	--	--
161	16	0 - 3.00	0.35	--	--	--	--
161	17	0 - 8.50	0.92	--	--	--	--
161	2	0 - 2.00	0.22	--	--	--	--
161	3	0 - 2.50	0.26	--	--	--	--
161	4	0 - 3.00	0.31	--	--	--	--
161	5	0 - 2.00	0.22	--	--	--	--
161	7	0 - 1.50	0.17	--	--	--	--
161	9	0 - 3.00	0.31	--	--	--	--
162	1	0 - 7.50	0.83	--	--	--	--
162	10	0 - 6.00	0.66	--	--	--	--
162	11	0 - 5.50	0.61	--	--	--	--
162	13A	0 - 5.50	0.60	--	--	--	--
162	13B	0 - 5.00	0.54	--	--	--	--
162	14	0 - 5.50	0.61	--	--	--	--
162	15	0 - 5.50	0.61	--	--	--	--
162	16	0 - 5.50	0.61	--	--	--	--

162	17	0 - 5.50	0.57	--	--	--	--
162	18	0 - 1.00	0.13	--	--	--	--
162	19	0 - 2.00	0.22	--	--	--	--
162	2	0 - 7.50	0.83	--	--	--	--
162	20A	0 - 2.00	0.22	--	--	--	--
162	20C	0 - 2.50	0.28	--	--	--	--
162	20D	0 - 9.00	0.93	--	--	--	--
162	20E	0 - 5.00	0.54	--	--	--	--
162	21	0 - 4.50	0.48	--	--	--	--
162	3	0 - 14.50	1.49	--	--	--	--
162	4	0 - 5.50	0.57	--	--	--	--
162	6	0 - 5.50	0.61	--	--	--	--
162	7	0 - 5.50	0.61	--	--	--	--
162	8	0 - 5.50	0.61	--	--	--	--
162	9	0 - 5.50	0.61	--	--	--	--
174	4	--	--	0 - 14.50	0.45	--	--
370	8	--	--	0 - 12.00	0.38	--	--
369	3	--	--	0 - 9.50	0.29	--	--
145	2A	--	--	0 - 51.50	1.78	--	--
145	6	--	--	1 - 31.00	3.92	--	--
169	1	--	--	0 - 1.50	0.07	--	--
169	3	--	--	0 - 11.50	0.52	--	--
169	4	--	--	0 - 2.50	0.11	--	--
173	2	--	--	0 - 10.00	0.31	--	--
174	9B	--	--	0 - 11.00	0.34	--	--
174	9C	--	--	0 - 7.00	0.22	--	--
217	4	--	--	0 - 10.00	0.31	--	--
217	5	--	--	0 - 33.00	1.03	--	--
219	5C	--	--	0 - 10.00	0.31	--	--
221	15	--	--	0 - 14.50	0.67	--	--
222	4D	--	--	0 - 16.50	0.50	--	--
259	3A	--	--	0 - 4.50	0.21	--	--
267	25A	--	--	0 - 8.00	0.37	--	--
267	25B	--	--	0 - 12.50	0.57	--	--
369	1A	--	--	3 - 59.00	11.26	--	--
365	1	--	--	3 - 10.50	9.61	--	--
365	19	--	--	0 - 2.50	0.08	--	--
366	1	--	--	1 - 17.00	3.63	--	--
367	-	--	--	1 - 98.00	6.12	--	--
367	1	--	--	1 - 98.00	6.12	--	--
368	-	--	--	3 - 13.50	9.78	--	--
144	1A	--	--	2 - 86.00	8.87	--	--

152	1	--	--	0 - 4.00	0.13	--	--
152	11	--	--	0 - 9.50	0.43	--	--
152	12	--	--	0 - 9.50	0.45	--	--
152	14A	--	--	0 - 7.00	0.22	--	--
152	5B	--	--	0 - 4.50	0.21	--	--
153	1A	--	--	1 - 84.00	8.56	--	--
155	2	--	--	0 - 24.50	1.12	--	--
156	1	--	--	0 - 49.50	2.28	--	--
156	2	--	--	0 - 61.00	2.82	--	--
156	4	--	--	0 - 4.50	0.21	--	--
157	13B	--	--	0 - 8.50	0.40	--	--
157	1A1	--	--	3 - 46.50	16.09	--	--
159	2	--	--	0 - 9.00	0.28	--	--
161	1	--	--	0 - 93.00	2.86	--	--
162	5	--	--	0 - 24.00	0.73	--	--
169	11	--	--	0 - 3.00	0.15	--	--
169	12	--	--	0 - 3.00	0.15	--	--
169	13	--	--	0 - 6.00	0.28	--	--
169	14A	--	--	0 - 3.00	0.14	--	--
169	14B	--	--	0 - 3.50	0.15	--	--
169	14C	--	--	0 - 3.00	0.14	--	--
169	15A	--	--	0 - 19.50	0.89	--	--
169	15B	--	--	0 - 16.00	0.74	--	--
169	15C	--	--	0 - 7.50	0.33	--	--
169	15D	--	--	0 - 7.50	0.33	--	--
169	15E	--	--	0 - 33.50	1.54	--	--
169	5	--	--	0 - 2.50	0.11	--	--
169	6A	--	--	0 - 2.50	0.11	--	--
169	6C	--	--	0 - 10.50	0.49	--	--
169	7	--	--	0 - 3.00	0.15	--	--
169	8	--	--	0 - 3.00	0.15	--	--
169	9	--	--	0 - 4.00	0.19	--	--
170	2	--	--	0 - 12.00	0.38	--	--
170	3	--	--	0 - 11.50	0.35	--	--
172	1A	--	--	0 - 14.00	0.40	--	--
172	1B	--	--	0 - 21.00	0.65	--	--
172	1C	--	--	0 - 12.00	0.37	--	--
172	1E	--	--	0 - 5.50	0.17	--	--
172	1F	--	--	0 - 10.50	0.33	--	--
172	1G	--	--	0 - 5.00	0.15	--	--
172	1H	--	--	0 - 6.00	0.19	--	--
172	1I	--	--	0 - 6.50	0.20	--	--

172	2A1	--	--	0 - 1.00	0.06	--	--
172	2A2	--	--	0 - 1.00	0.06	--	--
172	2A3	--	--	0 - 0.50	0.06	--	--
172	3A	--	--	0 - 12.00	0.37	--	--
172	3B	--	--	0 - 4.50	0.14	--	--
172	3C	--	--	0 - 5.50	0.17	--	--
172	4	--	--	0 - 8.00	0.25	--	--
172	5B	--	--	0 - 4.00	0.12	--	--
172	5C	--	--	0 - 8.00	0.26	--	--
172	5D	--	--	0 - 2.00	0.06	--	--
172	5E	--	--	0 - 2.00	0.06	--	--
172	5F	--	--	0 - 2.00	0.06	--	--
172	6	--	--	0 - 65.00	2.00	--	--
172	7	--	--	0 - 22.50	0.70	--	--
172	8	--	--	0 - 3.50	0.11	--	--
173	1	--	--	1 - 7.00	3.33	--	--
173	10A	--	--	0 - 4.00	0.13	--	--
173	10B	--	--	0 - 4.00	0.12	--	--
173	10C	--	--	0 - 4.00	0.12	--	--
173	10D	--	--	0 - 3.50	0.11	--	--
173	11	--	--	0 - 9.00	0.28	--	--
173	12	--	--	0 - 9.00	0.28	--	--
173	15	--	--	0 - 5.00	0.15	--	--
173	4B	--	--	0 - 6.50	0.21	--	--
173	5B	--	--	0 - 14.00	0.44	--	--
173	8	--	--	0 - 9.50	0.29	--	--
174	10A	--	--	0 - 15.00	0.47	--	--
174	10B	--	--	0 - 10.00	0.31	--	--
174	11	--	--	0 - 10.50	0.33	--	--
174	12	--	--	0 - 10.50	0.33	--	--
174	13	--	--	0 - 12.50	0.39	--	--
174	14A	--	--	0 - 14.00	0.43	--	--
174	14B	--	--	0 - 5.00	0.15	--	--
174	14C	--	--	0 - 1.00	0.06	--	--
174	14D	--	--	0 - 2.00	0.06	--	--
174	15	--	--	0 - 10.00	0.31	--	--
174	16	--	--	0 - 10.50	0.33	--	--
174	17	--	--	0 - 11.50	0.39	--	--
174	18A	--	--	0 - 4.00	0.12	--	--
174	18B1	--	--	0 - 1.00	0.06	--	--
174	1A	--	--	0 - 2.00	0.06	--	--
174	1B	--	--	0 - 1.00	0.06	--	--

174	1C	--	--	0 - 7.00	0.22	--	--
174	2	--	--	0 - 34.50	1.06	--	--
174	3A	--	--	0 - 8.00	0.25	--	--
174	3B1	--	--	0 - 1.00	0.06	--	--
174	3B2	--	--	0 - 57.50	1.77	--	--
174	6	--	--	0 - 13.50	0.41	--	--
174	9A	--	--	0 - 14.50	0.45	--	--
174	9D	--	--	0 - 9.00	0.28	--	--
175	1A	--	--	1 - 51.50	5.09	--	--
217	1A	--	--	0 - 27.50	0.85	--	--
217	1B	--	--	0 - 27.50	0.85	--	--
217	1C	--	--	1 - 8.00	3.34	--	--
217	3A	--	--	0 - 5.00	0.15	--	--
217	3B	--	--	0 - 7.00	0.23	--	--
217	6	--	--	0 - 30.00	0.93	--	--
217	7	--	--	0 - 56.00	1.73	--	--
218	1	--	--	4 - 31.50	13.35	--	--
219	1	--	--	0 - 32.50	1.00	--	--
219	2A	--	--	0 - 39.00	1.21	--	--
219	2B	--	--	0 - 5.00	0.15	--	--
219	3A	--	--	0 - 14.00	0.43	--	--
219	3B	--	--	0 - 11.00	0.34	--	--
219	3C	--	--	0 - 9.00	0.28	--	--
219	3D	--	--	0 - 29.00	0.89	--	--
219	3E	--	--	0 - 14.00	0.43	--	--
219	3F	--	--	0 - 7.50	0.24	--	--
219	3G	--	--	0 - 25.00	0.77	--	--
219	4A	--	--	0 - 13.00	0.40	--	--
219	4B	--	--	0 - 12.50	0.39	--	--
219	5A	--	--	0 - 13.00	0.40	--	--
219	6	--	--	0 - 39.00	0.93	--	--
219	7	--	--	0 - 16.00	0.50	--	--
219	8	--	--	0 - 18.00	0.55	--	--
219	9	--	--	0 - 19.00	0.59	--	--
220	6B	--	--	0 - 16.00	0.50	--	--
220	10A	--	--	0 - 82.00	2.53	--	--
220	10B	--	--	0 - 14.50	0.45	--	--
220	2A	--	--	0 - 33.00	1.03	--	--
220	2B	--	--	0 - 4.00	0.12	--	--
220	3A	--	--	0 - 20.00	0.63	--	--
220	3B	--	--	0 - 1.50	0.06	--	--

220	3C	--	--	0 - 26.50	0.80	--	--
220	3E	--	--	0 - 10.00	0.31	--	--
220	4	--	--	0 - 18.00	0.55	--	--
220	5A	--	--	0 - 14.00	0.50	--	--
220	5B	--	--	0 - 13.00	0.40	--	--
220	6A	--	--	0 - 13.00	0.40	--	--
220	7A	--	--	0 - 3.50	0.11	--	--
220	7B	--	--	0 - 18.00	0.55	--	--
220	8A	--	--	0 - 9.00	0.28	--	--
220	8B	--	--	0 - 5.50	0.17	--	--
220	9A	--	--	0 - 18.00	0.55	--	--
220	9B	--	--	0 - 13.50	0.42	--	--
221	1A	--	--	4 - 60.00	14.47	--	--
222	1	--	--	3 - 4.00	14.05	--	--
222	11A	--	--	0 - 59.00	1.82	--	--
222	2A	--	--	1 - 14.50	3.56	--	--
225	-	--	--	3 - 30.00	15.22	--	--
226	1A	--	--	3 - 1.50	14.07	--	--
226	7	--	--	0 - 27.50	1.27	--	--
227	1	--	--	2 - 55.50	11.82	--	--
229	3A	--	--	0 - 70.50	3.25	--	--
230	2A	--	--	1 - 27.50	5.91	--	--
233	1	--	--	2 - 14.50	9.93	--	--
236	1A	--	--	2 - 4.50	8.99	--	--
236	9	--	--	0 - 78.00	2.71	--	--
237	1	--	--	2 - 70.50	12.53	--	--
237	4A	--	--	0 - 18.00	0.55	--	--
239	-	--	--	4 - 46.00	20.60	--	--
240	1	--	--	2 - 59.00	12.01	--	--
240	5A	--	--	0 - 72.50	2.23	--	--
241	1A	--	--	2 - 71.50	12.55	--	--
244	1A	--	--	0 - 83.00	2.63	--	--
245	1A	--	--	2 - 44.00	11.11	--	--
245	5A	--	--	0 - 90.50	2.80	--	--
254	11	--	--	0 - 83.00	2.56	--	--
255	1A	--	--	0 - 35.00	1.11	--	--
257	1	--	--	0 - 37.00	1.69	--	--
257	10C	--	--	0 - 4.00	0.18	--	--
257	3	--	--	0 - 39.50	1.22	--	--
258	1	--	--	0 - 25.50	1.18	--	--
258	7	--	--	0 - 41.00	1.39	--	--
259	3B	--	--	0 - 4.50	0.21	--	--

259	3F	--	--	0 - 11.00	0.51	--	--
259	3G	--	--	0 - 15.50	0.72	--	--
259	3H	--	--	0 - 33.00	1.52	--	--
259	6	--	--	0 - 15.50	0.71	--	--
259	7	--	--	0 - 33.00	1.50	--	--
259	8A	--	--	0 - 5.00	0.23	--	--
259	8B	--	--	0 - 19.50	0.89	--	--
263	1A	--	--	1 - 98.00	9.18	--	--
264	11A	--	--	0 - 6.00	0.28	--	--
264	2	--	--	0 - 26.00	1.20	--	--
264	3	--	--	0 - 10.50	0.49	--	--
264	4	--	--	0 - 10.50	0.49	--	--
264	5	--	--	0 - 24.50	1.12	--	--
264	6B	--	--	0 - 10.00	0.46	--	--
264	7A	--	--	0 - 7.00	0.32	--	--
267	10A	--	--	0 - 4.50	0.21	--	--
267	10B	--	--	0 - 4.00	0.18	--	--
267	10C	--	--	0 - 4.00	0.18	--	--
267	11A	--	--	0 - 5.00	0.23	--	--
267	11B	--	--	0 - 3.00	0.14	--	--
267	11C	--	--	0 - 3.50	0.16	--	--
267	11D	--	--	0 - 4.00	0.18	--	--
267	11E	--	--	0 - 1.50	0.07	--	--
267	11F	--	--	0 - 1.00	0.06	--	--
267	11G	--	--	0 - 3.50	0.16	--	--
267	12A	--	--	0 - 2.00	0.10	--	--
267	12B	--	--	0 - 2.00	0.10	--	--
267	12C	--	--	0 - 14.00	0.65	--	--
267	12D	--	--	0 - 2.00	0.09	--	--
267	13A	--	--	0 - 0.50	0.06	--	--
267	13B	--	--	0 - 5.50	0.25	--	--
267	14A	--	--	0 - 10.50	0.49	--	--
267	14B	--	--	0 - 10.50	0.49	--	--
267	15	--	--	0 - 9.00	0.41	--	--
267	16A	--	--	0 - 7.00	0.32	--	--
267	16B	--	--	0 - 7.50	0.35	--	--
267	17A	--	--	0 - 2.00	0.09	--	--
267	17B	--	--	0 - 3.50	0.17	--	--
267	17C	--	--	0 - 4.00	0.18	--	--
267	18A	--	--	0 - 2.00	0.09	--	--
267	18B	--	--	0 - 2.50	0.11	--	--
267	18C	--	--	0 - 3.00	0.14	--	--

267	19A	--	--	0 - 1.50	0.07	--	--
267	19B	--	--	0 - 3.50	0.16	--	--
267	19C	--	--	0 - 4.50	0.20	--	--
267	1A	--	--	0 - 11.00	0.34	--	--
267	1B	--	--	0 - 10.50	0.32	--	--
267	1C	--	--	0 - 9.50	0.30	--	--
267	1D	--	--	0 - 14.50	0.45	--	--
267	1E	--	--	0 - 12.00	0.37	--	--
267	20A	--	--	0 - 1.50	0.06	--	--
267	20B	--	--	0 - 1.00	0.06	--	--
267	20C	--	--	0 - 0.50	0.06	--	--
267	21	--	--	0 - 3.00	0.15	--	--
267	22	--	--	0 - 14.00	0.65	--	--
267	23A	--	--	0 - 2.50	0.10	--	--
267	23B	--	--	0 - 5.00	0.22	--	--
267	23C	--	--	0 - 6.00	0.28	--	--
267	23D	--	--	0 - 17.50	0.80	--	--
267	23E	--	--	0 - 15.00	0.69	--	--
267	23F	--	--	0 - 17.00	0.79	--	--
267	24	--	--	0 - 10.00	0.47	--	--
267	25C	--	--	0 - 12.00	0.55	--	--
267	25D	--	--	0 - 13.50	0.62	--	--
267	25E	--	--	0 - 3.00	0.14	--	--
267	2A	--	--	0 - 3.50	0.10	--	--
267	2B	--	--	0 - 3.00	0.09	--	--
267	2C	--	--	0 - 0.50	0.06	--	--
267	2D	--	--	0 - 3.00	0.09	--	--
267	4	--	--	0 - 3.00	0.15	--	--
267	5	--	--	0 - 3.50	0.16	--	--
267	8A	--	--	0 - 18.50	0.85	--	--
272	1	--	--	1 - 41.00	6.54	--	--
299	3C	--	--	0 - 4.50	0.20	--	--
350	-	--	--	2 - 19.50	10.20	--	--
351	12A	--	--	0 - 29.00	0.90	--	--
351	1A	--	--	2 - 42.00	11.18	--	--
351	4A	--	--	0 - 53.50	1.67	--	--
351	7A	--	--	0 - 21.50	0.66	--	--
357	-	--	--	1 - 83.00	8.42	--	--
360	1	--	--	0 - 7.50	0.23	--	--
363	11	--	--	0 - 34.50	1.57	--	--
363	13A	--	--	0 - 3.50	0.16	--	--
363	15	--	--	0 - 1.00	0.06	--	--

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363	16	--	--	0 - 1.50	0.07	--	--
363	18	--	--	0 - 5.50	0.24	--	--
363	1B	--	--	0 - 2.50	0.12	--	--
370	1A	--	--	2 - 18.50	6.74	--	--
59	10	--	--	0 - 9.00	0.28	--	--
59	11A	--	--	0 - 6.00	0.19	--	--
59	11B	--	--	0 - 4.50	0.14	--	--
59	12A	--	--	0 - 3.00	0.09	--	--
59	12B	--	--	0 - 3.00	0.09	--	--
59	12C	--	--	0 - 20.00	0.62	--	--
59	13	--	--	0 - 10.50	0.33	--	--
59	14A	--	--	0 - 4.50	0.12	--	--
59	14B	--	--	0 - 4.00	0.13	--	--
59	2B	--	--	0 - 6.00	0.19	--	--
59	3	--	--	0 - 86.50	2.68	--	--
59	4A	--	--	0 - 20.00	0.62	--	--
59	4B	--	--	0 - 2.00	0.06	--	--
59	4C	--	--	0 - 30.00	0.93	--	--
59	4D	--	--	0 - 12.00	0.37	--	--
59	5	--	--	0 - 50.00	1.55	--	--
59	6	--	--	0 - 30.50	0.94	--	--
59	7	--	--	0 - 36.00	1.11	--	--
59	8A	--	--	0 - 8.50	0.27	--	--
59	8B	--	--	0 - 8.50	0.26	--	--
59	8C	--	--	0 - 18.00	0.56	--	--
62	1C	--	--	0 - 13.00	0.40	--	--
62	1E	--	--	0 - 13.00	0.40	--	--
62	3	--	--	0 - 7.50	0.24	--	--
62	9B	--	--	0 - 31.00	0.95	--	--

1 - 77.00 19.17 122 - 52.50 469.26

குறிப்பு 2 :



1. மேற்கண்ட தகவல் / சான்றிதழ் நகல் விவரங்கள் யின் பதிவேட்டிலிருந்து பெறப்பட்டவை. இவற்றை தாங்கள் <http://eservices.tn.gov.in> என்ற இணைய தளத்தில் 17/01/049/01739/10900 என்ற குறிப்பு எண்ணை உள்ளீடு செய்து உறுதி செய்துகொள்ளவும்.
2. இத் தகவல்கள் 10-01-2018 அன்று 10:46:21 AM நேரத்தில் அச்சடிக்கப்பட்டது.
3. கைப்பேசி கேமராவின் 2D barcode படிப்பான் மூலம் படித்து 3G/GPRS வழி இணையதளத்தில் சரிபார்க்கவும்

ANNEXURE-IIIB

பொதுத் தகவல்					புதுப் பிளவு						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
பெண்	பெண்	பெண்	பெண்	பெண்	பெண்	பெண்	பெண்	பெண்	பெண்	பெண்	பெண்
124	1A	2240887	1739	சுமந்திரா சிவசுந்தரி							
125	1	0160	-	-							
125	2A	0576178	1739	சுமந்திரா சிவசுந்தரி							
	6	1310	3.92	1739							
202	1A	0080	0.25	1689	சுமந்திரா சிவசுந்தரி						
	1B	0063	0.20	1689	"						
	2	0425	0.25	1689	"						
	3A	0050	0.15	1689	"						
	3B	0050	0.15	1689	"						
	3C	0050	0.56	1689	"						
	4	0045	0.20	1689	"						
	5	0060	0.42	1689	"						
	6	0060	0.40	1689	"						
	7A	0070	0.52	1689	"						
	7B	0070	0.54	1689	"						
	8A	0080	0.25	1689	"						
	8B	0085	0.26	1689	"						
	8C	0065	0.26	1689	"						
	8D	0070	0.22	1689	"						
	8E	0025	0.11	1689	"						

350/82-ALF, T11-A-10-40,00,000 Cps. G.P. 10/17

சுமந்திரா சிவசுந்தரி
21. பிப்ரவரி 2017
சுமந்திரா சிவசுந்தரி

சுமந்திரா சிவசுந்தரி புதுப்பிளவு கட்டுப்பாடு அமைச்சு

பொதுத் தகவல்					புதுப் பிளவு						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
பெண்	பெண்	பெண்	பெண்	பெண்	பெண்	பெண்	பெண்	பெண்	பெண்	பெண்	பெண்
124	1A	2240887	1739	சுமந்திரா சிவசுந்தரி							
125	1	0160	-	-							
125	2A	0576178	1739	சுமந்திரா சிவசுந்தரி							
	6	1310	3.92	1739							
202	1A	0080	0.25	1689	சுமந்திரா சிவசுந்தரி						
	1B	0063	0.20	1689	"						
	2	0425	0.25	1689	"						
	3A	0050	0.15	1689	"						
	3B	0050	0.15	1689	"						
	3C	0050	0.56	1689	"						
	4	0045	0.20	1689	"						
	5	0060	0.42	1689	"						
	6	0060	0.40	1689	"						
	7A	0070	0.52	1689	"						
	7B	0070	0.54	1689	"						
	8A	0080	0.25	1689	"						
	8B	0085	0.26	1689	"						
	8C	0065	0.26	1689	"						
	8D	0070	0.22	1689	"						
	8E	0025	0.11	1689	"						

[illegible]

380/82-R.F. III-A-10-40,000 Cps. - 6021-1000 2037

சீராம சிர்வாடி

21. பூதப்பிரகாசம் என்ற நிகழ்வு

தமிழ்நாடு வட்டம்: 100% மாவட்டம்

[illegible]

1	2	3	4	5	6	7	8	9	10	11	12
பெயர்	பெயர்	பெயர்	பெயர்	பெயர்	பெயர்	பெயர்	பெயர்	பெயர்	பெயர்	பெயர்	பெயர்
1	2	3	4	5	6	7	8	9	10	11	12
219	48	0120	0120	1739	தமிழ்நாடு கிராம நிர்வாக அமைச்சு						
	48	0125	0125	1739	"						
	5A	0130	0130	1739	"						
	5B	0130	0130	1739	"						
	5C	0130	0130	1739	தமிழ்நாடு கிராம நிர்வாக அமைச்சு						
	6	0130	0130	1739	"						
	7	0130	0130	1739	"						
	8	0130	0130	1739	"						
	9	0130	0130	1739	"						
220	1	0130	0130	1739	தமிழ்நாடு கிராம நிர்வாக அமைச்சு						
	2A	0130	0130	1739	"						
	2B	0130	0130	1739	"						
	3A	0130	0130	1739	"						
	3B	0130	0130	1739	"						
	3C	0130	0130	1739	"						
	3D	0130	0130	1739	"						
	3E	0130	0130	1739	"						
	4	0130	0130	1739	"						

1	2	3	4	5	6	7	8	9	10	11	12
பெயர்	பெயர்	பெயர்	பெயர்	பெயர்	பெயர்	பெயர்	பெயர்	பெயர்	பெயர்	பெயர்	பெயர்
1	2	3	4	5	6	7	8	9	10	11	12
221	1	0130	0130	1739	தமிழ்நாடு கிராம நிர்வாக அமைச்சு						
	2	0130	0130	1739	"						
	3	0130	0130	1739	"						
	4	0130	0130	1739	"						
	5	0130	0130	1739	"						
	6	0130	0130	1739	"						
	7	0130	0130	1739	"						
	8	0130	0130	1739	"						
	9	0130	0130	1739	"						
	10	0130	0130	1739	"						
	11	0130	0130	1739	"						
	12	0130	0130	1739	"						
	13	0130	0130	1739	"						
	14	0130	0130	1739	"						
	15	0130	0130	1739	"						
	16	0130	0130	1739	"						
	17	0130	0130	1739	"						
	18	0130	0130	1739	"						
	19	0130	0130	1739	"						
	20	0130	0130	1739	"						
	21	0130	0130	1739	"						
	22	0130	0130	1739	"						
	23	0130	0130	1739	"						
	24	0130	0130	1739	"						
	25	0130	0130	1739	"						
	26	0130	0130	1739	"						
	27	0130	0130	1739	"						
	28	0130	0130	1739	"						
	29	0130	0130	1739	"						
	30	0130	0130	1739	"						
	31	0130	0130	1739	"						
	32	0130	0130	1739	"						
	33	0130	0130	1739	"						
	34	0130	0130	1739	"						
	35	0130	0130	1739	"						
	36	0130	0130	1739	"						
	37	0130	0130	1739	"						
	38	0130	0130	1739	"						
	39	0130	0130	1739	"						
	40	0130	0130	1739	"						
	41	0130	0130	1739	"						
	42	0130	0130	1739	"						
	43	0130	0130	1739	"						
	44	0130	0130	1739	"						
	45	0130	0130	1739	"						
	46	0130	0130	1739	"						
	47	0130	0130	1739	"						
	48	0130	0130	1739	"						
	49	0130	0130	1739	"						
	50	0130	0130	1739	"						
	51	0130	0130	1739	"						
	52	0130	0130	1739	"						
	53	0130	0130	1739	"						
	54	0130	0130	1739	"						
	55	0130	0130	1739	"						
	56	0130	0130	1739	"						
	57	0130	0130	1739	"						
	58	0130	0130	1739	"						
	59	0130	0130	1739	"						
	60	0130	0130	1739	"						
	61	0130	0130	1739	"						
	62	0130	0130	1739	"						
	63	0130	0130	1739	"						
	64	0130	0130	1739	"						
	65	0130	0130	1739	"						
	66	0130	0130	1739	"						
	67	0130	0130	1739	"						
	68	0130	0130	1739	"						
	69	0130	0130	1739	"						
	70	0130	0130	1739	"						
	71	0130	0130	1739	"						
	72	0130	0130	1739	"						
	73	0130	0130	1739	"						
	74	0130	0130	1739	"						
	75	0130	0130	1739	"						
	76	0130	0130	1739	"						
	77	0130	0130	1739	"						
	78	0130	0130	1739	"						
	79	0130	0130	1739	"						
	80	0130	0130	1739	"						
	81	0130	0130	1739	"						
	82	0130	0130	1739	"						
	83	0130	0130	1739	"						
	84	0130	0130	1739	"						
	85	0130	0130	1739	"						
	86	0130	0130	1739	"						
	87	0130	0130	1739	"						
	88	0130	0130	1739	"						
	89	0130	0130	1739	"						
	90	0130	0130	1739	"						
	91	0130	0130	1739	"						
	92	0130	0130	1739	"						
	93	0130	0130	1739	"						
	94	0130	0130	1739	"						
	95	0130	0130	1739	"						
	96	0130	0130	1739	"						
	97	0130	0130	1739	"						
	98	0130	0130	1739	"						
	99	0130	0130	1739	"						
	100	0130	0130	1739	"						

பிரதமர் பக்கம் (1)					பிரதமர் பக்கம் (2)						
பிரதமர் பக்கம் (1)	பிரதமர் பக்கம் (2)	பிரதமர் பக்கம் (3)	பிரதமர் பக்கம் (4)	பிரதமர் பக்கம் (5)	பிரதமர் பக்கம் (6)	பிரதமர் பக்கம் (7)	பிரதமர் பக்கம் (8)	பிரதமர் பக்கம் (9)	பிரதமர் பக்கம் (10)	பிரதமர் பக்கம் (11)	பிரதமர் பக்கம் (12)
220	5A	1400 043	1739	5.14.19	5.14.19						
	5B	0160 050	1739		11						
	6B	0160 050	1739		11						
	6B	0160 050	1739		11						
	7A	0055 011	1739		11						
	7B	0160 050	1739		11						
	8A	0040 028	1739		11						
	8B	0050 017	1739		11						
	9A	0160 050	1739		11						
	9B	0160 050	1739		11						
	9C	0240 000	1739		11						
	10A	0020 015	1739		11						
	10B	0160 050	1739		11						
	11A	0160 050	1739		11						
	11B	0160 050	1739		11						
221	1A	0160 050	1739		11						
	1B	0160 050	1739		11						
222	1	0160 050	1739		11						
	2A	0160 050	1739		11						
	3A	0160 050	1739		11						
	4A	0160 050	1739		11						
	11A	0160 050	1739		11						

380/82 - P.F. 123-A-10 - 40,00,000, Cpx (Cpx) 1000-2-1000

பிரதமர்
பிரதமர்

21.4.19
பிரதமர்

பிரதமர் பக்கம் (2)					பிரதமர் பக்கம் (3)						
பிரதமர் பக்கம் (2)	பிரதமர் பக்கம் (3)	பிரதமர் பக்கம் (4)	பிரதமர் பக்கம் (5)	பிரதமர் பக்கம் (6)	பிரதமர் பக்கம் (7)	பிரதமர் பக்கம் (8)	பிரதமர் பக்கம் (9)	பிரதமர் பக்கம் (10)	பிரதமர் பக்கம் (11)	பிரதமர் பக்கம் (12)	பிரதமர் பக்கம் (13)
220	5A	1400 043	1739	5.14.19	5.14.19						
	5B	0160 050	1739		11						
	6B	0160 050	1739		11						
	6B	0160 050	1739		11						
	7A	0055 011	1739		11						
	7B	0160 050	1739		11						
	8A	0040 028	1739		11						
	8B	0050 017	1739		11						
	9A	0160 050	1739		11						
	9B	0160 050	1739		11						
	9C	0240 000	1739		11						
	10A	0020 015	1739		11						
	10B	0160 050	1739		11						
	11A	0160 050	1739		11						
	11B	0160 050	1739		11						
221	1A	0160 050	1739		11						
	1B	0160 050	1739		11						
222	1	0160 050	1739		11						
	2A	0160 050	1739		11						
	3A	0160 050	1739		11						
	4A	0160 050	1739		11						
	11A	0160 050	1739		11						

[illegible]

ANNEXURE-IIIC

1	2	3	4	5	6	7	8	9	10	11	
							மு. கை.	தொ. ஏர்.	பி. கை.		
143	2H	143-2 பா	ர	4	...	5-2	9	3 09	0 01.0	0 06	1602 ச. ஆயுதகம் மற்றும் மூன்று பேர்களும்.
	2 I	-2பா	ர	4	...	5-2	9	3 09	0 03.5	0 11	174 ச. கணேசன்.
	2 J	-2பா	ர	4	...	5-2	9	3 09	0 04.5	0 15	330 ச. சண்முகம்.
	2K	-2பா	ர	4	...	5-2	9	3 09	0 04.5	0 15	75 ச. ஆயுதகம்.
	2L	-2பா	ர	4	...	5-2	9	3 09	0 04.0	0 12	797 ச. பிச்சை மூப்பனார்.
	2M	-2பா	ர	4	...	5-2	9	3 09	0 04.0	0 12	821 தா. பூசை மூப்பனார்.
	3	-3	ர	4	...	5-2	9	3 09	0 13.0	0 40	928 பெ. மருதமுத்து கோனார்.
	4	-4	ர	4	...	5-2	9	3 09	0 09.5	0 29	928 பெ. மருதமுத்து கோனார்.
	5A	-5பா	ர	4	...	5-2	9	3 09	0 07.0	0 22	253 பெ. சாதிதாத கோனார்.
	5B	-5பா	ர	4	...	5-2	9	3 09	0 42.5	1 32	847 தா. பெரியார் கோனார்.
	6	-6	ர	4	...	5-2	9	3 09	0 07.5	0 23	405 பி. சின்னம் பிள்ளையம்மாள்
									2 32.0	7 27	
144	1A	144-1 பா	ர	4	...	5-2	9	3 09	0 05.5	0 18	1598 ச. பக்கிசாமி மற்றும் மூன்று பேர்களும்.
	1B	-1பா	ர	4	...	5-2	9	3 09	0 22.5	0 70	407 அ. சின்னம் மூப்பனார்.
	2A	-2பா	ர	4	...	5-2	9	3 09	0 05.5	0 18	1598 ச. பக்கிசாமி மற்றும் மூன்று பேர்களும்.
	2B	-2பா	ர	4	...	5-2	9	3 09	0 04.0	0 12	511 சு. செங்கமலம்
	2C	-2பா	ர	4	...	5-2	9	3 09	0 06.0	0 19	1067 மு. சாமையா
	2D	-2பா	ர	4	...	5-2	9	3 09	0 03.5	0 11	726 சு. பக்கிசாமி
									0 03.5	0 11	511 சு. செங்கமலம்.
									0 03.5	0 11	726 சு. பக்கிசாமி.

சின்னம்

திருமதி சின்னம்

21, புதுப்பாணையம் திருவாரூர்

அரியலூர் வட்டம் & மாவட்டம்

விவரப்படுத்தியமை.

	2	3	4	5	6	7	8	9	10	11	12
							குறைவு	தொகுப்புகள்	குறைவு		
2G	144-2	ர	9	...	5-2	9	3 09	0 13 5	0 42	728	மு. ப. மணி
3A	-2ur	ர	4	...	5-2	9	3 09	0 11-0	0 34	1138	நா. ப. மணி
3B	-2ur	ர	4	...	5-2	9	3 09	0 10-0	0 31	1071	நா. ப. மணி
3C	-2ur	ர	4	...	5-2	9	3 09	0 10-0	0 31	407	நா. ப. மணி
4A	-4ur	ர	4	...	5-2	9	3 09	0 15-0	0 46	471	நா. ப. மணி
4B	-4ur	ர	4	...	5-2	9	3 09	0 17-0	0 53	451	நா. ப. மணி
5	-5	ர	4	...	5-2	9	3 19	0 79.5	2 46	1226	அருள்மிகு விஸ்வநாத சுவாமி கோவில்.
6	-6	ர	4	...	5-2	9	3 09	0 72.0	2 26	28	அருள்மிகு அழகர் தருமேஸ் வர் சுவாமி கோவில்.
7	-7	ர	4	...	5-2	9	3 09	0 03.0	0 09	1226	அருள்மிகு விஸ்வநாத சுவாமி கோவில்.
								2 86-0	8 88		
1	145-1	ர	4ur	0 76 0	வாரி.
2A	-2ur	ர	4	...	5-2	9	3 09	0 03 0	0 09	821	நா. ப. மணி
2B	-2ur	ர	4	...	5-2	9	3 09	0 04.5	0 14	1070	நா. ப. மணி
3D	-2ur	ர	4	...	5-2	9	3 09	0 00.5	0 06	929	க. மணி
4D	-2ur	ர	4	...	5-2	9	3 09	0 01.0	0 06	1003	க. மணி
5D	-2ur	ர	4	...	5-2	9	3 09	0 01.0	0 06	670	க. மணி
6D	-2ur	ர	4	...	5-2	9	3 09	0 00.5	0 06	723	க. மணி
7D	-3ur	ர	4	...	5-2	9	3 09	0 03.0	0 10	174	க. மணி
8D	-3ur	ர	4	...	5-2	9	3 09	0 03.0	0 09	75	க. மணி

144	1A	144x100	5	4	5.2	9	3.08	0.05.5	0.18
	1B	"	"	"	"	"	"	0.22.5	0.70
	2A	24x	"	"	"	"	"	0.05.5	0.18
	2B	"	"	"	"	"	"	0.04.0	0.12
	2C	"	"	"	"	"	"	0.06.0	0.19
	2D	"	"	"	"	"	"	0.03.5	0.11
	2E	"	"	"	"	"	"	0.03.5	0.11
	2F	"	"	"	"	"	"	0.03.5	0.11
	2G	"	"	"	"	"	"	0.13.5	0.42
	3A	34x	"	"	"	"	"	0.11.0	0.34
	3B	"	"	"	"	"	"	0.10.0	0.31
	3C	"	"	"	"	"	"	0.10.0	0.31
	4A	44x	"	"	"	"	"	0.15.0	0.46
	4B	"	"	"	"	"	"	0.17.0	0.53
	5	5	"	"	"	"	"	0.79.5	2.45
	6	6	"	"	"	"	"	0.73.0	2.26
	7	7	"	"	"	"	"	0.03.0	0.09

1739.90 (144x100) இலக்கில் உள்ளது

Subdivisions 1A, 1B, 2A to 2G, 3A to 3C, 4A, 4B, 5 to 7 changed as per
 the Table for 1A, 1B, 2A to 2G, 3A to 3C, 4A, 4B, 5 to 7 (Annex 17)
 TKN 131/140 for 3.55 for Subdivisions 1A, 1B, 2A to 2G, 3A to 3C, 4A, 4B, 5 to 7
 changed as 144/100

144	1A	5	4	5.2	9	3.08	2.86.0	887
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1739.90 (144x100)
 இலக்கில் உள்ளது
 அல்லது

இந்தியா மீட்டர்

25/4/18

கிராம நிர்வாக அலுவலர்
 21, பஞ்சபாளையம் கிராமம்
 அரியலூர் வட்டம் & மாவட்டம்

	2	3	4	5	6	7	8	9	10	11	12
							நு. பை.	தொகை	நு. பை.		
5	316-5	ர	4		5-2	9	3 09	0 40.5	1 23	176 ம. கத்தாமி	
6	-6	ர	4		5-2	9	3 09	0 37.0	1 15	6 து. அப்பாதுரை	
7A	-7பா	ர	4		5-2	9	3 09	0 25.0	0 77	176 ம. கத்தாமி.	
7B	-7பா	ர	4		5-2	9	3 09	0 23.0	0 71	470 ஆ. கருவிவேல்	
7C	-7பா	ர	4		5-2	9	3 09	0 15.5	0 48	734 பெ. பழனிசாமி	
7D	-7பா	ர	4		5-2	9	3 09	0 14.0	0 43	1167 ரா. வெட்கம்.	
7E	-7பா	ர	4		5-2	9	3 09	0 06.5	0 21	177 பெ. கருப்பையா	
7F	-7பா	ர	4		5-2	9	3 09	0 06.0	0 19	425 பெ. சின்னப்பா	
7G	-7பா	ர	4		5-2	9	3 09	0 06.5	0 21	734 பெ. பழனிசாமி	
								5 55.0	17 16		
A	317-1பா	ர	4		5-2	9	3 09	0 27.5	0 85	601 வே. நியாக ராஜன்.	
B	-1பா	ர	4		5-2	9	3 09	0 27.5	0 85	1007 வே. முத்து பட்டயச்சி.	
C	-1பா	ர	4		5-2	9	3 09	1 08.0	3 34	448 கோ. சீனி லட்சன்.	
D	-2	ர	4		5-2	9	3 09	0 11.5	0 35	941 ந. மணிவண் ணன்.	
E	-3பா	ர	4		5-2	9	3 09	0 05.0	0 15	621 செ. துரைசாமி	
F	-3பா	ர	4		5-2	9	3 09	0 07.0	0 23	79 செ. ஆதிமுலம்.	
G	-4	ர	4		5-2	9	3 09	0 10.0	0 31	177 பெ. கருப்பையா	
H	-5	ர	4		5-2	9	3 09	0 33.0	1 02	671 கோ. நாக ராஜன்.	
I	-6	ர	4		5-2	9	3 09	0 30.0	0 91	671 கோ. நாக ராஜன்.	
J	-7	ர	4		5-2	9	3 09	0 56.0	1 73	647 பெ. நல்லமரசன்	
								3 15.5	9 77		

கிராம நிர்வாக அலுவலர்
21, பழப்பாளையம் கிராமம்
சரியலூர் ஸ்டாட்ம் & மாலட்டி

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1	2	3	4	5	6	7	8	9	10	11	
							நு. அபு	தெர. எரிவி	நு. அபு		
218	①	218-1	0	4	...	5-2	9	3 08	0 32.0	0 94	326 து. பஞ்சாயத்து.
	2A	-218	0	4	...	5-2	9	3 09	0 24.0	0 73	1072 து. பஞ்சாயத்து.
	2B	-218	0	4	...	5-2	9	3 09	0 18.0	0 56	034 து. பஞ்சாயத்து.
	2C	-218	0	4	...	5-2	9	3 09	0 18.0	0 56	1080 து. பஞ்சாயத்து.
	2D	-218	0	4	...	5-2	9	3 09	0 24.0	0 73	514 து. பஞ்சாயத்து.
	2E	-218	0	4	...	5-2	9	3 09	0 19.5	0 63	6 து. பஞ்சாயத்து.
	2F	-3	0	4	...	5-2	9	3 09	0 19.0	0 59	321 து. பஞ்சாயத்து.
	2G	-4	0	4	...	5-2	9	3 09	0 20.0	0 63	326 து. பஞ்சாயத்து.
	2H	-5	0	4	...	5-2	9	3 09	0 11.5	0 35	1069 து. பஞ்சாயத்து.
	2I	-6	0	4	...	5-2	9	3 09	0 11.5	0 36	1069 து. பஞ்சாயத்து.
	2JA	-718	0	4	...	5-2	9	3 09	0 17.0	0 53	1015 து. பஞ்சாயத்து.
	2JB	-718	0	4	...	5-2	9	3 09	0 22.0	0 67	514 து. பஞ்சாயத்து.
	2JC	-8	0	4	...	5-2	9	3 09	0 19.5	0 60	92 து. பஞ்சாயத்து.
	2JD	-9	0	4	...	5-2	9	3 09	0 20.5	0 64	571 து. பஞ்சாயத்து.
	2JE	-10	0	4	...	5-2	9	3 09	0 11.5	0 36	845 து. பஞ்சாயத்து.
	2JF	-11	0	4	...	5-2	9	3 09	0 09.5	0 30	356 து. பஞ்சாயத்து.
	2JG	-12	0	4	...	5-2	9	3 09	0 10.0	0 31	396 து. பஞ்சாயத்து.
	2JHA	-1318	0	4	...	5-2	9	3 09	0 03.5	0 11	396 து. பஞ்சாயத்து.
	2JHB	-1318	0	4	...	5-2	9	3 09	0 21.5	0 67	722 து. பஞ்சாயத்து.
	2JHC	-318	0	4	...	5-2	9	3 09	0 05.0	0 15	667 து. பஞ்சாயத்து.
	2JHD	-318	0	4	...	5-2	9	3 09	0 16.5	0 51	667 து. பஞ்சாயத்து.

பஞ்சாயத்து அலுவலர்

21, புதுப்பாளையம் கிராமம்
அரியலூர் வட்டம் & மாவட்டம்

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	2	3	4	5	6	7	8	9	10	11	12
15	215-15	r	4		5-2	9	3 09	0 26.5	0 81	449 தி. சிவிலாசன்	
16	-16	r	4		5-2	9	3 09	0 24.5	0 76	449 தி. சிவிலாசன்	
17	-17	r	4		5-2	9	3 09	0 26.5	0 83	449 தி. சிவிலாசன்	
								4 31 5	13 35		
D	219-1	r	4		5-2	9	3 09	0 32.5	1 00	893 தா. பொன்றாமு	
21	-21	r	4		5-2	9	3 09	0 39.0	1 21	548 க. தங்கராசு	
22	-22	r	4		5-2	9	3 09	0 05.0	0 15	956 க. மாணிக்கம்	
23A	-23A	r	4		5-2	9	3 09	0 14.0	0 43	44 த. அஞ்சலையம் மாள்.	
24	-24	r	4		5-2	9	3 09	0 11.0	0 34	893 தா. பொன்றாமு	
25	-25	r	4		5-2	9	3 09	0 09.0	0 28	44 த. அஞ்சலையம் மாள்.	
D	-31A	r	4		5-2	9	3 09	0 29.0	0 89	92 பொ. இளைய பெருமாள்.	
E	-31A	r	4		5-2	9	3 09	0 14.0	0 43	802 கோ. பிச்சப் பிள்ளை	
26	-31A	r	4		5-2	9	3 09	0 07.5	0 24	44 த. அஞ்சலையம் மாள்.	
27	-31A	r	4		5-2	9	3 09	0 25.0	0 77	893 தா. பொன்றாமு	
28	-41A	r	4		5-2	9	3 09	0 13.0	0 40	321 ரா. கோவித்த சாமி.	
29	-41A	r	4		5-2	9	3 09	0 12.5	0 39	571 ரா. தங்கவேல்.	
30	-51A	r	4		5-2	9	3 09	0 13.0	0 40	572 மு. தங்கராசு.	
31	-51A	r	4		5-2	9	3 09	0 91.0	2 80	1334 ப. செல்லம் மாள் (1), ரா. அல மேஜி (2).	
32	-51A	r	4		5-2	9	3 09	0 10.0	0 31	572 மு. தங்கராசு.	
33	6	r	4		5-2	9	3 09	0 30.0	0 93	1465 கோ. ராசம்பலாசன்	

1	2	3	4	5	6	7	8	9	10	11
219	7	219-7	"	"	5-2	9	3 09	0 16.0	0 50	722 மெ. பரதமுத்தி.
	8	-8	"	"	5-2	9	3 09	0 18.0	0 55	1064 கேள். ரா. சபை.
	9	-9	"	"	5-2	9	3 09	0 19.0	0 59	843 கேள். பெருமாள்.
								4 08.5	12 61	
220	(1)	220-1	"	"	5-2	9	3 09	0 56.5	1 75	217 ம. காமாட்சி.
	2A	-2பா	"	"	5-2	9	3 09	0 33.0	1 03	939 க. மருதாழி.
	2B	-2பா	"	"	5-2	9	3 09	0 04.0	0 12	322 அ. கோவிந்த சாமி.
	3A	-3பா	"	"	5-2	9	3 09	0 20.0	0 62	322 அ. கோவிந்த சாமி.
	3B	-3பா	"	"	5-2	9	3 09	0 01.5	0 06	1335 அ. கோவிந்த சாமி (1), சாமி தாத்ரூப் பண்டி (2).
	3C	-3பா	"	"	5-2	9	3 09	0 26.5	0 80	358 அ. சாமிநாதன்.
	(3D)	-3பா	"	"	5-2	9	3 09	0 02.0	0 06	1335 அ. கோவிந்த சாமி (1), சாமி தாத்ரூப் பண்டி (2).
	3E	-3பா	"	"	5-2	9	3 09	0 10.0	0 31	322 அ. கோவிந்த சாமி.
	4	-4	"	"	5-2	9	3 09	0 18.0	0 55	939 க. மருதாழி.
	5A	-5பா	"	"	5-2	9	3 09	0 14.0	0 43	1685 ம. வீரமுத்து(1) ம. செங்க சாமி (2), ம. முத்துசாமி (3).
	5B	-5பா	"	"	5-2	9	3 09	0 16.0	0 50	1685 ம. வீரமுத்து(1) ம. செங்க சாமி (2), ம. முத்துசாமி (3).
	6A	-6பா	"	"	5-2	9	3 09	0 13.0	0 40	337 க. சண்முகம்.
	6B	-6பா	"	"	5-2	9	3 09	0 16.0	0 30	81 க. அனுபூதி.
	7A	-7பா	"	"	5-2	9	3 09	0 03.5	0 11	358 அ. சாமிநாதன்.

தொகுப்பு நிர்வாக அலுவலர்

சு. பூதப்பாளையம் கிராமம்

அரியலூர் வட்டம் & மாவட்டம்

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220	3D 300	8.405	5.29	3.09	0.02.0	0.067	1739	g/m ³ 2.0
-1	I	"	"	"	0.56.5	1.75		g/m ³ 2.0
-9C	900	"	"	"	0.26.0	0.80		Change as per
-11A	1100	"	"	"	0.45.0	1.40		TK 8A69/1408
-11B	1100	"	"	"	0.14.0	0.43		SPL. Tahsildar L.A
								Tancem B. iyalla
								Remo 13/95
								d/7.12.6.07

221-1A	221-1A	8.405	5.29	3.09	0.08.0	0.25	
-1B	1B	2.45	5.29	3.09	0.08.5	0.27	
-1C	1C	2.45	5.29	3.09	0.01.0	0.06	
-2A	2A	2.45	5.29	3.09	0.01.0	0.06	
-2B	2B	2.45	5.29	3.09	0.05.5	0.17	
-2C	2C	2.45	5.29	3.09	0.08.5	0.26	
-2A	2D	2.45	5.29	3.09	0.01.0	0.06	
-3A	3A	2.45	5.29	3.09	0.11.0	0.35	

1729 g/m³ 2.0
g/m³ 2.0
g/m³ 2.0
g/m³ 2.0

2.0 g/m³ 2.0

25.4/18

1	2	3	4	5	6	7	8	9	10	11	12
32	(31)	221-3 பா	ர	4	...	5-2	9	3 09	0 09.0	0 28	451 தா. சினிவாசன்
	(4A)	-4பா	ர	4	...	5-2	9	3 09	0 01.0	0 06	1336 தா. சினி வாசன் (1), கந்தையர் (2)
	(4B)	-4பா	ர	4	...	5-2	9	3 09	0 30.5	0 93	471 தா. கந்தையர்
	(4C)	-4பா	ர	4	...	5-2	9	3 09	0 29.0	0 89	451 தா. சினிவாசன்
	(5)	-5	ர	4	...	5-2	9	3 09	0 21.5	0 66	1147 ம. செங்கையர்.
	(6A)	-6பா	ர	4	...	5-2	9	3 09	0 06.5	0 20	1147 ம. செங்கையர்.
	(6B)	-6பா	ர	4	...	5-2	9	3 09	0 16.0	0 49	1147 ம. செங்கையர்.
	(7A)	-7பா	ர	4	...	5-2	9	3 09	0 03.0	0 09	1070 தா. ராமசாமி
	(7B)	-7பா	ர	4	...	5-2	9	3 09	0 01.5	0 06	724 த. பரமசிவம்.
	(7C)	-7பா	ர	4	...	5-2	9	3 09	0 11.0	0 65	1070 தா. ராமசாமி.
	(8A)	-8பா	ர	4	...	5-2	9	3 09	0 01.5	0 06	648 செ. தடேசன்.
	(8B)	-8பா	ர	4	...	5-2	9	3 09	0 03.0	0 25	450 தா. சினிவாசன்
	(8C)	-8பா	ர	4	...	5-2	9	3 09	0 08.0	0 25	821 தா. பூசை மூப்பனார்.
	(8D)	-8பா	ர	4	...	5-2	9	3 09	0 14.5	0 45	1070 தா. ராமசாமி.
	(8E)	-8பா	ர	4	...	5-2	9	3 09	0 01.0	0 06	45 தா. அலமேது.
	(8F)	-8பா	ர	4	...	5-2	9	3 09	0 07.5	0 23	174 தா. கணேசன்.
	(8G)	-8பா	ர	4	...	5-2	9	3 09	0 09.0	0 28	450 தா. சினிவாசன் மூப்பனார்.
	(8H)	-8பா	ர	4	...	5-2	9	3 09	0 01.5	0 06	724 தா. பரமசிவம்.
	(9)	-9	ர	4	...	5-2	9	3 09	0 12.0	0 38	648 செ. தடேசன் மூப்பனார்.
	(10A)	-10பா	ர	4	...	5-2	9	3 09	0 08.0	0 24	821 தா. பூசை மூப்பனார்.
	(11B)	-10பா	ர	4	...	5-2	9	3 09	0 07.0	0 22	1070 தா. ராமசாமி.

கிராம நிர்வாக அலுவலர்

21, புதுப்பாணையம் கிராமம்

அலுவலர் வட்டம் 9 மார்ச் 11

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5.2.2 3.0.4 0.09.0 0.28
 5.2.2 3.0.4 0.01.0 0.06
 5.2.2 3.0.4 0.30.5 0.93
 5.2.2 3.0.4 0.29.0 0.64
 5.2.2 3.0.4 0.21.5 0.66
 5.2.2 3.0.4 0.06.5 0.20
 5.2.2 3.0.4 0.16.0 0.49
 5.2.2 3.0.4 0.03.0 0.09
 5.2.2 3.0.4 0.21.0 0.75
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 5.2.2 3.0.4 0.01.5 0.06
 5.2.2 3.0.4 0.08.0 0.23
 5.2.2 3.0.4 0.08.0 0.23
 5.2.2 3.0.4 0.14.5 0.45
 5.2.2 3.0.4 0.01.0 0.06
 5.2.2 3.0.4 0.07.5 0.23
 5.2.2 3.0.4 0.09.0 0.28
 5.2.2 3.0.4 0.01.5 0.06
 5.2.2 3.0.4 0.12.0 0.38
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 5.2.2 3.0.4 0.07.0 0.22
 5.2.2 3.0.4 0.03.0 0.09
 5.2.2 3.0.4 0.07.5 0.24
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 5.2.2 3.0.4 0.19.0 0.58
 5.2.2 3.0.4 0.06.5 0.20
 5.2.2 3.0.4 0.04.0 0.28
 5.2.2 3.0.4 0.07.5 0.23
 5.2.2 3.0.4 0.08.0 0.28
 5.2.2 3.0.4 0.01.0 0.06
 5.2.2 3.0.4 0.01.0 0.06
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103

1739 8.10.19 -

- 8.10.19 -

- 8.10.19 -

- 8.10.19 -

2.10.19 17.39

2.10.19 17.39

	2	3	4	5	6	7	8	9	10	11
1A	5-1-11	ர	12	...	5-2	9	3 09	0 03.0	0 09	450 அ. பிள்ளை முப்பள்ளி.
1B	11-11	ர	12	...	5-2	9	3 09	0 07.5	0 24	45 ந. அ. பிள்ளை.
1C	12-11	ர	12	...	5-2	9	3 09	0 03.0	0 09	1337 ந. அ. பிள்ளை (1) அ. பிள்ளை முப்பள்ளி (2).
1D	12-11	ர	12	...	5-2	9	3 09	0 19.0	0 58	45 ந. அ. பிள்ளை.
1E	12-11	ர	12	...	5-2	9	3 09	0 08.5	0 26	450 அ. பிள்ளை முப்பள்ளி.
1F	12-11	ர	12	...	5-2	9	3 09	0 09.0	0 28	45 ந. அ. பிள்ளை.
1G	13-11	ர	12	...	5-2	9	3 09	0 07.5	0 23	511 க. செங்கமலம்.
1H	13-11	ர	12	...	5-2	9	3 09	0 09.0	0 28	1067 மு. இராமையா.
1I	13-11	ர	12	...	5-2	9	3 09	0 01.0	0 06	724 ந. பாமலிவம்.
1J	13-11	ர	12	...	5-2	9	3 09	0 01.0	0 06	511 க. செங்கமலம்.
1K	14	ர	12	...	5-2	9	3 09	0 04.5	0 14	174 க. கணேசன்.
1L	15	ர	12	...	5-1	7	4 62	0 14.5	0 67	511 க. செங்கமலம்.
1M	16	ர	12	...	5-2	9	3 09	0 13.0	0 40	724 ந. பாமலிவம்.
1N	17-11	ர	12	...	5-2	9	3 09	0 04.0	0 12	1070 ந. ராமசாமி.
1O	17-11	ர	12	...	5-2	9	3 09	0 04.0	0 12	797 ச. பிச்சை முப்பள்ளி.
1P	17-11	ர	12	...	5-2	9	3 09	0 05.5	0 17	174 க. கணேசன்.
1Q	18-11	ர	12	...	5-2	9	3 09	0 09.0	0 28	407 அ. சின்னப்பா.
1R	18-11	ர	12	...	5-2	9	3 09	0 29.5	0 91	1071 அ. ராமசாமி.
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21, புதுப்பாளையம் சிராமம்

அரியலூர் வட்டம், மாவட்டம்

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REPORT ON THE DETAILED GEOLOGICAL INVESTIGATION
FOR LIMESTONE IN PUDUPALAYAM AND ADJOINING
VILLAGES, ARIYALUR TALUK,
TIRUCHIRAPALLI DISTRICT.

