Application Form (Form I & Draft EIA Report)

For

Pudupalayam Limekankar & Limestone Quarry – 23.35.0 Ha

(Greenfield Project)

at

S.F. No. 222/1, 222/2A, 222/11A, 225, 226/1A, 226/7, 227/1, 233/1, 236/1A, 236/9 & 239 - 23.35.0 Ha, 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 Proponent details:
& Laboratory details:

M/s. TamilNadu Cement

Ecotech Labs Pvt Ltd,





No 48, 2nd Main road, South extension Ram nagar, Pallikaranai, Chennai -600100. Corporation Limited
(A Government of TamilNadu
Undertaking)
5th Floor, Aavin Illam, No.3A,
Pasumpon Muthuramalingam Salai,
Nandanam,

Chennai-600035

Date:

From

M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu 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 Pudupalayam Limekankar & Limestone Quarry at S.F. No. 222/1, 222/2A, 222/11A, 225, 226/1A, 226/7, 227/1, 233/1, 236/1A, 236/9 & 239 - 23.35.0 Ha, Pudupalayam Village, Ariyalur Taluk, Ariyalur District, Tamil Nadu – Regarding.

Ref: Letter No. SEIAA - TN/F. No 7605/SEAC/ToR- 795/2020 dated 21.10.2020

Please find enclosed herewith the application of Draft EIA Report along with necessary enclosures towards seeking environmental clearance for the Pudupalayam Limekankar & Limestone Quarry over a total extent of 23.35.0 Ha in , Pudupalayam Village, Ariyalur Taluk, Ariyalur District, Tamil Nadu State. 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 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. TamilNadu Cement Corporation Limited

(A Government of TamilNadu Undertaking)

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

Muthuramalingam Salai, Nandanam,

Chennai-600035

UNDERTAKING

I hereby, undertake that the Environmental Impact Assessment (EIA) Report for the Proposed Pudupalayam Limekankar & Limestone Quarry at S.F. No. 222/1, 222/2A, 222/11A, 225, 226/1A, 226/7, 227/1, 233/1, 236/1A, 236/9 & 239 - 23.35.0 Ha , Pudupalayam Village, Ariyalur Taluk, Ariyalur District, Tamil Nadu and the report is in entire compliance with the Terms of Reference (TOR) issued by SEIAA, Tamil Nadu, vide Letter No. SEIAA – TN/F. No 7605/SEAC/ToR- 795/2020 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: Ariyalur Yours faithfully

Date: M/s. Tamil Nadu Cements Corporation Limited

Piot No 48A, 2nd Main Road, Ram Nagar, South Extension, Pallikkaranat, Chennat - 600 100 GST NO 33AADCE6103A2ZH PAN NO AADCE6103A



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

UNDERTAKING

I, Dr. A. Dhamodharan, Managing Director confirms that this Draft EIA Report of proposed Proposed Pudupalayam Limekankar & Limestone Quarry at S.F. No. 222/1, 222/2A, 222/11A, 225, 226/1A, 226/7, 227/1, 233/1, 236/1A, 236/9 & 239 - 23.35.0 Ha, Pudupalayam Village, Ariyalur Taluk, Ariyalur District, Tamil Nadu 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

A-DJames

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

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

Date: Place: Chennai

Declaration of Experts contributing to the EIA

Declaration by experts contributing to the EIA report for the Proposed Pudupalayam Limekankar & Limestone Quarry at S.F. No. 222/1, 222/2A, 222/11A, 225, 226/1A, 226/7, 227/1, 233/1, 236/1A, 236/9 & 239 - 23.35.0 Ha, 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.

Project	Limekankar & Limestone Quarry - 23.35.0Ha	
Type & Category	1 (a) Mining of Minerals	
Project Proponent	M/s. Tamil Nadu Cements Corporation Limited	
Environment	M/s. Eco Tech Labs Pvt. Ltd.,	
Consultant with their	QCI Accreditated	
Accreditation Status		
NABET Certificate No.	NABET/ EIA/2124/SA 0147	
EIA Coordinator		
Name	Dr. A. Dhamodharan (Mining of Minerals)	
Signature	A-Dymen 11 x	
Period of Involvement February 2021 – till now		
Contact Information	M/s. Eco Tech Labs Pvt. Ltd.	
	No. 48, 2nd Main Road,	
	Ram Nagar South Extension	
	Pallikaranai, Chennai - 600 100	
	Mobile: +91 9789906200	
	E-mail: dhamo@ecotechlabs.in	

Functional Area Experts

The basic fact division that environment and laboratory are accredited by NABL and Ministry of Environment and Forests, India and by other international bodies, stand testimony to its emphasis.

S. No	Functional areas	Name of the experts	Involvement (Period and task)	Signature and date
1	AP	Mrs. K. Vijayalakshmi	 Selection of Baseline Monitoring stations based on the wind direction Interpretation of Baseline data by comparing it with standards prescribed by CPCB against the type of area Identification of sources of air pollution and suggesting mitigation measures to minimize impact <i>Period: June 2020 – till now</i> 	est.
2	WP	Dr. A. Dhamodharan	 Selection of baseline Monitoring Locations for Ground water analysis and also identifying nearest surface water to be studied. Interpretation of baseline data collected Identification of impacts based on the baseline study conducted and also to the ground water and nearby surface water due to the proposed project Preparation of suitable and appropriate mitigation plan. Period: June 2020 – till now 	A-D) Jeanne
3	SHW	Dr. A. Dhamodharan	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 <i>Period: June 2020 – till now</i>	A-D) James

4	SE	Mr. S. Pandian	 Primary data collection through the census questionnaire Obtaining Secondary data from authenticated sources and incorporating the same in EIA report. Impact assessment & proposing suitable mitigation plan CSR budget allocation by discussing with the local body and allotting the same for need based activity. Period: June 2020 – till now 	a s
5	ЕВ	Dr. A. Dhamodharan	 Primary data collection through field survey and sheet observation for ecology and biodiversity Secondary Collection through various authenticated sources Prediction of anticipated impacts and suggesting appropriate mitigation measures. Period: June 2020 – till now 	
6	HG	Dr. T. P. Natesan	 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 Determination of groundwater use pattern, development of rainwater harvesting program. Storm water management through garland drainage system. Period: June 2020 – till now 	(n) ~
7	GEO	Dr. T. P. Natesan	1. Field survey for assessing regional and local geology, aquifer distribution, Determination of groundwater use pattern, development of rainwater harvesting program. Period: June 2020 – till now	C.00/00/1
8	SC	Dr. A. Dhamodharan	 Interpretation of baseline report Identification of possible impacts on soil, prediction of soil conservation and suggesting suitable mitigation measures. Period: June 2020 – till now 	A-DJonne

9	AQ	Mrs. K. Vijayalakshmi	 Collection of Meteorological data for the baseline study period Plotting wind rose plot and thereby selecting the monitoring locations based on the wind pattern Estimation of sources of air emissions and air quality modeling is done Interpretation of the results obtained Identification of the impacts and suggesting suitable mitigation measures. Period: June 2020 – till now 	who from the same of the same
10	NV	Mrs. Neha Singh	 Selection of monitoring locations Interpretation of baseline data Prediction of impacts due to noise pollution and suggestion of appropriate mitigation measures Period: June 2020 – May 2021 	Birgh
11	LU	Dr. T. P. Natesan	 Collection of Remote sensing satellite data to study the land use pattern. Primary field survey and limited field verification for land categorization in the study area Preparation of Land use map using Satellite data for 10km radius around the project site. Period: June 2020 – till now 	C.0001
12	RH	Mr. Pinaki Dasgupta	 Identification of the risk Interpreting consequence contours Suggesting risk mitigation measures <i>Period: June 2020 – Nov 2021</i> 	Sund

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

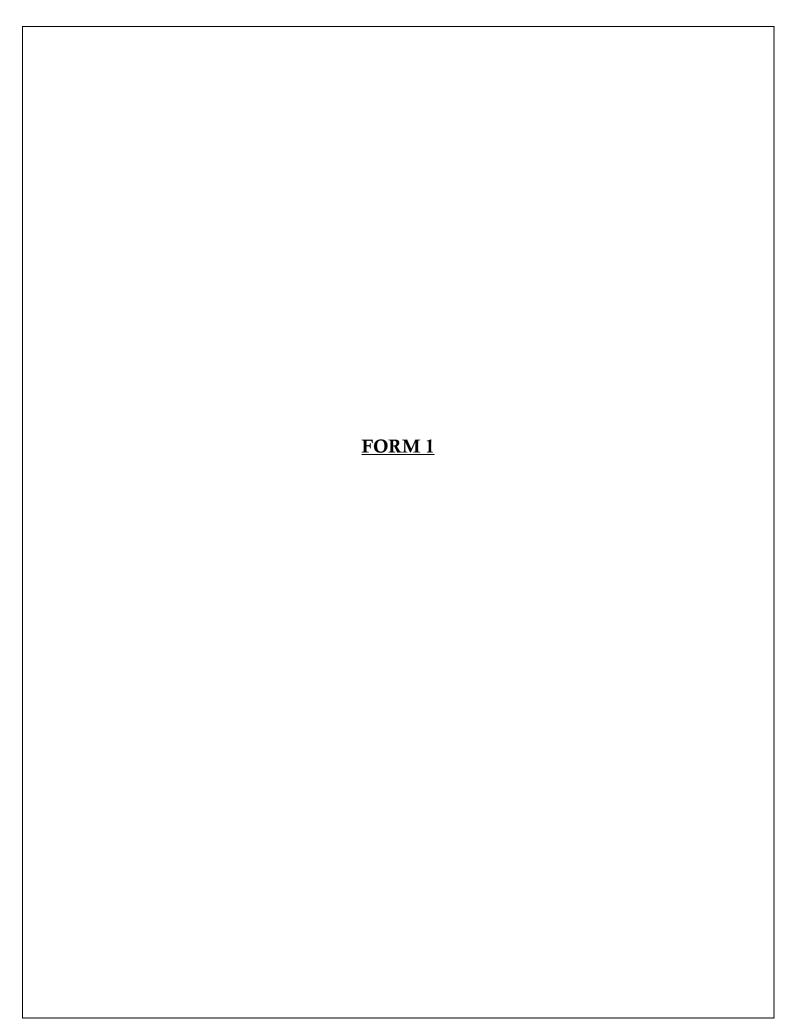
Designation: Managing Director

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

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

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FORM - I

I. BASIC INFORMATION

S.	Item	Details
No.		
1	Name of the project	Pudupalayam Limekankar & Limestone Quarry total extent of 23.35.0 Ha
2	S. no. in the schedule	1 (a) Mining of Minerals.
3	Proposed area	Area: 23.35.0 Ha Proposed Capacity of Limestone ROM: 1066316 Tonnes Proposed Capacity of Limekankhar ROM: 108704 Tonnes.
4	New/Expansion/Modernization	New
5	Existing capacity/Area etc	Area : 23.35.0 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′ 11.82″ to 11° 05′ 37.18″N Longitude: 79° 08′ 46.58″ to 79° 09′ 07.38″E
	Plot/Survey/Khasra No	222/ 1,222/ 2A, 222/ 11A, 225, 226/ 1A, 226/ 7, 227/ 1, 233/ 1, 236/1A, 236/ 9 & 239
	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 SW
11	Nearest town, city, district headquarters along with distance in kms	Town - Ariyalur - 10 Km NW City - Ariyalur - 10 Km NW District - Ariyalur - 10 Km NW
12	Village Panchayats, Zilla Parishad, municipal corporation, local body (Complete postal addresses with telephone nos. to be given)	Village - Pudupalayam Panchayat - Pudupalayam Taluk - Ariyalur District - Ariyalur
13	Name of the applicant	Thiru.T.Ravichandran
14	Registered address	M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking) 5th Floor, Aavin Illam, No.3A, Pasumpon Muthuramalingam Salai, Nandanam, Chennai-600035

S.	Item	Details
No.		
15	Address for correspondence: Name	Thiru.T.Ravichandran
	Designation	Deputy General manager
	Address	M/s. TamilNadu Cement Corporation Limited (A Government of TamilNadu Undertaking) 5th Floor, Aavin Illam, No.3A, Pasumpon Muthuramalingam Salai, Nandanam, Chennai-
	Dia and a	600035
	Pin code	ari@tancem.com,
	E-mail	acwmines@gamil.com
	Telephone No. / Fax No.	9123547311
16	Details of alternative sites	There is no alternative site examined as the
	examined, if any, Location of	project site is specific.
	these sites should be shown on	
	a topo sheet	
17	Interlinked projects	There is no necessity for interlinked project
18	Whether separate application	As there is no inter linked projects, separate
	of interlinked project has been submitted?	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 Limekankhar & Limestone is specific to one site oriented.
	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) Act, 1972? (c) The CRZ Notification 1991	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
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.3992/MMA.2/2019-1 dated 02.08.2019. Mining Plan was approved by The Indian Bureau
		of Mines, Chennai vide letter no.

S.	Item	Details
No.		
		TN/ALR/LST&KNK/MP/2062.MDS dated
		09.10.2019.
	Forest land involved (hectares)	No Forest land involved
24	Whether there is any litigation	There is no litigation pending with court as
	pending against the project	against this 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	

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 23.35.0 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 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 pisiculture purpose.
1.4	Pre-construction investigations e.g. bore	No	No investigations have been carried out for soil and water

S.	Information/Checklist	Yes/No	Details thereof (with approximate
No.	confirmation		quantities /rates, wherever possible)
			with sources of information data
	holes, soil testing?		
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 Limekankhar 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 pisiculture 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	Method of mining will beOpencast 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 proposed based on the rock formation
1.14	Facilities for storage of goods or materials?	No	Mines Office along with separate facility for storage or goods or materials will be constructed before commencement of mining operations
1.15	Facilities for treatment or	Yes	1) Solid Waste
	disposal of solid waste or		I) Top soil: Top soil so generated will be

S.	Information/Checklist	Yes/No	Details thereof (with approximate
No.	confirmation		quantities /rates, wherever possible)
			with sources of information data
	liquid effluents?		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 pipelines?	No	The project doesn't involve diversion of transmission or pipe lines
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

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible)
			with sources of information data
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	The mining area of 23.35.0 Hectares is a patta land The proposed area is devoid of vegetation expect some few bushes and were previously seasonal agriculture were carried out.

2.2	Water (expected source & competing users) Unit: KLD	Yes	The project does not require huge amount water for quarry operation and total water requirement is 22.65 KLD Drinking Water : 0.65 KLD
			Dust Suppression : 11 KLD Green belt : 11 KLD Total : 22.65 KLD
			Water will be supplied from existing mine of TANCEM which is covered in Mining Lease G.O.No.344
2.3	Minerals (MT)	Yes	Proposed Capacity of Limestone ROM : 1066316 Tonnes Proposed Capacity of Limekankhar ROM : 108704 Tonnes
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	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.
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	No	No hazardous materials used in this project.
	materials, which are		
	hazardous (as per MSIHC		
	rules) to human health or		

	the environment (flora, fauna, and water supplies)		
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.	Information/Checklist	Yes/No	Details thereof (with approximate
No.	confirmation		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 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.

S.	Information/Checklist	Yes/No	Details thereof (with approximate
No.	confirmation		quantities /rates, wherever possible)
			with sources of information data
4.6	Sewage sludge or other	No	Neither effluent is generated nor treated in
	sludge from effluent		this quarry
	treatment		
4.7	Construction or demolition	No	No construction or demolition wastes
	wastes		generated
4.8	Redundant machinery or	No	No machinery is left redundant
	equipment		
4.9	Contaminated soils or other	No	There is no contaminated soil or other
	materials		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.	Information/Checklist	Yes/No	Details thereof (with approximate
No.	confirmation		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 SOx and NOx 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 or transport	Yes	The emission of SOx and NOx 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. 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

S.	Information/Checklist	Yes/No	Details thereof (with approximate		
No.	confirmation		quantities /rates, wherever possible) with		
			sources of information data		
			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	No	The limestone quarrying doesn't produce any		
	of waste		hazardous waste		
5.7	Emissions from burning of	No	No incineration of solid waste or materials		
	waste in open air (e.g. slash				
	materials, construction				
	debris)				
5.8	Emissions from any other	No	There is no emissions from other sources		
	sources				

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

S.	Information/Checklist	Yes/No	Details thereof (with approximate	
No.	confirmation		quantities /rates, wherever possible) with	
			sources of information data	
6.1	From operation of equipment	Yes	There is likelihood of some increase in noise	
	e.g. engines, ventilation plant,		due to operational machinery like dumpers/	
	crushers		compressor/excavator/rock breaker, etc.	
			which generates high level of noise at source	
			ranges from 80-90 decibels.	
6.2	From industrials or similar	No	There is no processing plant involved	
	processes			
6.3	From construction or	No	No construction or demolition work	
	demolition		envisaged.	
6.4	From blasting or piling	No	No drilling & blasting is proposed	
6.5	From construction or	Yes	Noise generation will be from excavator and	
	operational traffic		tippers. It should be maintained less than	
			85dB as prescribed by DGMS	
6.6	From lighting or cooling	No	No lighting or cooling system required	
	systems			
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.	Information	/Checklist	Yes/No	Details	thereof	(with	approximate
----	-------------	------------	--------	---------	---------	-------	-------------

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

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

S.	Information/Checklist	Yes/No	Details thereof (with approximate
No.	confirmation		quantities /rates, wherever possible) with
			sources of information data
8.1	From explosions, spillages, fires etc from storage, handling, use or production of hazardous substances	Yes	Not applicable as there is spillage, fire, etc. required or 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 unauthorised 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 activates 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.: • 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 developments	No	After complete excavation, the area will be 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.	Areas	Yes/No	Aerial distances (within 15 km.) Proposed
No.			project location boundary

S.	Areas	Yes/No	Aerial distances (within 15 km.) Proposed
No.			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 with in 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	Nakkankuzhi Lake 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-up area	Yes	The area applied for mining lease lies in 9.08 km NW of Ariyalur and with a total population of 7.55 Lakhs

S.	Areas	Yes/No	A	erial distances (within 15 k	m.) Proposed	
No.		,		project location boundary		
9.	Areas occupied by	Yes		-		
	sensitive man-made land		S. No.	Places	Dist. From	
	uses (hospitals, schools,		NO.	Schools & Colleges	Project Site	
	places of worship, community facilities)		1		6.5Km NE	
			2	SRM College of Edcation	10.02 Km NW	
			3	Govt Higher secondary school	10.34 Km NW	
			3	Nelli Andavar Institute of Technology	0.50 Km W	
			4	Aditya Brila Public school	2.37 Km N	
				Hospitals		
			1	Ezhil Hospital	10.07 km NW	
			2	Ariyalur General hospital	10.05 Km NW	
			3	RR Hospital	9.55 Km NE	
10.	Areas containing important, high quality or	No	NIL			
	scarce resources					
	(Groundwater / surface					
	water resources, forestry,					
	agriculture, fisheries,					
	tourism, minerals)					
11.	Areas already subjected to	No	-			
	pollution or					
	environmental					
	damage. (where existing					
	legal standards are					
	exceeded)					
12.	Areas susceptible to	No	The	project area falls under seis	smic zone (II) No	
	natural hazard which		ear	th quakes history found witl	hin 15 Km aerial	
	could cause the project to		dist	ance from the project	site. Adequate	
	present environmental		mea	asures will be adopted to pro	event flooding in	
	problems (earthquakes,		the	project site.		
	subsidence, landslides,					
	erosion, flooding or					
	extreme or adverse					
	climatic conditions)					

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."

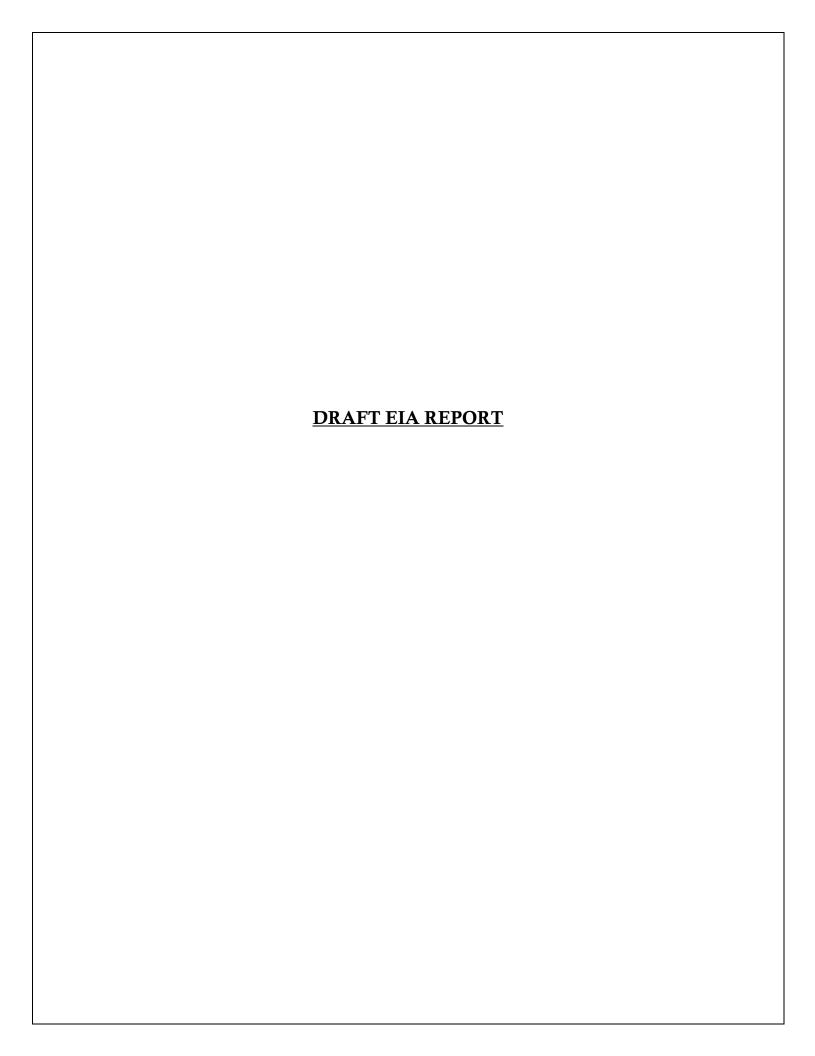
Place: Ariyalur

Date :

Signature of the Consultant

Signature of the Applicant

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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,

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Redgravel, Brickclay, pebbles, filling earth and Kankar are also found in this District. Internal trade of 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.

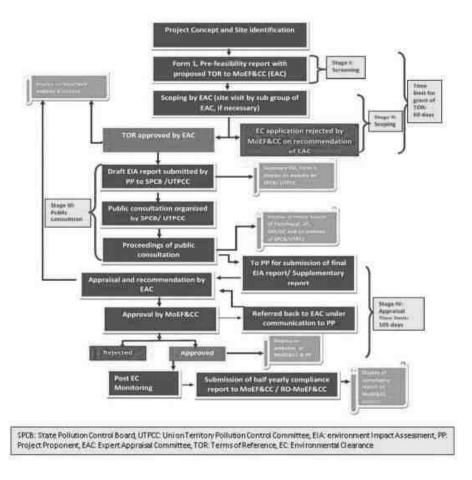


Figure 1.1 Environmental Clearance process

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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. 7605/SEAC/ToR-795/2020 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
	Water level & Quality	Quarterly/ Half Yearly
2.	Monitoring	
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 operation i.e., land availability, utilities (power and water supply) and infrastructure facilities such

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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 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

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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,

Ariyalur Cement Factory,

Ariyalur Taluk,

Ariyalur District – 621729.

1.8 Brief Description of the Project

1.8.1 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 Village, Ariyalur Taluk, Ariyalur District, Tamil Nadu. It is a plain terrain. The total allotted mine lease for the proposed project is 23.35 Ha with their maximum annual production capacity i.e.

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256200 Tonnes of Limestone and 33914 Tonnes of Limekankar to be mined for (Sixty months) Five years only.

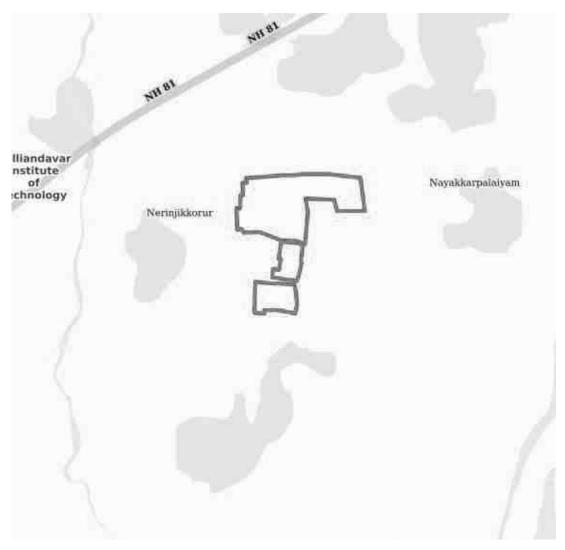


Figure 1.2 Site Connectivity

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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

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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 – 222/1, 222/2A, 222/11A, 225, 226/1A, 226/7, 227/1, 233/1, 236/1A, 236/9, 239, 223, 224, 232 & 233/16 in Pudupalayam Village, AriyalurTaluk& District and Tamil Nadu State over an extent of 24.20.0 hectares in Patta Lands& Government Poramboke Lands for a period of 30 years.

Precise Area Communication Letter was communicated vide Industries (MMA.2) Department, Secretariat, in Letter No. 3392/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 23.35.0 hectares for a period of 10 years and 50 years respectively, by deleting 0.85.0 hectares of Government lands was issued.

2.1.1 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.

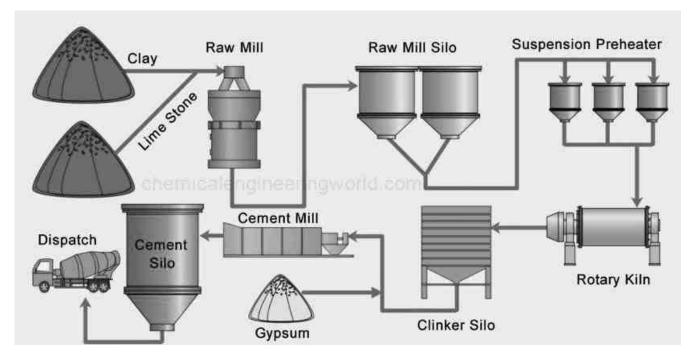
2.1.2 Need for the project:

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 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.

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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 and Limekankar of 256200 Tonnes/Annum and 33914 Tonnes/Annum will be used to manufacture 188385.7 Tonnes/Annum of Cement. The manufacturing process of the cement is shown below



The mines are captive mines and there is no crushing unit inside the quarrying area

2.2 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

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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

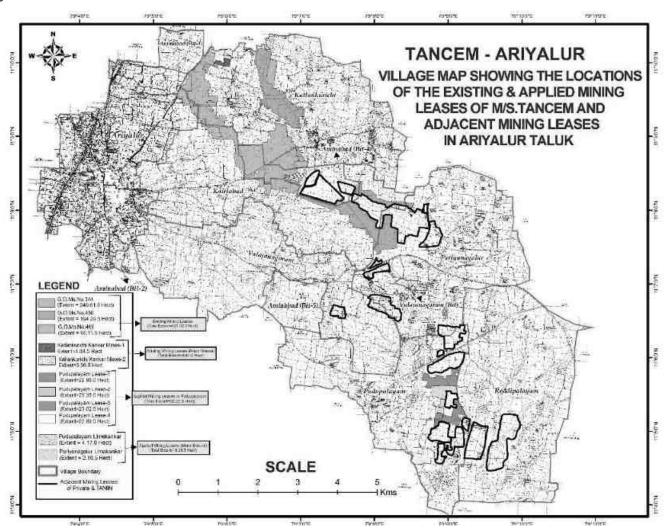


Figure 2.1Village Map showing the Locations of the Existing and Applied Mining

Leases in the Ariyalur District

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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 2.2 Site Connectivity to TANCEM, Ariyalur Cement Factory

The Photographs of TANCEM, Ariyalur Cement Factory is shown Below





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Figure 2.3Photographs 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	23.35 На
4	Location	S.F No: 222/1, 222/2A, 222/11A, 225, 226/1A, 226/7, 227/1, 233/1, 236/1A, 236/9 & 239, Pudupalayam Village, Ariyalur Taluk, Ariyalur District
5	Latitude	11°05'11.82" N to 11°05'37.18" N
6	Longitude	79°08'46.58" E to 79°09'07.38" E
7	Topography	Plain terrain
8	Site Elevation above MSL	≃57 m from above MSL
9	Topo sheet No.	58 M/04
10	Minerals of Mine	Limekankar & Limestone
11		Linestone capacity of ROM: Available Reserves : 1066316 Tones 5 years Production : 1025236 Tones Limekankar capacity of ROM Available Reserves : 108704 Tones 5 years Production : 100384 Tones
12	Ultimate depth of Mining	17.75m below ground level
13	Method of Mining	Opencast mechanized mining by using Mega Rock Breaker, Excavators for

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14	Water demand	loading operations and tippers for transport of minerals from the project site to factory. Drilling and Blasting operation is based on the rock formation 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.
		3392/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/2062.MDS
		dated 09.10.2019
20	Boundary Fencing	7.5m, 10m and 50m (Near Narrunkuzhi
		Eri)safety distance to the boundary,
21	Constant at an	fencing will be provided.
21	Ground water	The quarry operation is proposed up to a
		depth of 17.75 m below ground level. The water table is below 60-65 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.
21	Habitations within 500m radius of	There is no Habitation within 500m
	Project Site	radius
23	Drinking water	Water will be supplied from existing
		mine of TANCEM which is covered in

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	Mining Lease G.O. No. 344 and from
	nearby vendors



Figure 2.4: Google Earth Image of the Project Site

2.2.1 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	Ariyalur &	226/7 etc	4.83.0	Limestone	16.06.1995 to
	Cements Ltd	Pudupalayam		GO (3D) 5		15.06.2015
				dated		Deemed to be
				04.01.1995		extended

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2.	Tvl. India Cements Ltd	Ariyalur & Pudupalayam	265, 226 etc	29.29.5 GO No. 75	Limestone	upto 15.06.2035 09.02.1989 to 08.02.2009
	Cements Ltd	1 daapalayam		dated 04.08.2003		Deemed to be extended
						upto 08.02.2039
			Proposed M	ines		
1	Tv1.	Ariyalur &	144,217,218	22.96.0	Limestone	-
	TANCEM	Pudupalayam	etc		&	
					Limekankar	
2	Tvl.	Ariyalur &	229,230 etc	23.02.5	Limestone	-
	TANCEM	Pudupalayam			&	
					Limekankar	
3	Tv1.	Ariyalur &	350,351 etc	22.89.0	Limestone	-
	TANCEM	Pudupalayam			&	
					Limekankar	
4	Tv1.	Ariyalur &	221/1, 2A,	23.35.0	Limestone	-
	TANCEM	Pudupalayam	etc		&	
					Limekankar	
	Expired and abandoned Mines					
	Nil					

2.2.2 Site Connectivity:

The site is connected to NH 227 (700m, N) through Nerinjikorai. Cement and limepowder are manufactured in Ariyalur. These products enter into the market in different parts of the country.

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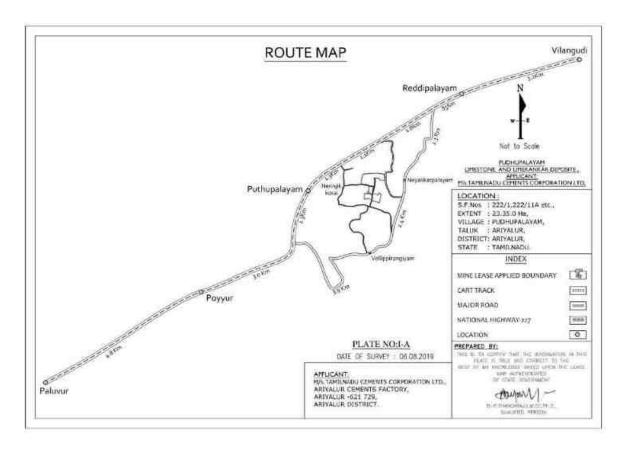


Figure 2.5 Site Connectivity

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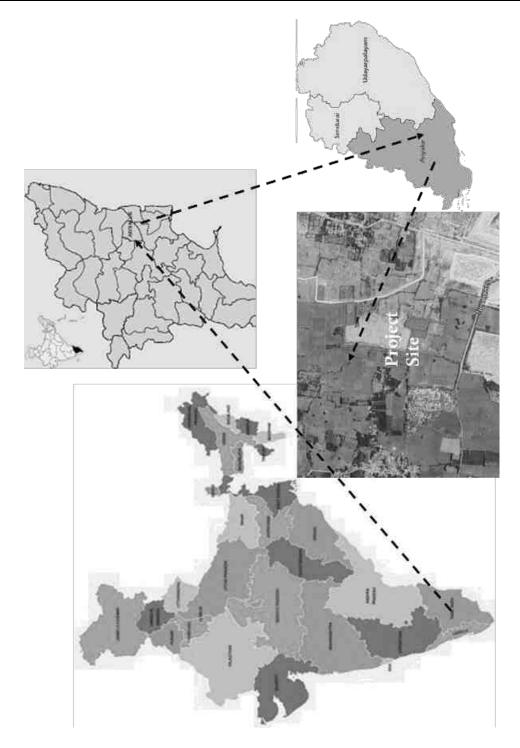


Figure 2.6: Location Map of the Project Site

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2.3 Location Details:

Table 2-3: Location Details

S. No	Particulars	Details	
1	T . (4 1.	11°05'11.82"	N
1.	Latitude	11°05'37.18" N	
2	T 41.	79°08'46.58"	E
2.	Longitude	79°09'07.38" E	
3.	Site Elevation above MSL	57m from MSL	
4.	Topography	Plain terrain	
5.	Land use of the site	Patta Land	
6.	Extent of lease area	23.35 Ha	

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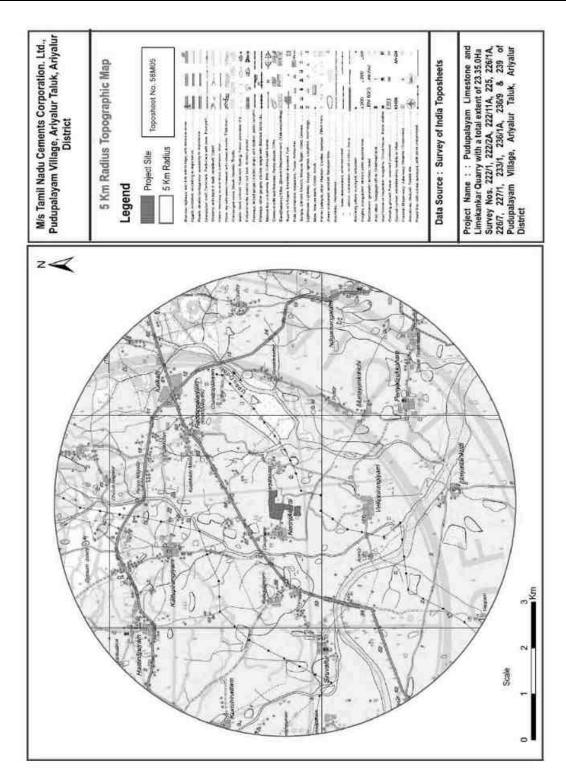


Figure 2.7: Topo Map of Project Site

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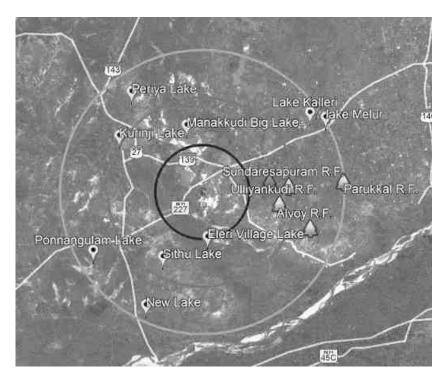


Figure 2.8: Environmental Sensitivity within 15km radius



Figure 2.9: Coordinates of the project site

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2.3.1 Site Photographs

The site photographs of the project site are as follows









Figure 2.10: Site Photographs

2.3.2 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.

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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	04.02.7
2	Dump	04.19.4
3	Office & Infrastructure	00.05.0
4	Mine Roads	00.50.0
5	Green Belt Development	04.41.5
6	Un utilized area	10.16.4
	Total	23.35.0

2.3.3 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	Approximate Distance	Population
	Villages	& Direction from	
		Project Site (km)	
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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2.3.4 Village Map

The Pudupalayam Village map is given below

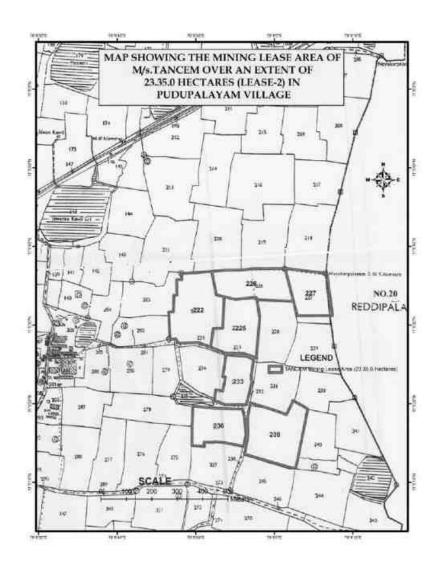


Figure 2.11: Pudupalayam Village map

2.4 Leasehold Area

The proposed Pudupalayam Limekankar & Limestone Quarry – 23.35.0 Ha is a own patta land of M/s. TamilNadu Cement Corporation Limited. The lease area falls in S.F. No. 222/1, 222/2A,

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222/11A, 225, 226/1A, 226/7, 227/1, 233/1, 236/1A, 236/9 & 239 - 23.35.0 Ha, 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.

2.5 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

Lower: Uttatur

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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

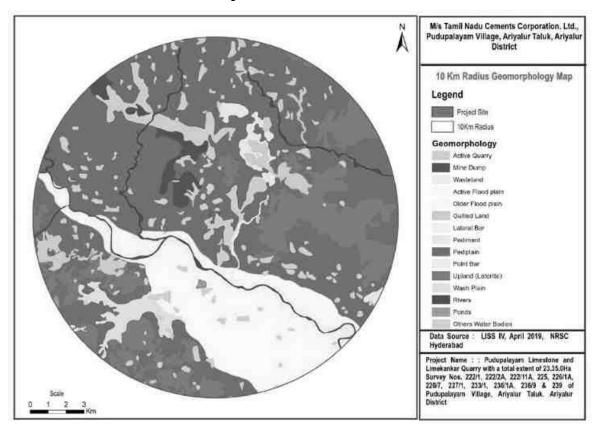


Figure 2.12: Geomorphology

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The proposed project lies in the active quarry area.

2.6 Quality of Reserves:

The mining lease area is of 23.35 Ha, with production capacity of 1025236 Ts of Limestone and 100384 Ts of Limekankar and 263336 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 - 1066316 Tones Limekankar – 108704 Tones
3	Proposed Production	Limestone - 1025236 Tones Limekankar - 100384 Tones
4	Elevation Range of the Mine Site	57m 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.

2.6.1 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

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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% CaCO3 is best suited for cement industries. More than 70% CaCO3 Limekankar material is used for blending with limestone in these particular formations.

2.6.2 Geological Reserves

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

Table 2-7: Geological Reserves

Description	Section	Limestone ROM (Ts)	Limestone @100% Recovery (Ts)	LimekankarROM (Ts)	Limekankar @100% Recovery (Ts)	Topsoil (Ts)
Mineral Reserve	X3 Y3- AB	41080	41080	8319	8319	23296
	X5Y5- CD	5580	5580	1249	1249	4752
	X6Y6-IJ	225252	225252	19217	19217	51408
	X7Y7- KL	49280	49280	9315	9315	25232
	X8Y8- KL	65400	65400	12120	12120	31944
	X9Y9- OP	650748	650748	54008	54008	137472
	X10Y10- MN	28976	28976	4475	4475	12528
	Total	1066316	1066316	108704	108704	286632

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2.6.3 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

							i.		Limestone	T Y	7	13	mekankar				Orw to
Year Section	Section	Bench	L in (m)	in (m)	in (m)	Volume in (Cu.m.)	BD	ROM	Limestone @ 100% Recovery (Ts)	Volume in (Cu.m.)	80	ROM	Limekankar @ 100% Recovery (Ts)	topsoil in(Ts)	Location of advancement	waste	
			54	58	2	6264	2							12528			
	X10Y10-	ii ii	51	52	0.75					1989	2.25	4475	4475				
l year	MN	iii	48	46	-6	13248	2	26496	26496	1 - 7 - 7		0.233123					
		- IV	.40	31	1	1240	2	2480	2480						Northern side		
	Wassa.	1	44	192	2	16896	2							33792	of Block-IV		
	X9Y9-	i i	38	185	0.75					5273	2.25	11863	11863				
	UP	HT.	33	180	- 6	35640	2	71280	71280								
		-		Tot	al=				100256				16338	46320		1:0:46	
		1 1	56	192	2	21504	2							43008			
	X9Y9-	- 1	56	185	0.75					7770	2.25	17483	17483		Center		
F year	00	ili	56	180	-6	60480	2	120960	120960		1		1077793		portion of		
		lv l	70	161	6	67620	2	135240	135240						Block-IV		
				Tot	al=				256200				17483	43008	100000000	1.0.1	
		ī	58	192	1 2	22272	2							44544		-	
	X9Y9-	1	58	185	0.75	500000	-			8048	2.25	18107	18107	1000000	Southern		
II Year	OP	- 11	58	180	6	62640	2	125280	125280	99.10		10101	19391		side of Block-		
III (Ca)	-	iv	58	161	6	56028	2	112056	112056								
	_		- 50	Tot		60000		112000	237336				18107	44544	2000	101	
		1	21	192	1 2	8064	2		201000				10101	16128	1		3.46.34
	X9Y8-	i	21	185	0.75	1900019	-			2914	2.25	6556	6556	70.120			
	OP	iii	21	180	6	22680	2	45360	45360	2014	4.23	0000	0000		i I		
		iv.	21	161	6	20286	2	40572	40572		-			-			
	_	IV.	121	66	2	15972	2	MUDIE	405(%:		_			31944	-		
	wave w	- 1	114	63	0.75	10212	-			5387	2.25	12120	12120	21244			
	X8Y8-KL	- N	109	60	5	32700	2	65400	65400	0307	2.40	12120	12120	_	Southern side of Block- IV		
IVYear	_	81	76	83	2	12616	2	00400	03400	_	-	_		25232			
	X7Y7-KL					12010	- 2	_		4140	0.05	9315	9315	20202			
	WALKLUM?	#	69	80	0.75	24540	- 0	40000	10220	4140	2.25	9315	9315				
	-		64		5	24640	2	49280	49280					47470			
	Messe 21	1	52	84	2	8736	2			2000	0.05	5000	2000	17472			
	X6Y6-IJ	#	45	78	0.75	A Text state	-	20048	25542	2633	2.25	5923	5923				
	_	- ##	40	73	6	17520	2	35040	35040		-		20044	*****		18180181	
				Tot		Allehora			235652				33914	90776		1:0.38	
Control Control	similar co	1	101	84	2	16968	2			2000	0.05		33936	Block-			
V Year	X6Y5-IJ	i i	101	78	0.75	4.49.99		40.00	100.000	5909	2.25	13294	13294		III,Southern	- a taking	
		iii .	101	73	ő	44238	2	88476	88475						side of Block-	1.0.19	
		iv	122	54	6	39528	1 2	79056	79056		I	1			IV&II		
		V	105	36	3	11340	2	22680	22680						100000		
		1	27	44	2	2376	2		2000		1	1		4752			
	17000E	ii ii	20	37	0.75		-			555	2.25	1249	1249		1		
	X5Y5-	- # 1	15	31	6	2790	2	5580	5580	_					1		
	GH	li li	.58	85	0.75	- Canada				3698	2.25	8319	8319				
			52	79	5	20540	2	41080	41080						1		
				Tot	al=				195792				14543	38688		2.77	
	Grand Total							1025236				100384	263336		1:0.7		

Proposed Yearwise production - Summary

	Li	mestone	Lim	ekankar		
Year	Limestone ROM (Ts)	Limestone @ 100% Recovery (Ts)	Limekankar ROM (Ts)	Limekankar @ 100% Recovery (Ts)	Topsoil (Ts)	Ore to Overburden Ratio

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I year	100256	100256	16338	16338	46320	1:0.46
II Year	256200	256200	17483	17483	43008	1:0.16
III Year	237336	237336	18107	18107	44544	1:0.18
IV Year	235652	235652	33914	33914	90776	1:0.38
V Year	195792	195792	14543	14543	38688	1:0.26
Total	1025236	1025236	100384	100384	263336	1:0.26

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

he applicant has proposed to carry out 1025236 Ts of Limestone and 100384 Ts of Limekankar and 263336 Ts of topsoil for the period of Five Years.

2.7 Type of Mining

2.7.1 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 with6.0m 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-IV and 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 37.25m.

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2.7.2 Dump rehandling

Formerly the applied area where two dumps with a dump of dimensions Dump-1 [65m X 80m X 6m(h)] and Dump-2 [79m X 50m X 5m(h)] are present was belonging to M/s. The Ramco Cements Ltd., now it has been declared that area is for M/s. TANCEM and the dumps situated in the northern side of the area caused by M/s. The Ramco Cements Ltd., will be re-handled by them self as per the agreement. 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.

2.7.3 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	Hydraulic excavator attached with rock breaker – 2 Nos each	
	of 0.6 Cum Bucket capacity.	
	Details	
	Make – TATA Hitachi	
	Motive power – Diesel and H.P – 900	
	Taurus – 6 Nos. each with 20 tonnes capacity	
	Details	
	Make – Leyland	
	Motive power – Diesel and H.P – 90	

2.7.4 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

2.7.5 Backfilling of voids

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

2.7.6 Overburden

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

2.8 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 2-10: 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

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

2.8.1 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

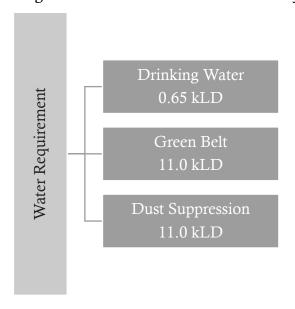


Figure 2.13: Water Balance Chart

Source of water from existing mine of TANCEM – Photographs







Figure 2.14 Source of water from existing mine of TANCEM

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2.9 Project Implementation Schedule

The implementation schedule of the proposed Mine Lease of M/s. TamilNadu Cement Corporation Limited (23.35 ha) is as follows

MINING SCHEDULE					
Activity	June-22	Jun-23	Jun-24	Jun-25	Jun-26
Site Clearance					
Excavation - Top Soil Removal/Overburden					
I Year Production - (100256 Ts of Limestone &					
16338 Ts of Limekankar)					
II Year Production - (256200 Ts - Limestone & 17483					
Ts - Limekankar)					
III Year Production - (237336 Ts - Limestone &					
18107 Ts - Limekankar)					
IV Year Production - (235652 Ts - Limestone &					
33914 Ts - Limekankar)					
V Year Production - (195792 Ts - Limestone &					
14543 Ts - Limekankar)					

Figure 2.15: Mining Schedule

2.10 Project Cost

a. Project Cost/Investment Cost

S.No	Description	Cost (Rs)	
1.	Land Cost	1,56,44,500	
2.	Operational Cost	Limestone – Rs. 274043212 Limekankhar – Rs. 27936928	
3.	EMP Cost	20,00,000	
Total		319624640	

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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	319624640
	Total	6392492.8

Project	Pudupalayam Limekankar & Limestone Quarry – 23.35.0 Ha	Chapter 3
Project Proponent	M/s. TamilNadu Cement Corporation Limited	Description of the
	(A Government of TamilNadu Undertaking)	Environment
Project Location	ration Pudupalayam Village, Ariyalur Taluk, Ariyalur District	
-		Report)

3. Description of the Environment

3.1 General

The method of mining for extracting rough stone and gravel 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"

Project	Pudupalayam Limekankar & Limestone Quarry – 23.35.0 Ha	Chapter 3
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• 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.

We have obtained Terms of Reference from SEIAA vide Letter No. SEIAA – TN/F. No 7605/SEAC/ToR- 795/2020 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.

3.2.1 Frequency of Monitoring

Table 3-1Frequency of Sampling and Analysis

Atributes	Sampling	Frequency
Air environment – Meterological (wind speed, wind direction, rainfall, humidity, temperature)	Project site	1 hourly continuous

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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
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

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3.2.2 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)

3.2.3 Study area details

Table 3-2Study area details

S. No	Description	Details	Source
1.	Project Location	Survey number	Field
	_	222/1,222/2A,222/11A, 225,	Study
		226/1A, 226/7, 227/1, 233/1,	
		236/1A, 236/9 & 239 in	
		Pudupalayam Village, Ariyalur	
		Taluk, Ariyalur District	
2.	Latitude & Longitude	11°05'11.82" N to 11°05'37.18" N	Topo
		79°08'46.58" E to 79°09'07.38" E	Sheet
3.	Topo Sheet No.	58M/04	Survey of
			India
			Toposheet
4.	Mine Lease Area	23.35 Ha	
Demogra	aphy in the study area (as	per Census 2011)	
5.	Total Population	754,894	Census
6.	Total Number of	196810	Survey of
	Households		India
7.	Maximum	33.7°C	IMD
	Temperature (°C)		
8.	Minimum	24.2°C	
	Temperature (°C)		
9.	Ecological Sensitive	Nakkankuzhi Eri adjacent to the	Survey of
	Areas - Wetlands,	project site	India
	watercourses or other		Toposheet
	waterbodies, coastal		

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	zone, biospheres, mountains, forests		
10.	Densely Populated area	Reddipalayam (3.6 km, NE)	
11.	1	Nearest Place of worship: Karupasamy Temple Ayyanar Temple	Google Earth/ Field study

3.2.3 Site Connectivity:



Figure 3.1 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 .

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3.3 Land use Analysis

3.3.1 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 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.

3.3.2 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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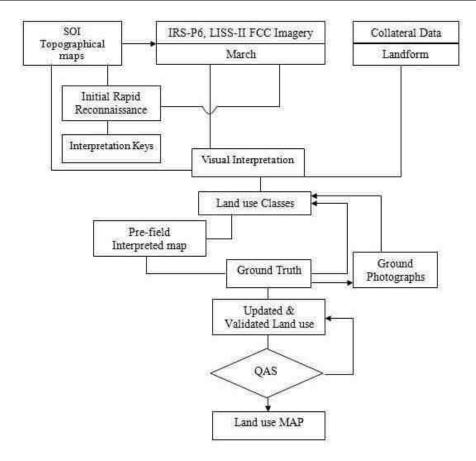


Figure 3.2 Flow Chart showing Methodology of Land use mapping

3.3.3 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.

3.3.4 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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3.3.5 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/01,02,03have 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 -1 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

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classification 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

3.3.6 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

3.4 Description of the Land Use / land cover classes

3.4.1 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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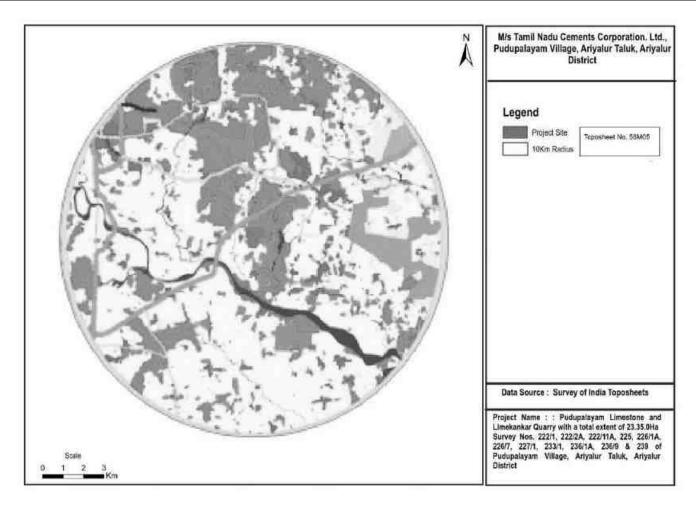


Figure 3.3 Land use classes around 10 km radius from the project site

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

3.4.2 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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3.4.3 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.

3.5 Water Environment

3.5.1 Contour & Drainage

The project site is 51m 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 southeast, 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.

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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 in sedimentary tract and dentritic to trellis in crystalline area.

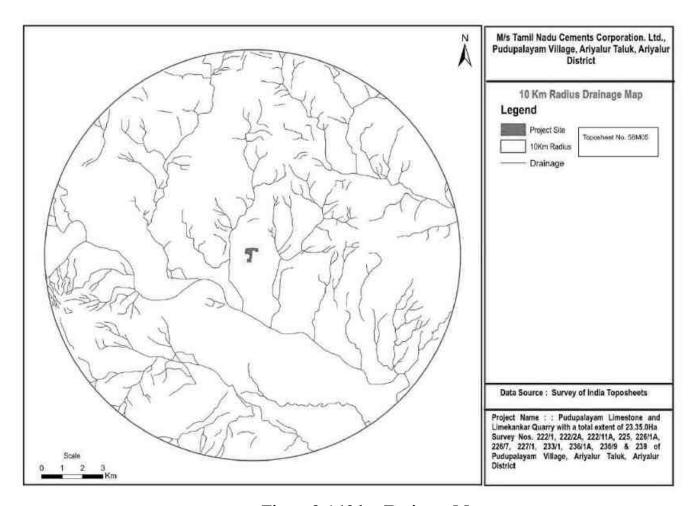


Figure 3.4 10 km Drainage Map

3.5.2 Geomorphology

The geomorphologic study is done within 5 km from the project site. The major formations are

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- **Denudational Origin- Pediment Pediplain Complex:** The groundwater condition in pediments generally varies depending upon the type of underlying folded structures, fracture systems and degree of weathering. Groundwater prospecting in pediments is considered as normal to poor.
- Anthropogenic Origin: The area nearby project site has anthropogenic origin.

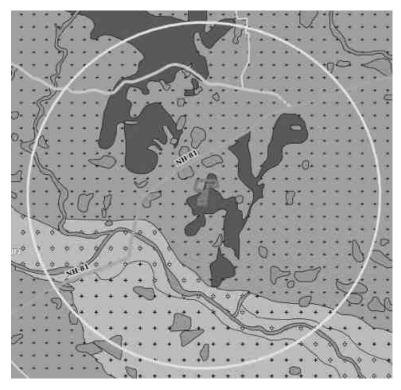


Figure 3.5 Geomorphology within 5km from the project site

3.5.3 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

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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 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

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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 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.

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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.

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

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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 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.

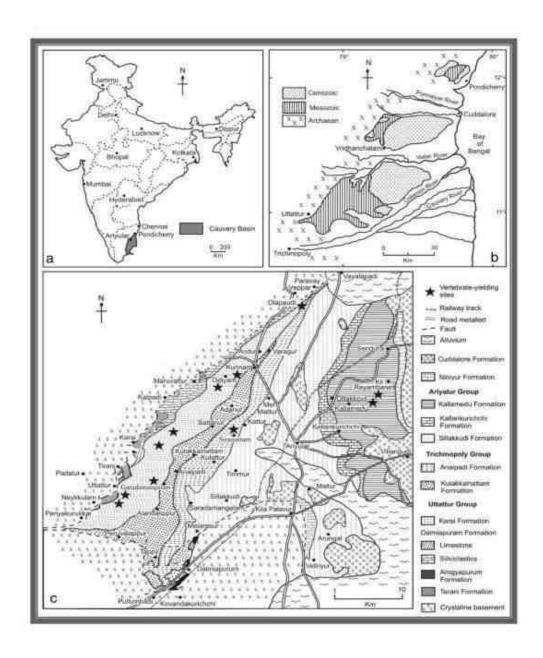
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The following geological setup has been identified for these deposits of cretaceous age and the order of superposition is described.

Upper: Niniyur

Cretaceous age Middle: Ariyalur, Trichinopoly

Lower: Uttatur



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Figure 3.6 Geological Map of Ariyalur District (Source: District Survey Report, Ariyalur

District)

3.5.4 Hydrogeology

The major aquifer systems in the district are constituted by (1) Basal crystalline rocks consisting mainly of Charnockites, Granites and Gneisses of Archean age and (2) Sedimentary formations ranges in age from Cretaceous to Recent (Plate-II).

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 ferrugeous 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.

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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.

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 $7.74~\rm x$ 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.

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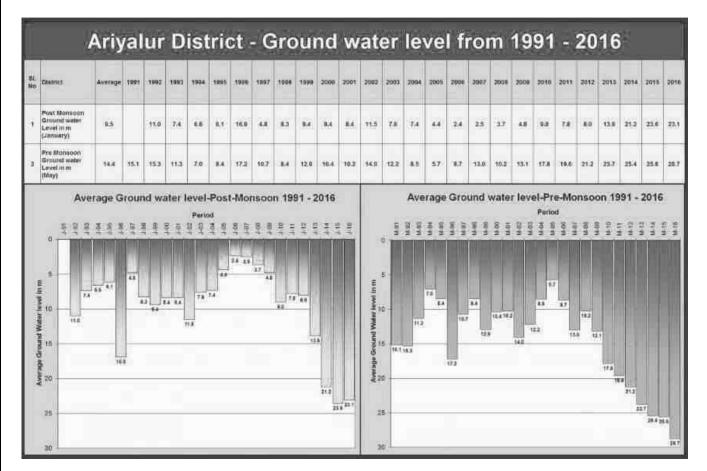


Figure 3.7 Ariyalur District – GW Level from 1991-2016

Depth of ground water Level & Ground water prospects

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.)

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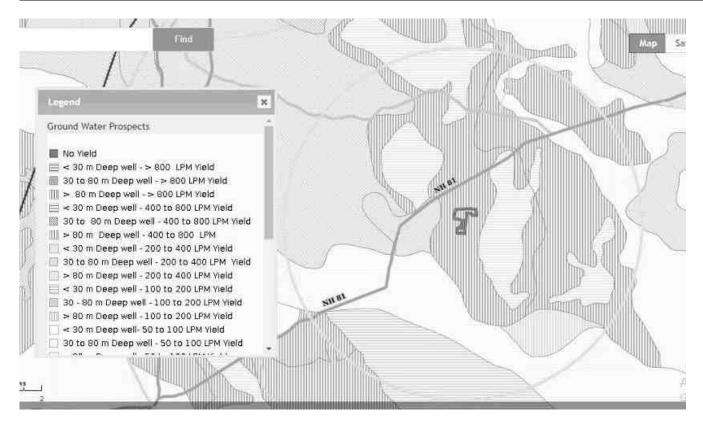


Figure 3.8 Ground water prospects within 5 km radius of the project site

3.5.5 Ground water quality monitoring

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

Table 3-3 Ground water Quality Analysis

Environmental Parameters: Ground water Quality Analysis				
Monitoring Period July – September 2020				
Design Criteria	Based on the Environmental settings in the study area			
Monitoring Locations	Project Site – GW 1			

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	Near Marudhaiyar River– GW 2
	Nerinjikorai, W – GW 3
	Periyanagalur, N- GW 4
	Near Muniyankurichi Bus Stop – 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 Edn2012.3500 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 CaCO₃	APHA 22 nd Edn.2012-2320-B
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

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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

3.5.6 Water Quality Monitoring Photographs

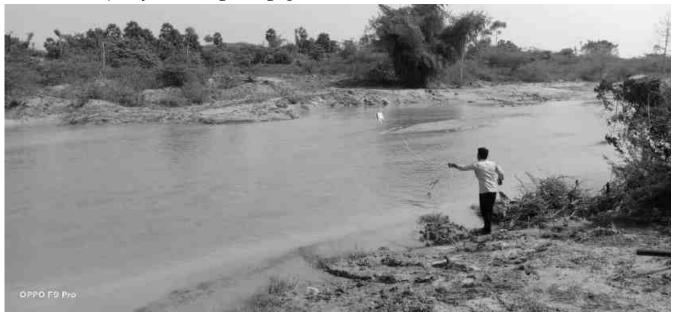


Table 3-4 Ground water sampling results

S. no	Parameters	Units	Project Site	Near Marudhaiyur	Nerinjikorai	Periyanagalu r	Muniyankurchi Bus Stop
1	pH (at 25°C)	-	7.18	7.26	6.94	7.62	7.75
2	Electrical Conductivity	μS/cm	745	1327	1010	630	890
3	Color	Hazen Unit	1.0	1.0	1	5	5.0
4	Turbidity	NTU	BQL (LOQ:1	BQL (LOQ:1)	BQL (LOQ:1)	2	5.2
5	Total Dissolved Solids	mg/L	498	862	650	402	588

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6	Total Suspended Solids	mg/L	BQL (LOQ:2	BQL (LOQ:2)	BQL (LOQ:2)	3.80	7.40
7	Total Hardness as CaCO ₃	mg/L	272	270	400	300	230
8	Calcium Hardness as CaCO ₃	mg/L	160	130	280	200	130
9	Magnesium Hardness as CaCO ₃	mg/L	112	140	120	99.5	99.7
10	Calcium as Ca	mg/L	64	52	112	80	52
11	Magnesium as Mg	mg/L	27	34	29	24	24
12	Chloride as Cl	mg/L	49	160	107	78	97
13	Sulphate as SO ₄	mg/L	81.0	269	142	32.0	106
14	Total Alkalinity as CaCO ₃	mg/L	387	355	409	305	441
15	Iron as Fe	mg/L	BQL (LOQ:0.1)	BQL (LOQ:0.1)	BQL (LOQ:0.1)	0.32	0.113
16	Silica as SiO ₂	mg/L	33.5	10.3	16.5	6.75	0.75
17	Fluoride as F	mg/L	BQL (LOQ:0.2)	BQL (LOQ:0.2)	BQL (LOQ:0.2)	BQL (LOQ:0.2)	0.26
18	Nitrate as NO ₃	mg/L	19.5	22.5	9.2	4.95	15.4
19	Potassium as K	mg/L	1.2	6.06	4.99	3.60	4.25
20	Sodium as Na	mg/L	39.5	148	97	69.0	76.8
21	Ecoil	mg/L	22	<2	14	<2	17
22	Coliform	mg/L	280	9	110	<2	80

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.

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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: 6.94 - 7.75.

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.

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: 402 - 862 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: 52 – 112 mg/L.

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

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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: 24 - 34 mg/L.

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

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: 49-160 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: 305 - 441mg/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:

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Value observed in project site: 230 - 400 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/100ml – e-coli

17 mpn/100ml – 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.

3.5.7 Surface Water Analysis

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

Table 3-5 surface water sample results

Parameters	Unit	River Marudaiyar	Eleri Lake
pH (at 25°C)	-	7.8	7.59
Electrical Conductivity	μS/cm	2450	211
Colour	Hazen Unit	35	5.0
Turbidity	NTU	62.5	2.0
Total Dissolved Solids	mg/L	1558	135

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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.

3.6 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

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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 insummer and falls down to 27°C in December – January. The wind direction is NE-SW andvice-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
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

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	2	2018	25.8	0	4.5	1.2	46.5	96.5	25	74.3	22.6	200.2	297.9	20.2
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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 3-6 Meteorological data for July 2020

_	Max Temp	Min Temp	Wind Speed
Date	(°C)	(°C)	(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 3-7 Meteorological data for August 2020

	Max Temp	Min Temp	Wind Speed
Date	(°C)	(°C)	(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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Table 3-8 Meteorological data for September 2020

	Max		
	Temp	Min Temp	Wind Speed
Date	(°C)	(°C)	(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

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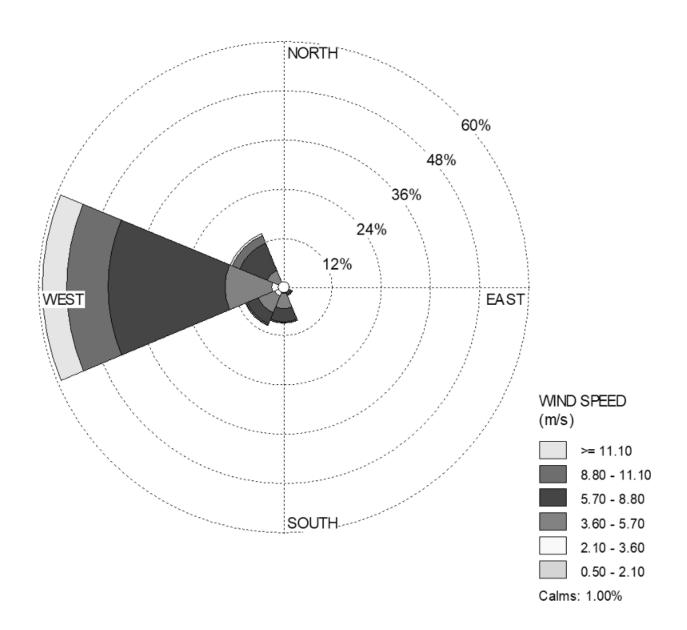


Figure 3.9 Windrose

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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.



Figure 3.10 Selection of Sampling Location

3.6 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	0.3	Е	

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	Veliperingyam		
	Road		
	Near Ariyalur	4.18	E
	Muttavancheri		
	Govindaputhur		
	Road		
	Periyanagalur	4	N
	Pudupalayam,	4	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 Hocheiser Method)		Modified Jacob & 006)
Frequency of Monitoring	2 days in a week, 4 weeks in a month for 3 months in a season.		

3.6.1 Ambient Air Quality Monitoring Photographs









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Figure 3.11 Site Monitoring Photographs – Ambient Air Quality Monitoring

3.6.2 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

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				PM 10 (μg/m ³)			PM 2.	5 (μg/n	1 ³)		SO2	(μg/m³)			NOx	(μg/m³)
Code	Location	Min	Max	Avg	98 percentile	Min	Max	Avg	98 percentile	Min	Max	Avg	98 percentile	Min	Max	Avg	98 percentile
AAQ 1	Project Site	33	44	39.8	43.54	14	22	18.4	22	5	11	7.7	10.54	10	18	13.8	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 Muttavancheri Govindaputhur Road, E	50	58	52.9	57.08	24	29	26.0	28.54	12	17	14.3	16.54	26	36	31.0	35.08
AAQ4	Periyanagalur, N	40	50	45.3	49.54	19	25	21.8	24.54	9	15	12.0	14.54	16	23	19.5	22.54
AAQ 5	Pudupalayam, W	33	45	38.5	44.08	14	23	18.4	22.54	6	11	8.9	11	15	20	17.4	19.54
NAAQ Resident	Standards - ial Area		100) (μg/m	3)		60	(μg/m³)			80 (μg/m³)			80 (µ	g/m³)	•

Table 3-9 Ambient Air Quality

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3.6.3 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), NOx (36 (μg/m3), Sox (17 (μg/m3) is observed in AAQ 3 - Near Ariyalur Muttavancheri Govindaputhur Road, E.

Inference:

The monitoring results for PM10, PM2.5, NOx and SOx 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.

NOx:

The major source of NOx 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 NOx 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.

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SOx:

The main source of SOx 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 SOx.

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

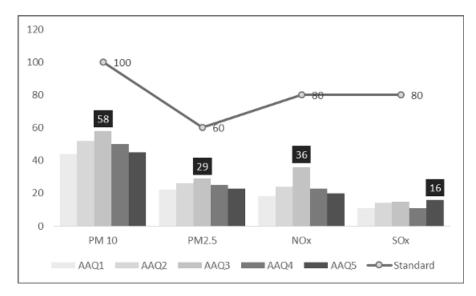
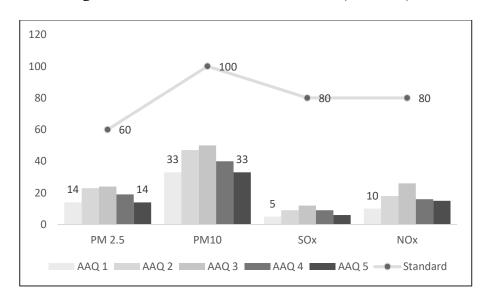


Figure 3.12 Maximum Values of PM 10, PM 2.5, NOx & SOx



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Figure 3.13 Minimum Values of PM 10, PM 2.5, NOx & SOx

3.7 Noise Environment:

Table 3-10 Noise Analysis

Environmental Parameters	Environmental Parameters: Noise Analysis				
Monitoring Period	July – September 2020				
Design Criteria	Based on the Sensitivity of the area				
Monitoring Locations	Project Site -N1				
	Near Nerinjikkorai Veliperingyam Road, E – N2				
	Near NH 227-N3				
	Near Muniyankurichi Bus Stop – N4				
	Periyathirukkonam, 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

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3.7.1 Noise Monitoring Photographs









Figure 3.14 Site Monitoring Photographs – Ambient Noise Level

3.7.2 Day Noise Level (Leq day)

Table 3-11 Day Noise Level (Leq day)

T a sadia n	Leq day in dB(A)				
Location	Max	Min	Average		
Project Site -N1	49	45	47		

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Near Nerinjikkorai Veliperingyam Road, E – N2	47	43	45
Near NH 227 -N3	47	43	45
Near Muniyankurichi Bus Stop – N4	48	44	46
Periyathirukkonam N5	48	43	46

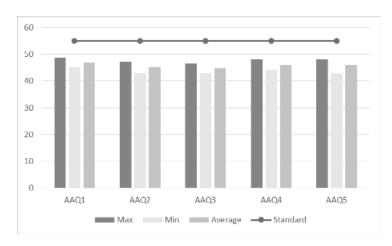


Figure 3.15 Day Noise Level (Leq day)

3.8.2 Night Noise Level (Leq Night)

Table 3-12 Night Noise Level (Leq Night)

Location	Leq Night in dB(A)			
	Max	Min	Average	
Project Site -N1	41	38	40	
Near Nerinjikkorai Veliperingyam				
Road, E – N2	43	39	41	
Near NH 227 -N3	42	40	41	
Near Muniyankurichi Bus Stop – N4	44	40	42	
Periyathirukkonam N5	42	40	41	

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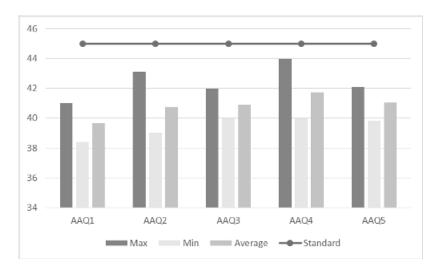


Figure 3.16 Night Noise Level (Leq Night)

Observation:

The maximum Day noise was found to be 49 dB(A) in Project Site and the night noise was found to be 44 dB(A) Near Muniyankurichi Bus Stop – N4. The minimum Day Noise and Night noise were 43 dB(A) in N2, N3 & N5 and 38 dB(A) in Project Site.

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 Muniyankurichi Bus Stop, 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 38 dB(A), which is observed in Project Site. This is mainly due to the reason that the site is vacant and mining activities will be stopped in the adjacent mines during the night time

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

3.8 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

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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.

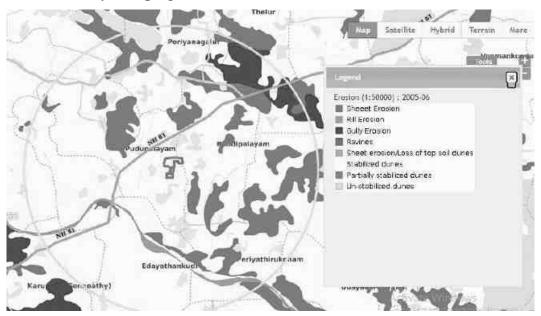


Figure 3.17 Soil Erosion pattern within 5 km radius of the project site

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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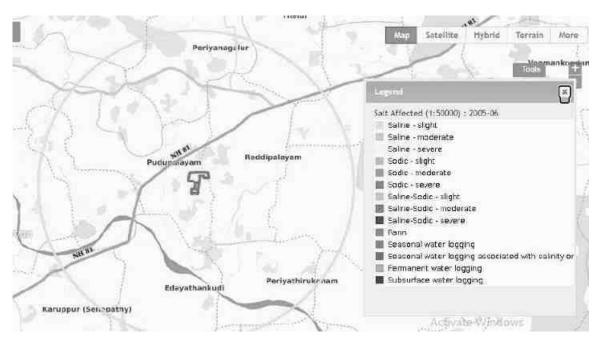
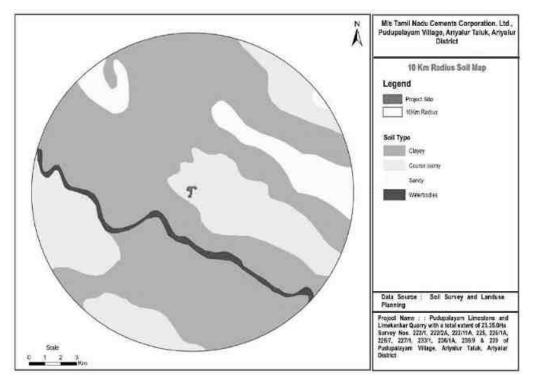


Figure 3.18 Soil Salinity Study within 5 km radius of the project site

The type of soil around 10km radius of the project site is shown in the figure below



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Figure 3.19 Soil Map around 10km Radius

The lithology around 10km radius of the project site is shown in the figure below

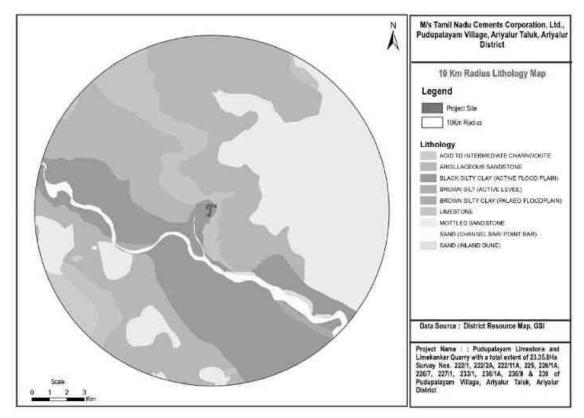


Figure 3.20 Lithology Map around 10km radius of the project site

3.8.1 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.

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Table 3-13 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				
	Near Marudhaiyar River – SQ 2				
	Nerinjikorai, W – SQ 3				
	Periyanagalur, N – SQ4				
	Near Muniyankurichi Bus Stop – 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 3-14 Soil Quality Analysis

S.No	Parameters	Units	Project Site	Marudhaiyur Near	Nerinjikorai	Periyanagalu r	Minyankurc hi Bus Stop
1	pH (at 25°C)	-	7.23	7.65	7.48	6.98	7.49
2	Electrical Conductivity	mS/cm	0.875	0.89	0.987	0.86	1.198
3	Water Holding Capacity	m1/1	3.6	8.8	8.5	3.3	7.2
4	Bulk Density	g/cm³	1.1389	1.1276	1.1472	1.1382	1.1479
5	Calcium as Ca	mg/kg	78.2	22.0	76.2	28.6	28.0
6	Sodium as Na	mg/kg	242	355	365	168	488
7	Potassium as K	mg/kg	36.2	18.9	18.2	17.9	24.2
8	Organic matter	%	0.07	0.32	0.09	0.10	0.33

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9	Magnesium as Mg	mg/kg	9.54	9.6	10.2	7.58	11.0
10	Total Nitrogen	%	0.027	0.032	0.030	0.028	0.039
11	Available Phosphorous	mg/kg	210	385	230	219	626
12	Sand	%	55	23.5	22	55	24.8
13	Clay	%	19	64	64	21	62.2
14	Silt	%	26	12.5	14	25	13.0
15	Cation Exchange Capacity	meq/100g	9.27	7.88	8.22	7.74	11.0
16	SAR	meq/kg	10.0	15.8	15.1	7.93	19.8
17	Silicon	%	0.95	0.48	0.5	0.92	0.7
18	Chloride	mg/kg	123	37.2	135	129	133
19	Total Soluble Sulphates	mg/kg	248	208	262	265	214
20	Zinc	mg/kg	19.6	20.8	19.5	18.8	19.5

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 1.127 to 1.147 g/cc which indicates favorable physical condition for plant growth. The water holding capacity was found in the range of 3.3ml/l to 8.8 ml/l.

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

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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 60-65m, which also a turns as an adding factor to it.

3.9 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

3.9.1 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
 - o *Line transects* feature only a length dimension, usually defined by a tape stretched across the area to be sampled.
 - o Belt transects have a width as well as length.
 - o *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.

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- 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.

3.9.2 Tools Used

- 1. Nails,
- 2. String/Ropes,
- 3. Paper,
- 4. Pen,
- 5. Tape,
- 6. Hammer
- 7. GPS
- 8. Camera
- 9. Binocular

3.9.3 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 3-15 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

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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

3.9.4 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 quadrate 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*.

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 3-16 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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<u>Table 3-17 Tree Species in the core Zone</u>

S. No.	Scientific Name	Local Name	Total No. of species	Total of Quadrants with snecies	Total No. of Ouadrants	Density	Frequency (%)	Abundance	Dominance	Relative Density	Relative Frequency	Relative Dominance	IVI	IUCN Conservation Status
		Athi				0.3				1.6		4.4	8.3	Least Concern
1	Ficus Carica	Maram	2	2	6	3	33.33	1	0.28	8	2.17	5	1	
	Cassia siamea	ManjalKon				0.5				2.5		1.1	5.8	Least Concern
2		rai	3	2	6	0	33.33	1.5	0.07	2	2.17	1	1	
						0.6				3.3		4.4	12.	Least Concern
3	Acacia nilotica	Karuvelai	4	4	6	7	66.67	1	0.28	6	4.35	5	16	
						0.6				3.3		7.9	15.	Not assessed
4	Bambusa vulgaris	Moongil	4	4	6	7	66.67	1	0.50	6	4.35	2	63	
	Anacardium					0.1				8.0		6.9	8.8	Not assessed
5	occidentale	Cashew	1	1	6	7	16.67	1	0.44	4	1.09	6	8	
						0.3				1.6		4.3	8.1	Least Concern
6	Alstonia scholaris	Elilaipalai	2	2	6	3	33.33	1	0.27	8	2.17	1	6	
						0.5				2.5		3.6	9.3	Not assessed
7	Psidium guajava	Guava	3	3	6	0	50.00	1	0.23	2	3.26	1	9	
						0.1				0.8		2.5	4.4	Not assessed
8	Aegle marmelos	Vilvam	1	1	6	7	16.67	1	0.16	4	1.09	0	3	
	Causuarina					0.3				1.6		3.3	7.2	Not assessed
9	equisetifolia	Savukku	2	2	6	3	33.33	1	0.21	8	2.17	4	0	
						0.1				0.8		3.2	5.1	Not assessed
10	Albizia amara	Wunja	1	1	6	7	16.67	1	0.20	4	1.09	2	4	

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						1.6	100.0			8.4		2.3	17.	Not assessed
11	Cocos nucifera	Thennai	10	6	6	7	0	1.67	0.15	0	6.52	9	32	
	Artocarpus					0.3				1.6		2.8	6.7	Not assessed
12	heterophyllus	Palaa	2	2	6	3	33.33	1	0.18	8	2.17	5	0	
						0.6				3.3		1.2	8.9	Not assessed
13	Bombax ceiba	Sittan	4	4	6	7	66.67	1	0.08	6	4.35	7	8	
						2.8	100.0	2.83		14.		1.9	22.	Not assessed
14	Azadirachta indica	Veppam	17	6	6	3	0	3333	0.13	29	6.52	8	79	
		Cemmayir-				0.1				0.8		3.3	5.2	Least Concern
15	Delonix regia	Konrai	1	1	6	7	16.67	1	0.21	4	1.09	4	7	
		Perungondr				0.1				0.8		2.6	4.5	Least Concern
16	Delonix elata	ai	1	1	6	7	16.67	1	0.17	4	1.09	2	4	
1						0.1				0.8		2.2	4.2	Not assessed
17	Dalbergia sissoo	Shisham	1	1	6	7	16.67	1	0.15	4	1.09	9	1	77
10	-					0.3			0.00	1.6	0.45	1.1	5.0	Not assessed
18	Ficus benghalensis	Alai	2	2	6	3	33.33	1	0.08	8	2.17	9	4	NT / 1
10						0.1	4		0.00	0.8	1 00	3.6	5.5	Not assessed
19	Annona squamosa	Sitapalam	1	1	6	7	16.67	1	0.23	4	1.09	<u>l</u>	3	N-4 1
20	D'd 11.1.1.1.1	TZ 1 1 1'		1		0.1	16.67	1	0.14	0.8	1 00	2.1	4.1	Not assessed
20	Pithecellobium dulce	Kodukapuli	1	1	6	/	16.67	1	0.14	4	1.09	8	1 7.1	Not assessed
21	T' 1''	Arasa	2	2		0.5	50.00	1	0.00	2.5	2.26	1.3	7.1	Not assessed
21	Ficus religiosa	maram	3	3	6	0	50.00	1	0.09	2	3.26	5	3	Not assessed
22	O	Nagalinga	_	2		0.8	50.00	1 (7	0.14	4.2	2.26	2.1	9.6	Not assessed
22	Couroupita guianensis	m	5	3	6	3	50.00	1.67	0.14	0	3.26	8	4	Not assessed
22	Musa maradias	Voorbei	3	2	4	0.5	50.00	1	0.00	2.5	2 26	1.1	6.9 7	INUL assessed
23	Musa paradise	Vaazhai	3	3	6	0	50.00	1	0.08	2	3.26	3.3	-	Not assessed
24	Drosonis iulifloro	Vaelikaruv	3	2	6	0.5	50.00	1	0.21	2.5	2 26		9.1	110t assessed
24	Prosopis juliflora	ai	3	3	6	0	50.00	1	0.21	2	3.26	4	3	

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25	.	3.6	7			1.1	100.0	1.16	0.07	5.8	<i>.</i> 50	1.1	13.	Data insufficient
25	Mangifera indica	Mamaram	/	6	6		0	6667	0.07	8	6.52	1	52	NT
						0.3				1.6		2.8	6.7	Not assessed
26	Mimusops elengi	Magizham	2	2	6	3	33.33	1	0.18	8	2.17	5	0	
						1.0	100.0			5.0		3.7	15.	Not assessed
27	Morinda pubescens	Nuna	6	6	6	0	0	1	0.24	4	6.52	4	31	
		Poovarasa				0.5				2.5		2.3	8.1	Not assessed
28	Thespesia populnea	m	3	3	6	0	50.00	1	0.15	2	3.26	9	8	
						0.5				2.5		1.8	7.6	Not assessed
29	Tectona grandis	Thekku	3	3	6	0	50.00	1	0.12	2	3.26	8	6	
						1.6	100.0	1.66		8.4		3.0	18.	Not assessed
30	Tamarindus indica	Puli	10	6	6	7	0	6667	0.20	0	6.52	9	02	
						0.8				4.2		1.7	7.0	Not assessed
31	Syzygium cumini	naval	5	1	6	3	16.67	5	0.11	0	1.09	9	7	
						0.5				2.5		1.4	7.2	Not assessed
32	Carica papaya	Papaya	3	3	6	0	50.00	1	0.09	2	3.26	3	1	
	A A V					0.1				0.8		4.4	6.3	Not assessed
33	Ziziphus mauritiana	Elandai	1	1	6	7	16.67	1	0.28	4	1.09	5	8	
	•					0.3				1.6		3.6	7.4	Not assessed
34	Citrus medica	Elumichai	2	2	6	3	33.33	1	0.23	8	2.17	1	6	
Tot	al	•	119	92					6.35					

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Table 3-18 Shrubs in the Core Zone

S. No.	Scientific Name	Local Name	Total No. of species	Total of Quadrants with species		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	Stachytarpheaurticifolia	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	Woodfordiafruiticosa	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	Vishapoondu	50	13	24	2.08	0.54	3.85	25.77	13.13	Not Assessed

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Table 3-19 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	Ruelliastrepens	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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3.9.5 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 3-20 Calculation of species diversity

Description	Formula
Species diversity – Shannon – Wiener Index	$H=\Sigma[(p_i)^*\ln(p_i)]$
	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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3.9.6 3.10.5 Calculation of species diversity by Shannon – wiener Index, Evenness and richness by Margalef for trees

i. Species Diversity

Scientific Name	Common	No. of	Pi	ln (Pi)	Pi x ln (Pi)
	Name	Species			
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
	Cemmayir-	1	0.008929	-4.7185	-0.04213
Delonix regia	Konrai				
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

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		• /

Total | 112 | -3.22

H (Shannon Diversity Index) =1.76 Shrubs

Scientific Name	Common	No. of	Pi	ln (Pi)	Pi x ln (Pi)
	Name	Species			
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	Unnichedi	9	0.046392	-3.07063	-0.14245
Calotropis gigantea	Erukam	14	0.072165	-2.6288	-0.18971
Stachytarpheaurticifolia	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
Tabernaemontanadivaricata	Crepe Jasmine	3	0.015464	-4.16925	-0.06447
Chloromolaena odorata	Venapacha	9	0.046392	-3.07063	-0.14245
Euphorbia geniculata	Amman	3	0.015464	-4.16925	-0.06447
	Pacharisi				
Catharanthus roseus	Nithyakalyani	3	0.015464	-4.16925	-0.06447
Woodfordiafruiticosa	Velakkai	3	0.015464	-4.16925	-0.06447
Morindapubescens	Mannanunai	2	0.010309	-4.57471	-0.04716
Acalypha indica	Kuppaimeni	20	0.103093	-2.27213	-0.23424
Parthenium hysterophorous	Vishapoondu	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
Helicteresisora	Valampuri	2	0.007937	-4.83628	-0.03838
Cynodondactylon	Arugu	12	0.047619	-3.04452	-0.14498

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Sporobolus fertilis	Giant Parramatta Grass	9	0.035714	-3.3322	-0.11901
Viburnum	Viburnum	5	0.019841	-3.91999	-0.07778
dentatum					
Heraculem	Hog Weed	20	0.079365	-2.5337	-0.20109
spondylium					
Laportea	Peruganchori	30	0.119048	-2.12823	-0.25336
canadensis	_				
Euphorbia hirta	Amman Pacharisi	5	0.019841	-3.91999	-0.07778
Tridax	Vettukaayathalai	5	0.019841	-3.91999	-0.07778
procumbens	•				
Tephrosia	Kavali	20	0.079365	-2.5337	-0.20109
purpurea					
Sida cordifolia	Maanikham	45	0.178571	-1.72277	-0.30764
Tridax	Cuminipachai	15	0.059524	-2.82138	-0.16794
procumbens	•				
Ruelliastrepens	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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3.9.7 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 3-21 Frequency Pattern

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

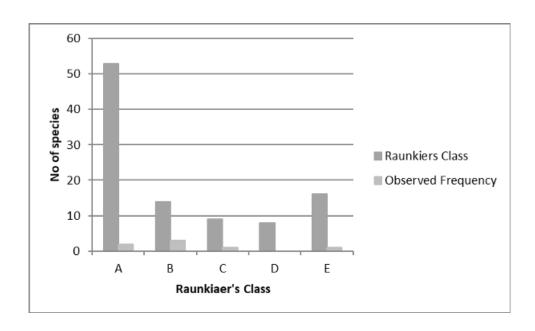
Where A>B>C>=<D<E

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	В
2.	Cassia siamea	ManjalKonrai	33.33	В
3.	Acacia nilotica	Karuvelai	66.67	D
4.	Bambusa vulgaris	Moongil	66.67	D
5.	Anacardium		33.33	В
	occidentale	Cashew		
6.	Alstonia scholaris	Elilaipalai	33.33	В
7.	Psidium guajava	Guava	50.00	С
8.	Aegle marmelos	Vilvam	16.67	A
9.	Causuarina		33.33	В
	equisetifolia	Savukku		
10.	Albizia amara	Wunja	16.67	A
11.	Cocos nucifera	Thennai	100	Е
12.	Artocarpus		33.33	В
	heterophyllus	Palaa		
13.	Bombax ceiba	Sittan	66.67	D
14.	Azadirachta indica	Veppam	100	Е
15.		Cemmayir-	16.67	A
	Delonix regia	Konrai		
16.	Delonix elata	Perungondrai	16.67	A

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



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Figure 3.21 Raunkiaer's class for the observed species

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

3.9.8 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.