PHASE III INVESTIGATION

SEPTEMBER 1984

DEPARTMENT OF GEOLOGY AND MINING,
GUINDY, MADRAS 600 032,
TAMIL NADU.

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Previous work

A brief summary of the work carried out by previous workers of the department in Pudupalaiyam and Reddipalayam area is given below. For additional details, the earlier reports on Phase I and Phase II work may be referred to.

R. Srinivasan and N. Muthukumaraswamy (1963) first reported the occurrence of good grade limestone in Reddipalayam village in the course of their search and description of high grade limestone in parts of Ariyalur and Lalgudi taluks. On the basis of preliminary examination they reported occurrence of the limestone over an area of about 200 metres square upto a depth of 4 metres. The CaO content ranged from 50 to 54%, R_2O_3 1.72 to 1.95% and A.I. 2.40 to 3.81%. A reserve of 2,25,000 tons was estimated to be available in the deposit. They suggested a detailed work including drilling in the area.

This was followed up by a detailed drilling programme using a calyx type core drill by A. Padmanabhan and T.M. Sridharan (1964).

An area of about 10 acres comprising R.S.Nos.163, 164 and 167 of Reddipalayam village was originally estimated to contain 250,000 tons of limestone analysing to over 50% CaO. The drill data suggested wild variation in the depths of persistence, within a confined area indicating variations in the deposition. The above authors have also reported on the occurrence of limestone in the adjoining villages of Pudupalayam. The relevant data are furnished in the Appendix.

On the basis of report of limestone in Reddipalayam and of its good grade, M/s. South India Viscose have obtained a mining lease over 12 hectares in the village since 1965 and are carrying out a small scale mining operation in the area for use in their viscose plant at Sirumugai, Coimbatore district.

The work carried out by Oil and Natural Gas Commission, in the area has already been summarised in the earlier reports and is not further considered here.

A. Introduction

The detailed geological investigation of sedimentary cretaceous limestone occurring near Ariyalur in Tiruchi District was taken up in June 1975 on behalf of Tamil Nadu Cements Corporation with a view to locate suitable grade of deposits in the area for setting up of a cement plant of 1,500 tonnes/day capacity. During the course of investigation it was found that the Limestone belt was very extensive in nature extending from Aminabad village in the North near Ariyalur through Kallankurichi, Periyanaagalur, Valajanagaram, Pudupalayam villages upto the proximity of Marudaiyar River in the south, over a length of about 20 kms. and hence the investigation was decided to be taken up in detail in successive stages.

The first phase of the investigation which lasted from June 1975 to May 1976 consisted in the detailed examination of an area of about 400 Hectares in Kallankurichi and parts of Aminabad and Kairulabad villages where a measured reserve of 24 million tonnes of cement grade (70% total carbonates and above (mostly calcium)) was proved.

The feasibility of setting up a cement plant with the stated capacity based on the above reserves was established and as a result the Ariyalur Cement Plant was commissioned.

The second phase of investigation which lasted between August 1976 and February 1977 resulted in establishing a measured reserve of 51 million tonnes of Limestone over an extent of 362 Hectares in Periyanaagalur, Valajanagaram and parts of Kairulabad and Pudupalaiyam villages with a quality ranging between 75 and 95% total carbonates. During the second phase of investigation it was further observed that the limestones continued in the neighbouring areas in parts of Pudupalaiyam, Reddipalayam villages as well and the work in these areas was taken up separately to be investigated in detail.

The present report thus relates to the detailed work carried out in these neighbouring areas falling in Pudupalayam, Reddipalayam and Periathirukonam villages of Ariyalur Taluk, Tiruchi District. A summary of the outcome of entire investigation is also attempted in the

present report. Possibilities of further exploration and mining of Limestone of cement grade in the area have also been attempted.

During the course of the present investigation the limestone was found occurring under a comparatively thick mantle of soil in most of the places and hence the reserves are to be taken as more of an interpretative nature in spite of the fact that 24 Bore Holes were put down in the area.

B. Resume of the present investigation.

The area covered under investigation for Limestone forms a contiguous part of the belt of Limestone already delineated in the earlier phases of investigation and the deposit is found to occur in the northern and eastern parts of Pudupalayam village as well as in the western adjunct of Reddipalayam village of Ariyalur Taluk, Tiruchi District extending over a length of about 6 kms. and having an average width of over 400 metres. The limestone continues into Periathirukonam village also, upto the left banks of Marudaiyar River.

The investigation comprised in drilling 24 diamond drill holes at an interval of about 600 metres and in addition a few (29) shallow wagon drill holes were located in between the diamond drill holes in order to obtain correlative information on the behaviour of the deposit not covered by regular core drilling methods. The diamond drill holes ranged in depth from 6 metres to 69 metres from ground level while for the wagon drill the depth ranged from 5 to 16.5

metres. In all 612.35 metres of diamond drilling and 21.4 metres of wagon drilling were carried out in the area. A few trial pits 1 metre by 1 metre were also opened mainly to delineate the western contact of limestone. In all 350 numbers of core and sludge samples were analysed for total carbonate contents and other constituents at the Tamil Nadu Cements Laboratory at Alangulam and Ariyalur.

On the basis of drill work data, it is found that the Limestone ranges in width from 250 to 400 metres and that it occurs at depths ranging from 3 to 40 metres from ground

level. There is wide variation in the thickness of limestone from place to place.

The Limestone overlies a conglomerate bed on the west, but in general the nature of both the lower and upper contacts is obscure and concealed under a fairly thick overburden of soil. For the above reason it has not been possible to determine the eastern limit of extension of the limestone and hence the demarcation line has been assumed on the basis of 1:1 O.B. to ore ratio and 30 metres of depth as the economical limit of mining.

The Limestone is fossiliferous in the entire extent of the area. It is pink and buff in colour and at times grades into grey or black types as in Reddipalayan quarry of Tvl. South India Viscose Ltd. It is generally fine grained and silty. The chemical analysis shows a range from of 78 to 92% of total carbonates with very little MgO while the average SiO_2 in high grade types content is about 4.5%. The total iron content reported as Fe_2O_3 is fairly low being 1.5 to 4.5% with only a few samples showing high values of 6 to 8%.

As stated above the task of delineating the eastern (upper) margin of the deposit was found to be difficult owing to heavy overburden of soil which ranged in thickness at around 6 to 11 metres. Hence only a rough delineation of width of limestone is attempted after taking into consideration the Reduced Level reading of boreholes and on the basis of assumption of limit of economical mining upto a maximum depth of 30 metres from ground level. Since there is variation in the thickness of Limestone from one place to another within the deposit itself, it has not been possible to bring out any definable model for correct estimation of the reserves of the Limestone of the area. Two discrete blocks one northern and the other southern have been delineated in the area based on drill hole data. After taking all factors into consideration, a total reserve of 23 million tonnes of limestone has been estimated to occur in the area. The fairly high total carbonate content (73 to 92%) of the Limestone as well as the low iron content makes it also suitable for use as blending material with the

lower grade and iron rich varieties of Limestone elsewhere in the area. However due to the heavy overburden of soil there is likelihood of incurring a high loss in winning these deposits.

C. Details of present investigation.

1. Location and Communication.

The area investigated lies about 12 kms. to the southeast of Ariyalur Town, Tiruchi District and falls between longitudes East 79° 05' and 79° 10' and latitudes North 11° 04' and 11° 07' covered by Survey of India toposheet 58 M/4. The Kilpalavur--Jayamkondan road crosses the limestone between 11 and 13 kms. before joining the Ariyalur--Jayamkondan road a little before Vilangudi. (The Marudayar River flows immediately to the South of the area). The access to Ariyalur Town and Railway Station is from the Vilangudi Junction road with the deposits situated at an overall distance of about 13 kms. from the Kilpalavur road. (The mined stones from the Limestone quarries operated by Tvl. Fixit Private Ltd. in Periyanaagalur village are being transported along this Kilpalavur--Jayamkondan highway to Dalmiapuram via Kilpalavur). The Limestone mines of

Tvl. South India Viscose Limited also comprise part of this deposit. Only Kutcha cart tracts traverse the deposit linking the hamlets in Pudupalaiyam village. Thus the interior areas are difficult of easy access.

2. Topography climate and vegetation

The region lying within the revenue limits of Pudupalayam and Periathirukonam villages is characterised by the presence of an undulating topography, over which are dotted a number of irrigational tanks and channels. The Perianthalar Odai flows to the west and the Reddipalayan Odai flows to the east of the area, these seasonal streams ultimately draining into the Marudaiyar River which borders the area in the south. The drainage pattern of the area is towards south. The ground water table is shallow. The mean elevation of the area is 50 metres above mean sea level. Only at a few places like the junction of cart tract from Vellipiringiyam to main highway, north of Pudupalayam village and on the cart tract leading from Pudupalayam village to Vellipiringiyam are outcrops of limestone seen

while in the rest of the area the deposit is characterised by the thick mantle of soil which ranges from 4 to 28 metres in thickness. As in the other parts of this region, dry crops of corriandur, chillies, maize, etc. are grown under favourable conditions.

Geology

The geological and the lithological features of the region have been fully described in the earlier two reports. The formations in the area are contiguous with those found in the Northern portions and behave similarly.

The lower most formation in this area is a shale and generally represents a change in lithology through a pebble bed layer. In addition, in many bore holes a green siltstone is also encountered at depths which can be considered as similar to those reported in the quarry in Kallakudi village operated by M/s. Dalmia Cements Limited. The presence of chert also in the area in limestone can be interpreted as due to replacement of limestone by silica rich solutions, probably derived from shear planes a feature.

already recorded in the limestone formation described in Valajanagaram (Phase II report) area.

A detailed description of the Geology follows in the table below.

Table

The rock formations of this area are of marine sedimentary origin and are referable to the Arivalur stage of the upper Cretaceous period and more particularly to Maestrichtian stage.

Recent and Quaternary	Alluvium and soil, kanbar
--- Unconformity ---	
Arivalur stage (Kallankurichi formation)	1. Marly limestone 2. Black and green siltstone 3. Conglomerate bed 4. Shell limestone and Arenaceous limestone
Maestrichtian stage	5. Arenaceous limestone
--- Unconformity ---	

1. Marly Limestone

This formation found on the western and southern contact of limestone as lower beds, is mainly comprised of yellow to buff coloured, semi-consolidated marly limestone. These formations are encountered on the Kipalavur--Jayankondam road, north of Pudupalayam village.

2. Green and Black siltstone

These beds are found only in bore hole locations in the area. They are compact in nature and the fact that they have been encountered below a pebble bed would place them on par with the marly limestone of this area. From their wide prevalence at depths, these beds perhaps represent a regionwide phenomenon, before the deposition of the limestones in the area.

3. Pebble Bed (Conglomerate beds)

The pebble beds in this area are of restricted thickness although prevalent as a more or less continuous horizon overlying the shales and sandstones and in effect denoting a break in the depositional sequence. They are of varying

thickness being as low as two metres while reaching to a maximum thickness of 12 metres. In some places they may be absent altogether. The individual pebbles of quartz range in thickness from 1 cm. to about 5 cm. The individual pebbles are well rounded and generally are elongated and occur admixed with fragments of shells. The matrix is made up of fine arenaceous material. They are semi consolidated.

Limestone

In Phase I area, viz. in Kallankurichi area, more than one bed of limestone was developed. As in the Periyanaagalur area (reported in Phase II investigation) the Limestones are of one generation only. In the north-eastern portion over a restricted portion and falling in Reddipalayam village the limestone is hard in nature consisting of coralline rags, while in the southern parts of the deposits it is composed of shells of various sizes in a soft matrix of marl. This change in the characteristic of limestone perhaps denotes a variation in depth of platform. Such coralline rag material

but of a pink colour have been reported in several places in the region especially at the basement platform of archaean rocks. (Localities: Olaipadi, Neykulam, Tirupam, Mel Arasur, Dalmiapuram, etc. in Perambalur and Lalgudi Taluks). Here though no basement archaeans have been located in the quarries of Reddipalayam where these rag material are developed. There is wide variation in the thickness of development of limestone which ranges from 2 metres to 30 metres which may be attributed as due to surface erosion after deposition. As in the contiguous Valajanagaram area described in the Phase II report, the limestones are characterised by a heavy overburden of soil which at times may be as much as 30 metres thick or even more. Please refer to plates.

Characteristics of Limestone of the area.

The limestones occur in the area in the form of a belt, which is sinuous in nature. The belt over a length of four kilometres trends in west to east direction before it veers from north to south direction over another length of 2.5 kilometres. It is inferred that there may

be a break or deep erosion in the belt for a distance of a kilometre or so in the middle of Pudupalayam village. Beyond this the belt changes to a east-west direction over an undetermined length. Further on it is covered by the Marudayar alluvium. A major part of the limestone is confined to the northern portions of Pudupalayam village while a part of it falls also in Reddipalayam village. Although their continuation in Periatthirukonam village has been established on the basis of drill hole no detailed work was carried out on the deposits in this village also for the reason that it was not easily accessible and also because of the presence of heavy overburden of soil making recovery of core a difficult proposition.

The lower most contact of the limestone can be fairly well demarcated in the field both from bore holes and from wagon drill hole data, outcrops of pebble beds etc. The upper contact of limestone was struck in all the bore holes but the aerial delineation of limestone has been

made in the plan, after considering the overburden to ore ratio as 1 : 1. The above consideration necessarily gives a limitation to the extent of limestone that can be considered for economic exploitation. This way the limestone marked in the plan ranges in width from 200 metres to 650 metres, the average being 400 metres.

A perusal of the geological plan shows that while bore holes PPM 20, 22, 23 and 24 contain limestone at considerable depths, some of them fall outside the zone of economic mining. In general the upper surface of limestone is covered by a overburden of soil i.e. it is of a concealed nature but an exception to this is to be found in the South India Viscose Quarry in Reddipalayam village, where incidentally the limestone has a different lithology when compared to the limestone in other portions.

The limestone varies in thickness from 2 to 5 metres in the west to as much as 15 metres towards north east and east indicating a lensoid nature of the deposit. As already stated this

can be attributed to the differences in the level of erosion of the formation subsequent to deposition.

Prospecting for Limestone in the area

A portion of the area under report was already prospected during the Phase II investigation, on the basis of which a brief note was included in the earlier report. Totally 24 diamond drill boreholes and 23 wagon drill holes besides a few trial pits were put down in the area. Since the nature of the deposit was not known it was initially decided to take recourse to drilling in a grid pattern at a regular 600 metres interval to be followed by wagon holes in the intervening areas at 200 metre intervals. In practice, however it was possible to adhere to this plan only in the northern portions of the area only. The reason for the deviation from the programme originally chalked out, was due to the extreme variation in thickness, extensive soil cover and difficulty in wagon drilling due to encountering of water table at shallow lands and difficulty in moving rigs through soft and sodden ground while the

presence of crops and hamlets in the area also contributed to the deviation or curtailing of this programme. Non-availability of wagon drill equipments also played its part in the revision in programme of investigation.

Diamond drill Holes

As the dip of the formations is very low, all the 24 drill holes were put down vertically. The core recovery in all holes are very poor ranging from poor to about 30%. Hence sludge samples were also collected from the drill holes at regular intervals of 1 metre as was done in the other portions of the deposit, investigated in the first two phases. The depth of drill holes differs widely depending upon its proximity to western contact. Thus most of the bore holes located away from the contact were drilled for greater depths to encounter limestone. The variation in depth of drill holes range from 10 to 69 metre. The drill holes revealed that the lower contact of limestone is represented by a conglomeratic bed in most of the cases while in some

bore holes green and black shales were recorded. In all 612 metres of core drilling was carried out. 850 numbers of core/sludge samples were collected for chemical analyses.

Wagon Drills

Originally it was proposed to cover the entire area in detail at 200 metres interval by wagon drill operation. But due to non availability of equipments and sometimes due to shallow water table conditions it was possible to put down only 29 wagon drills in this area. Since the limestone in drill holes were encountered at relatively great depth from ground level the wagon drill holes were of no avail and in most instances could not penetrate beyond 8 metres. The maximum depth to which the wagon drill penetrated was 16.5metres. Samples were collected for every metre of drilling and analysed for their carbonate contents.

Pits

In addition to the above methods of prospecting 18 pits were opened at the contact between the limestone and the country rock, to

determine the geological parameter of deposits. Most of the pits were shallow but were helpful in the delineation of the boundary as well as in the collection of samples. The dimension of the pits is 1 metre x 1 metre. The samples which represented shallow depths upto 2 metres analysed to a total carbonate content between 68 and 94%.

Quality of the Limestone deposits

850 numbers of core and sludge samples from 24 diamond drill holes were collected and analysed at the chemical laboratories of Tamil Nadu Cements Corporation at Alangulam and at Ariyalur. In addition to these the wagon drill and pit samples collected were also analysed. The total carbonate of the all samples were determined and depending upon the results obtained out of these composite samples out of the successive groups of samples were prepared and analysed for the major constituents. In carrying out the above composite analysis for constituents like Al_2O_3 , Fe_2O_3 , SiO_2 etc. only those samples which analysed to over 75% total carbonate are taken into account.

The chemical analyses of the bore holes are listed in the Appendix.

Diamond drill core samples

All the 24 diamond drill holes have yielded cores with a recovery of 30% of core material. The CaCO_3 content of most of core samples of limestone exceed 85% and in respect of bore holes PPM 6, PPM 9, PPM 10, PPM 11, PPM 14, PPM 16 to PPM 24 i.e. almost all of the bore holes the total carbonate content rose to 90% and above. The average silica content of the samples 3 to 4%. In exceptional cases even good grade limestone show SiO_2 content as much as 12% perhaps indicating admixture with detrital sands. Fe_2O_3 in general is low being about 2% which may occasionally rise to 5% to 8%. Alumina is also low ranging from 1 to 3%. MgO is generally less than 0.5%. CaO ranges from 43 to 53%. In fact a relatively low iron content is uniformly observed in the limestones in the area.

Sludge samples

The sludge samples of bore holes behave similar to core samples and in most cases show a lower total carbonate content (less by 2%) while the core samples represent manipulated thickness, the sludge samples on the other hand are collected at every one metre interval and were also collected in such a manner to co-terminate with the end of each run of drilling to facilitate a comparison between the core and sludge values at periodic intervals. The other constituents in the sludge samples behave similar with those of core samples. The sludge samples in this manner help to fill the gap in respect of core samples on account of fairly high degree of core loss. The total carbonates generally range between 75 and 85%. In respect of other constituents like MgO , Fe_2O_3 , Al_2O_3 , etc., the sludge samples behave similarly to core samples except as in Bore hole 22 there is a varied difference.

Wagon drill samples

Unlike in the area covered during the Phase I and Phase II operations drilling by wagon drill operation was not so successful

the bore holes so drilled being only 25 in number in addition to 4 already put down in Phase II work. The difficulty in carrying out in the operations of wagon drills in the area was due to following factors:-

1. Prevalance of shallow water conditions
2. Soil and overburden cover being high
3. Presence of standing crops
4. Bottleneck in availability of equipment and compressors

Thus there are several gaps between the individual diamond drill holes necessitating interpretation of data. This is especially true of the eastern and southern portion of the deposits. The analyses of the wagon drill holes show a total carbonate of 72 to 91% of Limestone and an average of total carbonate content of 82%. The SiO_2 ranges from 4.8 to 12%. Iron and Alumina is generally low as in the core and sludge samples. The CaO ranges from 44 to 51.60% with MgO less than 1%. For reasons already enunciated the wagon drill holes operations in general were not of good avail in the present course of investigation.

Pit samples

17 numbers of pit samples were collected from the several pits opened at on the lower contact of the Limestone. Samples were collected only from the floors of the pit in view of the shallow depth. TCO_3 content of the pit ranges from 68 to 96%. The pits were located mainly to aid in delineating the contact of Limestone wherever possible.

In general the limestone in the area show more or less a uniform composition with respect to thickness within the respective bore holes although they appear to be of slightly higher grade in the southern block of the deposits.

The limestone deposits occur ring in the Pudupalayam and Reddipalayam villages covered in this phase of investigation are of slightly higher grade than actually required for cement plant. There are very few actual outcrops of Limestone. Most of the deposits occur away from the main Kilpalavur--Jayamkondam highway. They are finer grained and with exceptional ^{of} Reddipalayam area contain only small quantity of macro fossils

and replacement by chert is of limited nature, in these blocks.

Reserves of Limestone

The limestone deposits in this area extend over 6 km. length and 400 to 600 metres width with a thickness ranging from 3 to 20 metres. There is practically little variation in the quality of Limestone. In respect of the deposits described in Phase I and II reports on the basis of a number of wagon drill holes, interspacing diamond drill holes, it was possible to divide them conveniently into blocks on the basis of the chemical quality and thickness of persistence for arriving at an estimate on the reserves of limestone.

However, it has not been possible to consider the deposit under description, on a similar basis since in practice it was not possible to carry out drilling at a regular grid interval and hence proper interpolation was not possible.

Based on the drill hole data the area under investigation has been divided into two blocks one termed the Northern and the other the Southern block. While Limestones have been encountered in all the boreholes put down the area it is not possible to extend the delineation of the workable reserves of the Limestone beyond the 1:1 ratio adopted here as the basis of economical mining. Thus bore holes PPM21, 23 and 24 all fall outside the zone of economic mining of the deposits since the O.B. to O ratio exceeds 1:1 in these bore hole locations. Thus the upper contact of Limestone has been marked only as an indicated line, taking into account the factor of high overburden.

Northern Block

This block extends over a length of 2000 metres and a width of about 700 metres and comprises bore holes PPM 1, 2, 3, 5, 13, 16, 18, 19, 20 and 22. Besides wagon drill holes 1, 2, 3, 4, 5, 7, 8, 59A, 64, 71 and 81. In addition diamond and wagon drill holes already put down in the earlier phase of investigation

and designated as VJN 1, 2, 4 and 5 and W 36, 37, 38, 43, 33, 34, 35, 35A, 36B, 35B, 39, 40, 41, 42, 42A, 44, 46, 47, 48, 49, 50, 51, 52 and 54 respectively and which were located in the contiguous portion falling in Valajanagaram village as well as in the western part of Pudupalayam have already been considered in the estimate of reserves in the II Phase of investigation and therefore have been deleted for the purpose of calculation of reserves in this block now.

A part of the economically mineable Limestone of this zone extends into the adjoining Reddipalayam village also.

The northern Block of deposit has an average thickness of Limestone 7 to 17 metres and for the purpose of reserve calculation the minimum thickness of 8 metres has been assumed. Here the overburden of soil ranges from 3 to 10 metres and hence the ore to overburden ratio is more than 1 : 1, at a few places.

A narrow central portion having a width of 500 metres x 1000 metres contains high overburden. The bore holes located in this portion are PPM 6, 7, 8, 12, 14, 15 and 16.

This central block of the zone has a thickness of limestone of 6 metres but has a overburden ranging over again to about 8 metres and this is slightly in excess of the stipulations taken into economic reserve calculations. Hence no attempt is made to calculate the reserves for this area. Hence there is a hiatus in the belt of mineable limestone.

SOUTHERN BLOCK.

The southern zone has a length of 1200 metres and width of about 650 metres. The thickness of Limestone in this zone varies from 5 to 27 metres a soil cover upto 12 metres. The following diamond drill holes and wagon drill holes were put down in the above area. PPM 9, 10, 11, 17 and 21 and WP 114, 113A, 118, 123, 113, 131, 132, 133, 134, 136 and 135. The soil overburden ranges from 1 to 12 metres with a preponderance in the northern portion. This zone is also remarkable for the prevalence of good grade Limestone at comparatively shallow depths. The difference in thickness of Limestone from west to east is perhaps to be attributed to the erosion surface.

Since the number of reference points in the area of investigation is not adequate, subdivision of the deposits in the various zones of limestone in relation to the differing depths of persistence of limestone is not attempted, unlike in the area of investigation in Phase I and II. For the purpose of reserve calculation a bulk density of 2.5 has been assumed. But there appears to exist certain reservation against this assumption on the basis of data obtained in trial mining operations. However in this report the value of 2.5 has been assumed and the reserves calculated as was done in Phase I and II. A few geological cross sections in the different zones have been attempted to decipher the attitudes of formation. The III Phase of investigation is also indicative of narrowing down of the belt of Limestone.

Description of Individual Block

Block I. - Northern Block

This block falls in the parts of revenue village of Pudupalayam, Valajanagaram and Reddipalayam. The length of the zone is 2.0 km. and the width of the zone is 700 metres. The area occupied by the zone is 130 hectares. The revenue survey numbers comprising this block of Pudupalayam village are as follows:-

Pudupalayam village

R.S.No.55, 56, 58, 59, 60, 61, 62,
63, 64, 65, 155, 156, 157, 158, 159,
160, 161, 162, 163, 164, 165, 166, 167,
168, 169, 170, 171, 173, 174, 175, 176,
177, 178, 179, 180, 181, 182, 183, 184,
185, 186, 187, 188, 194, 195, 196, 197,
199, 203, 204, 205, 207, 208, 209, 210,
211, 212, 213, 214, 215, 216, 217, 218,
219 and 220.

Reddipalayam village

R.S.No.162, 163, 164, 174, 175, 183,
183, 184, 189, 190, 191, 192 and 193.

The area falling in Valajanagaram is excluded from consideration as an estimate of measured reserve has already been made under Zone C in Phase II report. Thickness of Limestone ranges from 7 to 17 and an average of 8 metres is taken as the depth of persistence of Limestone.

Reserves will be

$$133 \times 10,000 \times 8 \times 2.5 =$$

26.6 million tonnes.

In the above calculations the area falling in Reddipalayam village and now being operated by M/s. South India Viscose Limited would have to be excluded which measures an area of 12.51 hectares.

The main Kilpalavur--Jayamkondan highway passes through the area over a zone 1.5 kms. long. A safety zone of 45 metres on either side would have to be left out of consideration for mining of limestone. This would represent an area of $\frac{1,500 \times (90+10)}{10,000}$ or 15 hectares.

Hence totally an area of 12.50 + 15 + 27.50 hectares would have to be excluded from the calculation of reserves in this northern block which would account for a quantity of

$$27.50 \times 10,000 \times 2.5 \times 8 = 5,500,000 \text{ tonnes.}$$

Hence deducting this from the figures estimated above, the net reserve of 21.1 million tonnes may be considered as the reserves available in this block.

After allowing for a 30% as loss, on account of mining, voids, rejects, etc., the above reserves would be reduced to

$$21.1 \times \frac{70}{100} = \underline{\underline{14.77 \text{ million tonnes}}}$$

Southern Block

The Southern Block comprises the following R.S.Nos.

Puduralayam village

R.S.Nos. 253 to 260, 261, 263 to 266,
(268 to 272), (352 to 354), (361 to 366),
(368), 376, 382 to 384 and 396 to 415.

Reddipalayam village

R.S.Nos. 345, 348, 349, 350, 351, 352
and 353.

Periathirukonam village

R.S.Nos. 4 and 7

The following drill holes and wagon holes were put down in this area to determine the behaviour of the deposit.

Drill holes PPM 9, 10, 11, 17 and 21

Wagon Drill WP 109, 113A, 114, 118, 123,
holes 130 to 137.

The length of the zone is 2 kms. and the average width is 500 metres. Hence an area of 100 hectares may be considered as containing limestone. The thickness of limestone varies from 6 to 21 metres and the average has been taken as 11 metres,

$$100 \times 10,000 \times 11 \times 2.5 = 27,500,000 \text{ tonnes.}$$

An area of about 15 hectares lies close to the Vellipirangiyam village, where it would not be possible to carry out any mining operation due to proximity of village site and dwellings etc. This would account for a quantity of $15 \times 10,000 \times 11 \times 2.5 = 4.23$ million tonnes. After excluding this, a reserve of

23.21 million tonnes of limestone can be considered as available for mining. After allowing for a 30% loss on account of voids and mining loss, a reserve of 16.24 million tonnes may be considered as available for mining.

However in arriving at these figures, the approach ~~pabs~~ to the area as well as the numerous tank dotting this region have not been taken into consideration for exclusion from calculation of reserves. On an approximate calculation, an area of about 35 hectares are classified as public utility features such as irrigation tank, temple, footpaths, graveyards and this would on an average account for deduction of about 8 million tonnes in the available reserves calculated above, excluding consideration for safety zones.

Thus out of a total reserve of 31 million tonnes estimated over the two blocks, the above deductions would have to be made, thereby reducing the amount of total reserves to 23 million tonnes in the area.

A summary of the entire investigation carried out in Ariyalur area would not be out of place here.

The limestone of Ariyalur area are referable to the Maestrichtian stage of upper cretaceous and are characterised by the development of large sized limeshells. There is a variation in the deposition sequence as traced from Ariyalur Town to Pudupalayam. Firstly the northern portions of the deposit are characterised by at least three distinct strata of limestone, although the two upper most are of limited thickness and extent. Further formation of kankar and secondary limestone are more prevalent in the northern portions. In the northern and central portions like Kallankurichi and Periyanaгалur villages the limestones actually outcrop on the surface, while southwards in parts of Valajanagaram and in Pudupalaiyam villages, the outcrop of limestone is scarce or not present at all. One exception is the Reddipalayam area, where the limestones are well exposed. The third bed of limestone which outcrops in the above places is the most important source of limestone in the entire area.

The dips of the beds are uniform and low, viz. 3 to 4° towards ENE or E and the persistence of limestone dipward is characteristic in all the places, as is brought out by the intersation of beds in all the bore holes in the dipward or hanging wall sides.

The lithology of the limestone has displayed some changes in the content and development of shells. In the northern and central portions, coarse macro shells are abundant, while in the southern portions as in Valajanagaram and Pudupalayam villages they are micrograined with a few visible shells except for Reddipalayam occurrence which is of altogether of a different kind and which may be considered as more of a raw material

The thickness of overburden is again different in different areas. In the north it is of a limited nature while in Valajanagaram and Pudupalaiyam it reaches as 40 metres. One possible explanation of the deep seated character of limestone may be due to changes in the dip direction of the beds and the floor of the bed.

The limestone deposit of the Ariyalur area assume a sinuous shape as is evidenced from the map of the area. The shallowing of the deposits northwards relative to those occurring in the south and also the difference in the structure of deposits may perhaps indicate a landward extension of the meandering basin northwards.

Another factor brought out by the mining agencies like the Dalmia Cements and Ariyalur Cements is that there is a tendency for the iron content to increase at certain depths and in certain zones, necessitating blending of the deposits with sweetness, like iron poor varieties, although in respect of total carbonate or other contents, all the deposits meet the requirements of cement grade and more. They have come with figures for the blending proportions required for various grades. It is in this context that the limestones of Pudupalaiyam area are attractive to be considered as a suitable blending material. They are sufficiently high grade in CaCO_3 and also are of the same time relatively lower in

iron and hence may be considered as excellent material for use as blending.

Regarding the usability of the limestone of the area in the various stages of cement industry are on account of inherent moisture and fineness the grind mill, since they are of sedimentary origin and consist of admixed shells, a suitable additive material and or process has to be adopted for their optimum utilisation.

Therefore the question arises as to whether the entire belt where more than 100 million tonnes of limestone are expected to be available is to be considered for development of cement industry and allied industries, or whether several other industries like metallurgical or chemical industries can also be envisaged.

No attempt is made here however to suggest on the mode of utilisation of the deposits. But taking into account the proximity of other raw materials like the potential salt works of Thanjavur coast, the possibilities of utilisation of the usable grade of limestone in the soda

ash industry can be explored provided they are found suitable. However any further elaboration is outside the scope of the present work.

The full potentiality of the deposit was not at first realised when the investigation was started in 1975, but when the preliminary work was completed, it came to be realised that there are additional reserves of limestone along the same belt further to the south of the area originally taken up for assessment in Kallankurichi and Periyanaalur.

As reported during Phase I and II work, extension of limestone further south of Marudayar river has been recorded. Hence there is scope for extending the area of exploitation of limestone on the basis of further detailed investigation in the area, while the heavy overburden is likely to prove to be an inhibiting factor.

Acknowledgement

The third phase of investigation commenced in July 1977 and was completed in November 1978. The following officers of the Department of Geology and Mining were connected with the investigation. Tvl. S. Nagamuthu, P. Singaravelu and K. Shanmugam, Assistant Directors were in charge of the investigation including wagon drilling. They were assisted by Thiru A. Kandaswamy, Assistant Geologist. The drilling work was carried out by the Department of Geology and Mining using a Voltas-Joy 7 and Long year-32 diamond drill. A wagon drill of Tamil Nadu Cements was also spared for the above investigation. Thiru A. Padmanabhan, Geologist inspected the work from time to time and gave suggestions for planning of work. The entire work was carried out under the guidance and personal supervision of Thiru V. Gopal, the former Director of Geology and Mining. The reduced levels of the Diamond Drill holes was provided by the Surveyors of the Ariyalur Cement Plant. The chemical analysis

and funding of the investigation was undertaken by the Ariyalur Cement Plant who also provided the much needed facilities for carrying out the work.

Grateful thanks are due to Thiru T.S. Paramasivan, the Director of Geology and Mining and Thiru R. Srinivasan, Additional Director of Geology and Mining for the help and suggestions given in bringing out this report.

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APPENDIX - I

. Physical characteristics of Ariyalur Limestone

APPENDIX - IV

Physical characteristics of Ariyalur Limestone

The Cretaceous limestones from Periyannagalur block have been tested by several organisations for their physical and calcining properties, particularly with reference to their suitability for use in the iron and steel industry. The following are the range in values obtained from a large number of samples.

Physical appearance

The limestones are cream to yellow in colour. They are made up of calcareous matrix with numerous shell fragments and sand. The cementing material is calcareous. The samples from the top 0.3 metres depth appear to be slightly harder than the samples below that level.

Specific gravity

3.34 to 3.51

Bulk density

2.50 to 2.81 gm./cm³

Porosity

17.70 to 22.6 per cent

Cold crushing strength

(a) 112 to 327 kg/cm² for softer varieties

(b) 186 to 504 kg/cm² for harder type.

The general range in hardness is 200 to 350 kg/cm²

Calcination

Calcination was almost complete when placed in a muffle furnace for one hour at 950°C and the product was quite reactive.

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APPENDIX - II

Chemical Analyses of samples of limestones
collected from Pudupalayam and Reddipalayam
by the previous workers

(A. Padmanabhan and T.M. Sridharan,
R. Srinivasan and N. Muthukumaraswamy)

ANALYSIS OF LIMESTONE OF REDDIPALAYAM

Sample Number	Moisture	Loss on ignition	Acid insolubles	R ₂ O ₃	Fe ₂ O ₃	Al ₂ O ₃	CaO	MgO
(in per cent)								
CrL 30	0.05	40.43	2.40	1.95	1.18	0.77	54.05	Trace
CrL 31	0.04	41.17	3.81	1.72	0.63	1.09	49.83	2.01

APPENDIX - III

Geological Logs of diamond drill holes

Sludge sample Diamond Drill Hole No. PPM. 4 R. S. No. 221 Village: Pudupalaya.

Sample Number	Depth in metres From	Depth in metres To	TCO ₃	SiO ₂	Fe ₂ O ₃ (in per cent)	Al ₂ O ₃	CaO	MgO	Loss on ignition
SS1	0.00	1.00	23.40						
SS2	1.00	2.00	56.00	46.62	2.40	4.00	26.60	0.22	21.00
SS3	2.00	3.00	55.00						
SS4	3.00	4.00	12.80						
SS5	4.00	5.00	6.60						
SS6	5.00	6.00	7.60						
SS7	6.00	7.00	8.40	76.97	2.40	8.04	5.40	0.78	4.70
SS8	7.00	8.00	5.80						
SS9	8.00	9.00	5.10						
SS10	9.00	10.00	4.80						

Sludge sample		Diamond Drill Hole No. PEM. 13		R. S. No. 246		Village: Pudupalaya		
Sample Number	Depth in metres From To	TCO ₃	SiO ₂	Fe ₂ O ₃ (per cent)	Al ₂ O ₃	CaO	MgO	Loss on ignition
SS1	0.00	1.00						
SS2	1.00	2.00						
SS3	2.00	3.00	34.80	4.43	5.92	29.00	0.85	24.11
SS4	3.00	6.00						
		49.20						
		67.80						
		62.80						
		15.80						

Sludge sample		Diamond Drill Hole No.19		R.S.No.216		Village: Pudupalayam		
Sample Number	Depth in metres From To	Tco ₃	SiO ₂ (in per cent)	Fe ₂ O ₃	Al ₂ O ₃	CaO	MgO	Loss on ignition
SS1	0.00	36.20	9.70	2.88	1.88	47.65	0.20	38.04
SS2	0.80	56.60	10.36	2.40	1.68	47.52	0.18	37.78
SS3	1.80	34.40	6.56	2.00	1.28	50.30	0.15	39.54
SS4	2.80	83.60	8.90	2.00	1.40	48.97	0.32	38.63
SS5	3.80	88.20	5.64	2.64	0.92	50.52	0.19	39.15
SS6	4.80	85.60	8.77	2.00	1.80	48.23	0.16	38.90
SS7	5.80	88.50	6.92	2.00	1.34	50.09	0.16	39.32
SS8	6.80	85.80	7.11	2.24	1.40	49.53	0.13	39.03
SS9	8.00	87.80	9.89	3.84	2.26	46.59	0.15	37.17
SS10	9.00	86.60	9.39	2.72	2.62	47.22	0.01	37.46
SS11	10.00	80.60	13.57	4.72	2.78	43.09	0.13	35.16
SS12	11.00	82.00	8.91	3.28	2.18	48.23	0.11	38.12
SS13	12.00	75.40						
SS14	13.00	83.60						
SS15	14.00	61.00						
SS16	15.00	15.60						
SS17	16.00	3.80						
SS18	17.00	1.80						
SS19	18.00	3.40						
SS20	19.00	6.80						
SS21	20.00	5.40						
SS22	21.00	2.60						
SS23	22.00	3.40						

Sample Number	Depth in metres From	Depth in metres To	TCO ₃	SiO ₂	Fe ₂ O ₃ (in per cent)	Al ₂ O ₃	CaO	MgO	Loss on ignition
SS24	23.00	24.00	30.20						
SS25	24.00	25.00	14.20						
SS26	25.00	26.00	5.20	67.22	4.80	6.92	10.00	0.46	9.32
SS27	26.00	27.00	2.20						

REPORT ON THE DETAILED PROSPECTING FOR
LIME STONE IN PUDUPALAYAM AND
REDDIPALAYAM VILLAGES,
ARIYALUR TALUK, TRICHIRAPPALLI DISTRICT

(PHASE—V)

By
S. BHASKARAN
Assistant Director
(Geology and Mining)

July, 1994

*DEPARTMENT OF GEOLOGY AND MINING,
MADRAS—600 032*

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REPORT ON THE DETAILED PROSPECTING FOR LIMESTONE IN PUDUPALAYAM AND REDDIPALAYAM VILLAGES ARIYALUR TALUK, TIRUCHIRAPALLI DISTRICT

1. PREAMBLE

1.1. Tvl. Tamilnadu Cements Corporation Ltd. commissioned their second plant under public sector near Ariyalur and commenced commercial production adopting dry process of cement manufacture with full rated production capacity of 1500 t.p.d. and 0.5 million tonnes per annum. The then State Geology Branch (Department of Geology and Mining) carried out the entire prospecting operations in three different phases (Phase-I to Phase-III) and assessed the limestone reserves both quantitatively and qualitatively. Based on the above prospecting operations the plant was assured with limestone reserves for more than 50 years. However, during the actual working of the mines and utilising the mined limestone operational and process problems due to high percentages of iron content in the limestone. Taking into account of the request of the corporation, the department also reassessed the high iron limestone deposits in the areas reserved for TANCEM in Valajanagaram area and demarcated the high and low iron limestone horizons for planning the mining operations (Phase-IV - 1984-85).

The present investigation was taken up to prove additional limestone reserves in Pudupalayam and Reddipalayam villages in Ariyalur Taluk, Tiruchirapalli District (Phase-V). The detailed prospecting including drilling was carried out between April and August, 1988. In all, 21 diamond drill holes for a total depth of 701.35 m were drilled during the entire prospecting of this phase. and one hundred and seventy two (172) core samples were collected and analysed in the departmental laboratory at Madras.

A total mineable reserves of about 13.88 million tonnes of limestone has been estimated in Pudupalayam and Reddipalayam villages of Ariyalur Taluk.

2. LOCATION AND COMMUNICATION

2.1. The area taken for prospecting in Pudupalayam and Reddipalayam villages of Ariyalur taluk lies about 12 kms. South-East of Ariyalur town. The Kilpalur-Jayankondam road, forming part of the Tiruchirapalli-Chidambaram State Highway, runs north of the deposit. Ariyalur, the taluk Headquarters with telegraphic facility, can be reached from the prospecting area, from Vilangudi diversion of the above road. Ariyalur

is the nearest railway station on the Tiruchirapalli-Villupuram chord line of the Southern Railway with siding facility. This area prospected forms part of Survey of India Toposheet No.58M/4. Marudaiyar River flows immediately south of the prospecting area. The existing limestone mines of Tvl. South India Viscose Ltd., Dharani Cements Ltd. and Alagappa Cements Ltd. also comprise part of the main deposit occurring in this area. The area is also served with village cart-tracts connecting hamlets of Pudupalayam and Reddipalayam villages.

3. TOPOGRAPHY, CLIMATE AND VEGETATION

3.1. The area taken for prospecting within the revenue limits of Pudupalayam and Reddipalayam villages is characterised by the presence of an undulating topography dotted with number small of irrigation tanks, drainage channels and dugwells. The PeriyanaGalur Odai runs along the western margin of the deposit, whereas the Reddipalayam Odai flows along the eastern periphery of the deposit. Both the above streams are seasonal and drain into the Marudaiyar River in the south. The general drainage flow of the area is towards south and south east. The water table is shallow during monsoon seasons and gradually advances down to deeper levels during summer months.

3.2. The regional climate of the area is arid in most part of the year, and receives the maximum rainfall during November and December at the time of North-East monsoon. The mean elevation of the area is 50 M, above Mean Sea Level. As observed in major part of the region, coriander, chilly, maize, etc. are the common dry crops grown under favourable conditions.

4. PREVIOUS WORK

4.1. As the limestone deposit now prospected, forms part Kallakurichi formations of the Ariyalur stage, belonging to Tiruchirappalli cretaceous system, the area attracted different agencies to study the area at regular intervals. The Govt. of India agencies-Viz-Oil and Natural Gas Commission, Geological Survey of India, Mineral Exploration Corporation Ltd., Central Ground Water Board, etc. have carried out extensive studies of the cretaceous formations with respect to their individual nature of field study and interest of utilizing the limestone deposit. The rich faunal wealth of both macro and micro fossils in the cretaceous formations have also drawn the attention of the researchers of different universities in different parts of the country.

4.2. In order to exploit the mineral wealth and utilising the limestone deposit in limebased industries, the then State Geology Branch have carried out detailed prospecting in the area in different phases since 1964 to 1977, at different periods. The deposit was also reassessed by the Dept. of Geology and Mining during 1984-85. The earlier reports of the department on the area cover the entire stretch of limestone for about 20kms. from North-South from Srinivasapuram to Periyathirukkonam villages.

5. GEOLOGY

5.1. The geological and the lithological data of the Ariyalur region have been discussed at length in detail in the prospecting reports of the Department, under different phases of investigation. Therefore the same details have not been repeated in the current report. The geological formations in the current investigation area are contiguous and exhibit similar behaviour as found in the northern part of the same deposit.

5.2. The area covered under present (Phase-V) investigation forms part of the Ariyalur stage of Trichinopoly Cretaceous system and the limestone bed is referable to the Kallankurichi formations, of the Maestrichtian period. The limestone bed lies conformably over a conglomerate bed as could be seen along the (western) lower contact of the deposit. The general trend of the deposit in this part of the limestone occurrence is North-South with gentle dips towards East. The deposit is overlapped by a thick soil cover and sandstones along the eastern and North-Eastern margins. The sandstone is referable to Kallamedu formations. The upper contact of the limestone is mostly concealed. The occurrence of chert intervening the limestone bed in the area prospected may be inferred as a product of replacement of calcium carbonate by silica from such solutions probably derived from the overlying sand stones in the area.

5A. PRESENT WORK (PHASE-V)

5A The Department of Geology and Mining earlier carried out prospecting in different parts of the limestone deposit in Ariyalur area and reports were published. Therefore, the present work forms the Phase - V investigations, carried out in parts of Pudupalayam villages of Ariyalur taluk during the period between April and August 1988, Thiru M.K.Somasekar, Assistant Geologist, the drilling personnel of the department and the geological staff of the TANCEM were associated in the prospecting operations. The diamond drill rigs of TANCEM and of the DGM one rig from either side were deployed for the prospecting work by drilling.

6. DRILLING AND SAMPLING

6.1. The area covered under phase-V prospecting in Pudupalayam and Reddipalayam villages forms part of the area prospected in the above villages under phase-III and of the additional area on the eastern side of the deposit in Reddipalayam village with overburden of sandstone.

6.2. As the DGM and TANCEM have involved themselves independently on the study of the limestone deposit and as they have carried out detail mapping of the limestone occurrence in Pudupalayam and Reddipalayam area, with available well and earlier drill data demarcating the limestone deposit, no mapping work afresh was carried out during the current phase of prospecting. Therefore, the earlier map prepared by TANCEM relating to the area was used for finalising the borehole locations etc. The geological map exhibiting the limits of limestone occurrence in the area is also appended to this report (Map No.2).

6.3. The diamond drilling operations in the area was planned on a regular grid pattern. The limestone bearing area was divided into 300m square grid, and drilling operations was completed in the area. In all 21 diamond boreholes, vertical in nature, were drilled for a total depth of 701.395 metres. While planning the borehole locations, utmost care has been followed to avoid the borehole points falling on the adjacent mining lease hold areas in Pudupalayam and Reddipalayam villages for limestone granted to private companies.

6.4. As followed in the earlier phases of investigations samples were also collected for chemical analysis. The limestone core samples were collected for every metre (run) of the core or as and when variations in the lithology were observed. Totally 172 core samples were collected in the prospecting operations. The longitudinal half of the limestone samples were analysed in the departmental laboratory at Madras adopting standard procedure of chemical analysis. The other half of the core was retained by TANCEM for cross check in future, and for simultaneous analysis. However, the sludge samples from the bore holes were not collected during Phase-V prospecting, for the reason that, the samples are not representative of the strata drilled and the chemical analysis appear to be misleading.

6.5. The physical log of the boreholes drilled in the area and the chemical analysis are appended to this report (Annexure I). The limestone core samples collected during the

Prospecting were initially analysed for the total carbonate content. The samples which analysed below 70% total carbonate were not considered for detail analysis.

The samples analysed total carbonate content 70% and above were only taken for complete analysis of other constituents and details are furnished (Annexure-1).

7. DESCRIPTION OF INDIVIDUAL ROCK TYPES

a. Sandstone :

7.1. The sandstone is occurring underlying the conglomerate bed and in the core samples it is greenish in colour when wet, and evengrained in texture with mostly quartz and feldspar grains and altered clay. The sandstone is hard and compact and the binding material is calcareous in nature. However, the sand stone encountered in the upper contact of the limestone is loose and friable and it is coarse grained.

b. Conglomerate

7.2. The conglomerate bed is occurring below the limestone and its thickness varies from one metre to 3.5 m. (at places). The conglomerate is composed of quartz pebbles of different sizes and the matrix is calcareous in nature. As could be seen in the core samples and in few well debris examined in the area, the quartz pebbles are well rounded and uniform in size. The conglomerate bed is indicative of a break in the deposition in the area. As observed in the geological cross sections, there is no limestone below the conglomerate and therefore it forms a marker horizon for mining limestone in the area prospected in Pudupalayam and Reddipalayam villages.

c. Chert

7.3. In the area prospected, there is a significant layer of chert encountered in the boreholes, which is conspicuously absent in the area North of Trichirapalli-Chidambaram road covered under phase - II and phase - IV investigations. The thickness of chert bed varies between 0.5 to 3.5 m. The chert encountered in the boreholes is yellow in colour, amorphous in nature with typical conchoidal fracture. The chert bed is also found to occur intervening the limestone bed in particular places. The chert might have been formed by precipitation from silica rich solutions derived from the sandstones occurring in the area.

d. Shell Limestone

The limestone occurring in Pudupalayam and Reddipalayam villages covered under prospecting area is generally yellow in colour, hard and compact with abundance of shells. The presence of abundant shells and the calcareous binding medium made the limestone ideal for use in the limebased industries. As examined in the nearby limestone mines. Tvl. Alagappa Cements (P) Ltd., and TAN-INDIA LTD., the limestone is comprised of larger bivalved shells of Gryphea and Alectrionia and broken shell pieces of Inoceramus. The shell lime stone occurring in the area is compact and being sedimentary origin, absorbs water under moist conditions and hence the limestone is hygroscopic.

8. ESTIMATION OF RESERVES

8.1. The reserves of limestone available in the area prospected in Pudupalayam and Reddipalayam villages covered under phase V investigation has been estimated blockwise by geological cross section method. As the two limestone beds encountered in the northern extension of the deposit in Valajanagaram village is absent in this portion of the deposit and the two beds have merged together forming a single unit of limestone, the reserves are estimated for the entire limestone bed encountered in Pudupalayam Reddipalayam area. The chemical analysis of the core samples collected have also clearly indicated uniformity of the deposit throughout the area prospected and confirmed the limestone occurrence in the area is of a single unit only.

8.2. During the earlier phases of investigation the reserves of limestone were estimated taking into account that, the entire surface rights of the area prospected will be under the control/possession of TANCEM and reserves are computed being mineable reserves available in the area covered under that particular phase of investigation. However, during the discussions, it was suggested by TANCEM, that the reserves of the phase V investigation may be furnished both in the reserved and unreserved lands separately, covered under phase V investigation. The above suggestion was adopted while estimating the reserves in Pudupalayam Reddipalayam Area.

8.3. While estimating the reserves initially the portion of the grid line falling in the reserved/unreserved lands has been divided into different segments according to land category and reserves are calculated block wise, individually. The area of influence was also restricted depending upon the above category of land. The geological reserves of limestone in the prospecting area were initially calculated for all grid line areas and

subsequently the mineable/measured reserves are estimated adopting 70% recovery of mineral limestone providing allowance of 30% for mining loss, voids and vugs in the deposit. By adopting surface right category of reserved and unserved nature the quantity of limestone is estimated separately for each grid line area. Similarly, while estimating the reserves of limestone a ratio of 1:1 for overburden to limestone is strictly maintained.

8.4. As the prospecting operations were in progress it was observed that the limestone deposit is found to occur in the eastern continuation of the area in Reddipalayam village and bore holes were drilled to prove further continuation. Though limestone deposit was encountered on the eastern continuity in most of the grid lines only the area in three grid lines maintain 1:1 ore to over burden ratio and hence they are alone considered for reserves estimation. However, the data available is incomplete. Therefore, the reserves estimated in the eastern continuity is considered under the category of inferred reserves available in the area. The bulk density of limestone was maintained as 2 as followed in the earlier phases of propsecting.

8.5. The details of estimation of reserves are furnished in the Annexure II appended to this report. Thus, a total geological reserves of 23.75 million tonnes of limestone has been estimated in the entire area covered under prospecting phase V. Out of the total quantity, 5.72 million tonnes of limestone has been estimated in the reserved area for TANCEM and a quantity of 8.16 million tonnes would be available in the unreserved area. The above limestone reserves are of mineable/measured category. In addition, a quantity of 3.71. Million tonnes of limestone of inferred reserves would be available in the eastern continuation.

9. QUALITY OF LIMESTONE

9.1. As discussed in the foregoing paragraph, the limestone occuring in the area prospected is of sedimentary shell lime stone variety with abundant shells and calcareous material. The limestone is generally yellow in colour, hard and compact and it is also hygroscopic.

9.2. The chemical analysis of core samples clearly indicate that, the weighted average of total carbonate content in all the above boreholes analyse above 85% and the same increases upto plus 90% in majority of samples collected from the bore holes. Similarly, the SiO_2 content of the samples analysed ranges between 5 to 7% with required

Al_2O_3 . The Mgo content in almost all the analysis of core samples, indicated less than one percent. As reported, the presence of high percentages iron in limestone available in the northern parts of the limestone in Valajanagaram area posed problems in the process of cement manufacture for TANCEM. The iron content of the limestone available in the area prospected in Pudupalayam - Reddipalayam is fairly low and the average of iron in all the samples analysed below 3%. Therefore, the limestone occurring in the area prospected under phase V is fairly high grade suitable to be utilised for correcting material for high iron limestone identified earlier in Periyaganalur-Valajanagaram areas.

10. SUMMARY AND CONCLUSION

1.1. The Department of Geology and Mining at the instance of Tamil Nadu Cements Corporation Ltd., Ariyalur works, has carried out extensive geological exploration by diamond drilling in the freehold area in Pudupalayam and Reddipalayam villages, Ariyalur taluk, Tiruchirapalli district between April and August 1988. The area prospected is comprised of both by the Department of Geology and Mining and TANCEM and diamond drill rigs of both the organisations were deployed for the work. 21 Vertical diamond drill holes, for a total depth of 701.35 metres were drilled during the prospecting work. 172 core samples were collected and analysed in the department laboratory.

10.2. As may be seen in the geological cross sections appended to this report, the thickness of limestone gradually increases along the dip and the maximum thickness of limestone encountered in the area is about 18 M. The thickness of overburden, sandstone and chert also increases correspondingly towards eastern extension of limestone. However, in the reserve estimation ore to overburden ratio is maintained as 1:1.

10.3. The quality of limestone is also chemically uniform with high calcium content and low iron percentage. Therefore, the limestone available in the area is of high grade variety suitable for blending.

10.4. A total of about 23.75 million tonnes of geological reserves has been estimated in Pudupalayam and Reddipalayam area under Phase V. A quantity of 5.721 million tonnes of mineable/measured reserves of limestone and 8.163 million tonnes of measured reserves have been estimated in the reserved and unserved lands respectively prospected in Pudupalayam- Reddipalayam area. In addition, the area prospected also contain an inferred reserve of about 3.714 million tonnes in the eastern continuity of the deposits.