Validation of Primary Data

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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5.Na.	Butanical Names	Family	Habit
2.	Acurcia milenten (L.) Del. Indica (Bireth) Brumm	Mimosacuse	Trest
2.3	Aeglemannelis (L.)Coir.	Rotacoar:	Phints :
3	sterror femetic (L.)A.L.bus.	Amuranthacese.	True
4	Alongium solo(folium (1. f. y/Wangerin.	Alangiareae	Tree
1	Ambienteles malabaries (L.) Kunts	Limiteria	Fürziti
6	Asperuger nicemone Willd.	Asparagacian	Climbing borb
	Atalantia monophella (L.) Core.	Maracese	True
80	Anadioscus milios A. Jane.	Metiocene	Tree
9	Asima jenucantha Lam.	Selvadoraceae	Tree
10	Boerhavia diffine L	Nyviaginaceae	Herb
1.1	Gadaput Professor (L.) Druce.	Саррагасове	Sandi
12	Correse carandan L.	Армсупастав	Shrub
DE	Carminia retusa (Vahl) Masam.	Ноги финста	Samb
14	Camplia Silfornii L.	Linescene	Clumbing borb
15	Commangant quinna (Thak)Tavengalam	Mobiocom	Shrub
0.1	Gramgelinguriou L. var. kirnia (Bach Ham. cs DC) Formun.	Mentipotmacion)	Climbing berb
17	Come quadrungularie I.	Vitacese	Climbing strob
1%	Classione domain (Willd) Roomer	Platacole:	Shrub
119	Cleany vocase 1.	Clemnacess	Morte
20	Conceller frimmer (L.) Diefs	Cucurbiticeae	Climbing borb
21	Coldenia procumbent L	Borngonacene:	Fürth:
22	Combestion albidon G Box.	Comfretness	Climbing herb
23	Commeling benghalensis L.	Commeliturese	33crb
24	Crateria magnia (Lina.) DC.	Campuraceae	Tree.
25	Carendiga architidas Gueranas	Нуровійнегое	Herh
26	Concepts replace Boxb.	Consubstaceae	Climbing berb
27	Compilicatemma seconom (Rosth) Alaton:	Vitacine:	Climbing herb
28	Consider discriber (L.) First	Poteran	Herb
29	Ciperus miundus L	Cyperaceae	\$4erb)
30	Dendrophiline felouir (L.f.) Extingiti-	Listanthaceur	True
31	Disaprons change J. Koul ex rela.	Ebusacese	True
32	Desputes against (Wight & Art.) Pax & Hoffin.	Eigherhiscore	Tree
33	Eminulus abmodent L. st.	Consultationae	#4crh
3.4	Ficus being hadensist.	Moracone	Terr
35	Ficus recement L	Moraceas	Tree
36	Fixes religious L.	Monacere	True
37	Flimbergylie sp.	Cyperacose	Florite .
18	Flavourita indica (Barm. DMerr.	Flacturtingung	True
39	Glavinia superba L.	Libuccoe	Climbing berb
40	Olyewania pentaphylle (Besz) DC	Maracrae	Shride
41	Conscurpter anianese Willd	Hirman discose	Tree
42	Bubenaria sp.	Outhidaceae	Herb
43	Hedyotta puberula (Ci.Don)Am.	Mobilecome	Herbi
44	Heliotropium indicum L	Воторинское:	Herte
45	Hemidemus milieus (L.) R.Br. var. imilieus	Psymbocaceae	Climbing harb
46	Hiptuge bengkalemir (L.) Kuri Holopurka magnitola (Roxbs Planchon	Mulphigiaceus Ulmaceue	Sande
48	Megenia mystica L	Limcow	Liona
49	Hybanther enneugreenses (L.) F. Much.	Violaceur	Herb
58	Byth manuales (L.) P. Miles.	Lamiaceae	Herb
20	Ichnocaryna murucus (L.) R.Se:	Арисуписти	Climbing shrok

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52	THE RESIDENCE OF THE PARTY OF T	With the same	######################################
	Indigofore asynchronolos M. Valid es DC	Euroccion:	Herb
5.5	Indepoting lineage Ali	Fahricane	Herb
34	Indonesialla echiotico (L.) Sessmads.	Agunthacung	\$4cmb
55	Janeinium ungustfellium (L.) Willit.	Obsesse	Climbing herb
	Justicia glavere Britise	Adanthucese:	Herb
57	Autien maples D.Den.	Aconthocose	EGenti-
58	Justicia tranquebarionne L. L.	Aeunthocung	Herb
57 58 59	Legitralenia rettoulata (Retr.) Wagit & Am.	AssAsptadacese	Clambing berb
0.07	Lencar arguere (Willd.) Link.	Lamineuse	Herb
6.7	Mallingo persophylla L.	Molloginacone	24cmhy
6.2	Marinda pubences LE Smith var. pubencena	Hobiacone	Torr
63.	Madhaca Inegilidia (Roen.) Mache:	Loganiaurae	Tree
64	Olaz scandons Bonts	Olaraneae	Tree
6.5	Opunta dilleri (Ker Gew.) Haw-	Cautacene	Shride
00	Orthogolou throughour (Buth) Sesson	Limincuse	Herb
63	Personal odorem Willd	Mulyucune	Herb
68	Pedulum march L	Pedulinosia	Filiate .
69	Percularia dannia (Forsek.) Chiav.	Astlepiadreme	Climbing harb
-70	Phonbago perfora a L	Plumbuginicour	Shrub
>71	Pongamia pinnuta (L.) Pierre	Fuhre coop	Tree
72	Secretega lemogyrus (Willit Muell, Acg	Eighirthicese	Shrub
73	Sirgefungt mict-monthing L.	Leganiacese	True
71 72 73 74	Tinfalallo assistes (L.) Lam.	Workscoper	Clombing shrub
75	Tribudar lanaginosas L.	Zygophy fluceae	Herb
76	Zerjeher semerikana Lamovar swamernami	Whammacone	Shrult:
71	Zomia girbona Spati	Falmoune	Hoth

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)

3.9.9 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).
- Visual Encounter Method: A visual encounter survey (VES) is one in which field personnel walk through an area or habitat for a prescribed time period systematically searching for animals.

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

Methodology Adopted:

Visual encounter methodology is adopted without any time constraint

Tools Used:

Torch for carrying out survey during night time, Binoculars, Camera, GPS, Notebook, Pen

Study in the core zone:

Visual Encounter Methodology 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 stripped 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 and the frequency of the monitoring is once in a month during the study period of July – September 2020. 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.

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Table 3-22 List of fauna species

Scientific Name	Common Name	Schedule of wild	IUCN conservation	
		life protection act		
Mammals				
Funambulus	Palm Squirrel	IV	Least Concern	
pennanti				
Mus rattus	Indian rat	IV	Not listed	
Bandicota	Indian mole rat	IV	Least Concern	
bengalensis				
Funambulus	Three stripped palm	IV	Least Concern	
palmarum	squirrel			
Herestes	Common Man	IV	Not listed	
edwardsii				
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	Indian dog	Not listed	Not listed	
familiaris				
Bos Indicus	Indian Cow	Not listed	Not listed	
Bubalus bubalis	Buffalo	I	Not listed	
Sus scrofa	Domestic pig	Not listed	Not listed	
domesticus				
Reptiles & Amphil	pians			
Chameleon	Chameleon	IV	Not listed	
zeylanicum				
Calotes versicolor	Common garden	rden II Not listed		
	lizard			
Bungarus	Common krait	IV	Not listed	
caeruleus				
Ophisops	Snake eyed lizard		Not listed	
leschenaultia				
Bufo	Toad	IV	Least concern	
melanostictus				
Ptyas mucosa	Rat snakes	IV	Least concern	
Hemidactylus sp.	House lizard		Not listed	
Butterflies				
Danaus	Plain Tiger		Not listed	
chrysippus				
Papilio demoleus	Common lime		Not listed	

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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	1	Common	Morning	September
Coracias benghalensis	Indian Roller	IV	Least Concern	Evening	July
Merops orinetali	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 & evening multiple times	3 months
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

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			Tarat	Observed	
Pavo cristatus	Peafow1	Ι	Least Concern	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
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

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	,		1	1	
Dendrocitta	Indian Tree	IV	Common,	Morning	July
vagabunda	pie		Resident		
Dicrurus	Grey	IV	Resident	Morning	July
longicaudatus	drongo				
Dicrurus	Black	IV	Common,	Morning	July
macrocerus	Drongo		Resident		
Dissemurus	Rackete			Morning	
paradiseus	tailed	IV	Resident		July
_	drongo				
Francolinus	Grey	IV	Common,	Evening	September
pondicerianus	Partridge		Resident	Evening	Зеріспівсі
Galerida	Malabar	IV	Resident	Evening	Santambar
malabarica	crested lark		Resident		September
Callua gallua	Red jungle	IV	Resident	Evening	T.,1,,
Gallus gallus	fow1		Resident		July
II-1: In Assa	Brahmny	IV	C	Evening	Cantanalaan
Haliastur Indus	kite		Common		September
TT'	Common	IV		Evening	
Hierococys	hawk		Common	8	July
varius	cuckoo				J
Lobvanella	Redwattled	IV	- · · ·	3.5	
indicus	lapwing		Resident	Morning	July, August
Lonchura	Blackheade	IV	Common,		
malacca	d Munia		Resident	Morning	July
Megalaima	Indian	IV		Evening	
merulinus	cuckoo	- 1	Common	Zvennig	July, August
	Common	IV	_	Evening	
Milyus migrans	kite	- 1	Common	Zvennig	July
Mirafra	Red winged	IV	Common,		
erythroptera	Bushlark	± 7	Resident	Morning	August
Phalacrocorax		IV	Common,		
carbo	Cormorant	Ι γ	Resident	Morning	September
Carbo		IV	resident	Seen in	
		1 4		morning &	
Quills contronix	Grey quail		Common		3 months
	_			evening	
Carriaclaidas	Indian	137	Common	multiple times	
Saxicoloides	Indian	IV	Common,	Morning	September
fulicata	Robin	TT 7	Resident		*
Tchitrea	Paradise	IV	Common	Morning	July, August
paradisi	Flycatcher	77.7			
Temenuchus	Brahmny	IV	Common	Seen in	3 months
pagodarum	myna			morning &	

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				evening multiple times	
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 Same	Scientific Name	Migratory Status	IUCN Status	February	May
10			The hended Goose	Anser indexes	W88	LC	X	-
2			Соция Рушну-досек	Nettagras coremanifoliumus	RE	LC	×	-+
3	Asser brenes		Cagancy	Aras querquadida	WS4	LC	X	74
£		Anntidae	Nothern Shoveler	dinas elyperata	WM	LC	- 2	×
5			Indian Spot-hilled Duck	Anas poecelarin neha	RE	LC	x	X
6			Northam Pertail	Airus acada	Whd	LC	8	-
7			Tuffet Duck	Aydnya fidigala	WM	LC	X	
Ħ	Gelliformes	Pharmales	Grey Famoulia	Francoines pondicertains	28	LC	X	X
4	The state of the s		Indus Peafowi	Para cerutatus	ME	10	Х	X
10	Poduspecifornes	Podrapeddue	Lutle Grebe	Tuchybophu infloslits	9.0	LC	X	- 15
J.	Phoenicoptenformes	Phoenicoptendoe	Planugo sp	Phoemogurens sp.	WSt	St	X	3
12	Cisconiiformes	Cicornidae	Azim Openbill	-Emasteratus contitana	35	re	Х	-8
11	т, всоки постиев	Cicochane	Printed Stork	Adjust the Representation	134	NT	1.0%	N
14		Animgsloe	Opental Darter	Анктра такторачке	86	NT	X	
15.	Bridomes	Phalacroomicidise	Count Cormorant	Phalasecora: carba	13.0	TC.	X	33
15			Indian Connorant	Phainstenesses Junivalles	8281	172	30	3
17		Phalacrocorneidse	Little Communica	Phalacrocorus mger	21	LC	Х	- 8
14	Polecons formers	Pelecandre.	Spot-Infled Pelicen	Pelecenny philippensis	LM	MI	TR:	X
19		Andeidse	Giey Elexin	Апбов степа	EM	I,C	х	×
30			Papir Heron	Duba purpurea	RE	LC	X	X
21			Great Agent	Cases malter allows	JOE .	rc.	X	
21:			Intermedicte Egret	Mesophoya internadia	RE	LC	X	Х
23:			Little Egyrt	Вденна дасина	RE	LC	X	Х
34			Cattle Egnst	Jubaleus iku	ROE	UZ:	(X)	Х
25			Indian Fond Heron	Androla grayu	RE	LC	X	X
26			Black-enweed Night-Herce	North of an appellment	RE	DC.	X	
27		Threskorrathudae	Glossy Ibes	Hegasiks faksuteilus	LM	0.5	- 3-	X
28		1. Arresta de la Companio	Block-basiled from	Dwodiomes по lmisc ербиня	RE	SIT	X	X
29	- CANONINA TROPOS CARA	***********	Shiken	Acatemer beating	RE	LC	X	X
30	Acceptationnes	Accipicados	Estack Kits:	Allowamigrous	305	102	- 3	×

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S. No	Order	Family	Common Name	Scientiffe Name	Migratory Status	HUCN States	February	Мо
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RE - Resident, LM - Local Migrant, WM - Winter Migrant

3.10 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:

Table 3-23 Demographic study around 10km from the project site

					Literacy			Total
List of Villages	HouseHold	Population	Male	Female	Rate	SC	ST	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
Periyanagalur	1041	3538	1762	1776	1975	692	0	1805
Thelur	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

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Alanduraiyarkattalai	544	2106	1090	1016	1685	427	0	967
Amenabath	170	654	315	339	349	122	0	243
Siruvalur	594	2155	1043	112	1261	453	0	1125
Govindapuram	1242	4996	2502	2494	3260	1347	0	2399

Source: Census of India, 2011

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,

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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

3.10.1 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

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.

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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

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

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

3.11.2 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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LAND ENVIRONMENT:

Aspect		Im	pact			Mitigation Measures
Mining of Limestone and Limekankar	The propose	ed 23	.35.0	Ha mi	ne in	The proposed project site is prone to
	Pudupalayam	min	es Li	mestone	and	gully erosion and sheet erosion and
	Limekankar o	uarry (of 10663	316 Tor	nes and	gully erosion (Source: Bhuvan).In
	108704 Tone	s respe	ectively.	The	quarry	order to prevent erosion, thick
	operation is	propose	ed to c	arry ou	ıt with	vegetation will be provided along the
	conventional	open c	ast mecl	nanized	mining	safety distance on the mine lease area in
	Limekankar r	nineral	one ben	ch is p	roposed	the following way.
	with 0.75m h	eight an	d width	with 60	0° slope	- 3 Tier planatation will be done Herbs and shrubs will be planted
	and for Lime	stone m	nineral t	wo benc	hes are	alternatively between two thick canopy
	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				trees Tree species like Neem, Magizham,	
					Tamarind, Elandhai and Vilvam will be planted along the roads, outer periphery of	
					5 years,	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	
	Dimensions Ultimate pit dimension				preventing the erosion It is proposed to improve the affected land	
		Pit -	Pit -	Pit -		wherever possible for better land use, to support vegetation and creation of water
		1	2	3	Pit 4	reservoir in the ultimate pit after quarrying.

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Length (m)	58	155	120	180
Width (m)	37	85	150	195
Depth (m)	8.75	17.75	7.75	14.75

This may lead to soil erosion, degradation and resource loss.

The main impact of open cast mining on landuse is land degradation. The land is bound to be excavated for mining of Limestone and Limekankar. The overburden (Topsoil) present upto a depth of 2m BGL (Quantity **286632** MT) will be stocked in the Block III and the same will be used for Afforestation to be done along the safety distance.

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.

The proposed mining activity is carried out in almost plain terrain where the contour level difference is 2m.

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Impact on soil of the study area will be minimal as there are no wastewater generated, heavy metal infusion, stack emissions.

Impact due to transformation of terrain characteristics over the large area results in soil degradation.

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.

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.

The 100% recovery is achieved by extracting the entire mineable reserve. Hence there will be no refuse generation 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.

WATER ENVIRONMENT:

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Aspect	Impact	Mitigation Measures
Loading and unloading, Transportation of	The mining in the area may cause ground	The water table will not be intersected
the excavated mineral.	water contamination due to intersection of	during mining, as the ultimate depth is
	the water table and mine runoff.	limited upto 17.75 meter below the ground
		level, whereas the ground water table is at
		60-65m 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.
	The ground water depletion may occur due	
	to mining activity.	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

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	treatment and after confirming to best
Improper management of Domestic	designated usage stipulated by CPCB.
wastewater in the Mine lease may create	
unhygienic conditions in the site thereby	Provision of urinals/Latrines along with
causing health impacts to the labors	septic tank followed by soak pit
	arrangement will be provided in the Mine
	Lease area for the proper management of
	wastewater

AIR ENVIRONMENT:

Aspect	Impact	Mitigation Measures
Loading and unloading, Transportation of	Impacts during Operation Phase	Mitigation Measures during Operation Phase
the excavated mineral.	During mining operation, fugitive dust and	It is proposed to plant 250 Nos of local
	other air pollutants like particulate matter	species (with 50 Nos each year) along the
	(PM10 & PM 2.5) will be generated.	haul roads, outer periphery within the lease
		area to prevent the impact of dust in
		consultation with Forest department for

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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.

the plantation of trees (Neem, Magizham, Tamarind, Elandhai and Vilvam) in two tier to combat air pollutionand with herbs (Nerium) in between the tree species.

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.

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 generation of dust.

The trucks will be covered by tarpaulin.

Overloading will be avoided.

Personal Protective Equipments (PPEs) like eye goggles, dust mask, leather gloves, safety shoes &boots will be

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	provided to the workers engaged at dust
	generation points like excavation and
Effect on Human	loading points.
 Adverse effect on human working labourers and ne villagers like effect on brea respiratory system, damage tissue, influenza or asthma. Dust generation due to loa unloading of mineral and transportation can also a workers as well as nearby villeffect on Plants 	eighboring thing and e to lung ending and el due to effect the
Stomatal index may be mining to dust deposit on leaf.	

The mathematical model used for predictions on air quality impact in the present study is AERMOD View 9.9.0.

S. N O	Description	Symbol	Quantity
1.	Moisture Content (%)	M	5
2.	Silt Content (%)	S	8
3.	Wind Speed (m/s)	u	3
4.	Production (Tons/Day)		712.89
5.	No. of excavator on site		2
6.	Average Speed of tipper on haul road (kmph)	S	25

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7.	Weight of fully loaded truck (tons)	W	26
8.	Number of Tippers per day		45
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	24929
13.	Mist spraying Control Efficiency during excavation, Loading/Unloading and Haulage (%)	ŋ	97.326%
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

Emission Factors for uncontrolled mining

Activity	Emission Factor		References		
Topsoil handling	Bulldozing	15.048 kg PM ₁₀ / Hr excavation	USEPA (2008)	Jose I. Huertas & Dumar A. Camacho & Maria E. Huertas, Standardized emissions	
	Loading	2.3237E-04 kg PM ₁₀ / average time between	USEPA (2006a)	inventory methodology for open-pit mining areas,	

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	Ha	Anticipated
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		spray application		Environmental Science	
				Pollution Research, 2012.	
	Haulage	0.69718 kg PM ₁₀ /VKT	USEPA (2006a) Cowherd (1988)		
_ ,	Wet drilling	8.00E-5 lbs PM ₁₀ / Ton produce	,		
Rough stone mining Loading		1.00E-4 lbs PM ₁₀ / Ton produce	Pollutant Emission Factors, Volume 1: Stationary Point of Area Sources, Fifth Edition, AP-42. U.S. Environment Protection Agency, Office of Air Quality Planning of Standards. Research Triangle Park, North Carolina.		

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 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:

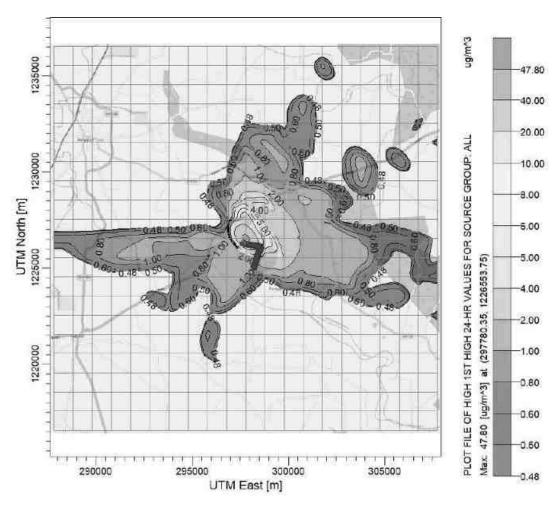
- 1. Hydraulic excavator (700kW power rating)- 2nos.
- 2. Portable Compressors (290 psi, 300HP)- 2nos.
- 3. Tipper (20T Capacity)

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

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Proponent	(A Government of TamilNadu Undertaking)	& Mitigation Measure
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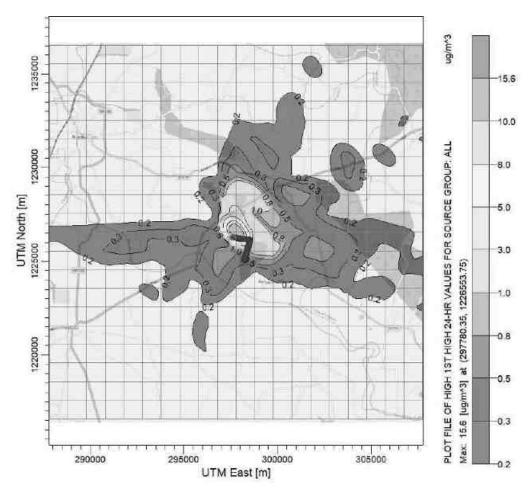
Δ.	Activity Source Ty		Emissions (g/s)				
710	Mility	bouree Type	TSPM	PM_{10}	PM _{2.5}	NO _x	СО
На	ıulage	Line volume	0.1135	0.0321	0.0192	0.0838 (from tipper)	0.0505 (from tipper)
Topsoil handling	Bulldozing		0.1122	0.0372	0.0223	0.0496 (from excavator)	0.4342 (from excavator)
Rough stone	Wet drilling	open pit	0.000499	0.000099	0.000059	0.01044 (from compressor)	0.00226(from compressor)
mining	Loading		0.000624	0.000125	0.000074	-	-

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	Ha	Anticipated
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Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	(Draft EIA Report)



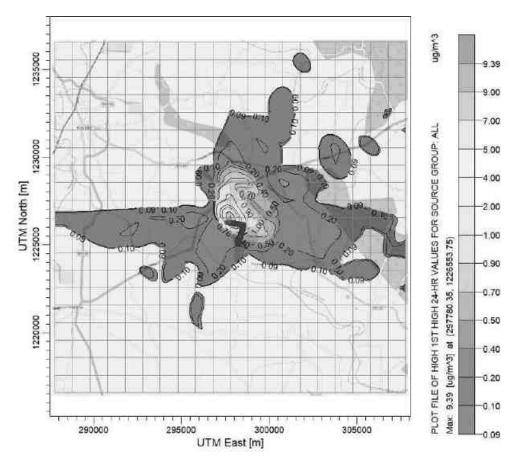
Predicted 24-Hrs GLC of Particulate matter TSPM within 10 km Radius of the Study Area

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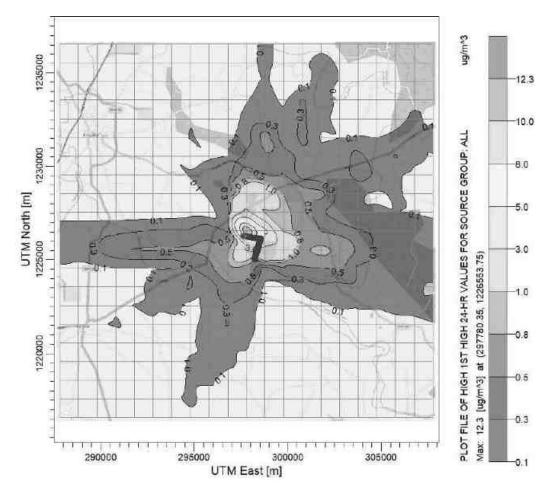
Predicted 24-Hrs GLC of PM10 within 10 km Radius of the Study Area

Project	Pudupalayam Limekankar & Limestone Quarry – 23.35.0	Chapter 4
	Ha	Anticipated
Project	M/s. TamilNadu Cement Corporation Limited	Environmental Impacts
Proponent	(A Government of TamilNadu Undertaking)	& Mitigation Measure
Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	(Draft EIA Report)



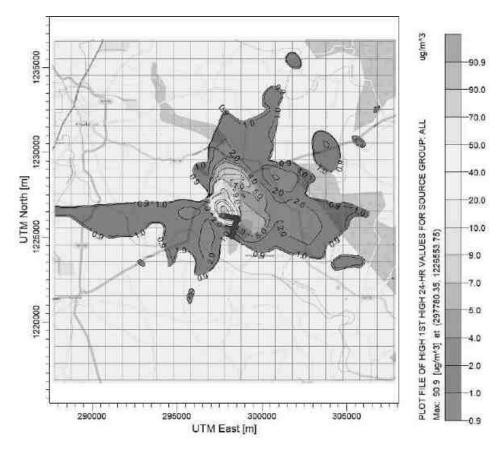
Predicted 24-Hrs GLC of PM2.5 within 10 km Radius of the Study Area

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	Ha	Anticipated
Project	M/s. TamilNadu Cement Corporation Limited	Environmental Impacts
Proponent	(A Government of TamilNadu Undertaking)	& Mitigation Measure
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Predicted 24-Hrs GLC of NOX within 10 km Radius of the Study Area

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	Ha	Anticipated
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Proponent	(A Government of TamilNadu Undertaking)	& Mitigation Measure
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Predicted 24-Hrs GLC of CO within 10 km Radius of the Study Area

NOISE ENVIRONMENT:

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	Ha	Anticipated
Project	M/s. TamilNadu Cement Corporation Limited	Environmental Impacts
Proponent	(A Government of TamilNadu Undertaking)	& Mitigation Measure
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Aspect	Impact	Mitigation Measures
Loading and unloading, Transportation of	Usage of Equipments (Excavator - 82	• The machinery will be maintained in
the excavated mineral.	dBA, Tipper - , Jack Hammer), Machinery	good running condition so that noise will
	and trucks used for transportation will	be reduced to minimum possible level.
	generate noise.	Awareness will be imparted to the
		workers once in six months about the
	Noise from the machinery can cause	permissible noise level and effect of
	hypertension, high stress level, hearing	maximum exposure to those levels.
	loss, sleep disturbance etc due to prolonged	Adequate silencers will be provided in all
	exposure.	the diesel engines of vehicles.
		• It will be ensured that all
		transportation vehicles carry a valid PUC
		Certificates.
	Number of vehicles will be increased due to	
	theproposed mining activity hence vehicle	Speed of trucks entering or leaving the
	may collate which may result in unwanted	mine will be limited to moderate speed
	sound and can also cause impact on human	(20km/hr) to prevent undue noise from
	health like breathing and respiratory	empty vehicles.

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	Ha	Anticipated
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system, damage to lung tissue, influenza or The noise generated by the machinery will asthma. be reduced by proper lubrication of the machinery and other equipments. It is proposed to plant 250 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 mine will be implemented to attenuate noise. 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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BIOLOGICAL ENVIRONMNENT:

Aspect	Impacts	Mitigation Measures
Site Clearance	Loss of habitat due to site clearance which	The proposed mining lease is already a barren
	may lead to ecological disturbance.	land hence no site clearance is required. Only
		few shrubs and herbslike parthenium sp.,
		prosopis juliflora were present.
Planting of trees	Development of afforestation in the mine	7.5m safety distance will be provided all along
	lease area will have a positive impact as the	the boundary of the mine lease area and safety
	land was initially a barren.	distance of 50m in the western side due to the
		presence of adjoining odai. This will attract
		avifauna thus enhancing the existing
		ecological environment.

SOCIO ECONOMIC ENVIRONMNENT:

Aspect	Impact	Mitigation Measures
	1	

Project	Pudupalayam Limekankar & Limestone Quarry – 23.35.0	Chapter 4
	Ha	Anticipated
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Proposed implementation of Mining	Land acquisition for the implementation of	The proposed project is a own patta land of
activity	the project may result in loss of assets,	TANCEM and the land is vacant where
	which in return will make the PAP to shift,	there are no human settlement within
	losing their normal routine and livelihood	500m radius. Hence the project does not
		involve Rehabilitation and resettlement
Loading and Transportation of the mined	The mining activities may cause dust	No human activity is envisaged near the
out mineral	emission, noise pollution thereby causing	project site. The nearest human settlement
	disturbance to the local habitat	is observed in, which is 1km away from the
		project site.
Grazing and Rearing activities in the	The Grazing and rearing of local animals	It is proposed to use graveled road and
nearby villages	like Sheep, Goat and cows is observed in	nearest paved road and preferred not to use
	the nearby villages, which may be affected	unpaved roads. In addition to that, the
	due to the project as the movement of the	speed of trucks will be limited to 20km/hr
	vehicles may affect/injure the animals	to avoid any accidents
Employment opportunity	The project will improve the livelihood of	After the development of the proposed
	the local people	mine, it will improve the livelihood of local
		people and also provide the direct and
		indirect employment opportunities. The
		rough stone and gravel for the

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	Ha	Anticipated
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		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	As a part of CER, 2% of the project cost i.e,	
	resource augmentation & Community	Rs. 6392492.8 will be allocated. The	
	resource development	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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	Ha	Anticipated
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Other Impacts:

S. No	Aspect	Impact	Mitigation measure
1.	Risk due to the	Accidents may occur in the mine	Proper PPE kit (Safety jacket, Helmet, Safety
	proposed mining	area	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 will be checked for health	All the labors will be checked and
	Labors	condition before employing them	screened for health before employing them
		in mining activity	
			After employing them, periodical
			medical checkups will be held once in
			every six months

Project	Pudupalayam Limekankar & Limestone Quarry – 23.35.0 Ha	Chapter 5
Project Proponent	M/s. TamilNadu Cement Corporation Limited	Analysis of Alternatives
	(A Government of TamilNadu Undertaking)	(Draft EIA Report)
Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	

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.

ToR issued by the SEIAA-TN vide Letter No. SEIAA-TN/F. No. 7605/SEAC/ToR-795/2020 Dated: 21.10.2020. The study for alternative analysis involves in-depth examination of site and technology.

5.1.1 Analysis for Alternative Sites and Mining Technology

5.1.1.1 Alternative Site

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

5.1.1.2 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 5-1: 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, Periyanagalur & 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 TANCEM which is covered in Mining Lease G.O. No. 344 and from nearby vendors.

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Project Proponent	M/s. TamilNadu Cement Corporation Limited	Environmental
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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	ters Sampling Frequency I		Location	
Air environment –	5 locations	24 hourly twice a week	Project Site, Near	
Pollutants		4 hourly.	Nerinjikkorai	
PM 10		Twice a week, One non	Veliperingyam	
PM 2.5		monsoon season	Road, Near Ariyalur	
SO ₂		8 hourly, twice a week	Muttavancheri	
NO _x		24 hourly, twice a week	Govindaputhur	
Lead in PM			Road,	

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			Periyanagalur, Pudupalyam
Noise	5 locations	24 hourly Once in 5 locations	Project Site, Near Nerinjikkorai Veliperingyam Road, Near NH 227, Near Muniyankurichi Bus Stop, Periyathirukkonam
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	Project Site, Near Marudhaiyar River, Nerinjikorai, Periyanagalur, Near Muniyankurichi Bus Stop

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Water (surface water)	Sample from	One time Sampling	Marudhaiyar River &
 pH Temperature Turbidity Magnesium Hardness Total Alkalinity Chloride Sulphate Fluoride Nitrate Sodium Potassium Salinity Total nitrogen Total Coliforms Fecal Coliforms 	nearby lakes/river		Eleri Lake
Soil	5 locations	Once in 5 locations	Project Site, Near
(Organic matter,			Marudhaiyar River,
Texture, pH,			Nerinjikorai,
Electrical			Periyanagalur, Near
Conductivity,			Muniyankurichi Bus
Permeability, Water			Stop
holding capacity,			
Porosity)			
Ecology and	Study area	One time Sampling	
biodiversity Study	covering 5 km		
	radius		

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Socio- Economic	Villages	One time Sampling	
study	around 5 km		
(Population, Literacy	radius		
Level, employment,			
Infrastructure like			
school, hospitals &			
commercial			
establishments)			

Table 6-2: Monitoring Schedule during Mining

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

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_	(A Government of TamilNadu Undertaking)	(Draft EIA Report)
Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	

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 eternal 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 facture 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.

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

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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:

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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,
- 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.

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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;
- 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

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• 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.

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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;
- 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;

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- 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;

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- 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;

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- > 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:

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- 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:

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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:

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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 assement in case of any such situations.

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

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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.

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

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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.

8.1.1 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 (Rough stone & Gravel) will sold in the market in the affordable price.
- b.Infrastructure: The excavated rough stone and gravel will be used for Laying Roads, Building & Construction Projects, Bridges.
- 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 250 numbers of native species along with some fruit bearing and medicinal trees during the mining plan period.

8.2 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 rough stone and gravel 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. 6392492.8 will be allocated. The detailed agenda, which is to be executed has been framed. The salient features of the programme are as follows:

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

8.3 Project Cost Budget:

Table 8-1: Budget for the proposed project

S.No	Description	Cost (Rs)
1.	Land Cost	1,56,44,500
2.	Operational Cost	Limestone – Rs. 274043212 Limekankhar – Rs. 27936928
3.	EMP Cost	20,00,000
	Total	319624640

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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 interorganizational arrangements for effective implementation of the mitigation measures.

9.2 Subsidence

Mining will be carried out by opencast semi mechanized mining method with drilling & blasting as per mining plan approved by Department of Mining and Geology, Virudhunagar. 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 37.25m. 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 37.25m] 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.

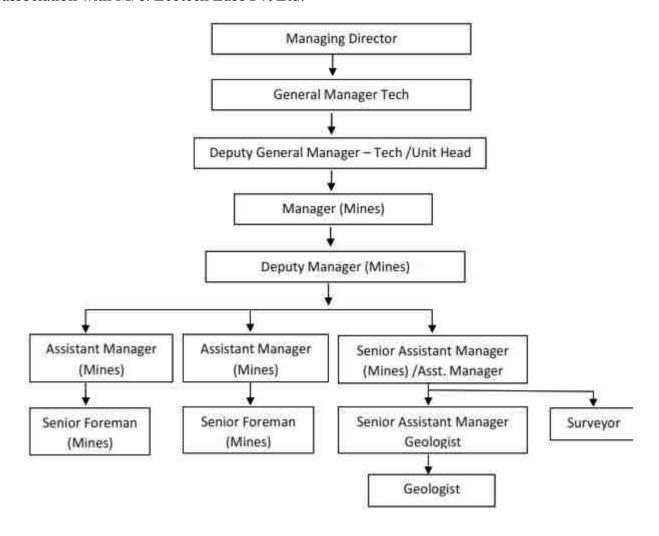
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Water table is found at a depth of 38m during summer and 35m during rainy season which is observed from the existing borehole in Nerinjikorai village.

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	Activity	Anticipated	Mitigation measures	Budgetary
	Environment	/Aspect	impacts		Allocation
1.	Air	Fugitive Emission	During mining operation, fugitive dust and other air pollutants like particulate matter (PM10	 Planting of trees along the safety distance of the Mine Lease Area Water will be sprinkled in the 	Rs.4,90,000 Rs.3,50,000
			& PM 2.5) will be generated.	site as dust suppression measure.	
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	• 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,	Use of personal protective devices i.e., earmuffs and earplugs by workers, who are working in high noise generating areas	Rs.50,000

Project	Pudupalayam Limekankar & Limestone Quarry – 23.35.0	Chapter 9
	Ha	Environmental
Project	M/s. TamilNadu Cement Corporation Limited	Management Plan
Proponent	(A Government of TamilNadu Undertaking)	(Draft EIA Report)
Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	

			blasting may generate noise		
4.	Land	Improper management of Storm water Runoff	Storm water Runoff may result in Soil Erosion	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.	health and safety of the workers with effective	Rs.50,000 Rs.50,000

Project	Pudupalayam Limekankar & Limestone Quarry – 23.35.0	Chapter 9
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Project	M/s. TamilNadu Cement Corporation Limited	Management Plan
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				√	checkups to labor and conducting free medical camps Providing safety helmet, Gloves, Jacket & Boots	Rs.36,000
				✓	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.	•	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

Project	Pudupalayam Limekankar & Limestone Quarry – 23.35.0	Chapter 9
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	ii.	Sanitary Maintenance	1,00,000
	iii.	Safety Kits	1,36,000
	iv.	Water Sprinkling	3,50,000
	v.	Afforestation, Plantation & Maintenance	4,90,000
2.	Envi	ronmental 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		2,181,000

Project	Pudupalayam Limekankar & Limestone Quarry – 23.35.0	Chapter 10
	Ha	Summary &
Project	M/s. TamilNadu Cement Corporation Limited	Conclusion
Proponent	(A Government of TamilNadu Undertaking)	(Draft EIA Report)
Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	

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 Limestone & Limekankar is a cluster of six mining project. The individual mine lease area is 23.35.0 Ha of Limestone and Limekankar Quarry located at S.F No: 222/1, 222/2A, 222/11A, 225, 226/1A, 226/7, 227/1, 233/1, 236/1A, 236/9 & 239, Pudupalayam Village, Ariyalur Taluk, Ariyalur District. The area lies in the latitude of 11°05'11.82" N to 11°05'37.18" N and longitude of 79°08'46.58" E to 79°09'07.38" E. The area is marked in the survey of India Topo sheet No. 58 M/04.

10.2 Project Overview

Table 10-1: Project Overview

Particulars	I	Details
Location	S.F No : 222/1,	222/2A, 222/11A,
	226/1A, 226/7, 227	/1, 233/1, 236/1A, 23
	& 239, Pudupalayan	n Village, Ariyalur Ta
	Ariyalur District	
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	23.35.0 Ha	
Elevation above msl	\simeq 57 m from above M	ISL
Ecological Sensitive Areas -	Nakkankuzhi Eri	is adjacent to the
Wetlands, watercourses or other	proposed ML area	a and 50m safety
waterbodies, coastal zone,	distance provided for	quarrying to Eri.
biospheres, mountains, forests		
	There are no other w	ater bodies like river,
	lake, within 500m rad	dius of lease area.
Densely Populated area	Reddipalayam (3.6 k	m, NE)

Project	Pudupalayam Limekankar & Limestone Quarry – 23.35.0	Chapter 10
	Ha	Summary &
Project	M/s. TamilNadu Cement Corporation Limited	Conclusion
Proponent	(A Government of TamilNadu Undertaking)	(Draft EIA Report)
Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	

A 1.1 1.1	NI (DI C 1)
Areas occupied by sensitive man-	Nearest Place of worship:
made land uses (hospitals, schools,	W. T. 1 (670) W.
places of worship, community	Vinayagar Temple (670km, W)
facilities)	Sengamalaiyar Andavar temple (1.22 km,
	NW)
	1.0.01
	AG Church (8 km, NW)
	A : 1 M (0.01 NW)
	Ariyalur Mosque (8.8 km, NW)
Nearest Road	NH 227(Trichy Main Road, 0.75 km,
	North)
Nearest Highway	NH 227(Trichy Main Road, 0.75 km,
	North)
Nearest Railway Station	Ariyalur Railway Station (11.08 km, NW)
Project cost	Rs. 319624640
Minerals of Mine	Limestone & Limekankar
	Proposed capacity of Limestone: 1025236
	Tones
D 1 1 1 1 (27.5)	
Proposed production of Mine	
	Proposed capacity of Limekankar:
	100384 Tones
Illimate double of Mining	25 mg h al arry amazym d 1 arra1
Ultimate depth of Mining	35m below ground level
Method of Mining	Open cast, mechanized mining
Water demand	22.65 KLD
	Water will be supplied from existing mine
Source of water	of TANCEM which is covered in Mining
	Lease G.O. No. 344 and from nearby
Man name	vendors.
Man power	13 Nos.
	Precise Area Communication Letter was
Mining Lease	communicated vide Industries (MMA.2)
	Department, Secretariat, in Letter No.
	3392/MMA.2/2019-1, Dated: 02.08.2019
	Mining Plan was approved by The In
Mining Plan Approval	Bureau of Mines, Chennai vide letter
3 rr	TN/ALR/LST&KNK/MP/2062.MDS d
	09.10.2019
	7.5m, 10m and 50m (Near Narrunk
Boundary Fencing	Eri)safety distance to the boundary, fencing
	be provided

Project	Pudupalayam Limekankar & Limestone Quarry – 23.35.0	Chapter 10
_	Ha	Summary &
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Ground water	Post Monson 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.

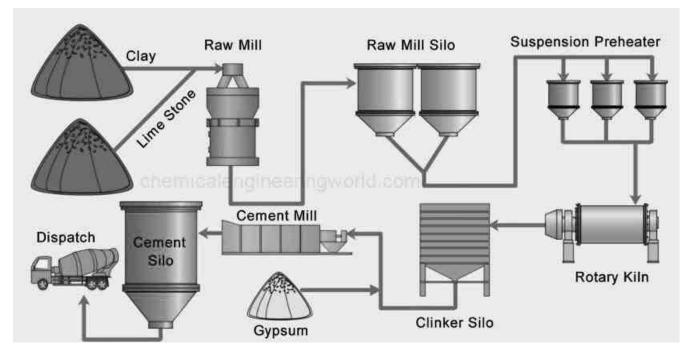
10.3 Justification of the proposed project

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 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 256200 Tonnes/Annum and 33914 Tonnes/Annum will be used to manufacture 188385.7 Tonnes/Annum of Cement. The manufacturing process of the cement is shown below

Project	Pudupalayam Limekankar & Limestone Quarry – 23.35.0	Chapter 10
_	Ha	Summary &
Project	M/s. TamilNadu Cement Corporation Limited	Conclusion
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Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	



The mines are captive mines and there is no crushing unit inside the quarrying area

Table 10-2: Anticipate Impacts & Appropriate Mitigation Measures

S. No.	Potential Impact	Mitigation Measure
1	The main impact in the air environment	Proper mitigation measures like water
	is dust emission during various mining	sprinkling on haul roads will be
	activities such drilling, blasting,	adopted to control dust emissions.
	excavation, loading and transportation.	To control the emissions regular
	The dust emission may affect the quality	preventive maintenance of
	of ambient air in the and around the	equipments will be carried out on
	mine area. The increased emission may	contractual basis.
	cause respiratory & Cardiovascular	Plantation will be carried out along
	problems in human health	approach roads & mine premises.
2	Waste water will be generated due to	No waste water will be generated
	mining activity and from other domestic	from the mining activity of minor

Project	Pudupalayam Limekankar & Limestone Quarry – 23.35.0	Chapter 10
	Ha	Summary &
Project	M/s. TamilNadu Cement Corporation Limited	Conclusion
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Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	

	activities. These may contaminate the	minerals as the project only involves
	ground water leading to ground water.	lifting of over burden from mine site.
	The mining activity may affect the	The wastewater generated from the
	ground water table	domestic activity will be disposed off
		safely through the proposed septic
		tank
		Mining will not intersect ground
		water table. Hence the water table will
		not be impacted due to the proposed
		project
3	Noise will be generated in the mine area	Periodical monitoring of noise will be
	during various mining activities such as	done.
	blasting, drilling, excavation. During	No other equipments except the
	transportation of the mined out mineral,	transportation vehicles and Excavator
	there may be noise generation due to the	(as & when required) for loading will
	movement of vehicles. This may impact	be allowed at site.
	the health condition of the workers by	Noise generated by these equipments
	creating headache	shall be intermittent and does not
		cause much adverse impact.
		Plantation will be carried out along
		approach roads. The plantation
		minimizes propagation of noise and
		also arrest dust.
4	Solid waste will be generated from the	The 100% recovery is achieved by
	mining activity as there will be refuse	extracting the entire mineable reserve.
	after 95% recovery and also generation of	Hence there will be no refuse
	domestic waste	generation due to the mining activity.
		Apart from that, a very meagre

Project	Pudupalayam Limekankar & Limestone Quarry – 23.35.0	Chapter 10
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Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	

		quantity of domestic waste will be
		generated in the project, which will be
		handed over to the local body on daily
		basis.
5	During mining activities, there are	Dust masks will be provided as
	chances of workers getting health issues	additional personal protection
	or may be prone to accidents	equipment to the workers working in
		the dust prone area.
		Periodical trainings will be conducted
		to create awareness about the
		occupational health hazards due to
		activities like blasting, drilling,
		excavation
		Workers health related problem if
		any, will be properly addressed.

Project	Pudupalayam Limekankar & Limestone Quarry – 23.35.0	Chapter 11
	Ha	Disclosure of
Project	M/s. TamilNadu Cement Corporation Limited	Consultant
Proponent	(A Government of TamilNadu Undertaking)	(Draft EIA Report)
Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	

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	Project Pudupalayam Limekankar & Limestone Quarry – 23.35.0	
	Ha	Disclosure of
Project	M/s. TamilNadu Cement Corporation Limited	Consultant
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Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	

• 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

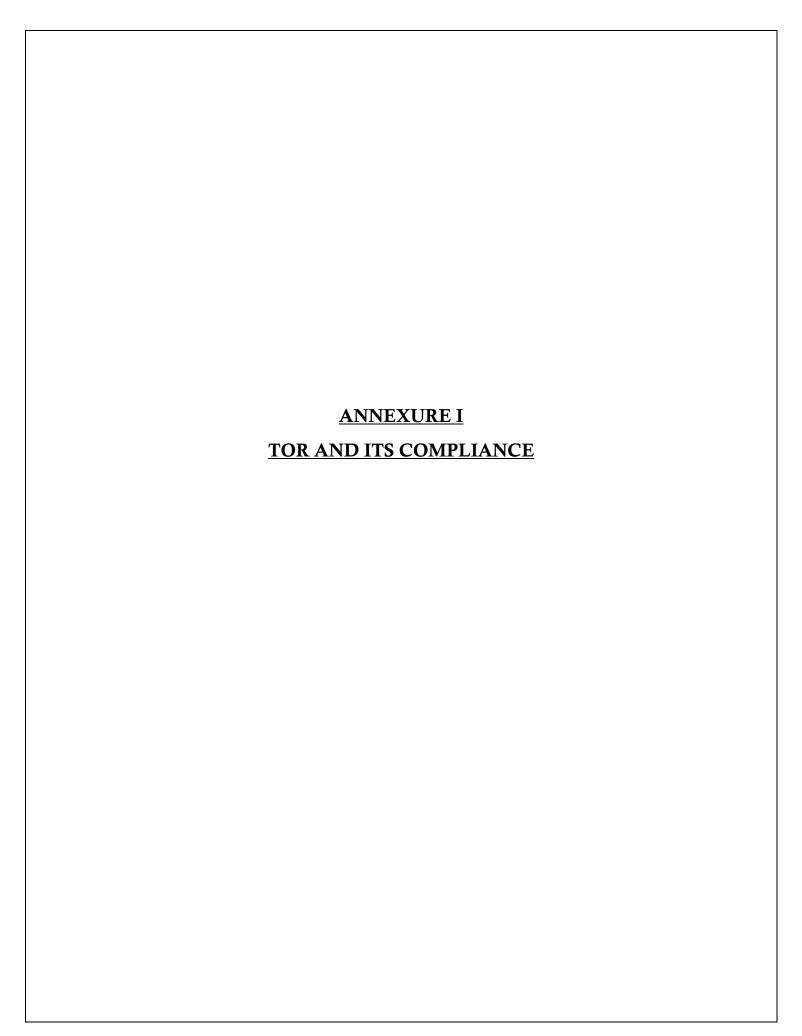
Eco Tech Labs Pvt. Ltd. (formerly Eco Tech Consultants) was established in the year 2013. we offer environmental consultancy & Laboratory services for various residential, commercial & industrial development projects.

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)







MENSTER (MINES)

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

STATE LEVEL ENVIRONMENT IMPACT ASSESSMENT AUTHORITY - TAMIL NADU

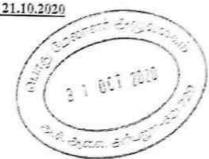
3rd Floor, Panagal Maaligai, No.1, Jeenis Road, Saidapet, Chennai-15. Phone No.044-24359973 Fax No. 044-24359975

TERMS OF REFERENCE (TOR)

Lr No.SEIAA-TN/F.No.7605/SEAC/ToR-795/2020 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 23.35.0Ha at S.F.Nos. 222/1, 222/2A. 222/11A, 225, 226/1A, 226/7, 227/1, 233/1, 236/1A, 236/9 & 239 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/53685/2020 Dated: 06.06.2020

- 2. Your application submitted for Terms of Reference dated: 22.06.2020
- 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.

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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 23.35.0Ha at S.F.Nos. 222/1, 222/2A, 222/11A, 225, 226/1A, 226/7, 227/1, 233/1, 236/1A, 236/9 & 239 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.

- 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 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.
- The project proponent shall conduct the Cumulative impact study on the Agricultural area due to Mining, Crushers and other activities around the site area.
- The details of surrounding well and the cumulative impact on the ground water shall be part of EIA study.
- The Socio-economic impact assessment due to the project needs to be carried out within 10km of the buffer zone from the mines.
- 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).

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

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A. STANDARD TERMS OF REFERENCE

- Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.
- A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.
- 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

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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

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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. 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

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2 1 OCT 2020

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 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

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- 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.
- 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

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- 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:-
 - Executive Summary of the EIA/EMP Report
 - 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 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

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- the Consultants issued by MoEF&CC vide O.M. No. J-11013/41/2006-IA.II(1) 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-IA.II(1) 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).
- Process description in brief, specifically indicating the gaseous emission, liquid effluent and 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.
- 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.
- Detailed mining closure plan for the proposed project approved by the Geology of Mining department shall be shall be submitted along with EIA report.

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- 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.
- EIA report should strictly follow the Environmental Impact Assessment Guidance Manual for Mining of Minerals published February 2010.
- 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.
- 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, with in 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
- 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 intuitions/NABET Accredited agencies.
- 27. A detailed report on the green belt development already undertaken is to be furnished and also

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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.
- 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.
- 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-IA.II (I) dated 4th August, 2009, which are available on the website of this Ministry should also be followed.
- 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

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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 <u>valid for a period of three years</u> 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.

MEMBER SECRETARY SEIAA-TN

Copy to:

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



Project	Pudupalayam Limekankar & Limestone Quarry - 23.35.0 Ha	ToR Points
Project Proponent	M/s. Tamilnadu Cements Corporation Limited	Standard ToR
Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	Compliance

COMPLIANCE OF TOR CONDITIONS

Point wise compliance of TOR points issued by SEIAA,TN vide letter No. SEIAA-TN /F.No.6705/SEAC/TOR-795/2020 Dated 21.10.2020 for Mining of Limestone and Limekankar Over an Extent of 23.35.0 Ha in S.F No. 222/1, 222/2A, 222/11A, 225, 226/1A, 226/7, 227/1, 233/1, 236/1A, 236/9 & 239, Pudupalayam Village, Ariyalur Taluk, Ariyalur District, Tamil Nadu

To	Description	Response	Page Ref.
R	•	•	in EIA
Ref.			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.	This is a fresh mining project of Limestone and Limekankar The Proponent has obtained The Precise Area Communication Letter No. 3392/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. Proposed Production of limestone and Limekankar for five years is proposed in the EIA/EMP in chapter no-2.	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 23.35.0 Ha for the mining of limestone and Limekankar is approved by The Indian Bureau of Mines, Chennai Letter No. TN/ALR/LST&KNK/MP/2062.MDS 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.	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. The mining plan of the project site has been submitted to Indian Bureau of Mines, Chennai	Annexure- IV
4.	All corner coordinates of the mine lease area, superimposed on a High Resolution	Details of coordinates of all corner of proposed mining lease area have been incorporated in Chapter 2 of EIA/ EMP Report.	

Project	Pudupalayam Limekankar & Limestone Quarry - 23.35.0 Ha	ToR Points
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	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).		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	Noted.	

Project	Pudupalayam Limekankar & Limestone Quarry - 23.35.0 Ha	ToR Points
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	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 noncompliances / 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. The study area will comprise of 10 km zone around the mine lease from lease periphery and	It is an open cast mechanised mining project. No blasting and drilling involved. It is proposed to mine through rock breakers. Study area comprises of 10 km radius from the mine lease boundary is considered only for Land use, Soil, Ecology & Biodversity & Socio Economic Study	Chapter-2,
9.	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 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	Pudupalayam Limekankar & Limestone Quarry - 23.35.0 Ha	ToR Points
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	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.		
	Details of the land for	The top soil & over burden was removed already	Chapter-2,
	any Over Burden	during the earlier quarrying operations and	Chapter 2,
	3	further removal of over burden does not arises.	
	Dumps outside the mine	further removar of over burden does not arises.	
11.	lease, such as extent of		
	land area, distance from		
	mine lease, its land use,		
	R&R issues, if any,		
	should be given.		
	A Certificate from the	The proposed mining lease area is not falling	
	Competent	under forest land.	
	Authority in the State	didei forest land.	
	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		
	1 -		
	regarding the status of		
1.0	forests, the site may be		
12.	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.		
12	Status of forestry	The proposed mining lease area is not falling	
13.	clearance for the	under forest land.	
	·		

Project	Pudupalayam Limekankar & Limestone Quarry - 23.35.0 Ha	ToR Points
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	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.		
	Implementation status	Not Applicable.	
		Not Applicable.	
	of recognition of forest		
	rights under the	There is no involvement of forest land in the	
	Scheduled Tribes and	project area.	
14.	other Traditional Forest		
	Dwellers (Recognition		
	of Forest Rights) Act,		
	2006 should be		
	indicated.		
	The vegetation in the	Details of flora have been discussed in Chapter-3	Chapter-3
	RF / PF areas	<u>-</u>	Chapter-5
1.5		of the EIA/EMP Report.	
15.	in the study area, with		
	necessary details, should		
	be given.		
	A study shall be got	There is no Wildlife Sanctuary within 10 km	
	done to	radius of the mining lease area.	
	ascertain the impact of		
	the Mining Project on		
	wildlife of the study		
	area and details		
	furnished. Impact of the		
16.	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 National Parks. Sanctuaries.	
		· · · · · · · · · · · · · · · · ·	
	Parks, Sanctuaries,	Biosphere Reserves, Wildlife Corridors,	
	Biosphere Reserves,	Tiger/Elephant Reserves/Critically Polluted	
17.	Wildlife Corridors,	areas within 10 km radius of the mining lease	
17.	Tiger/Elephant	area. Only Karaivetti Bird Sanctuary is found at	
	Reserves/(existing as	a distance of 16km radius from the Mine Lease	
	well as proposed), if any,	Area (SW)	
	within 10 km of the	()	
•	WILLIAM TO KILL OF THE		

Project	Pudupalayam Limekankar & Limestone Quarry - 23.35.0 Ha	ToR Points
Project Proponent	M/s. Tamilnadu Cements Corporation Limited	Standard ToR
Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	Compliance

	T		
	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		
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, 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.	Details biological study (flora & fauna) within 10 km radius of the project site have 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.	Chapter 3
19.	Proximity to Areas declared as 'Critically Polluted' or the Project	The proposed mining lease area is not falling under forest land.	

Project	Pudupalayam Limekankar & Limestone Quarry - 23.35.0 Ha	ToR Points
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20.
21.
21.
21.
20.

Project	Pudupalayam Limekankar & Limestone Quarry - 23.35.0 Ha	ToR Points
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	Rehabilitation &		
	Resettlement Policy		
	should be kept in view.		
	In respect of SCs /STs		
	and other weaker		
	sections of the society		
	in the study area, a		
	need based sample		
	survey, family-wise,		
	should be undertaken to		
	assess their		
	requirements, and		
	action programmes		
	prepared and submitted		
	accordingly, integrating		
	the sectoral programmes		
	of line departments of		
	the State Government. It		
	may be clearly brought		
	out whether the village		
	located in the mine lease		
	area will be shifted or		
	not.		
	The issues relating to		
	shifting of		
	Village including their		
	R&R and socio-		
	economic aspects should		
	be discussed in the		
	report.	Deceling data collected decide Dec Mari	Charter 2
	One season (non-	Baseline data collected during Pre Monsoon	Chapter 3
	monsoon)and (Summer	Season (July – September 2020) has been incorporated in ELA (EMP report	
	Season),(Post monsoon)	incorporated in EIA/EMP report.	
	primary baseline data on	Sita Chagifia matralagiant data has been collected	
	ambient air quality CPCB Notification of	Site Specific metrological data has been collected	
	2009 water quality,	and incorporated in EIA/EMP report.	
	noise level, soil and flora	The key plan of monitoring station has been	
	and fauna shall be	discussed in Chapter-3. Locations of the	
22.	collected and the AAQ	monitoring stations have been selected keeping	
	and other data so	in view the pre- dominant downwind direction	
	compiled presented	and location of the sensitive receptors and also that	
	date-wise in the EIA and	they represent whole of the study area.	
	EMP Report.	the start and the start area.	
	Site-specific		
	meteorological data		
	1		

Project	Pudupalayam Limekankar & Limestone Quarry - 23.35.0 Ha	ToR Points
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	T =		
	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.		61 4
	Air quality modeling	Air quality modeling & Impact of Air quality has	Chapter-4
	should be	been incorporated in Chapter-4 of EIA/EMP	
	carried out for	report.	
	prediction of impact of		
	the project on the air		
	quality of the area. It should also take into	Tunnamoutation of minaral drawing anamation of	
		Transportation of mineral during operation of	
	account the impact of movement of vehicles	mines will be done by road & NH 227 through dumpers and the impact of movement of vehicles	
	for transportation of mineral.	are incorporated in EIA/EMP report.	
	illillerai.		
	The details of the		
	model used and		
23.		Air modeling result furnished in chanter A	
23.		Air modeling result furnished in chapter-4	
	for modeling should be provided.		
	piovided.		
	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.		
	maicated on the map.		

Project	Pudupalayam Limekankar & Limestone Quarry - 23.35.0 Ha	ToR Points
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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 and from nearby vendors	
26.	Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.	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 regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished.	Maximum working depth: 17.75 m BGL The water table is below 60-65 m from ground level which is observed from the nearby bore wells and the data obtained from existing government and private boreholes. So mine working will not be intersecting the ground water table.	

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	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	There is no stream passing through the lease area.	
30.	brought out. Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and bgl. A schematic diagram may also be provided for the same.	Highest elevation: 55 AMSL Depth: 60-65m Below Ground Water Level	Chapter-2
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	Green Belt will be provided along the periphery of the project site in the safety distance	

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	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	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 preplacement medical examination and	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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	periodical medical examination schedules should be incorporated in the EMP.The project 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.	Suitable measure will be adopted to minimize occupational health impacts of the project.	Chapter-4
37.	Measures of socio economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.	CSR Activity Affidavit is attached as Annexure	
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	The Public hearing / Consultation is yet to be conducted.	

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40.	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. Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the project should be given.	_	plicable igation is pending aga	inst the project in any	
	The cost of the project (capital cost	S.No.	Description	Cost	Chapter-2
	and recurring cost) as well as the cost towards	1	Land Cost	15644500	
41.	implementation of EMP	2	Operational cost	301980140	
	should clearly be spelt out.	3	EMP Cost	20,00,000]
	out.		Total	319624640	
	7.	D: .		Did A	
42.	Disaster Management Plan	Disaster Management and Risk Assessment has be 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.			Chapter-8	
44			ow mentioned general points are also to be followed		
(a)	Executive Summary of the EIA/EMP report	Executive Summary 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	Complied		(b)	

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	44 4 4 4		
	collected and the sources		
()	should be indicated.	0 1: 1	
(e)	Where the documents	Complied	
	provided		
	are in a language other		
	than English, an English		
	translation should be		
(0)	provided.		
(f)	The Questionnaire	The complete questionnaire has be prepared	
	for		
	environmental appraisal		
	of mining projects as		
	devised earlier by the		
	Ministry shall also be		
(-)	filled and submitted.	The DIA was at her have a second and	
(g)	While preparing the	The EIA report has been prepared and	
	EIA report, the instructions for	complying with the circular issued by MoEF vide	
		O.M. No. J-11013/41/2006-IA.II(I) dated 4th	
	the proponents and instructions for the	August, 2009.	
	consultants issued by		
	MoEF vide O.M.		
	No. J-		
	11013/41/2006-IA.II(I)		
	dated4th August, 2009,		
	which are available on		
	the website of this		
	Ministry, should also be		
	followed.		
(h)	Changes, if any made	There are no changes in prepared EIA as per	
()	in the	submitted Form-1 & PFR	
	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		

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the PH again with the		
revised documentation		
As per the circular	Will be complied after grant environment	
no. J-	clearance form SEIAA, Tamilnadu	
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.		
The EIA report should		
also include (i) surface		
plan of the area	All Sectional Plates of Quarry is enclosed in	
indicating contours of	Mining PlanAnnexure-IV	
main topographic		
features, 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 is conducted and attached as Annexure VII.

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.

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 60-65m BGL. Hence the proposed mining activity will not affect the ground water table

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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

Z time graphic view, in court 10 min 12 graphic view								
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
Periyanagalur	1041	3538	1762	1776	1975	692	0	1805
Thelur	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
Siruvalur	594	2155	1043	112	1261	453	0	1125
Govindapuram	1242	4996	2502	2494	3260	1347	0	2399

Source: Census of India, 2011

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.

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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

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.

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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
5	% of people employeed 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.

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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.

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%

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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.

As a part of CER, 2% of the project cost i.e., Rs. 6392492.8 will be allocated and the CER

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.

- 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
- \clubsuit 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.
 - 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).

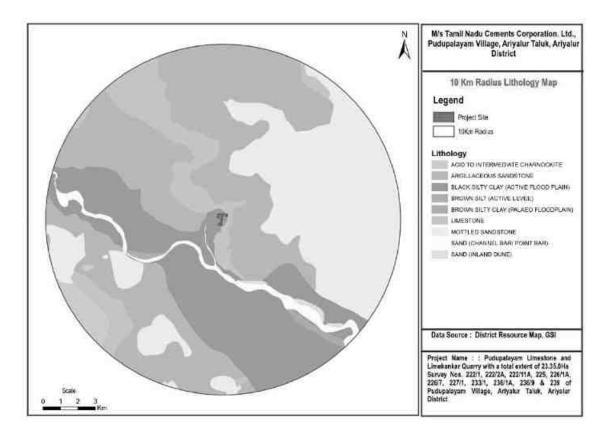
Noted and will be complied.

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

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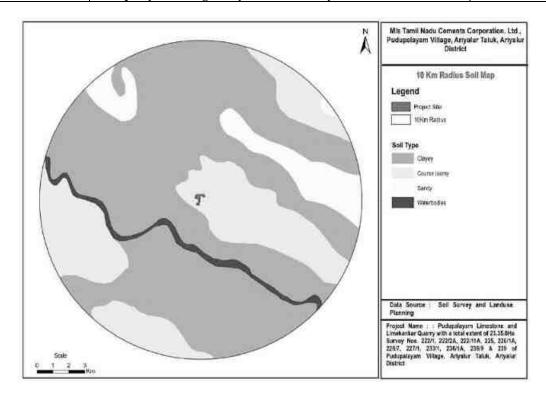
of various landforms. Various land forms occurring in the area such as structural hills, erosional plains, residual hills rolling uplands and pediments of different facies belonging to the denudational and structural land forms. Fluvial landforms caused by the activity of Cauvery, Marudayar and Vellar river systems, include younger flood plains, older flood plains and buried pediments.



Lithology around the 10kmradius 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 μ m) 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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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 clayrich 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.

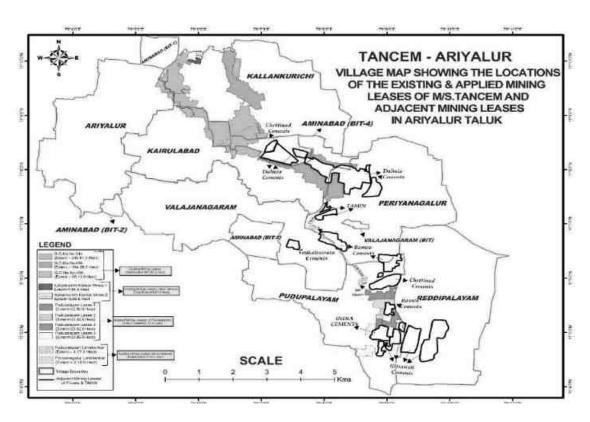
13. A study shall be conducted on the number of trees (name of the species, age) present in the mining lease applied area and how they will be managed during mining activity.

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

S. No.	Name of the the owner	Taluk & Village	S. F. Nos.	Extent (in Ha) &	Mineral	Lease period
		8		G.O.No.		
	Existing Mines					
1.	Tvl. Ramco	Ariyalur &	226/7 etc	4.83.0	Limestone	16.06.1995 to
	Cements Ltd	Pudupalayam		GO (3D) 5		15.06.2015
				dated		Deemed to be
				04.01.1995		

Project	Pudupalayam Limekankar & Limestone Quarry - 23.35.0 Ha	ToR Points
Project Proponent	M/s. Tamilnadu Cements Corporation Limited	Standard ToR
Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	Compliance

2.	Tvl. India Cements Ltd	Ariyalur & Pudupalayam	265, 226 etc	29.29.5 GO No. 75 dated	Limestone	extended upto 15.06.2035 09.02.1989 to 08.02.2009 Deemed to be	
				04.08.2003		extended upto	
						08.02.2039	
	Proposed Mines						
1	Tvl.	Ariyalur &	144,217,218	22.96.0	Limestone &	-	
	TANCEM	Pudupalayam	etc		Limekankar		
2	Tvl.	Ariyalur &	229,230 etc	23.02.5	Limestone &	-	
	TANCEM	Pudupalayam			Limekankar		
3	Tvl.	Ariyalur &	350,351 etc	22.89.0	Limestone &	-	
	TANCEM	Pudupalayam			Limekankar		
4	Tvl.	Ariyalur &	221/1, 2A, etc	23.35.0	Limestone &	-	
	TANCEM	Pudupalayam			Limekankar		
	Expired and abandoned Mines						
	Nil						



As the mine lease area is rich in majormineral 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.	Name	Age (in	Dimension
No		Approximation)	(width x height)

Project	Pudupalayam Limekankar & Limestone Quarry - 23.35.0 Ha	ToR Points
Project Proponent	M/s. Tamilnadu Cements Corporation Limited	Standard ToR
Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	Compliance

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

16. Reserve Funds should be earmarked for proper closure plan

The funds will be provided for proper closure plan as per the Mining Plan approved by Indian Bureau of Mines

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/ Awarness will be briefed on daily basis.

Work Place

- 1. Social distancing will be maintained and ensured at work place minimum of six feet will be maintained
- 2. Awarness Signages will be provided at work place.
- 3. Re-Usable materials/ tools, tackles will be disinfected frequently.

Project	Pudupalayam Limekankar & Limestone Quarry - 23.35.0 Ha	ToR Points
Project Proponent	M/s. Tamilnadu Cements Corporation Limited	Standard ToR
Project Location	Pudupalayam Village, Ariyalur Taluk, Ariyalur District	Compliance

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

Mess:

- 1. Cooks are provided with PPEs and required awarness
- 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:

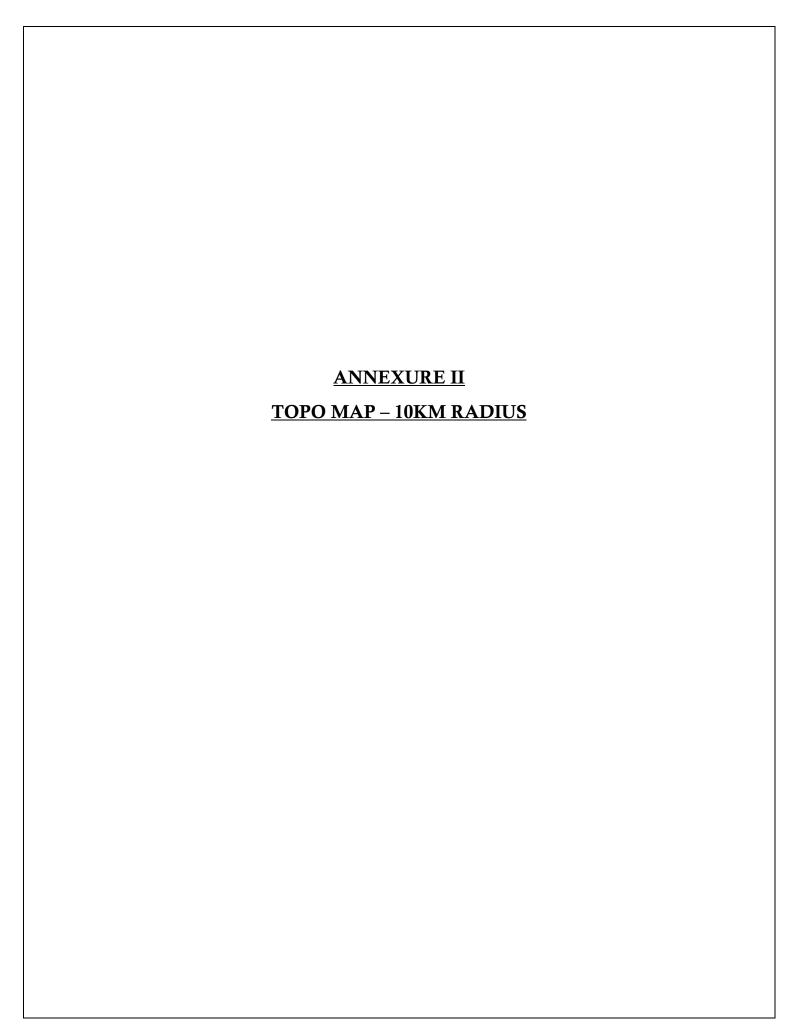
- 1. Toilets will be cleaned for every 4 hours
- 2. full PPEs will be provided for the Janitors
- 3. Alcohol-based disinfectant will be utilized

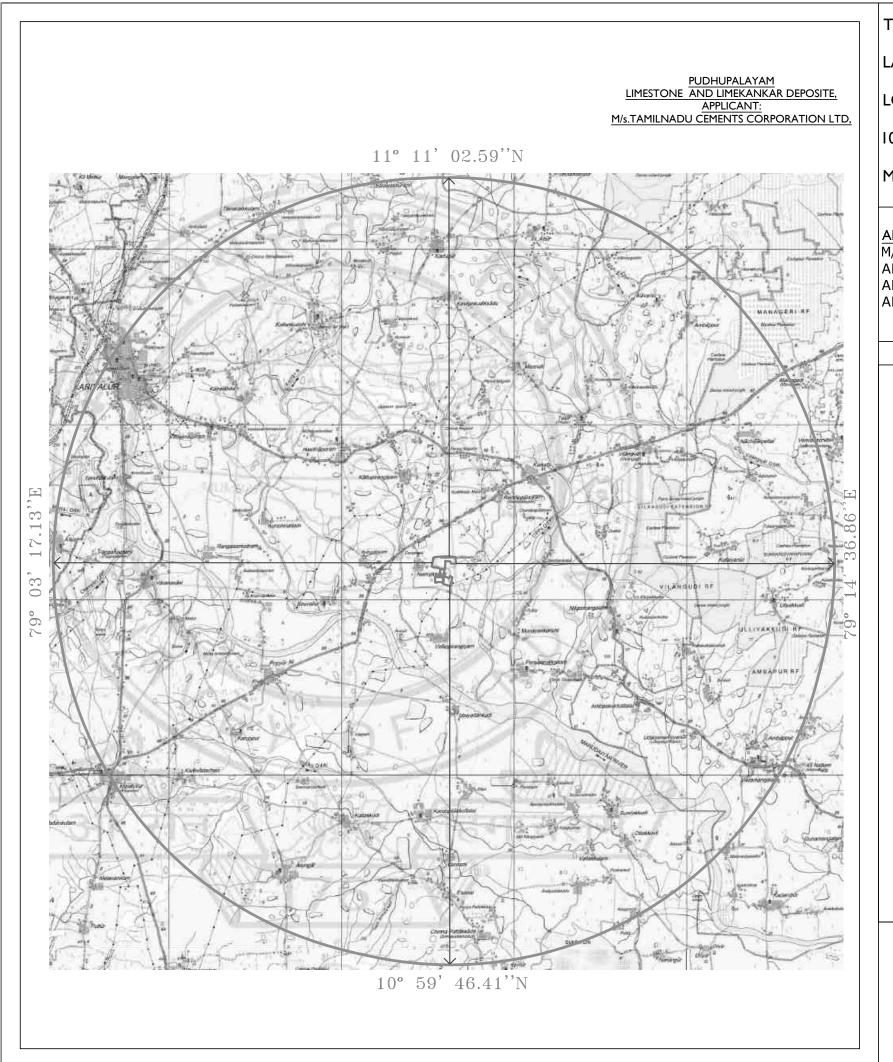
Quarantine facility

- 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 form 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.





TOPO SHEET NO.: 58 M/04

LATITUDE: 11° 05' 11.82"N to 11° 05' 37.18"N

LONGITUDE: 79° 08' 46.58"E to 79° 09' 07.38"E

10 KM RADIUS :

M.L.APPLIED AREA:

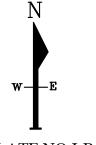


PLATE NO:I-B

DATE OF SURVEY: 06.08.2019

APPLICANT:

M/s.TAMILNADU CEMENTS CORPORATION LTD. ARIYALUR CEMENTS FACTORY,

ARIYALUR -621 729, ARIYALUR DISTRICT.

LOCATION:

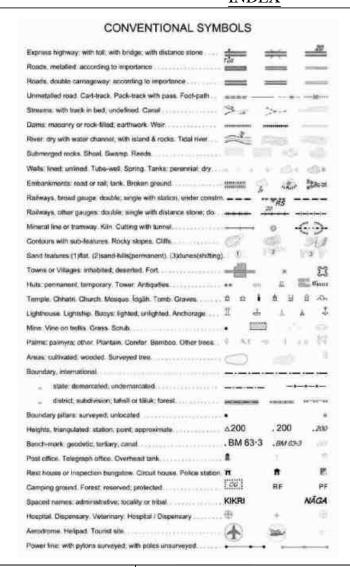
S.F.Nos : 222/1,222/11A etc.,

EXTENT: 23.35.0 Ha, VILLAGE: PUDHUPALAYAM,

TALUK : ARIYALUR,

DISTRICT: ARIYALUR, STATE: TAMILNADU.

INDEX



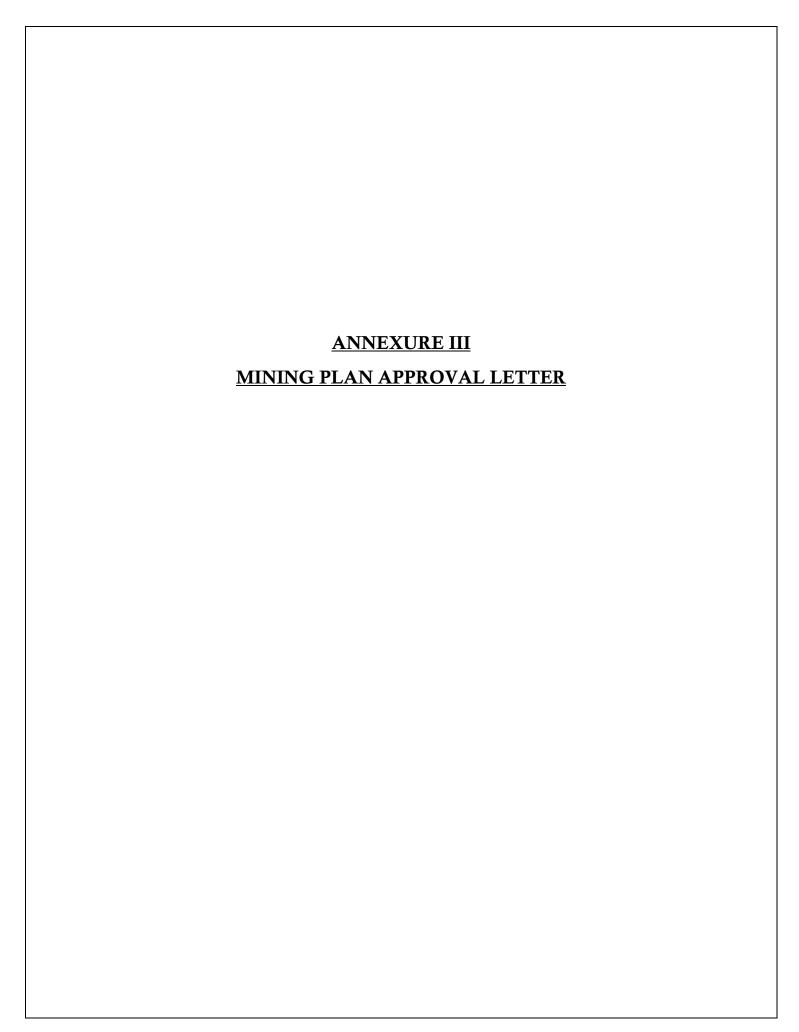
PREPARED BY:

KEY PLAN

SCALE- 1:1,00,000

THIS IS TO CERTIFY THAT THE INFORMATION IN THIS
PLATE IS TRUE AND CORRECT TO THE
BEST OF MY KNOWLEDGE BASED UPON THE LEASE MAP
AUTHENTICATED
BY STATE GOVERNMENT







GOVERNMENT OF INDIA MINISTRY OF MINES INDIAN BUREAU OF MINES

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.