10.5 TANCEM have to acquire additional bearing lands in Pudupalayam and Reddipalayam villages, which fall under the unreserved category apart from the area reserved for them. The details of survey numbers to be acquired is given below:--

Pudupalayam: 242, 243, 250, 251, 252, 262 (p), 267 (p)

Reddipalayam: 182, 183, 184, 191, 192, 193, 194, 321, 322

323, 324, 325, 326, 327, 328, 329, 330, 331

332, 333, 334, 335, 337, 340, 342, 343, & 364

11. ACKNOWLEDGEMENT

11.1. The author is thankful to Tvl. Tamil Nadu Cements Corporation Ltd., Ariyalur Cements works for the excellent co-operation extended for carrying out the prospecting work and to Thiriu S. Parthasarathy, Manager (Geology) and his team of Geologists for the co-ordination during the field work. The author's thanks are also due to Tvl. A. Padmanabhan, Additional Director (G&M) and V. Srinivasan, Deputy Director (Geology) for their valuable guidance in bringing out this report.

Sd. S. Bhaskaran

Sd. V. Srinivasan
Deputy Director (G & M)

Sd. N. Subramanian
Joint Director (G & M)

Sd: A. PadMANABHAN
Addl. Director (G & M)

Sd: M. Abul Hassan IAS.,
Director of Geology & Mining


P. DINESH SINGH,
MANAGER (MINES)

KALLANKURICHI LIMESTONE MINES
TAMILNADU CEMENTS CORPORATION LTD.,
ARIYALUR CEMENT WORKS
ARIYALUR - 621 729

Bore Hole No. PD/4-1

District : Tiruchirapalli
Taluk : Ariyalur
Village : Reddipalayam

S.F.No. : 148
Nature of the Hole : Vertical
Reduced Level : + 50.155 M

Depth in Metres	Lithology	Sample No.	TCO ₃	LOI	SiO ₂	Fe ₂ O ₃	Al ₂ O ₃	CaO	MgO	Remarks
0.00 - 0.60	Top Clayey soil	-	-	-	-	-	-	-	-	All the samples analyse lowgrade
0.60 - 3.00	Yellow shell Limestone	-	-	-	-	-	-	-	-	
3.00 - 20.50	Pale green fine grained sandstone	PD/4-1/1	13.00	-	-	-	-	-	-	
20.50 - 26.20	Yellow calcareous sandstone	PD/4-1/2	31.71	-	-	-	-	-	-	
26.20 - 32.30	Grey coloured coarse sand stone	PD/4-1/3	36.04	-	-	-	-	-	-	

Bore hole closed at the depth of 32.30 metres

Bore Hole No. PD/4-2

District : Tiruchirapalli
Taluk : Ariyalur
Village : Reddipalayam

S.F.No. : 221
Nature of the Hole : Vertical
Reduced Level : + 55.000 M

Depth in Metres	Lithology	Sample No.	TCO ₃	LOI	SiO ₂	Fe ₂ O ₃	Al ₂ O ₃	CaO	MgO	Remarks
0.00 - 0.60	soil cover	-	-	-	-	-	-	-	-	All samples analyse lowgrade. Hence no detail analysis conducted
0.60 - 9.40	Yellow shell Limestone	PD/4-2/1	30.52	-	-	-	-	-	-	
9.40 - 15.50	-do-	PD/4-2/2	8.89	-	-	-	-	-	-	
15.50 - 24.75	-do-	PD/4-2/3	23.45	-	-	-	-	-	-	
24.75 - 30.80	Pale green fine grained sandstone	PD/4-2/4	29.36	-	-	-	-	-	-	

Bore hole closed at the depth of 30.80 metres

Bore Hole No. PD/4-3

District : Truchirapalli
Taluk : Arniyalur
Village : Pudupalayam

S.F.No. : 219
Nature of the Hole : Vertical
Reduced Level : + 55.940 M

Depth in Metres	Lithology	Sample No.	TCO ₃	LOI	SiO ₂	Fe ₂ O ₃	Al ₂ O ₃	CaO	MgO	Remarks
0.00 - 1.50	Clayey soil cover	-	-	-	-	-	-	-	-	The lime stone bed is Intervened by a chert layer
1.50 - 4.25	Kankary Limestone	-	-	-	-	-	-	-	-	Weighted average of sample NO. 3-5 is as follows
4.25 - 6.45	Yellow shell Limestone	PD/4-3/1	90.84	40.20	5.71	1.77	0.76	50.67	0.22	3-5 is as follows
6.45 - 7.00	Yellow chert	PD/4-3/2	1.45	-	-	-	-	-	0.33	TCO ₃ - 86.70
7.00 - 9.00	Yellow shell limestone	PD/4-3/3	89.35	39.67	6.23	2.11	1.28	49.39	0.44	CaO - 47.94
9.00 - 11.00	-do-	PD/4-3/4	83.10	38.08	9.14	1.58	4.67	45.55	0.30	SiO ₂ - 7.15
11.00 - 13.75	-do-	PD/4-3/5	87.19	39.17	6.38	2.21	2.15	48.61	-	Fe ₂ O ₃ 1.99
13.75 - 14.05	Yellow arenaceous limestone	PD/4-3/6	1.38	-	-	-	-	-	-	-
14.05 - 17.10	Conglomerate	PD/4-3/7	10.17	-	-	-	-	-	-	-
17.10 - 30.80	Buff and Yellow sandstone	PD/4-3/8	12.97	-	-	-	-	-	-	-

Bore hole closed at the depth of 30.80 metres

Bore Hole No. PD/4-4

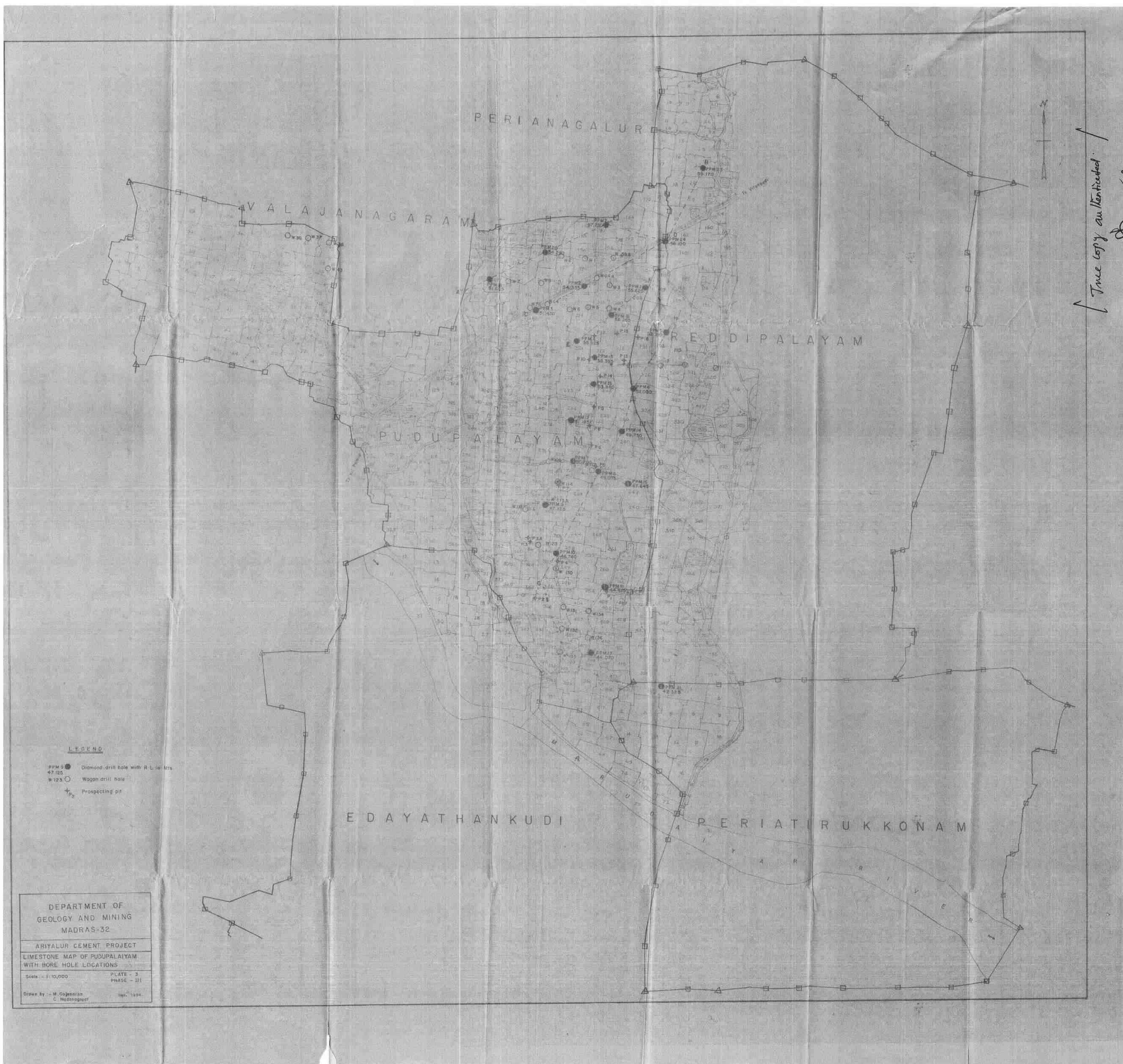
District : Tiruchirappalli
Taluk : Ariyalur
Village : Pudupalayam

S.F.No. : 218
Nature of the Hole : Vertical
Reduced Level : + 54.925 M

Depth in Metres	Lithology	Sample No.	TCO ₃	LOI	SiO ₂	Fe ₂ O ₃	Al ₂ O ₃	CaO	MgO	Remarks
0.00 - 1.80	Soil Cover									
1.80 - 6.00	Yellow limestone	PD/4-4/1	1.72							
6.00 - 10.75	Chert finegrained yellow in colour	PD/4-4/2	0.82							
		PD/4-4/3	6.29							
		PD/4-4/4	1.32							
10.75 - 11.00	Yellow shell limestone	PD/4-4/5	93.04	41.23	3.60	1.80	0.98	51.48	0.33	
11.00 - 11.50	chert	PD/4-4/6	10.54							
11.50 - 12.50	Yellow shell limestone	PD/4-4/7	87.28	39.19	6.01	3.20	1.68	48.54	0.22	
12.50 - 13.05	chert	PD/4-4/8	7.98							
13.05 - 15.55	Yellow shell limestone	PD/4-4/9	87.72	39.62	6.37	2.87	1.66	48.79	0.22	
15.55 - 18.00	-do-	PD/4-4/10	87.32	38.54	7.88	2.40	1.40	48.08	0.44	
18.00 - 18.60	Conglomerate	PD/4-4/11	39.84							
18.60 - 30.80	Yellow and Buff sand stone	PD/4-4/12	13.55							

Bore hole closed at the depth of 30.80 metres

ANNEXURE-IVA



ANNEXURE-V

TEST REPORT

Report Number: ULR – TC606019000000373P

Report Date: 17.08.2019

Issued To :	Tamilnadu Cements Corporation Limited, (A Government of Tamilnadu Undertaking) Ariyalur Cements Factory, Ariyalur District.	Sample Location	S.F.No.: 144/1A, 217/1A etc., Extent : 22.96.0 Ha Pudupalayam Village, Ariyalur Taluk Ariyalur District.
Attention	-	Sample Receipt Condition	Ambient – Good
TRF. No.	661	Sample Quantity	2 Kg
Sample Name	Limestone	Sampled by	Client
Sample Description	Powder	Sampling Method	-
Sample Code	GLCS / 1767	Date of Analysis	16.08.2019
Sample Receipt Date	16.08.2019	Date of Completion	17.08.2019

Sl. No.	TEST PARAMETERS	TEST METHOD	UNIT	RESULTS
1	Calcium as CaO	IS 1760 (Part 3) :1992 (Reaffirmed - 2006)	%	49.28
2	Magnesium as MgO	IS 1760 (Part 3) :1992 (Reaffirmed - 2006)	%	0.52
3	Iron as Fe ₂ O ₃	IS 1760 (Part 3) :1992 (Reaffirmed - 2006)	%	1.06
4	Alumina as Al ₂ O ₃	IS 1760 (Part 3) :1992 (Reaffirmed - 2006)	%	1.35
5	Silica as SiO ₂	IS 1760 (Part 2) :1991 (Reaffirmed - 2006)	%	9.61
6	Loss On Ignition	IS 1760 (Part 1) :1991 (Reaffirmed - 2006)	%	37.89
7	*Calcium as CaCO ₃	By Calculation	%	87.98
8	*Magnesium as MgCO ₃	By Calculation	%	1.09
9	*Lime Saturation Factor	GLCS/SOP/M/035	%	1.89

Note: * Not covered under NABL scope


Prepared


Verified
*****End of Report*****
Page 1 of 1

For Global Lab and Consultancy Services




Authorised Signatory
Dr.P. THANGARAJU
Managing Partner

Note: The test results are only to the sample submitted for test. Any Correction of the test report on full or part shall invalidate the report. Samples are not drawn by us unless otherwise stated. Sample will be retained for 14 days from the date of reporting except in case of regulatory samples or specifically instructed by client. Perishable samples will be discarded immediately after reporting. We do not accept any liability with regard to origin or source from which the samples are extracted. The Laboratory is not responsible for authenticity of photocopied test reports. Any holder of this report is advised that information contained here on reflects the laboratory's finding at the time of its intervention only and within the limits of client instructions. The authenticity of the test reports issued by us can be verified by submitting an E-mail request with report number and report date along with report copy.

ANNEXURE-VA

TEST REPORT

Report Number: ULR – TC606019000000374P

Report Date: 17.08.2019

Issued To :	Tamilnadu Cements Corporation Limited, (A Government of Tamilnadu Undertaking) Ariyalur Cements Factory, Ariyalur District.	Sample Location:	S.F.No. 144/1A, 217/1A etc., Extent 22.96.0 Ha Pudupalayam Village, Ariyalur Taluk Ariyalur District.
Attention	-	Sample Receipt Condition	Ambient – Good
TRF. No.	661	Sample Quantity	2 Kg
Sample Name	Lime Kankar	Sampled by	Client
Sample Description	Powder	Sampling Method	-
Sample Code	GLCS / 1768	Date of Analysis	16.08.2019
Sample Receipt Date	16.08.2019	Date of Completion	17.08.2019

Sl. No.	TEST PARAMETERS	TEST METHOD	UNIT	RESULTS
1	Calcium as CaO	IS 1760 (Part 3) :1992 (Reaffirmed - 2006)	%	45.26
2	Magnesium as MgO	IS 1760 (Part 3) :1992 (Reaffirmed - 2006)	%	0.44
3	Iron as Fe ₂ O ₃	IS 1760 (Part 3) :1992 (Reaffirmed - 2006)	%	0.95
4	Alumina as Al ₂ O ₃	IS 1760 (Part 3) :1992 (Reaffirmed - 2006)	%	1.35
5	Silica as SiO ₂	IS 1760 (Part 2) :1991 (Reaffirmed - 2006)	%	13.99
6	Loss On Ignition	IS 1760 (Part 1) :1991 (Reaffirmed - 2006)	%	36.95
7	*Calcium as CaCO ₃	By Calculation	%	82.58
8	*Magnesium as MgCO ₃	By Calculation	%	0.92
9	*Lime Saturation Factor	GLCS/SOP/M/033	%	1.03

Note: * Not covered under NABL scope

For Global Lab and Consultancy Services


Prepared


Verified
*****End of Report*****
Page 1 of 1




Authorised Signatory
Dr. P. THANGARAJU
Managing Partner

Note: The test results are only to the sample submitted for test. Any Correction of the test report on full or part shall invalidate the report. Samples are not drawn by us unless otherwise stated. Sample will be retained for 14 days from the date of reporting except in case of regulatory samples or specifically instructed by client. Perishable samples will be discarded immediately after reporting. We do not accept any liability with regard to origin or source from which the samples are extracted. The Laboratory is not responsible for authenticity of photocopied test reports. Any holder of this report is advised that information contained here on reflects the laboratory's finding at the time of its intervention only and within the limits of client instructions. The authenticity of the test report's issued by us can be verified by submitting an E-mail request with report number and report date along with report copy.

ANNEXURE-VI

Form I.R.

CERTIFICATE OF INCORPORATION

No. 7081 of 1978

I hereby certify that TAMIL NADU CEMENTS CORPORATION LIMITED is this day incorporated under the Companies Act, 1956 (No. 1 of 1956) and that the Company is Limited.

Given under my hand at MADRAS this Eleventh Twenty second

February one thousand nine hundred and seventy six
day of Magha
One thousand eight hundred and ninety seven (Saka).

The Registrar of Companies
Tamil Nadu

Sd.
(A. G. SIRSI)
Registrar of Companies,
Tamil Nadu.

MEMORANDUM OF ASSOCIATION
OF
TAMIL NADU CEMENTS CORPORATION LIMITED



Handwritten signature

TAMIL NADU CEMENTS CORPORATION LIMITED

- I. The name of the Company is Tamil Nadu Cements Corporation Limited.
- II. The registered office of the Company will be situated in the State of Tamil Nadu.
- III. The objects for which the Company is established are the following :
 - A. The main objects to be pursued by the Company on its incorporation are :
 1. To take over from the Tamil Nadu Industrial Development Corporation Limited the cement factory at Alangulam, Ramnad District with all its assets and liabilities and also the project relating to the establishment of a Cement Factory at Ariyalur, Tiruchirappalli District with all the rights and liabilities at an agreed price by mutual consent between the Company and Tamil Nadu Industrial Development Corporation Limited.
 2. To produce, manufacture, purchase, refine, prepare, process, import, export, sell and generally to deal in cement, portland cement, alumina cement, lime and limestone, clinker and / or bye-products thereof and building materials generally and in connection therewith to acquire, erect, construct, establish, operate and maintain cement factories, limestone quarries, workshops and other works.
 3. To purchase, take on lease, or otherwise acquire the undertaking, business and property or any part thereof of any company or companies carrying on business as manufacturers of cement in India or otherwise, or any other business which the Company is entitled to carry on.
 4. To carry on all or any of the businesses of manufacturers and sellers of and dealers and workers in cement of all

sheds, concrete, asbestos, gypsum, coal, lime, hoastan cloth, gunny bags, paper bags, lime, plaster, whitening, clay, ball-sile, soapstone, ochres, paints, fixing materials, gravel, sand, bricks, tiles, pipes, pottery, earthen ware, artificial stone and manufacturers', builders' and dyers' requisites and conveniences of all kinds.

5. To work mines or quarries and to prospect for, search for, find, win, get, work, crush, smelt, manufacture or otherwise, deal with, limestone, chalk, clay, ores, metals, minerals, oils, stones or deposits or products and generally to carry on the business of mining in all its branches.

6. To carry on the trade or business of engineers, founders, smiths, metal workers, machinists, manufacturers of plant and machinery required or utilised by cement factories, quarries and mines.

B. The objects incidental or ancillary to the attainment of the main objects are :

1. To acquire by concession, grant, purchase, barter, lease, licence or otherwise, either absolutely or conditionally and either solely or jointly with others, any lands, buildings, easements, way leaves, privileges, rights, licences, powers and concessions and in particular any water rights or concessions for the purpose of obtaining motive power, and any machinery, plant, utensils, goods, trade-marks and other movable and immovable property of any description which the Company may think necessary or convenient for purposes of its business or which may seem to the Company capable of being turned to account.

2. To search for ores and minerals, mines and to win the ore and minerals either by itself after obtaining the necessary licence from Government or to permit any person, firm or company, who has the required valid licence for mining purposes, to mine in or over any land belonging to the Company, either by way of Lease or under a Lease and Licence Agreement.

3. To use, cultivate, work, manage, improve, carry on, develop and turn to account the undertaking, lands, mines, rights, privileges, property and assets of any kind of the Company or any part thereof.

4. To enter into partnership or into any arrangement for share of profits, union of interests, co-operation, joint adven-

ment, Local Body, authority, person, persons, or company carrying on or engaged in or about to carry on or engage in any business or transaction which this Company is authorised to carry on or engage in or in any business or transaction capable of being conducted so as, directly or indirectly, to benefit the Company and to take or otherwise acquire shares and securities of any such Company and to sell, hold re-issue, with or without guarantee, or otherwise deal with the same.

5. To acquire, be interested in, construct, maintain, carry out, improve, work, alter, control and manage any roads, bridges, tunnels, water-works, water-rights, canals, irrigation works, gas works, coal mines, electric works, reservoirs, water courses, furnaces, stamping works and con- works, and factories, warehouses and other works and conveniences which the Company may think conducive to any of the objects or which may seem calculated, directly or indirectly, to promote the Company's interests and to contribute to and take part in constructing, maintaining, carrying on, improving, working, controlling and managing of any such works or conveniences.

6. To enter into any arrangements with any Government or State or authorities municipal, local or otherwise, that may seem conducive to the Company's objects or any of them, and to obtain from any such Government or State or authority any rights, privileges and concessions which the Company may think desirable to obtain and to carry out, exercise, and comply with any such arrangements, rights, privileges and concessions.

7. To undertake and carry on any business, transaction or co-operation commonly undertaken or carried on by promoters of companies, concessionaries, contractors for public and other works or merchants.

8. To be interested in, promote and undertake the formation and establishment of such institutions, businesses, pools, combines, syndicates - industrial, trading or manufacturing - as may be considered to be conducive to the profit and interest of the Company and to acquire, promote and/or subsidise interests in any industry or undertaking and to carry on any other business (industrial, trading, manufacturing or other) which may seem to the Company capable of being conveniently carried on in connection with any of the objects of the Company or otherwise calculated, directly or indirectly,

to render any of the Company's properties or rights for the time being profitable.

9. To purchase or otherwise acquire and undertake the whole or any part of the business, property, rights, and liabilities of any person, firm or Company, carrying on any business which this Company is authorised to carry on or possessed of any property or rights suitable for any of the purposes of the Company and to purchase, acquire, apply for, hold, sell and deal in shares, stock, debentures or debenture stock of any such persons firm or company, and to conduct, make or carry into effect any arrangement in regard to the winding up of the business of any such person, firm or company.

10. To amalgamate with any company or companies having objects altogether or in part similar to those of this Company.

11. To pay all costs, charges, and expenses of, and incidental to, the promotion and formation, registration and establishment of this Company and the issue of its capital, including any under-writing or other commissions, broker's fee and charges in connection therewith.

12. To pay for any properties, rights or privileges acquired by the Company in shares or debentures of the Company, or partly in shares or debentures and partly in cash, or otherwise, to give shares or stock or debentures of this Company in exchange for shares or stock of debentures of any other company.

13. To remunerate or make donations to (by cash or other assets, or by the allotment of fully or partly paid shares, or by a call or option on shares, debentures, debenture stock or securities of this or any other Company, or in any other manner, whether out of the Company's capital, profits or otherwise) any person or persons for services rendered or to be rendered in introducing any property or business to the Company, or placing or assisting to place or guaranteeing the subscription of any shares, debentures, debenture stock or other securities of the Company or for any other reason which the Company may think proper.

14. To procure the registration or other recognition of the Company in any country, State or place and to establish and regulate agencies for the purpose of the Company's business.

15. To apply or join in applying to, and obtain from, any Parliament or Legislative Authority, Government, local municipal or other authority or body, or with any landholders or other persons for any Acts of Parliament or other Acts of Legislature, laws, decrees, concessions, orders, rights or privileges or authority that may seem conducive to the Company's object or any of them or may seem expedient, to obtain any provisional order or Act of Parliament for enabling the Company to carry any of its objects into effect or for effecting any modification of the Company's constitution, or for any other purpose which may seem expedient and to oppose any proceedings or applications or legislation or grant or withdrawal of any rights, privileges or concessions or any imposition or alteration or cancellation of any taxes or duties or tariff, which may seem calculated directly or indirectly to prejudice the Company's interests.

16. To open and keep a register or registers in any country, State, territory or dominion whether it may be deemed advisable to do so and to allocate any number of the shares in the Company to such register or registers.

17. To undertake and execute any trusts the undertaking where of may seem desirable other gratuitously or otherwise.

18. To draw, make, issue, accept and to endorse, discount and negotiate promissory notes, hundies, bills of exchange, bills of lading, delivery orders, warrants, warehouse keeper's certificates and other negotiable or commercial or mercantile instruments connected with the business of the Company.

19. To invest, apply for and acquire, or otherwise employ moneys belonging to or entrusted to the Company whether or not immediately required in such manner upon securities and shares or without security, upon such terms as may be thought proper, and from time to time to vary such transactions in such manner as the Company may think fit.

20. To lend or deposit moneys belonging to or entrusted to or at the disposal of the Company to such person or Company and in particular to customers and others having dealings with the Company, with or without security, upon such terms as may be thought proper and to guarantee the performance of contracts by such person or Company, but not to do the business of banking defined in the Banking Regulations Act, 1949.

21. To make advances upon or for the purchase of materials, goods, machinery, stores and other articles required for the purpose of the Company.

22. To borrow or raise money, with or without security or to receive money or deposit, at interest or otherwise in such manner as the Company may think fit and, in particular by the issue of debenture or debenture stock convertible into shares of this or any other Company, and on security of any such money so borrowed, raised or received, to mortgage, pledge or charge the whole or any part of the property, assets or revenue of the Company, present or future, including its uncalled capital and to purchase, redeem, or pay off any such securities. The Company shall not do the business of Banking as defined in the Banking Regulations Act, 1949.

23. To sell and in any other manner deal with or dispose of the undertaking or property of the Company or any part thereof for such consideration as the Company may think fit, and in particular for shares, debentures and other securities of any other company having objects altogether or in part similar to those of this Company and to promote any other company or companies for the purpose of its or their acquiring all or any of the property, rights or liabilities of this Company.

24. To improve, manage, work, develop, exchange, lease, mortgage, turn to account, abandon or otherwise deal with all or any part of the property, rights and concessions of the Company.

25. To place to reserve or to distribute as dividend or bonus among the members or otherwise to apply, as the Company may from time to time think fit, any moneys received by way of premium or debentures issued at a premium by the Company and any moneys received in respect of dividends, accrued on forfeited shares and profits arising from the sale by the Company of forfeited shares or from unclaimed dividends, subject to the provisions of law in that behalf.

26. Except in the matter of distributing the profits of the Company by way of dividends, to distribute any of the property of the Company amongst members in specie or kind, subject to the provisions of law in that behalf.

27. To provide for the welfare of employees or ex-

employees of the Company or its predecessors in business and the wives, widows and families of the dependants or connections of such person by building or contributing to the building of houses, dwellings or chawls, or by grants of money, pension, allowances, bonus, payments towards insurance or other payment; or by creating and from time to time subscribing or contributing to, aiding or supporting provident and other associations, institutions, funds, or trusts, or conveniences and by providing or subscribing or contributing towards places of instruction and recreation, hospitals and dispensaries, medical and other attendance and other assistance as the Company shall think fit, and to subscribe or contribute or otherwise to assist or to guarantee money to charitable, benevolent, religious, scientific, national or other institutions or objects or for any exhibition, or for any public, general or useful objects, to any political party or for any political purpose to any individual or body.

28. To do all or any of the above things and all such other things as are incidental or may be thought conducive to the attainment of the above objects or any of them in any part of the world, and as principals, agent, contractors, trustees or otherwise and by or through trustees, agents or otherwise and either alone or in conjunction with others, and so that the word "Company" in this Memorandum when applied otherwise than to this Company shall be deemed to include any authority, partnership or other body of persons whether incorporated or not and whether domiciled in India or elsewhere.

29. To apply for, purchase or otherwise acquire any patents, brevets d'invention, licences, concessions, and the like, conferring any exclusive or non-exclusive or limited right to use any secret or other information as to any invention which may seem capable of being used for any of the purposes of the Company, or the acquisition of which may seem calculated, directly or indirectly to benefit the Company, and to use, exercise, develop, grant licences in respect of or otherwise turn into account the property rights or information so acquired.

30. To establish, promote, subsidise and otherwise assist any company or companies, syndicate or other concern for the purpose of setting up any industry or running and industrial undertaking, acquiring any property or furthering any of the objects of this Company.

31. To do any work, necessary or convenient for the purpose of the Company.

32. To construct, improve, maintain, develop, work, manage, carry out or control any roads, ways, tramways, railways, branches or sidings, bridges, reservoirs, water courses, wharves, manufactories, warehouses, electric works, shops, stores and other works and conveniences, which may seem calculated directly or indirectly to advance the Company's interest and to contribute to, subsidise or otherwise assist or take part in the construction, improvement, maintenance, working, management, carrying, out or control thereof.

33. To develop and turn to account any land acquired by the Company or in which it is interested, and in particular by laying out and preparing the same for building purposes, constructing, altering, pulling down, decorating, maintaining, fitting up, and improving buildings and by planting, paving, draining (farming cultivating and letting on building lease or building agreement) and by advancing money to and entering into contracts and arrangements of all kinds with builder and others.

34. To apply for and take out, purchase or otherwise acquire any trade mark, patents, patent rights, inventions, copy right, designs of secret processes, which may be useful for the Company's objects, and to grant licences to use the same, and to work, develop, carry out, exercise and turn to account the same.

35. To issue, or guarantee the issue of, or the payment of interest on the shares, debentures, debenture stock, or other securities or obligations, of any company or association and to pay or provide for brokerage commission and underwriting in respect of any such issue.

36. To receive grants, loans, advances or other money's or deposit, or otherwise from State or Central Government, Banks, Companies, Trusts, or individuals with or without allowance of interest thereon.

37. To acquire by subscription, purchase or otherwise, and to accept and take hold and sell, shares or stock in any company, society or undertaking, the objects of which shall, either in whole or in part, be similar to those of this Com-

38. To establish, maintain, subscribe to or subsidise or become member of training institutions, research laboratories, research institutions, and experimental workshops for scientific and technical research and experiments.

39. To instal and work, pilot, proto-type or semi-scale units or full commercial plants to develop a particular invention or inventions.

40. To act as agent for Government or other authorities or any manufacturers, merchants and others and to transact and carry on agency business of every kind and of any description.

41. To employ or pay experts, foreign consultants, etc., in connection with the planning and development of all or any of the business connected with the Company's operations.

42. To create any depreciation fund reserve fund, sinking fund, insurance fund, or and special or other fund, whether for depreciation or for repaying, replacing, improving, extending or maintaining any of the property of the Company or for redemption of debentures or redeemable preference shares or for special dividends or for special dividends or for equalising dividends or for any other purpose whatsoever, and to transfer any such fund or part thereof to any of the other funds therein mentioned.

43. To use trade marks or trade names or brands for the products and goods of the Company and adopt such means of making known the business and products of the Company or of any company in which this Company is interested as may seem expedient and in particular by advertising in newspapers, magazines, periodicals by circulars, by purchase and exhibition of works of art or interest, by opening stalls and exhibitions, by publication and distribution of books and periodicals, calendars, almanacs and diaries, by distributing samples and by granting prizes, rewards and donations.

44. To apply the assets of the Company in any way in or towards the establishment, maintenance or extension of any association, institutions or fund in any way connected with any particular trade or business or scientific research, industry or commerce.

46. To establish, maintain and operate technical training institutions and hostels for technical staff of all categories of officers, workers, clerks, technical and other personnel likely to be useful to or assist in any business which the Company is authorised to carry on.

47. To let out on lease or on hire, all or any of the property of the Company either immovable or movable including and all and every description of apparatus or appliances.

48. To establish agencies or branches in India and elsewhere and to regulate and discontinue the same.

(C) The other objects of the Company not indicated in (A) and (B) are :-

1. To carry on the business of iron and steel and tool makers, metal workers, mechanists, iron and steel converters, metallurgists, and to buy, sell, manufacture, repair, convert, alter, let on hire and deal in machinery, implements, rolling stock, and metal and hardware of all kinds and to undertake and execute any contracts or other works, involving supply or use of any machinery or any tools and to carry out any ancillary or other works comprised therein.

2. To carry on the business of manufacturers of and dealers in paper of all kinds, and articles made from paper or pulp, and materials used in the manufacture or treatment of paper, including cardboard, railway and other tickets, mill boards, and wall and ceiling papers.

3. To carry on the business of manufacturers, producers, refiners, developers and dealers in all kinds of metals, minerals, chemicals, substances and products, whether natural or artificial including in particular, but without limitation, plastics, resins and goods and articles made from the same and compounds, intermediates, derivatives and by-products thereof.

4. To carry on the business of iron and steel and tool makers, metal workers, mechanists, iron and steel converters, metallurgists, and to buy, sell, manufacture, repair, convert, alter, let on hire and deal in machinery, implements, rolling stock and other like goods and the production and working of metals and minerals of all kinds and the production manufacture and preparation of any other materials which may be usefully or conveniently combined with the engineering or manufacturing business of the Company.

IV. The liability of the members is limited.

V. The share capital of the Company is Rs. 15.00 crores divided in to 1,50,000 equity shares of Rs. 1,000/- each. Subject to the provisions of the Act, the Company has the power from time to time to increase or reduce its capital as equity and preference shares and to attach to any class or classes of such shares, any preferences, rights, privileges, or priorities in payment of dividends, or distribution of assets or otherwise over any other shares, or to subject the same to any restrictions or limitations of conditions, and to vary the regulation of the Company as far as necessary to give effect to the same and upon the subdivision of a share to apportion the right to participate in profits in any manner.

We the several persons, whose names and addresses are subscribed hereto, are desirous of being formed into a Public Limited Company in pursuance of this Memorandum of Association and we respectively agree to take the number of shares in the capital of the Company set opposite to our respective names.

ARTICLES OF ASSOCIATION OF TAMIL NADU CEMENTS CORPORATION LIMITED



Handwritten signature

No.	Name, address, description and occupation of subscribers	No. of equity shares taken by each subscriber	Signature of subscribers	Right to act as witnesses and their addresses, description and occupation.
1.	C. V. R. PANIKAR, S/o Thiru I. A. Panikar Chairman & M.D. TIDCO, 150-A, Anna Salai, Madras-2	ONE	(Sd.) C. V. R. PANIKAR	(Sd.) A. Duraispandian Spl. Officer for Tamilnad Cements, 150-A, Anna Salai, Madras-2
2.	S. GUHAN S/o Dr. K. S. Sanjivi Finance Secretary Govt. of Tamil Nadu	ONE	(Sd.) S. GUHAN	(Sd.) S. Ramamurthy, Production Manager, Tamilnad Cements, Alangulam
3.	A. PADMANABAN S/o D. Annadani Secretary (Industries) Govt. of Tamil Nadu	ONE	(Sd.) A. PADMANABAN	(Sd.) G. Muthukrishnan Deputy Secretary, TIDCO, Madras-2
4.	A. S. PADMANABAN S/o A. P. Subramaniam General Manager, Tamilnad Cements, Alangulam, Ramanathapuram Dt.	ONE	(Sd.) A. S. PADMANABAN	(Sd.) A. Duraispandian Special Officer for Tamilnad Cements, 150-A, Anna Salai, Madras-2
5.	K. P. GEETHAKRISHNAN S/o Dr. K. R. Parthasarathy, Director (Finance) TIDCO 150-A, Anna Salai, Madras-2	ONE	(Sd.) K. P. GEETHAKRISHNAN	
6.	K. PALANIMANICKAM S/o Kulandaiya Development Manager, TIDCO 150-A, Anna Salai, Madras-2	ONE	(Sd.) K. PALANIMANICKAM	
7.	A. M. THANGARAJ S/o Thiru E. Asirvatham Secretary, TIDCO 150-A, Anna Salai, Madras-2	ONE	(Sd.) A. M. THANGARAJ	
Total			Seven	

Dated at Madras this Ninth day of February, 1976

OF

TAMIL NADU CEMENTS CORPORATION LIMITED

Definitions :—In these articles unless the context otherwise requires—

- I. "The Company" means the Tamil Nadu Cements Corporation Limited.
- II. "The Act" means the Companies Act, 1956 (Central Act of 1956).
- III. "The Office" means the Registered Office for the time being of the Company.
- IV. "TIDCO" means Tamilnadu Industrial Development Corporation Limited.
- V. "The Register" means the register of members to be kept pursuant to Section 150 of the Act.
- VI. "Dividend" includes bonus.
- VII. "Capital" means the capital for the time being raised or authorised to be raised for the purpose of the Company.
- VIII. "Shares" means the shares or stock into which the capital is divided and the interest corresponding with such shares or stock.
- IX. "Board" means Board of Directors.
- X. "The Directors" means the Directors for the time being of the Company.
- XI. "Persons" includes any Company or Association or Body of individuals whether incorporated or not.
- XII. "Month" means a calendar month.

graphy and other modes representing or reproducing words in a visible form.

XIV. "Executor" or "Administrator" means a person who has obtained probate or letters of administration as the case may be, from a competent court.

XV. "Regulation of the Company" means the regulations for the time being in force for the management of the Company.

XVI. "Seal" means the common seal for the time being of the Company.

XVII. "The Chairman" means the Chairman of the Board of Directors for the time being of the Company.

Unless the context therein requires the words or expressions contained in these articles shall bear the same meaning as in the Act.

Company to be a Public Company.

2. The Company is a Public Limited Company :

(a) The right of transfer of shares shall be restricted as hereinafter provided.

3. The regulations contained in Table 'A' in the first Schedule to the Act shall apply to the Company except in so far as they have been specifically excluded by or under these Articles.

4. The regulations for the management of the Company and for the observance of the members thereof and their representatives shall subject to any exercise of the statutory powers of the Company in reference to the repeal or alteration of or addition to its regulations by special resolution as prescribed or permitted by the Act, be such as are contained in these Articles.

5. The Capital of the Company is Rs. 12,50,00,000 (Rupees twelve Crores and five lakhs) divided in to 1,25,00,000 (one lakh and twenty five thousand) equity shares of Rs. 1,000 (Rupees one thousand) each.

purchased.

Allotment of shares.

7. Subject to the provisions of the Act and these Articles and to the rights of the TIDCO, the shares shall be under the control of the Board of Directors who may allot or otherwise dispose of the same to such persons on such terms and conditions as they think fit.

Subject to the provisions, if any in that behalf of the Memorandum of Association of the Company and without prejudice to any special rights previously conferred on the holders of existing shares in the Company, any share in the Company, may be issued with such preferred, deferred or other special rights, or such restrictions, whether in regard to dividend, voting rights of share capital or otherwise, as the Company may from time to time by special resolution determine, and any preference share may with the sanction of a special resolution be issued on the terms that it is, or at the option of the Company is liable to be redeemed.

Commission.

8. The Company may at any time pay a commission to any person for subscribing or agreeing to subscribe whether absolutely or conditionally for any shares, debentures or debenture stock of the Company or procuring or agreeing to procure subscriptions (whether absolute or conditional) for any shares debentures or debenture stock of the Company so that if the commission in respect of shares shall be paid or payable out of capital or out of profits, the statutory conditions and requirements shall be observed and complied with and the amount or rate of commission shall not exceed 5 per cent of the price at which the shares are issued and 2½ per cent of the price at which debentures or debenture stock are issued in each case subscribed or to be subscribed. The commission may be paid or satisfied in cash or in shares, debentures or debenture stock of the Company.

Share Certificates.

9. Every person whose name is entered as a member in the register shall without payment of any fee or charge, be entitled to a certificate under the seal of the Company specifying the share or shares held by him and the amount paid thereon.

Provided that, in respect of a share or shares held jointly

Particulars on Share Certificates.

10. Every certificate of shares shall specify the number and denoting numbers of the share in respect of which it is issued and the amount paid up thereon and shall be signed by at least two Directors subject to Companies (Issue of Share Certificates) Rules, 1960.

Issue of new Share Certificate in place of one defaced, torn or old, decrepit, worn out or lost or destroyed.

11. If any Share Certificate is defaced, torn or old, decrepit, worn out, or there is no further space on the back thereof for endorsement of transfer, then, upon the surrender thereof to the Company, it may order the same to be cancelled and issue a new certificate in lieu thereof.

If any share Certificate is lost or destroyed, it may be renewed on obtaining prior consent of the Board and on payment of a fee of 50 Paise and in such reasonable terms, if any, as to evidence and indemnity and the payment of out-of-pocket expenses incurred by the Company in investigating evidence, as the Directors think fit.

Calls on shares.

12. The Board of Directors may, from time to time make calls upon the members in respect of any moneys unpaid on their shares and specify the time or times of payments and each member shall pay to the Company at the time or times so specified the amount called on his shares.

Provided, however, that the Board of Directors may, from time to time at their discretion extend the time fixed for the payment of any call.

When interest on call payable.

13. If the sum payable in respect of any call be not paid on or before the day appointed for payment thereof, the holder for the time being, or the allottee of the share in respect of which a call shall have been made, shall pay interest on the same at such rate not exceeding 6 per cent per annum at the Board of Directors shall fix from the day appointed for the payment thereof to the time of actual payment but the Board of Directors may waive payment of such interest, wholly or in part.

Forfeiture of shares.

14. (1) If a member fails to pay any call, or instalment of a call, on the day appointed for payment thereof, the Board may, at any time thereafter during such time as any part of the call or

instalment of the call or instalment as is unpaid together with any interest which may have accrued.

(a) The notice aforesaid shall name a further day (not being earlier than the expiry of fourteen days from the date of service of the notice) on or before which the payment required by the notice is to be made; and

(b) state that, in the event of non-payment on or before the day so named, the shares in respect of which the call was made will be liable to be forfeited.

(3) If the requirements of any such notice as aforesaid are not complied with any share in respect of which the notice has been given may, at any time, thereafter before the payment required by the notice has been made, be forfeited by a resolution of the Board to that effect.

(4) A forfeited share may be sold or otherwise disposed on such terms and in such manner as the Board thinks fit.

(5) At any time before a sale or disposal of the forfeited shares as aforesaid, the Board may cancel the forfeiture on such terms as it thinks fit.

Effects of forfeiture.

15. (1) A person whose shares have been forfeited shall cease to be a member in respect of the forfeited shares but shall notwithstanding the forfeiture, remain liable to pay to the Company all moneys which on the date of forfeiture, were presently payable by him to the Company in respect of shares.

(2) The liability of such persons shall cease if and when the Company shall have received payment in full of all such money in respect of the shares.

Declaration of for forfeiture.

16. (1) A duly verified declaration in writing that the declarant is a Director, the Manager or the Secretary of the company and that a share in the Company has been duly forfeited on a date stated in the declaration shall be conclusive evidence of the facts therein stated as against all persons claiming to be entitled to the share.

(2) The Company may receive the consideration, if any, given for the share or any sale or disposal thereof and may execute a transfer of the share in favour of the person to whom the share is sold or disposed of.

(4) The transferee shall not be bound to see to the application of the purchase money, if any, nor shall his title to the share be affected by any irregularity or invalidity in the proceedings in reference to the forfeiture sale or disposal of the shares.

Provisions regarding forfeiture to apply in the case of non-payment of sums payable at a fixed time.

17. The provisions of these articles as to forfeiture shall apply in the case of non-payment of any sum which, by terms of issue of a share, becomes payable at a fixed time, whether on account of the nominal value of the share or by way of premium as if the same had been payable by virtue of a call duly made and notified.

Payment in anticipation of calls may carry interest.

18. The Board of Directors may, if they think fit, receive from any member willing to advance the same, all or any part of the moneys due upon the shares held by him beyond the sums actually called for and upon the moneys so paid in advance or so much thereof as from time to time exceeds the amount of calls then made upon the share in respect of which such advance has been made, the Company may pay interest at such rate not exceeding 6 percent per annum as the members paying such sum in advance and the Directors agree upon. The Board of Directors may, at any time, repay the amount so advanced upon giving to such member three months' notice in writing.

Joint holders liability to pay.

19. The joint holders of a share shall be jointly and severally liable to pay all calls in respect thereof.

Company's lien on share.

20. The Company shall have the first and paramount lien on every share (not being a fully paid share) for all moneys (whether presently payable or not) called or payable at a fixed time in respect of that share, and the Company shall also have a lien on all shares (other than fully paid shares) standing registered in the name of a single person, for all moneys presently payable by him or from his estate to the Company, but the Board of Directors may, at any time, declare any share to be wholly or in part exempt from the provisions of this article. The Company's lien, if any, on the share shall extend to all dividends payable thereon.

Enforcement of lien by sale.

21. The Company may sell, in such manner as the Board of Directors think fit, any shares on which the Company has a lien, but no sale shall be made unless a sum in respect of

demanding payment of such part of amount in respect of which the lien exists as is presently payable has been given to the registered holder for the time being of the share, or the persons entitled thereto by reason of his death or insolvency.

Application of proceeds of sales.

22a. The proceeds of the sale shall be received by the Company, and shall be applied in payment of such part of the amount in respect of which the lien exists as is presently payable, and the residue if any shall (subject to a lien for sums not presently payable as existed upon the shares prior to the sale) be paid to the persons entitled to the shares at the date of the sale. The purchaser shall be registered as the holder of the shares and he shall not be bound to see to the application of the purchase money, nor shall his title to the shares be affected by any irregularity or invalidity in the proceedings in reference to the sale.

Registration of shares.

23. Subject to section 111 of the Act, the Board of Directors may in their absolute discretion refuse to register any proposed transfer of shares.

Notice of refusal to register transfer.

24. If the Board of Directors refuse to register the transfer of any shares they, shall within two months of the date on which the instrument of transfer is delivered to the Company send to the transferee and the transferor notice of the refusal.

Company not bound to recognise any interests in shares other than that of the registered holders.

25. Save as herein otherwise provided, the Board of Directors shall be entitled to treat the person whose name appears on the register of members as the holder of any share, as the absolute owner thereof and accordingly shall not (except as ordered by a court of competent jurisdiction or as by law required) be bound to recognise any *beneficial* trust or equity or equitable contingent or other claim to or interest in such share on the part of any persons, whether or not it shall have express or implied notice thereof.

Execution of transfer.

26. The instrument of transfer of any share in the Company shall be executed both by the transferor and transferee and the transferor shall be deemed to remain holder of the share until the name of the transferee is entered in the register of members in respect thereof.

(a) The instrument of transfer is in the prescribed form and complies with all the formalities prescribed under section 108 (1A) of the Act.

(b) The instrument of transfer is accompanied by the certificate of shares to which it relates and such other evidence as the Board may reasonably require to approve the title of the transferor to make the transfer.

(c) The instrument of transfer is in respect of only one class of shares.

Transfer to be left at office and evidence of title to be given.

28. Every instrument of transfer shall be left at the office for registration, accompanied by the certificate of shares to be transferred, and such evidence as the Company may require to prove the title of the transferor or his right to transfer the shares. All instruments of transfer shall be retained by the Company, but any instrument of transfer which the Board may decline to register shall on demand, be returned to the persons depositing the same.

Transmission by operation of law.

29. Nothing contained in Article 23 shall prejudice any power of the Company to register as shareholder any persons to whom the right to any shares in the Company has been transmitted by operation of law.

No Fee on transfer.

30. The Company shall not charge any fees for transfers or transmissions in respect of any number of shares of the Company.

When register of members and debenture holders may be closed.

31. The register of members or the register of debenture holders may be closed for any period or periods not exceeding in the aggregate 45 days in any year but not exceeding 30 days at any one time after giving not less than 7 days previous notice by advertisement in some newspaper circulating in the District in which the registered office of the Company is situated.

Director's right to refuse registration subject to the provision of Section 111 of the Act.

32. The Board of Directors shall have the same right to refuse to register the name of a person entirely, by transmission to any shares or his nominee as if he were the transferee named in an ordinary transfer presented for registration.

33. Subject to such directions as may be issued by the Directors, the share capital by such sum, to be divided into shares of such amount, as may be specified in the resolution.

34. Subject to such directions as may be issued by the Directors, the share capital by such sum, to be divided into shares of such amount, as may be specified in the resolution.

On what condition new shares may be issued.

35. Subject to such directions as may be issued by the Directors, the share capital by such sum, to be divided into shares of such amount, as may be specified in the resolution.

36. Subject to such directions as may be issued by the Directors, the share capital by such sum, to be divided into shares of such amount, as may be specified in the resolution.

How far new shares to rank with shares in original capital

37. Subject to the provisions of Sections 100 to 104 of the Act, and to such directions as may be issued by the Directors, the share capital by such sum, to be divided into shares of such amount, as may be specified in the resolution.

New shares to be offered to Members.

38. Subject to the provisions of Sections 100 to 104 of the Act, and to such directions as may be issued by the Directors, the share capital by such sum, to be divided into shares of such amount, as may be specified in the resolution.

Reduction of Capital.

paid off upon the footing that it may be called up again or otherwise and the Board of Directors may, subject to the provisions of the Act, accept surrender of shares.

Sub-division and consolidation of shares.

38. Subject to the approval of TIDCO, the Company in general meeting may, from time to time, sub-divide or consolidate its shares or any of them and exercise any of the other powers conferred by Section 94 of the Act and shall file with the Registrar such notice of exercise of any such powers as may be required by the Act.

Power to modify.

39. If at any time, the capital, by reason of the issue of preference shares or otherwise, is divided into different classes of shares, all or any of the rights and privileges attached to each class may, subject to the provisions of Sections 105 and 107 of the Act be modified, abrogated or dealt with by agreement between the Company and by any person purporting to contact on behalf of that class. Provided such agreement is (a) ratified in writing by the holders of shares of that class or at least three-fourths of the nominal issue value of them or (b) confirmed by a resolution passed at a separate general meeting and supported by the votes of at least three-fourths of the holders of shares of that class and all the provisions hereinafter contained as to general meeting shall mutatis mutandis apply to every such meeting, except that the quorum thereof shall be members holding, or representing by proxy one-fifth of the nominal amount of the issued shares of that class. This Article shall not by implication curtail the power of modification which the Company would have if the Article were omitted.

Power to borrow.

40. Subject to the approval of TIDCO, the Board of Directors may from time to time, borrow, or secure the payment of any sum or sums of money for the purposes of the Company by means of a resolution passed at a meeting of the Board.

Conditions on which money may be borrowed.

41. The Board of Directors may, subject to the approval of TIDCO, secure the repayment of such moneys in such manner and upon such terms and conditions in all respect as they think fit and in particular, by the issue of bonds, perpetual, or redeemable debentures or debenture stock or any mortgage, charge or other security on the undertaking of the whole or any part of the property of the Company (both present and future) including its uncalled capital for the time being.

Securities may be assignable free from equities.

42. Debentures, debenture-stock, bonds or other securities may be made assignable free from any equities between the Company and the person to whom the same may be issued.

Issue at discount etc., or with special privilege.

43. Subject to the approval of TIDCO and the provisions of Section 117 of the Act, any debentures debenture stock, bonds or other securities may be issued at a discount, premium or otherwise, and with any special privileges as to redemption, surrender, drawings, allotment of shares, attending general meetings of the Company, appointment of Directors and otherwise.

Persons not to have priority over any prior charge.

44. Whenever any uncalled capital of the Company is charged all persons taking any subsequent charge thereon shall take the same subject to such prior charge and shall not be entitled by notice to the shareholders or otherwise to obtain priority over such prior charge.

Indemnity may be given.

45. If the Directors or any of them or any other persons shall become personally liable for the payment of any sum properly due from the company, the Directors may execute or cause to be executed any mortgage, charge or security over or affecting the whole or any part of the assets of the Company by way of indemnity to secure the Directors or persons so becoming liable as aforesaid from any loss in respect of such liability.

General Meetings.

46. The first Annual General Meeting of the Company shall be held within eighteen months of its incorporation. The Company shall in each calendar year hold in addition to any other meetings an Annual General Meeting. Not more than 15 months shall elapse between the date of one Annual General Meeting and that of the next. The first Annual General Meeting and the subsequent Annual General Meetings of the Company shall be held in accordance with the provisions of Section 166 of the Act. All meetings of the Company other than the Annual General Meetings shall be called Extraordinary Meetings.

When extraordinary meeting to be called.

47. Subject to the provision of Section 169 of the Act the Board of Directors may whenever they think fit and they shall, on the requisition of the holders of not less than one-tenth of the paid up capital of the Company as at that date carried a right of voting in regard to that matter and on which all calls or other sums then due have been paid forthwith

proceed to convene an extraordinary meeting of the Company and in the case of such requisition the following provisions shall have effect—

(1) The requisition must state the objects of the meeting and must be signed by the requisitionists and deposited at the office and may consist of several documents in like form each signed by one more or requisitionists.

(2) If the Board of Directors of the Company do not proceed within twenty one days from the date of the deposit of the valid requisition to cause a meeting to be called for the consideration of these matters on a day not later than forty five days from the date of the deposit of the requisition, the requisitionists or a majority of them in value may themselves convene the meeting, but any meeting so convened shall be held within three months from the date of the deposit of the requisition.

(3) Any meeting convened under this Article by the requisitionists shall be convened in the same manner as nearly as possible as that in which meetings are to be convened by the Board of Directors. If, after a requisition has been received, it is not possible for sufficient number of Directors to meet in time so as to form a quorum, any Director may convene an Extraordinary General Meeting in the same manner as nearly as possible as that in which meetings may be convened by the Board of Directors.

Notice of meeting.

48. A General meeting of the Company may be called by giving not less than twenty one days' notice in writing specifying the place, day and hour of meeting, with a statement of the business to be transacted at the meeting. Such notice shall be served on every member in the manner herein after provided, but with the consent in writing of all the members entitled to receive notice of same, any particular meeting may be convened by such shorter notice and in such manner as those members may think fit.

Provided however, that where any resolution is intended to be passed as a special resolution at any general meeting as required by sub-section (2) of section 189 of the Act, notice of such meetings specifying the intention to propose the resolution as a special resolution shall be served.

Omission to give notice.

49. The accidental omission to give notice to, or the non-receipt of notice by, any member or other person to whom it should be given shall not invalidate the proceedings at the meeting.

Business of Annual General Meeting.

50. The business of an annual general meeting shall be to receive and consider the profit and loss account, the balance sheet, and the report of the Directors and of the auditors, to declare dividends, and to appoint Directors in the place of those retiring. All other business transacted at an annual general meeting, and all business transacted at an extraordinary meeting shall be deemed special business.

Quorum.

51. Five members present in person shall be a quorum for a general meeting.

Right of TIDCO to appoint any person as their representative.

52. (1) TIDCO so long as they are the share holders of the Company, may from time to time, appoint one or more persons who need not be a member or members of the Company, to represent them at all or any meetings of the Company.

(2) Any one of the persons appointed under sub-clause (1) of this Article who is personally present at the meeting shall be deemed to be a member entitled to vote and be present in such meetings and to vote on their behalf whether on a show of hands or on a poll.

(3) TIDCO may, from time to time cancel any appointment made under sub-clause (1) of this Article and make fresh appointments.

(4) Any person appointed by TIDCO under this Article may if so authorised, by such order, appoint a proxy, whether specially or generally.

Chairman of general meeting.

53. The Chairman of the Board of Directors shall be entitled to take the Chair at every general meeting or if there be no such Chairman, or if at any meeting he shall not be present within fifteen minutes after the time appointed for holding such meeting or is unwilling to act as Chairman, the members present shall choose another Director as Chairman, and if no Director shall be present or if all the Directors present decline to take the Chair, then, the members present shall choose one of their members to be Chairman.

If quorum not present when meeting to be dissolved and when to be adjourned.

How questions to be decided at meeting.

What is to be evidence of passing of a resolution, where poll not demanded.

Poll.

Power to adjourn General Meeting.

In what cases Poll taken without adjournment.

54. If within fifteen minutes from the time appointed for the meeting a quorum is not present, the meeting convened upon such requisition as aforesaid, shall be dissolved; but in any other case it shall stand adjourned to the same day in the next week at the same time to place, and if at such adjourned meeting a quorum is not present, those members who are present shall be a quorum and may transact the business for which the meeting was called.

55. Every question submitted to a meeting shall be decided by a show of hands and in the case of an equality of votes, the Chairman shall have a casting vote in addition to the vote or votes to which he may be entitled as a member.

56. At any general meeting a resolution put to vote of the meeting shall be decided on a show of hands, unless a poll is, before or on the declaration of the result of the show of hands, demanded by a member present in person or by proxy or by duly authorised representative and unless a poll is so demanded, a declaration by the Chairman that a resolution has or has not, on a show of hands, been carried or carried unanimously or by a particular majority, and an entry to that effect in the book of proceedings of the Company, shall be conclusive evidence, of the fact, without proof of the number or proportion of the vote recorded in favour of or against that resolution.

57. If a poll is duly demanded, it shall be taken in such manner and at such time and place as the Chairman of the meeting directs and either at once, or after an interval or adjournment or otherwise, and the result of the poll shall be deemed to be resolution of the meeting at which the poll was demanded. The demand of a poll may be withdrawn.