Dated:

SPEED POST

To:

M/s. Tamilnadu Cements Corporation Ltd. (A Governmet of Tamilnadu Undertaking) Ariyalur Cement Factory Ariyalur District.

No. TN/ALR//LST&KNK/MP/2062.MDS

Sub.: Approval of Mining Plan (including Progressive Mine Closure Plan) for Pudupalayam Lime Kankar & Limestone deposit over 23.35 Ha. in S.F. No. 222/1, 222/2A, 225, 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-II/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.
- 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.

 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

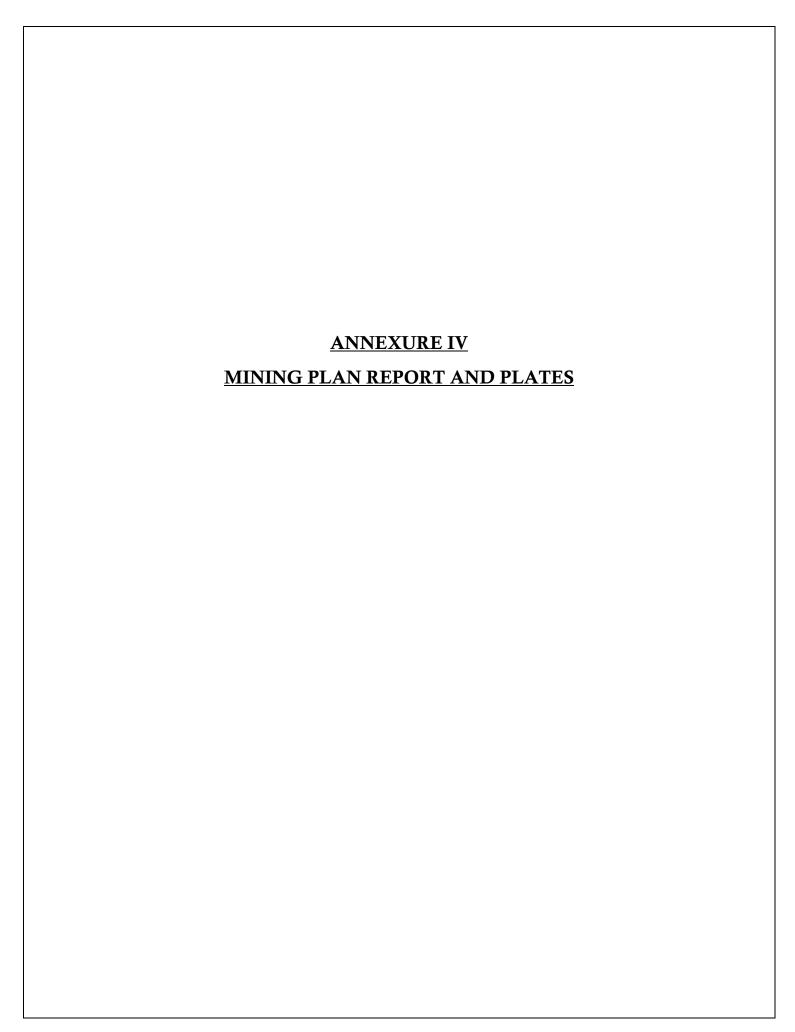
Copy for information to:

 Sri P. Thangaraju, QP, M/s. Geo Exploration & Mining Solutions, Old No. 260-B, New No. 17, Advaitha Ashram Road, Alagapuram, Salem – 636 004.

 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



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

OVER AN EXTENT OF 23.35.0Ha IN S. F. NOS.222/1, 222/2A, 222/11A, 225, 226/1A, 226/7,227/1, 233/1, 236/1A, 236/9 & 2390F PATTA LANDS INPUDUPALAYAM VILLAGE, ARIYALUR TALUK, ARIYALUR DISTRICT, TAMILNADU STATE.

(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

INTRODUCTION:-

This Mining Plan and Progressive Mine Closure Plan forfresh grant of mining lease for PudupalayamLimekankar& Limestone Deposit, over an extent of 23.35.0hectares inS.F.Nos: 222/1, 222/2A, 225, 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 – 222/1, 222/2A, 222/11A, 225, 226/1A, 226/7, 227/1, 233/1, 236/1A, 236/9, 239, 223, 224, 232 & 233/16 in Pudupalayam Village, AriyalurTaluk& District and Tamil Nadu State over an extent of 24.20.0 hectares in Patta Lands& Government Poramboke Lands for a period of 30 years.

Precise Area Communication Letter was communicated vide Industries (MMA.2) Department, Secretariat, in Letter No. 3392/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 23.35.0 hectares for a period of 10 years and 50 years respectively, by deleting 0.85.0 hectares of Government landswas 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 is 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 50 meters safety distance to the tiled shed with low tension power line situated in S.F.No.283/8A in the Western side of the lease applied area of S.F.No.222/2A.
- d. The applicant company shall provide 10 meters safety distance to the footpathsituated in S.F.No.228/2A from north to south in the eastern side of S.F.No.225.
- e. The applicant company shall provide 10 meters safety distance to the footpath situated in Government land in S.F.Nos.223, 224, 232, 233/16, 238 & 281.
- f. The applicant company shall provide 50 meters safety distance to the low tension power line passing from east to west in S.F.No.283/8A in the western side of the lease applied area of S.F.No.222/2A.
- g. The applicant company shall provide 50 meters safety distance to the low tension power line passing from north to south direction in the south western corner of applied area of S.F.No.236/1A and also in the eastern side of S.F.Nos.275/1, 2, & 278/16C.
- h. The applicant company shall provide 50 meters safety distance to the low tension power line passing in S.F.No.326/2C ofReddipalayam village from east to west direction in the eastern side of applied area in S.F.No.227.
- i. The applicant company shall provide 50 meters safety distance to Nakkankuzhi lake situated in S.F.No.235 in the northern side of the applied area in S.F.No.236/1A.
- j. The applicant company shall provide and maintain safety distance of 7.5 meters to the adjoining patta lands.
- k. 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.
- I. Environmental Clearance shall be obtained from the competent authority before the grant of mining lease.
- m. The applicant company shall obtain necessary clearance from the Tamil Nadu Pollution Control Board before the commencement of mining operations.

n. 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 (Otherthan 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 10,25,236 Ts Limestone and 1,00,384Ts 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

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
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
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	-
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
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
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
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
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
624, 23.09.1998	110.68.5	Ariyalur	Limestone	Working	TN/TCR/MP/L ST-916-SZ, 18.10.2000	13.07.2001	-
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
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
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
	Govt. Order & Date 871/MMD2, 20.08.1990 215 ind, 18.09.1995 427 ind, 19.03.1980 3(D) 107 ind, 11.07.1997 344, 10.03.1980 456, 16.05.1985 469, 21.05.1985 624, 23.09.1998 409/ind, 12.10.1993 198/ind, 26.12.1986 729/ind, Dated	Govt. Order & Date in Ha 871/MMD2, 20.08.1990	Govt. Order & Date Area in Ha Location 871/MMD2, 20.08.1990 420.25.0 Virudhunagar 215 ind, 18.09.1995 180.83.0 Virudhunagar 427 ind, 19.03.1980 268.80.0 Virudhunagar 3(D) 107 ind, 11.07.1997 7.55.5 Tirunelveli 344, 10.03.1980 240.61.5 Ariyalur 456, 16.05.1985 194.29.5 Ariyalur 469, 21.05.1985 66.11.5 Ariyalur 624, 23.09.1998 110.68.5 Ariyalur 409/ind, 12.10.1993 6.61.5 Cuddalore 198/ind, 26.12.1986 12.30.0 Ariyalur 729/ind, Dated 24.32.5 Pandapuli	Govt. Order & Date Area in Ha Location Type of mineral 871/MMD2, 20.08.1990 420.25.0 Virudhunagar Limestone 215 ind, 18.09.1995 180.83.0 Virudhunagar Limestone 427 ind, 19.03.1980 268.80.0 Virudhunagar Limestone 3(D) 107 ind, 11.07.1997 7.55.5 Tirunelveli Limestone 344, 10.03.1980 240.61.5 Ariyalur Limestone 456, 16.05.1985 194.29.5 Ariyalur Limestone 469, 21.05.1985 66.11.5 Ariyalur Limestone 624, 23.09.1998 110.68.5 Ariyalur Limestone 409/ind, 12.10.1993 6.61.5 Cuddalore Clay 198/ind, 26.12.1986 12.30.0 Ariyalur Clay 729/ind, Dated 24.32.5 Pandapuli Limestone	Govt. Order & Date Area in Ha Location Type or mineral Non-Working 871/MMD2, 20.08.1990 420.25.0 Virudhunagar Limestone Non-Working 215 ind, 18.09.1995 180.83.0 Virudhunagar Limestone Non-Working 427 ind, 19.03.1980 268.80.0 Virudhunagar Limestone Non-Working 3(D) 107 ind, 11.07.1997 7.55.5 Tirunelveli Limestone Non-Working 344, 10.03.1980 240.61.5 Ariyalur Limestone Non-Working 456, 16.05.1985 194.29.5 Ariyalur Limestone Non-Working 469, 21.05.1985 66.11.5 Ariyalur Limestone Non-Working 409, 21.05.1985 10.68.5 Ariyalur Limestone Working 409/ind, 12.10.1993 6.61.5 Cuddalore Clay Non-Working 198/ind, 26.12.1986 12.30.0 Ariyalur Clay Non-Working 729/ind, Dated 24.32.5 Pandapuli Limestone Non-Working	Govt. Order & Date Area in Ha Date Location Type or mineral Non-Working approval of MP/MS 871/MMD2, 20.08.1990 420.25.0 Virudhunagar Limestone Non-Working TN/TNL/MP/L ST/1/122-SZ 10.02.2004 215 ind, 18.09.1995 180.83.0 Virudhunagar Limestone Non-Working TN/VDN/LST/MS/74/SZ, 13.03.2005 427 ind, 19.03.1980 268.80.0 Virudhunagar Limestone Non-Working TN/VDN/LST/MS/74/SZ, 13.03.2005 3(D) 107 ind, 11.07.1997 7.55.5 Tirunelveli Limestone Non-Working TN/TNL/MP/L ST-149/SZ, 13.03.2005 344, 10.03.1980 240.61.5 Ariyalur Limestone Non-Working TN/PBR/MS/L ST-1257-SZ, 19.01.2001 456, 16.05.1985 194.29.5 Ariyalur Limestone Non-Working TN/PBR/LST/MS-86-SZ, 29.03.2001 469, 21.05.1985 66.11.5 Ariyalur Limestone Non-Working TN/TCR/MP/L ST-196-SZ, 18.10.2000 409/ind, 12.10.1993 12.30.0 Ariyalur Limestone Non-Working TN/TCR/FC/M S-108-MDS, 04.07.2001 198/ind, Dated 19.07 1980 124.32.5 Pandapuli	Mining lease Govt. Order & Date Area in Ha Location Type of mineral Non-working Area in Ha Area in Ha Location Type of mineral Non-working Area in Ha A

MP& PMCP Pudupalayam Limekankar & Limestone Deposit

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.	3997/MMA.2 /2019-1, Dated:02.08. 2019	22.96.0	Ariyalur	Limekankar & Limestone	Fresh Lease applied	Mining Plan & PMCP under preparation	50 Years & 10 years	-
18.	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	-
	Total	1616.22.5						

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 (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 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

Designation
ry /CMD, rporation 002. Chairman and Managing Director
y to etries c, Chennai Director
Mining, 32 Director
AD Board, 00 005. Director
ment, ure) Director c, Chennai
tto otries c, Chennai
ment and tment, Director
Malony 600 017. Director
lings) CE Vorks auk, Director
amilnadu I Floor, na Salai, 2.
arpet, Director
ו

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 employedunder 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′ 11.82″ toN 11° 05′ 37.18″

E 79° 08′ 46.58″ to E 79° 09′ 07.38″

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]

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
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: 3392/MMA.2/2019-1 Dated: 02.08.2019was 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-fore	st
Forest (specify)	Area (ha)	/	Area (ha)
	Nil	i). Waste land 	23.35.0 Ha.
		ii).Grazing land	
		iii).Agriculture land	
		iv).Other (specify)	

Table-4

District & State	Village & Taluk	Land Classification	Survey No.	Extent (in Hect)
			222/1	3.04.0
			222/2A	1.14.5
	Pudupalayam&Ariyalur		222/11A	0.59.0
		Own Patta land	225	3.30.0
			226/1A	3.01.5
Ariyalur&Tamilnadu			226/7	0.27.5
			227/1	2.55.5
			233/1	2.14.5
			236/1A	2.04.5
			236/9	0.78.0
			239	4.46.0
	Total			23.35.0 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 1.4 kms westofPudupalayam Village. Pudupalayam Village is located at a distance of about 9.0 km SoutheastofAriyalur District.

The area applied for mining leaselies 0.56km Southeastof Trichy – Chidambaran (NH - 277) National Highway Road.

Table - 5

S.No	Particulars	Location	Direction	Approximate Distance in Km
1	Nearest Post office	Siruvalur	SW	2.2
2	Nearest Town(D.H)	Ariyalur	NW	10
3	Nearest Police Station	Thelur	NE	5.4
4	Nearest Govt. Hospital	Poyyur	SW	5
5	Nearest School	Reddipalayam	NE	3.6
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	253

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 W Corner								
Point Id.	Latitude	Longitude	Point Id.	Latitude	Longitude			
	Block - I		32	11° 05' 19.84"N	79° 08' 56.39"E			
1	11° 05' 27.17"N	79° 08' 51.91"E	33	11° 05' 20.40"N	79° 08' 52.39"E			
2	11° 05' 27.76"N	79° 08' 50.31"E	34	11° 05' 20.74"N	79° 08' 52.38"E			
3	11° 05' 27.68"N	79° 08' 47.78"E	35	11° 05' 21.77"N	79° 08' 52.54"E			
4	11° 05' 28.25"N	79° 08' 47.43"E	36	11° 05' 21.60"N	79° 08' 53.44"E			
5	11° 05' 28.14"N	79° 08' 46.71"E	37	11° 05' 23.39"N	79° 08' 53.76"E			
6	11° 05' 31.64"N	79° 08' 46.58"E	38	11° 05' 23.41"N	79° 08' 53.42"E			
7	11° 05' 31.67"N	79° 08' 47.16"E	Block - III					
8	11° 05' 33.75"N	79° 08' 47.22"E	39	11° 05' 19.68"N	79° 08' 49.63"E			
9	11° 05' 33.78"N	79° 08' 47.60"E	40	11° 05' 19.43"N	79° 08' 52.40"E			
10	11° 05' 35.76"N	79° 08' 47.56"E	41	11° 05' 19.30"N	79° 08' 55.94"E			
11	11° 05' 35.75"N	79° 08' 48.20"E	42	11° 05' 18.13"N	79° 08' 56.23"E			
12	11° 05' 36.55"N	79° 08' 48.16"E	43	11° 05' 15.96"N	79° 08' 56.39"E			
13	11° 05' 36.96"N	79° 08' 53.69"E	44	11° 05' 14.56"N	79° 08' 56.11"E			
14	11° 05' 36.98"N	79° 08' 55.86"E	45	11° 05' 15.03"N	79° 08' 53.71"E			
15	11° 05' 37.15"N	79° 08' 57.30"E	46	11° 05' 15.16"N	79° 08' 52.35"E			
16	11° 05' 37.18"N	79° 09' 01.37"E	47	11° 05' 15.07"N	79° 08' 52.33"E			
17	11° 05' 36.57"N	79° 09' 06.69"E	48	11° 05' 15.09"N	79° 08' 51.10"E			
18	11° 05' 31.20"N	79° 09' 07.38"E	49	11° 05' 14.54"N	79° 08' 51.09"E			
19	11° 05' 31.17"N	79° 09' 02.90"E	50	11° 05' 14.68"N	79° 08' 49.50"E			
20	11° 05' 33.00"N	79° 09' 02.43"E	Block - IV					
21	11° 05' 33.21"N	79° 08' 57.76"E	51	11° 05' 20.08"N	79° 08' 56.93"E			
22	11° 05' 31.08"N	79° 08' 58.15"E	52	11° 05' 19.22"N	79° 08' 59.76"E			
23	11° 05' 25.83"N	79° 08' 57.69"E	53	11° 05' 18.57"N	79° 09' 01.54"E			
24	11° 05' 26.35"N	79° 08' 56.14"E	54	11° 05' 20.34"N	79° 09' 02.40"E			
25	11° 05' 26.39"N	79° 08' 53.84"E	55	11° 05' 20.22"N	79° 09' 02.65"E			
Block - II		56	11° 05' 19.29"N	79° 09' 04.25"E				
26	11° 05' 26.19"N	79° 08' 53.84"E	57	11° 05' 11.82"N	79° 09' 02.74"E			
27	11° 05' 26.00"N	79° 08' 56.51"E	58	11° 05' 11.83"N	79° 09' 02.14"E			
28	11° 05' 25.61"N	79° 08' 57.34"E	59	11° 05' 13.87"N	79° 08' 56.22"E			
29	11° 05' 23.13"N	79° 08' 57.04"E	60	11° 05' 15.98"N	79° 08' 56.69"E			
30	11° 05' 22.74"N	79° 08' 57.15"E	61	11° 05' 18.09"N	79° 08' 56.63"E			
31	11° 05' 20.98"N	79° 08' 56.74"E	-	-	-			

Please refer Mine Lease Plan - Plate No.II.

c). Attach a general location map showing area and access routes. It is preferredthat the area be marked on a Survey of India topographical map or a cadastralmap 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: 3392/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.

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. <u>Exploration:</u>

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 datasare furnished below:

Table-7

No. of Diamond drills	Depth of Diamond drills (m)	Depth of deposition	Strata
	16.15	55.00m - 53.00m	Topsoil
PPM-6		53.00m - 52.25m	Kankar
		52.25m - 47.25m	Limestone
	7.75	55.00m - 53.00m	Topsoil
PPM-13		53.00m - 52.25m	Kankar
		52.25m - 47.25m	Limestone
	17.75	55.00m - 53.00m	Topsoil
PPM-12		53.00m - 52.25m	Kankar
		52.25m - 37.25m	Limestone
	17.75	55.00m - 53.00m	Topsoil
PD/6-3		53.00m - 52.25m	Kankar
		52.25m - 37.25m	Limestone
	9.75	55.00m - 53.00m	Topsoil
PPM-14		53.00m - 52.25m	Kankar
		52.25m - 45.25m	Limestone
	7.75	55.00m - 53.00m	Topsoil
PPM-7		53.00m - 52.25m	Kankar
		52.25m - 47.25m	Limestone
	14.75	55.00m - 53.00m	Topsoil
PD/7-3		53.00m - 52.25m	Kankar
		52.25m - 40.25m	Limestone
	14.75	55.00m - 53.00m	Topsoil
PD/7-3		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 drillsmade 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 Systemto calculating reserves and resources and to arrive UNFC 111 category.

Reserves were calculated based on the drilled core drill data, adjacent mine pit, nallahas, 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:

7.75m [2.0m Topsoil + 0.75m Limekankar + 5m Limestone (proved 111)]	North
8.75m [2.0m Topsoil + 0.75m Limekankar + 6m Limestone (proved 111)]	East
17.75m [2.0m Topsoil + 0.75m Limekankar + 15m Limestone (probable 222)]	South & West

Proposed to be carried out:

As per the UNFC guidelines, the applicant has proposed to carry out the exploration program during the first year 13 Core drills (PBh-1 to PBh-13) 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 orderissuedby 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 orunder rule 22(6) of the MCR'1960 for approval of modification, specify reasonand 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 mine lease applied area 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 $1.6 \, \mathrm{km}$ 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 1015m 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 1.118lakhs 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 32,933hectares (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 subdendritic 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 Ariyalurdistrict 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.

Geomorphologicallythe 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 expect 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 bestdeveloped 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; 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 gypsiferoussiltyclay 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 Uttathurformation 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, gypseousclaystone, 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) AriyalurPondicherry depression,
- (2)Kumbakonam-Madnam-Shiyali ridge,
- (3) TanjoreTranquibar-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) complied 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:

4	AGE	<u>ROCKFORMATION</u>	
	Recent	- Topsoil &L	imekankar
	U	nconformities	
	Cretaceous	Shell & Co	ral limestone
	Archaen	- (Boulders	of charnockites)
	1		

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 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

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 - SDip amount and direction : Vertical dip

d) (i) 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.TheDirector of Geology and Mining,

ThiruVe 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:

Diamond Drill No	Type	Diameter	Spacing	inclination	Strike/foliation
8nos. of Diamond Drills (PPM-6, PPM-13, PPM-12, PPM-14, PPM-7, PD/7-3, PD/7-3A & PD/6-3)	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

LIMESTONE		LIMEKANKAR
Parameter	Composition %	Composition %
Calcium Oxides (CaO)	50.12	46.24
Magnesium Oxides (MgO)	0.28	0.48
Iron (Fe ₂ O ₃)	1.01	0.99
Alumina as (Al ₂ O ₃)	0.81	1.35
Silica (SiO ₂)	8.78	14.03
Loss of Ignition (LOI)	36.12	36.67
Calcium as CaCo₃	89.47	62.54
Magnesium as MgCo ₃	0.59	1.00
Lime saturation Factor	1.65	1.05

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 & Limestoneis 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	upto17.75metres depth.
	[8 Core Drills – upto17.75metres (maximum)]
	from working pit level.
	PPM-6- 16.15m
	PPM-13 - 7.75m
	PPM-12 -17.75m
	PD/6-3 -17.75m
	PPM-14 - 9.75m
	PPM-7 – 7.75m
	PD/7-3 - 14.75m
	PD/7-3A - 14.75m
	Total meterage – 106.4m
Total operating expenditure	Core drills - Rs. 1200/m (avg)
incurred :	(106.4m x Rs. 1200) = Rs.1,27,680/-

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.VAto 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, thirteen core drills (Pbh1- Pbh13) for the first year of Mining Plan period (i.e. after the grant of mining lease) of60m 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	13 nos. [Core drills] – each 60m (d)	100m	Core drill of depth 60m each (13 X 60m = 780m	-	-

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)
	X3Y3-AB	41080	41080	8319	8319	23296
	X5Y5-CD	5580	5580	1249	1249	4752
	X6Y6-IJ	225252	225252	19217	19217	51408
A. Mineral Reserves	X7Y7-KL	49280	49280	9315	9315	25232
(111)	X8Y8-KL	65400	65400	12120	12120	31944
	X9Y9-OP	650748	650748	54008	54008	137472
	X10Y10-MN	28976	28976	4475	4475	12528
	Total	1066316	1066316	108704	108704	286632
B. Mineral Resour	ces (222)	3840909	3840909	186180	186180	441316
C. Mineral Resources benches (2)		76608	76608	449	449	449
D. Mineral resources	221	998100	998100	56143	56143	133080
locked up in 7.5m &	222	636750	636750	35817	35817	
50m safety distance	Total	1634850	1634850	91960	91960	133080

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 No– V & VA.

Table-14

7.75m [2.0m Topsoil + 0.75m Limekankar + 5m Limestone (proved 111)]	North
8.75m [2.0m Topsoil + 0.75m Limekankar + 6m Limestone (proved 111)]	East
17.75m [2.0m Topsoil + 0.75m Limekankar + 15m Limestone (probable 222)]	South & West

Reassessed Mineral Reserves and Resources as per UNFC System as on 05.08.2019 Table-15

						Lime	estone			Limel	kankar		
In (m) I	Volume in (Cu.m.)	Bulk Density	ROM	Limestone @ 100% Recovery (Ts)	Volume in (Cu.m.)	Bulk Density	ROM	Limekankar @ 100% Recovery (Ts)	topsoil in(Ts)				
	i	64	91	2	11648	2		` '				, ,	23296
X3Y3-AB	ii		85	0.75					3698	2.25	8319	8319	
	iii	52	79	5	20540	2	41080	41080					
			Total		•			41080				8319	23296
	i	27		2	2376	2							4752
X5Y5-CD	ii	20		0.75					555	2.25	1249	1249	
	iii	15	31	6	2790	2	5580	5580					
					•			5580				1249	4752
	i	153	84	2	25704	2							51408
	ii	146		0.75					8541	2.25	19217	19217	
X6Y6-IJ	iii	141	73	6	61758	2	123516	123516					
	iv	122	54	6	39528	2	79056	79056					
	٧	105		3	11340	2	22680	22680					
			Total		•			225252				19217	51408
	i	76	83	2	12616	2							25232
X7Y7-KL	ii	69	80	0.75					4140	2.25	9315	9315	
	iii	64	77	5	24640	2	49280	49280					
			Total		-			49280				9315	25232
	i	121	66	2	15972	2							31944
X8Y8-KL	ii	114	63	0.75					5387	2.25	12120	12120	
	iii	109	60	5	32700	2	65400	65400					
			Total		•			65400				12120	31944
	i	179	192	2	68736	2							137472
X9Y9-OP	ii	173	185	0.75					24004	2.25	54008	54008	
A919-OP	iii	168	180	6	181440	2	362880	362880					
	iv	149	161	6	143934	2	287868	287868					
			Total		•			650748				54008	137472
	i	54	58	2	6264	2							12528
X10Y10-MN	ii	51	52	0.75					1989	2.25	4475	4475	
VIOLIO-ININ	iii	48	46	6	13248	2	26496	26496					
	IV	40	31	1	1240	2	2480	2480					
			Total					28976				4475	12528
			Grand Tota	al				1066316				108704	286632

Table-16

B. Mineral Resources (222)

						Lime	estone			Limel	kankar		
Section	Bench	Length in (m)	Width in (m)	Depth in (m)	Volume in (Cu.m.)	Bulk Density	ROM	Limestone @ 100% Recovery (Ts)	Volume in (Cu.m.)	Bulk Density	ROM	Limekankar @ 100% Recovery (Ts)	topsoil in(Ts)
	i	129	182	2	46956	2							93912
	ii	129	182	0.75					17609	2.25	39619	39619	
X2Y2-AB	iii	129	182	6	140868	2	281736	281736					
	iv	129	182	6	140868	2	281736	281736					
	V	129	182	3	70434	2	140868	140868					
			Total					704340				39619	93912
	i	110	153	2	33660	2							67320
	ii	110	153	0.75					12623	2.25	28401	28401	
X4Y4-AB	iii	110	153	6	100980	2	201960	201960					
	iv	110	153	6	100980	2	201960	201960					
	V	110	153	3	50490	2	100980	100980					
			Total					504900				28401	67320
	i	106	83	2	17596	2							35192
	ii	106	83	0.75					6599	2.25	14847	14847	
X5Y5-AB	iii	106	83	6	52788	2	105576	105576					
	iv	106	83	6	52788	2	105576	105576					
	V	106	83	3	26394	2	52788	52788					
			Total					263940				14847	35192
	i	30	31	2	1860	2							3720
	ii	30	31	0.75					698	2.25	1569	1569	
X5Y5-CD	iii	30	31	6	5580	2	11160	11160					
	iv	30	31	6	5580	2	11160	11160					
	V	30	31	3	2790	2	5580	5580					
			Total			-		27900				1569	3720
	i	129	111	2	28638	2							57276
	ii	129	111	0.75					10739	2.25	24163	24163	
X1Y1-EF	iii	129	111	6	85914	2	171828	171828					
	iv	129	111	6	85914	2	171828	171828					
	V	129	111	3	42957	2	85914	85914					
			Total					429570				24163	57276
	i	153	100	2	30600	2							61200
X2Y2-EF	ii	153	100	0.75					11475	2.25	25819	25819	
	iii	153	100	6	91800	2	183600	183600					

			Grand Tota	al				3840909				186180	441310
<u> </u>		1	Total				,	58410					
X10Y10-MN	V	55	59	3	9735	2	19470	19470					1
\((40\)\((40\)\)	iv	55	59	6	19470	2	38940	38940					1
		<u> </u>	Total		1 1	-	1 2 2 2 2 2	104799					
X9Y9-OP	٧	181	193	3	104799	1	104799	104799			1		1
	<u> </u>		Total				1 1 1 1 1	144936					
X8Y8-KL	V	122	66	3	24156	2	48312	48312					
	iv	122	66	6	48312	2	96624	96624			1		
<u> </u>	•		Total	Ü	10101		1 00000	116424			1		
X7Y7-KL	V	77	84	3	19404	2	38808	38808			1		
	iv	77	84	6	38808	2	77616	77616			1		
	v	0.5	Total		17743		33490	106470					
X3Y3-AB	V	65	91	3	17745	2	35490	35490					
1	iv	65	91	6	35490	2	70980	70980			+	2104	0002
	V	18	91 Total	3	4914	2	9828	9828 49140				2764	6552
_	iv	18	91	6	9828	2	19656	19656					
X6Y6-GH	iii	18	91	6	9828	2	19656	19656					
\\(\alpha\)\\(\alpha\)	ii 	18	91	0.75	0000		10050	10050	1229	2.25	2764	2764	
	<u> </u>	18	91	2	3276	2			1000		 		65
		1	Total					871080				48998	11614
	V	244	119	3	87108	2	174216	174216					
_	iv	244	119	6	174216	2	348432	348432					
X3Y3-EF	iii	244	119	6	174216	2	348432	348432					
	ii	244	119	0.75					21777	2.25	48998	48998	
	i	244	119	2	58072	2							1161
			Total					459000				25819	6120
	٧	153	100	3	45900	2	91800	91800					
	iv	153	100	6	91800	2	183600	183600					

Minaral Dana		!	- (004)			Table-	17						
Wilneral Reso	urces locked ι	ip in benche	es (221)			Lime	stone			Limek	ankar		
Section	Bench	Length in (m)	Width in (m)		Volume in (Cu.m.)	Bulk Density	ROM	Limestone @ 100% Recovery (Ts)	Volume in (Cu.m.)	Bulk Density	ROM	Limekankar @ 100% Recovery (Ts)	topsoil in(Ts)
X3Y3-AB	ii	7	6	0.75					32	2.25	71	71	
ASTS-AD	iii	13	12	6	936	2	1872	1872					
			Total					1872				71	
	ii	7	7	0.75					37	2.25	83	83	
VEVE OD	iii	13	13	6	1014	2	2028	2028					
X5Y5-CD	iv	28	44	6	7392	2	14784	14784					
	V	28	44	3	3696	2	7392	7392					
•		•	Total	•	•	•		24204				83	
	ii	7	7	0.75					37	2.25	83	83	
X6Y6-IJ	iii	13	13	6	1014	2	2028	2028					
X6Y6-IJ	iv	31	32	6	5952	2	11904	11904					
	V	49	50	3	7350	2	14700	14700					
1			Total	•	I.	•		28632				83	
\/=\/= /	ii	7	4	0.75					21	2.25	47	47	
X7Y7-KL	iii	13	7	6	546	2	1092	1092					
1		•	Total			•		1092				47	
) (0) (0 I (I	ii	7	3	0.75					16	2.25	35	35	
X8Y8-KL	iii	13	6	6	468	2	936	936		_			
l.		-	Total			l		936				35	
	ii	7	7	0.75					37	2.25	83	83	
X9Y9-OP	iii	13	13	6	1014	2	2028	2028	-	-			
	iv	31	31	6	5766	2	11532	11532					
L		-	Total	-		1		13560				83	
	ii	4	7	0.75					21	2.25	47	47	
X10Y10-MN	iii	7	13	6	546	2	1092	1092					
	iv	15	29	6	2610	2	5220	5220					
L		1	Total					6312				47	
			Grand Total	al	76608				449				

Table-18

D. Mineral resources locked up in 7.5m & 50m safety distance (221)

			Lime	stone		Limekankar				
Area Sa m	Area Sq.m		Bulk		Limestone @ 100%	Volume	Bulk		Limekankar @ 100%	Topsoil in
7.100 04	in (m)	Volume in (Cu.m.)	Density	ROM	Recovery (Ts)	in (Cu.m.)	Density	ROM	Recovery (Ts)	Ts
33270	2	66540	2							133080
33270	0.75					24953	2.25	56143	56143	
33270	15	499050	2	998100	998100					
	Tota	I		998100	998100			56143	56143	133080

Table-19

D. Mineral resources locked up in 7.5m & 50m safety distance (222)

	Depth		Lin	nestone		Limekankar				Topsoil
Area Sq.m	in (m)	Volume in (Cu.m.)	Bulk Density	ROM	Limestone @ 100% Recovery (Ts)	Volume in (Cu.m.)	Bulk Density	ROM	Limekankar @ 100% Recovery (Ts)	in Ts
21225	0.75					15919	2.25	35817	35817	-
21225	15	318375	2	636750	636750					-
	To	otal		636750	636750			35817	35817	-

Table-20

Description	Section	ROM (Ts)	Limestone @ 100% Recovery (Ts)	ROM (Ts)	Limekankar @ 100% Recovery (Ts)	Topsoil (Ts)
	X3Y3-AB	41080	41080	8319	8319	23296
	X5Y5-CD	5580	5580	1249	1249	4752
	X6Y6-IJ	225252	225252	19217	19217	51408
A Mineral December (111)	X7Y7-KL	49280	49280	9315	9315	25232
A. Mineral Reserves (111)	X8Y8-KL	65400	65400	12120	12120	31944
	X9Y9-OP	650748	650748	54008	54008	137472
	X10Y10-MN	28976	28976	4475	4475	12528
	Total	1066316	1066316	108704	108704	286632
B. Mineral Resource	es (222)	3840909	3840909	186180	186180	441316
C. Mineral Resources locked u	p in benches (221)	76608	76608	449	449	449
D. Mineral resources locked 221		998100	998100	56143	56143	133080
up in 7.5m & 50m safety	222	636750	636750	35817	35817	
distance	Total	1634850	1634850	91960	91960	133080

The Mineral reserves still available in this mine would be 10,66,316tonnes of Limestoneand1,08,704tonnes ofLimekankar.

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	Crada
	Limestone Limekankar		Grade
G1 – Detailed exploration	2.141	0.165	Cement grade
G2 - General Exploration	4.477	0.221	-
G3 - Prospecting	-	-	-
G4 - Reconnaissance	-	_	-

Table-22

	-	Ouantity in	million tons	
	UNFC code	Limestone	Limekankar	Grade
A.Total Mineral Reserv	Ve	Limestone	Lilliekalikai	
Proved Mineral Reserve	111	1.066	0.108	Cement grade
Probable Mineral Reserve	121 and 122	-		-
B.Total Remaining Re	sources			
Feasibility mineral Resource	211	-		-
Prefeasibility mineral resource	221 and 222	5.552	0.278	Cement grade
Measured mineral resource	331	-		-
Indicated mineral resource	332	-		-
Inferred mineral resource	333	-		-
Reconnaissance mineral resource	334	-		-
Total Reserves + Resources		6.618	0.386	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 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 I^{st} year Northern side of Block-IV, II^{nd} and III^{rd} year is proposed in progress to southern side of the Block-IV, IV^{th} year is proposed continuously Block IV, III & II and V^{th} 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-IVand 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 37.25m. Please refer Plate Nos. VA to VE1.

The proposed average annual production Limestone will be 2,05,047tonnes and Limekankar will be 20,077tonnes 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 existing waste dumps from the adjacent Mining lease are situated in the northern side of the area, yearwise production is proposed for working other than dumping 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.

The topsoil generated is proposed to be dumped in the Northwestern side of the area applied for mining lease and 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 all along the 7.5m, 10m& 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.

MP& PMCP

The year wise production and development schedule proposed for the present mining plan period under (UNFC 111) is tabulated below. Table-23

								Limestone			Li	mekankar				Ore to
Year	Section	Bench	L in (m)	W in (m)	D in (m)	Volume in (Cu.m.)	BD	ROM	Limestone @ 100% Recovery (Ts)	Volume in (Cu.m.)	BD	ROM	Limekankar @ 100% Recovery (Ts)	topsoil in(Ts)	Location of advancement	waste ratio
		i	54	58	2	6264	2							12528		
	X10Y10-	ii	51	52	0.75					1989	2.25	4475	4475			
	MN	iii	48	46	6	13248	2	26496	26496							
I year		IV	40	31	1	1240	2	2480	2480						Northern side	
ı y c ai	X9Y9-	i	44	192	2	16896	2							33792	of Block-IV	
	OP	ii	38	185	0.75					5273	2.25	11863	11863			
	OF	iii	33	180	6	35640	2	71280	71280							
				Tota					100256				16338	46320		1:0.4
		i	56	192	2	21504	2							43008		
	X9Y9-	ii	56	185	0.75					7770	2.25	17483	17483		Center	
II year	OP	iii	56	180	6	60480	2	120960	120960						portion of	
		iv	70	161	6	67620	2	135240	135240						Block-IV	
		1		Tota					256200				17483	43008		1:0.1
		i	58	192	2	22272	2							44544		
			2.25	18107	18107		Southern									
III Year	OP	iii	58	180	6	62640	2	125280	125280						side of Block-	
		iv	58	161	6	56028	2	112056	112056						IV	
				Tota			1 -		237336				18107	44544		1:0.1
		l	21	192	2	8064	2							16128		
	X9Y9-	li 	21	185	0.75					2914	2.25	6556	6556			
	OP	iii	21	180	6	22680	2	45360	45360							
		iv	21	161	6	20286	2	40572	40572					04044		
	V0V0 I	- I	121	66	2	15972	2			5007	0.05	10100	40400	31944		
	X8Y8-KL	II	114	63	0.75	20700		05400	05400	5387	2.25	12120	12120		Southern	
IVYear		iii	109 76	60 83	5 2	32700 12616	2	65400	65400					25232	side of Block-	
	V7V7 I/I	::				12010	2			4440	2.25	0045	0245	25232	IV	
	X7Y7-KL	iii	69 64	80 77	0.75	24640	2	49280	49280	4140	2.25	9315	9315			
		 	52		5 2	8736	2	49200	49200					17470		
	X6Y6-IJ	l ii	45	84 78	0.75	0/30				2633	2.25	5923	5923	17472		
	70 t 0-13	iii	40	78	6	17520	2	35040	35040	2033	2.23	5923	39 2 3			
		III	40	Tota		1/520		33040	235652				33914	90776		1.0.0
		·	101	84	2	16968	2		233032				33914	33936	Plook	1:0.3
V Year	X6Y6-IJ	ii	101	78	0.75	10900				5909	2.25	13294	13294	33830	3936 Block- III,Southern	
v real	∧0 i 0-iJ	iii	101	78	6	44238	2	88476	88476	2909	2.25	13294	13294		side of Block-	1.0 4
		III	101	13	U	44230		004/0	004/0						SILLE OF DIOCK-	1:0.1

MP& PMCP Pudupalayam Limekankar & Limestone Deposit

	iv	122	54	6	39528	2	79056	79056						IV & II	
	٧	105	36	3	11340	2	22680	22680							
	i	27	44	2	2376	2							4752		
X5Y5-	ii	20	37	0.75					555	2.25	1249	1249			
GH	iii	15	31	6	2790	2	5580	5580							
GH	ii	58	85	0.75					3698	2.25	8319	8319			
	iii	52	79	5	20540	2	41080	41080							
	•		Tot	al=		•		195792				14543	38688	•	
Grand Total					1025236				100384	263336		1:0.25			

Table - 24
Summary of Yearwise [1st year to 5th year]

	Lim	estone	Lin	nekankar			
Year	ROM (Ts)	Limestone @ 100% Recovery (Ts)	ROM (Ts) Limekankar @ 100% Recovery (Ts)		Topsoil (Ts)	Ore to Overburden ratio	
l Year	100256	100256	16338	16338	46320	1;0.46	
II Year	256200	256200	17483	17483	43008	1;0.16	
III Year	237336	237336	18107	18107	44544	1;0.18	
IV Year	235652	235652	33914	33914	90776	1;0.38	
V Year	195792	195792	14543	14543	38688	1;0.26	
Total	1025236	1025236	100384	100384	263336	1;0.26	

b) Indicate year-wise tentative Excavation in Cubic Meters indicating development, ROM, pit wise as in table below:

I. Insitu Tentative Excavation:

Table-25

		Total tentative excavation (Cum)				ROM ir	n (Cum)	
Year	Pit No.	Limestone	Limekankar	Topsoil (Cum)	SB/IB (Cum)	Recoverable Reserves @100% of Limestone (cum)	Recoverable Reserves @100% of Limekankar (cum)	Ore to Overburden ratio
1	2	3	4	5	6	7	8	9
1st Year		50128	7262	23160	-	50128	7262	1;0.46
2nd Year		128100	7770	21504	-	128100	7770	1;0.16
3rd Year	-	118668	8048	22272	-	118668	8048	1;0.18
4 th Year		117826	15073	45388	-	117826	15073	1;0.38
5th Year		97896	6464	19344		97896	19344	1;0.26
Total		512618	44617	131668	-	512618	44617	1;0.26

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

Formerly the applied area where two dumps with a dump of dimensions Dump-1 [65m \times 80m \times 6m(h)] and Dump-2 [79m \times 50m \times 5m(h)] are present was belonging to M/s. The Ramco Cements Ltd., now it has been declared that area is for M/s. Tancem and the dumps situated in the northern side of the area caused by M/s. The Ramco Cements Ltd., will be re-handled by them self as per the agreement.

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.

c) Enclose Individual year wise development plans and sections showing pit layouts, dumps, stacks of mineral reject, if any, etcin 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.VAto 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.VAto VE1).

Extent of Mechanization:

Excavators are proposed for the formation of benches and loading. Rock breaker is proposed for development activities.