58. The Chairman of a general meeting may, with the consent of the meeting, adjourn the same, from time to time and from place to place, but no business shall be transacted at any adjourned meeting other than the business left unfinished at the meeting from which the adjournment took place.

59. Subject to the provisions of Section 180 of the Act, any poll duly demanded on the election of a Chairman of a meeting or on any question of adjournment shall be taken at the meeting and without adjournment.

60. The demand of a poll shall not prevent the continuance of a meeting for the transaction of any business other than the question on which a poll has been demanded.

61. The Chairman of any meeting shall be the sole judge of the validity of every vote tendered at such meeting. The Chairman present at the taking of poll shall be the sole judge of the validity of every vote tendered at such poll.

62. Upon a show of hands every member present in person shall have one vote and upon a poll every member present in person or by proxy or by duly authorised representative shall have voting rights in proportion to his share of the paid up equity capital of the Company.

63. A proxy shall not be entitled to vote on a show of hands.

64. Any person entitled under the transmission clause to any share may vote at any general meeting in respect thereof in the same manner as if he were the registered holder of such shares provided that forty eight hours at least before the time of holding the meeting or adjourned meeting as the case may be, at which he proposes to vote, he shall satisfy the Board of Directors of his right to such shares, unless the Board of Directors shall have previously admitted his right to such shares or his right to vote at such meeting in respect thereof.

65. Where there are joint registered holders of any share any one of such persons may vote at any meeting either personally or by proxy, in respect of such shares as if he were solely entitled thereto, and if more than one such joint holders be present, the joint holder whose name stands first on the register in respect of such share shall alone be entitled to vote in respect thereof. Several executors or administrators of a deceased member in whose name any share stands shall for the purpose of this clause be deemed joint holder thereof.

66. A member of unsound mind, or in respect of whom an order has been made by any court having jurisdiction in lunacy may vote either on a show of hands or on poll by his committee or other legal guardian, and any such committee or guardian may on a poll, vote by proxy.

Business may proceed not withstanding demand of poll.

Chairman's Decision conclusive.

Votes of Members.

Voting by proxy on show of hands.

Votes in respect of Shares of Deceased and Bankrupt Members.

Joint Holders.

Votes in respect of shares of Members of Unsound Minds.

Time for objection to vote.

73. No objection shall be made to the validity of any vote except at the meeting or poll at which such vote shall be tendered, and every vote whether given personally or by proxy, not disallowed at such meeting or poll, shall be deemed valid for all purposes of such meeting or poll whatsoever.

Number of Directors.

74. (c) Until otherwise decided by the Company in a General Meeting, the number of Directors shall not be less than three and more than fifteen. The Directors are not required to hold any qualification shares.

(b) One third of the Board of Directors shall be appointed by TIDCO, while the remaining 2/3 shall be appointed by the Company at the Annual General Meeting.

(c) At the Annual General Meeting in every year, one third of the Board of Directors for the time being other than the Directors appointed by the TIDCO shall be liable to retirement by rotation or if their number is not three or a multiple of three, then the number nearest to one-third shall retire from office.

(d) The Directors to retire in every year shall be those who have been longest in office since their last election, but as between the persons who became Directors on the same day, those who retire shall unless they otherwise agree among themselves, be determined by lot.

(e) TIDCO shall have the power to remove any Director appointed by them at any time in their absolute discretion.

(f) The following shall be the first Directors of the Company.

1. Thiru C. V. R. Panikar, I.A.S.,
Chairman and Managing Director,
TIDCO, Madras-2.
2. Thiru K. P. Geethakrishnan, I.A.S.,
Director (Finance),
TIDCO, Madras-2.

67. On a poll, votes may be given either personally or by proxy or by duly authorised representative.

68. A member entitled to attend and vote at a meeting may appoint another person (whether a member or not) as his proxy to attend a meeting and vote on a poll. No member shall appoint more than one proxy to attend on the same occasion. A proxy shall not be entitled to speak at a meeting or to vote except on a poll. The instrument appointing a proxy shall be in writing and be signed by the appointer or his attorney duly authorised in writing or if the appointer is a body corporate, be under its seal or be signed by an officer or an attorney duly authorised by it.

69. The instrument appointing a proxy and the power of attorney or other authority, if any, under which it is signed, or a notari ally certified copy of that power or authority, shall be deposited at the registered office of the Company not less than forty eight hours before the time for holding the meeting or adjourned meeting at which the person named in the instrument proposes to vote, or, in the case of a poll not less than 24 hours before the time appointed for taking of the poll and in default the instrument of proxy shall not be treated as valid.

70. A vote given in accordance with the terms of an instrument of proxy shall be valid notwithstanding the previous death or insanity of the principal or the revocation of the proxy or of the authority under which the proxy was executed or the transfer of the shares in respect of which the proxy is given, provided that no intimation in writing of such death, insanity, revocation, or transfer or transmission shall have been received at the office of the Company before the commencement of the meeting or adjourned meeting at which the proxy is used.

71. The instrument appointing a proxy shall be in either of the forms in schedule IX to the Act, or a form as near thereto as circumstances admit.

72. No member shall be entitled to be present, or to vote on any question either personally or by proxy at any general meeting or upon a poll, or be reckoned in quorum whilst any call or other sum shall be due and payable to the Company in respect of any of the shares of such members.

Proxies permitted.

Instrument appointing Proxy to be in writing.

Instrument Appointing Proxy to be deposited at Office.

When vote by proxy valid though Authority revoked.

Form of Proxy.

No Member entitled to vote etc., while call due to Company.

3. Thiru A. Padmanabhan, I. A. S.
Secretary to Government of Tamilnadu,
Industries Department, Madras-9.

4. Thiru S. Guhan, I. A. S.
Special Secretary to Govt. of Tamilnadu,
Finance Department, Madras-9

5. Thiru B. Vijaya Raghavan, I. A. S.
Secretary to Govt. of Tamilnadu,
Public Works Department, Madras-9.

6. Thiru K. Venkatesan, I. A. S.
Director of Industries and Commerce,
Chennai, Madras-5.

7. Thiru R. A. Seetharam Das, I. A. S.
Chairman and Managing Director,
Tamil Nadu Harijan Housing and
Development Corporation Ltd.,
Madras-6

8. Thiru P. Sivalingam, B. E. (HONS),
M. S. (Civil) F. I. E. (IND)
Chief Engineer,
Public Works Department,
Chennai, Madras-5.

74 (g) Notwithstanding anything to the contrary contained in these Articles, so long as any monies remain owing by the Company to the Industrial Development Bank of India (IDBI), Industrial Finance Corporation of India (IFCI), The Industrial Credit and Investment Corporation of India (ICICI) or to any other Finance Corporation or Credit Corporation or to any other Financing Company or Body out of any loans granted by them to the Company or so long as IDBI, IFCI, ICICI, or any other Financing Corporation or Credit Corporation or any other Financing Company or Body (each of which IDBI, IFCI, ICICI, or any other Finance Corporation or Credit Corporation or any other Financing Company or Body is hereinafter in this Article referred to as "the Corporation") continue to hold Debentures in the Company by direct subscription or private placement, or so long as the Corporation holds Shares in the Company as a result of underwriting or direct subscription or so long as any

Nominee Directors.

The Board of Directors of the Company shall have no power to remove from office the Nominee Director/s. At the option of the Corporation such Nominee Director/s shall not be required to hold any share qualification in the Company. Also, at the option of the Corporation such Nominee Director/s shall not be liable to retirement by rotation of Directors. Subject as aforesaid, the Nominee Director/s shall be entitled to the same rights and privileges and be subject to the same obligations as any other Director of the Company. The Nominee Director/s so appointed shall hold the said office only so long as any moneys remain owing by the Company to the Corporation or so long as the Corporation holds Debentures in the Company as a result of direct subscription or private placement or so long as the Corporation holds Shares in the Company as a result of underwriting or direct subscription or the liability of the company arising out of the Guarantee is outstanding and the Nominee Director/s so appointed in exercise of the said power shall ipso facto vacate such office immediately the moneys owing by the company to the Corporation is paid off or on the Corporation ceasing to hold Debentures Shares in the Company or on the satisfaction of the liability of the Company arising out of the Guarantee furnished by the Corporation.

The Nominee Director/s appointed under this Article shall be entitled to receive all notices of and attend all General Meetings, Board Meetings and of the Meetings of the Committee of which Nominee Director/s is a member/s as also the minutes of such meetings. The Corporation shall also be entitled to receive all such notices and minutes.

the Company shall pay to the Nominee Director/s sitting fees and expenses which the other Directors of the Company are entitled, but if any other fees, commission, monies or remuneration in any form is payable to the Director/s of the Company, the fees, commission, monies and remuneration in relation to such Nominee Director/s shall accrue to the Corporation and same shall accordingly be paid by the Company directly to the Corporation. Any expenses that may be incurred by the Corporation or such Nominee Director/s in connection with their appointment or Directorship shall also be paid or reimbursed by the Company to the Corporation or as the case may be to such Nominee Director/s.

Provided that if any such Nominee Director/s is an officer of the Corporation the sitting fees, in relation to such Nominee Director/s shall also accrue to the Corporation and the same shall accordingly be paid by the Company directly to the Corporation.

Provided further that if such Nominee Director/s is an officer of the Reserve Bank of India, the sitting fees in relation to such Nominee Director/s shall also accrue to IDBI and the same shall accordingly be paid by the company directly to IDBI.

In the event of the Nominee Director/s being appointed as whole time Director/s, such Nominee Director/s shall exercise such powers and such rights as are usually exercised or available to a whole time Director in the Management of the affairs of the Company. Such whole time Director/s shall be entitled to receive such remuneration fees, commission and monies as may be approved by the Corporation.

Casual vacancy.

75. If the office of any Director other than one appointed by TIDCO, becomes vacant before the expiry of the period of directorship in the normal course, the resulting casual vacancy may be filled up by the Board of Directors, at a meeting of the Board. Any person so appointed shall hold office only upto the date to which the Director in whose place he was appointed would have held office if the vacancy had not occurred as aforesaid.

In case of the Director appointed by TIDCO, the vacancy to be filled in by TIDCO and such Director shall hold office

upto the date to which the Director in whose place he was appointed would have held office if the vacancy had not occurred as aforesaid.

Additional Director.

76. The Board of Directors may, from time to time, appoint any person as an additional Director provided that the number of Directors and additional Directors together shall not exceed the maximum number of Directors fixed under Article 74 (a) above. Any person so appointed as an additional Director shall hold office upto the date of the next annual General Meeting of the Company.

77. The office of a Director shall be vacated if:

a. he is found to be of unsound mind by a Court of competent jurisdiction;

b. he has applied to be adjudicated an insolvent;

c. he is adjudged an insolvent;

d. he is convicted by a Court of any offence involving moral turpitude and is sentenced in respect thereof to imprisonment for not less than six months;

e. he absents himself from three consecutive meetings of the Board of Directors or from all meetings of the Board for a continuous period of three months, which ever is longer without obtaining leave of absence from the Board; or

- f. he (whether by himself or by any person, for his benefit or on his account) or any firm in which he is a partner or any private Company of which he is a Director accepts a loan or any guarantee or security for a loan from the Company in contravention of Section 295 of the Act;
- g. he acts in contravention of section 293 of the Act;
- h. he becomes disqualified by an order of Court under Section 203 of the Act;
- i. he is removed in pursuance of Section 284 of the Act.

Vacation of office by Directors.

(2) Notwithstanding anything in clauses (d), (e) and (h) aforesaid, the disqualification referred to in those clauses shall not take effect.

- (a) for thirty days from the date of the adjudication;
- (b) where any appeal or petition is preferred within the thirty days aforesaid against the adjudication, sentence or conviction resulting in the sentence, or order until the expiry of seven days, from the date of which such appeal or petition is disposed of; or
- (c) where within the seven days aforesaid, any further appeal or petition is preferred in respect of the adjudication, sentence, conviction or order and the appeal or petition, if allowed, would result in the removal of the disqualification, until such further appeal or petition is disposed of.

Alternate Director.

78. a. If a Director is absent from Tamil Nadu for a period of not less than three months, the Board of Directors or TIDCO, in case if that Director was their appointee may appoint an alternate Director during the said period of absence.

b. An alternate Director appointed as aforesaid shall not hold office as such for a period longer than that permissible to the original Director in whose place he has been appointed and shall vacate office if and when the original Director returns to the State in which meetings of the Board are ordinarily held.

Powers of General Meeting to increase or reduce number of Directors.

79. Subject to the provisions of Sections 252, 255 and 259 of the Act, the Company in General Meeting may increase or reduce the number of Directors subject to the limits set out in clause 74 (a) of the Articles of Association of the Company, and may also determine in what rotation the increased or reduced number is to retire.

Powers to remove Directors by ordinary resolution

80. Subject to the provisions of Section 284, the Company may by an ordinary resolution remove any Director who is subject to retirement by rotation before the expiration

of the period of office and by an ordinary resolution appoint another person in his stead; the person so appointed shall be subject to retirement at the same time as if he had become a Director on the day on which the Director in whose place he is appointed was last elected as Director.

Sitting fees and travelling allowance to the Directors.

81. The Directors shall be entitled to such sitting fees for attending meeting of the Board of Directors or a Committee or Subcommittee thereof, as may be fixed by the Board of Directors not exceeding Rs. One hundred and twenty-five per meeting.

In addition to the remuneration payable to them in pursuance of the Act, the Directors may be paid all travelling, hotel and other expenses properly incurred by them (i) in attending and returning from meetings of Board of Directors or any Committee thereof or (ii) in connection with the business of the Company.

General Power of Company vested in Board of Directors.

82. The business of the Company shall be managed by the Board of Directors who may pay all expenses incurred in getting the Company registered and may exercise all such powers of the Company as are not by the Act or any statutory modification thereof for the time being in force or by these articles required to be exercised by the Company in general meeting, subject nevertheless to the provisions of these Articles to the provisions of the Act, and to such regulations being not inconsistent with the provisions, as may be prescribed by the Company in general meeting but no regulation made by the Company in general meeting shall invalidate any prior act of the Directors which would have been valid if that regulation had not been made.

Specific powers to the Board of Directors.

83. Without prejudice to the general powers conferred by Article 76 and the other powers conferred by these Articles but subject to the provisions of section 202 of the Act, the Board of Directors shall have the following powers namely:—

(1) to purchase, take on lease or otherwise acquire for the Company, property rights or privileges which the Company is authorised to acquire at such price, and generally on such terms and conditions as they think fit;

(2) to authorise the undertaking of works of a capital nature, subject to the condition that all cases involving a

capital expenditure exceeding rupees ten lakhs shall be referred to TIDCO for their approval before authorization;

(3) to pay for any property, rights or privileges acquired by or services rendered to the Company either wholly or partially in cash or in shares, bonds, debentures or other securities of the Company and any such shares may be issued either as fully paid up or with such amount credited as paid up thereon as may be agreed upon; and any such bonds, debentures or other securities may be either specifically charged upon all or any part of the property of the Company and its uncalled capital or not so charged;

(4) to secure the fulfilment of any contracts or engagements entered into by the Company by mortgage or charge of all or any of the property of the Company and its uncalled capital alignment for the time being or in such other manner as they may think fit;

(5) to appoint at their discretion, remove or suspend such managers, secretaries, officers, clerks, agents and servants for permanent, temporary or special services, as they may from time to time, think fit, and to determine their powers and duties and fix their salaries or emoluments and to require security of such amount as they think fit in such instances;

Provided further that no post shall be created and no appointment of persons in any post of which the maximum of the time scale of pay is Rs.4,050/- per month or more shall be made without the prior approval of the State Government.

of TIDCO and the State Government.

(6) to appoint any person or persons (whether incorporated or not) to accept and hold in trust for Company any property belonging to the Company or in which it is interested or for any other purposes, and to execute, and do such deeds and things as may be requisite in relation to any such trust and to provide for the remuneration of such trustee or trustees;

(7) to institute, conduct, defend, compound or abandon any legal proceedings by or against the Company or its officers or otherwise concerning the affairs of the Company and also to compound and allow time for payment or satisfaction of any claims or demands by or against the Company;

(8) to refer any claims or demands by or against the Company to arbitration, and observe and perform the awards;

(9) to make and give receipts, releases and other discharges for money payable to the Company and for the claims and demands of the Company;

(10) to determine the person who shall be entitled to sign on the Company's behalf, bills, notes, receipts acceptances, endorsements, cheques, releases, contracts and documents;

(11) to appoint any person to be the attorney or agent of the Company with such powers (including power to sub-delegate) and upon such terms as may deem fit;

(12) to invest in the Reserve Bank of India or in such securities as may be approved by TIDCO and deal with any of the moneys of the Company upon such investments authorised by the Memorandum of Association of the Company (not being shares in this Company) and in such manner as they think fit, and from time to time to vary or release such investments;

(13) to execute in the name and on behalf of the Company in favour of any Director or other person who may incur or be about to incur any Personal liability for the benefit of the Company such mortgages of the Company's property (present and future, as they think fit and any such mortgage may contain a Power of sale and such other powers, covenants and provisions as shall be agreed upon;

(14) Subject to the approval of TIDCO, to give to any person employed by the Company a commission on the profits of any particular business transaction or a share in the general profits of the Company, and such commission or share of profits shall be treated as part of the working expenses of the Company;

(15) from time to time to make vary and repeal bye-laws for the regulation of the business of the Company, its officers and servants;

(16) to give, award or allow any bonus, pension, gratuity or compensation to any employee, of the Company or his widow, children or dependents, that may appear to the Directors just or proper, whether such employee, his widow, children or dependents have or have not a legal claim upon the Company;

(17) before declaring any dividend and subject to the approval of TIDCO, to set aside such portion of the profits of the Company as they may think fit, to form a fund to provide for such pensions, gratuities or compensation or to create any provident or benefit fund in such manner as the Directors may deem fit;

(18) from time to time and at any time to establish any Local Board for managing any of the affairs of the Company in any specified locality in the State of Tamil Nadu or out of the State of Tamil Nadu and to appoint any persons to be members of such Local Board and to fix their remuneration, and from time to time and at any time to delegate to any person so appointed any of the powers, authorities and discretion for the time being vested in the Directors other than their power to make call; and to authorise the members for the time being of any such Local Board or any of them to fill up any vacancies therein and to act notwithstanding vacancies and any such appointment or delegation may be made in such terms and subject to such conditions as the Directors may think fit and the Directors may at any time remove any person so appointed and may annul or vary any such delegation;

(19) to enter into all such negotiations and contracts and rescind and vary all such contracts and execute and do all such acts, deeds and things in the name and on behalf of the Company as they may consider expedient for or in relation to any of the matters aforesaid or otherwise for the purpose of the Company; and

(20) subject to Section 292 of the Act to delegate all or any of the powers, authorities and discretion for the time being vested in them, subject however to the ultimate control and authority being retained by them.

84. (1) TIDCO may appoint any one of the Directors of the Board to be the Managing and / or wholetime Director or Chairman for such period and upon such terms as it may think fit for the conduct or management of the business of the Company subject to the control and supervision of the Board of Directors. The Managing Director and / or wholetime Director or Chairman so appointed may be authorised by the Board to exercise such of the powers and discretion in relation to the affairs of the Company as are specifically delegated to him / them by the Board and are not required to be done by the Board of Directors of the Company at the General Meeting under the Act.

(2) The Managing Director and/or whole time Director or Chairman shall be paid such salary and allowances as may be fixed by TIDCO.

(3) In the absence of the Managing Director on leave or otherwise, the Board may with the previous approval of TIDCO, empower any other Director or Chairman or any Principal officer of the Company to perform all or any of his functions and duties provided that where such absence is not likely to exceed three months, the previous approval of TIDCO shall not be necessary.

85. The Directors shall cause minutes to be made in books provided for the purpose—

- (a) of all appointments of officers made by the Directors;
- (b) of the names of the Directors present at each meeting of the Directors and of any Committee of the Directors;
- (c) of all resolutions and proceedings at all meetings of the Company and of the Directors and of the Committees of Directors; and every Director present at any meeting of Directors or Committee of Directors shall sign his name in a book to be kept for the purpose.

Directors to cause Minutes to be made in the Books.

86. The seal of the Company shall not be affixed to any instrument except by the authority of a resolution of the Board of Directors and except in the presence of at least two Directors and Secretary or such other person as the Board may appoint for the purpose; and the said Directors and Secretary or the person aforesaid shall sign every instrument to which the seal is so affixed in his presence.

Seal.

87. The Directors may meet together for the transaction of business once in every three calendar months and at least four such meetings shall be held in every year. They may adjourn and otherwise regulate their meetings and proceedings as they think fit. One third of the total strength of Directors, (any fraction contained in that one third being rounded off as one) or minimum two disinterested directors whichever is higher shall be a quorum.

Meeting of Directors and quorum.

Appointment of Managing Director/Whole-time Director/Chairman

Place of meeting.

88. The meeting of the Board may be held at the registered office or anywhere else within the State of Tamil Nadu if it is in the interest of the Company.

Director may summon meeting.
How questions to be decided?

89. A Director may at any time convene a meeting of the Board of Directors and questions arising at any meetings shall be decided by majority of votes. The Chairman shall have a second or casting vote.

Power of quorum.

90. A meeting of the Board of Directors at which a quorum is present shall be competent to exercise all or any of the authorities, powers and discretion by or under the Articles of the Company for the time being vested in or exercisable by the Board of Directors generally.

Chairman of Directors' Meetings.

91. TIDCO may nominate a Director as Chairman of the Directors' meetings and determine the period for which he is to hold office. If no such Chairman is nominated, or if at any meeting the Chairman is not present within 5 minutes after the time for holding the same, the Directors present may choose one of their members to be Chairman of the meeting.

Powers of Chairman.

92. The Chairman shall reserve for the decision of TIDCO any proposals or decisions of the Board of Directors or any matter brought before the Board which arises, in the opinion of the Chairman an important issue and which is on that account fit to be reserved for the decision of TIDCO and no decision on such an important issue shall be taken in the absence of the Chairman appointed by TIDCO.

In respect of matters reserved by the Chairman for decision of TIDCO, if the TIDCO's views are not received within a period of two months, the Board of Directors shall be entitled to act in accordance with the proposal or decision without further reference to TIDCO.

Delegation of Powers of Committees.

93. The Board of Directors may, subject to the restrictions laid down in Section 292 of the Act, delegate any of their powers to Committees consisting of such member or members of their body as they think fit and may, from time to time, revoke such delegation. Any Committee so formed shall, in the exercise of the powers so delegated, conform to any regulations that may, from time to time, be imposed upon it by the Board of Directors.

Chairman of meetings of Committees.

94. A Committee may elect a chairman of their meetings. If no such Chairman is elected or if at any meeting the Chairman is not present within 5 minutes after the time appointed for holding the same, the members present may choose one of their members to be Chairman of the meeting.

When actions of Directors of Committees valid notwithstanding with-standing defective Appointment

95. All acts done by any meeting of the Board of Directors or of a Committee of Directors, or by any person acting as a Director, shall notwithstanding that it be afterwards discovered that there was some defect in the appointment of such Directors or persons acting as aforesaid, or that they or any of them were disqualified, be as valid as if every such person had been duly appointed and was qualified to be a Director, provided that nothing in this article shall be deemed to give validity to acts done by a Director after his appointment has been shown to the Company to be invalid or to have terminated.

Resolution without Board Meeting valid.

96. Save as otherwise expressly provided in the Act, a resolution in writing signed by all the Directors then in India or by a majority of such of them as are entitled to vote on the resolution shall be as valid and effectual as if it had been passed at meeting of the Directors duly called and constituted.

Reserve Fund.

97. Subject to such directions as may, from time to time be issued by TIDCO in this behalf, the Board of Directors may, before recommending any dividend, set aside out of the profits of the Company such sums as they think proper as a reserve fund to meet contingencies or for equalising dividends, or for special dividends, or for repaying, improving and maintaining any of the property of the Company, and for amortisation of capital and for such other purposes as the Board of Directors shall in their absolute discretion think conducive to the interests of the Company, and may invest the several sums so set aside upon such investments (other than shares of the Company) as they may think fit from time to time, deal with and vary such investments, and dispose of all or any part thereof for the benefit of the Company and may divide the reserve funds into such special funds, as they think fit, and employ the reserve funds or any part thereof in the business of the Company and without being bound to keep the same separate from the other assets.

Dividends.

98. The profits of the Company available for payment of dividend subject to any special rights relating thereto created or authorised to be created by these presents sub-ject to the provisions of these presents as to the reserve fund and amortisation of capital shall with the approval of the Directors be divisible among the members in proportion to the amount of capital held by them respectively.

Provided always that any capital paid up on a share during the period in respect of which a dividend is declared shall only entitle the holder of such share to an apportioned amount of such dividend as from the date of payment.

Capital paid up in advance.

99. Where capital is paid up on any share in advance of calls upon the footing that the same shall carry interest such capital shall not, whilst carrying interest, confer a right to participate in profits.

Declaration of dividends.

100. The Company in General meeting may declare a dividend to be paid to the members according to their rights and interests in the profits and may fix the time for payment, but no dividend shall exceed the amount recommended by the Directors.

Dividends out of profits only and not to carry interest.

101. No dividend shall be payable otherwise than out of the profits of the year or other period or any other undistributed profits of the Company and no dividend shall carry interest as against the Company.

When to be deemed net profit.

102. The declaration of the Board of Directors as to the amount of the net profits of the Company shall be conclusive.

Interim Dividend.

103. Subject to the provisions of Section 205 of the Act, the Board of Directors may, from time to time, pay to the members such interim dividends as may be decided by them having regard to the position of the Company.

Debts may be deducted.

104. The Board of Directors may retain any dividends on which the Company has a lien, and may apply the same in or towards satisfaction of the debts, liabilities, or engagements, in respect of which the lien exists.

Dividend and Call together.

105. Any general meeting declaring a dividend may make a call on the members of such amount as the meeting fixes, but the call on each member shall not exceed the dividend payable to him and the call be made payable at the same time as the dividend, and the dividend may, if so arranged between the Company and the members, be set off against the call. The making of a call under this clause shall be deemed ordinary business of an ordinary general meeting which declares a dividend.

Dividends or Bonus payable wholly or partly in cash.

106. Any general meeting declaring a dividend may resolve or direct that such dividend wholly or in part be paid in cash in accordance with Section 205 of the Act and in particular of paid up share debenture or debenture stock of any other company; or may appoint any person to sign such contract on behalf of the person entitled to the dividend of the capitalised fund, and such appointment shall be effective.

Effect of transfer.

107. A transfer of shares shall not pass the right to any dividend declared thereon after transfer and before the registration of the transfer.

Retention in certain cases.

108. The Board of Directors may retain the dividends payable upon the shares in respect of which any person is under Article 23 entitled to become a member or which any person under that clause is entitled to transfer, until such person shall become a member in respect of such shares or shall duly transfer the same.

Dividend to Joint Holders

109. Any one of the several persons, who are registered as the joint holders of any share may give effectual receipts for all dividends and payments on account of dividends in respect of such shares.

Payment by Post.

110. Unless otherwise directed, any dividend may be paid by cheque or warrant through post to the registered address of the member of person entitled or in the case of the joint holders, to the address of that one whose name stands first in the register in respect of the joint-holding; or to such person and to such address as the shareholder or joint-holder may in writing direct, and every cheque or warrant so sent shall be made payable to the order of the person to whom it is sent.

Appointment of Auditors.

121. The auditors of the Company shall be appointed or reappointed by the Central Government on the advice of the Comptroller and Auditor-General of India and their rights and duties shall be regulated by Sections 224 to 233 of the Act.

Auditors' right to attend meetings.

122. The auditors of the Company shall be entitled to receive a notice of and to attend any general meeting of the Company at which any accounts which have been examined or reported on by them are to be laid before the Company and may make any statement or explanation they desire with respect to the accounts.

Powers of the Comptroller and Auditor-General of India.

123. The Comptroller and Auditor-General of India shall have power:

(a) to direct the manner in which the Company's accounts shall be audited by the auditors appointed in pursuance of Article 121 hereof and to give such auditors instructions in regard to any matter relating to the performance of their functions as such;

(b) to conduct a supplementary or test audit of the Company's accounts by such person or persons as he may authorise in his behalf; and for the purposes of such audit, to have access at all reasonable times, to all accounts, accounts books, vouchers, documents and other papers of the Company and to require information or additional information to be furnished to any person or persons so authorised, on such matters, by such person or persons and in such form, as the Comptroller and Auditor-General of India may by general or special order, direct.

Comments upon or supplement to audit report by the Comptroller and Auditor-General of India to be placed before ordinary meetings.

124. The auditors aforesaid shall submit a copy of their audit report to the Comptroller and Auditor-General of India who shall have the right to comment upon or supplement the audit report in such manner as he may think fit. Any such comments upon or supplement to the audit report shall be placed before the annual general meeting of the Company at the same time and in the same manner as the audit report.

Accounts to be deemed finally settled

125. Every accounts of the Company when audited and approved by General Meeting shall be conclusive. Whenever any minor or obvious errors in the accounts were subsequently found out the Board of Directors can correct such minor or

Right of TIDCO.

126. Notwithstanding anything contained in any of these articles, TIDCO may, from time to time, issue such directives as they may consider necessary in regard to the conduct of the business of the Company or Directors thereof and in like manner may vary and amend any such directive. The Board of Directors shall give immediate effect to directives so issued.

How notices to be served on members.

127. A notice may be given by the Company to any member either personally or by sending it by post, to him to his registered address, or (if he has no registered address) to the address if any supplied by him to the Company for the giving of notice to him.

Notification of address by a holder of registered shares having no registered place of address.

128. A holder of registered shares, who has no registered place of address may, from time to time, notify in writing to the Company an address, which shall be deemed his registered place of address, within the meaning of Article 127.

When notice may be given by Advertisement.

129. If a member has no registered address and has not supplied to the Company an address for the giving of notices to him, a notice addressed to him and advertised in newspapers circulating in the neighbourhood of the registered office of the Company, shall be deemed to be duly given to him on the date on which the advertisement appears.

Notice to joint holders.

130. A notice may be given by the Company to the joint holders of a share by giving the notice to the joint holder named first in the register in respect of the share.

How notice to be given to representatives of a deceased or a bankrupt member

131. A notice may be given by the Company to the persons entitled to a share in consequence of the death or insolvency of a member by sending it through the post in a prepaid letter addressed to them by name, or by the title or representatives of the deceased or assignee of the insolvent or by any like description, at the address (if any) supplied for the purpose by the persons claiming to be so entitled (until such an address has been so supplied) by giving notice in any manner in which the same might have been given if the death or insolvency had not occurred.

To whom notice
of general meeting
to be given.

132. Notice of every general meeting shall be given in the same manner hereinbefore authorised to (a) every member of the Company except those members who having no registered address have not supplied to the Company an address for the giving of notice to them, and also to (b) every person entitled to a share in consequence of the death or insolvency of a member, who, but for his death or insolvency, would be entitled to receive notice of the meeting provided the Company has due notice.

Transferees, etc.
bound by prior
notice.

133. Every person, who by operation of law, transfer or other means whatsoever, shall become entitled to any share shall be bound by every notice in respect of such share which previously to his name and address and title to the share being notified to and registered by the Company, shall be duly given to the person from whom he derives his title to such share.

How notice to
be signed.

134. The signature to any notice to be given by the Company may be written or printed.

How time to be
counted.

135. Where a given number of days notice or notice extending over any other period is required to be given the day of service shall, unless it is otherwise provided, be counted in such number of days or other period.

Distribution of
assets on winding
up.

136. If the Company shall be wound up and the assets available for distribution among the members as much shall be insufficient to repay the whole of the paid up capital, such assets shall be distributed so that, as nearly as may be the losses shall be borne by the members in proportion to the capital paid up or which ought to have been paid up at the commencement of the winding up, on the shares held by them respectively. And if in a winding up, the assets available for distribution among the members shall be more than sufficient to repay the whole of the capital paid up, the excess shall be distributed among the members in proportion to the capital paid up or which ought to have been paid up on the shares held by them respectively. But this clause shall be without prejudice to the rights of the holders of shares issued upon special terms and conditions.

Secrecy Clause.

137. No member shall be entitled to require discovery or any information respecting any detail of Company's trading or any matter which may be in the nature of a trade secret, mystery of trade or secret process which may relate to the

conduct of the business of the Company and which in the opinion of the Directors it will be inexpedient in the interests of the members of the Company to communicate to the public.

138. Subject to the provisions of Section 201 of the Act, every Director, Manager, Auditor, Secretary and other officer or servant of the Company shall be indemnified by the Company against, and it shall be the duty of the Directors out of the funds of the Company to pay all costs, losses and expenses which any such officer or servant may incur or become liable to, by reason of any contract entered into, or act or thing done by him as such officer or servant or in any way in the discharge of his duties; and the amount for which such indemnity is provided shall immediately attach as a lien on the property of the Company, and have priority as between the members over all other claims.

139. No Director, or other officer of the Company shall be liable for the acts, receipts, neglects or defaults of any other Director or Officer of the Company or for joining in any receipt or other act for conformity or for any loss or expenses happening to the Company through the insufficiency or deficiency of title to any security in or upon which any of the moneys of the Company shall be invested or for any loss or damage arising from the bankruptcy, insolvency or tortious act of any person with whom any moneys securities or effect shall be deposited or for any other loss, damage or misfortune whatever which shall happen in the execution of the duties of his office or in relation thereto, unless the same happens through his own negligence, default, misfeasance, breach of duty, or breach of trust.

Individual respon-
sibility of
Directors.

42
98

43
42

S. No.	Subscriber	Address, description and occupation, if any	Signature of subscribers	Other will and their address, description and occupation
1.	C. V. R. PANIKAR S/o Thiru I. A. PANIKAR.	Chairman & M. D. TIDCO, 150 - A, Anna Salai Madras - 2.	(Sd.) C. V. R. PANIKAR	(Sd.) A. Duraipandian Special Officer, Tamilnad Cements, 150 - A, Anna Salai, Madras - 2.
2.	S. GUHAN S/o Dr. K.S. Sanjivi	Finance Secretary, Govt. of Tamil Nadu	(Sd.) S. GUHAN	"
3.	A. PADMANABAN S/o Thiru D. Arandam	Secretary, Industries, Govt. of Tamil Nadu	(Sd.) A. PADMANABAN	"
4.	A. S. PADMANABAN S/o Thiru A. P. Subramaniam	General Manager, Tamilnad Cements Alangulam	(Sd.) A. S. PADMANABAN	(Sd.) S. Ramamurthy, Production Manager, Tamilnad Cements, Alangulam.
5.	K. P. GEETHA-KRISHNAN S/o Dr. K.R. Parthasarathy.	Director (Finance) TIDCO 150 - Anna Salai, Madras 2.	(Sd.) K. P. GEETHA-KRISHNAN	(Sd.) G. Muthukrishnan Dy. Secretary, TIDCO, 150 - A, Anna Salai, Madras - 2.
6.	K. PALANI-MANICKAM S/o Thiru Kulandiya	Development Manager, TIDCO, 150 - A, Anna Salai, Madras - 2.	(Sd.) N. PALANI-MANICKAM	(Sd.) A. Duraipandian, Special Officer, Tamilnad Cements, 150 - A, Anna Salai, Madras - 2.
7.	A. M. THANGARAJ S/o Thiru E. Asirvatham	Secretary, TIDCO, 150 - A, Anna Salai, Madras - 2.	(Sd.) A. M. THANGARAJ	"

Dated this day of Ninth February, 1976.

ANNEXURE-VIA

TECHNICAL DEPARTMENT

CERTIFIED TRUE EXTRACTS OF MINUTES OF THE 272TH BOARD MEETING OF TAMILNADU CEMENTS CORPORATION LIMITED HELD ON 13.06.2017 AT 5:00 P.M. AT CONFERENCE HALL, INDUSTRIES DEPARTMENT (9TH FLOOR), SECRETARIAT, CHENNAI-9

Item No.	Res No.	Subject
9		To consider the Delegation of powers to Unit Heads - To comply with Mines Statute -Ariyalur Cement Unit, Alangulam Cement Unit and Stoneware Pipe Factory, Vrldhachalam
	288	<p>The Board considered and approved the proposal and passed the following resolutions:</p> <p>"RESOLVED THAT the Unit Heads of Alangulam Cement Unit, Ariyalur Cement Unit and Stoneware Pipe Factory, Vrldhachalam be and are hereby delegated powers :</p> <ol style="list-style-type: none"> 1. To apply for mining leases to government to execute necessary deeds for mining leases with Government and to submit all returns and reports to the authorities concerned. 2. To sign all documents, deeds and returns to be sent to Government Authorities who administer the acts relating to Mines, Factories, Explosives and all other Acts applicable to Factory and Mines. 3. To act as Agent of all mines of the respective factory attached to the Unit concerned under the Acts and Rules applicable to mines if no mines agreement is separately designated by the Managing Director and to Act as the Occupier and Manager of the factory under the Act and Rules applicable to the factory".

/TRUE COPY/

for TAMILNADU CEMENTS CORPORATION LIMITED

(G. ALAGARSAMY)
COMPANY SECRETARY



TECHNICAL DEPARTMENT

CERTIFIED TRUE EXTRACTS OF MINUTES OF THE 278TH BOARD MEETING OF TAMILNADU CEMENTS CORPORATION LIMITED HELD ON 13.06.2017 AT 5:00 P.M. AT CONFERENCE HALL, INDUSTRIES DEPARTMENT (9TH FLOOR), SECRETARIAT, CHENNAI-5.

Item No.	Res No.	Subject
10		To consider the change of ownership - Nomination of the Principal Secretary / Managing Director as owner of the Captive Mines of the Ariyalur & Alangulam Cement Units and Stone Pipe Factory, Vridhachalam.
	289	<p>The Board approved and ratified the Nomination of the Principal Secretary/ Managing Director as owner of the Captive Mines of Ariyalur, Alangulam Cement Unit and Stoneware Pipe Factory, Vridhachalam and passed the following resolutions:</p> <p>"RESOLVED THAT Tmt. D.Sabitha, IAS, Principal Secretary / Managing Director of TANCEM be and is hereby nominated as Owner of the following Mines of TANCEM in the place of Thiru. C. Kamaraj, IAS, with effect from 08.03.2017:</p> <ol style="list-style-type: none"> 1. Alangulam Lime Stone Mines, Gopalapuram Lime Stone Mines & Pandapull Lime Stone Mines of Alangulam Cement Unit and the mines to be operated in future for the areas where mining lease are vested with Alangulam Cement Unit of TANCEM. 2. Kallankruchi Lime Stone Mines (KLSM) and Anandavadi Lime Stone Mines of Ariyalur Cement Unit and the mines to be operated in future for the areas where mining lease are vested with Ariyalur Cement Unit of TANCEM. 3. Panikuppam Clay Mines, Tharanipalayam Clay Mines & Karai Clay Mines of Stoneware Pipe Factory and the mines to be operated in future for the areas where mining lease are vested with Stoneware Pipe Factory of TANCEM".

/TRUE COPY/

for TAMILNADU CEMENTS CORPORATION LIMITED

(G.ALAGARSAMY)
COMPANY SECRETARY





TAMILNADU CEMENTS CORPORATION LIMITED

(A GOVERNMENT OF TAMILNADU UNDERTAKING)
L.L.A. Building, 735, Anna Salai, Chennai - 600 002
Phone: 28525461, 28525471, 2841663

E-mail: personnel@tancem.com WEBSITE: www.tancem.com Fax: 044-28523991

PROCEEDINGS OF THE PRINCIPAL SECRETARY / MANAGING DIRECTOR, TANCER

PRESENT: TMT D.SABITHA, I.A.S

Proc.No:2593/A1/2018

Date 28.04.2018

Sub: Estt-TANCER-Ariyalur Cement Works - Thiru T.Ravichandran,
Dy. General Manager (Technical), Ariyalur- to carry out the functions
of the Unit Head, Ariyalur Cement Works, Ariyalur - Order Issued.

Read: This office Circular No:2593/A1/2018 dated 25.04.2018.

Order:

Thiru T.Ravichandran, Dy. General Manager (Technical), Ariyalur will
discharge the functions attached to the office of the Unit Head, Ariyalur Cement
Works, Ariyalur.

This order takes effect from 28.04.2018.

SD/-
Principal Secretary/MD

To

Thiru T.Ravichandran,
Dy. General Manager (Technical),
Ariyalur Cement Works,
Ariyalur.

Copy to:

1. GM (Tech.)/ G.M (Mkt)
2. All ROOs - CO
3. All Units
4. Notice Board

(Forwarded by order)

Asst. Manager (P&A)



47 49

RESOLUTION NO.141 DATED 14/8/79 IN RESPECT OF THE UNIT
HEADS OF ALANGULAM CEMENT WORKS AND ARIYAIUR CEMENT WORKS.

FINANCE:

1. To draw cheques jointly with Financial Controller and in his absence with Accounts Officer with no limits.
2. To sanction expenditure pertaining to the unit an account of telephone, postage, maintenance of Vehicles, advertisement, travelling allowance rules and regulations and sanction medical reimbursement subject to reimbursement rules.
3. To approve tour programme and sanction tour advance.
4. To refund EMD and security deposit received by the corporation after the tender as finalised or the work is executed by the Contractor as the case may be.
5. To incur entertainment expenditure subject to maximum of Rs.250/- pm and over all budget provisions for the year, such expenditure being reported every month to the registered office.
6. To liquidated damages in case of breach of contract like late delivery etc., upto a value of Rs.2500/- in each case subject to the reasons being recorded and reported and reported to R.O. at the end of every year.
7. To incur expenditure for safety week, Republic day, Independence day celebrations upto Rs.250/- at a time subject to a total ceiling of Rs.750/- per year.
8. Subject to budget provision and limits laid down in the Service rules and by the Board to sanction advances other than conveyance advance to Officers/Staff.
9. To approve debit slips supported by vouchers and sanction order wherever necessary.
10. To declare and dispose of as unserviceable, obsolete or surplus articles or stores or plans etc., and sanction w/off of losses due to theft, negligence, fraud or other causes upto a limit of Rs.5,000 for the year as a whole provided the loss of article is not at result of the negligence on the part of the unit or the members of the staff. For the purpose of calculating the value, original value of articles shall be taken into account.
stores and purchases/Revenue expenditure:
11. Subject to budget provisions purchase raw materials, spares, consumable items etc., other than items that are reserved for centralised purchases from R.O. for running the plant which is of a revenue nature upto a value of Rs.1/- lakh at a time. The enquiries and purchases shall be subject to the procedure detailed in the appendix enclosed/Appendix-I.
12. (1) Purchases exceeding Rs.1/- lakh but upto Rs.2.5 lakhs shall be scrutinised by the unit level tender committee and purchases beyond Rs.2.5 lakhs and upto Rs.5/- lakhs shall be scrutinised by the tender committee, including of Development Manager and the Secretary-cum-Financial Controller of the R.O.

(Contd ... 2)

24. To execute agreements on behalf of the company with the Electricity Board for availing power supply.
25. To apply for mining leases to Government to execute necessary deeds for mining leases with Government and to submit all returns and reports to the authorities concerned.
26. To sign all documents, deeds and returns to be sent to Government authorities who administer the Acts relating to Mines factories, explosives and all other acts applicable to factory and Mines.
27. To execute all deeds and contract documents for contracts entered into with civil, electrical and other works applicables including materials suppliers.
28. To sign documents and deeds before Government and other author ities for telephone, postal except motor vehicles insurance.
29. To execute documents with the Labour Officer concerned for construction of quarters under subsidised indl. housing scheme and to execute agreements and mortgage deeds for all housing schemes sanctioned by the Board, Government and by authorities administering limestone dolomite cess fund.
30. To act as Agent of all mines of the respective factory attached to the Unit concerned under the Acts and rules applicable to mines if no Mines agreement is separately designated by the Managing Director and to Act as the occupier and Manager of the factory under the Act and rules applicable to the factory.
31. To apply for licence, make deposits and settle liabilities pertaining to Central Excise duty and also to execute necessary bonds required by Central Excise authorities.
32. To initiate legal action against parties who are in default of payments against the outstanding bills for the supply of cement and sign all the necessary legal papers and documents connected therewith for and on behalf of the Corporation subject to obtaining approval of Managing Director in each case for engaging a specific lawyer and payment of fees to him.
33. To call for tenders in respect of civil contracts supply of raw materials, spares, consumables items etc., to open tenders and negotiate with the tenderers on behalf of the Corporation.
34. To sign and execute contract deeds and instruments on behalf of the unit.

SD/- xxx, Secy-cum-F.C. SD/- xxx/M/A/ SD/- xxx/M.D.

/true copy/

[Signature]
Special Tahsildar (L.A) Unit-II
M/s. Tamil Nadu Cements Corp. Ltd.
ARIYALUR-621 713.



[Signature]

48
50

11. (11) Purchases exceeding Rs.5/- lakhs shall be referred to M.D. for approval alongwith the recommendations of the tender committee inclusive of Development Manager and the Secretary-cum-Financial Controller of the R.O. Managing Director will be the competent authority to decide revenue purchases coating more than Rs.5/- lakhs. However any purchases exceeding Rs.7.5 lakhs will be decided by the Executive Sub-Committee of the Board of Directors.

Capital expenditure other than Civil:

12. To incur capital expenditure other than on civil items upto a limit of Rs.50,000/- at a time subject to budget estimates and R.O. be kept informed at the end of every month regarding the orders placed. Further subject to quarterly allotment of the approved budgetary provisions by the R.O.

Civil Works :

13. To accord technical sanction without any limit.
14. To accord administrative approval upto Rs.50,000/- with tender excess of 5% only subject to the quarterly allotment of budget estimates.
15. To accept tenders for works in respect of which the estimates prepared as per State public works Department schedules does not exceed Rs.50,000/- provided the tender excess is with in 5% of the estimate.
16. To award works on nomination upto Rs.10,000/- for each work provided the tender excess is within 5% of the estimate subject to the details being reported to the R.O. at the end of every month.

ADMINISTRATION :

17. To appoint persons upto the scale of Rs.500-40-900 in case of Board scales subject to the budgetary provision and sanction of posts by Managing Director.
18. To engage manual labourers on daily basis in works of not permanent nature subject to the norms prescribed, maximum duration not to exceed 45 days and same to be reported to R.O. at the end of every month for scrutiny and ratification.
19. Subject to limits laid down by R.O. from time to time to sanction periodical increments in respect of all officers, staff and workers at the Unit.
20. To declare progradation for all employees for he is the appointing authority.
21. To initiate disciplinary action and pass final orders in all cases for which he is appointing authority. In all the cases where he is not the appointing authority, he may indicate action subject to the passing of final orders by Managing Director.
22. To sanction all kinds of leave for the Officers, Staff and Workers attached to the Unit except preparatory to retirement and encashment of leave in the event of resignation/retirement.
23. To accord sanction for and regular dearness allowance and other allowances from time to time as per wage board award Government orders as the case may be.

(Contd ...3)

ANNEXURE-VIB

BOARD OF DIRECTORS

Sl.No.	Name of Director	
1.	Tmt. D.Sabitha, IAS Additional Chief Secretary / CMD, Tamilnadu Cements Corporation Limited, Chennai – 600 002	Chairman
2.	Thiru N.Muruganandam, IAS Principal Secretary to Government Additional Chief Secretary to Government, Industries Department, Secretariat, Chennai-9	Director
3	Dr. R.Palaniswamy, IAS., Commissioner, Geology & Mining, Guindy, Chennai –32	Director
4	Dr.C.N.Maheswaran, IAS Managing Director TWAD Board, Chepauk, Chennai – 600 005	Director
5	Thiru M.A.Siddique, IAS Secretary to Government, Finance(Expenditure) Department, Secretariat, Chennai	Director
6	Thiru K.Balasubramaniam, IAS Deputy Secretary to Government, Industries Department, Secretariat, Chennai	Director
7	Thiru. K.Baskaran, IAS Director, Rural Development and Panchayat Raj Department, Chennai.	Director
8	Thiru.P.Krishnamurthi 1B, Suvarna Lok, 34, Malony Road T.Nagar Chennai 600 017	Director
9	Thiru.R.Jayasingh Engineer in Chief (Buildings) CE (Buildings), Public Works Department, Chepauk, Chennai-5	Director
10	Thiru. T.Velmurugan, Director(Generation) TNEB, 10 th Floor, Eastern Wing, 144, Anna Salai, Chennai – 600 002	Director
11	Dr.G.Natarajan 288, TTK Road, Alwarpet, Chennai-18	Director

ANNEXURE-VIC



Tamilnadu Cements Corporation Ltd.

(A GOVERNMENT OF TAMIL NADU UNDERTAKING)

Corporate Office: L.L.A. Building, No.735, Anna Sala, Chennai - 600 002.

Fax: 044-28523981 / Website: www.tancem.com

CIN: U40200TN1976SG0007081

Phone: 28525461

28525471

28561735

28525230

DATE:20.09.2019

AUTHORIZATION

I hereby authorize **Mr. T. Ravichandran, Deputy General Manager (Technical)/Unit Head of Ariyalur Cement Unit** to discharge the **functions of Mines Agent** with respect to all the captive limestone and limekanker mines owned by TANCER.

Further he is hereby authorized to sign in the applications for grant of Mining Lease and Environmental Clearance submitted to State/Central Governments; to sign in all the statutory Mining Plans, Review of Mining Plan, Progressive Mine Closure Plan etc., and to sign in the statutory Mine Plans and Sections, Maps and other related statutory reports to be submitted to Indian Bureau of Mines and Directorate General of Mines Safety.

(D. SABITHA, I.A.S.)
Nominated Mines Owner/
Addl. Chief Secretary/CMD

ANNEXURE-VII



இந்திய அரசாங்கம்
Government of India



பெயர்: ரவிச்சந்திரன் தங்கவேலு
Ravichandran Thangavel
பெயர்: ரவிச்சந்திரன் தங்கவேலு
Name: THANGAVEL

பிறந்த தேதி: 10/02/1967
Age: 54 Male

2278 8111 9370



புகார் - சாதாரண மனிதனின் அதிகாரம்



Unique Identification Authority of India

முகவரி: 123 மயார்முது தெரு
பெயர்: ரவிச்சந்திரன் தங்கவேலு
பெயர்: ரவிச்சந்திரன் தங்கவேலு
பெயர்: ரவிச்சந்திரன் தங்கவேலு
பெயர்: ரவிச்சந்திரன் தங்கவேலு

Address: S/O Thangavel
NO 123 MAYAR MUTHU
STREET, KK NAGAR,
Tiruchirappalli, Kk Nagar,
Tamil Nadu 620021

2278 8111 9370

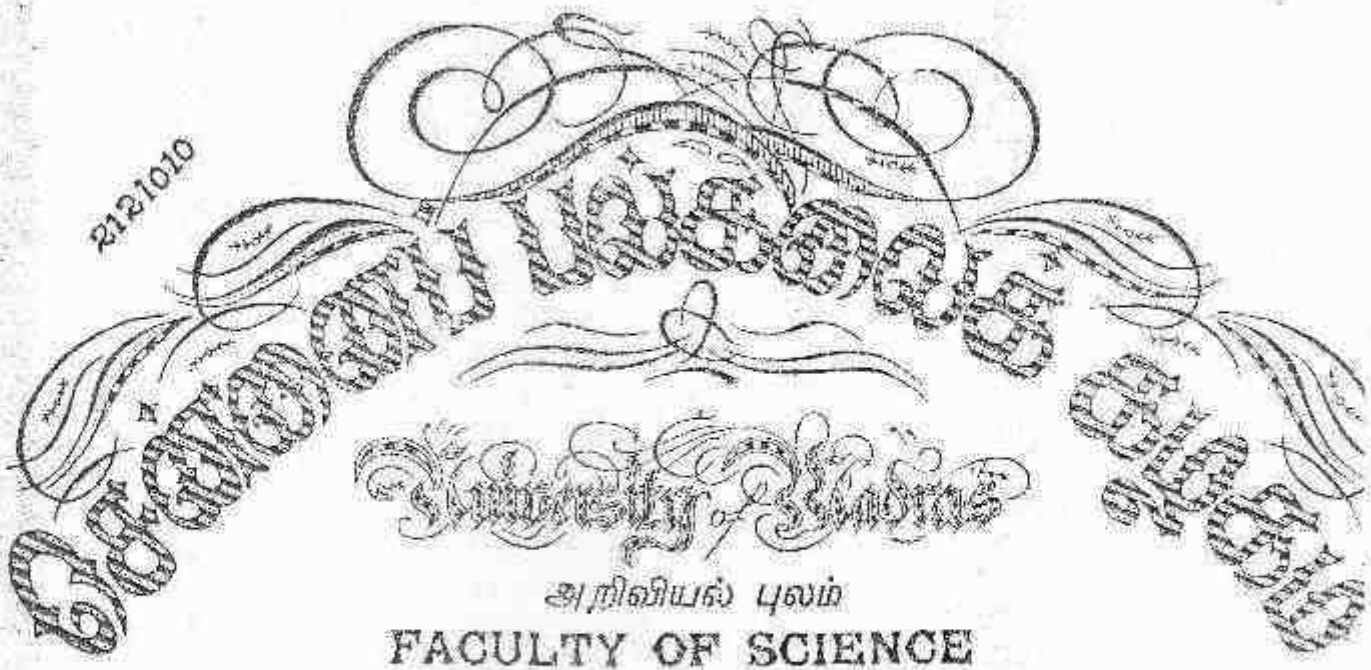


Ravichandran Thangavel

UNIT HEAD
TAMIL VADU CEMENTS CORPN LTD.
ARIYALUR WORKS
ARIYALUR-621728



ANNEXURE-VIII



சென்னைப் பல்கலைக் கழகப் பேரவை 1934 ஆம் ஆண்டு...
ஏப்ரல் மாதம் 14-ந் திகதி கனிமவியல் தோய்வில்
பெ. தங்கராஜன் என்பவர் இத் தரையில்
தேர்ச்சி உபத்தரகராகி தக்க தேர்வாளர்கள் சான்றளித்தபடி அறிவியல் நிறைஞர்
என்றும் பட்டத்தை அவருக்குப் பல்கலைக் கழக இலச்சினையுடன் வழங்குகிறது.

The Senate of the UNIVERSITY OF MADRAS hereby
makes known that... P. Thangaraju
has been admitted to the Degree of Master of Science, he/she
having been certified by duly appointed Examiners to be qualified
to receive the same in Geology and was placed in the
First Class, at the Examination held in April 1934



Given under the seal of the University

செயலாங்கு, Chennai

சென்னை, Madras

திகதி Dated: 25-01-1939

Dr. P. THANGARAJU, M.Sc., Ph.D.
Qualified Person

பதிவாளர்
Registrar


சுமண வேங்கு
Vice-Chancellor

GOVERNMENT OF INDIA
MINISTRY OF LABOUR AND REHABILITATION
OFFICE OF THE DIRECTOR GENERAL OF MINES SAFETY

Certificate of Practical experience granted by the Manager to a candidate for a Manager's / Surveyor's / Foreman's / Over man's / Sirdar's / Mate's / Short firer's/ Blaster's Certificate of competency (Restricted) examination under the Metalliferous Mines Regulations 1961.

I **T.VENKATARAJAGOPALAN** being the Mines Agent of **M/S.LIMENAPH CHEMICALS, RAJAPALAYAM OF LIMESTONE PRODUCTS (Thenmali Limestone Mine)** do hereby certify that **Thiru. P.THANGARAJU**, son of **S.PERIASAMY** (whose signature is appended) worked as a Geologist in the above mine from 02.05.1994 to 30.12.1999. During his term of work aforesaid, he has obtained practical experience as detailed overleaf. The duties connected with his work have involved continuous attendance at the mine and have been efficiently performed by him.

I believe him to be of good character and a fit and proper candidate to be examined for Certificate of Competency.