Table - 27

Туре	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

T	ype	Nos.	Size/Capacity	Make	Motive power	H.P
Ta	urus	6	20tonnes	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	04.02.7	04.02.7
2.	Dump	02.12.4	04.19.4	04.19.4
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	00.50.0	00.50.0
8.	Areas under plantation	Nil	04.41.5	04.41.5
9.	Un utilized area	21.22.6	10.16.4	10.16.4
10.	Total	23.35.0	23.35.0	23.35.0

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. <u>Exploration:</u>

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 datasare furnished below:

Table-30

No. of Diamond drills	Depth of Diamond drills (m)	Depth of deposition	Strata
		55.00m - 53.00m	Topsoil
PPM-6	16.15	53.00m - 52.25m	Kankar
		52.25m - 47.25m	Limestone
		55.00m - 53.00m	Topsoil
PPM-13	7.75	53.00m - 52.25m	Kankar
		52.25m - 47.25m	Limestone
		55.00m - 53.00m	Topsoil
PPM-12	17.75	53.00m - 52.25m	Kankar
		52.25m - 37.25m	Limestone
		55.00m - 53.00m	Topsoil
PD/6-3	17.75	53.00m - 52.25m	Kankar
		52.25m - 37.25m	Limestone
		55.00m - 53.00m	Topsoil
PPM-14	9.75	53.00m - 52.25m	Kankar
		52.25m - 45.25m	Limestone
		55.00m - 53.00m	Topsoil
PPM-7	7.75	53.00m - 52.25m	Kankar
		52.25m - 47.25m	Limestone
		55.00m - 53.00m	Topsoil
PD/7-3	14.75	53.00m - 52.25m	Kankar
		52.25m - 40.25m	Limestone
		55.00m - 53.00m	Topsoil
PD/7-3	14.75	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:

7.75m [2.0m Topsoil + 0.75m Limekankar + 5m Limestone (proved 111)]	North
8.75m [2.0m Topsoil + 0.75m Limekankar + 6m Limestone (proved 111)]	East
17.75m [2.0m Topsoil + 0.75m Limekankar + 15m Limestone (probable 222)]	South & West

Proposed to be carried out:

As per the UNFC guidelines, the applicant has proposed to carry out the exploration program during the first year 13 Core drills (PBh-1 to PBh-13) 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.

During the mining plan period, the mining operations are proposed to be carried out in the Ist year Northern side of Block-IV, IInd and IIIrd year is proposed in progress to southern side of the Block-IV, IVth year is proposed continuously Block IV, III & II and Vth 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 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 37.25m. Please refer Plate Nos. VA to VE1.

i) Recovery of ROM:

The area applied for mining lease consists of 23.35.0 Ha, after leaving 7.5m, 10m & 50mboundary barrier only 18.06.4 Ha could be mined. Out of this only 04.02.7Ha is proposed for an optimum depth of maximum 17.75m from RL 55.0m to RL 37.25mhas 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 i	mineral reserves ROM	Limestone	Limekankar	
UNFC 111 (re-assessed on 05.08.2019)	1066316 Ts	108704 Ts	
Proposed a	nnual production ROM	205047 Ts	20077 Ts	
Anticipated	life of the mine	1066316 /205047	108704 /20077	
Anticipated	life of the mine	5.0 years	5.0 years	
No. of work	ing days in a year	30	0 Days	
Average Me	enthly production Minorals	205047/12	20077/12	
Average MC	onthly production Minerals	17087	1673	
Anticipated	Daily production of Minerals	17087/25	1012/25	
Anticipateu	Daily production of Millerais	683.48Ts	66.92 Ts	
No of work	ing hours per day	8.00 AM to 5.00 PM with		
NO. OF WORK	ing nours per day	1 hour lunch interval (12 Pm To 1 Pm)		
Total no. of labours to be engaged			13	
OMS	Daily production of Minerals	683.48 Ts	66.92 Ts	
UNS	No. of workers	13	13	
	OMS =	52.57 Ts	5.14 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 No. IV& IVA for geological plan and sections.

The ultimate pit dimensions will be as under:

Table -33

Dimensions	Present		Size of pit after five years				Ultimate pit dimensions at the end of life of the mine				
Size	size of pit	Pit-1	Pit-2	Pit-3	Pit-4	Pit-5	Pit-1	Pit-2	Pit-3	Pit-4	Pit-5
Length (m)	-	58	155	120m	180	66	58	155	120	180	66
Width (m)	-	37	85	150	195	93	37	85	150	195	93
Depth (m)	-	8.75	17.75	7.75	14.75	7.75	8.75	17.75	7.75	14.75	7.75

Please refer Plate No. IX& IXA.

ii) <u>Disposal of waste:</u>

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.

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.

Proposed generation of waste for first Five Years:

Table-34

Year	Limestone	Limekankar	Topsoil	Ore to
Tear	ROM (Ts)	ROM (Ts)	(Ts)	Overburden ratio
l Year	100256	16338	46320	1;0.46
II Year	256200	17483	43008	1;0.16
III Year	237336	18107	44544	1;0.18
IV Year	235652	33914	90776	1;0.38
V Year	195792	14543	38688	1;0.26
Total	1025236	100384	263336	1;0.26

Dimension of the waste dumps during the present mining plan period:

Dimension of the dumps at the end of the I Year:

Table-35

Existing Dump-1 (from adjacent Mine lease area)	65m X 80m X 6m(h)	North
Existing Dump-2 (from adjacent Mine lease area)	79m X 60m X 5m(h)	North
Proposed Topsoil Temporary Dump-3	60m X 70m X 5.5m(h)	Northwest

Dimension of the dumps at the end of the IIYear:

Table-36

Existing Dump-1 (from adjacent Mine lease area)	65m X 80m X 6m(h)	North
Existing Dump-2 (from adjacent Mine lease area)	79m X 60m X 5m(h)	North
Proposed Topsoil Temporary Dump-3	60m X 70m X 10.6m(h)	Northwest

Dimension of the dumps at the end of the III Year:

Table-37

Existing Dump-1 (from adjacent Mine lease area)	65m X 80m X 6m(h)	North
Existing Dump-2 (from adjacent Mine lease area)	79m X 60m X 5m(h)	North
Proposed Topsoil Temporary Dump-3	60m X 70m X 15.9m(h)	Northwest

Dimension of the dumps at the end of the IV Year:

Table-38

Existing Dump-1 (from adjacent Mine lease area)	65m X 80m X 6m(h)	North
Existing Dump-2 (from adjacent Mine lease area)	79m X 60m X 5m(h)	North
Proposed Topsoil Temporary Dump-3	60m X 70m X 26.7m(h)	Northwest

Dimension of the dumps at the end of the V Year:

Table-39

Existing Dump-1 (from adjacent Mine lease area)	65m X 80m X 6m(h)	North
Existing Dump-2 (from adjacent Mine lease area)	79m X 60m X 5m(h)	North
Proposed Topsoil Temporary Dump-3	60m X 70m X 31.3m(h)	Northwest

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	1025236	100384	263336

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 Northwestern portion of the area and also utilized for Afforestation purposes.

Dimension of dumps during the end of the life of the mine:

Table-41

Existing Dump-1 (from adjacent Mine lease area)	65m X 80m X 6m(h)	North
Proposed Topsoil Temporary Dump-2	60m X 76.3m X 31.3m(h)	Northwest
Proposed Bund	163m x 15m x 9.7m(h)	Northeast

The waste does not consists any toxic substance in the form of solid, liquid andgas.

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.

b) 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 17.75m from RL 55.0m to RL 37.25m. 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 37.25m]

c) 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 leaseas 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 2,63,336 Ts of topsoil would be generated during the present plan period is proposed to be dumped on the Northwestern 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 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.

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.

V	Topsoil (cum)		Mineral rejects (cum)				
Year	Reuse / spreading	Storage	Backfilling	Storage	Blending	Beneficial	
I Year	23160	-	-	-	-	-	
II Year	21504	-	-	-	-	-	
III Year	22272	-	-	-	-	-	
IV Year	45388	-	-	-	-	-	
V Year	19344	-	-	-	-	-	
Total	131668	-	-	-	-	-	

Table-41A

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:

Formerly the applied area where two dumps with a dump of dimensions Dump-1 [65m X 80m X 6m(h)] and Dump-2 [79m X 50m X 5m(h)] are present was belonging to M/s. The Ramco Cements Ltd., now it has been declared that area is for M/s. Tancem and the dumps situated in the northern side of the area caused by M/s. The Ramco Cements Ltd., will be re-handled by them self as per the agreement.

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.

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 and then backfill 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 & Limestoneis not for sale. The mined Limekankar & Limestoneisproposed 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:

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.

The details of proposed employment are given below:

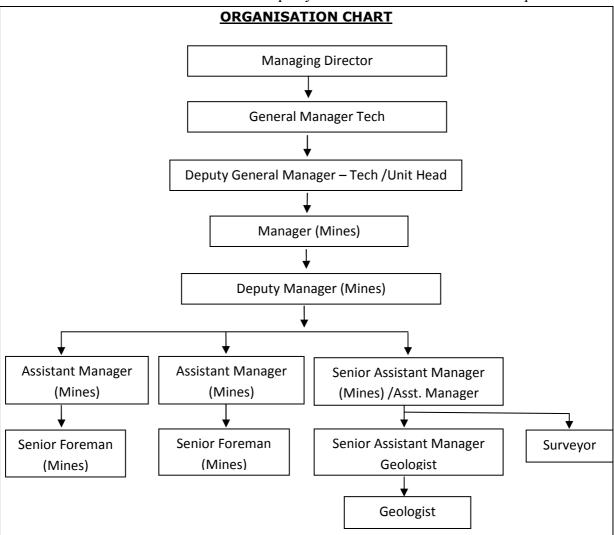
Table -43

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

	Tabic	· !!			
	Description	Lime	stone	Limeka	nkar
Average Minera year for the firs	al Production expected per t five years	205	5047 Ts	200	077 Ts
No. of days like	ly to be worked		300 (days	
Average Minera UNFC 111 for i	al production per day under nsitu deposit	480	6.28 Ts	66	.92 Ts
OMS =	Daily Production in Ts	683.49	= 52.57 Ts	66.92	= 5.14 Ts
	No. of Workers	13	- 52.57 18	13	- 5.14 18



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 aplain 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

	Table 15	
S.No	Description	Present Area (Ha)
1	Mining	Nil
2.	Dump	02.12.4
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	21.22.6
10.	Total	23.35.0

(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. Nakkankuzhi Eriis 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 NABLlaboratory.

(iv) Noise Level & Vibration Levels (Due To Blasting):

The noise producing sources are the tipperthat 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 upto42°C in summer and falls down to 27°C 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 about1.4kmsSouthwest 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

SI. No.	Name of Hamlets	Distance in Km	Population	Direction
1	Reddipalayam	3.6	4150	NE
2	Periyathirukkonam	3.5	2750	SE
3	Pudupalayam	1.4	3650	SW
4	Periyanagalur	2.7	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 Additional Area Present Area at the end of required during the S.No Description mining plan period Area Mining Plan Period(Ha) (Ha) (Ha) [Ist year to Vth year] 04.02.7 Mining Nil 04.02.7 1 2. 02.12.4 04.19.4 04.19.4 Dump Office & infrastructure 00.05.0 3. Nil 00.05.0 4. Processing plant Nil Mineral stack processing yard Nil 5. Sub grade mineral stacks Nil 6. 7. Mine roads Nil 00.50.0 00.50.0 Nil 04.41.5 04.41.5 8. Areas under plantation Un utilized area 21.22.6 10.16.4 9. 10.16.4 23.35.0 10. Total 23.35.0 23.35.0

(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 NABLlaboratory.

(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:

Nakkankuzhi Eri 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 37 persons in the various categories as skilled/semiskilled/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 : 04.02.7 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 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. 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 Northwestern 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 andhence, 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 $[1^{st} year]$.

Summary of Yearwise Proposal

Table-48

.,	5	Table-46		
Items	Details	Proposed	Actual	Remarks
	Area afforested			
	(ha)			
	No of saplings			
Dump	planted	Afforestation is not	Not	Since it is an active dump.
Management	Cumulative no of	proposed on the	carried	Hence the afforestation is
Management	plants	Dump	out	not proposed on the dump
	Cost including			
	watch and care			
	during the year			
	Area available for			
	rehabilitation (ha)			
	Afforestation			In the present plan period
	done(ha)			only the depth will be
	No of saplings			enhanced. Hence the
	planted in the year	Rehabilitation an	N1.1	worked out benches used for
Management of	Cumulative no of	afforestation is not	Not	movement of men and
worked out	plants	proposed on the	carried out	machineries. After the mine
benches	Any other method	worked out benches		reached it ultimate pit limit,
	of rehabilitation			the worked out benches will be reclaimed and re- habitation will be carried out.
	(specify)			
	Cost including			
	watch and care			
	during the year			
	Void available for			
	Backfilling (L x B x			
	D) pit wise /stope			Backfilling, reclamation and
	wise			
	Void filled by waste			rehabilitation is not proposed
Reclamation and	/tailings	There is no proposal	Not	in the present plan period. It
Rehabili-tation by	Afforestation on the	for reclamation and	carried	will be carried out at the end
backfilling	backfilled area	rehabilitation		of the life of the mine when
	Rehabilitation by			the mine reaches its ultimate
	making water			pit limit.
	reservoir			F
	Any other means			
	(specify)			
	Area available (ha)	0.88.3 ha		
	` '	0.88.3 ha –	Will be	
Rehabili-tation of	Area rehabilitated	980Neem saplings	Carried	Afforestation cost
waste land within		Green Belt	out as	Rs.98,000/-
lease	Method of	Development	per .	
	rehabilitation	(Afforestation)	proposal	
Others (specify)	-	-	_	-
Janoro (opcony)				

Environmental monitoring (core zone & buffer zone)

Air quality (Rs. / sample)	Water quality (Rs. / sample)	Noise (Rs. /	Ground vibration (Rs. /
Sumple)		area)	area)
2500	2500	2500	2500

The information on protective measures for reclamation and rehabilitation works during the period $[2^{nd} \ year]$.

Summary of Yearwise Proposal

Table-50

Dump Management of Management of Worked out benches Management of Worked out benches Reclamation and Rehabili-tation of Rehabilitation and afforestation is not proposed on the Dump Not carried out worked out benches of the worked out benches of the worked out benches out of the worked out benches out of the proposed on the Dump Not carried out out of the proposed of the worked out benches out of the proposed of the worked out benches out out of the proposed of the worked out benches out of t	Itome	Details	Proposed	Actual	Remarks
Dump Management of Management of worked out benches Management of worked out benches Reclamation and Rehabili-tation by backfilling Making water reservoir Any other method of Rehabilitation of Packfilling Water available for any other method of relabilitation of Rehabilitation of Rehabilitation of Area available (ha) Area available for rehabilitation (ha) Afforestation and Afforestation is not proposed on the Dump Afforestation is not proposed on the worked out benches Afforestation and afforestation is not proposed on the worked out benches out worked out benches worked out benches worked out benches out worked out benches worked out benches out worked out	Items		Proposed	Actual	Remarks
Dump Management Dump Management					
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waste land within Groop Bolt Out as De 98 000/		Motherdof			Rs.98,000/-
Dovolonment	lease		Development		
rehabilitation (Afforestation) proposal		renabilitation		proposal	
Others (specify)	Others (specify)	-	-	-	-

Environmental monitoring (core zone & buffer zone)

Air quality (Rs. / sample)	Water quality (Rs. / sample)	Noise (Rs. /	Ground vibration (Rs. /
sample)		area)	area)
2500	2500	2500	2500

The information on protective measures for reclamation and rehabilitation works during the period $[3^{rd}$ year].

Summary of Yearwise Proposal

Table-52

Dump Management Dump Management Comulative no of plants Cost including watch and care during the year Area available for rehabilitation (ha) No of saplings planted Odne(ha) No of saplings watch and care during the year Area available for rehabilitation (ha) Afforestation Odne(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 Afforestation on the backfilled area Rehabilitation by making water reservoir Any other means (specify) Afforestation and rehabilitation Replacement of worked out benches 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 rehabilitation will be carried out. There is no proposal for reclamation and rehabilitation reclamation and rehabilitation shall make a planted Afforestation is not proposed on 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 rehabilitation will be carried out. Backfilling, reclamation and rehabilitation is not proposed on the worked out benches will be reclaimed out 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 out and rehabilitation will be carried out. Backfilling, reclamation and rehabilitation is not proposed on the worked out benches will be renamed. Hence the worked out benches worked out benches will be carried out. Not carried out. Not carried out. In the present plan pactiod. It is not proposed. Not carried out worked out benches out after the mine reached it ultimate out after the mine reached it ultimate out after the mine reached it	Itomo	Details	Dropood	A otuo!	Domarka
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Reclamation and Rehabili-tation by backfilling Rehabilitation by backfilled area Rehabilitation by making water reservoir Any other means (specify) Reclamation and /tailings There is no proposal for 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 reaches its ultimate pit limit. 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 reaches its ultimate pit limit.					
Reclamation and Rehabilitation by backfilling Rehabilitation by backfilled area Rehabilitation by making water reservoir Any other means (specify) There is no proposal for reclamation and rehabilitation And 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.		D) pit wise /stope			
Reclamation and Rehabilitation by backfilling Backfilled area Rehabilitation by making water reservoir Any other means (specify) There is no proposal for reclamation and rehabilitation Proposal for reclamation Proposal f					
Rehabili-tation by backfilling Rehabilitation by Backfilled area Rehabilitation by making water reservoir Any other means (specify) Afforestation on the backfilled area rehabilitation for reclamation and rehabilitation out of the life of the mine when the mine reaches its ultimate pit limit.					
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Rehabilitation by making water pit limit. reservoir Any other means (specify)	Rehabili-tation by	Afforestation on the		carried	
making water pit limit. reservoir Any other means (specify)		backfilled area	rehabilitation	out	of the life of the mine when
reservoir Any other means (specify)		Rehabilitation by			the mine reaches its ultimate
Any other means (specify)		making water			pit limit.
(specify)		reservoir			
		Any other means			
		(specify)			
Area available (ha) 0.88.3 ha Will E		Area available (ha)	0.88.3 ha	\A/:II I= =	
Rehabili-tation of Area rehabilitated 0.88.3 ha – 980 Carried Carried	Dehabili totion of	Aroa robabilitatad	0.88.3 ha – 980		
Neem sanlings Aftorestation cost		Area renabilitated	Neem saplings		Afforestation cost
waste land within Groon Bolt Out as Pe 98 000/-		Mathadaf			Rs.98,000/-
Dovolonment	lease		Development		
rehabilitation (Afforestation) proposal		renabilitation		proposal	
Others (specify)	Others (specify)	-	-	-	-

Environmental monitoring (core zone & buffer zone)

Air quality (Rs. / sample)	Water quality (Rs. / sample)	Noise (Rs. /	Ground vibration (Rs. /
Sample)		area)	area)
2500	2500	2500	2500

The information on protective measures for reclamation and rehabilitation works during the period [4^{th} year].

Summary of Yearwise Proposal

Table-54

Items	Details	Proposed	Actual	Remarks
Dump Management	Area afforested (ha) No of saplings planted Cumulative no of plants Cost including watch and care during the year	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
Management of worked out benches	Area available for rehabilitation (ha) 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	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 rehabitation will be carried out.
Reclamation and Rehabili-tation by backfilling	Void available for Backfilling (L x B x D) pit wise /stope wise Void filled by waste /tailings Afforestation on the backfilled area Rehabilitation by making water reservoir Any other means (specify)	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.
Rehabili-tation of waste land within lease	Area available (ha) Area rehabilitated Method of rehabilitation	0.88.3 ha 0.88.3 ha – 980 Neem saplings Green Belt Development (Afforestation)	Will be Carried out as per proposal	Afforestation cost Rs.98,000/-
Others (specify)	-	-	-	-

Environmental monitoring (core zone & buffer zone)

Air quality (Rs. / sample)	Water quality (Rs. / sample)	Noise (Rs. /	Ground vibration (Rs. /
Sumple)		area)	area)
2500	2500	2500	2500

The information on protective measures for reclamation and rehabilitation works during the period $[5^{th}$ year].

Summary of Yearwise Proposal

Table-56

Itoma	Dotoilo	Dropood	A of col	Domarka	
Items	Details	Proposed	Actual	Remarks	
	Area afforested				
	(ha)				
	No of saplings	A			
Dump	planted	Afforestation is not	Not	Since it is an active dump.	
Management	Cumulative no of	proposed on the	carried	Hence the afforestation is	
	plants	Dump	out	not proposed on the dump	
	Cost including				
	watch and care				
	during the year				
	Area available for				
	rehabilitation (ha)				
	Afforestation			In the present plan period	
	done(ha)			only the depth will be	
	No of saplings			enhanced. Hence the	
Management of	planted in the year	Rehabilitation an	Not	worked out benches used for	
worked out	Cumulative no of	afforestation is not	carried	movement of men and	
benches	plants	proposed on the	out	machineries. After the mine reached it ultimate pit limit, the worked out benches will be reclaimed and rehabitation will be carried out.	
belleties	Any other method	worked out benches	Out		
	of rehabilitation				
	(specify)				
	Cost including				
	watch and care				
	during the year				
	Void available for		Not carried out		
	Backfilling (L x B x				
	D) pit wise /stope				
	wise			Backfilling, reclamation and	
	Void filled by waste			rehabilitation is not proposed	
Reclamation and	/tailings	There is no proposal for reclamation and rehabilitation		in the present plan period. It	
Rehabili-tation by	Afforestation on the			will be carried out at the end	
backfilling	backfilled area			of the life of the mine when	
	Rehabilitation by			the mine reaches its ultimate	
	making water			pit limit.	
	reservoir				
	Any other means				
	(specify)				
	Area available (ha)	0.88.3 ha	Will be Carried out as per proposal		
Rehabili-tation of	n of Area rehabilitated	0.88.3 ha – 980			
waste land within lease		Neem saplings		Afforestation cost	
	Method of	Green Belt		Rs.98,000/-	
lease	rehabilitation	Development			
	TEHADIIIALIUH	(Afforestation)			
Others (specify)	-	=	-	-	

Environmental monitoring (core zone & buffer zone)

Air quality (Rs. / sample)	Water quality (Rs. / sample)	Noise (Rs. /	Ground vibration (Rs. /
Sumple)		area)	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. There is no proposal for Stabilisation & Rehabilitation of dumps				
В)	Stabilisation & Rehabilitation of dumps					
C)	Rehabilitation of barren area within lease	i)	Afforestation (Green land building on boundary barrier)	4.41.5 ha	4900 saplings	Rs.4,90,000/-
		ii)	Others – watchman		Nil	

Table-59

Ī	Air quality (Rs. /	Water quality (Rs. /	Noise (Rs. /	Ground vibration
	sample)	sample)	area)	(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

Tuble 00					
	Air Quality	Water Quality	Noise	Ground	
Year	Sampling	Sampling	Monitoring	vibration	Total (Rs.)
	(Rs.)	(Rs.)	(Rs.)	test (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.4,90,000/-= 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.14,90,000/-=

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 eternal 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 facture 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 assement 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.

- a. Notice to be served to all concerned authority.
- b. The mining pit area shall be covered by temporary fencing.
- c. Watchman will be posted round the clock to prevent any unauthorized or inadvertent entry of public.
- d. Works on stabilization of dumps to provided vegetal cover would be taken up.
- e. Construction of garland or retaining walls around the dumps will be attempted.
- f. Watering of plants in the afforested area will be considered.
- g. All safety precautions shall be taken care off as per rule.

Financial Assurance:

Table indicating the break-up of areas in the Mining Lease for calculation of Financial Assurance under Rule 27 of MCDR-2017:

Table-61

SI. 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	04.02.7	04.02.7	-	04.02.7
2.	Storage for top soil	Nil	Nil	Nil	-	Nil
3.	Waste dump site	02.12.4	04.19.4	04.19.4	-	04.19.4
4.	Mineral storage	Nil	-	-		-
5.	Infrastructure -	Nil	00.05.0	00.05.0	-	00.05.0
	workshop,	Nil	-	-	-	-
	administrative	Nil	•	•	-	-
	building etc.	Nil	-	-	-	-
6.	Roads	Nil	00.50.0	00.50.0	-	00.50.0
7.	Railways	Nil	•	•	-	-
8.	Green Belt	Nil	04.41.5	04.41.5		04.41.5
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	02.12.4	10.16.4	10.16.4	-	10.16.4

The mining lease area put to use for mining and allied activities is about 10.16.4 Ha. The financial assurance for 10.16.4 hectares at the rate of Rs. 3,00,000/- per ha works out to Rs. 30,49,200/-.

Hence, the financial assurance in the form of Bank Guarantee for Rs. 30,49,200/-(Rupees Ten lakhs 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.,

Geology and Mining Ariyalur.

Place: Salem
Date: 25.09.2019



தமிழ்நாடு சிமைண்ட 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:

PART-B

9.0 Certificates/ Undertakings/Consents

CONSENT LETTER/ UNDERTAKING/ CERTIFICATE FROM THE

APPLICANT

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

 The Mining Plan in respect of Pudupalayam Limekankar & Limestone deposit over an area of 23.35.0Ha, 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, Advaitha 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.

 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 சிமைண்ட் 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:

3.

4.

5.

Date:

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 23.35.0Ha. 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.

"The provisions of Mines Act, Rules and Regulations made there under have been observed in the Mining Plan over an area of 23.35.0Ha 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".

I T.Ravichandran, Deputy General Manager (Technical)/Unit Head and Authorized signatory of M/s. Tamilnadu Cements Corporation Ltd., of the fresh area applied for Mining Lease vide Precise area communication letter No. 3392/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 23.35.0Ha 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 23.35.0 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.,

Daym -

Place: Salem

Date: 25.09.2019

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ANNEXURE-I

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 23.35.0 hectares in S.F.Nos: 222/1, 222/2A, 225, 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. 3992/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. 3392/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 where 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]

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. 04329 228531

Telephone Number Fax 04329 228776

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 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 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.

Detail	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 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:

ıa	n	

No. of Diamond drills	Depth of Diamond drills (m)	Depth of deposition	Strata				
	, ,	55.00m - 53.00m	Topsoil				
PPM-6	16.15	53.00m - 52.25m	Kankar				
		52.25m - 47.25m	Limestone				
		55.00m - 53.00m	Topsoil				
PPM-13	7.75	53.00m - 52.25m	Kankar				
		52.25m - 47.25m	Limestone				
		55.00m - 53.00m	Topsoil				
PPM-12	17.75	53.00m - 52.25m	Kankar				
		52.25m - 37.25m	Topsoil Kankar Limestone Topsoil				
		55.00m - 53.00m	Topsoil				
PD/6-3	17.75	53.00m - 52.25m	Kankar				
		52.25m - 37.25m	Limestone				
		55.00m - 53.00m	Topsoil				
PPM-14	9.75	53.00m – 52.25m Kankar					
		53.00m - 52.25m Kankar 52.25m - 45.25m Limestone					
		55.00m - 53.00m	Topsoil				
PPM-7	7.75	53.00m - 52.25m	Kankar				
		52.25m - 47.25m	Limestone				
		55.00m - 53.00m	Topsoil				
PD/7-3	14.75	53.00m - 52.25m	Kankar				
		52.25m - 40.25m	Limestone				
		55.00m - 53.00m	Topsoil Kankar Limestone Topsoil				
PD/7-3	14.75	53.00m - 52.25m	Limestone Topsoil Kankar Limestone Topsoil Kankar Limestone Topsoil Kankar				
		52.25m - 40.25m					

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 were calculated based on the drilled core drill data, adjacent mine pit, nallahas, 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:

7.75m [2.0m Topsoil + 0.75m Limekankar + 5m Limestone (proved 111)]	North
8.75m [2.0m Topsoil + 0.75m Limekankar + 6m Limestone (proved 111)]	East
17.75m [2.0m Topsoil + 0.75m Limekankar + 15m Limestone (probable 222)]	South & West

Proposed to be carried out:

As per the UNFC guidelines, the applicant has proposed to carry out the exploration program during the first year 13 Core drills (PBh-1 to PBh-13) 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.11.

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) : 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

b. <u>Geo-physical prospecting in the way of vertical electrical sounding:</u>

Geophysical survey in the form of vertical electrical sounding (VES), has been conducted in the area applied for 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. <u>Geo-chemical prospecting:</u>

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)	50.12	46.24
Magnesium Oxides (MgO)	0.28	0.48
Iron (Fe ₂ O ₃)	1.01	0.99
Alumina as (Al ₂ O ₃)	0.81	1.35
Silica (SiO ₂)	8.78	14.03
Loss of Ignition (LOI)	36.12	36.67
Calcium as CaCo₃	89.47	62.54
Magnesium as MgCo ₃	0.59	1.00
Lime saturation Factor	1.65	1.05

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 – V & VA.

d. <u>Technological prospecting:</u>

The deposit is a uniform grade. Based on the four 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 four 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:

Thirteen core drills (Pbh-1 to Pbh-13) of 60m (d) each are proposed to be carried out in the first year of 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	13 nos. [Core drills] – each 60m (d)	100m	Core drill of depth 60m each (13 X 60m = 780m	1	-

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

								Limestone			Lir	nekankar				
Year	Section	Bench	L in (m)	W in (m)	D in (m)	Volume in (Cu.m.)	BD	ROM	Limestone @ 100% Recovery (Ts)	Volume in (Cu.m.)	BD	ROM	Limekankar @ 100% Recovery (Ts)	topsoil in(Ts)	Location of advancement	Ore to waste ratio
		i	54	58	2	6264	2							12528		
	X10Y10-	ij	51	52	0.75					1989	2.25	4475	4475			
	MN	iii	48	46	6	13248	2	26496	26496						NI - mtla - ma	
I year		IV	40	31	1	1240	2	2480	2480						Northern side of	
i yeai	X9Y9-	i	44	192	2	16896	2							33792	Block-IV	
	OP	ii	38	185	0.75					5273	2.25	11863	11863		DIOCK IV	
	<u> </u>	iii	33	180	6	35640	2	71280	71280							
				Tota					100256				16338	46320		1:0.46
		i	56	192	2	21504	2							43008		
	X9Y9-	ii	56	185	0.75					7770	2.25	17483	17483		Center	
II year	OP	iii	56	180	6	60480	2	120960	120960						portion of	
		iv	70	161	6	67620	2	135240	135240						Block-IV	
	Total=							256200				17483	43008		1:0.16	
	X9Y9- OP	i	58	192	2	22272	2							44544		
Ш		ii	58	185	0.75					8048	2.25	18107	18107		Southern	
Year		iii	58	180	6	62640	2	125280	125280						side of	
ı caı		iv	58	161	6	56028	2	112056	112056						Block-IV	
				Tota		T		T	237336				18107	44544		1:0.18
		i	21	192	2	8064	2							16128		
	X9Y9-	ii	21	185	0.75					2914	2.25	6556	6556			
	OP	iii	21	180	6	22680	2	45360	45360							
		iv	21	161	6	20286	2	40572	40572							
	X8Y8-	i	121	66	2	15972	2							31944		
	KL	ii	114	63	0.75					5387	2.25	12120	12120		Southern	
IVYear		iii	109	60	5	32700	2	65400	65400						side of	
	X7Y7-	i	76	83	2	12616	2							25232	Block-IV	
	KL	ii	69	80	0.75					4140	2.25	9315	9315		2.00	
		iii	64	77	5	24640	2	49280	49280							
		i	52	84	2	8736	2							17472		
	X6Y6-IJ	ii	45	78	0.75					2633	2.25	5923	5923			
		iii	40	73	6	17520	2	35040	35040							
		1		Tota					235652				33914	90776		1:0.38
V Year	X6Y6-IJ	i	101	84	2	16968	2							33936	Block-III,	1:0.19

	ii	101	78	0.75					5909	2.25	13294	13294		Southern	
	iii	101	73	6	44238	2	88476	88476						side of	
	iv	122	54	6	39528	2	79056	79056						Block-IV & II	
	٧	105	36	3	11340	2	22680	22680							
	i	27	44	2	2376	2							4752		
X5Y5-	ij	20	37	0.75					555	2.25	1249	1249			
GH	≔	15	31	6	2790	2	5580	5580							
GH	:=	58	85	0.75					3698	2.25	8319	8319			
	∷	52	79	5	20540	2	41080	41080							
Total=						195792				14543	38688				
Grand Total						1025236				100384	263336		1:0.25		

Table-7 Summary of Yearwise [1st year to 5th year]

	Lime	estone	Lin	nekankar		
Year	ROM (Ts)	Limestone @ 100% Recovery (Ts)	ROM (Ts)	Limekankar @ 100% Recovery (Ts)	Topsoil (Ts)	Ore to Overburden ratio
I Year	100256	100256	16338	16338	46320	1;0.46
II Year	256200	256200	17483	17483	43008	1;0.16
III Year	237336	237336	18107	18107	44544	1;0.18
IV Year	235652	235652	33914	33914	90776	1;0.38
V Year	195792	195792	14543	14543	38688	1;0.26
Total	1025236	1025236	100384	100384	263336	1;0.26

5.0 Mining 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 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 Northeast and Centre portion of the area applied for mining lease starting from South and progress towards the Northern side 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 37.25m. Please refer Plate Nos. VA to VE1.

The proposed average annual production Limestone will be 2,05,047 tonnes and Limekankar will be 20,077 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 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.

The topsoil generated is proposed to be dumped in the Northwestern side of the area applied for mining lease and 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 all along the 7.5m, 10m & 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 1.4 kms west 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 0.56km 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
2	Nearest Town (D.H)	Ariyalur	NW	10
3	Nearest Police Station	Thelur	NE	5.4
4	Nearest Govt. Hospital	Poyyur	SW	5
5	Nearest School	Reddipalayam	NE	3.6
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	253

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:

a) Environmental impact assessment (EIA) studies/environmental (EMP):

(i) 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 dentritic pattern.

(ii) 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.

(iii) 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.

(iv) 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.

(v) Water quality:

Ground water in this area and the surrounding wells are potable and within the drinking water standards.

(vi) Historical and Monuments:

There are no Public Buildings or Places or National Monuments near the area.

(vii) 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.

(viii) 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.

(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/semiskilled/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.

b) Environment Management Plan:

(i) Temporary storage and utilization of topsoil:

The topsoil is black cotton soil. It occurs to a depth of 2m. About 2,63,336Ts of topsoil would be generated during the present plan period is proposed to be dumped on the Northwestern 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 17.75m. 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, 10m & 50m boundary barrier to plant 980 neem saplings every year along the boundary barrier 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 %
1 st year	0.88.3	980		7.5m,10m &	3mx3m	80%
2 nd year	0.88.3	980		50m boundary	3mx3m	80%
3 rd year	0.88.3	980	Neem	barrier of the	3mx3m	80%
4 th year	0.88.3	980		area applied for	3mx3m	80%
5 th vear	0.88.3	980	1	mining lease	3mx3m	80%

Table-10

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, 10m and 50m boundary barrier of the area applied for mining lease. Nearly 04.41.5 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 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 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 lease.

Tribal issues, national monuments, etc.:

	There	are	no	triba	l hal	oita	nts in	and	arour	nd the	mine	site,	the	popu	ulatio	ns ar
mostly	agric	ultura	al ba	ased	and	it i	s only	seas	sonal.	There	is no	Publ	ic Bu	ilding	g, Pla	ces o
Worshi	p, Nat	tional	Мо	num	ents	or	Places	of A	Archae	eologic	al inte	rest	near	the	area	withi
2km ra	dius.															

11.0 Economic Evaluation:

The cost of land/Ha is Rs. $6,70,000 \times 23.35.0 \text{ ha.} = 1,56,44,500/-$

The total cost production/ton is Rs. 257.

Total Mineral reserves (proved 111) @ 100% recovery of Limestone will be 7,29,396 Ts.

Total Mineral reserves (proved 111) @ 100% recovery of Limekankar will be 60,726 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. 500000/-

Operating Cost:

Table-11

. 44.6 ==							
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. 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. 222/1, 222/2A, 225, etc., 23.35.0Ha.) 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 No. IV & IVA. (Geological plan and sections).

2. 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:

LIMESTONE LIMEKANKAR Parameter Composition % Composition % Calcium Oxides (CaO) 50.12 46.24 Magnesium Oxides (MgO) 0.28 0.48 0.99 Iron (Fe₂O₃) 1.01 Alumina as (Al₂O₃) 0.81 1.35 Silica (SiO₂) 8.78 14.03 Loss of Ignition (LOI) 36.12 36.67 Calcium as CaCo₃ 89.47 62.54 Magnesium as MgCo₃ 0.59 1.00 Lime saturation Factor 1.65 1.05

Table-1

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.

3. 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. 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:

Thirteen core drills (Pbh-1 to Pbh-13) of 60m (d) each are proposed to be carried out in the first year of the plan period. The proposed exploration program is given in the following table:

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	13 nos. [Core drills] – each 60m (d)	100m	Core drill of depth 60m each (13 X 60m = 780m	-	-				

Table-2

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 in 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)	50.12	46.24	
Magnesium Oxides (MgO)	0.28	0.48	
Iron (Fe ₂ O ₃)	1.01	0.99	
Alumina as (Al ₂ O ₃)	0.81	1.35	
Silica (SiO ₂)	8.78	14.03	
Loss of Ignition (LOI)	36.12	36.67	
Calcium as CaCo₃	89.47	62.54	
Magnesium as MgCo₃	0.59	1.00	
Lime saturation Factor	1.65	1.05	

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 plant and environmental impact assessment (This chapter is discuss in detail in pre-feasibility report which is enclosed annexure – I).

5. 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. 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 13 Core drills (PBh-1 to PBh-13) 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 and second 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 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

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

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 17.75mts with an average of 2.0m topsoil from RL 55.0m to RL 37.25m, 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 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 Northeast and Centre portion of the area applied for mining lease starting from South and progress towards the Northern side 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 37.25m. Please refer Plate Nos. VA to VE1.

The proposed average annual production Limestone will be 2,05,047 tonnes and Limekankar will be 20,077 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 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.

The topsoil generated is proposed to be dumped in the Northwestern side of the area applied for mining lease and 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 all along the 7.5m, 10m & 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 2,63,336 Ts of topsoil would be generated during the present plan period is proposed to be dumped on the Northwestern 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 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

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.

Proposed generation of waste for First Five Years:

Table-4

	Limestone	tone Limekankar		Ore to	
Year	ROM (Ts)	ROM (Ts)	Topsoil (Ts)	Overburden ratio	
l Year	ear 100256 163		46320	1;0.46	
II Year	256200	17483	43008	1;0.16	
III Year	237336	18107	44544	1;0.18	
IV Year	235652	33914	90776	1;0.38	
V Year	195792	14543	38688	1;0.26	
Total	1025236	100384	263336	1;0.26	

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	1025236	100384	263336

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

- 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

Existing Dump-1 (from adjacent Mine lease area)	65m X 80m X 6m(h)	North
Existing Dump-2 (from adjacent Mine lease area)	79m X 60m X 5m(h)	North
Proposed Topsoil Temporary Dump-3	60m X 70m X 5.5m(h)	Northwest

Dimension of the dumps at the end of the II Year:

Table-7

(from adjacent Mine lease area) Proposed Topsoil Temporary Dump-3	60m X 70m X 10.6m(h)	Northwest
Existing Dump-2	79m X 60m X 5m(h)	North
Existing Dump-1 (from adjacent Mine lease area)	65m X 80m X 6m(h)	North

Dimension of the dumps at the end of the III Year:

Table-8

Existing Dump-1 (from adjacent Mine lease area)	65m X 80m X 6m(h)	North
Existing Dump-2 (from adjacent Mine lease area)	79m X 60m X 5m(h)	North
Proposed Topsoil Temporary Dump-3	60m X 70m X 15.9m(h)	Northwest

Dimension of the dumps at the end of the IV Year:

Table-9

Existing Dump-1 (from adjacent Mine lease area)	65m X 80m X 6m(h)	North
Existing Dump-2 (from adjacent Mine lease area)	79m X 60m X 5m(h)	North
Proposed Topsoil Temporary Dump-3	60m X 70m X 26.7m(h)	Northwest

Dimension of the dumps at the end of the V Year:

Table-10

Existing Dump-1 (from adjacent Mine lease area)	65m X 80m X 6m(h)	North
Existing Dump-2 (from adjacent Mine lease area)	79m X 60m X 5m(h)	North
Proposed Topsoil Temporary Dump-3	60m X 70m X 31.3m(h)	Northwest

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 remedical 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 1.4 kms west 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 0.56km Southeast of Trichy – Chidambaran (NH - 277) National Highway Road.

Approximate S. No **Particulars** Location Direction Distance in Km Nearest Post office Siruvalur SW 2.2 2 Nearest Town (D.H) Ariyalur NW 10 3 Nearest Police Station Thelur ΝE 5.4 4 Nearest Govt. Hospital Poyyur SW 5 Reddipalayam 3.6 5 Nearest School NE Nearest DSP Office NW 10 6 Ariyalur 7 Nearest Railway Station Ariyalur NW 10 60 Nearest Airport Trichy SW 9 Nearest Seaport Chennai ΝE 253

Table - 11

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. 500000/-

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 were 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-

No. of Diamond drills	Depth of Diamond drills (m)	Depth of deposition	Strata
			Topsoil
PPM-6	16.15	53.00m - 52.25m	Kankar
		52.25m - 47.25m	Limestone
		55.00m - 53.00m	Topsoil
PPM-13	7.75	53.00m - 52.25m	Kankar
		52.25m - 47.25m	Limestone
		55.00m - 53.00m	Topsoil
PPM-12	17.75	53.00m - 52.25m	Kankar
		52.25m - 37.25m	Limestone
		55.00m - 53.00m	Topsoil
PD/6-3	17.75	53.00m - 52.25m	Kankar
		52.25m - 37.25m	Limestone
		55.00m - 53.00m	Topsoil
PPM-14	9.75	53.00m - 52.25m	Kankar
		52.25m - 45.25m	Limestone
	7.75	55.00m - 53.00m	Topsoil
PPM-7		53.00m - 52.25m	Kankar
		52.25m - 47.25m	Limestone
	14.75	55.00m - 53.00m	Topsoil
PD/7-3		53.00m - 52.25m	Kankar
		52.25m - 40.25m	Limestone
		55.00m - 53.00m	Topsoil
PD/7-3	7-3	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 were calculated based on the drilled core drill data, adjacent mine pit, nallahas, 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:

7.75m [2.0m Topsoil + 0.75m Limekankar + 5m Limestone (proved 111)]	North
8.75m [2.0m Topsoil + 0.75m Limekankar + 6m Limestone (proved 111)]	East
17.75m [2.0m Topsoil + 0.75m Limekankar + 15m Limestone (probable 222)]	South & West

Proposed to be carried out:

As per the UNFC guidelines, the applicant has proposed to carry out the exploration program during the first year 13 Core drills (PBh-1 to PBh-13) 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.11.

a. <u>Geological Mapping (Topographical and Contour map in 1: 1000 Scale):</u>

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) : 586 (max) Width (m) : 326 (max)

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

0.75m Limekankar

Strike direction : N - SDip 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. <u>Geo-chemical prospecting:</u>

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)	50.12	46.24
Magnesium Oxides (MgO)	0.28	0.48
Iron (Fe ₂ O ₃)	1.01	0.99
Alumina as (Al ₂ O ₃)	0.81	1.35
Silica (SiO ₂)	8.78	14.03
Loss of Ignition (LOI)	36.12	36.67
Calcium as CaCo₃	89.47	62.54
Magnesium as MgCo ₃	0.59	1.00
Lime saturation Factor	1.65	1.05

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.

d. <u>Technological prospecting:</u>

The deposit is a small with uniform grade. Based on the four 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 15-27m depth. Based on the four 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:

Thirteen core drills (Pbh-1 to Pbh-13) of 60m (d) each are proposed to be carried out in the first year of 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	13 nos. [Core drills] – each 60m (d)	100m	Core drill of depth 60m each (13 X 60m = 780m	-	-

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 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 Northeast and Centre portion of the area applied for mining lease starting from South and progress towards the Northern side 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 37.25m. Please refer Plate Nos. VA to VE1.

The proposed average annual production Limestone will be 2,05,047 tonnes and Limekankar will be 20,077 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 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.

The topsoil generated is proposed to be dumped in the Northwestern side of the area applied for mining lease and 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 all along the 7.5m, 10m & 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)	50.12	46.24
Magnesium Oxides (MgO)	0.28	0.48
Iron (Fe ₂ O ₃)	1.01	0.99
Alumina as (Al ₂ O ₃)	0.81	1.35
Silica (SiO ₂)	8.78	14.03
Loss of Ignition (LOI)	36.12	36.67
Calcium as CaCo₃	89.47	62.54
Magnesium as MgCo ₃	0.59	1.00
Lime saturation Factor	1.65	1.05

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:

7.75m [2.0m Topsoil + 0.75m Limekankar + 5m Limestone (proved 111)]	North
8.75m [2.0m Topsoil + 0.75m Limekankar + 6m Limestone (proved 111)]	East
17.75m [2.0m Topsoil + 0.75m Limekankar + 15m Limestone (probable 222)]	South & West

Reassessed Mineral Reserves and Resources as per UNFC System as on 05.08.2019 Table-19

A. Mineral Reserves (111)

						Lime	estone			Limel	kankar		
Section	Bench	Length in (m)	Width in (m)	Depth in (m)	Volume in (Cu.m.)	Bulk Density	ROM	Limestone @ 100% Recovery (Ts)	Volume in (Cu.m.)	Bulk Density	ROM	Limekankar @ 100% Recovery (Ts)	topsoil in(Ts)
	j	64	91	2	11648	2							2329
X3Y3-AB	ii	58	85	0.75					3698	2.25	8319	8319	
	iii	52	79	5	20540	2	41080	41080					
			Total	_				41080				8319	23296
	i	27	44	2	2376	2							475
X5Y5-CD	ii	20	37	0.75					555	2.25	1249	1249	
	iii	15	31	6	2790	2	5580	5580					
		_	Total				_	5580				1249	4752
	i	153	84	2	25704	2							5140
	ii	146	78	0.75					8541	2.25	19217	19217	
X6Y6-IJ	iii	141	73	6	61758	2	123516	123516					
	iv	122	54	6	39528	2	79056	79056					
	V	105	36	3	11340	2	22680	22680					
		_	Total				_	225252				19217	51408
	j	76	83	2	12616	2							2523
X7Y7-KL	ii	69	80	0.75					4140	2.25	9315	9315	
	iii	64	77	5	24640	2	49280	49280					
		1	Total	1	•	1		49280				9315	25232
	i	121	66	2	15972	2							3194
X8Y8-KL	ii	114	63	0.75		_			5387	2.25	12120	12120	
	iii	109	60	5	32700	2	65400	65400					
		1	Total			1 -		65400				12120	31944
L	<u> </u>	179	192	2	68736	2							13747
X9Y9-OP	<u>ii</u>	173	185	0.75	101110				24004	2.25	54008	54008	
	iii	168	180	6	181440	2	362880	362880					
	iv	149	161	6	143934	2	287868	287868					
Т		T = .	Total		0004			650748				54008	137472
Ļ	<u> </u>	54	58	2	6264	2			4000	0.05	4475	4.475	1252
X10Y10-MN	ii	51	52	0.75	10016		00.400	00.100	1989	2.25	4475	4475	
	iii	48	46	6	13248	2	26496	26496					
	IV	40	31 Total	1	1240	2	2480	2480				4475	40500
			Total Grand Total					28976 1066316				4475 108704	12528 286632

Table-20

B. Mineral Resources (222) B. Mineral Resources (222)

	-					Lime	estone			Limel	kankar		
Section	Bench	Length in (m)	Width in (m)	Depth in (m)	Volume in (Cu.m.)	Bulk Density	ROM	Limestone @ 100% Recovery (Ts)	Volume in (Cu.m.)	Bulk Density	ROM	Limekankar @ 100% Recovery (Ts)	topsoil in(Ts)
	I	129	182	2	46956	2		` '				` ,	93912
	li	129	182	0.75					17609	2.25	39619	39619	
X2Y2-AB	lii	129	182	6	140868	2	281736	281736					
	lv	129	182	6	140868	2	281736	281736					
	V	129	182	3	70434	2	140868	140868					
			Total					704340				39619	93912
	ı	110	153	2	33660	2							67320
	li	110	153	0.75					12623	2.25	28401	28401	
X4Y4-AB	lii	110	153	6	100980	2	201960	201960					
	lv	110	153	6	100980	2	201960	201960					
	V	110	153	3	50490	2	100980	100980					
			Total					504900				28401	67320
	I	106	83	2	17596	2							35192
	li	106	83	0.75					6599	2.25	14847	14847	
X5Y5-AB	lii	106	83	6	52788	2	105576	105576					
	lv	106	83	6	52788	2	105576	105576					
	>	106	83	3	26394	2	52788	52788					
			Total					263940				14847	35192
	ı	30	31	2	1860	2							3720
	li	30	31	0.75					698	2.25	1569	1569	
X5Y5-CD	lii	30	31	6	5580	2	11160	11160					
	lv	30	31	6	5580	2	11160	11160					
	V	30	31	3	2790	2	5580	5580					
			Total					27900				1569	3720
	I	129	111	2	28638	2							57276
	li	129	111	0.75					10739	2.25	24163	24163	
X1Y1-EF	lii	129	111	6	85914	2	171828	171828					
	lv	129	111	6	85914	2	171828	171828					
	V	129	111	3	42957	2	85914	85914					
			Total					429570				24163	57276
X2Y2-EF	ı	153	100	2	30600	2							61200
∧∠1∠-EF	li	153	100	0.75					11475	2.25	25819	25819	

			Grand Total	al				3840909				186180	441316
			Total		<u> </u>			58410					
A TO T TO-IVIIN	V	55	59	3	9735	2	19470	19470					
X10Y10-MN	lv	55	59	6	19470	2	38940	38940					
•		•	Total				•	104799					
X9Y9-OP	V	181	193	3	104799	1	104799	104799					
•		•	Total	•	•		•	144936					
X8Y8-KL	V	122	66	3	24156	2	48312	48312					1
V0V0 I/I	lv	122	66	6	48312	2	96624	96624					1
		1	Total	-				116424					1
X7Y7-KL	V	77	84	3	19404	2	38808	38808					1
\/7\/7.1/I	lv	77	84	6	38808	2	77616	77616					1
,I_			Total	-				106470					1
X3Y3-AB	V	65	91	3	17745	2	35490	35490					1
\(a\(a\)	lv	65	91	6	35490	2	70980	70980					1
L	<u> </u>		Total	_				49140				2764	6552
	V	18	91	3	4914	2	9828	9828					†
	lv	18	91	6	9828	2	19656	19656					1
X6Y6-GH	 lii	18	91	6	9828	2	19656	19656			1		1
	i	18	91	0.75	02.0	<u>=</u>			1229	2.25	2764	2764	+
	1	18	91	2	3276	2		07 1000				40000	65
	•	277	Total		07100		174210	871080			+	48998	11614
	V	244	119	3	87108	2	174216	174216					+
X313-EF	lv	244	119	6	174216	2	348432	348432					+
X3Y3-EF	<u> </u> ii	244	119	6	174216	2	348432	348432	21///	2.25	40990	40990	+
	li li	244	119	0.75	36072				21777	2.25	48998	48998	1101
		244	10tai 119	2	58072	2		459000				25819	1161
	V	153	100 Total	3	45900	2	91800	91800 459000			+	25819	6120
	lv	153	100	6	91800	2	183600	183600					+
	<u>lii</u>	153	100	6	91800	2	183600	183600			1		

Table-21

C. Mineral Resources locked up in benches (221)

Willeral Nesou	irces locked u	p iii belicii	(221)			Lime	stone			Limel	kankar		
Section	Bench	Length in (m)	Width in (m)	Depth in (m)	Volume in (Cu.m.)	Bulk Density	ROM	Limestone @ 100% Recovery (Ts)	Volume in (Cu.m.)	Bulk Density	ROM	Limekankar @ 100% Recovery (Ts)	topsoil in(Ts)
X3Y3-AB	ii	7	6	0.75				, ,	32	2.25	71	71	
V212-VD	iii	13	12	6	936	2	1872	1872					
			Total					1872				71	
	ii	7	7	0.75					37	2.25	83	83	
X5Y5-CD	iii	13	13	6	1014	2	2028	2028					
X313-CD	iv	28	44	6	7392	2	14784	14784					
	V	28	44	3	3696	2	7392	7392					
			Total					24204				83	
	ii	7	7	0.75					37	2.25	83	83	
X6Y6-IJ	iii	13	13	6	1014	2	2028	2028					
V0 I 0-13	iv	31	32	6	5952	2	11904	11904					
	V	49	50	3	7350	2	14700	14700					
			Total					28632				83	
X7Y7-KL	ii	7	4	0.75					21	2.25	47	47	
∧/ 1 /-NL	iii	13	7	6	546	2	1092	1092					
			Total					1092				47	
X8Y8-KL	ii	7	3	0.75					16	2.25	35	35	
70 I 0-LF	iii	13	6	6	468	2	936	936					
			Total					936				35	
	ii	7	7	0.75					37	2.25	83	83	
X9Y9-OP	iii	13	13	6	1014	2	2028	2028					
	iv	31	31	6	5766	2	11532	11532					
			Total					13560				83	
X10Y10-	ii	4	7	0.75					21	2.25	47	47	
MN	iii	7	13	6	546	2	1092	1092					
IVIIN	iv	15	29	6	2610	2	5220	5220					
			Total					6312				47	
			Grand Tot	al				76608				449	

Table-22

D. Mineral resources locked up in 7.5m & 50m safety distance (221)

	_		Lime	stone		Limekankar				
Area Sq.m	Depth	Volume	Bulk	DOM	Limestone @ 100%	Volume	Bulk	2014	Limekankar @ 100%	Topsoil
	in (m)	in (Cu.m.)	Density	ROM	Recovery (Ts)	in (Cu.m.)	Density	ROM	Recovery (Ts)	in Ts
33270	2	66540	2							133080
33270	0.75					24953	2.25	56143	56143	
33270	15	499050	2	998100	998100					
	Tota	ıl		998100	998100			56143	56143	133080

Table-23

D. Mineral resources locked up in 7.5m & 50m safety distance (222)

		-	Lin	nestone		Limekankar				
Area Sq.m	Depth in (m)	Volume in (Cu.m.)	Bulk Density	ROM	Limestone @ 100% Recovery (Ts)	Volume in (Cu.m.)	Bulk Density	ROM	Limekankar @ 100% Recovery (Ts)	Topsoil in Ts
21225	0.75					15919	2.25	35817	35817	-
21225	15	318375	2	636750	636750					-
	T	otal		636750	636750			35817	35817	-

Table-24

Summary of Reserves & Resources

Description	Section	ROM (Ts)	Limestone @ 100% Recovery (Ts)	ROM (Ts)	Limekankar @ 100% Recovery (Ts)	Topsoil (Ts)
	X3Y3-AB	41080	41080	8319	8319	23296
	X5Y5-CD	5580	5580	1249	1249	4752
	X6Y6-IJ	225252	225252	19217	19217	51408
A Mineral Becoming (111)	X7Y7-KL	49280	49280	9315	9315	25232
A. Mineral Reserves (111)	X8Y8-KL	65400	65400	12120	12120	31944
	X9Y9-OP	650748	650748	54008	54008	137472
	X10Y10-MN	28976	28976	4475	4475	12528
	Total	1066316	1066316	108704	108704	286632
B. Mineral Resource	es (222)	3840909	3840909	186180	186180	441316
C. Mineral Resources locked u	p in benches (221)	76608	76608	449	449	449
D. Mineral resources locked	221	998100	998100	56143	56143	133080
up in 7.5m & 50m safety	222	636750	636750	35817	35817	
distance	Total	1634850	1634850	91960	91960	133080

The Mineral reserves still available in this mine would be 10,66,316 tonnes of Limestone and 1,08,704 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)	1066316 Ts	108704 Ts
Proposed annual production ROM	205047 Ts	20077 Ts
Antisianta di lifa afitha maina	1066316 /205047	108704 /20077
Anticipated life of the mine	5.0 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

			Additional Area	
		Present	required during the	Area at the end of
S.No	Description	Area	Mining Plan	mining plan period
		(Ha)	Period(Ha)	(Ha)
			[I st year to V th year]	
1	Mining	Nil	04.02.7	04.02.7
2.	Dump	02.12.4	04.19.4	04.19.4
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	00.50.0	00.50.0
8.	Areas under plantation	Nil	04.41.5	04.41.5
9.	Un utilized area	21.22.6	10.16.4	10.16.4
10.	Total	23.35.0	23.35.0	23.35.0

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 : 23.35.0 Ha

S.F.Nos. : 222/1, 222/2A, 225, 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.3392/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 Limited,
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.222/1, 222/11A etc., – Pudupalayam Village – Ariyalur Taluk and District – Over an extent of 24.20.0 hectares of patta & Government Poramboke lands- Precise Area – Communicated – Approved Mining Plan and Environment Clearance Certificate – Requested – Regarding.

Ref:-

- Mining lease application of Tamil Nadu Cements Corporation Ltd, dated 08.06.2018.
- From the District Collector, Ariyalur Letter Rc.No.163/G&M/2018, dated 7.3.2019.
- From the Director of Geology and Mining Lr.Rc.1642/MM1/2019, dated 16.03.2019.

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 24.20.0 hectares in S.F.Nos.222/1, 222/2A, 223, 233/16 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 23.35.0 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

[P.T.O]

Rules, 1960 in favour of Tvl. TANCEM vide G.O.(Ms) No.921, Industries (M2) Department, dated 25.8.1986, after deleting 0.85.0 hectares of Government 1.0.1 in S.F.Nos. 223 (0.22.0), 233/16 (0.19.0), 224 (0.11.0), 232 (0.33.0) which are classified as footpath. The TANCEM owned patta lands in 232 (0.33.0) which are classified as footpath. The TANCEM owned patta lands in 232 (0.33.0) which are classified as footpath. The TANCEM owned patta lands in 232 (0.33.0), 222/1 (3.04.0), 222/2A (1.14.5), 222/11A (0.59.0) 225 (3.30.0), 226/1A (3.01.5), 226/7 (0.27.5), 227/1 (2.55.5), 233/1 (2.14.5), 236/1A (2.04.5), 236/9 (0.78.0), 239 (4.46.0) are not compact and contiguous. Hence, 23.04.5), 236/9 (0.78.0), 239 (4.46.0) are not compact and contiguous. Hence, 23.04.5) are requested for relaxation under section 6 (1)(c) of the Mines and 24.04.5) Minerals (Development and Regulation) Act, 1957 in view of huge requirement of 25.04.5) limestone for your Cement factory and also in the interest of Mineral 26.05.10 conservation.

- In view of the justification putforth, 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 23.35.0 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.
 - Since, the applied area is not compact and contiguous, the relaxation of the State Government under section 6 (1) (C) of MMDR Act, 1957 is granted.
 - c. The applicant company shall provide 50 meters safety distance to the tiled shed with low tension power line situated in S.F.No.283/8A in the western side of the applied area of S.F.No. 222/2A.
 - d. The applicant company shall provide 10 meters safety distance to the footpath situated in S.F.No.228/2A from north to south in the eastern side of S.F.No. 225...
 - e. The applicant company shall provide 10 meters safety distance to the footpath situated in Government land in S.F.No.223, 224, 232, 233/16, 238 & 281.
 - f. The applicant company shall provide 50 meters safety distance to the low tension power line passing from east to west in S.F.No.283/8A in the western side of the applied area of S.F.No. 222/2A.

[P.T.O]

g. The applicant company shall provide 50 meters safety distance to the low tension power line passing from north to south direction in the south western corner of applied area of S.F.No.236/1A and also in the eastern side of S.F.No.275/1,2 & 278/16C.

h. The applicant company shall provide 50 meters safety distance to the low tension power line passing in S.F.No.326/2C of Reddipalayam village from east to west direction in the eastern

side of applied area in S.F.No.227.

 The applicant company shall provide 50 meters safety distance to Nakkankuzhi lake situated in S.F.No.235 in the northern side of the applied area in S.F.No.236/1A.

j. The applicant company shall provide and maintain a safety

distance of 7.5 meters to the adjoining patta lands.

k. 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.

I. Environmental Clearance shall be obtained from the competent

authority before the grant of mining lease.

m. The applicant company shall obtain necessary clearance from the Tamil Nadu Pollution control Board before the commencement of mining operations.

n. The applicant company shall submit latest mining due clearance

certificate before the execution of lease deed.

The estimation of mineral reserves of limestone and lime kankar are as follows:-

SI.No	Details	Limestone	Limekankar
(i) ,	Total area applied for	23.35.0 Hect.	23.35.0 Hect.
(ii)	Area for safety distance	4.37.0 hects.	4.37.0 hects.
(iii)	Area available for exploitation	23.35.0 - 4.37.0 = 18.98.0 or 189800 Square meters	23.35.0 - 4.37.0 = 18.98.0 hects., or 189800 square metres
(iv)	Average depth of persistence	15.00 metres	0.75 metres
(v)	Percentage of recovery	100%	100%

[P.T.O]

(vi)	Inferred reserves of Minerals	Area x Depth x Specific Gravity of mineral			
			189800 x 0.75 x 2.25 x 100 /100 =3,20,288 M.Ts		
(vii)	Grade of Mineral	Suitable for cement manufacturing	Suitable for cement manufacturing		

Yours faithfully,

for Principal Secretary to Government.

Copy to:-

The Director of Geology and Mining, Guindy, Chennai-32.

The District Collector,
Ariyalur.

Tvl. Tamil Nadu Cements Corporation Limited,
Ariyalur Cement Factory,
Ariyalur District.
SF / SC.

ANNEXURE-IIA

NEW MINING LEASE APPLICATION IN PUDUPALAYAM VILLAGE

(PUBLIC SECTOR-A GOVERNMENT OF TAMILNADU UNDERTAKING/ML/NON-FOREST/PATTA LANDS/CAPTIVE USE)

(Submitted under section 17 of MMDR Amendment Act 2015)

LOCATION OF THE MINE LEASE APPLIED AREA

EXTENT : 24.20.0 Ha.

MINERAL: LIMESTONE

S.F.NO :222,223,224 etc

VILLAGE: PUDUPALAYAM

TALUK : ARIYALUR

DISTRICT: ARIYALUR

STATE : TAMILNADU



MINE OWNER/APPLICANT

Tvl. Tamilnadu Cements Corporation Ltd.,

(A Government of Tamilnadu Undertaking), Ariyalur Cement Works, II Floor, LLA Buildings, 735, Anna Salai, Chennai-02

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Tamilnadu Cements Corporation Ltd.

(A GOVERNMENT OF TAMILNADU UNDERTAKING)

Corporate Office: L.L.A. Building, No.735, Anna Salai, Chennal-600 002.

Fax: 044-28523991 / Website: www.tancem.com

CIN: U40200TN1976SGC007081

Phone: 28525461

Date: 08-06-2018

28525471

28591735

28525230

Tancem/ACW/Geo/100(3)/PLSM-2/2018

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 24.20.0 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 24.20.0Hectares in S.F.No. 222,223,224 & etc 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

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 CORPILIDL ARIYALUR WORKS ARIYALUR - 921 728



தமிழ்நாடு சிமைண்ட 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:

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 his 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 24.20.0 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 Tancom, Ariyalur Cement Works.

TAMILNADU CEMENT CORPORATION LTD., ARIYALUR CEMENT WORKS ARIYALUR-621 729

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

FORM – I (To be submitted in Triplicate)

at(Place) on (Date) Initial of Receiving Officer. APPLICATION FOR MINING LEASE (See Rule 22 (1) of the Mineral Concession Rules 1960) Dated the To The Principal Secretary to Government, Industries Department, Fort St. George, CHENNAI - 600 009. THROUGH: The District Collector, ARIYALUR. Sir, 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 07.06.2018. 3) The required particulars are given below. i) Name of the applicant with Tamilnadu Cements Corporation. Ltd. complete address, status Ariyalur Cement Works, of the applicant II Floor, L.L.A. Buildings, 735 Anna Salai, ChennaiI - 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 A Government of Tamilnadu company/public company/ undertaking. public sector undertaking/ joint sector undertaking or any other.

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	
(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.	
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			24.20.0 Hectares. (or) 59,77Acres.				
The second secon		n respect of whi	ch Mining	Lease is r	equired		
District	Taluk Villag	Village	Khasara	Plot No.	Extent		
			No.		Patta Lands	Poramboke Lands	Total
					Hec.Are.	Hec.Are.	Hec.Are.
Ariyalur	Ariyalur	Pudupalayam	Details are given in the enclosed Annexur		23.35.0	0.85.0	24.20.0
			Total		23.35.0	0.85.0	24.20.0
(a) Does the area for grant of (b) If not, owner and	ne applicant r which he f Mining lea has he obt d the occi	ained the conse	ghts over polication ant of the land for	Yes. TAN for which relevant	ICEM have s applied for record of pa nd adangal ar	urface right o grant of minin tta, chitta, co	ig lease an
undertaking mining operation, If so the consent of the owner and occupier of the land be obtained in writing and be filed. xi) (a) The situation of the area in respect of			Plans atta	ched			
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
(2) Legal status of the forest (namely reserved, protected, unclassified etc.)	Forest area, hence it is not applicable.
(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.

....4

b) Has already applied for but not granted.	Details are given in the enclosed Annexure.		
c) Being applied for simultaneously	Details are given in the enclosed Annexure.		
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, five 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 600 to 800 Mtrs. width 200 to 300 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) 	
 c) Proposed rate of mineral production when mines fully developed. 	1.0 lakh tonnes per year.
d)Anticipated life of the mines	30 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.	
 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
 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.	TANCEM have a team of qualified and well experienced Geologist and Mining Engineers for mining of limestone in a systematic and scientific way.
	S. PRASAD, Geologist with 6 years of experience in mineral exploration and mining activities.
	K. SENTHILKUMAR, Ist Class Mines Manager's Certificate of Competency issued by the D.G.M.S Experience over 7 years.
	Three A.M (Mines) and sufficient supporting Officers who are professionally qualified and experienced for mining activities are working in TANCEM.

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 constrains 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

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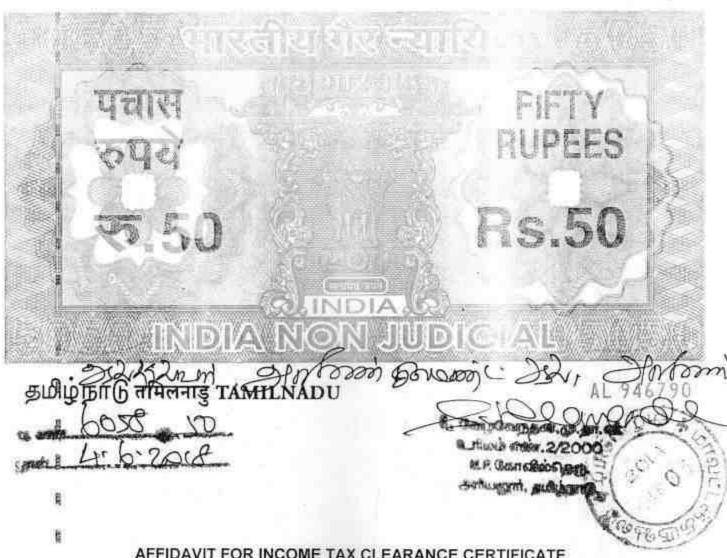
I, T. RAVICHANDRAN, S/o. A. Thangavel, aged 51 years, working as Deputy General Manager (Tech) / Unit Head of M/s. Tamilnadu Cements Corporation Limited, Ariyalur Cement Works, a Government of Tamilnadu undertaking company incorporated under the Companies Act, 1956 (Act 1 of 1956) and having it's Registered Office Tamilnadu Cements Corporation Ltd., L.L.A Building, 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) thefore execution of Mining Lease Deed.

For Tamilnadu Cements Corporation Ltd,
Ariyalur unit

Dy. General Manager (Tech) / Unit Head
UNIT HEAD

TAMINADU CEMENTE CORPORTIO
ARIYALIA MORRIS

R. MANCHARAN, B. Com. B. L.
Advecate & Notary Public,
AREA: Peringal No.
RANGE ARIYALUR - 521 704



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, IInd 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

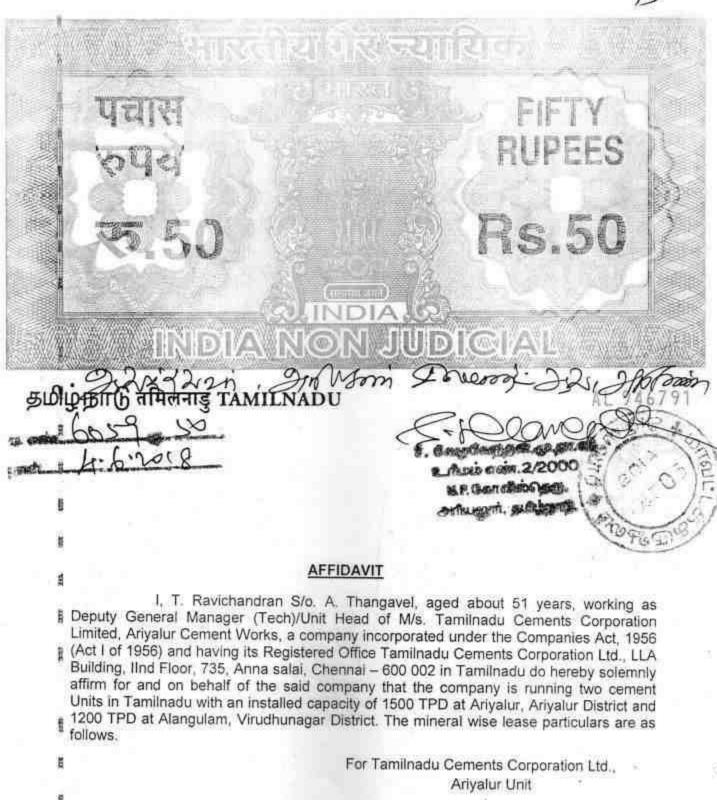
> Dy. General Manager (Tech) Unit Head UNITHEAD

TAMILMADU CEMENTS CORPILLTO. ARIYALUR WORKE ARIYALUR - 521 720

Solemnly attimed and signed before me on at Ariyalur

R.MANOHARAN, B.Com, R.I AREA: Perembalor District Regd No: G.O.M.S. No. 596 | 2002

R.MANOHARAN, B.Com., B.L. Advocate & Notary Public, 34, Periya Aranmani Street. ARIYALUR - 621 704.



Dy. General Manager (Tech)/Unit Head

TAMILNADU CEMENTE CORFN LTD.
ARIYALUR WORKS
ARIYALUR SENTES

Solemnly affirmed and slaned before me on at Ariyalur

R.MANOHARAM,E.Gom.,B.L.,
AREA: Perembalur District
Regd No:
G.O.MS.No.596 / 2002

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R.MANDHARAN, B.Com., B. Advocate & Notary Public, 34, Periya Aranmani Street, ARIYALUR - 621 704.

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TANCEM : ARIYALUR WORKS : ARIYALUR ANNEXURE - I

Regarding Mining Leases:

	Extent	Mineral
(a) Already under Mining Leases	(or) (1.70.0 Hect	Limestone
(b) Area applied for but not yet granted	59.17 Acres (or) 23.95.5 Hect.	Limestone
(c) Being applied for simultaneously	(or) (90.09.5 Hect.	Limestone





UNIT HEAD
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ARYMLUR WORKS.
ARYMLUR - 621 729

JAMILNADU CEMENT CORPORATION LILL.
ARIYALUR CEMENT WORKS
ARIYALUR CEMENT WORKS

MINES MANA

TANCEM: ARIYALUR WORKS: ARIYALUR ANNEXURE - II

Already held under Mining Leases for Ariyalur Unit.

Minerals	Limestone	Limestone	Limestone	Limestone	ctares (or)
Extent in Hectares N	000000	31.70.0 3.86.0 71.96.0 80.77.0 194.29.0	10.16.0 8.49.0 32.48.0 14.98.0 66.11.0	110.68.5	611.70.0 Hectares (or) 1510.91 Acres
District	Ariyalur	Ariyalur	Ariyalur	Ariyalur	
Name of the Village	Kallankurichi Ameenabad Kairulabad	Periyanagalur Ameenabad Kairulabad Kallankurichi	Kurumbanchavadi Ameenabad Kallankurichi Kairulabad	Anandavadi	Grand Total
S.No G.O.No. & Date	G.O.Ms.No.344 Dt. 10-03-1980	G.O.Ms.No.456 Dt. 16-05-1985	G.O.Ms.No.469 Dt. 21-05-1985	G.O.Ms.No.624 Dt. 23-09-1998	
S.No		7	6	4	

TANCEM : ARIYALUR WORKS : ARIYALUR ANNEXURE - III

Already held under Mining Leases for Alangulan Unit.

ct. Minerals	5.5 Limestone 5.0 5.0 5.0 5.0 5.0 5.0 5.0 5.0 5.0 5.0	1.5 Limestone 1.5 Limestone 1.5	3.5 Limestone 3.5 3.0 Limestone 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0	24.32.5 Limestone	.5 Limestone	901.76.0 Hect (or),
Extent in Heat.	233.99.5 176.56.0 9.69.5 420.25.0	1,63.5	113.50.0 57.62.5 3.80.5 76.20.0 11.51.0 6.16.0	24.32	4.91.5 2.64.0 7.55.5	901.76
District	Virudhunagar	Virudhunagar	Virudhunagar	Tirunelveli	Tirunelveli	
Name of the Village	Lakshmipuram Gopalapuram Vadakarai	Alangulam Lakshmipuram	Alangulum Pernaickenpatti Duraisamypuram Edirkottai Naranapuram Lakshmipuram	Pandapalli	Pandapalli Thenmalai	Grand Total
G.O.No. & Date	I. 871/MMD2 Dt.20-08-1990	595/Ind Dt.03-04-1972	427/Ind Dt.19-03-1980	739/Ind Dt.19-07-1980	G.O.3D No.107/Ind Dt.11-07-1997	0
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ARIVALUE - 621 773

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TANCEM: ARIYALUR WORKS: ARIYALUR ANNEXURE – IV

Area applied for but not granted

No	District	Taluk	Villages	Survey No.	Extent (In Hect)	Mineral
	Ariyalur	Arivalur	Pudupalavam	144, 217, 218 & etc	23.95.5	Limeston

Being applied for simultaneously for Ariyalur Unit

No.	District	Taluk	Villages	Survey No.	Extent (In Hect)	Mineral
	Ariyalur	Ariyalur	Pudupalayam	229,230,237 & etc	24,96.0	Limeston
133	Ariyalur	Ariyalur	Pudupalayam	350, 351, 356 & etc	24.13.5	Limestone
				Total	49.09.5	





DETAILS OF LANDS APPLIED FOR NEW MINING LEASE IN PUDUPALAYAM VILLAGE

VILLAGE NAME: PUDUPALAYAM

VILLAGE No. : 47

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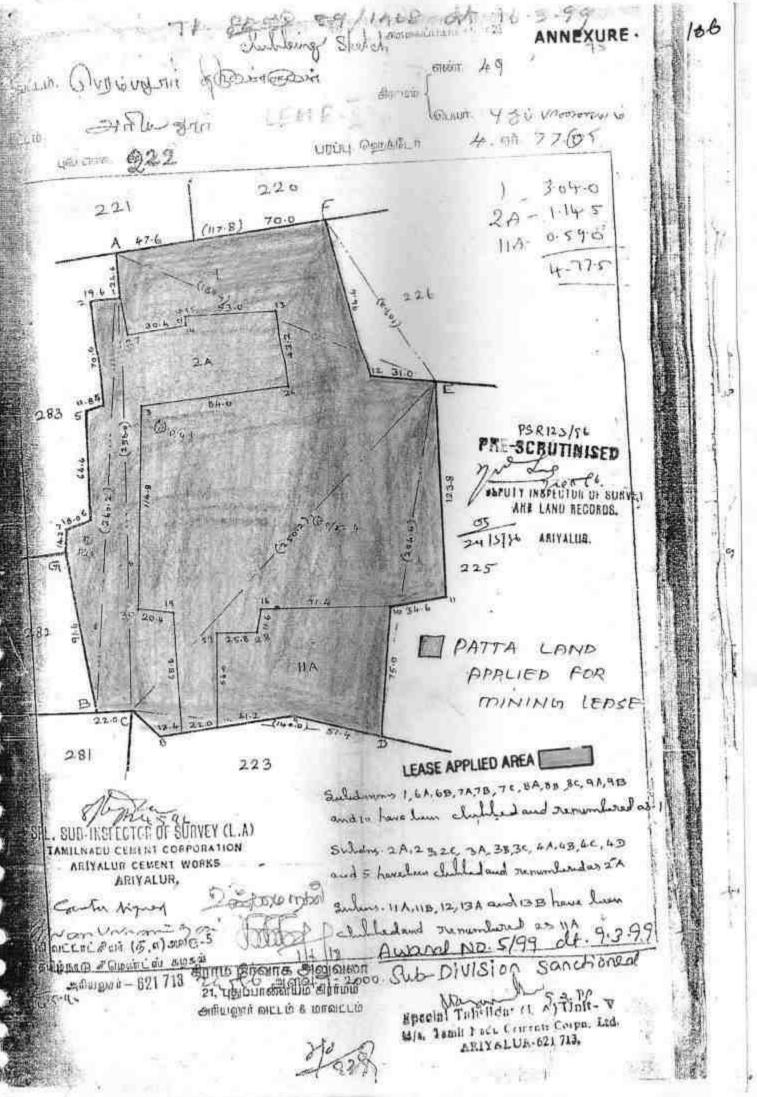
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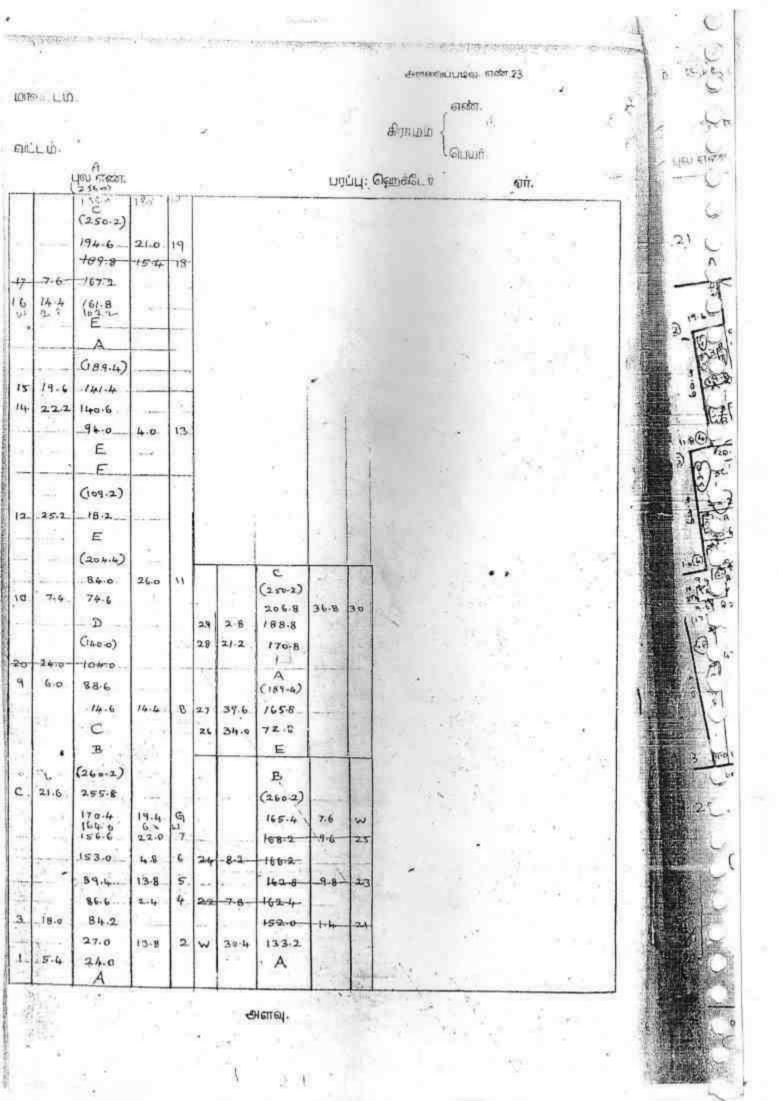
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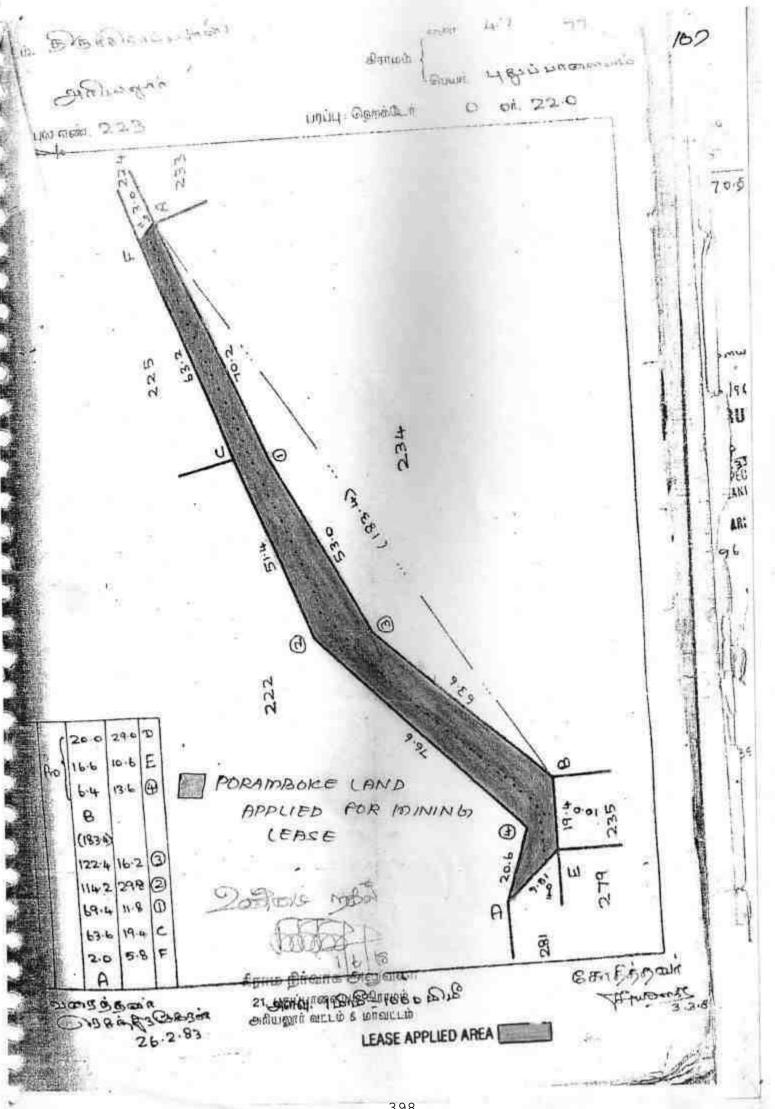
S.No	Survey No.	Sub Division No	Extent (Hec. Ares)	Total S.F. No Extent	Classification
			PATTA LANI	DS	
		1	3.04.0		
1	222	2A	1.14.5	4.77.5	
		11A	0.59.0		Patta Dry
2	225	-	3.30.0	3.30.0	(Patta No:
2	226	1A	3.01.5	3.29.0	1739
3	226	7	0.27.5		Tamilnadu
4	227	1	2.55.5	2.55.5	Cements
5	233	1	2.14.5	2.14.5	Corporation
6	236	1A	2.04.5	2.82.5	Limited)
0	230	9	0.78.0		
7	239		4.46.0	4.46.0	
		Total		23,35.0	
		P(DRAMBOKE L	ANDS	
8	223	:=	0.22.0	0.22.0	Foot Path
9	224	14	0.11.0	0.11.0	Foot Path
10	232	-	0.33.0	0.33.0	Foot Path
11	233	16	0.19.0	0.19.0	Foot Path
			l'otal	0.85.0	
		GRAND TOT	AL	24.20.0	