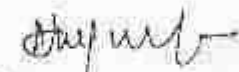

(Signature with date and official Seal)
[T.VENKATARAJAGOPALAN]

Mines Agent:

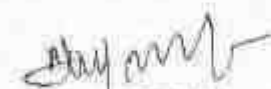
P.O. : **ARUKANGULAM**

District : **TIRUNELVELI**

State : **TAMIL NADU**


(Signature of Candidate)

(State name of Mineral) : **LIMESTONE**


Dr. P. THANGARAJU, M.Sc., Ph.D.
Qualified Person

S.No	Particulars of practical Experience (a)	Place of Experience (b)	Period of practical experience(c)		Total Experience (c)		
			From	To	Yr.	Month	Day
01.	As a Trainee in Drilling Operation.	Semi Mechanised Opencast working	02.05.1994	15.07.1995	01	02	14
02.	As a Trainee in Blasting Operation.		16.07.1995	10.12.1996	01	04	25
03.	Exploration		11.12.1996	31.01.1998	01	01	20
04.	Surveying		01.02.1998	25.06.1998	00	04	25
05.	Sampling Quality control and		26.06.1998	20.07.1999	01	00	24
06.	Supervision in HEMM Operation.		21.07.1999	30.12.1999	00	05	10
GRAND TOTAL					05	07	28
(Five Years Seven Months Twenty Eight Days Only)							

AVERAGE MONTHLY OUTPUT (D) / AVERAGE DAILY EMPLOYMENT (e) DURING THE ABOVE PERIOD IS GIVEN BELOW :

In below ground working	In open – cast working	In all
Nil	35	35
Nil		

or THENMALAI LIME STONE MINES

Signature of Candidate

Signature of Manager with Date & Seal
[T.VENKATARAJAGOPALAN]

Name of the Mine :

Instructions :-

01. State clearly the nature of duties
02. State whether on surface, in open cast workings or below ground.
03. State specifically the period spent by the applicant in different mining operations, or surveying operations, as the case may be. If the employment has not been such as to involve continuous attendance of the applicant at the mine, it must be stated how many days a week he was employed at the mine, whether underground or above ground and in what capacity.
04. Delete if the mine is a Metalliferous mine.
05. Delete if the mine is a Coal mine.

Dr. P. THANGARAJU, M.Sc., Ph.D.,
Qualified Person

ANNEXURE-IX

P

MINING PLAN & PROGRESSIVE MINE CLOSURE PLAN FOR PUDUPALAYAM LIME KANKAR & LIMESTONE DEPOSIT

(PUBLIC SECTOR - A GOVERNMENT OF TAMILNADU UNDERTAKING /
"A" CATEGORY / NON-FOREST / PATTALANDS / CAPTIVE USE)

SUBMITTED UNDER RULE 13 OF MCR, 2016 AND RULE 23 OF MCDR, 2017

Registration Number under Rule 45: IBM/7446/2011, dated 29.12.2011

LOCATION OF THE AREA



EXTENT : 22.96.0 ha.
S.F.NOs. : 144, 217/1A, 1C, 2, 3A, 3B, etc.,
VILLAGE : PUDUPALAYAM
TALUK : ARIYALUR
DISTRICT : ARIYALUR
STATE : TAMILNADU

MINE OWNER/APPLICANT

M/S. TAMILNADU CEMENTS CORPORATION LIMITED,
(A Government of Tamilnadu Undertaking)
Ariyalur Cement Factory,
Ariyalur District.

PREPARED BY

Dr. P. Thangaraju, M.Sc., Ph.D.,
Qualified Person

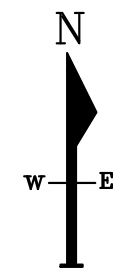
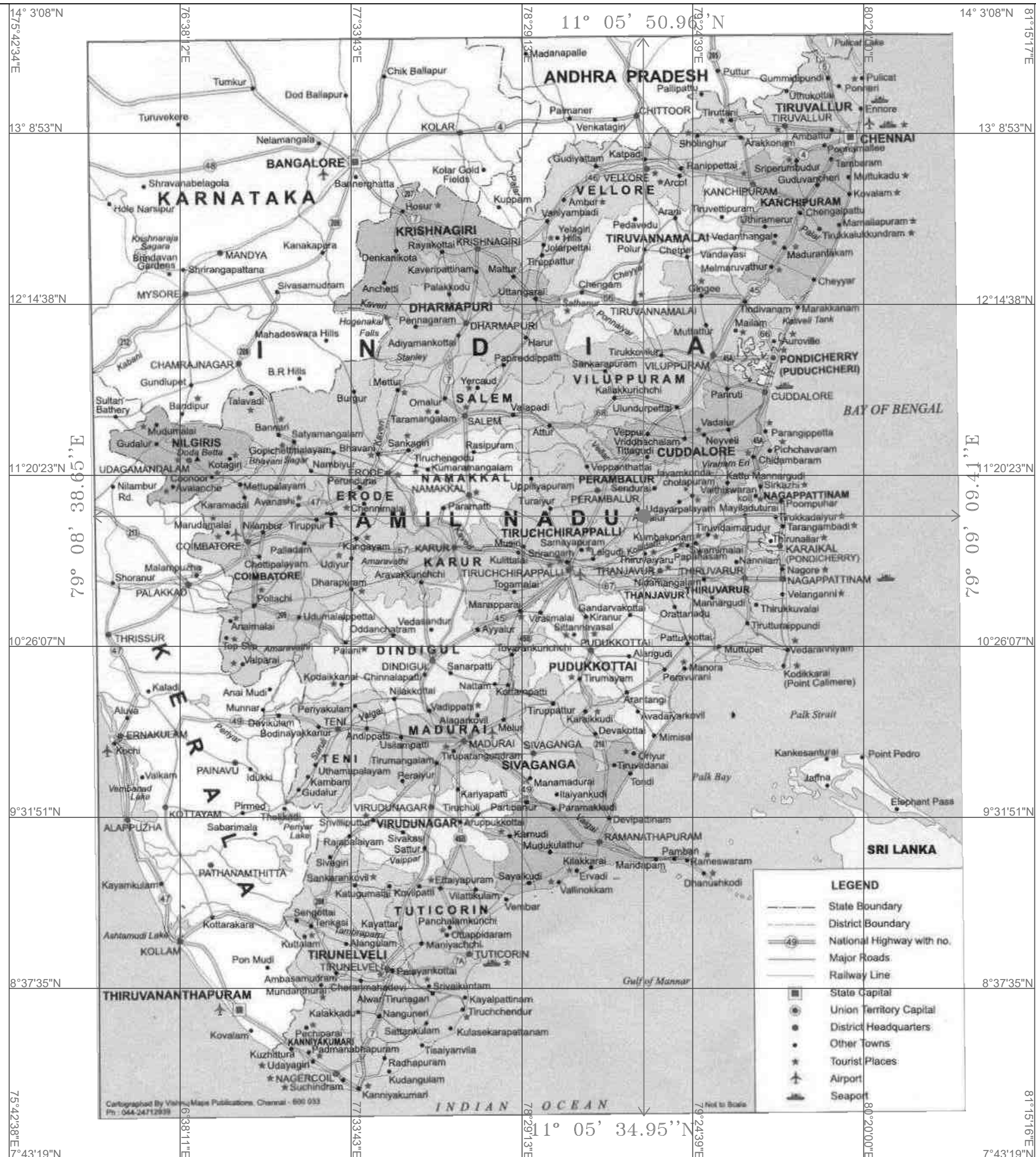
M/s. Geo Exploration and Mining Solutions,
Old.No.260-B, New No: 17,
Advaitha Ashram Road, Alagapuram, Salem - 636 004.
Cell: 94433 56539.
E-mail: geothangam@gmail.com

[VOLUME -II - PLATES]

PLATES

LIST OF PLANS AND SECTIONS

Sl.No.	Description	Scale	Plate no.
1	LOCATION PLAN	Not to Scale	I
2	ROUTE MAP	Not to Scale	IA
3	KEY PLAN	1:50,000	IB
4	MINE LEASE PLAN	1:2000	II
5	MINE LEASE PLAN (AUTHENTICATED)	1:2000	IIA
6	SURFACE PLAN	1:2000	III
7	GEOLOGICAL PLAN AND SECTIONS	Plan: 1:2000 Section : HOR-1:1000 VER:1:1000	IV & IVA
8	YEARWISE DEVELOPMENT & PRODUCTION PLAN	Plan: 1:2000 Section : HOR-1:1000 VER:1:1000	VA to VE1
9	MINE LAYOUT, LAND USE & AFFORESTATION PLAN	1:2000	VI
10	FINANCIAL AREA ASSURANCE PLAN	Plan: 1:2000	VII
11	ENVIRONMENT PLAN	1:5000	VIII
12	CONCEPTUAL PLAN AND SECTIONS	Plan: 1:2000 Section : HOR-1:1000 VER:1:1000	IX & IXA



PUDUPALAYAM
LIMEKANKAR AND LIMESTONE DEPOSIT ,
APPLICANT:
M/s.TAMILNADU CEMENTS CORPORATION LTD.

PLATE NO:I

DATE OF SURVEY : 05.08.2019

APPLICANT:

M/s.TAMILNADU CEMENTS
CORPORATION LTD.,
ARIYALUR CEMENTS FACTORY,
ARIYALUR-621 729
ARIYALUR DISTRICT

LOCATION OF MINE:

S.F.Nos : 144/1A,217/1A etc.,
EXTENT : 22.96.0 Ha,
VILLAGE : PUDUPALAYAM,
TALUK : ARIYALUR,
DISTRICT: ARIYALUR,
STATE : TAMILNADU.

INDEX

TOPO SHEET NO. : 58 M/04

LATITUDE : 11° 05' 34.95"N to 11° 05' 50.96"N

LONGITUDE : 79° 08' 38.65"E to 79° 09' 09.41"E

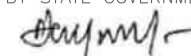
M.L.APPLIED AREA: ●

LOCATION PLAN

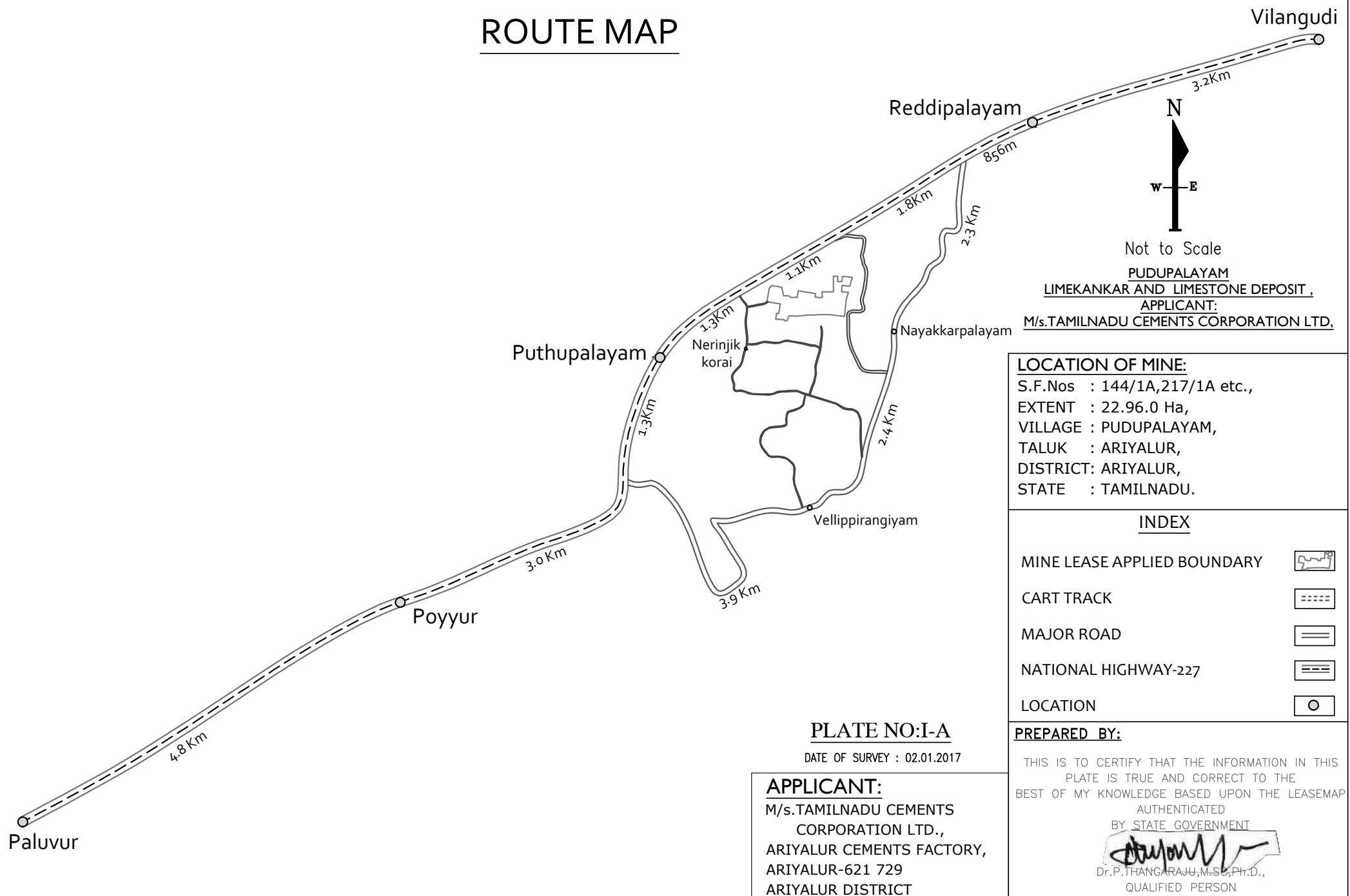
SCALE 1:24,00,000

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 LEASEMAP
AUTHENTICATED
BY STATE GOVERNMENT

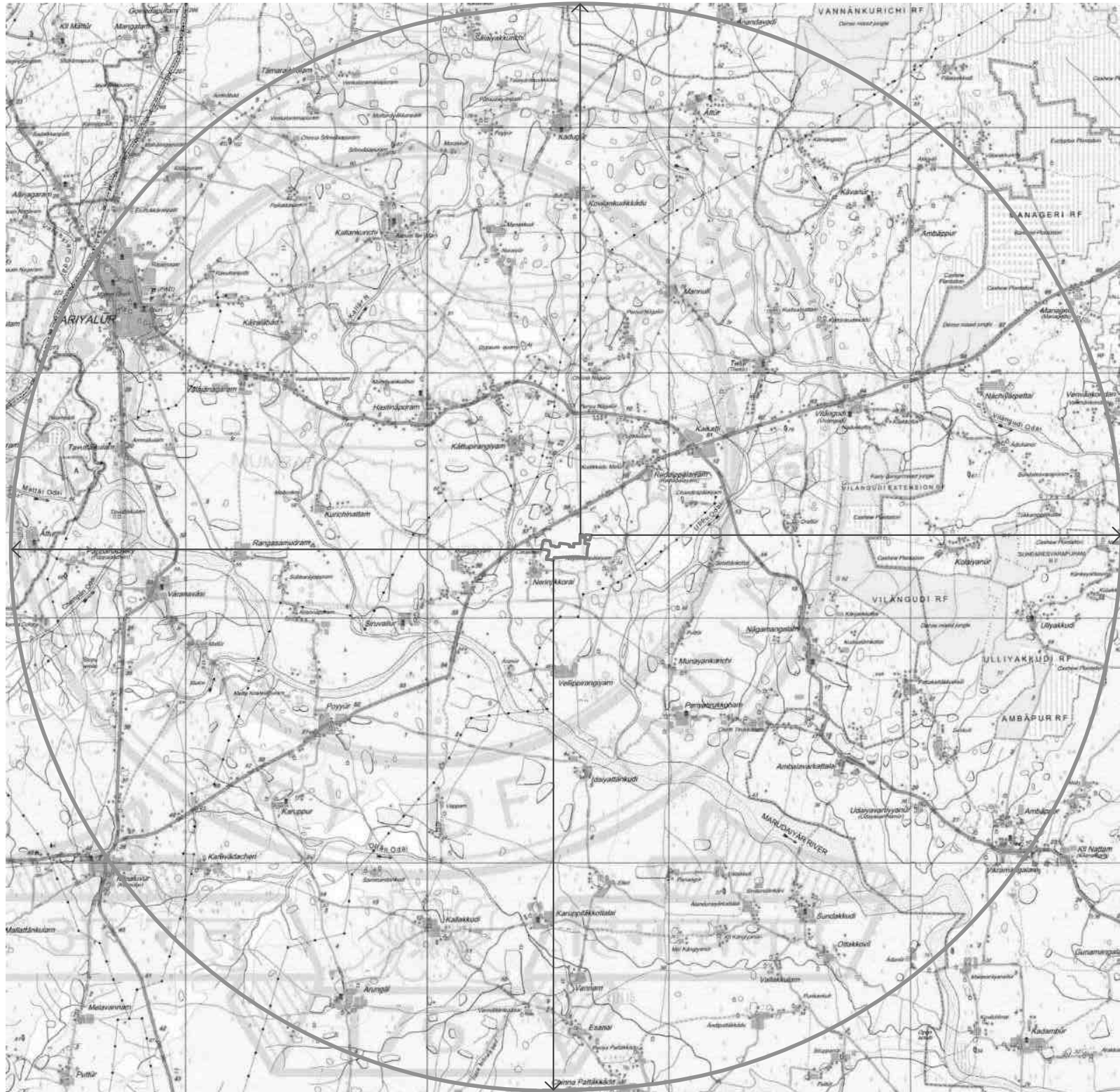

Dr.P.THANGARAJU,M.SC,Ph.D.,
QUALIFIED PERSON

ROUTE MAP



PUDUPALAYAM
LIMEKANKAR AND LIMESTONE DEPOSIT ,
APPLICANT:
M/s.TAMILNADU CEMENTS CORPORATION LTD.

11° 11' 16.37''N



11° 00' 09.54''N

TOPO SHEET NO. : 58 M/04

LATITUDE : 11° 05' 34.95"N to 11° 05' 50.96"N

LONGITUDE : 79° 08' 38.65"E to 79° 09' 09.41"E

10 KM RADIUS :

M.L.APPLIED AREA:

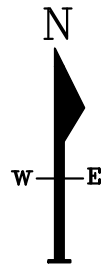


PLATE NO:I-B

DATE OF SURVEY : 05.08.2019

APPLICANT:
M/s.TAMILNADU CEMENTS
CORPORATION LTD.,
ARIYALUR CEMENTS FACTORY,
ARIYALUR-621 729
ARIYALUR DISTRICT

LOCATION OF MINE:
S.F.Nos : 144/1A,217/1A etc.,
EXTENT : 22.96.0 Ha,
VILLAGE : PUDUPALAYAM,
TALUK : ARIYALUR,
DISTRICT: ARIYALUR,
STATE : TAMILNADU.

INDEX

CONVENTIONAL SYMBOLS

Express highway with toll with bridge with distance stone	
Roads, metalled, according to importance	
Roads, district cartageable, according to importance	
Unmetalled road, Cart-track, Pack-track with poles, Footpath	
Streams with rock in bed, unmetalled Canal	
Dams, masonry or rock filled, earthwork, Wall	
River dry with water channel, with island & rocks, Total River	
Submerged rocks, Shoal, Swamp, Reefs	
Wells, lined, unlined, Tubewell, Spring, Tanks, perennial dry	
Embankments, road or rail tank, Broken ground	
Railways, broad gauge, double, single with station, under construction	
Railways, other gauges, double, single with distance stone, do	
Mineral line or tramway, K.M. Cutting with tunnel	
Contours with rock features, Rocky slopes, Cliffs	
Scarp features (Tidal, (2)land-filling, (3)unconsolidated)	
Towers or Villages, inhabited, deserted, Fort	
Hills, prominent, temporary, Tower, Antenna, etc.	
Temples, Ghats, Church, Mosque, Jagah, Tanks, Graves	
Lighthouse, Lightship, Buoy, lighted, unlighted, Anchorage	
Min. View or Islets, Rocks, Shoals	
Palms, papyrus, other, Plantain, Coffee, Rubber, Other trees	
Arums, cultivated, wooded, Surveyed tree	
Boundary, international	
State, demarcated, undemarcated	
Island, submergent, island or bluff, forest	
Boundary pillars, surveyed, uncoloured	
Height, triangulated station, spirit, aneroid	
Bench-mark, geodetic, tertiary, canal	
Post office, Telegraph office, Overhead tank	
Rail house or inspection bungalow, Civil house, Police station	
Camping ground, Forest, reserved, protected	
Special names, administrative, locality or tribal	
Hospital, Dispensary, Veterinary, Hospital, Dispensary	
Air station, Helipad, Transit site	
Power line, with pylons surveyed, with poles unsurveyed	

KEY PLAN

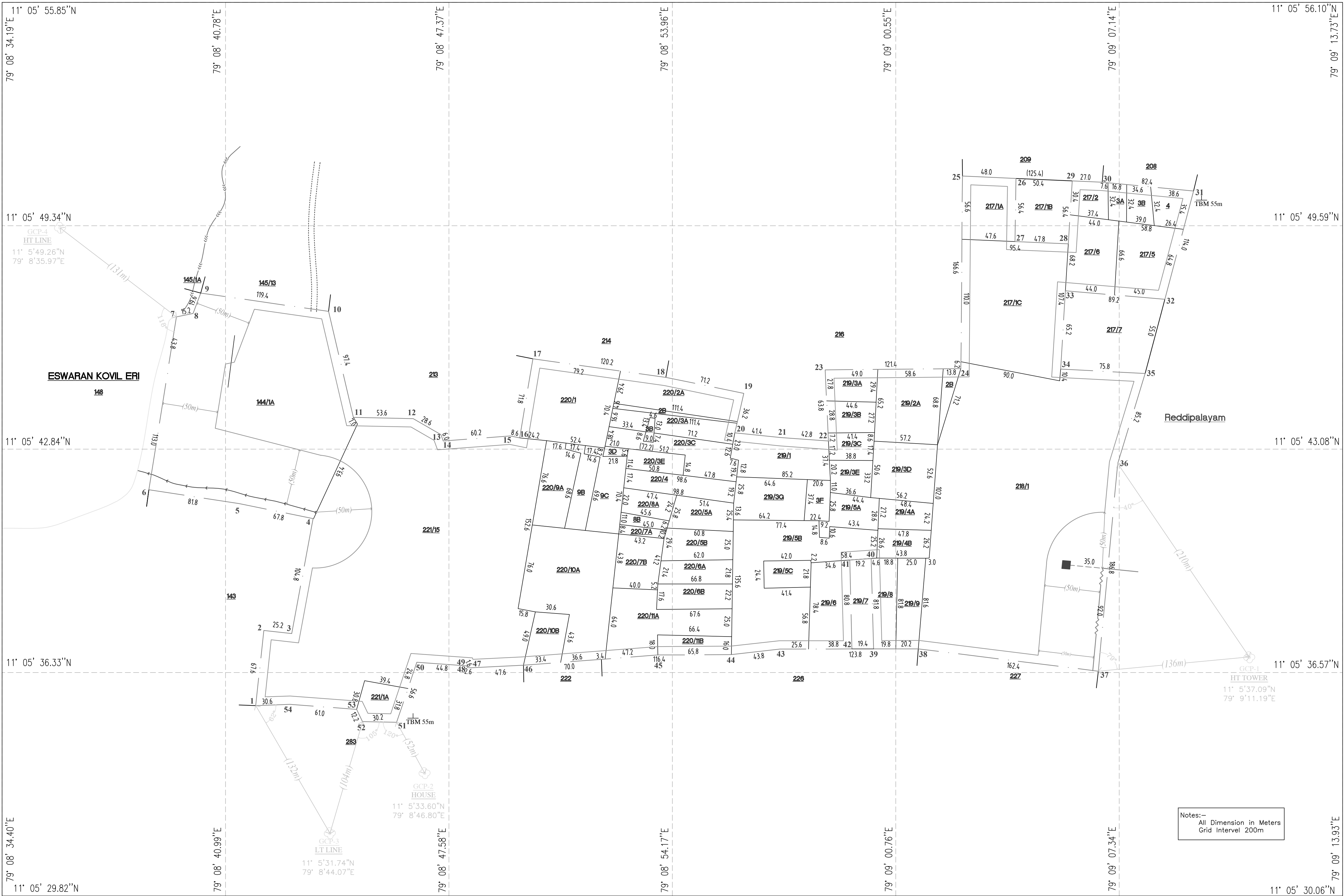
SCALE- 1:1,00,000

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 LEASEMAP
AUTHENTICATED
BY STATE GOVERNMENT

Dr.P.THANGARAJU, M.SC, Ph.D.,
QUALIFIED PERSON

BOUNDARY CO-ORDINATES		
S.N.	LATITUDE	LONGITUDE
1	11° 05' 35.41"N	79° 08' 41.84"E
2	11° 05' 37.60"N	79° 08' 42.07"E
3	11° 05' 37.51"N	79° 08' 42.89"E
4	11° 05' 40.87"N	79° 08' 43.50"E
5	11° 05' 41.29"N	79° 08' 41.32"E
6	11° 05' 41.68"N	79° 08' 38.65"E
7	11° 05' 46.72"N	79° 08' 39.43"E
8	11° 05' 46.82"N	79° 08' 39.92"E
9	11° 05' 47.42"N	79° 08' 40.15"E
10	11° 05' 46.91"N	79° 08' 43.92"E
11	11° 05' 43.82"N	79° 08' 44.67"E
12	11° 05' 43.80"N	79° 08' 46.44"E
13	11° 05' 43.34"N	79° 08' 47.26"E
14	11° 05' 43.15"N	79° 08' 47.32"E
15	11° 05' 43.31"N	79° 08' 49.30"E
16	11° 05' 43.26"N	79° 08' 49.58"E
17	11° 05' 45.56"N	79° 08' 49.95"E
18	11° 05' 45.05"N	79° 08' 53.88"E
19	11° 05' 44.59"N	79° 08' 56.18"E
20	11° 05' 43.44"N	79° 08' 55.92"E
21	11° 05' 43.31"N	79° 08' 57.28"E
22	11° 05' 43.22"N	79° 08' 58.69"E
23	11° 05' 45.29"N	79° 08' 58.58"E
24	11° 05' 45.35"N	79° 09' 02.58"E
25	11° 05' 50.96"N	79° 09' 02.59"E
26	11° 05' 50.90"N	79° 09' 04.17"E
27	11° 05' 49.07"N	79° 09' 04.15"E
28	11° 05' 49.01"N	79° 09' 05.73"E
29	11° 05' 50.84"N	79° 09' 05.83"E
30	11° 05' 50.81"N	79° 09' 06.71"E
31	11° 05' 50.57"N	79° 09' 09.41"E
32	11° 05' 47.41"N	79° 09' 08.58"E
33	11° 05' 47.64"N	79° 09' 05.65"E
34	11° 05' 45.36"N	79° 09' 05.52"E
35	11° 05' 45.24"N	79° 09' 08.01"E
36	11° 05' 42.62"N	79° 09' 07.22"E
37	11° 05' 36.56"N	79° 09' 06.69"E
38	11° 05' 37.18"N	79° 09' 01.37"E
39	11° 05' 37.17"N	79° 09' 00.06"E
40	11° 05' 39.80"N	79° 08' 59.97"E
41	11° 05' 39.76"N	79° 08' 59.34"E
42	11° 05' 37.17"N	79° 08' 59.42"E
43	11° 05' 37.15"N	79° 08' 57.30"E
44	11° 05' 36.98"N	79° 08' 55.86"E
45	11° 05' 36.96"N	79° 08' 53.69"E
46	11° 05' 36.63"N	79° 08' 49.73"E
47	11° 05' 36.55"N	79° 08' 48.16"E
48	11° 05' 36.56"N	79° 08' 48.08"E
49	11° 05' 36.60"N	79° 08' 48.06"E
50	11° 05' 36.70"N	79° 08' 46.59"E
51	11° 05' 34.95"N	79° 08' 46.00"E
52	11° 05' 34.96"N	79° 08' 45.00"E
53	11° 05' 35.32"N	79° 08' 44.82"E
54	11° 05' 35.45"N	79° 08' 42.85"E
DATUM WGS-84		



INDEX

- MINE LEASE APPLIED BOUNDARY
- 7.5m, 50m SAFETY DISTANCE
- APPROACH ROAD
- TEMPORARY BENCH MARK
- GROUND CONTROL POINT
- ESWARAN KOVIL ERI
- CHANNEL
- VARI COURSE
- PROPOSED EHT POWER LINE
- EHT POWER LINE POLE

PLATE NO.II
DATE OF SURVEY : 05.08.2019

APPLICANT:
M/s.TAMILNADU CEMENTS CORPORATION LTD.,
ARYIALUR CEMENTS FACTORY,
ARYIALUR-621 729
ARYIALUR DISTRICT

LOCATION OF MINE:
S.F.Nos : 144/1A,217/1A etc.,
EXTENT : 22.96.0 Ha,
VILLAGE : PUDUPALAYAM,
TALUK : ARYIALUR,
DISTRICT: ARYIALUR,
STATE : TAMILNADU.

MINE LEASE PLAN
SCALE 1:2000

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 LEASEMAP
AUTHENTICATED
BY STATE GOVERNMENT

Dr.P.THANGARAJU,M.SC,Ph.D.,
QUALIFIED PERSON

BOUNDARY CO-ORDINATES

S.N.	LATITUDE	LONGITUDE
1	11° 05' 35.41"N	79° 08' 41.84"E
2	11° 05' 37.60"N	79° 08' 42.07"E
3	11° 05' 37.51"N	79° 08' 42.89"E
4	11° 05' 40.87"N	79° 08' 43.50"E
5	11° 05' 41.29"N	79° 08' 41.32"E
6	11° 05' 41.68"N	79° 08' 38.65"E
7	11° 05' 46.72"N	79° 08' 39.43"E
8	11° 05' 46.82"N	79° 08' 39.92"E
9	11° 05' 47.42"N	79° 08' 40.15"E
10	11° 05' 46.91"N	79° 08' 43.92"E
11	11° 05' 43.82"N	79° 08' 44.67"E
12	11° 05' 43.80"N	79° 08' 46.44"E
13	11° 05' 43.34"N	79° 08' 47.26"E
14	11° 05' 43.15"N	79° 08' 47.32"E
15	11° 05' 43.31"N	79° 08' 49.30"E
16	11° 05' 43.26"N	79° 08' 49.58"E
17	11° 05' 45.56"N	79° 08' 49.95"E
18	11° 05' 45.05"N	79° 08' 53.88"E
19	11° 05' 44.59"N	79° 08' 56.18"E
20	11° 05' 43.44"N	79° 08' 55.92"E
21	11° 05' 43.31"N	79° 08' 57.28"E
22	11° 05' 43.22"N	79° 08' 58.69"E
23	11° 05' 45.29"N	79° 08' 58.58"E
24	11° 05' 45.35"N	79° 09' 02.58"E
25	11° 05' 50.96"N	79° 09' 02.59"E
26	11° 05' 50.90"N	79° 09' 04.17"E
27	11° 05' 49.07"N	79° 09' 04.15"E
28	11° 05' 49.01"N	79° 09' 05.73"E
29	11° 05' 50.84"N	79° 09' 05.83"E
30	11° 05' 50.81"N	79° 09' 06.71"E
31	11° 05' 50.57"N	79° 09' 09.41"E
32	11° 05' 47.41"N	79° 09' 08.58"E
33	11° 05' 47.64"N	79° 09' 05.65"E
34	11° 05' 45.36"N	79° 09' 05.52"E
35	11° 05' 45.24"N	79° 09' 08.01"E
36	11° 05' 42.62"N	79° 09' 07.22"E
37	11° 05' 36.56"N	79° 09' 06.69"E
38	11° 05' 37.18"N	79° 09' 01.37"E
39	11° 05' 37.17"N	79° 09' 00.06"E
40	11° 05' 39.80"N	79° 08' 59.97"E
41	11° 05' 39.76"N	79° 08' 59.34"E
42	11° 05' 37.17"N	79° 08' 59.42"E
43	11° 05' 37.15"N	79° 08' 57.30"E
44	11° 05' 36.98"N	79° 08' 55.86"E
45	11° 05' 36.96"N	79° 08' 53.69"E
46	11° 05' 36.63"N	79° 08' 49.73"E
47	11° 05' 36.55"N	79° 08' 48.16"E
48	11° 05' 36.56"N	79° 08' 48.08"E
49	11° 05' 36.60"N	79° 08' 48.06"E
50	11° 05' 36.70"N	79° 08' 46.59"E
51	11° 05' 34.95"N	79° 08' 46.00"E
52	11° 05' 34.96"N	79° 08' 45.00"E
53	11° 05' 35.32"N	79° 08' 44.82"E
54	11° 05' 35.45"N	79° 08' 42.85"E

DATUM WGS-84



PUDUPALAYAM
LIMEKANKAR AND LIMESTONE DEPOSIT
APPLICANT:
M/s.TAMILNADU CEMENTS CORPORATION LTD.

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 - APPROACH ROAD
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 - GROUND CONTROL POINT
 - ESWARAN KOVIL ERI
 - CHANNEL
 - VARI COURSE
 - PROPOSED EHT POWER LINE
 - EHT POWER LINE POLE

PLATE NO.II-A
DATE OF SURVEY : 05.08.2019

APPLICANT:
M/s.TAMILNADU CEMENTS CORPORATION LTD.,
ARIYALUR CEMENTS FACTORY,
ARIYALUR-621 729
ARIYALUR DISTRICT

LOCATION OF MINE:
S.F.Nos : 144/1A,217/1A etc.,
EXTENT : 22.96.0 Ha,
VILLAGE : PUDUPALAYAM,
TALUK : ARIYALUR,
DISTRICT: ARIYALUR,
STATE : TAMILNADU.

MINE LEASE PLAN
SCALE 1:2000

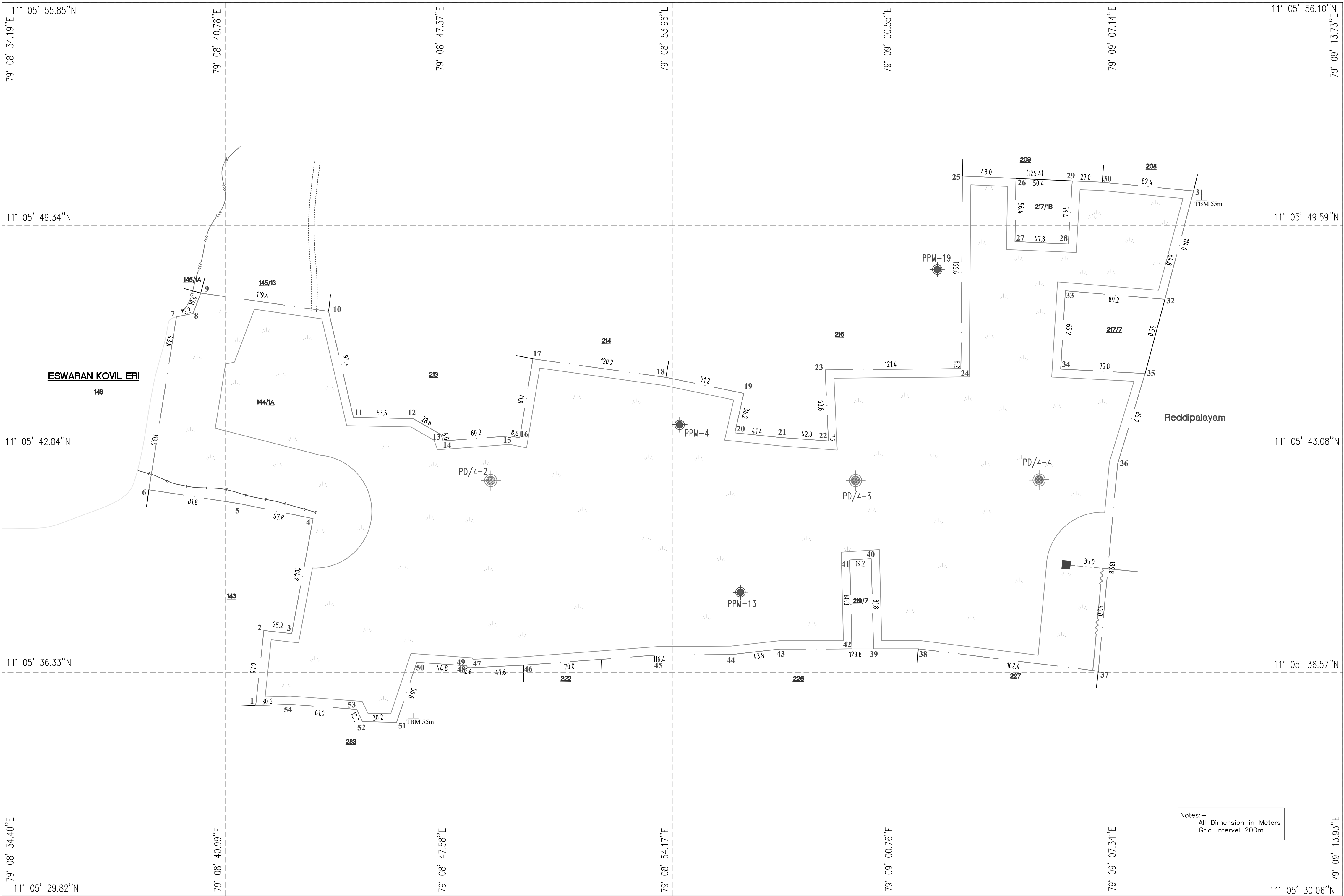
Notes:-
All Dimension in Meters
Grid Interval 200m

T.RAVICHANDRAN, B.E.
DY. GENERAL MANAGER (TECH)
TAMILNADU CEMENTS CORP.LTD
ARIYALUR CEMENT WORKS,
ARIYALUR - 621 729.

அரியலூர் செமென்ட்
கார்ப்பரேஷன்.

Deputy Director
Geology and Mining
Ariyalur.

BOUNDARY CO-ORDINATES		
S.N.	LATITUDE	LONGITUDE
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DATUM WGS-84		



PUDUPALAYAM
LIMEKANKAR AND LIMESTONE DEPOSIT
APPLICANT:
M/s.TAMILNADU CEMENTS CORPORATION LTD.

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- VARI COURSE
- PROPOSED EHT POWER LINE
- DIAMOND DRILL(PHASE-III)
- DIAMOND DRILL(PHASE-V)
- SCRUB
- EHT POWER LINE POLE

PLATE NO.III
DATE OF SURVEY : 05.08.2019

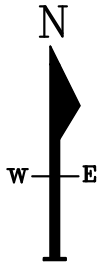
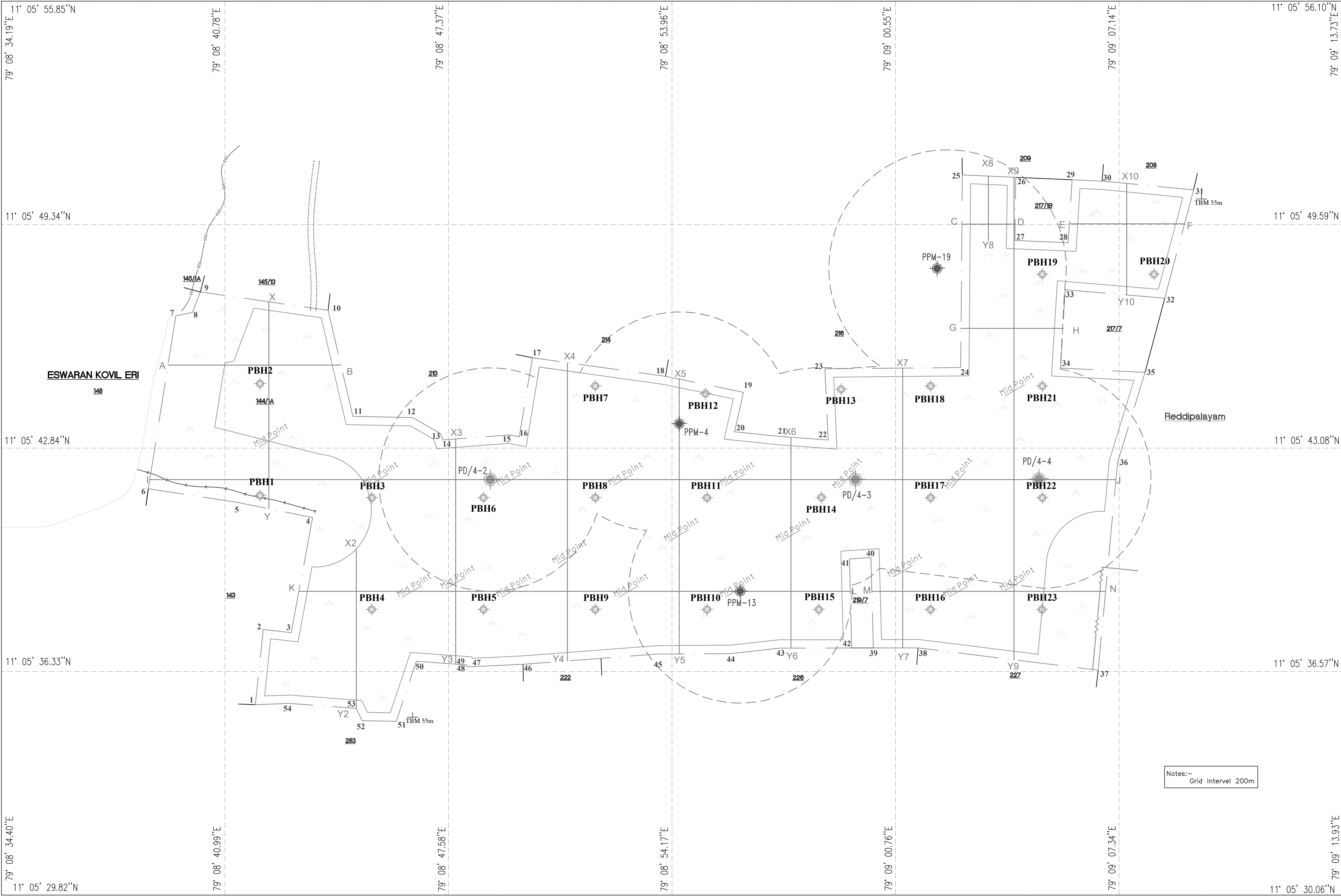
APPLICANT:
M/s.TAMILNADU CEMENTS CORPORATION LTD.,
ARIYALUR CEMENTS FACTORY,
ARIYALUR-621 729
ARIYALUR DISTRICT

LOCATION OF MINE:
S.F.Nos : 144/1A,217/1A etc.,
EXTENT : 22.96.0 Ha,
VILLAGE : PUDUPALAYAM,
TALUK : ARIYALUR,
DISTRICT: ARIYALUR,
STATE : TAMILNADU.

SURFACE PLAN
SCALE 1:2000

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 LEASEMAP
AUTHENTICATED
BY STATE GOVERNMENT
Dr.P.THANGARAJU,M.SC,Ph.D.,
QUALIFIED PERSON



PUDUPALAYAM
LIMEKANKAR AND LIMESTONE DEPOSIT.
APPLICANT:
M/s.TAMILNADU CEMENTS CORPORATION LTD.

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DIAMOND DRILL(PHASE-V)	
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PLATE NO.IV
DATE OF SURVEY : 05.08.2019

APPLICANT:
M/s.TAMILNADU CEMENTS CORPORATION LTD.,
ARIYALUR CEMENTS FACTORY,
ARIYALUR-621 729
ARIYALUR DISTRICT

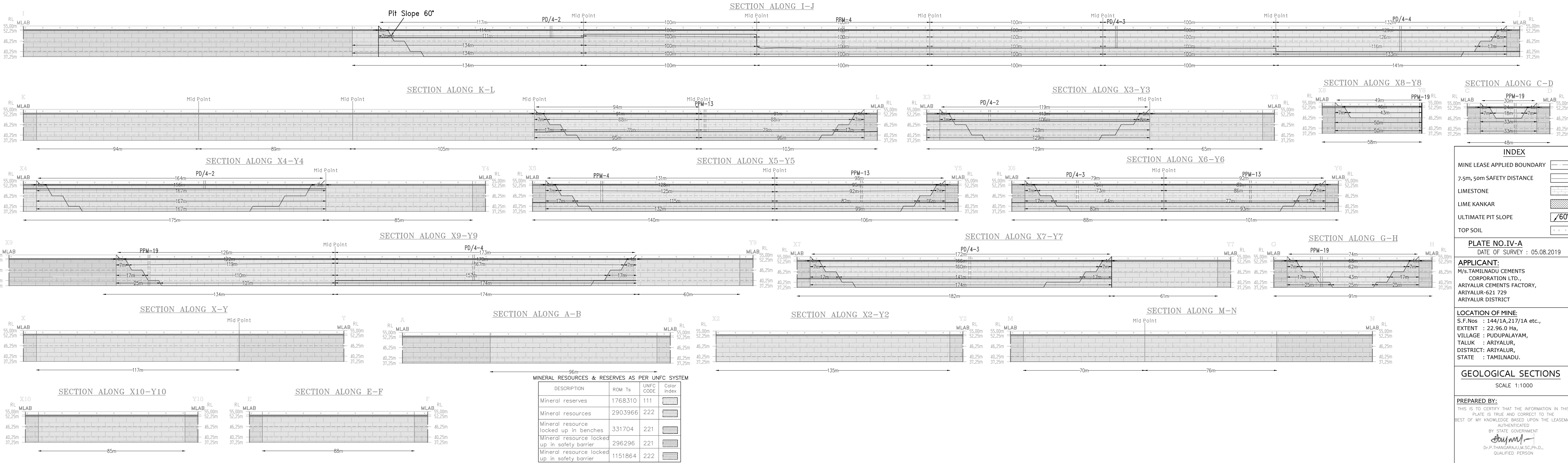
LOCATION OF MINE:
S.F.Nos : 144/1A,217/1A etc.,
EXTENT : 22.96.0 Ha,
VILLAGE : PUDUPALAYAM,
TALUK : ARIYALUR,
DISTRICT: ARIYALUR,
STATE : TAMILNADU.

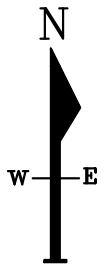
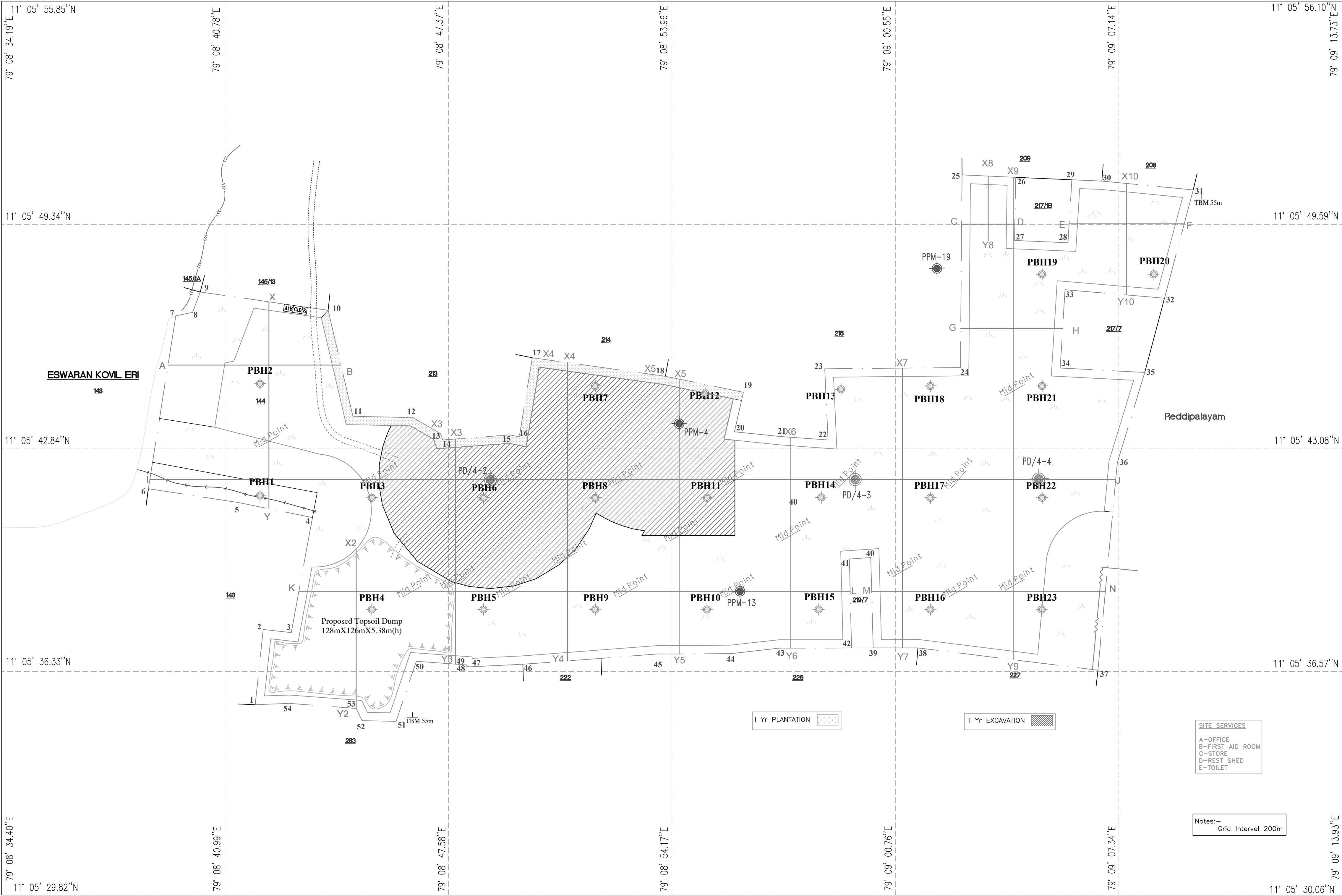
GEOLOGICAL PLAN
SCALE 1:2000

PREPARED BY:

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PLATE IS TRUE AND CORRECT TO THE
BEST OF MY KNOWLEDGE BASED UPON THE LEASEMAF
AUTHENTICATED
BY STATE GOVERNMENT

Dr.P.THANGARAJU,M.SC,Ph.D.,
QUALIFIED PERSON





PUDUPALAYAM
LIMEKANKAR AND LIMESTONE DEPOSIT,
APPLICANT:
M/s.TAMILNADU CEMENTS CORPORATION LTD.

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- PROPOSED BORE HOLE
- TOPSOIL DUMP
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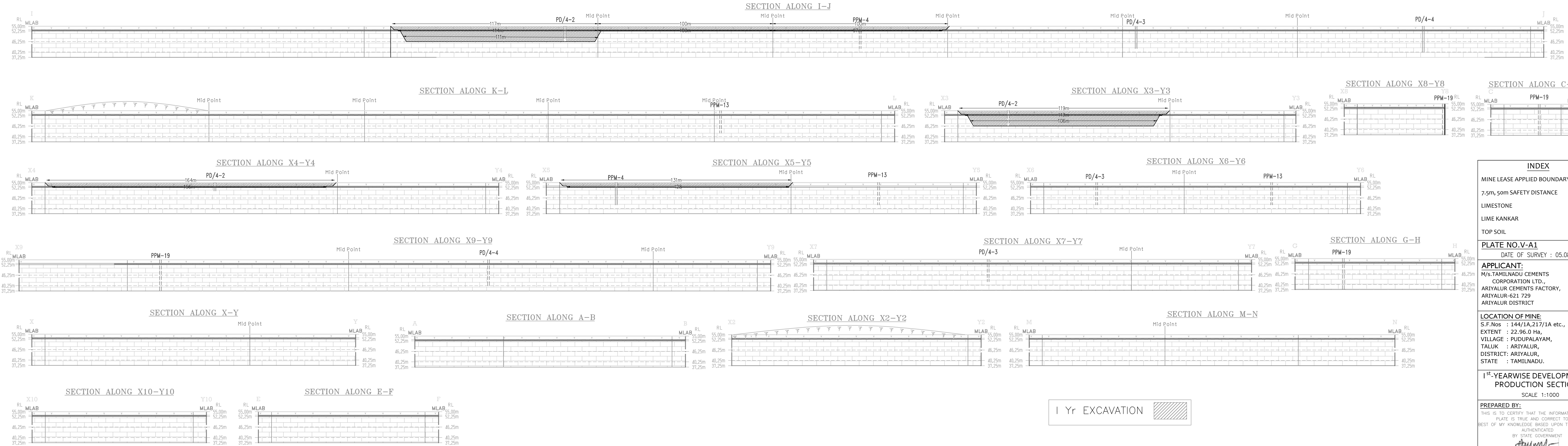
PLATE NO.V-A
DATE OF SURVEY : 05.08.2019

APPLICANT:
M/s.TAMILNADU CEMENTS
CORPORATION LTD.,
ARIYALUR CEMENTS FACTORY,
ARIYALUR-621 729
ARIYALUR DISTRICT

LOCATION OF MINE:
S.F.Nos : 144/1A,217/1A etc.,
EXTENT : 22.96.0 Ha,
VILLAGE : PUDUPALAYAM,
TALUK : ARIYALUR,
DISTRICT: ARIYALUR,
STATE : TAMILNADU.

1st-YEARWISE DEVELOPMENT
&PRODUCTION PLAN
SCALE 1:2000

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 LEASEMAP
AUTHENTICATED
BY STATE GOVERNMENT
Dr.P.J.HANAGARAJU,M.Sc,P.h.D.,
QUALIFIED PERSON



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MINE LEASE APPLIED BOUNDARY

7.5m, 50m SAFETY DISTANCE

LIMESTONE

LIME KANKAR

TOP SOIL

PLATE NO.V-A1

DATE OF SURVEY : 05.08.2019

APPLICANT:

M/s.TAMILNADU CEMENTS CORPORATION LTD.,
ARIYALUR CEMENTS FACTORY,
ARIYALUR-621 729
ARIYALUR DISTRICT

LOCATION OF MINE:

S.F.Nos : 144/1A,217/1A etc.,
EXTENT : 22.96.0 Ha,
VILLAGE : PUDUPALAYAM,
TALUK : ARIYALUR,
DISTRICT: ARIYALUR,
STATE : TAMILNADU.

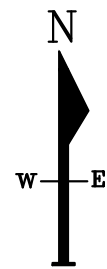
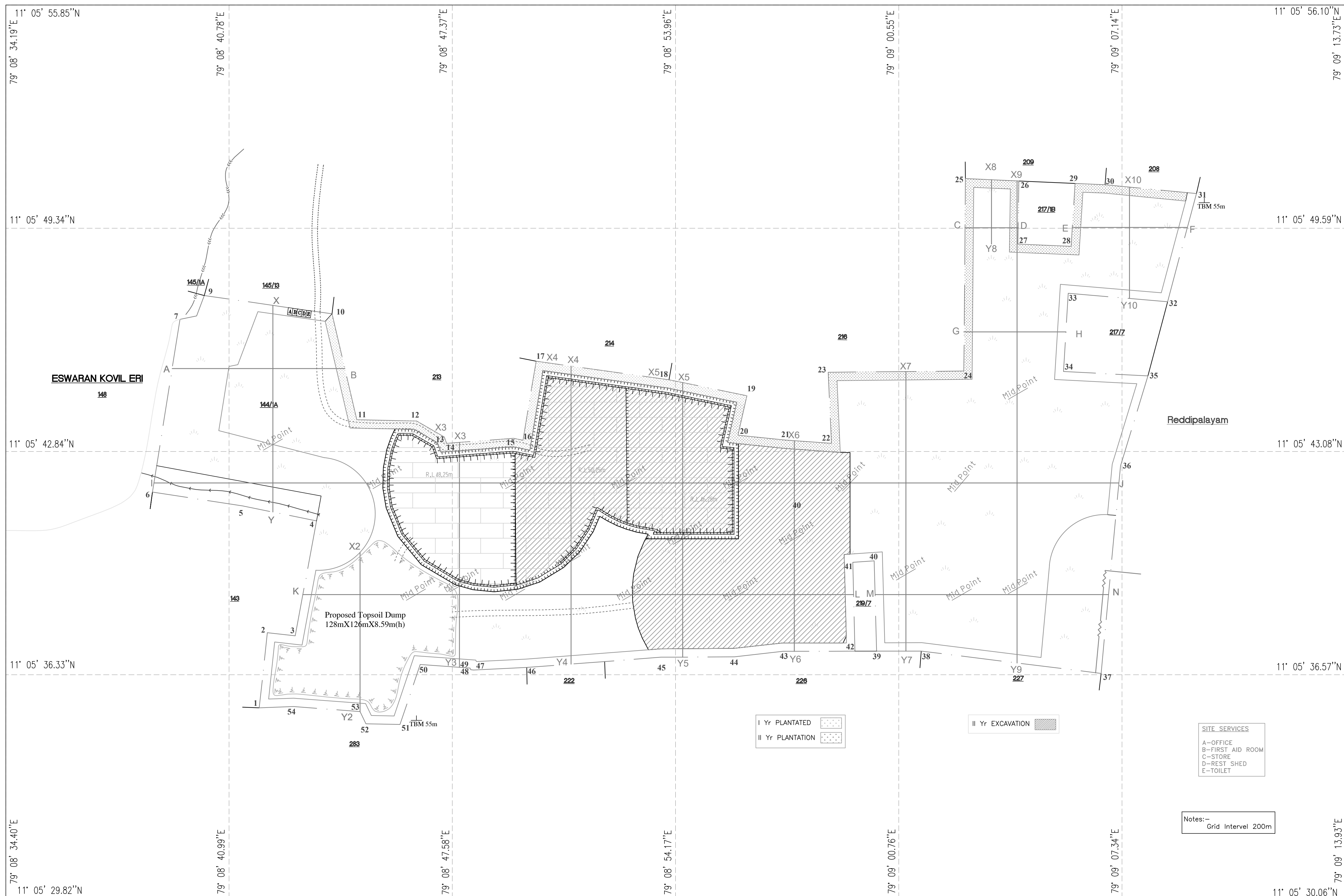
1ST-YEARWISE DEVELOPMENT & PRODUCTION SECTIONS

SCALE 1:1000

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 LEASEMAP AUTHENTICATED BY STATE GOVERNMENT

Dr.P.THANGARAJU,M.SC,Ph.D.,
QUALIFIED PERSON



PUDUPALAYAM
LIMEKANKAR AND LIMESTONE DEPOSIT ,
APPLICANT:
M/s.TAMILNADU CEMENTS CORPORATION LTD,

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VARI COURSE	
PROPOSED EHT POWER LINE	
SCRUB	
LIMESTONE	
TOPSOIL DUMP	
MINE ROAD	
MINE PIT	

PLATE NO.V-B

DATE OF SURVEY : 05.08.2019

APPLICANT:

M/s.TAMILNADU CEMENTS
CORPORATION LTD.,
ARIYALUR CEMENTS FACTORY,
ARIYALUR-621 729
ARIYALUR DISTRICT

LOCATION OF MINE:

S.F.Nos : 144/1A,217/1A etc.,
EXTENT : 22.96.0 Ha,
VILLAGE : PUDUPALAYAM,
TALUK : ARIYALUR,
DISTRICT: ARIYALUR,
STATE : TAMILNADU.

IInd-YEARWISE DEVELOPMENT
& PRODUCTION PLAN

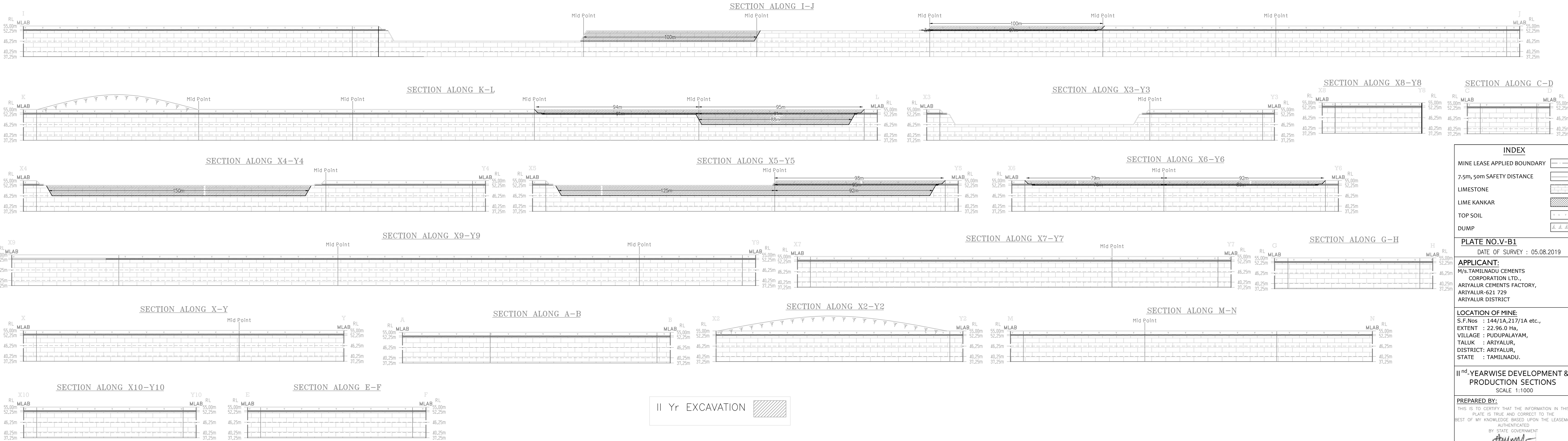
SCALE 1:2000

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 LEASEMAN'S
AUTHENTICATION

BY STATE GOVERNMENT

Dr.P.THANGARAJU,M.SC,Ph.D.,
QUALIFIED PERSON



INDEX

- MINE LEASE APPLIED BOUNDARY
- 7.5m, 50m SAFETY DISTANCE
- LIMESTONE
- LIME KANKAR
- TOP SOIL
- DUMP

PLATE NO.V-B1

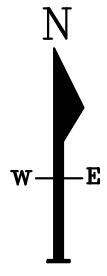
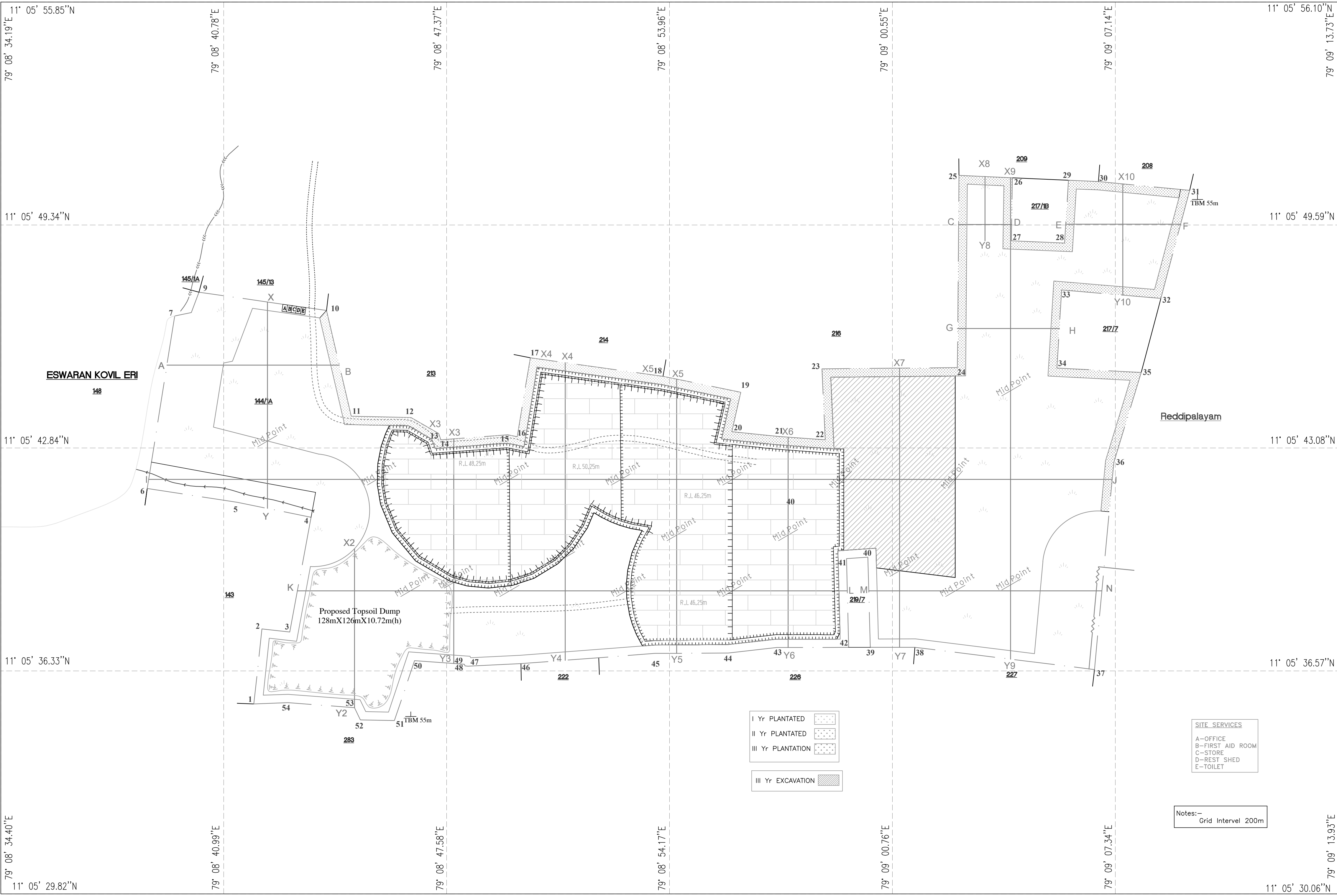
DATE OF SURVEY : 05.08.2019

APPLICANT:
M/s.TAMILNADU CEMENTS CORPORATION LTD.,
ARIYALUR CEMENTS FACTORY,
ARIYALUR-621 729
ARIYALUR DISTRICT

LOCATION OF MINE:
S.F.Nos : 144/1A,217/1A etc.,
EXTENT : 22.96.0 Ha,
VILLAGE : PUDUPALAYAM,
TALUK : ARIYALUR,
DISTRICT: ARIYALUR,
STATE : TAMILNADU.

IInd-YEARWISE DEVELOPMENT & PRODUCTION SECTIONS
SCALE 1:1000

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 LEASEMAP AUTHENTICATED BY STATE GOVERNMENT
[Signature]
Dr.P.THANGARAJU,M.SC,Ph.D.,
QUALIFIED PERSON



PUDUPALAYAM
LIMEKANKAR AND LIMESTONE DEPOSIT .
APPLICANT:
M/s.TAMILNADU CEMENTS CORPORATION LTD.

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SCRUB	
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TOPSOIL DUMP	
MINE ROAD	
MINE PIT	

PLATE NO.V-C
DATE OF SURVEY : 05.08.2019

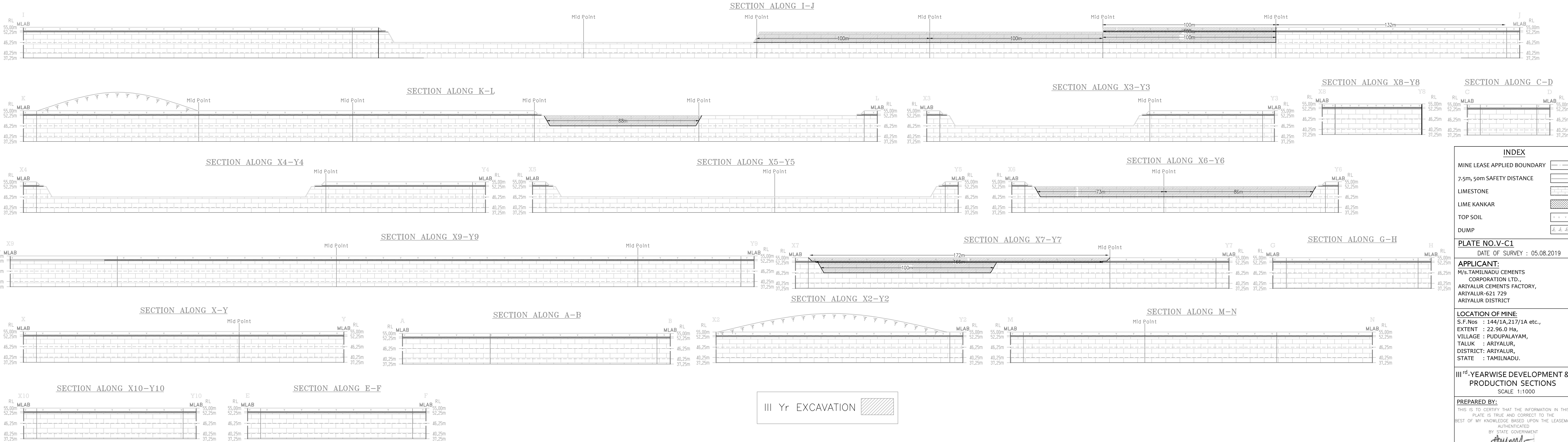
APPLICANT:
M/s.TAMILNADU CEMENTS
CORPORATION LTD.,
ARIYALUR CEMENTS FACTORY,
ARIYALUR-621 729
ARIYALUR DISTRICT

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S.F.Nos : 144/1A,217/1A etc.,
EXTENT : 22.96.0 Ha,
VILLAGE : PUDUPALAYAM,
TALUK : ARIYALUR,
DISTRICT: ARIYALUR,
STATE : TAMILNADU.

IIIrd-YEARWISE DEVELOPMENT
&PRODUCTION PLAN
SCALE 1:2000

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 LEASEMAP
AUTHENTICATED
BY STATE GOVERNMENT

Dr.P.THANGARAJU,M.SC,Ph.D.,
QUALIFIED PERSON



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DUMP	— — —

PLATE NO.V-C1

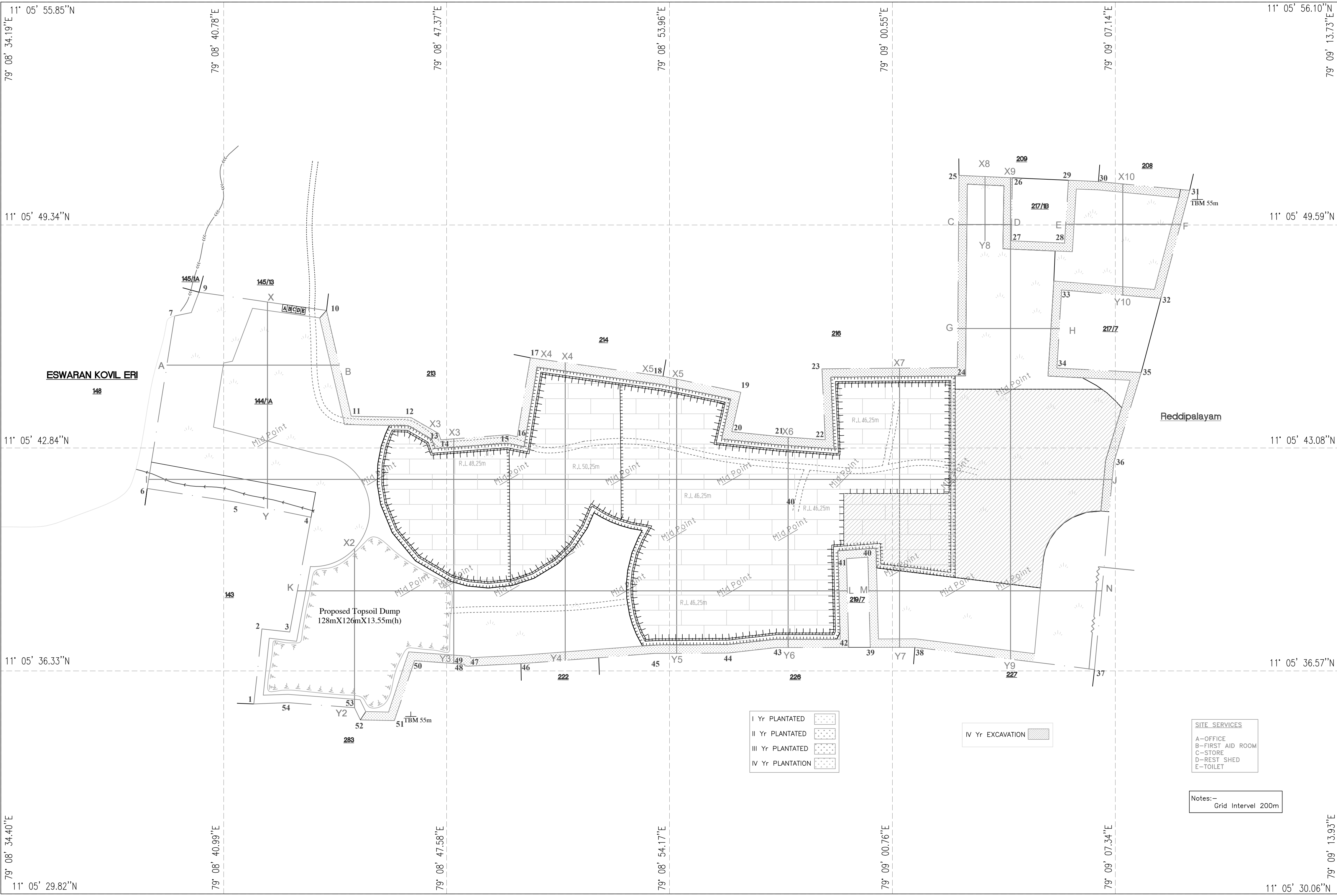
DATE OF SURVEY : 05.08.2019

APPLICANT:
M/s.TAMILNADU CEMENTS
CORPORATION LTD.,
ARIYALUR CEMENTS FACTORY,
ARIYALUR-621 729
ARIYALUR DISTRICT

LOCATION OF MINE:
S.F.Nos : 144/1A,217/1A etc.,
EXTENT : 22.96.0 Ha,
VILLAGE : PUDUPALAYAM,
TALUK : ARIYALUR,
DISTRICT: ARIYALUR,
STATE : TAMILNADU.

IIIrd-YEARWISE DEVELOPMENT &
PRODUCTION SECTIONS
SCALE 1:1000

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 LEASEMAP
AUTHENTICATED
BY STATE GOVERNMENT
Dr.P.Thangaraju
Dr.P.THANGARAJU,M.SC,Ph.D.,
QUALIFIED PERSON



PUDUPALAYAM
LIMEKANKAR AND LIMESTONE DEPOSIT ,
APPLICANT:
M/s.TAMILNADU CEMENTS CORPORATION LTD,

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LIMESTONE	
TOPSOIL DUMP	
MINE ROAD	
MINE PIT	

PLATE NO.V-D
DATE OF SURVEY : 05.08.2019

APPLICANT:
M/s.TAMILNADU CEMENTS CORPORATION LTD.,
ARIYALUR CEMENTS FACTORY,
ARIYALUR-621 729
ARIYALUR DISTRICT

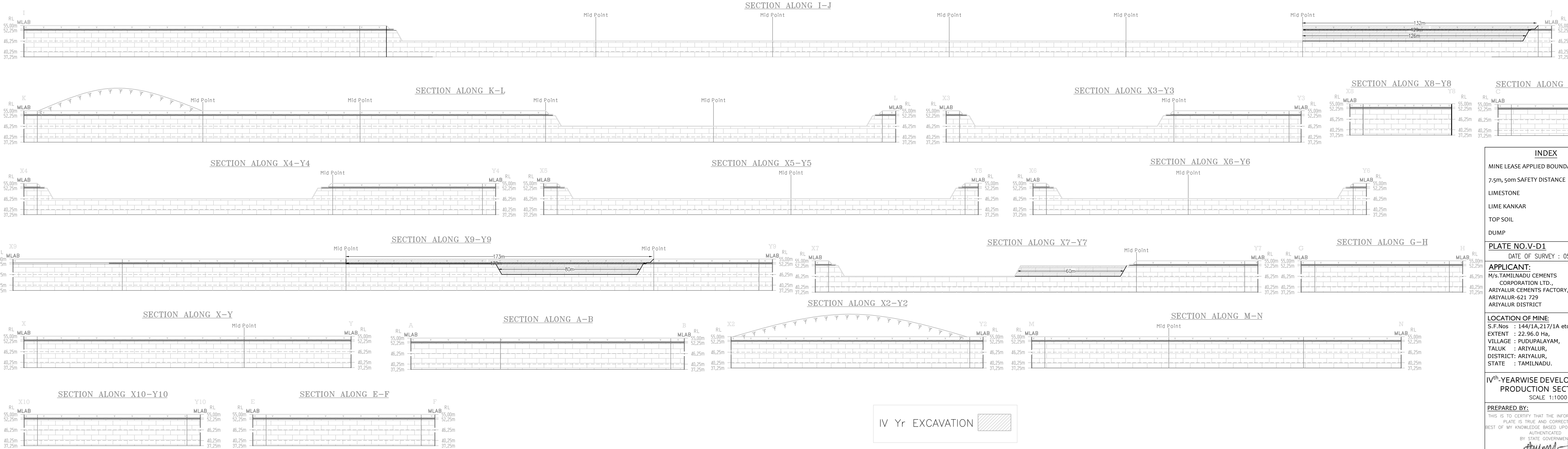
LOCATION OF MINE:
S.F.Nos : 144/1A,217/1A etc.,
EXTENT : 22.96.0 Ha,
VILLAGE : PUDUPALAYAM,
TALUK : ARIYALUR,
DISTRICT: ARIYALUR,
STATE : TAMILNADU.

IVth-YEARWISE DEVELOPMENT &PRODUCTION PLAN
SCALE 1:2000

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 LEASEMAP AUTHENTICATED BY STATE GOVERNMENT

Dr.P.THANGARAJU M.SC,Ph.D.,
QUALIFIED PERSON



INDEX

MINE LEASE APPLIED BOUNDARY

7.5m, 50m SAFETY DISTANCE

LIMESTONE

LIME KANKAR

TOP SOIL

DUMP

PLATE NO.V-D1

DATE OF SURVEY : 05.08.2019

APPLICANT:

M/s.TAMILNADU CEMENTS CORPORATION LTD.,
ARIYALUR CEMENTS FACTORY,
ARIYALUR-621 729
ARIYALUR DISTRICT

LOCATION OF MINE:

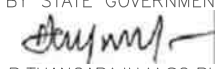
S.F.Nos : 144/1A,217/1A etc.,
EXTENT : 22.96.0 Ha,
VILLAGE : PUDUPALAYAM,
TALUK : ARIYALUR,
DISTRICT: ARIYALUR,
STATE : TAMILNADU.

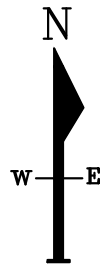
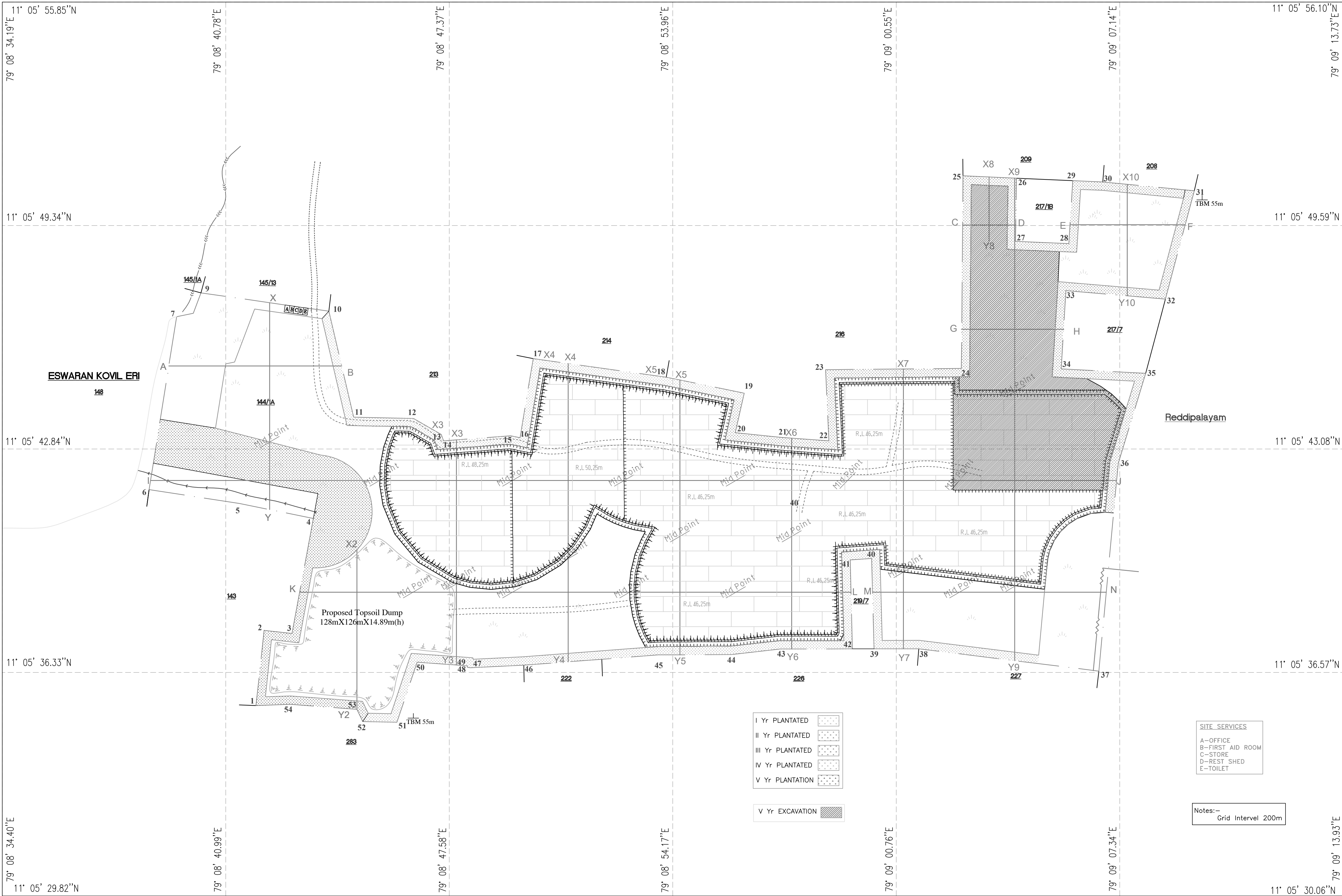
IVth-YEARWISE DEVELOPMENT & PRODUCTION SECTIONS

SCALE 1:1000

PREPARED BY:

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Dr.P.THANGARAJU,M.SC,Ph.D.,
QUALIFIED PERSON



PUDUPALAYAM
LIMEKANKAR AND LIMESTONE DEPOSIT,
APPLICANT:
M/s.TAMILNADU CEMENTS CORPORATION LTD.

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SCRUB	
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TOPSOIL DUMP	
MINE ROAD	
MINE PIT	

PLATE NO.V-E

DATE OF SURVEY : 05.08.2019

APPLICANT:

M/s.TAMILNADU CEMENTS
CORPORATION LTD.,
ARIYALUR CEMENTS FACTORY,
ARIYALUR-621 729
ARIYALUR DISTRICT

LOCATION OF MINE:

S.F.Nos : 144/1A,217/1A etc.,
EXTENT : 22.96.0 Ha,
VILLAGE : PUDUPALAYAM,
TALUK : ARIYALUR,
DISTRICT: ARIYALUR,
STATE : TAMILNADU.

Vth-YEARWISE DEVELOPMENT
&PRODUCTION PLAN

SCALE 1:2000

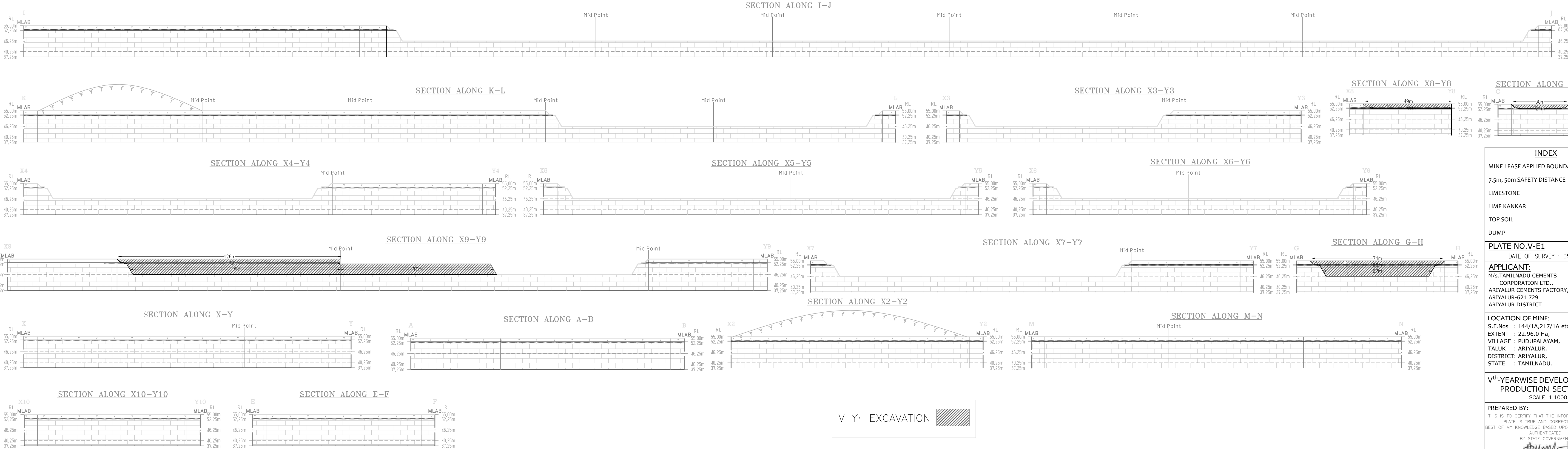
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AUTHENTICATED

BY STATE GOVERNMENT

Dr.P.THANGARAJU,M.SC,Ph.D.,

QUALIFIED PERSON



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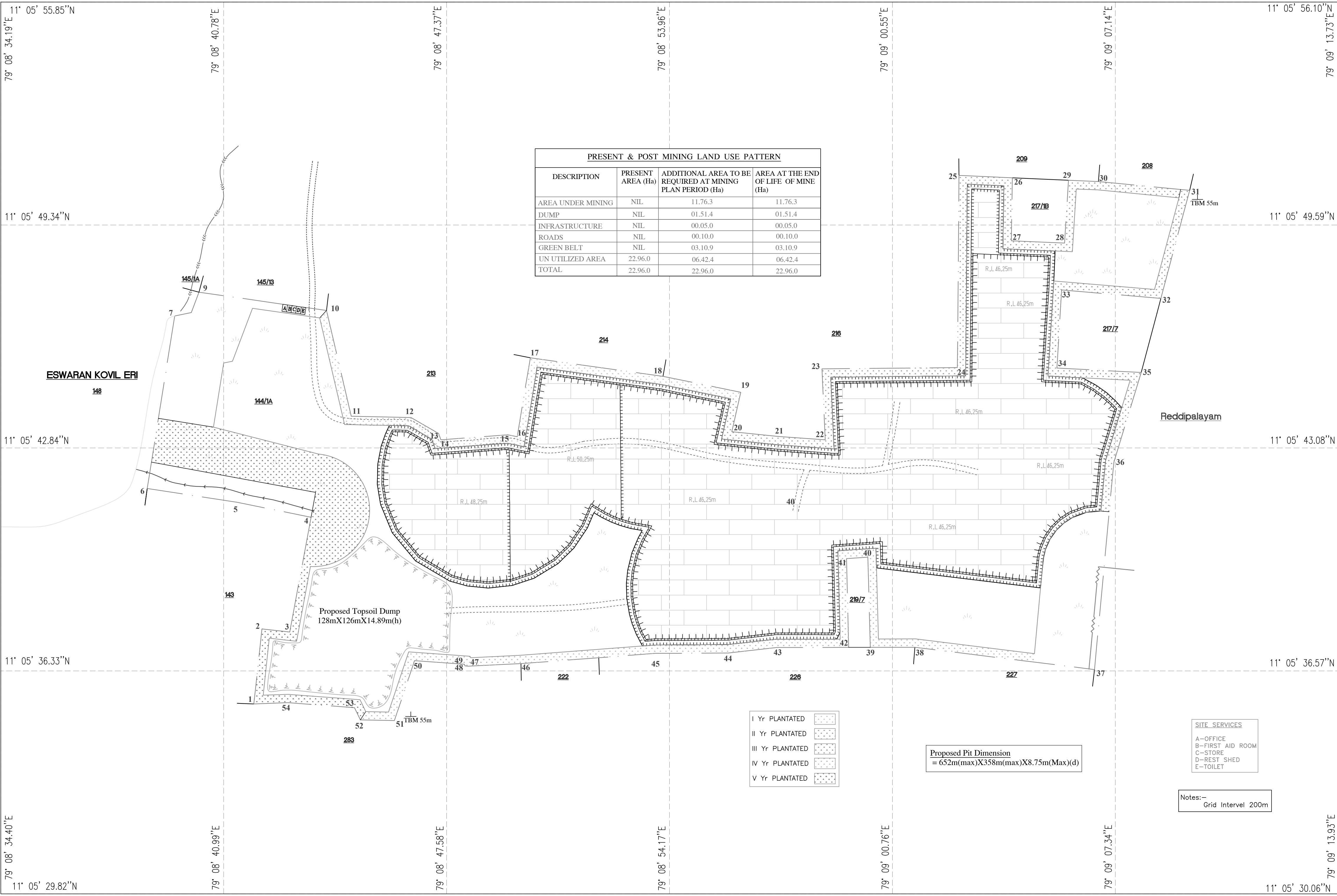
DATE OF SURVEY : 05.08.2019

APPLICANT:
M/s.TAMILNADU CEMENTS CORPORATION LTD.,
ARIYALUR CEMENTS FACTORY,
ARIYALUR-621 729
ARIYALUR DISTRICT

LOCATION OF MINE:
S.F.Nos : 144/1A,217/1A etc.,
EXTENT : 22.96.0 Ha,
VILLAGE : PUDUPALAYAM,
TALUK : ARIYALUR,
DISTRICT: ARIYALUR,
STATE : TAMILNADU.

Vth-YEARWISE DEVELOPMENT & PRODUCTION SECTIONS
SCALE 1:1000

PREPARED BY:
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BY STATE GOVERNMENT
[Signature]
Dr.P.THANGARAJU,M.SC,Ph.D.,
QUALIFIED PERSON



PUDUPALAYAM
LIMEKANKAR AND LIMESTONE DEPOSIT
APPLICANT:
M/s.TAMILNADU CEMENTS CORPORATION LTD.

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PLATE NO.VI
DATE OF SURVEY : 05.08.2019

APPLICANT:
M/s.TAMILNADU CEMENTS CORPORATION LTD.,
ARIYALUR CEMENTS FACTORY,
ARIYALUR-621 729
ARIYALUR DISTRICT

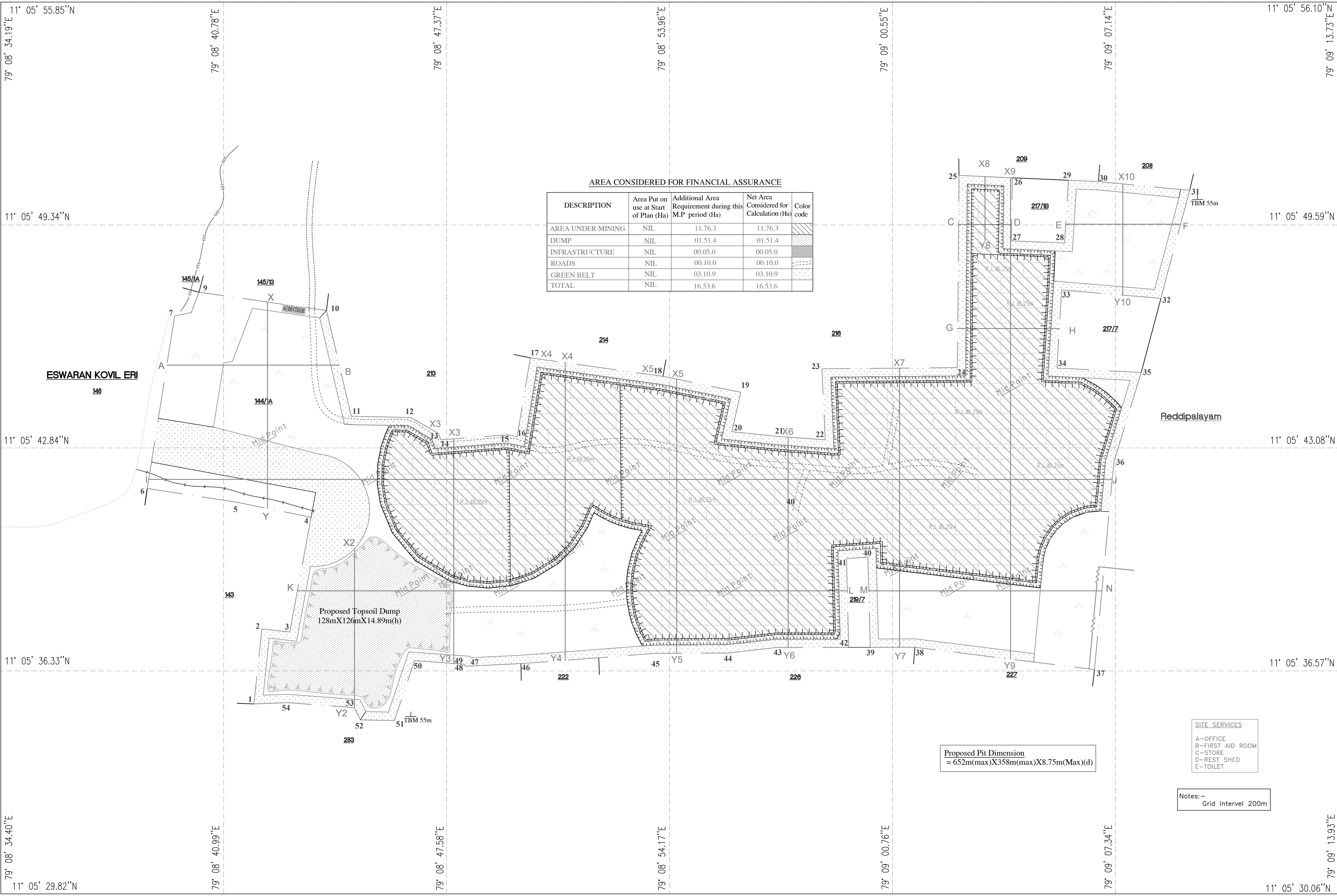
LOCATION OF MINE:
S.F.Nos : 144/1A,217/1A etc.,
EXTENT : 22.96.0 Ha,
VILLAGE : PUDUPALAYAM,
TALUK : ARIYALUR,
DISTRICT: ARIYALUR,
STATE : TAMILNADU.

MINE LAYOUT AND AFFORESTATION PLAN
SCALE 1:2000

PREPARED BY:

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PLATE IS TRUE AND CORRECT TO THE
BEST OF MY KNOWLEDGE BASED UPON THE LEASEMAF
AUTHENTICATED
BY STATE GOVERNMENT

Dr.P.THANGARAJU,M.SC,Ph.D.,
QUALIFIED PERSON



AREA CONSIDERED FOR FINANCIAL ASSURANCE				
DESCRIPTION	Area Put on use at Start of Plan (Ha)	Additional Area Requirement during this M.P period (Ha)	Net Area Considered for Calculation (Ha)	Color code
AREA UNDER MINING	NIL	11.76.3	11.76.3	
DUMP	NIL	01.51.4	01.51.4	
INFRASTRUCTURE	NIL	00.05.0	00.05.0	
ROADS	NIL	00.10.0	00.10.0	
GREEN BELT	NIL	03.10.9	03.10.9	
TOTAL	NIL	16.53.6	16.53.6	

N
W
E

PUDUPALAYAM
LIMEKANKAR AND LIMESTONE DEPOSIT.,
APPLICANT:
M/s.TAMILNADU CEMENTS CORPORATION LTD.

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MINE LEASE APPLIED BOUNDARY

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CHANNEL

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PROPOSED EHT POWER LINE

SCRUB

LIMESTONE

TOPSOIL DUMP

MINE ROAD

MINE PIT

PLATE NO.VII
DATE OF SURVEY : 05.08.2019

APPLICANT:

M/s.TAMILNADU CEMENTS CORPORATION LTD.,
ARIYALUR CEMENTS FACTORY,
ARIYALUR-621 729
ARIYALUR DISTRICT

LOCATION OF MINE:

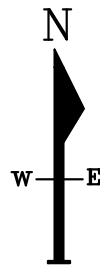
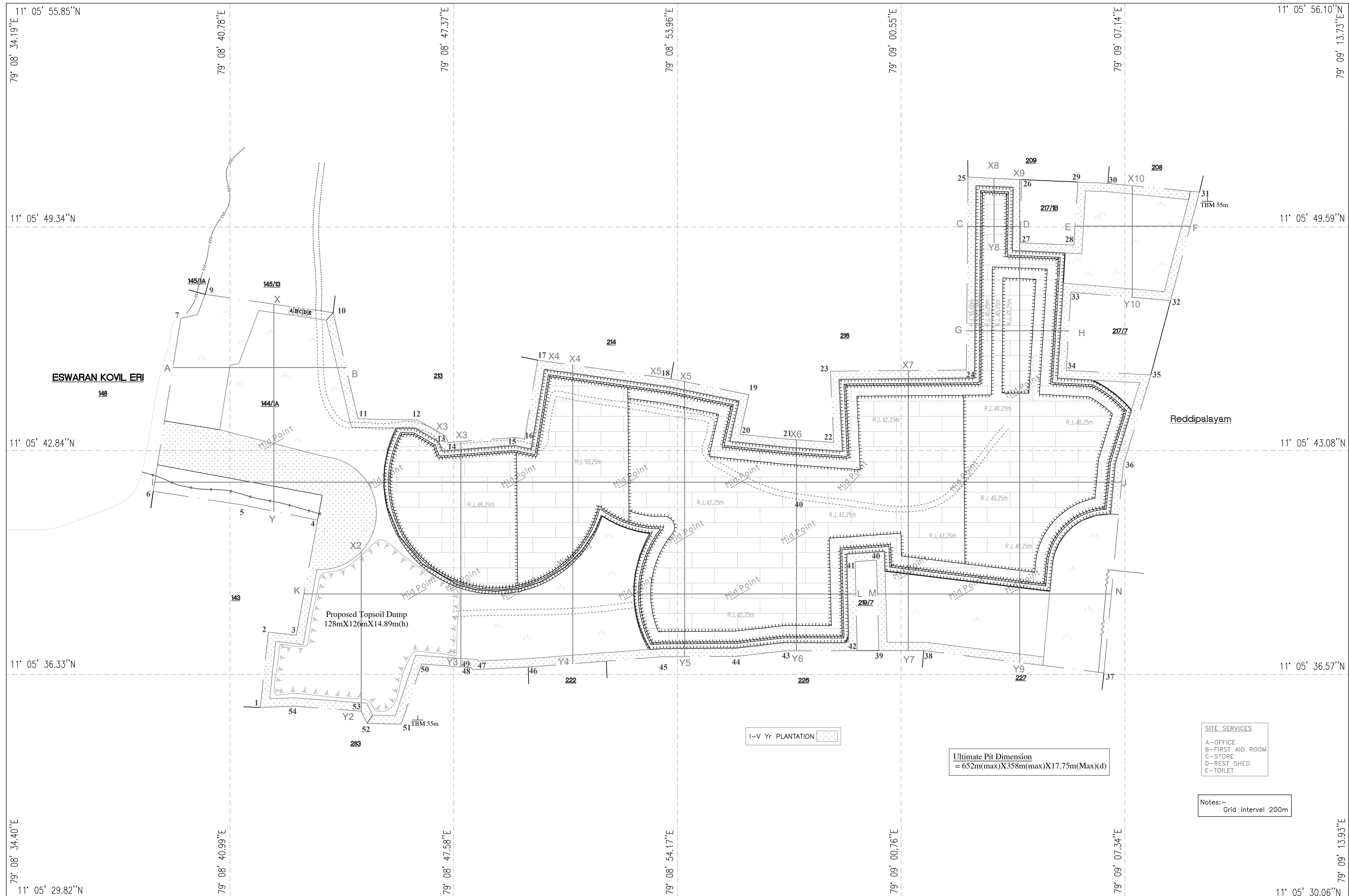
S.F.Nos : 144/1A,217/1A etc.,
EXTENT : 22.96.0 Ha,
VILLAGE : PUDUPALAYAM,
TALUK : ARIYALUR,
DISTRICT: ARIYALUR,
STATE : TAMILNADU.

FINANCIAL AREA ASSURANCE PLAN

SCALE 1:2000

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BY STATE GOVERNMENT
Dr.P.THANGARAJU,M.SC,Ph.D.,
QUALIFIED PERSON



PUDUPALAYAM
LIMEKANKAR AND LIMESTONE DEPOSIT,
APPLICANT:
M/s.TAMILNADU CEMENTS CORPORATION LTD.

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| PROPOSED EHT POWER LINE | |
| SCRUB | |
| LIMESTONE | |
| TOPSOIL DUMP | |
| MINE ROAD | |
| MINE PIT | |

PLATE NO.IX

DATE OF SURVEY : 05.08.2019

APPLICANT:

M/s.TAMILNADU CEMENTS
CORPORATION LTD.,
ARIYALUR CEMENTS FACTORY,
ARIYALUR-621 729
ARIYALUR DISTRICT

LOCATION OF MINE:

S.F.Nos : 144/1A,217/1A etc.,
EXTENT : 22.96.0 Ha,
VILLAGE : PUDUPALAYAM,
TALUK : ARIYALUR,
DISTRICT: ARIYALUR,
STATE : TAMILNADU.

CONCEPTUAL PLAN

SCALE 1:2000

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AUTHENTICATED

BY STATE GOVERNMENT
A-108-A

Dr.P.THANGARAJU,M.SC,Ph.D.,
QUALIFIED PERSON

ANNEXURE V
500M RADIUS DD LETTER

From

Tmt. B. Jothi, M.Sc.,
Deputy Director,
Geology and Mining Department
Ariyalur

To

Tvl. Tamilnadu Cements Corporation
Limited,
L.L.A Buildings, IInd Floor,
735, Anna Salai
Chennai-600 002

Rc.No.133/G&M/2018 Dated: 12.06.2020.

Sir/Madam,

Sub: Mines and Minerals – Major Mineral – Limestone – Ariyalur Taluk & District – Pudupalayam Village – S.F.Nos. 144/1A, 217/1A etc., - Over an extent of 22.96.0 Ha of Patta Lands – Mining Lease granted to Tvl. Tamilnadu Cements Corporation Limited for mining limestone & limekankar – Details of quarries situated within 500m radial distance – requested – Details furnished – Reg.

- Ref: 1. Representation of Tvl. Tamilnadu Cements Corporation Ltd., Ariyalur Cement Works, IInd Floor, L.L.A Buildings, 735, Anna Salai, Chennai – 600 002, Lr.No. TANCEM/ACW/Pudupalayam Lease (1)/MCR/2018, dated: 15.05.2018 (Received by this office 18.05.2018) enclosing the Mining Lease application under Rule 22(1) of MCR, 1960.
2. District Collector Lr. Rc.No.133/G&M/2018, dated 22.03.2019 addressed to the Principal Secretary to Govt. through The Director of Geology and Mining, Chennai-32.
3. Industries (MMA.2), Secretariat Department Lr.No. 3997/MMA.2/2019-1 dated 02.08.2019.
4. Representation of Tvl. TANCEM Lr.No. TANCEM/ACW/GEO/PPM-1/173/2020 08.06.2020.

Tvl. TANCEM Ltd, Chennai-02 have applied for mining lease for mining limestone & limekankar over an extent of 22.96.0 Ha. Of patta lands in S.F.Nos. 144/1A, 217/1A etc., in Pudupalayam village, Ariyalur Taluk & District for a period of 30 years vide proceedings in the reference 1st cited. Vide reference 2nd cited, the application of Tvl. TANCEM Ltd., was forwarded to Government through The Director of Geology and Mining for which the Government have communicated the Precise Area letter to Tvl. TANCEM Ltd., vide reference 3rd cited with instructions to submit approved mining plan and SEIAA Clearance.

As such, Tvl. TANCEM Ltd, Chennai-02 in the reference 4th cited have informed that they have proposed to apply for environmental clearance in SEIAA, Chennai-15 and have requested to provide the details of existing, abandoned & proposed mines falling within 500m radial distance from the mining lease boundary. The details are,

1. Existing Mines:

S.No	Name of the owner	Taluk & Village	S.F.Nos	Extent (In ha) & G.O.No	Mineral	Lease Period
1	Tvl. Ramco Cements Ltd	Ariyalur & Pudupalayam	226/7 etc	4.83.0. G.O (3D) 5 dated 04.01.1995	Limestone	16.06.1995 to 15.06.2015 Deemed to be extended upto 15.06.2035.
2	Tvl. Chettinad Cements Corpn. Ltd	Ariyalur & Pudupalayam	207,208 etc	37.01.0 G.O.27 dated 11.06.1989	Limestone	09.02.1989 to 08.02.2009 Deemed to be extended upto 08.02.2039.

2. Proposed Mines:

S.No	Name of the owner	Taluk & Village	S.F.Nos	Extent (In ha)	Mineral	Lease Period
1	Tvl. TANCEM	Ariyalur & Pudupalayam	221/1, 2A etc	23.35.0	Limestone & Limekanakar	-
2	Tvl. TANCEM	Ariyalur & Pudupalayam	229/3A, 230/2A, 237/1 etc	23.02.5	Limestone & Limekanakar	-
3	Tvl. TANCEM	Ariyalur & Pudupalayam	144,217, 218 etc	22.96.0	Limestone & Limekanakar	-

3. Expired and abandoned Mines:

S.No	Name of the owner	Taluk & Village	S.F.Nos	Extent (In ha)	Mineral	Lease Period
Nil						

V. S. S.
12/6/2022
Deputy Director
Geology and Mining,
Ariyalur.

A. D.
12/6/2022

ANNEXURE VI
VAO CERTIFICATE

அரியலூர் வருவாய் வட்டாட்சியர் அவர்களின் முன்பாக.

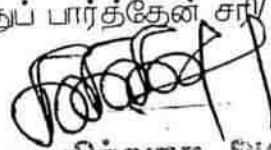
அரியலூர் வட்டம், புதுப்பாளையம் கிராம நிர்வாக அலுவலர் ஆகிய நான் அளிக்கும் வாக்குமூலம்.

அரியலூர் வட்டம், புதுப்பாளையம் கிராமத்தில் திருவாளர். தமிழ்நாடு சிமெண்ட் நிறுவனம் தனக்கு சொந்தமான மேற்படி கிராம புல எண். 144,217/1A, 1C,2,3A,3B,4.5.6, 218/1,219/1,2A,2B,3A,3B,3C,3D,3E,3F,3G,4A,4B,5A,5B,5C,6,8,9,220/1,2A,2B,3A,3B,3C,3D,3E,4,5A,5B,6A,6B,7A,7B,8A,8B,9A,9B,9C,10A,10B,11A,11B, 221/1A, மற்றும் 221/15 22.96.0 ஹெக்டேர் பரப்பளவில் சுண்ணாம்புக்கல் வெட்டி எடுக்க குத்தகை உரிமம் கோரியது தொடர்பாக மேற்படி புல எண்களில் .03.2019 அன்று தலப்பார்வை செய்து என்னை விசாரிப்பதை தெரிந்து கொண்டேன். சுண்ணாம்புக்கல் வெட்டி எடுக்க குத்தகை உரிமம் கோரும் புலங்களிலோ அல்லது அருகிலோ நீரோடைகளோ, ஏரி மற்றும் குளம் போன்ற நீர் அமைப்புகள் ஏதுமில்லை. கோவில் , மசூதி , தேவாலயம் மற்றும் மயானம் போன்ற நிரந்தர அமைப்புகள் ஏதுமில்லை. மேற்படி கிராமத்தில் மேற்படி புல எண்களில் சுண்ணாம்புக்கல் வெட்டி எடுப்பதால் சுற்றுச்சூழல் பாதிப்பு ஏதுமில்லை என்பதாலும் பொதுமக்கள் ஆட்சேபனை ஏதும் தெரிவிக்கவில்லை.

குத்தகை உரிமம் அனுமதி கோரும் நிலங்களில் மரங்கள் ஏதும் இல்லை.

புதுப்பாளையம் கிராமத்தில் கிராம புல எண் 144,217/1A,1C,2,3A,3B,4,5,6,218/1,219/1, 2A, 2B,3A,3B,3C, 3D, 3E,3F,3G,4A,4B,5A, 5B,5C,6, 8,9, 220/1,2A, 2B, 3A, 3B,3C,3D, 3E, 4,5A,5B,6A,6B,7A,7B,8A,8B,9A,9B,9C,10A, 10B,11A,11B, 221/1A, மற்றும் 221/15-ல் 22.96.0 ஹெக்டேர் பரப்பளவில் சுண்ணாம்புக்கல் வெட்டி எடுப்பதற்கு தி/ள் தமிழ் நாடு சிமெண்ட் கழகத்திற்கு குத்தகை உரிமம் வழங்கலாம் என்பதை பணிவுடன் தெரிவித்துக்கொள்கிறேன்.

/படித்துப் பார்த்தேன் சரி/



கிராம நிர்வாக அலுவலர்
சி.புது.மணையம்.கிராமம்

அரியலூர் வட்டம்
/என் முன்பாக/

27-2-19
வட்டாட்சியர்
அரியலூர்.

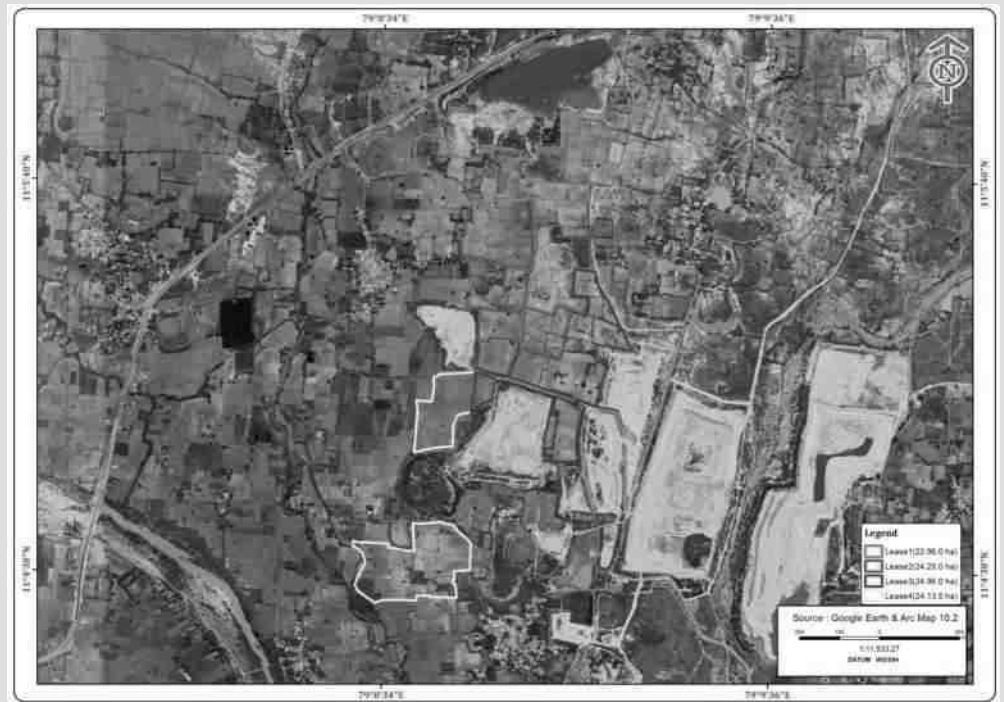
ANNEXURE VII
HYDROGEOLOGY REPORT



HYDROGEOLOGICAL REPORT FOR NEW PUDUPALAYAM LIMESTONE MINES



M/s. TAMILNADU CEMENTS CORPORATION LIMITED
(A Government of Tamil Nadu Undertaking)
ARIYALUR WORKS
ARASU NAGAR POST- 621 729, ARIYALUR DIST.
Corporate Office: 5th Floor, Aavin Illam, No.3A,
Pasumpon Muthuramalingam Salai, Nandanam, Chennai-600035
Tamil Nadu.



PREPARED BY

Dr.P. THANGARAJU, M.SC., Ph.D.

Govt. Approved Hydro Geologist,

M/s. Geo Exploration and Mining Solutions

Regd. Office: No. 17, Advaita Ashram Road,

Alagapuram, Salem – 636 004, Tamil Nadu

Mobile: +91 - 94433 56539

E-Mail: infogeoexploration@gmail.com

National Accreditation Board for Education & Training,
New Delhi.



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HYDROGEOLOGICAL REPORT FOR NEW PUDUPALAYAM LIMESTONE MINES

The Client requires detailed information on Groundwater Occurrences at Proposed Project Site of New Pudupalayam Limestone Mines, Ariyalur taluk and district. The objective of the present study is to assess the availability of groundwater and comment on aspects of depth to potential aquifers, aquifer availability and type, and possible yields. For this purpose, all available hydrogeological information of the areas has been analyzed, and a geophysical survey was done.

1. INTRODUCTION

APPLICANT DETAILS-

Name of the applicant: M/s Tamilnadu Cements Corporation Limited,
(A Government of Tamilnadu Undertaking)
[Thiru. C.Kamaraj, I.A.S., Managing Director]

Address : Ariyalur Works,
Arasu Nagar Post - 621 729
Ariyalur District.

State : TamilNadu

DETAILS OF THE AREA-

Land Classification : Patta Land

Survey Nos :

L1:144, 217/1A, 217/1C, 217/2, 217/3A, 217/3B, 217/4, 217/5, 217/6, 218/1, 219/1, 219/2A, 219/2B, 219/3A, 219/3B, 219/3C, 219/3D, 219/3E, 219/3F, 219/3G, 219/4A, 219/4B, 219/5A, 219/5B, 219/5C, 219/6, 219/8, 219/9, 220/1, 220/2A, 220/2B, 220/3A, 220/3B, 220/3C, 220/3D, 220/3E, 220/4, 220/5A, 220/5B, 220/6A, 220/6B, 220/7A, 220/7B, 220/8A, 220/8B, 220/9A, 220/9B, 220/9C, 220/10A, 220/10B, 220/11A, 220/11B, 221/1A & 221/15.

L2: 222/1, 222/2A, 222/11A, 225, 226/1A, 226/7,227/1, 233/1, 236/1A, 236/9 & 239.

L3: 229/3A, 230/2A, 237/1, 237/4A, 240/1, 240/5A, 241/1A, 244/1A, 245/1A, 245/5A, 267/1A, 1B, 1C, 1D, 1E, 2A, 2B, 2C, 2D, 10A, 10B, 10C, 11A, 11B, 11C, 11D, 11E, 11F, 11G, 12A, 12B, 12C, 12D, 13A, 13B, 14A, 14B, 15, 16A, 16B, 17A, 17B,17C, 18A, 18B, 18C, 19A, 19B, 19C, 20A, 20B, 20C, 21, 22, 23A, 23B, 23C, 23D, 23E, 23F, 24,25A, 25B, 25C, 25D, 25E & 272.

L4: 350, 351/1A, 351/4A, 351/7A, 351/12A, 357,365/1, 365/19, 366/1,367, 368, 369/1A, 369/3, 370/1A & 370/8.

Total Extent : 22.96.0+24.20.0+24.96.0+24.13.5 = **96.25.5 ha.**

Village	:Pudupalayam,
Taluk	:Ariyalur,
District	:Ariyalur

2.SCOPE OF THE WORK

The scope of work includes:

- ✚ Site visits to familiarize with the project areas. Identify any issues that might impact the groundwater scenario due to proposed mining activities.
- ✚ To obtain, study and synthesize background information including the geology, hydrogeology and existing borehole data, for the purpose of improving the quality of assessment and preparing comprehensive hydrogeological reports.
- ✚ To carry out hydrogeological evaluation and geophysical investigation in the selected sites in order to determine the potential for groundwater within the project site.
- ✚ To prepare hydrogeological survey reports in conformity with the provisions of the rules and procedure outlined by the Central Ground Water Board (CGWB).

The study involved hydrogeological & geophysical field investigations in which the available relevant geological and hydrogeological data were collected, analyzed, collated and evaluated within the context of the study objectives. The data sources consulted were mainly from:

- a) Central Ground Water Board (CGWB) Data
- b) State & District Geological and Hydrogeological Reports and Maps.
- c) Technical reports of the area by various organizations.

3. ABOUT THE STUDY AREA

3.1. Location and Accessibility

The study area falls in the Toposheet No: 58-M/04 and lies between North Latitudes 11°04'33.03" to 11°05'50.84" and East Longitudes 79°08'29.82" to 79°09'14.11". The Google map of the study area shown in

Fig.1. The area is situated at a distance of 8 km from Ariyalur & lies 130 m from Jayankondam-Trichy State Highway. Ariyalur is the nearest railhead on Chennai-Tiruchirapalli Broad gauge line of Southern Railway, at distance of 10 km. Tiruchirapalli is the nearest Airport.

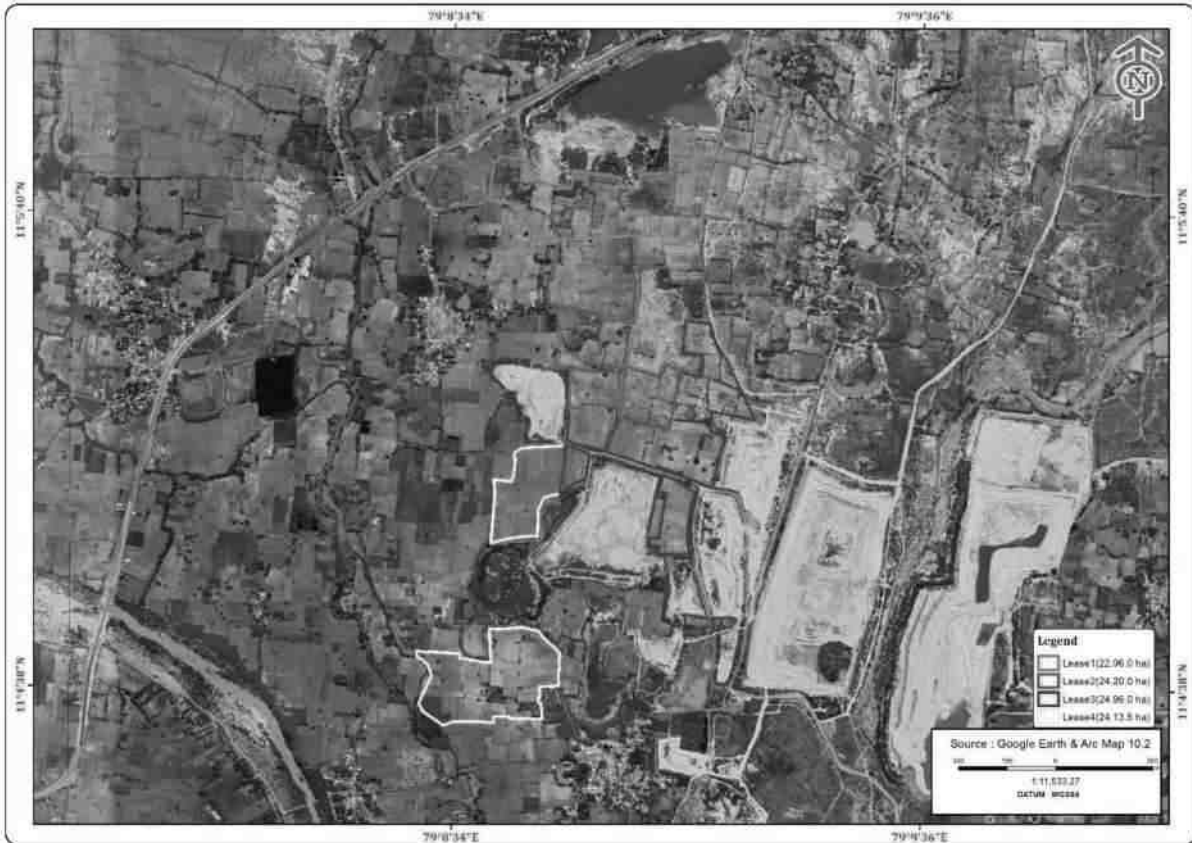


Figure1: The lease area is superimposed on Google Earth

3.2. Physiography and Drainage

Ariyalur district lies in the inland without coastal lines of Tamil Nadu. The lease applied area exhibits almost plain topography with gentle slope towards south side. The altitude of the area is 55m Above MSL. Denudational, structural and fluvial processes mainly control the geomorphic evolution of the area.

The study area is part of Marudaiyar - Ariyalur mini watershed of Ariyalur district which represents a part of marine sedimentary plains and river basin is mainly composed of Cretaceous, Tertiary and Quaternary formation which includes calcareous sandstones, shell limestones and alluvium. The Marudaiyar river flowing south easterly and is a seasonal tributary to river Pennar, which flows towards east to the Bay of Bengal

ultimately. The drainage pattern of the area is mostly controlled by the topographic and structural features. Radial and dentritic to sub-dentritic patterns are recognized in this district among the different drainage patterns and associated features. The drainage map of the study area is shown in Fig-2.

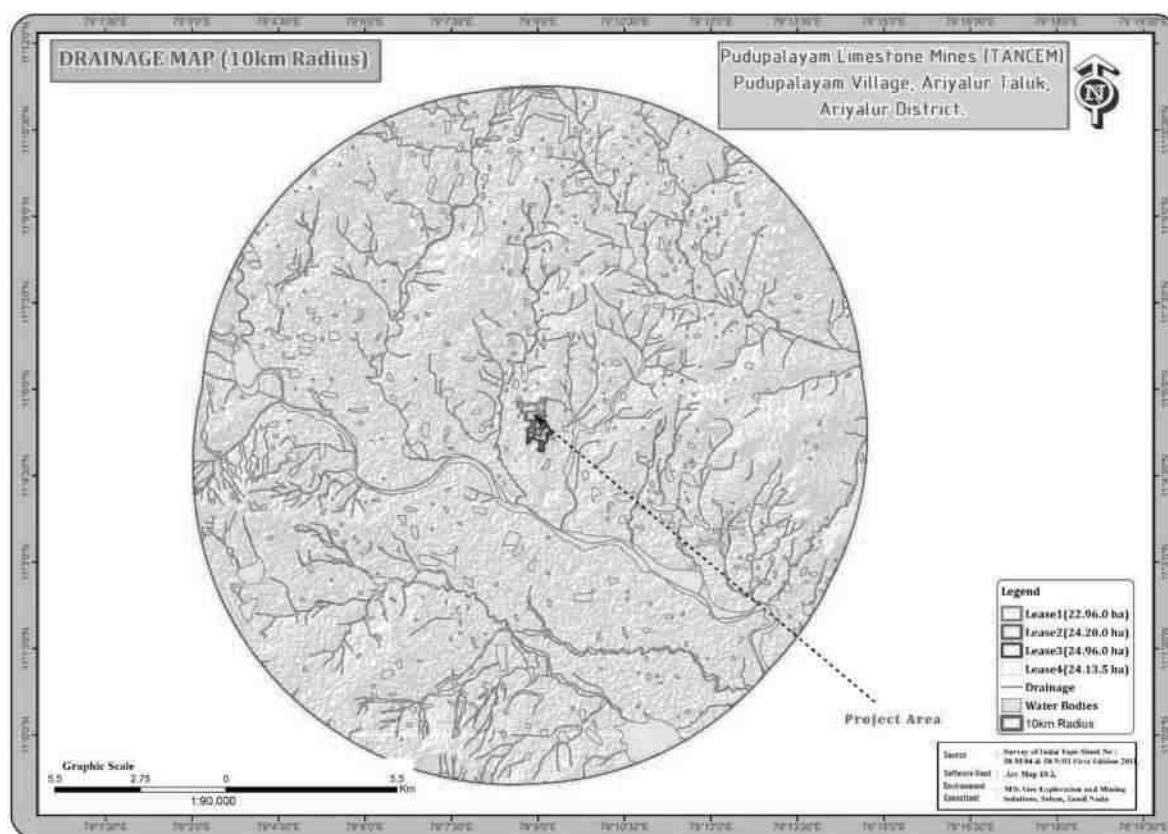


Figure2: Drainage

3.3 Climate and Rainfall

The area exhibits a subtropical climate and the temperature that goes up to 42°C in summer months and falls down to 27°C in December – January. The district generally has a high humidity. The district experiences strong winds during the southwest monsoon season. The wind direction is NE-SW and vice-versa. The wind speed during June to August is more than 25 km/hr. Thereafter there is a gradual decrease in speed reaching the lowest value 7.7 km/hr.

Ariyalur district receives the rainfall under the influence of both southwest and northeast monsoon. There is a gradual decrease in precipitation from northeast to southwest over the district. The normal

rainfall for the period (1901-70) ranges from 843.5 to 1123.3 mm. It is lowest in the Vembavur area and highest in the Jayankondan areas. The monthly and annual rainfall data of Ariyalur district for the period of 2017 to 2021 in which the study area is located is given in **Table-1**. The graphical presentation of the rainfall data is given in **Fig-3**.

Table1: Rainfall Data of Ariyalur District (in mm/day)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg	Annual
2017	2.47	0.15	1.53	0.11	1.17	1.51	2.13	4.94	3.46	5.47	10.21	2.94	3.02	1102.3
2018	0.74	0.18	0.42	0.76	1.96	2.05	1.62	1.52	2.64	5.37	9.15	1.47	2.33	850.4
2019	0.02	0.24	0.03	0.37	0.51	0.8	2.3	4.54	7.04	7.6	8.24	3.97	2.98	1087.7
2020	0.41	0.04	0.06	0.6	0.97	1.58	4.85	2.7	5.03	2.81	8.49	11.95	3.3	1204.5
2021	5.78	0.57	0	0.76	2.27	2.01	3.39	4.29	4.5	9.04	19.08	2.06	4.49	1638.85

The rainfall data is indicative of very low rainfall in 2018 it has adverse impact on the water table and ground water potential. The average annual rainfall normal (2017-2021) of Ariyalur district is 1176.75 mm. Projections of rainfall over Ariyalur for the periods 2010-2040 (2020s), 2040-2070 (2050s) and 2070-2100 (2080s) with reference to the baseline (1970-2000) indicate a decrease of 2.0%, 3.0% and 3.0% respectively.

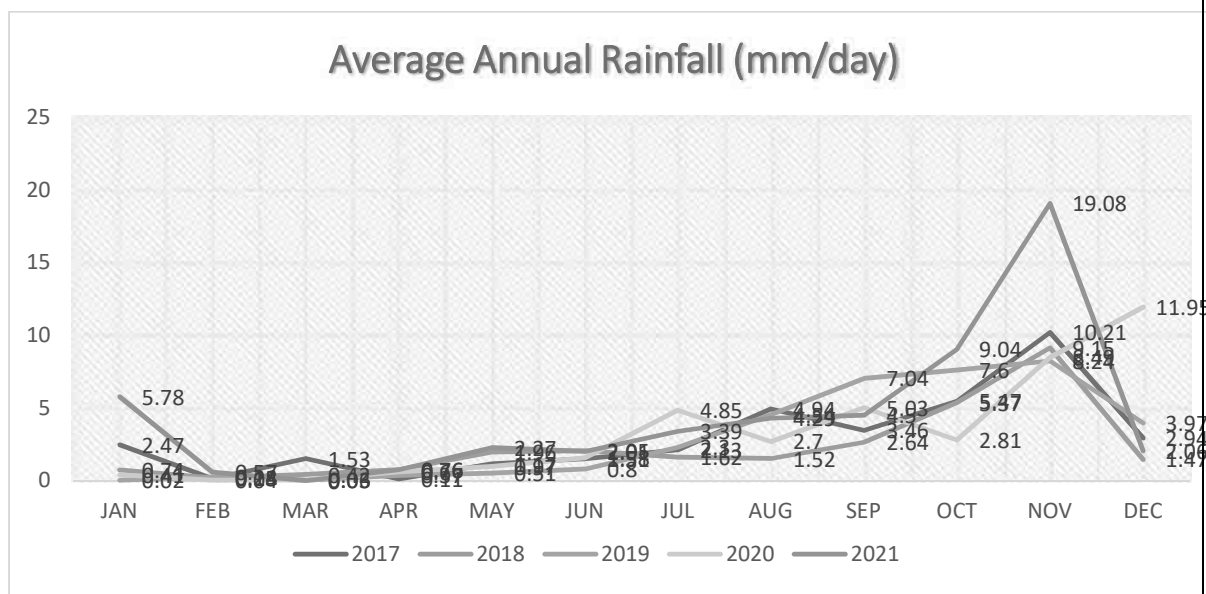


Figure3: Monthly Rainfall Distribution in Ariyalur District for 2017-2021

3.4. Soil

Soil of the area is mildly alkaline with medium water holding capacity. Soil is gray to dark gray to loam calcareous. Ariyalur series; Gray to dark gray, very deep calcareous, colluvial soil, fine textural, moderately slow permeability and moderately drained, soils occur in almost level lands. Other types of soils where found in Ariyalur district the most predominant soil in angular soil, muthukulam soil, palamedu soil kalathur soil etc., The soil map of the study area is given in **Fig-4**.

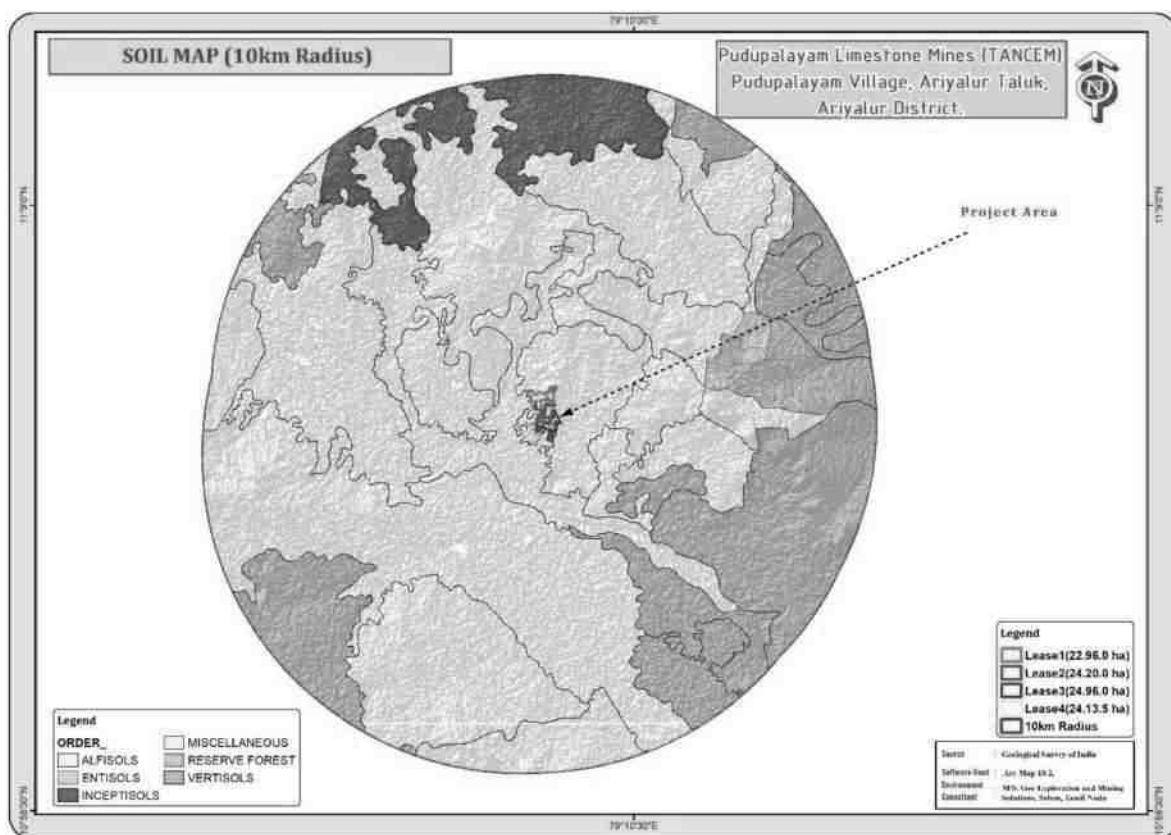


Figure 4: Soil

3.5 Geomorphology

The occurrence and movement of groundwater in the area is controlled by prevailing geomorphology. Denudational, structural and fluvial processes mainly control the geomorphic evolution of the area. Mainly the varying resistance of geological formations to erosional processes has governed the evolution of various landforms. Various land forms occurring in the area such as structural hills, erosional plains, residual hills rolling uplands and

pediments of different facies belonging to the Denudational and structural land forms. Fluvial landforms caused by the activity of Cauvery, Marudaiyur and Vellar river systems, include younger flood plains, older flood plains and buried pediments. The Geomorphology of the area is depicted in **Fig-5**.

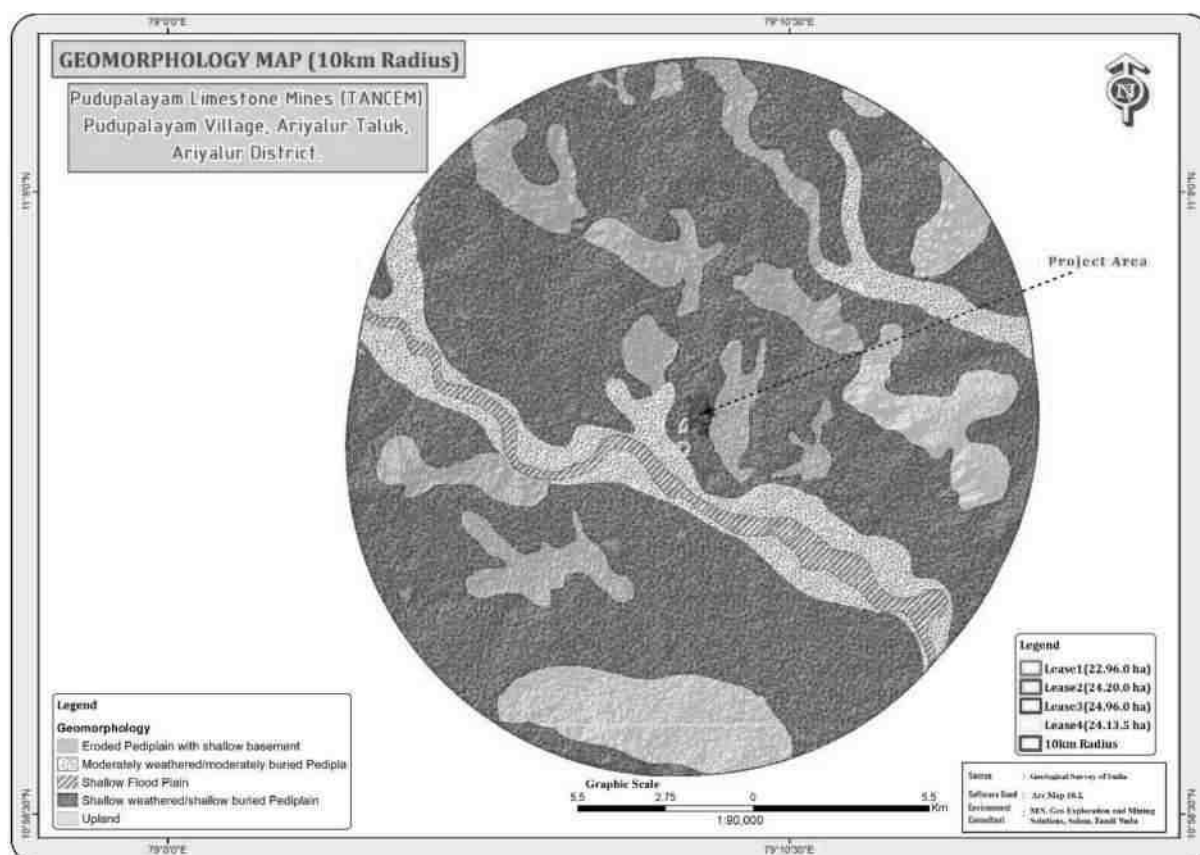


Figure 5: Geomorphology

3.6 Landuse / land cover

Landuse and land cover indicate the coverage and natural characteristics of land deduced by human activities, which are mainly associated with groundwater occurrence and development. The core zone is mostly dry uncultivated land covered by grass & shrubs. It is a dry land. Only seasonal cultivation is done in the surrounding area. In some areas, agriculture is done with lift irrigation. The main crops being cereals, pulses etc. The study area includes the following landuse/ land cover characteristics, which are shown in Fig 6: Built-up land, Agriculture land, Forest, Barren land, and water bodies. The major part of the study area is covered by agriculture land, due to the presence of good groundwater potential.

Table 2: Stratigraphic Succession in Ariyalur District

Age	Group	Formation	Lithology
Recent	-	Alluvium	Clay and Sand
-----Unconformity -----			
Miopliocene		Cuddalore	Ferruginous sand stone with clay bands
UpperCretaceous (Danian to Maestrichtian)	Niniyur	Niniyur Kallankurichi	Limestone, occasional sandstone and marl interpolation Limestone, sandstone, marl and occasional clay
Maestrichtian	Ariyalur	Sillakudi	Sandstone with Occasional clay
-----Unconformity -----			
Upper Cretaceous	Tiruchirapalli	Anaipadi	Sandstone and clay
-----Unconformity -----			
Upper Cretaceous	Uttattur	-	Limestone, gypseous clay/shale with thin sandstone
-----Unconformity -----			
Upper Jurassic to Lower Cretaceous	-	Gondwana	Brownish, Micaceous & silty ferruginous sandstone
-----Unconformity / Fault -----			
Archaean	-	Charnockites & Gneisses	-

3.7.2 Geology of the lease area

The sedimentary formations of coralline limestone belong to the cretaceous system and rest over archaean formations. The Limestone is creamy white in colour. Marine organisms such as shells, corals, microfossils, ammonites, Gryphea, crinoids formed them and foraminifera are composed chiefly of CaCO₃ with varying amounts of impurities such as sand, glauconite, ferruginous, phosphatic and bituminous matter.

The organic material rich in magnesium has given rise to magnesium bearing limestone in certain areas. The Limestone is hard, compact and amorphous in nature and indurated layers of limestone due to structural deformation and intense weathering. These organic limestones are basically marine sediments derived from rich coral-lime shells and other remains.

Topsoil:

The topsoil is black cotton soil. It occurs to a depth of 2m and lies over the limekankar formations.

Kankar:

Kankar has developed over the limestone extensively and ranges in thickness of 0.75 meters. The formation of Kankar is evidently due to the alternating wet and dry spells of tropical climate, which has caused leaching out of the clayey and siliceous portions in the top layer of limestone. Thus, though the Kankar is porous, pisolitic and red in colour due to dispersion of iron oxide, it analyses very high in calcium carbonate content (generally 85 to 95 per cent CaCO_3). The fragments of shells as well as cementing calcareous medium make the Kankar hard and difficult to break. The Kankar is at present being mined for manufactures slaked lime in country kilns for use in construction.

The physical attitude of the Limestone deposits is demarked as follows:

Strike length (m)	: 864 (max)
Width (m)	: 430 (max)
Depth (m)	: 17.75m with an average of 2m Topsoil & 0.75m Limekankar
Strike direction	: N-S
Dip amount and direction	: Vertical dip

The study area geological map is shown in Fig-7.

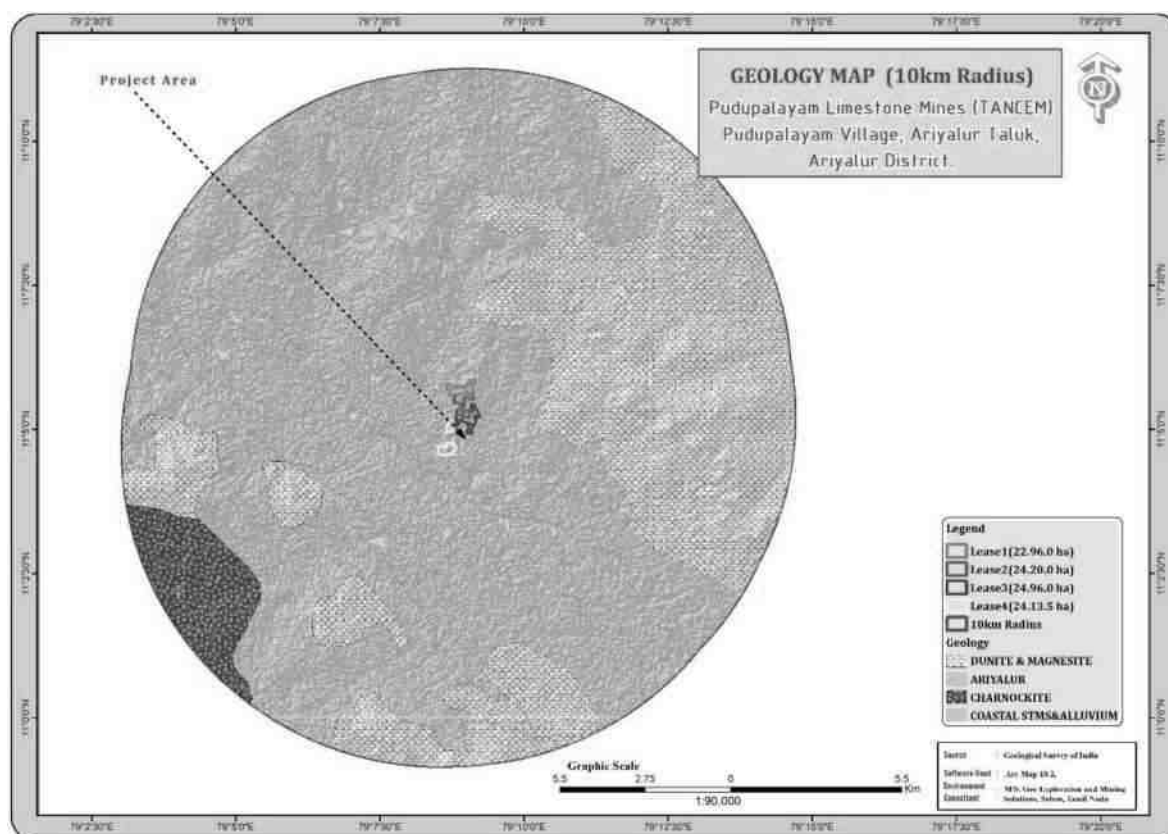


Figure7: Geology

3.8Lineament

Lineament is good source of trapping and storing of water resources and provides recharge toward the increase in groundwater table. In flat-lying sedimentary sequences Lineaments are commonly surface expressions of tectonic fractures and faults in the bedrock, emphasized on the surface by topography, drainage, and vegetation. The study area is having regional geological basins having faults and graben-ridge structures. The vast area covered by compact sedimentary rocks in Ariyalur district is having number of limestone mines and satellite imagery do not show any major lineaments but for few minor lineaments marked by the straight course of drainages. The lineament map of study area is shown in Fig-8.

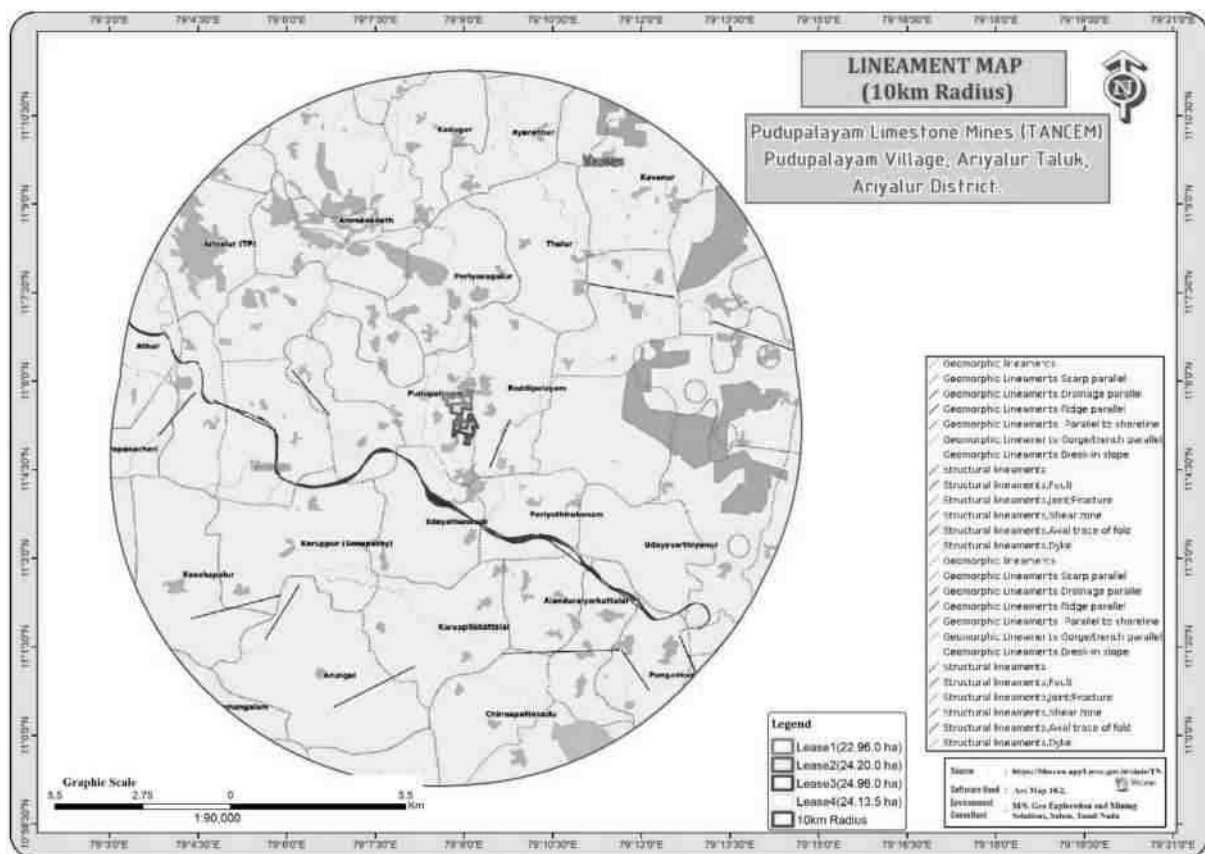


Figure 8: Lineament

4. HYDROGEOLOGY

4.1 Regional Hydrogeology

The study area is part of sedimentary rocks with compact Cretaceous formation where the groundwater occurrence is unconfined and confined conditions. The yield prospects of the compact limestones, sandstone and shale formations are moderate to poor. The local lithology along with its structural components controls the properties of the aquifer. Even though the porous formation comprising sandstones and limestones have localized good potential to store water in its interstitial spaces, the shallow aquifers in the study area have poor groundwater source. This may be attributed to the presence of thick shale formations below the top soil with very low vertical infiltration.

5.0 GEOPHYSICAL INVESTIGATION METHOD

A variety of methods are available to assist in the assessment of geological sub-surface conditions. The main emphasis of the fieldwork undertaken was to determine the thickness and composition of the sub-

surface formations and to identify water-bearing zones. This information was principally obtained in the field using, and vertical electrical soundings (VES). The VES probes the resistivity layering below the site of measurement. This method is described below.

5.1 Resistivity Method

Vertical electrical soundings (VES) were carried out to probe the condition of the sub-surface and to confirm the existence of deep groundwater. The VES investigates the resistivity layering below the site of measurement.

5.1.1 Basic Principles

The electrical properties of rocks in the upper part of the earth's crust are dependent upon the lithology, porosity, and the degree of pore space saturation and the salinity of the pore water. Saturated rocks have lower resistivity than unsaturated and dry rocks. The higher the porosity of the saturated rock, or the higher the salinity of the saturating fluids, the lower is the resistivity. The presence of clays and conductive minerals also reduces the resistivity of the rock.

The resistivity of earth materials can be studied by measuring the electrical potential distribution produced at the earth's surface by an electric current that is passed through the earth. Current is moved through the subsurface from one current electrode to the other and the potential difference is recorded as the current passes. From this information, resistivity values of various layers are acquired and layer thickness can be identified.

The apparent resistivity values determined are plotted as a log function versus the log of the spacing between the electrodes. These plotted curves identify thickness of layers. If there are multiple layers (more than 2), the acquired data is compared to a master curve to determine layer thickness.

This method is least influenced by lateral in-homogeneities and capable of providing higher depth of investigation.

The resistance R of a certain material is directly proportional to its length L and cross-sectional area A , expressed as:

$$R = R_s * L/A \text{ (in Ohm)}$$

Where R_s is known as the specific resistivity (characteristic of the material and independent of its shape or size)

With Ohm's Law,

$$R = dV/I \text{ (Ohm)}$$

Where dV is the potential difference across the resistor and I is the electric current through the resistor. The specific resistivity may be determined by:

$$R_s = (A/L) * (dV/I) \text{ (in Ohm m)}$$

5.1.2 Vertical Electrical Sounding (VES)

When carrying out a resistivity sounding, current is led into the ground by means of two electrodes. With two other electrodes, situated near the center of the array, the potential field generated by the current is measured. From the observations of the current strength and the potential difference, and considering the electrode separations, the ground resistivity can be determined. During a resistivity sounding, the separation between the electrodes is step-wise increased (known as a Schlumberger Array), thus causing the flow of current to penetrate greater depths. When plotting the observed resistivity values against depth on double logarithmic paper, a resistivity graph is formed, which depicts the variation of resistivity with depth. This graph can be interpreted with the aid of a computer, and the actual resistivity layering of the subsoil is obtained. The depths and resistivity values provide the hydrogeologist with information on the geological layering and thus the occurrence of groundwater.

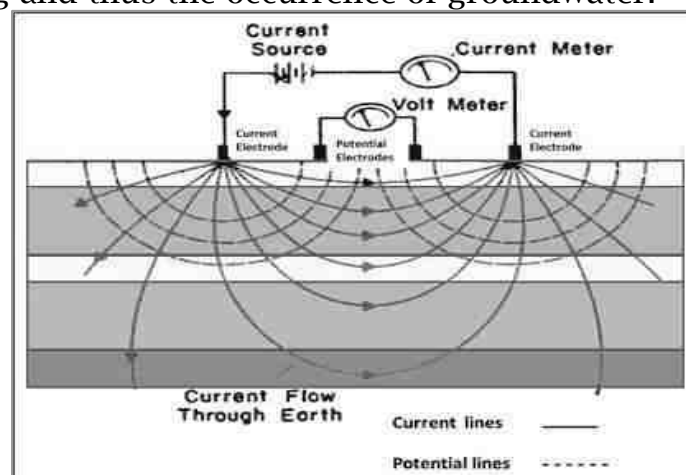


Figure 9: Vertical Electrical Sounding Method

5.1.3 Survey Layout

The layout for a resistivity survey depends on the choice of the current and potential electrode arrangement and it is called as an electrode array. The present study was done using Schlumberger array. One interesting aspect in VES is the principle of reciprocity, which permits the interchange of the potential and current electrodes without any effect on the measured apparent resistivity.

5.1.4 Equipment

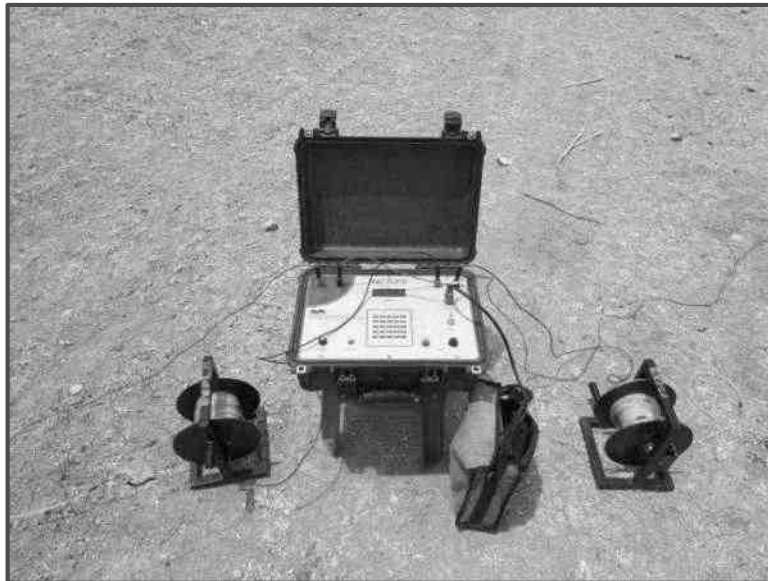


Figure10: SSR–MP–ATS instrument

The geophysical equipment deployed for the study is 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 innovative features. In the presence of random earth Noises, the signal to noise ratio can be enhanced by \sqrt{N} where N is the number of stacked readings. This SSR meter in which running averages of measurements [1, (1+2)/2, (1+2+3)/3... (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. For these significations, the signal stacking resistivity meter was used for (VES) Vertical Electric Resistivity Sounding.



Figure11: Field Photo of Geophysical Survey

The Vertical Electric Resistivity Soundings (VES) were conducted at 10 stations with the lease area for a depth of 50 to 100m. The location details of the vertical electrical sounding (VES) stations are given in Table-3.



Figure12: Geophysical Station located on Google image

Table3: GPS Co-ordinates of the VES Location

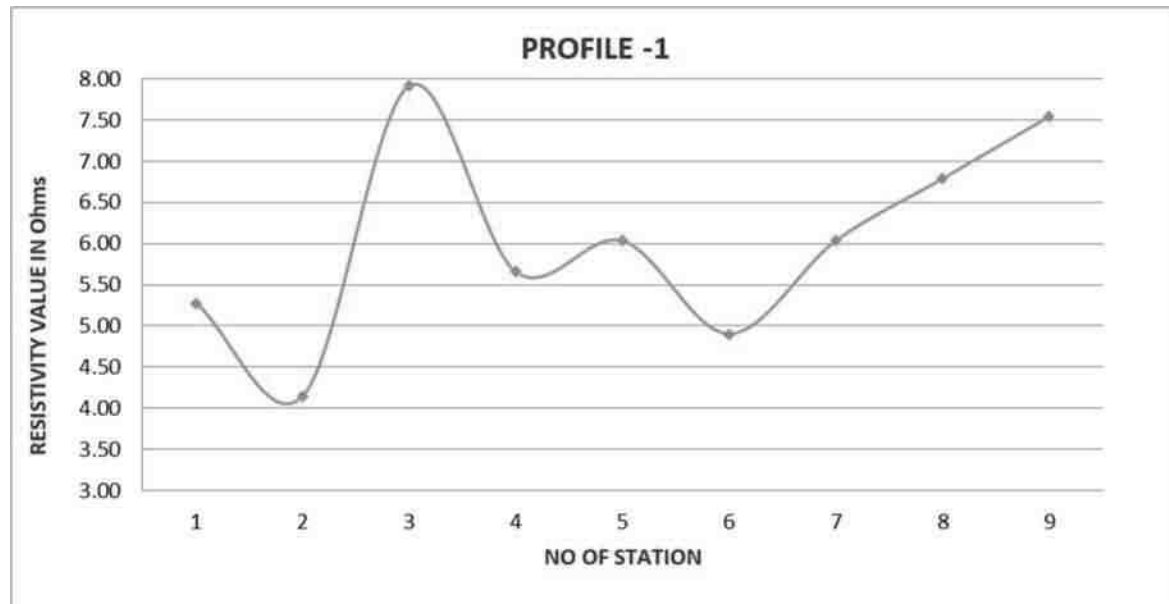
S.No	Latitude	Longitude
STATION-1	11° 04'41.16"N	79° 08'37.18"E
STATION-2	11° 04'41.59"N	79° 08'43.47"E
STATION-3	11° 05'04.74"N	79° 08'46.43"E
STATION-4	11° 05'05.15"N	79° 08'41.21"E
STATION-5	11° 05'38.76"N	79° 08'52.85"E
STATION-6	11° 05'38.20"N	79° 08'58.32"E
STATION-7	11° 05'38.30"N	79° 09'03.31"E
STATION-8	11° 05'09.38"N	79° 09'04.83"E
STATION-9	11°05'10.65"N	79° 08'58.69"E
STATION-10	11° 05'11.99"N	79° 08'53.86"E

The vertical electrical sounding data are interpreted by using IGIS software by Inverse slope method. The computer output of geo-electric layers is given in Annexure-2, which gives the apparent resistivity curve, depth wise resistance and interpreted layers with corresponding resistivity.

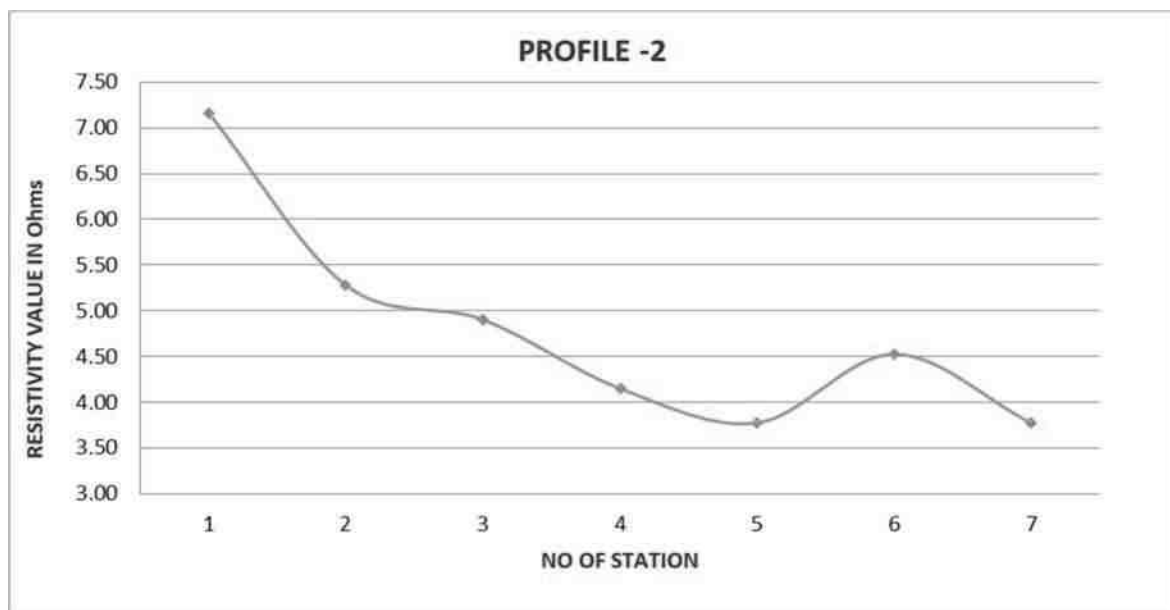
During the study the adjacent existing well, borewell are not examined because, the adjacent existing mines working in North, East and South side direction are not inforce of the groundwater table intersection.

5.2 Geophysical Profile Data and Graph

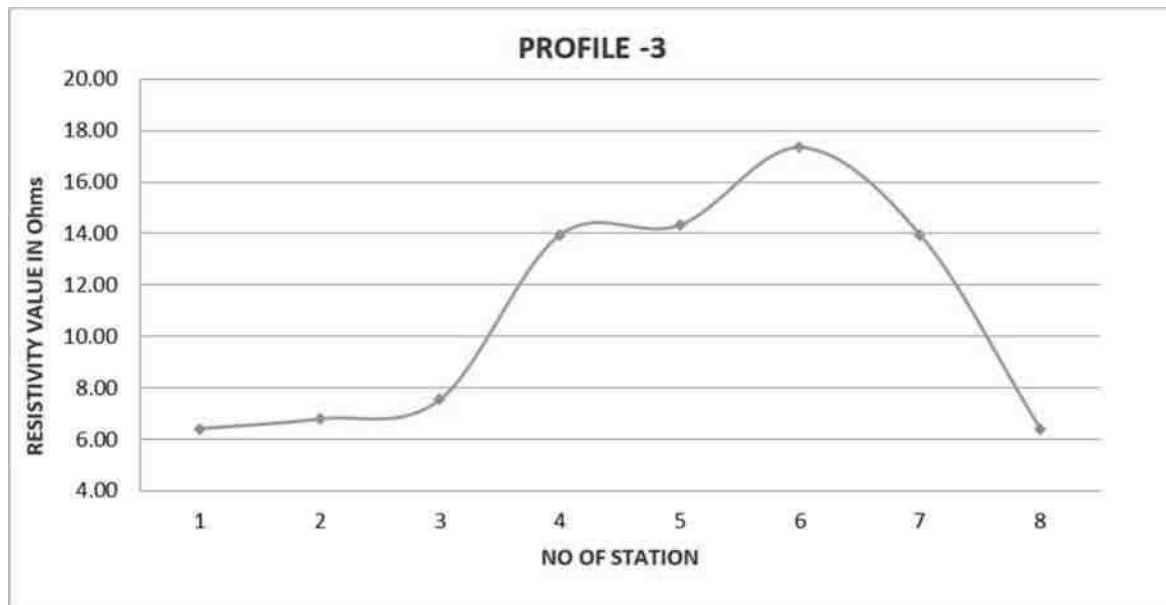
PROFILE -1					
GPS 11° 4'41.79"N, 79° 8'33.68"E					
S.NO	AB/2 (m)	MN/2(m)	Geometric Factor (K)	Resistance (R) Ohm	Apparent Resistivity Rho Ohm-meter
1	50.0	10	377.0	0.014	5.28
2	50.0	10	377.0	0.011	4.15
3	50.0	10	377.0	0.021	7.92
4	50.0	10	377.0	0.015	5.65
5	50.0	10	377.0	0.016	6.03
6	50.0	10	377.0	0.013	4.90
7	50.0	10	377.0	0.016	6.03
8	50.0	10	377.0	0.018	6.79
9	50.0	10	377.0	0.02	7.54



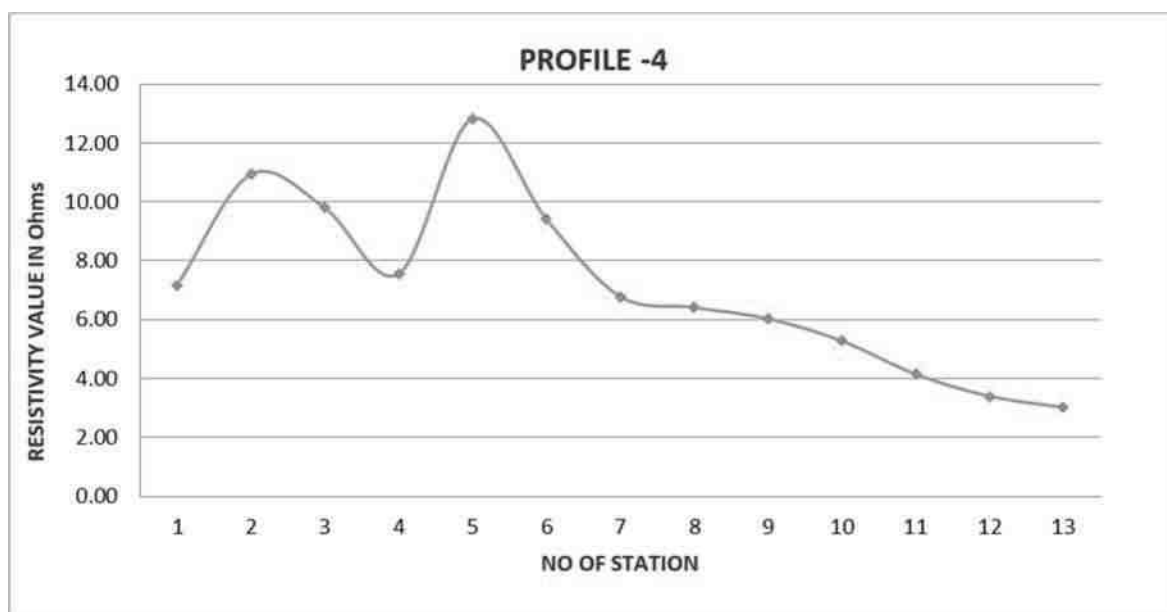
PROFILE- 2					
GPS - 11° 5'4.63"N, 79° 8'50.47"E					
S.NO	AB/2 (m)	MN/2(m)	Geometric Factor (K)	Resistance (R) Ohm	Apparent Resistivity Rho Ohm- meter
1	50.0	10	377.0	0.019	7.16
2	50.0	10	377.0	0.014	5.28
3	50.0	10	377.0	0.013	4.90
4	50.0	10	377.0	0.011	4.15
5	50.0	10	377.0	0.01	3.77
6	50.0	10	377.0	0.012	4.52
7	50.0	10	377.0	0.01	3.77



PROFILE -3					
GPS - 11° 5'38.73"N, 79° 8'51.11"E					
S.NO	AB/2 (m)	MN/2(m)	Geometric Factor (K)	Resistance (R) Ohm	Apparent Resistivity Rho Ohm-meter
1	50.0	10	377.0	0.017	6.41
2	50.0	10	377.0	0.018	6.79
3	50.0	10	377.0	0.02	7.54
4	50.0	10	377.0	0.037	13.95
5	50.0	10	377.0	0.038	14.33
6	50.0	10	377.0	0.046	17.34
7	50.0	10	377.0	0.037	13.95
8	50.0	10	377.0	0.017	6.41

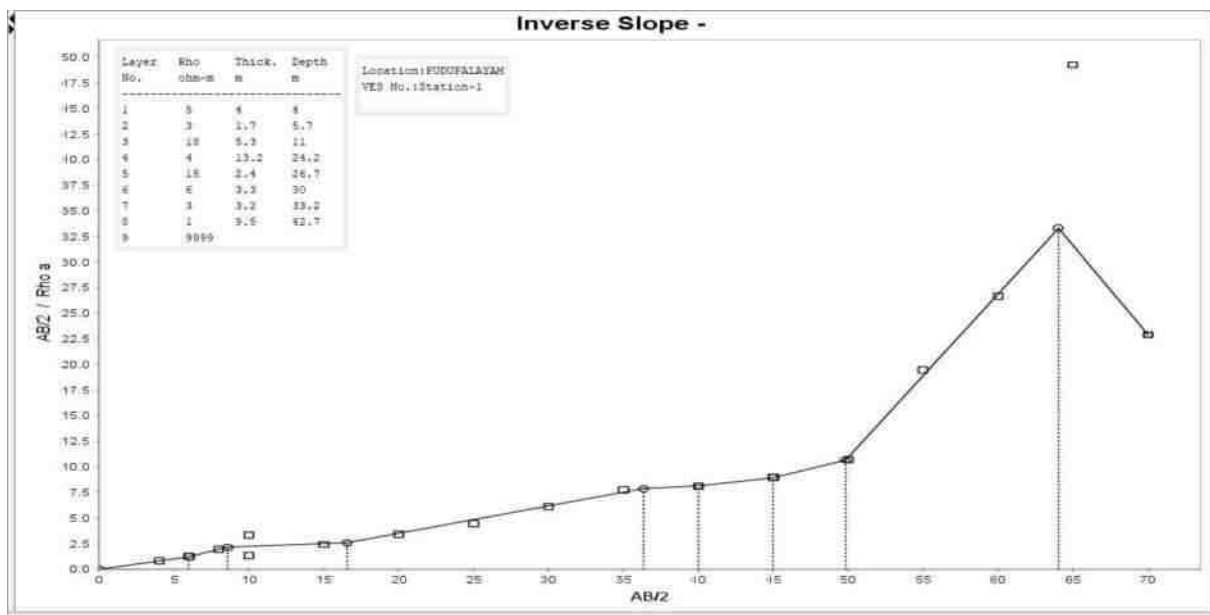
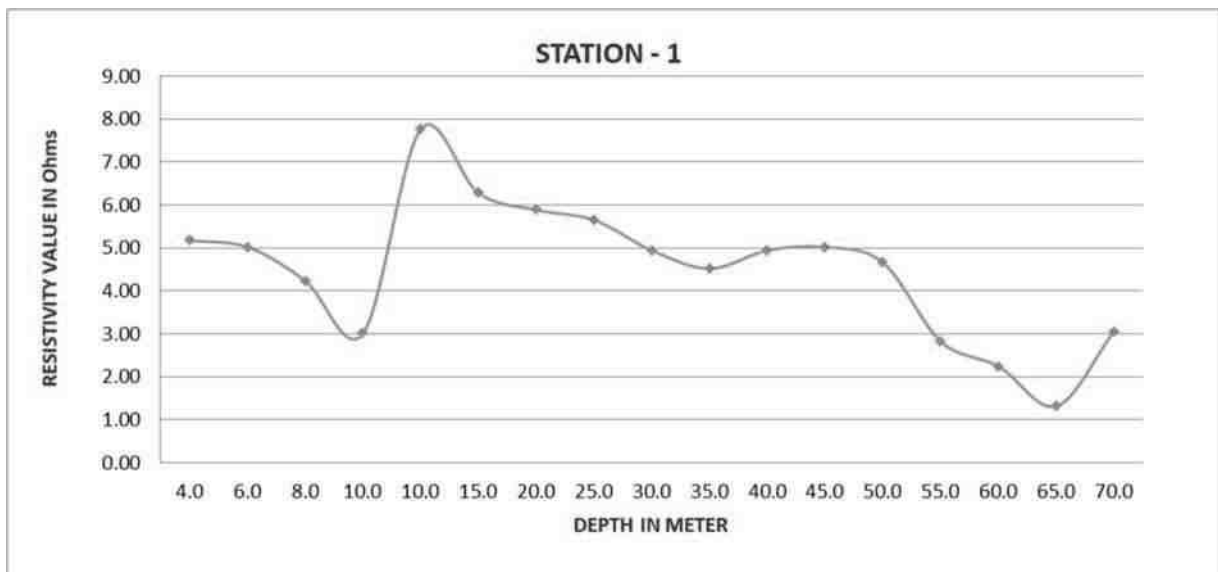


PROFILE -4					
GPS - 11° 5'8.53"N, 79° 9'8.32"E					
S.NO	AB/2 (m)	MN/2(m)	Geometric Factor (K)	Resistance (R) Ohm	Apparent Resistivity Rho Ohm-meter
1	50.0	10	377.0	0.019	7.16
2	50.0	10	377.0	0.029	10.93
3	50.0	10	377.0	0.026	9.80
4	50.0	10	377.0	0.02	7.54
5	50.0	10	377.0	0.034	12.82
6	50.0	10	377.0	0.025	9.42
7	50.0	10	377.0	0.018	6.79
8	50.0	10	377.0	0.017	6.41
9	50.0	10	377.0	0.016	6.03
10	50.0	10	377.0	0.014	5.28
11	50.0	10	377.0	0.011	4.15
12	50.0	10	377.0	0.009	3.39
13	50.0	10	377.0	0.008	3.02

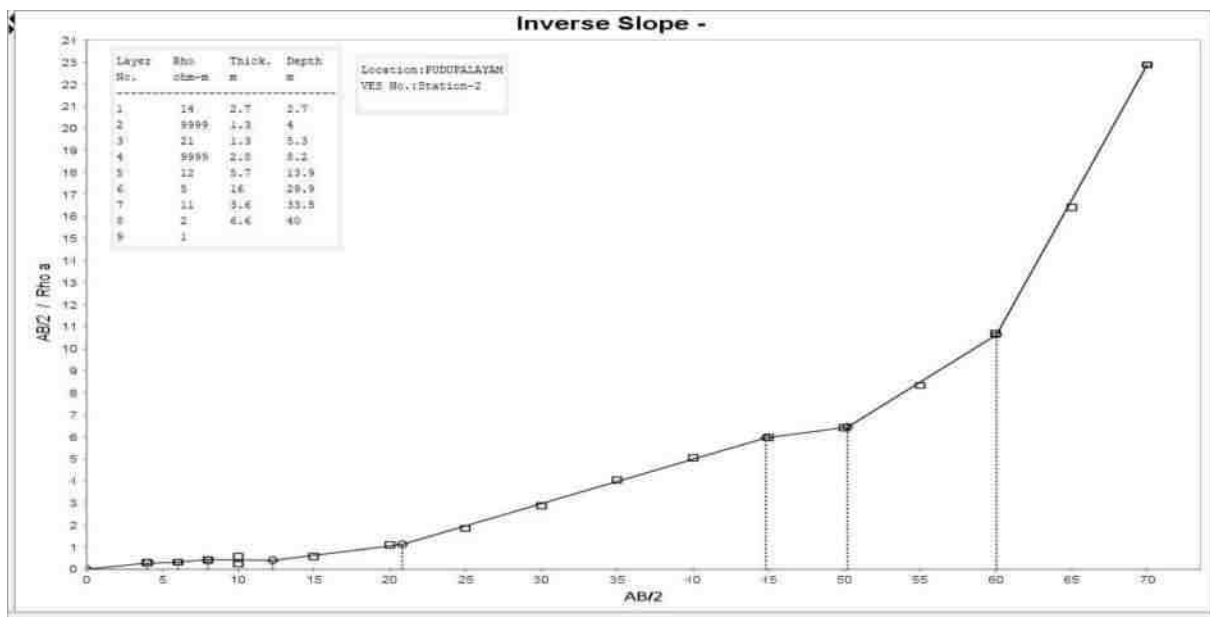
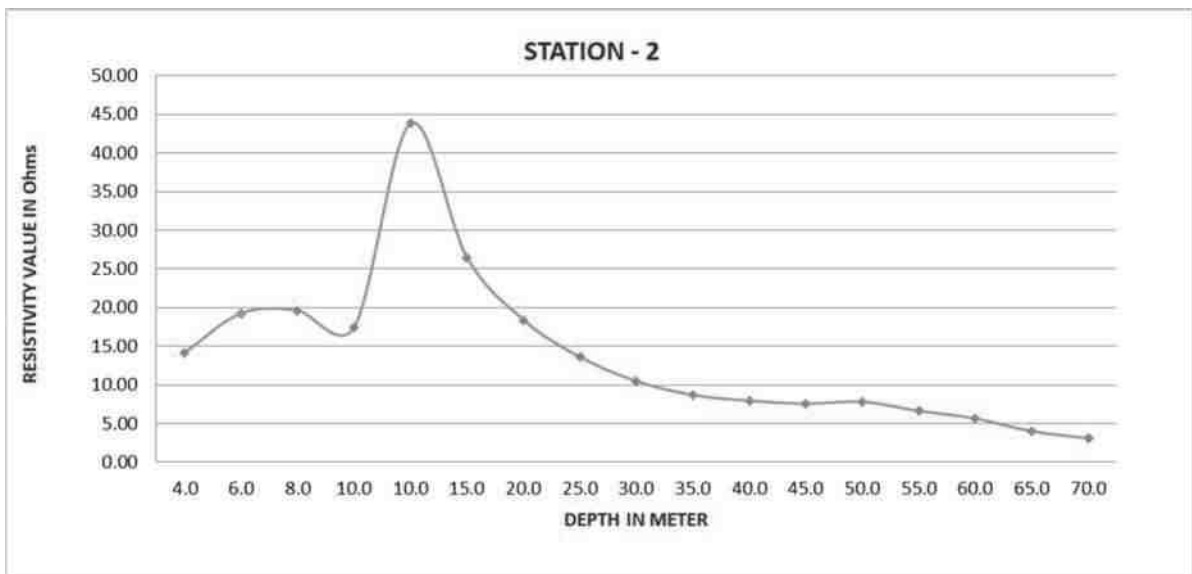


5.3 Geophysical Station Data and IGIS Graph

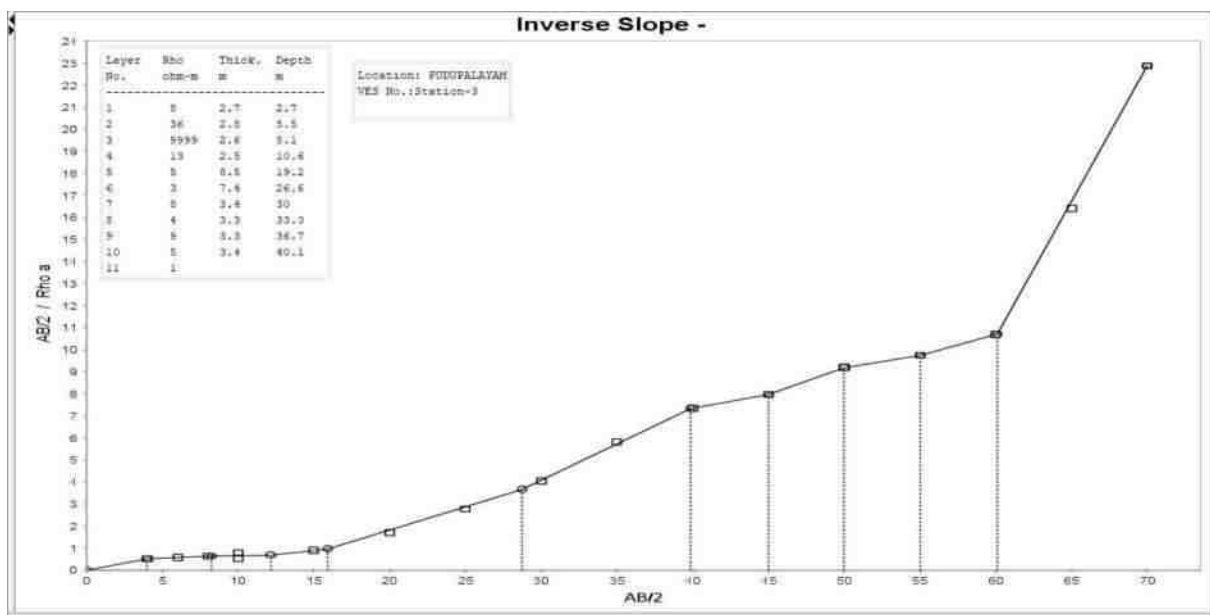
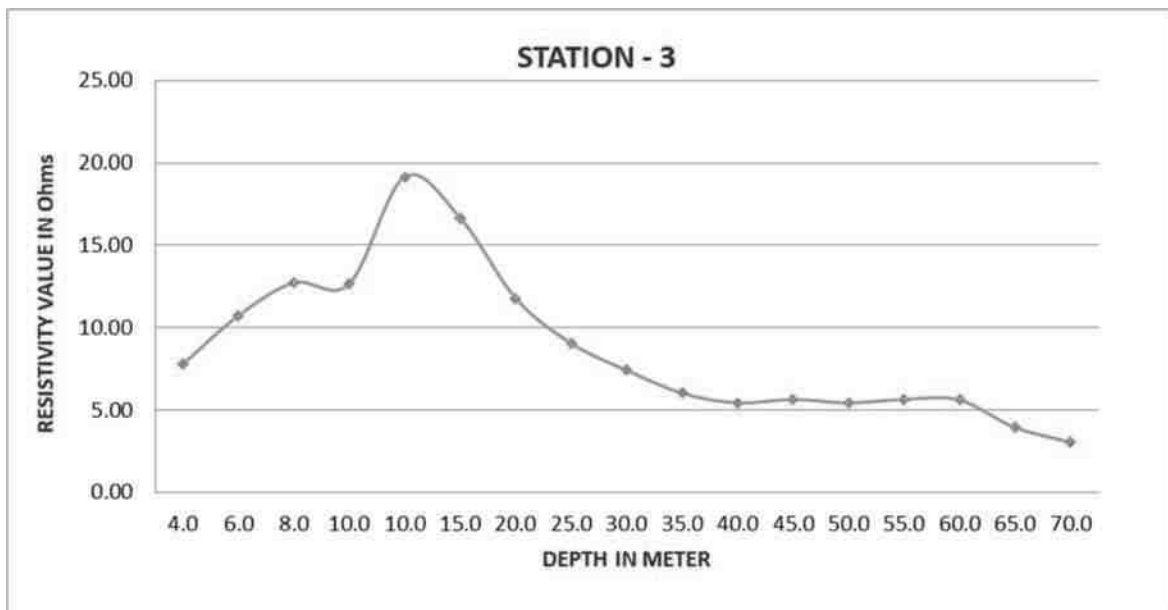
STATION - 1				
GPS - 11° 4'41.16"N, 79° 8'37.18"E				
AB/2 (m)	MN/2(m)	Geometric Factor (K)	Resistance (R) Ohm	Apparent Resistivity Rho Ohm-meter
4.0	2	9.4	0.55	5.18
6.0	2	25.1	0.2	5.03
8.0	2	47.1	0.09	4.24
10.0	2	75.4	0.04	3.02
10.0	5	23.6	0.33	7.78
15.0	5	62.8	0.1	6.28
20.0	5	117.8	0.05	5.89
25.0	5	188.5	0.03	5.65
30.0	5	274.9	0.018	4.95
35.0	5	377.0	0.012	4.52
40.0	5	494.8	0.01	4.95
45.0	5	628.3	0.008	5.03
50.0	5	777.5	0.006	4.67
55.0	5	942.5	0.003	2.83
60.0	5	1123.1	0.002	2.25
65.0	5	1319.5	0.001	1.32
70.0	5	1531.5	0.002	3.06



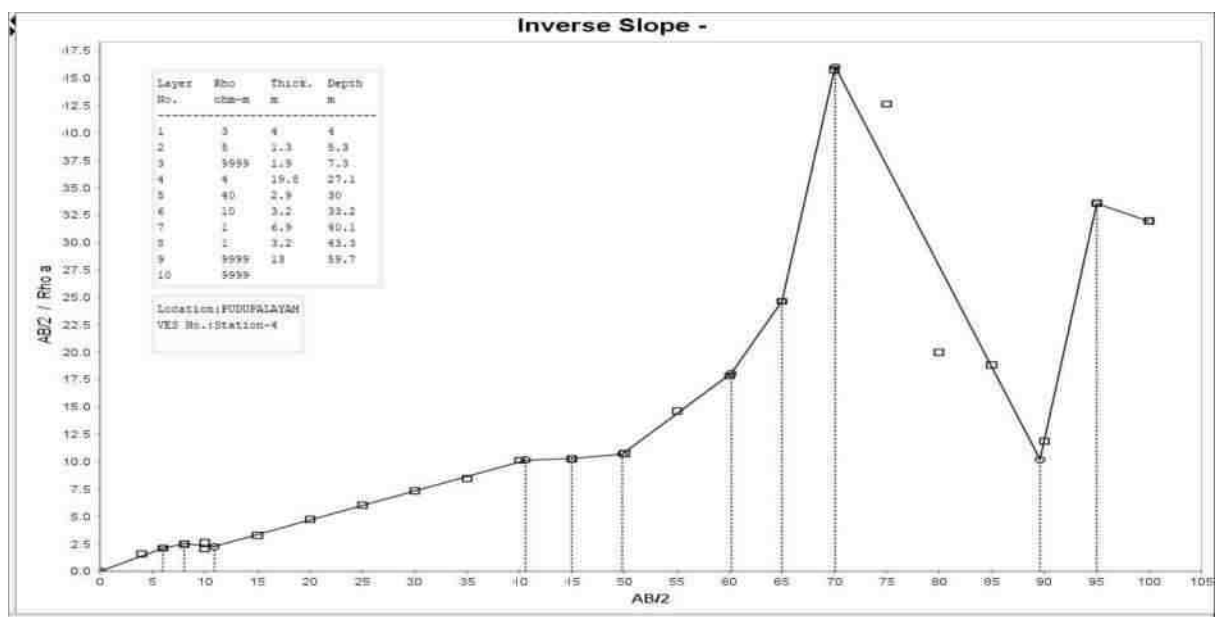
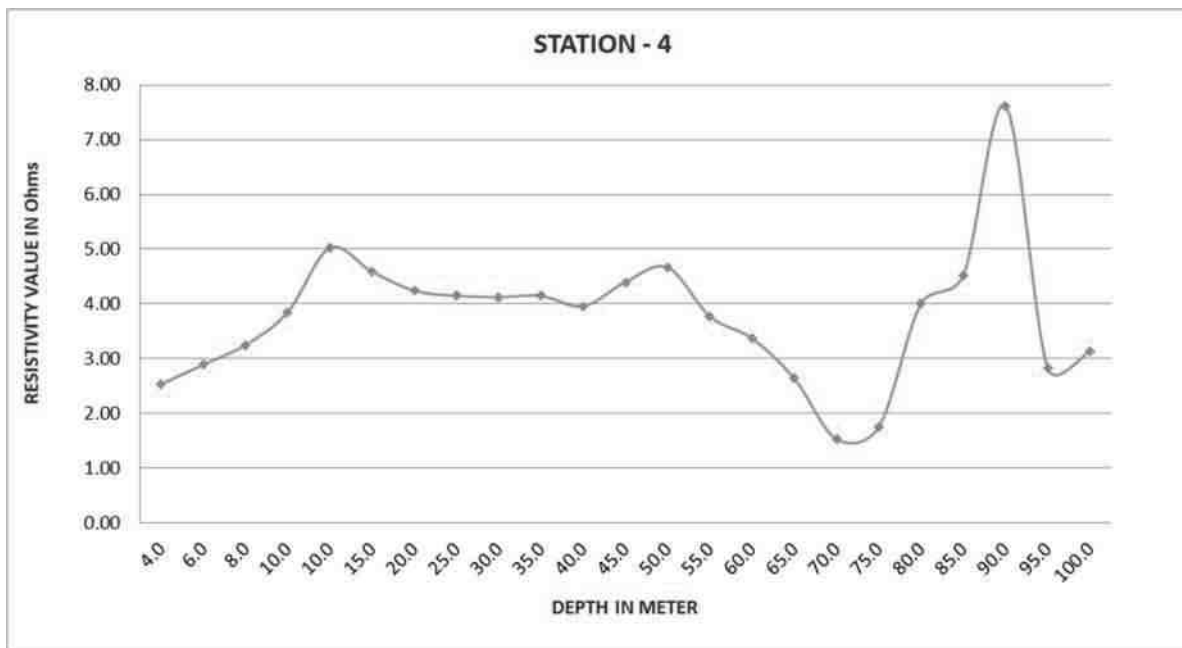
STATION - 2				
GPS - 11° 4'41.59"N 79° 8'43.47"E				
AB/2 (m)	MN/2(m)	Geometric Factor (K)	Resistance (R) Ohm	Apparent Resistivity Rho Ohm-meter
4.0	2	9.4	1.5	14.14
6.0	2	25.1	0.765	19.23
8.0	2	47.1	0.416	19.60
10.0	2	75.4	0.231	17.42
10.0	5	23.6	1.86	43.83
15.0	5	62.8	0.421	26.45
20.0	5	117.8	0.156	18.38
25.0	5	188.5	0.072	13.57
30.0	5	274.9	0.038	10.45
35.0	5	377.0	0.023	8.67
40.0	5	494.8	0.016	7.92
45.0	5	628.3	0.012	7.54
50.0	5	777.5	0.01	7.78
55.0	5	942.5	0.007	6.60
60.0	5	1123.1	0.005	5.62
65.0	5	1319.5	0.003	3.96
70.0	5	1531.5	0.002	3.06



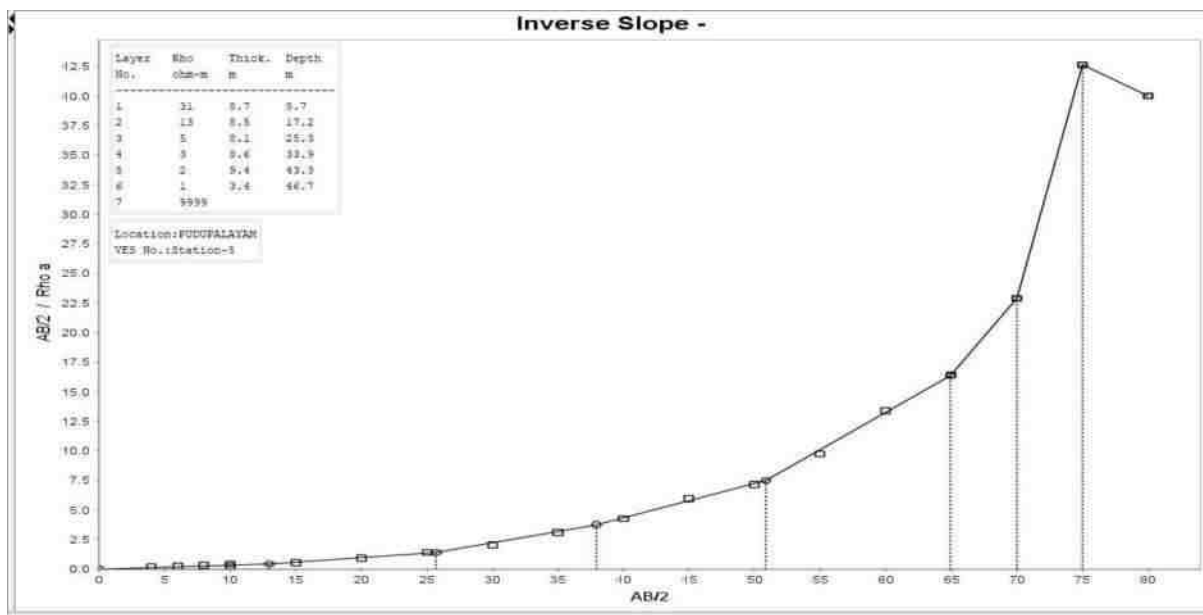
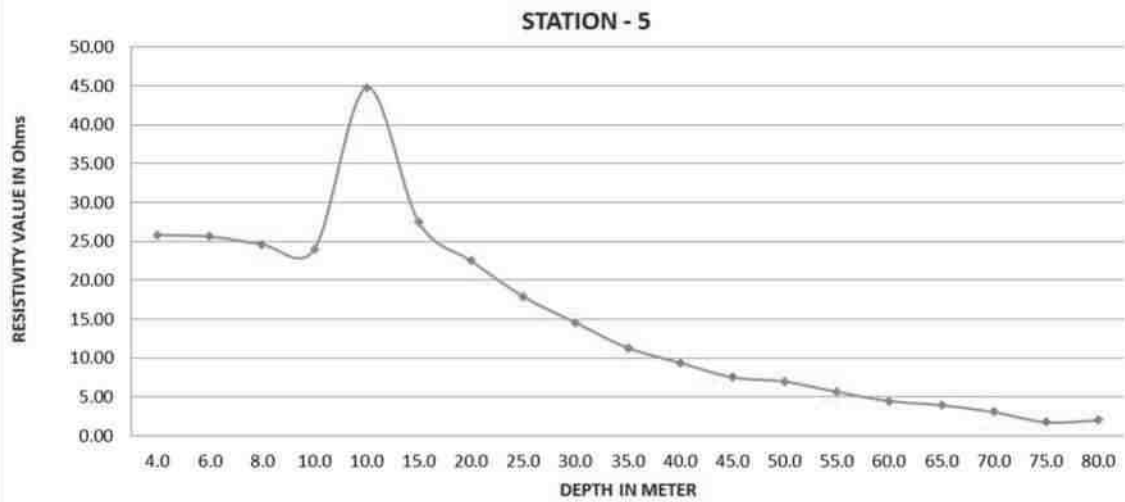
STATION - 3				
GPS - 11° 05'04.74"N 79° 08'46.43"E				
AB/2 (m)	MN/2(m)	Geometric Factor (K)	Resistance (R) Ohm	Apparent Resistivity Rho Ohm-meter
4.0	2	9.4	0.827	7.79
6.0	2	25.1	0.427	10.73
8.0	2	47.1	0.27	12.72
10.0	2	75.4	0.168	12.67
10.0	5	23.6	0.813	19.16
15.0	5	62.8	0.265	16.65
20.0	5	117.8	0.1	11.78
25.0	5	188.5	0.048	9.05
30.0	5	274.9	0.027	7.42
35.0	5	377.0	0.016	6.03
40.0	5	494.8	0.011	5.44
45.0	5	628.3	0.009	5.65
50.0	5	777.5	0.007	5.44
55.0	5	942.5	0.006	5.65
60.0	5	1123.1	0.005	5.62
65.0	5	1319.5	0.003	3.96
70.0	5	1531.5	0.002	3.06



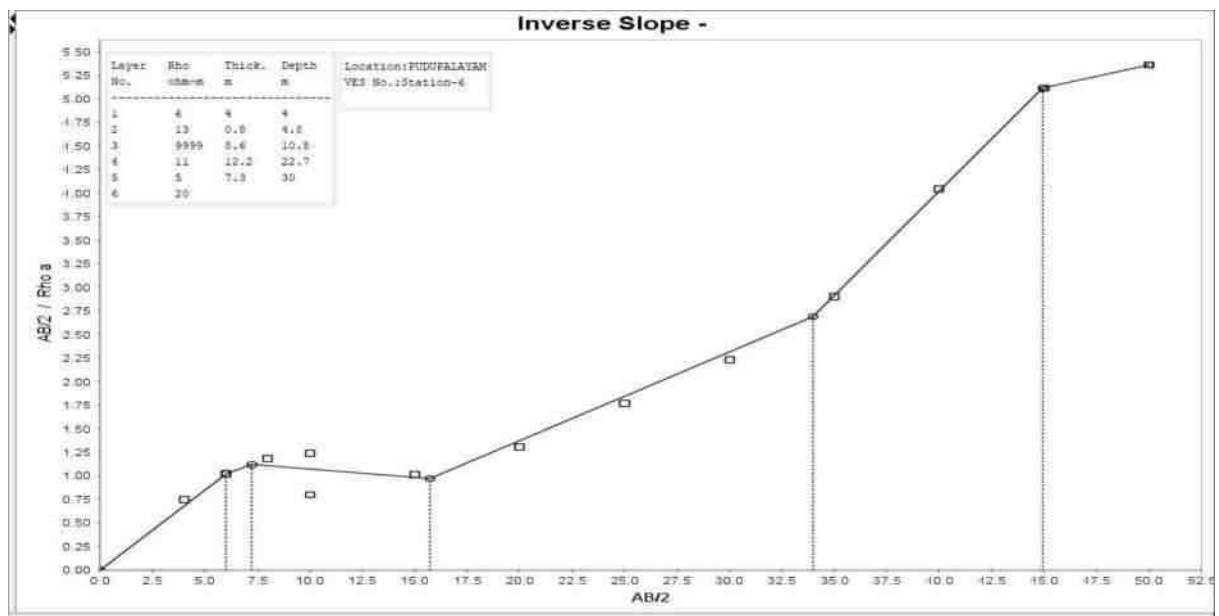
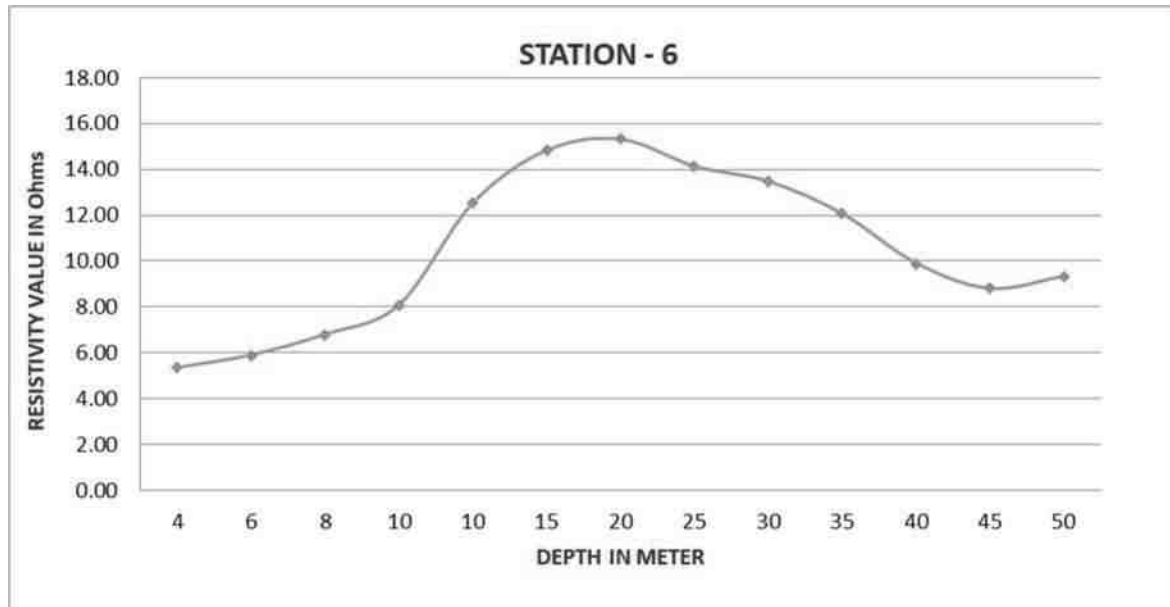
STATION - 4				
GPS - 11° 5'5.15"N 79° 8'41.21"E				
AB/2 (m)	MN/2(m)	Geometric Factor (K)	Resistance (R) Ohm	Apparent Resistivity Rho Ohm-meter
4.0	2	9.4	0.269	2.54
6.0	2	25.1	0.115	2.89
8.0	2	47.1	0.069	3.25
10.0	2	75.4	0.051	3.85
10.0	5	23.6	0.213	5.02
15.0	5	62.8	0.073	4.59
20.0	5	117.8	0.036	4.24
25.0	5	188.5	0.022	4.15
30.0	5	274.9	0.015	4.12
35.0	5	377.0	0.011	4.15
40.0	5	494.8	0.008	3.96
45.0	5	628.3	0.007	4.40
50.0	5	777.5	0.006	4.67
55.0	5	942.5	0.004	3.77
60.0	5	1123.1	0.003	3.37
65.0	5	1319.5	0.002	2.64
70.0	5	1531.5	0.001	1.53
75.0	5	1759.3	0.001	1.76
80.0	5	2002.8	0.002	4.01
85.0	5	2262.0	0.002	4.52
90.0	5	2536.8	0.003	7.61
95.0	5	2827.4	0.001	2.83
100.0	5	3133.7	0.001	3.13



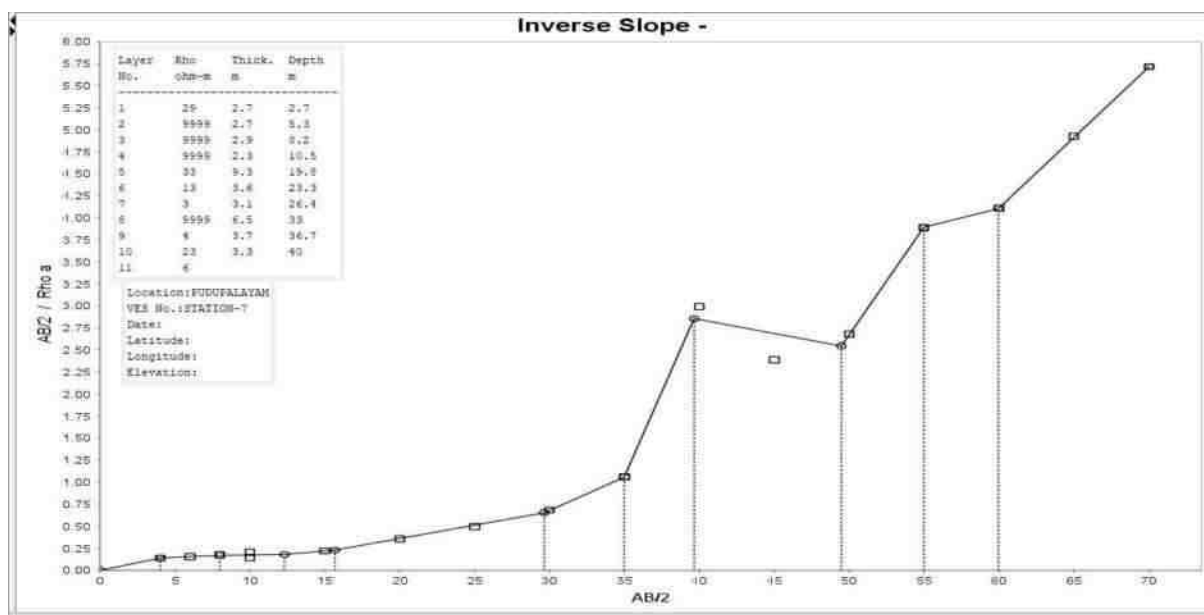
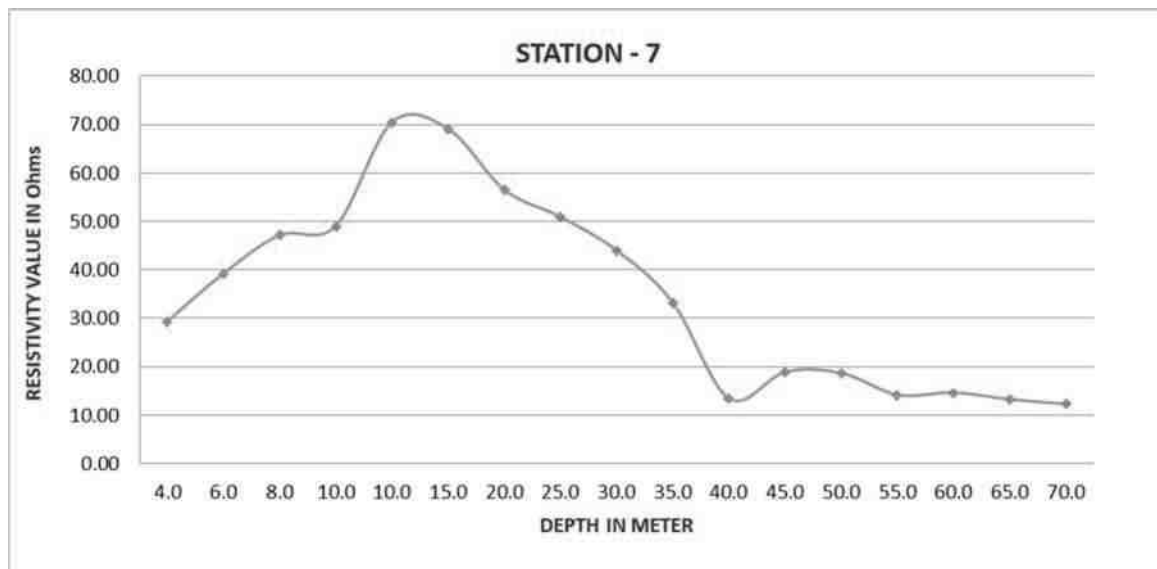
STATION - 5				
GPS - 11° 5'38.76"N 79° 8'52.85"E				
AB/2 (m)	MN/2(m)	Geometric Factor (K)	Resistance (R) Ohm	Apparent Resistivity Rho Ohm-meter
4.0	2	9.4	2.74	25.82
6.0	2	25.1	1.02	25.64
8.0	2	47.1	0.523	24.65
10.0	2	75.4	0.318	23.98
10.0	5	23.6	1.9	44.77
15.0	5	62.8	0.437	27.46
20.0	5	117.8	0.191	22.50
25.0	5	188.5	0.095	17.91
30.0	5	274.9	0.053	14.57
35.0	5	377.0	0.03	11.31
40.0	5	494.8	0.019	9.40
45.0	5	628.3	0.012	7.54
50.0	5	777.5	0.009	7.00
55.0	5	942.5	0.006	5.65
60.0	5	1123.1	0.004	4.49
65.0	5	1319.5	0.003	3.96
70.0	5	1531.5	0.002	3.06
75.0	5	1759.3	0.001	1.76
80.0	5	2002.8	0.001	2.00



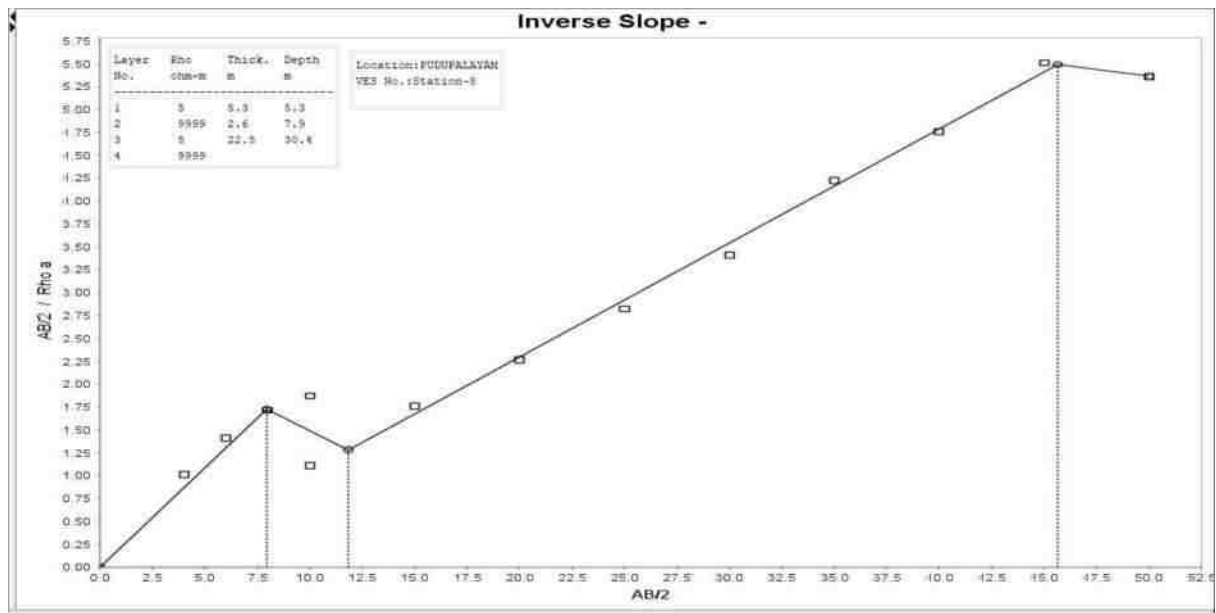
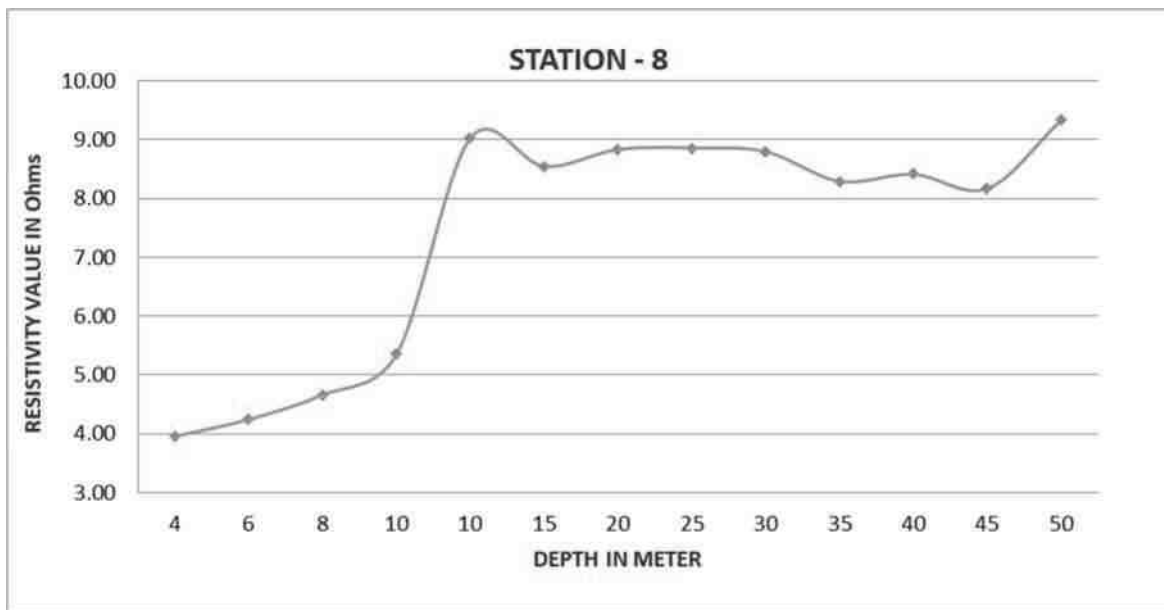
STATION - 6				
GPS - 11° 5'38.20"N 79° 8'58.32"E				
AB/2 (m)	MN/2(m)	Geometric Factor (K)	Resistance (R) Ohm	Apparent Resistivity Rho Ohm-meter
4.0	2	9.4	0.566	5.33
6.0	2	25.1	0.234	5.88
8.0	2	47.1	0.144	6.79
10.0	2	75.4	0.107	8.07
10.0	5	23.6	0.531	12.51
15.0	5	62.8	0.236	14.83
20.0	5	117.8	0.13	15.32
25.0	5	188.5	0.075	14.14
30.0	5	274.9	0.049	13.47
35.0	5	377.0	0.032	12.06
40.0	5	494.8	0.02	9.90
45.0	5	628.3	0.014	8.80
50.0	5	777.5	0.012	9.33



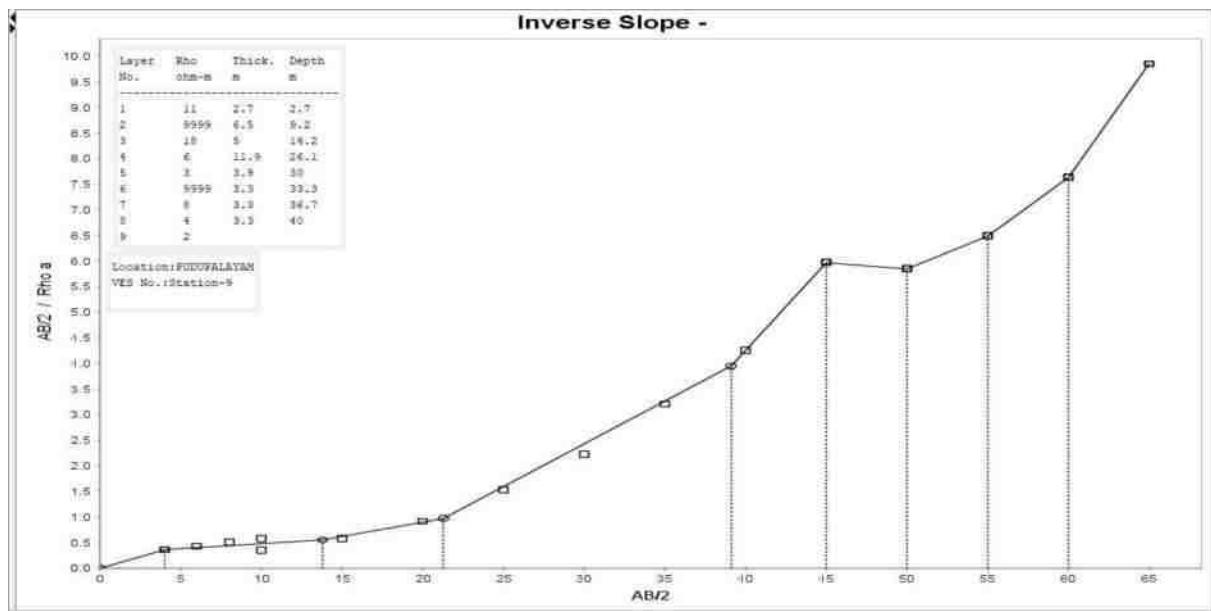
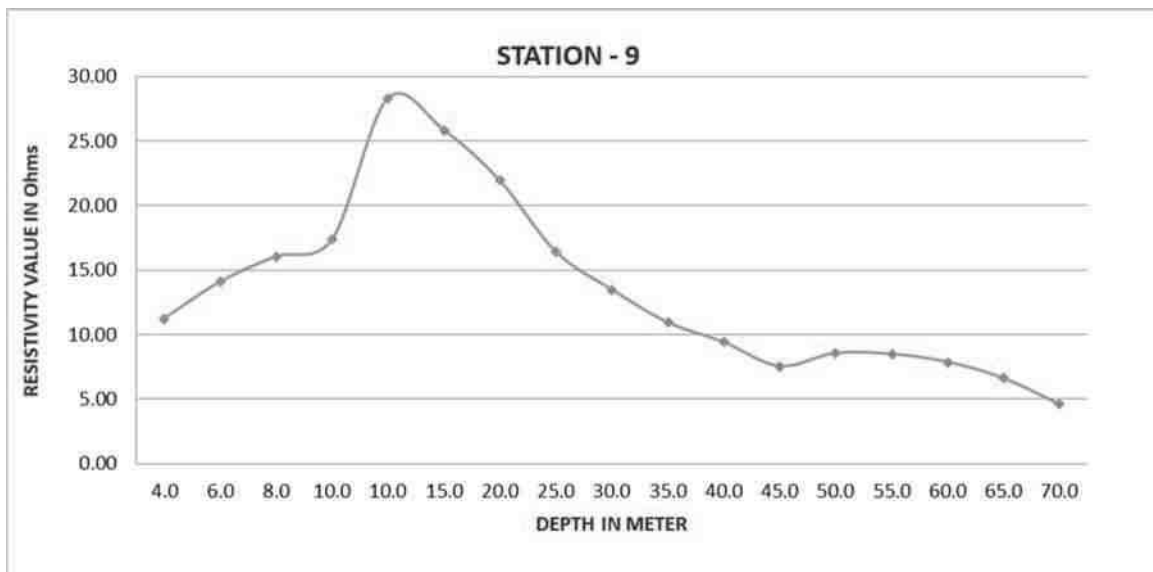
STATION - 7				
GPS - 11° 5'38.30"N 79° 9'3.31"E				
AB/2 (m)	MN/2(m)	Geometric Factor (K)	Resistance (R) Ohm	Apparent Resistivity Rho Ohm-meter
4.0	2	9.4	3.11	29.31
6.0	2	25.1	1.56	39.21
8.0	2	47.1	1	47.12
10.0	2	75.4	0.65	49.01
10.0	5	23.6	2.99	70.45
15.0	5	62.8	1.1	69.12
20.0	5	117.8	0.48	56.55
25.0	5	188.5	0.27	50.89
30.0	5	274.9	0.16	43.98
35.0	5	377.0	0.088	33.18
40.0	5	494.8	0.027	13.36
45.0	5	628.3	0.03	18.85
50.0	5	777.5	0.024	18.66
55.0	5	942.5	0.015	14.14
60.0	5	1123.1	0.013	14.60
65.0	5	1319.5	0.01	13.19
70.0	5	1531.5	0.008	12.25



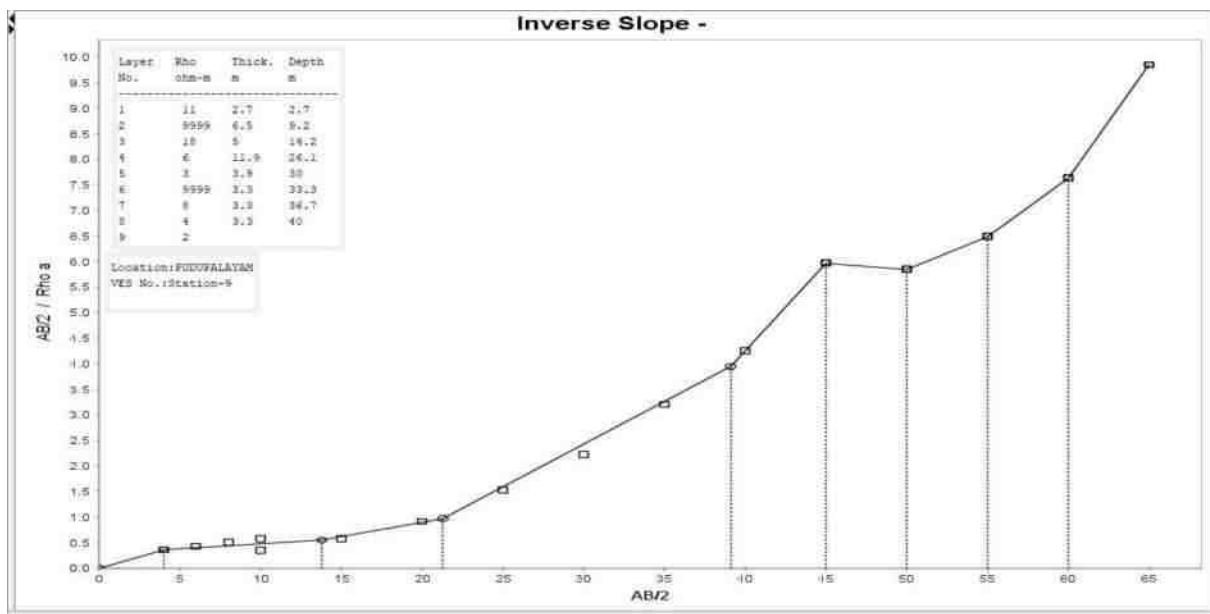
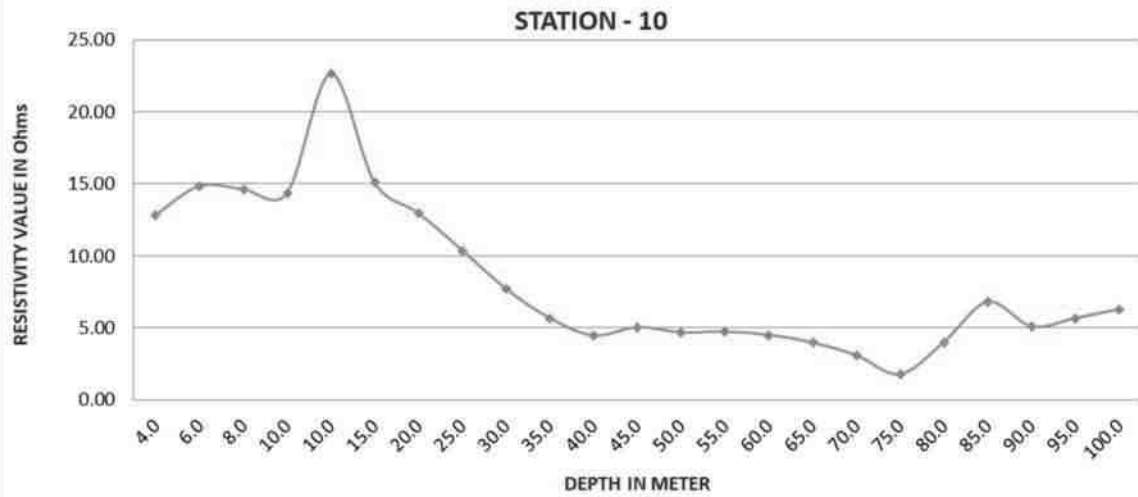
STATION - 8				
GPS - 11° 5'9.38"N 79° 9'4.83"E				
AB/2 (m)	MN/2(m)	Geometric Factor (K)	Resistance (R) Ohm	Apparent Resistivity Rho Ohm-meter
4.0	2	9.4	0.42	3.96
6.0	2	25.1	0.169	4.25
8.0	2	47.1	0.099	4.67
10.0	2	75.4	0.071	5.35
10.0	5	23.6	0.383	9.02
15.0	5	62.8	0.136	8.55
20.0	5	117.8	0.075	8.84
25.0	5	188.5	0.047	8.86
30.0	5	274.9	0.032	8.80
35.0	5	377.0	0.022	8.29
40.0	5	494.8	0.017	8.41
45.0	5	628.3	0.013	8.17
50.0	5	777.5	0.012	9.33



STATION - 9				
GPS - 11° 5'10.65"N 79° 8'58.69"E				
AB/2 (m)	MN/2(m)	Geometric Factor (K)	Resistance (R) Ohm	Apparent Resistivity Rho Ohm-meter
4.0	2	9.4	1.19	11.22
6.0	2	25.1	0.56	14.07
8.0	2	47.1	0.34	16.02
10.0	2	75.4	0.23	17.34
10.0	5	23.6	1.2	28.27
15.0	5	62.8	0.411	25.82
20.0	5	117.8	0.186	21.91
25.0	5	188.5	0.087	16.40
30.0	5	274.9	0.049	13.47
35.0	5	377.0	0.029	10.93
40.0	5	494.8	0.019	9.40
45.0	5	628.3	0.012	7.54
50.0	5	777.5	0.011	8.55
55.0	5	942.5	0.009	8.48
60.0	5	1123.1	0.007	7.86
65.0	5	1319.5	0.005	6.60
70.0	5	1531.5	0.003	4.59



STATION - 10				
GPS - 11° 5'11.99"N 79° 8'53.86"E				
AB/2 (m)	MN/2(m)	Geometric Factor (K)	Resistance (R) Ohm	Apparent Resistivity Rho Ohm-meter
4.0	2	9.4	1.36	12.82
6.0	2	25.1	0.59	14.83
8.0	2	47.1	0.31	14.61
10.0	2	75.4	0.19	14.33
10.0	5	23.6	0.96	22.62
15.0	5	62.8	0.24	15.08
20.0	5	117.8	0.11	12.96
25.0	5	188.5	0.055	10.37
30.0	5	274.9	0.028	7.70
35.0	5	377.0	0.015	5.65
40.0	5	494.8	0.009	4.45
45.0	5	628.3	0.008	5.03
50.0	5	777.5	0.006	4.67
55.0	5	942.5	0.005	4.71
60.0	5	1123.1	0.004	4.49
65.0	5	1319.5	0.003	3.96
70.0	5	1531.5	0.002	3.06
75.0	5	1759.3	0.001	1.76
80.0	5	2002.8	0.002	4.01
85.0	5	2262.0	0.003	6.79
90.0	5	2536.8	0.002	5.07
95.0	5	2827.4	0.002	5.65
100.0	5	3133.7	0.002	6.27



6.0 CONCLUSION

The present study to carried out geophysical survey to locate the groundwater resources at new pudupalayam limestone mines, Ariyalur. It is important to maintain the groundwater table in Ariyalur district because of the deficit in rainfall and various forms of mining activity carried on. Based on the available information and the geophysical investigations it is concluded that the project area is considered to have medium groundwater potential. Productive aquifers are expected at depth of 70m to 75m where minor fractures are observed and shallow aquifers are expected above 55m-60m BGL. The ultimate pit limit as per the approved mining plan depth is 17.75m below ground level (2m top soil + 0.75m Limekankar + 15m Limestone). Hence the mining operation restricted to ultimate pit 17.75m of the study area and the mining operation will not intersect the groundwater table. Therefore, mining activity will not have any impact on the water table.

Dr. P. Thangaraju, M.Sc., Ph.D.,
Govt. Approved Hydro Geologist
M/s. Geo Exploration and Mining Solutions,
Regd. Office: No. 17, Advaita Ashram Road,
Alagapuram, Salem – 636 004, Tamil Nadu
Mobile: +91 - 94433 56539
E-Mail: infogeoexploration@gmail.com



GEO EXPLORATION AND MINING SOLUTIONS

Regd Off No.17,
Advaitha Ashram Road,
Fairlands, Salem-636 004, Tamil Nadu.
Mobile: 9442278601, 9443356539,
E-MAIL: ifthiahmed@gmail.com, geothangam@gmail.com

ANNEXURE VIII
NABET CERTIFICATE



**QUALITY COUNCIL
OF INDIA**
Creating an Ecosystem for Quality



National Accreditation Board for Education and Training



Certificate of Accreditation

Eco Tech Labs Pvt Ltd.,

48, 2nd Main Road, Ram Nagar South Extension, Pallikaranai, Chennai- 600100, T.N.

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 - including Open cast only	1	1 (a) (i)	B
2	Thermal power plants	4	1(d)	A
3	Coal washeries	6	2 (a)	B
4	Metallurgical industries - Ferrous only	8	3 (a)	B
5	Synthetic organic chemicals industry (dyes & dye intermediates; bulk drugs and intermediates excluding drug formulations; synthetic rubbers; basic organic chemicals, other synthetic organic chemicals and chemical intermediates)	21	5 (f)	A
6	Airports	29	7 (a)	A
7	Industrial estates/ parks/ complexes/areas, export processing Zones (EPZs), Special Economic Zones (SEZs), Biotech Parks, Leather Complexes	31	7 (c)	A
8	Building and construction projects	38	8 (a)	B
9	Townships and Area development projects	39	8 (b)	B

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in SAAC minutes dated Apr. 20, 2021 and supplementary minutes dated Oct.19, 2021 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/22/2217 dated Jan. 19, 2022. The accreditation needs to be renewed before the expiry date by Eco Tech Labs Pvt. Ltd., Chennai following due process of assessment.

Sr. Director, NABET
Dated: Jan. 19, 2022

Certificate No.
NABET/EIA/2124/SA 0147

Valid up to
Sep. 15, 2023

For the updated List of Accredited EIA Consultant Organizations with approved Sectors please refer to QCI-NABET website.