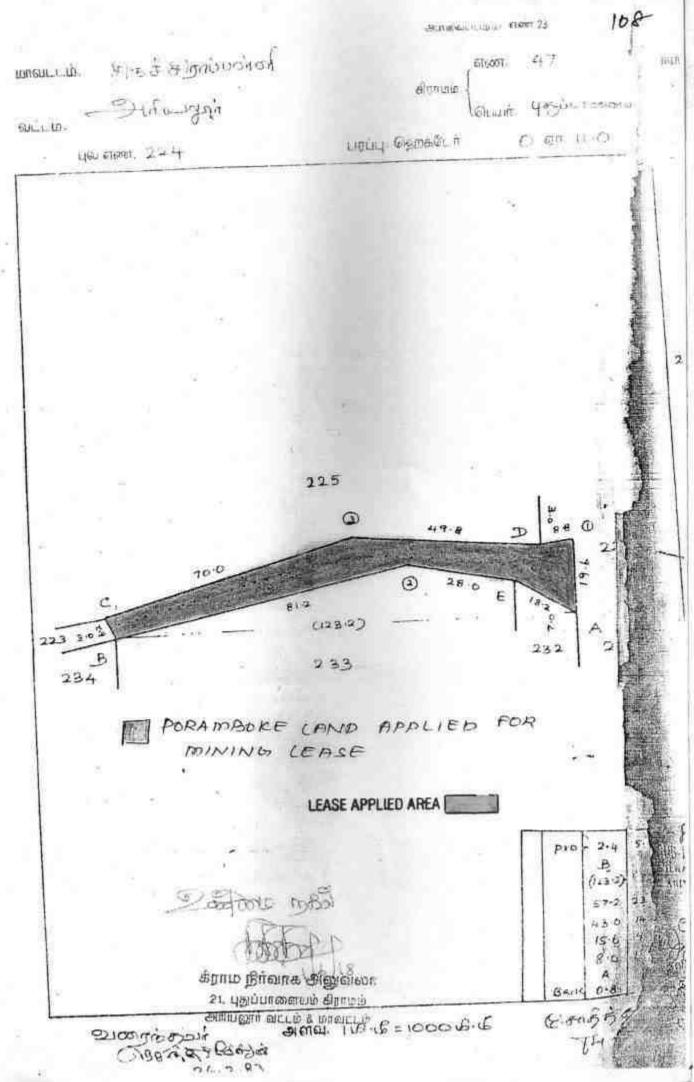


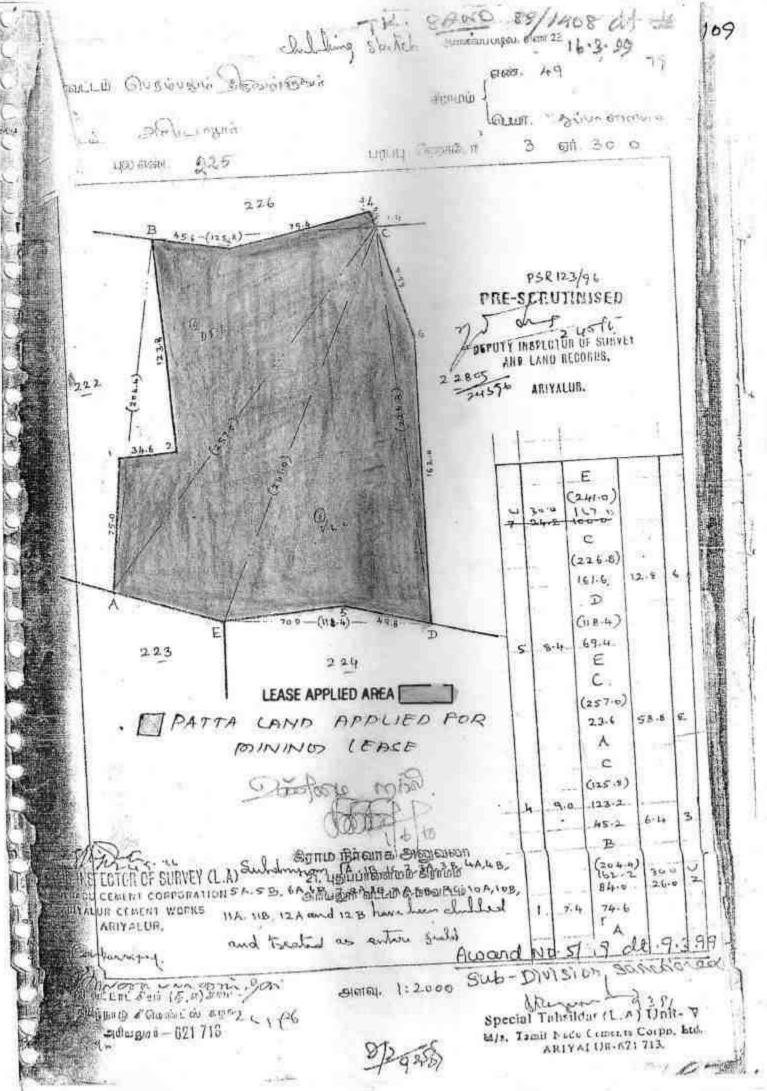
ANNEXURE-III

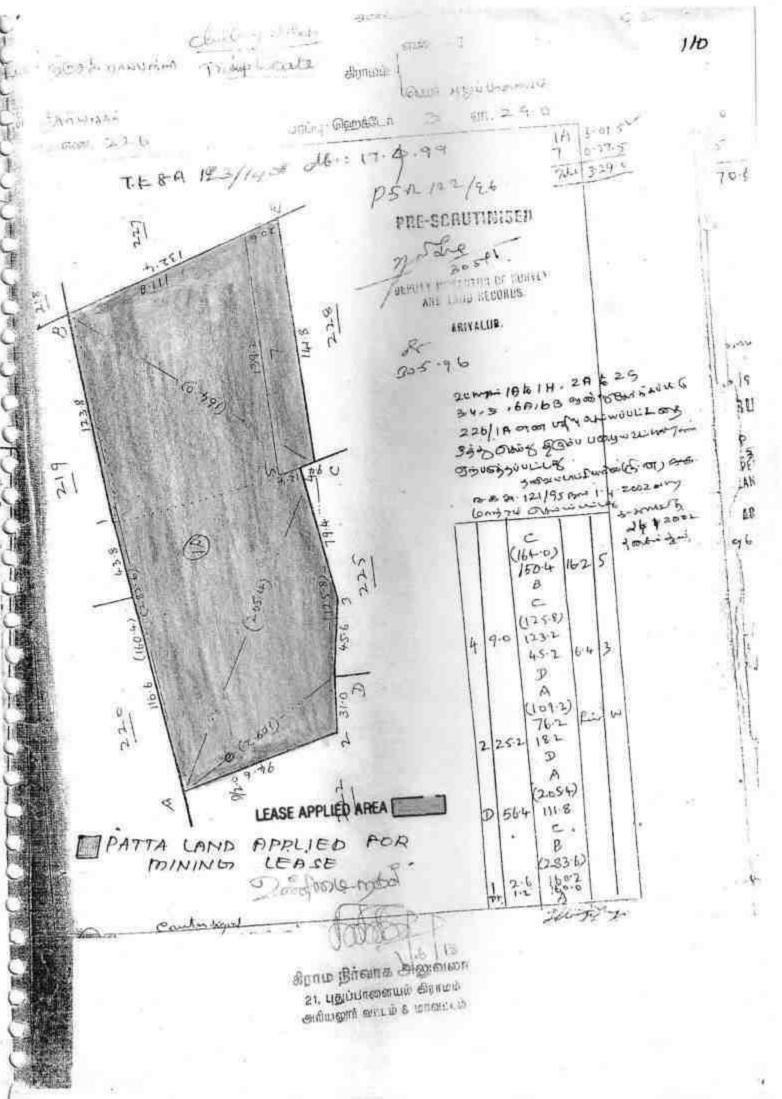


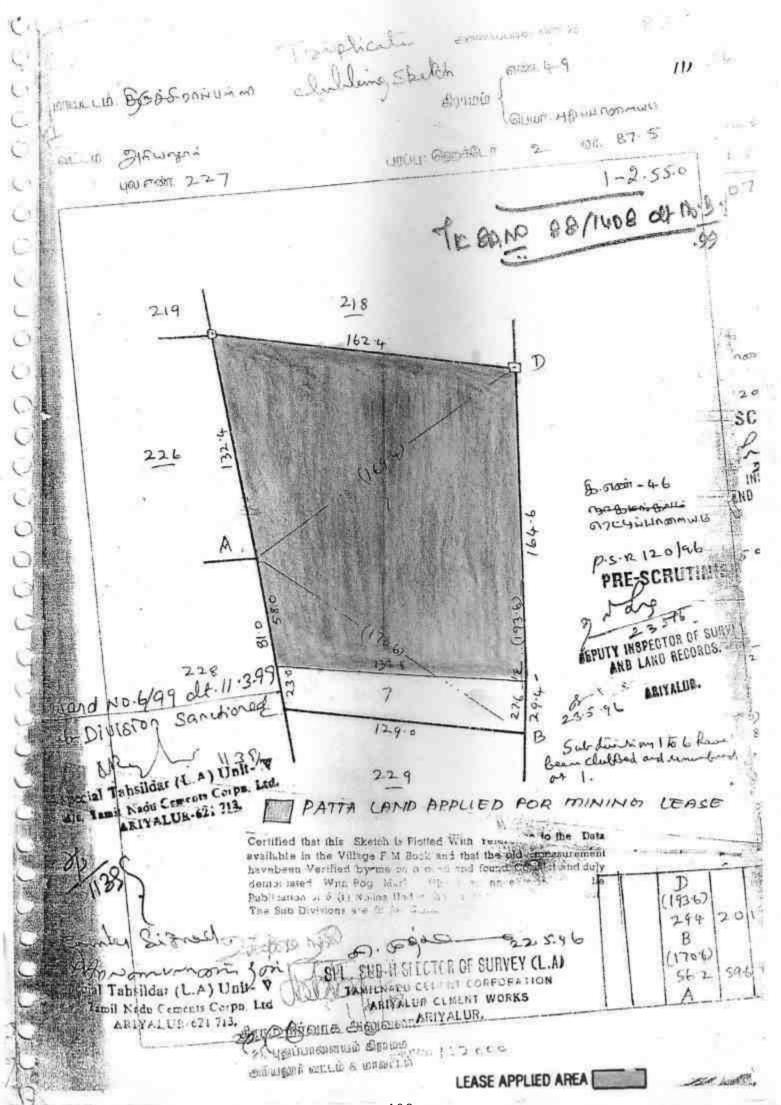


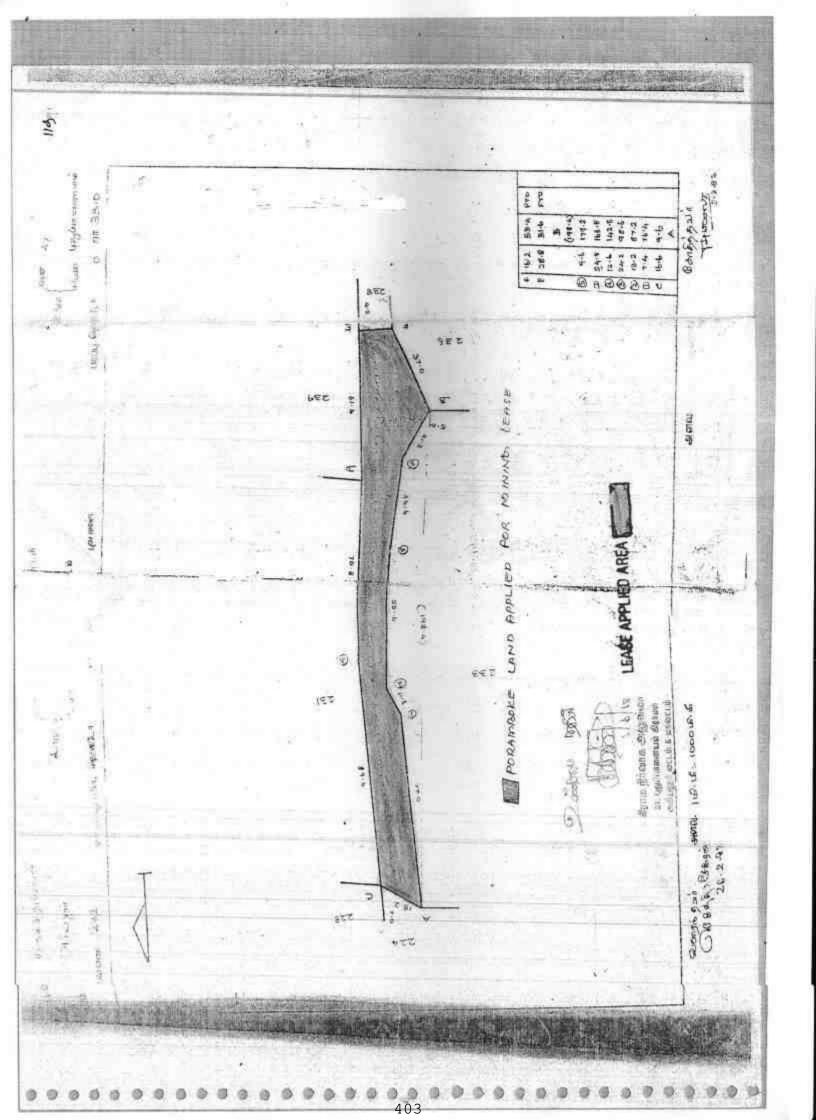




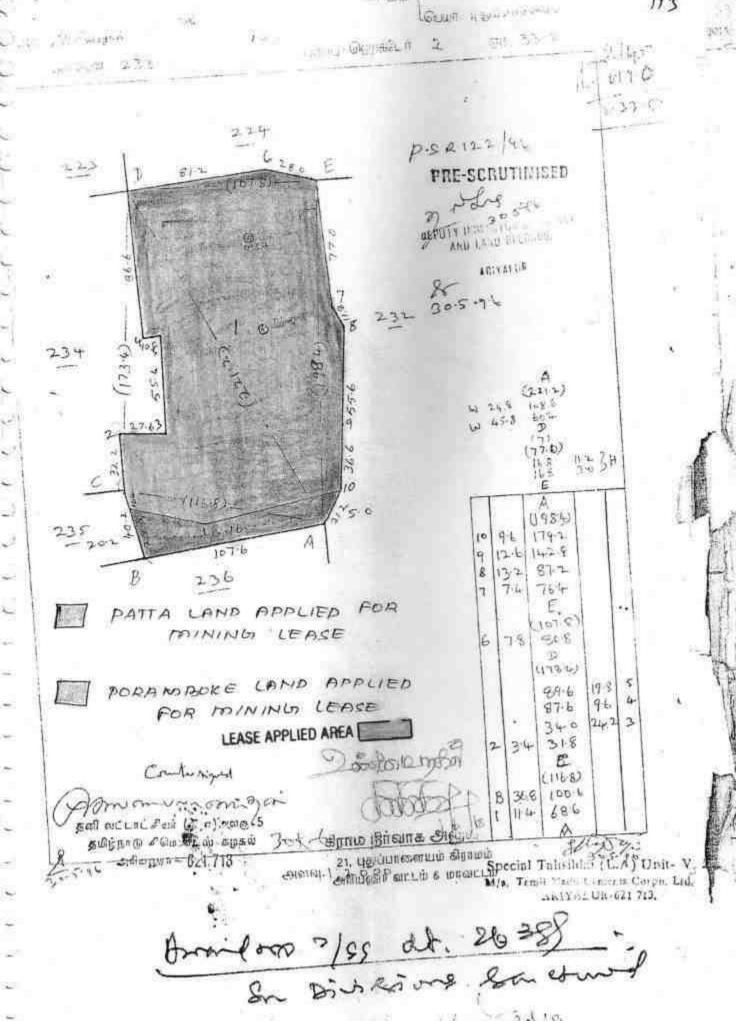








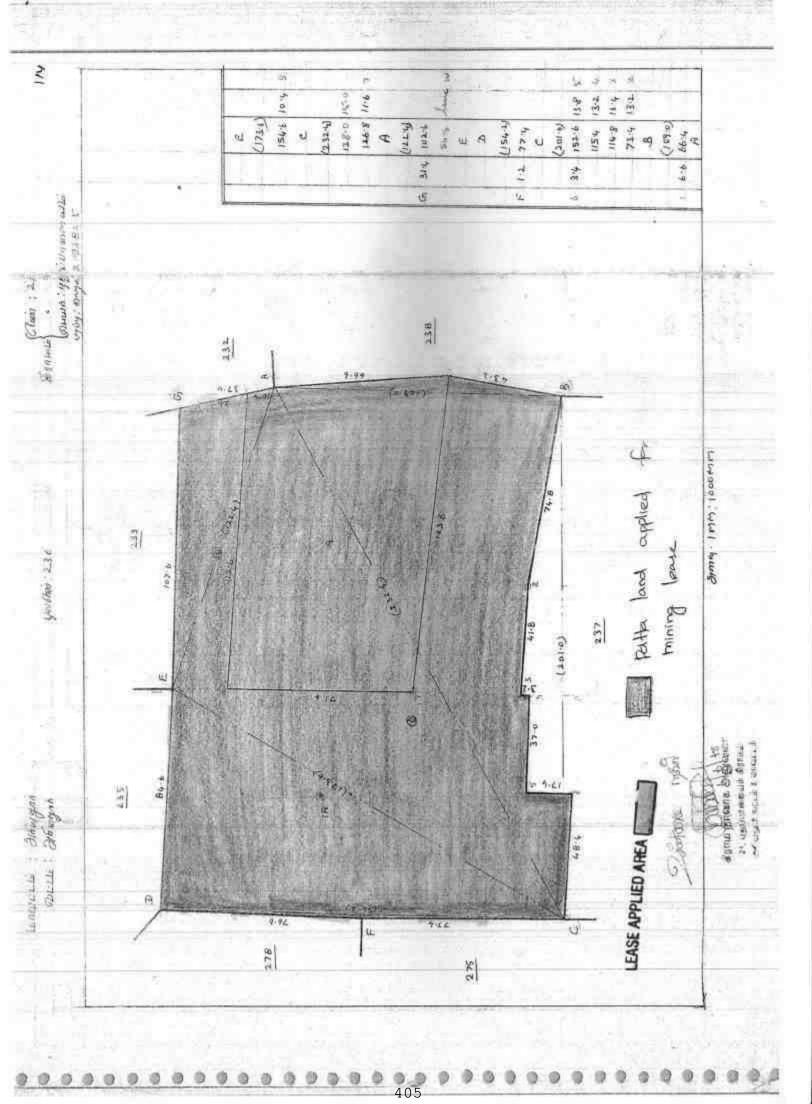




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LDG.

paraga to grangate ere.



to nour Lis : dihugan TSTANT :21 115 yerlm 239 Sonbla DILLE : Johnaysin (o) www. 1/2 bunanmest Uguy 9496 4 96460 230 231 (171-0) 232 3 240 238 187-4 4 18-2 B 244 245 (139.6) 75.0 8.0 A Patta land applied for B (205.0) mining leave 187-2 3.4 A LEASE APPLIED AREA E (171-0) 29.0 860 945 ale hata 51-4 33-2 7.6 3.6 D Honey. IMM: 2000 MM

கிராம் டூர்வாக அலுவலா 21. புதப்பாளையும் கிராம் அரியநார் கட்டம் 5 புதாகமும்

ANNEXURE-IIIA



தமிழக அரசு

வருவாய்த் துறை

நில உரிமை விபரங்கள் : இ. எண் 10(1) பிரிவு

மாவட்டம் : அரியலூர்

வட்டம் : அரியலூர்

வருவாய் திராமம் : புதுப்பாளையம்

பட்டா எண் : 1739

உரிமையாளர்கள் பெயர்

1. அரியதார ... தமிழ்நாடு ஈமெண்ட கழகம

		Demo	derile	புண்டுசம்		மற்ற	(COLE)
		ပ္ပတ္ပပ်ပျ	Bomes	ունու	தர்ளவ	ոգոր	தர்வை
புல எண்	உட்பிரிவு	ஹைக் - ஏர்	ത - അപ	ஹெக் - ஏர்	ത്ര - തവ	ஹெக் - ஏர்	கு - பை
161	6	0 - 1.50	0.17	4	220	***	155
162	20B	0 - 2.00	0.22	45	207		125
161	10	0 - 1,00	0.13	44	990	566	100
161	11	0 - 3,00	0.31		20 03	900	90
161	12	0 - 3.00	0.31		(4 0)	⊕ €0	200
161	13	0 - 5.50	0.61		57	3663	90
161	14	0 - 4.00	0.41	77	**	220	**
161	15	0 - 4.50	0.48	144	- 5	550	**
161	16	0 - 3.00	0.35	- 1	222	***	77.5
161	17	0 - 8.50	0.92	322	322	927	225
161	2	0 - 2.00	0.22	7.64	S84	227	44
161	3	0 - 2.50	0.26		7944		¥35
161	4	0 - 3.00	0.31	-4+	19 19.	***	247
161	5	0 - 2.00	0.22		586	57	200
161	7	0 - 1,50	0.17		***		550
161	9	0 - 3.00	0.31		**	57	**
162	3	0 - 7.50	0.83	2.2	22	77	77
162	10	0 - 6.00	0.66		-	162	22
162	11	0 - 5.50	0.61		-	24	44
162	13A	0 - 5.50	0.60		(44)	599	164
162	138	0 - 5.00	0.54		(**)	194	94
162	14	0 - 5.50	0.61	95		200	7966
162	15	0 - 5.50	0.61		1991	525	000
162	16	0 - 5,50	0.61			375	125
			7. A. 10. C.				

162	4.20	0 - 5.50	0.57	**	100	22	#
102	3(81)	0 = 1.00	0.13	100	844	-	22
162	19	0 - 2.00	0.22	100	(94)	11	-
162	8	0 - 7.50	0.83	(46)	(66)	66	22
162	206	0 - 2.00	0.22	355	(m 	-	
162	200	0 - 2,50	0.28	673	-		b-e-
162	200	0 - 9.00	0.93	-		0.00	
162	20E	0 - 5.00	0.54	122	150	. 	655
162	21	0 - 4.50	0.48	100	10.0	922	752
162	3	0 - 14.50	1.49	900	200	54	334
162	4	0 - 5.50	0.57	4.0	366	44	99
162	G	0 - 5.50	0.61	200	(44)	440	200
162	7	0 - 5,50	0.61	**	••	506	**
162	8	0 - 5.50	0.61	27.0	**	246	-
162	9	0 - 5.50	0.61	229	**	100	
174	4	90 0	546	0 - 14.50	0.45		5153
370	8	59	946	0 - 12.00	0.38	227	223
369	3		(44)	0 - 9.50	0.29	440	-
145	2A		(88)	0 - 51.50	1.78	944	-0.00
145	6	185		1 - 31.00	3.92	96	990
169	1	155	220	0 - 1.50	0.07	900	+
169	3	**	**	0 - 11,50	0.52	-	990
169	-4	160	225	0 - 2.50	0.11	***	***
173	2	322	227	0 - 10.00	0.31	**	576
174	9B	(44	920	0 - 11.00	0.34	227	22
174	9C	(9)	200	0 - 7.00	0.22		44
217	4		## 1	0 - 10.00	0.31	24	94
217	5		55	0 - 33.00	1.03		
219	5C	177		0 - 10.00	0.31	151	***
221	15		77	0 - 14.50	0.67	Litte	155
222	4D	722	22	0 - 16.50	G.50	3.22	1,75
259	ЗA	744	-	0 - 4.50	0.21		300
267	25A		Take 1	0 + 8.00	0.37	740	9.0
267	25B	0.00	294	0 - 12.50	0.57	199	44
369	IA	**	***	3 - 59.00	11.26	:##	544
365	1	**	**	3 - 10.50	9.61	900	1946
365	19	-	255	0 - 2.50	0.08	<u>⊕+</u> ;	386
366	1	77	185	1 - 17.00	3.63	225	366
367	1	**	-	1 - 98.00	6,12	***	199
367	30	W.	22	1 - 98.00	6.12	-	77
368	*	900	144	3 - 13.50	9,78	122	
144	1A	96	7667	2 - 86,00	8,87	-	1000

152	1	-	9+6	0 - 4.00	0.13	1 to	94/
152	11	64	3.6	0 - 9.50	0.43	100	200
152	12	(500)	line.	0 - 9.50	0.45	11	990
152	14A	8.0	0.00	0 - 7.00	0.22	-	880
152	58	-		0 - 4.50	0.21		***
153	1A	1000	172	1 - 84.00	8.56	22	25
155	2	8777	1077	0 - 24.50	1.12	77	20
156	1	***	-	0 - 49.50	2.28		
156	2	100	2+	0 - 61.00	2.82	**	44
156	4	400	**	0 - 4.50	0.21		990
157	136	994	066	0 - 8.50	0.40		3300
157	141		(be	3 - 46,50	16.09	**	2913
159	2	(40.00)	5.00	0 - 9.00	0.28	22	220
161	1	570	155	0 - 93.00	2.86	55	551.
162	5	**	157	0 - 24.00	0.73	77	22
169	11	12	726	0 - 3.00	0.15	\overline{H}	22
169	12		192	0 - 3.00	0.15	27 64	44
169	13	-	(48	0 - 6.00	0.28	ëë	***
169	14A		366	0 + 3.00	0.14	66	
169	14B	**	346	0 - 3.50	0.15	**	***
169	14C	350	325	0 - 3.00	0.14	155	22
169	15A		122	0 - 19.50	0.89	U.S.	7.7
169	158	***	**	0 - 16.00	0.74		-
169	15C	225	227.	0 - 7.50	0.33	192	- 44
169	15D	***	-	0 - 7.50	0.33	246	194
169	15E	943	344	0 - 33.50	1.54	766	D G
169	5	***	-	0 - 2.50	0.11	986	166
169	6A	200 0	100	0 - 2,50	0.11	285	0.00
169	6C	250	**	0 - 10.50	0.49	0.85	5.555
169	7	250	***	0 - 3.00	0.15	185	7.55
169	8	572	-	0 - 3.00	0.15	375	
169	9	2250	22	0 - 4.00	0.19	64	24
170	2	940	**	0 - 12.00	0.38	(4)	722
170	3	(40)	++:	0 - 11.50	0.35	(10)	7366
172	1A	**		0 - 14.00	0.40	(+)	100
172	18	€	196	0 - 21.00	0.65	1996	300
172	1C	350	-15	0 - 12.00	0.37	-	1.88
172	1E	### E	===	0 - 5.50	0,17	277	355
172	1F	22	37.	0 - 10.50	0.33	**	**
172	1G	220	522	0 - 5.00	0.15	- 44	**
172	1H	**	-	0 - 5.00	0.19	44	344
172	11	880	200	0 - 6.50	0.20	122	325

172	2A1	Ħ	(44)	0 - 1,00	0.06	200	120	
172	2A2	177	265	0 - 1:00	0.06	-	-	
172	2A3	1000	**	0 - 0.50	0.06	061	57.5	
172	AE	-	225	0 - 12.00	0.37	700	325	
172	38	Sec.	+30	0 - 4.50	0.14	240	44	
172	3C	100	227	0 - 5.50	0.17	360	990	
172	4	(44)	**	0 - 8.00	0.25	**	360	
172	58	70	99	0 - 4.00	0.12	22	**1	
172	5C	(44)	39	0 - 8.00	0.26		251	
172	50	100	596	0 - 2.00	0.06	177		
172	SE	350	885	0 - 2.00	0.06	64	55 122	
172	5F	625	1000	0 - 2.00	0.06	099	iii Vaa	
172	6	44.5		0 - 65.00	2.00	366	99	
172	7	945	-	0 - 22,50	0.70	566	(44	
172	8	3910	Death .	0 - 3,50	0.11	200	199	
173	1	***	**	1 - 7.00	3.33			
173	10A			0 - 4.00	0.13			
173	10B	100	990	0 - 4.00	0.12	989 Gall		
173	10C	-	240	0 - 4.00	0.12	200	27. 22.	
173	100	922	55	0 - 3.50	0.11	940	22	
173	11	-	**	0 - 9.00	0.28	90	## i	
173	12	400	22	0 - 9.00	0.28	22 0		
173	15	100	-	0 - 5.00	0.15		***	
173	4B	**	66	0 - 6.50	0.21	**	2 20.	
173	58	100		0 - 14.00	0.44	**	#	
173	8	**		0 - 9.50	0.29	790	12	
174	10A	-	: ee	0 - 15.00	0.47		722	
174	10B	**	** .	0 - 10.00	0.31		544	
174	11	500		0 - 10.50	0.33	440	4.0	
174	12	***	123	0 - 10.50	0.33	200	346	
174	13	99	1941	0 - 12.50	0.39		(200	
174	14A	**	40	0 - 14.00	0.43			
174	14B	Etc.			0.15	55 55	1001	
174	14C	155	96.7	0 - 1.00	0.06	661 926	5724 5224	
174	140	1,000	**:	0 - 2.00	0.06	220	**	
174	15	97		0 - 10.00	0.31	£65	***	
174	16	122	-	0 - 10.50	0.33	#40	940	
174	17	240	22	The Control House	0.39	55	9900	
174	18A	200	4		0.12			
174	1881	(44)	144	0 - 1.00	0.06	100	11	
174	1A	(#*)	794	0 - 2.00	0.06	1.00	55	
174	18			415.22	0.06	005 005		

100									
	174	10	900	199	0 - 7.00	0.22	0	27	80
	174	2	0.00	-	0 - 34,50	1.06	194	722	(VD) ((240
	174	3A:	(46)	0.0	0004183000	0.25	100	200	
	174	361	380	44	0 - 1.00	0.06	244	(100	
C1	174	382.	## N	4.00	0 - 57,50	1.77	137	(66	
	174	6	20	775	0 - 13.50	0.41	396	200	
	174	9A	227	1022	0 - 14.50	0,45	1077	3.85	
ŞI	174	9D	22	-	0 - 9.00	0.28	-	270	
	175	1A	421		1 - 51.50	5,09	32	34	
	217	14	901	(leak)	0 - 27.50	0.85	146	142	
	217	18	**	**	0 - 27.50	0.85	-	**	
	217	10	**	46	1 - 8.00	3.34	000		
gi	217	3A	55	225	0 - 5.00	0.15	(44)	(44)	
	217	38	27	**	0 - 7.00	0.23	the contract of		
1	217	6	ng.	**	0 - 30.00	0.93	(20)		
5	217	7	100	448	0 - 56.00	1.73	*	157.1	
	218	12	See	441	4 - 31.50	13.35	440		
	219	1	œ	840	0 - 32.50	1.00	**	\$#E	
	219	2A	0.00	(eac)	0 - 39.00	1,21	940	***	
	219	2B	100	22.0	0 - 5.00	0.15	***	***	
	219	ЗA	277	25/	0 - 14,00	0.43	360	***	
	219	38	22	÷	0 - 11.00	0.34	225	200	
3	219	3C	-	227	0 - 9.00	0.28	27.0	555	
3	219	3D	565		0 - 29.00	0.89	£	30	
	219	3E	246		0 - 14.00	0.43	99	1022	
	219	3F	***	nee .	0 - 7.50	0.24	22	22	
C	219	3G	(00)		0 - 25.00	0.77		22	
	219	44		350	0 - 13,00	0.40	100	e	
ĝ.	219	4B	1975	888	0 - 12.50	0.39		. 100	
	219	5A	**	577	0 - 13.00	0.40	(25	166	
	219	6	124 100	22	0 - 39.00	0.93	670	(311	
	219	7	-	34F	0 - 16.00	0.50	622		
	219	8	***	**	0 - 18.00	0.55	44	722	
Ž ^v	219	9	20 0		0 - 19.00	0.59	41	92	
	220	6B	355	194	0 - 16.00	0.50	1996	744	
	220	10A	223	**	0 - 82.00	2.53	300	046	
	220	108	5000	1761	0 - 14.50	0,45	100	590	
b	220	2A		atto	0 - 33,00	1.03	350	**	
	220	28	9 /	223	0 - 4.00	0.12	1775	-	
Q .	220	3A	***	1441	0 - 20.00	0.63	2	-	
and the same	220	38	(10 1)	3245	0 - 1.50	0.06	-11.5c	22	

220	30	350	***	0 - 26.50	0.80	200	(155)
220	3.6	965	49	0-10.00	0.31	4.0	44
220	4	940	50.00	0 - 18:00	0.55	***	100
220	5A:	#6	40	0 + 14.00	0.50	200	40
220	5B	80	199	0-13.00	0.40	2.00	46
220	6A	(40)	146	0-13.00	0.40	1200	925
220	7A	225	955	0 - 3,50	0.11	**	32
220	7B	27.0	40	0 - 18.00	0.55	100	-
220	8A	227	222	0 - 9,00	0.28	***	44
220	86	227	40	0 - 5.50	0.17	(ma)	***
220	9A	993	4.0	0 - 18.00	0.55	944	199
220	98	9960		0 - 13.50	0.42	200	566
221	1A	967	***	4 - 60.00	14.47	350	100
222	1	250	125	3 - 4,00	14,05	(25)	155
222	11A	55%	275	0 - 59.00	1.82	-	27
222	ZA.	=5	**	1 - 14.50	3,56	7227	***
225	ŝ	227	22	3 - 30.00	15.22	**	40
226	1A	220	100	3 - 1.50	14.07	(66)	100
226	7	240	(44)	0 - 27.50	1.27	(++)	**
227	1	887	440	2 - 55.50	11.82		des
229	3A	20 7	(68)	0 - 70.50	3.25	555	
230	ZA	***	(**)	1 - 27.50	5.91	1577	250
233	1	25,7	355)	2 - 14.50	9.93	**	722
236	1A	#0	-	2 - 4.50	8.99	***	544
236	9	2277	1225	0 - 78.00	2.71	**	(49)
237	1	227	-	2 - 70.50	12.53	(in)	**
237	4A	595		0 - 18.00	0.55	ee:	000
239	*	900	(44)	4 + 46.00	20,60		(22)
240	1	591	(**)	2 - 59.00	12.01	***	(77)
240	5A	220	(200	0 - 72.50	2.23	250	**
241	1A	200	**	2 - 71,50	12.55	25	**
244	1A	201	77	0 - 83.00	2.63	**	**
245	1A	70	-	2 - 44.00	11.11		***
245	5A	220	**	0 - 90.50	2.80	30	:0)
254	11	227	344	0 - 83.00	2.56		**
255	1A	920	-	0 - 35.00	1.11		100
257	1	960	100	0 - 37,00	1.69	***	200
257	10C	260	(89)	0 - 4,00	0.18	577	-
257	3	997	(44)	0 - 39,50	1.22	22	144
258	1	550	100	0 - 25.50	1.18	**	644
258	7	## V		0 - 41.00	1.39	340	(**)
259	38	72.	-	0 - 4.50	0.21	-	**
- PAINT	2500						

267	19A	200	233	0 - 1.50	0.07	164	94
267	198	27.1	570	0 < 3,50	6.16	544	0.00
267	19C	**	721	0 - 4,50	0.20	9.0	96
267	1A	125	192	0-11.00	0.34	066	Det
267	18	**	194	0 - 10:50	0.32	388	1155
267	10	44	566	0 - 9,50	0.30	1955	U53
267	10	40	199	0 - 14.50	0.45	155	57
267	15	**	166	0 - 12,00	0.37	£5	12.7
267	20A		225	0 - 1.50	0.06	***	22
267	20B	100	0.55	0-1.00	0.05	144	**
267	20C	the contract of the contract o	1525	0 - 0.50	0.06	++	***
267	21	10 State	194	0 - 3:00	0.15	**	65
267	22	-	584	0 - 14.00	0.65	tt	**
267	23A	(49)	Det.	0 - 2.50	0.10	27.	87
267	238	(**)	. 169	0 - 5.00	0.22	57	10
267	23C	5985	55	0 - 6,00	0.28	22	**
267	230	2993	55	0 - 17.50	0.80	11	25.
267	23E		44	0 - 15.00	0.69	##	##C
267	23F	722		0 - 17.00	0.79	**	880
267	24	***	**	0 - 10,00	0.47	**	885
267	25C	-	24	0 - 12,00	0.55	==	880
267	25D	400		0 - 13.50	0.62	77	55.7
267	25E	**	60	0 - 3.00	0.14	22	**
267	2A	***	#	0 - 3.50	0.10	123	027
267	28	120	57	0 - 3.00	0.09	#	¥40
267	2C	27	22	0 - 0.50	0.06	**	963
267	2D	522	#	0 - 3.00	0.09	***	967
267	4	**	¥4:	0 - 3.00	0.15	290	550
267	5	194	440	0 - 3.50	0.16	200	255
267	8A	1944	**	0 - 18.50	0.85	22	25.5
272	1	**	200	1 - 41.00	6.54	***	2200
299	3C	088	220	0 - 4.50	0.20	220	341
350	283	125	77	2 - 19.50	10,20	1000 4400	347
351	12A	27	220	0 - 29.00	0.90	940	**
351	1A	922	**	2 - 42.00	11.18	3 46 7	**
351	4A	122	***	0 - 53.50	1.67	200	300
351	7A	Ties.	**	0 - 21.50	0.66	350	**
357	0=	Del	**	1 - 83.00	8.42	22.0	**
360	11	CHEK	***	0 - 7.50	0.23	-	4.0
363	11	55	***	0 - 34.50	1.57	50	40
363	13A	100	77.0	0 - 3.50	0.16	(4.00)	40
363	15	22	200	0 - 1.00	0.06	-	700

363	16	255	200	0 - 1:50	0.07	25	80
363	18	125	55)	0 - 5.50	0.24	5711	5511
363	18	37	770	0 - 2.50	0.12	501	871
370	IA	44	007	2 - 18 50	6.74	22	2.
59	10	44	***	0 9.65	0.26	44	
59	11A	194	330	0 = 6:00	0.19	**	99
59.	118	90	980	0 - 4.50	0.14	***	**
59	12A	100	77	0 - 3.00	0.09	22	22
59	12B	225	227	0 - 3.00	0.09	**	72
59	12C	37.	77	0 - 20.00	0.62	55	55
59	13	22	22	0 - 10.50	0.33	=======================================	22
59	14A	40	**	0 - 4.50	0.12	11	##
59	148	***	F2	0 - 4.00	0.13	64	**
59	28	346	**	0 - 6:00	0.19	66	**
59	3	300	**	0 - 86,50	2.68	366	**
59	48	2000	55	0 - 20,00	0.62	66	tt
59	4B	1,757	1077	0 - 2.00	0.06	1.72	152
59	4C		- 22	0 - 30.00	0.93	**	
59	40	***	152	0 - 12.00	0.37	and the	100
59	5	**	255	0 - 50.00	1.55	250	792
59	6	(44)	266	0 - 30.50	0.94	599	566
59	7	***	1.00	0 - 36.00	1.11	100	3.66
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59	8B	***	34%	0 - 8.50	0.26	325	588
59	8C	**	**	0 - 16.00	0.56	-55	37
62	1C	224	20	0 - 13.00	0.40	-22	922
62	1E	242	44	0 - 13.00	0.40	142	-
62	3	***	**	0 - 7.50	0.24	52	See
62	98	***	744	0 - 31.00	0.95	**	44

குறிப்பு2 :

1 - 77,00

19.17



 மேற்கண்ட தகவல் / சான்றிதழ் நகல் விவரங்கள் மின் படுவேட்டிலிருந்து பெறப்பட்டவை. இவற்றை தாங்கள் http://eservices.tn.gov.in என்ற இணைய தளத்தில் 17/01/049/01739/10900 என்ற குறிப்பு எண்ணை உள்ளீடு செய்து உறுதி செய்துகொள்ளவும்.

469.26

தே தகவல்கள் 10-01-2018 அன்று 10:46:21 AM நேரத்தில் அச்சடிக்கப்பட்டது.

122 - 52.50

 கைப்பேசி கேமராவின்2D barcode படிப்பான் மூலம் படித்து 3G/GPRS வழி இணையதளத்தில் சரிபார்க்கவும்

ANNEXURE-IIIB

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ANNEXURE-IIIC

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21. புதுப்பானையம் சிராமம் அரியலூர் வட்டம் 8 மாவட்டம் 420

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கிராம நிர்வாக அனுவரை 21. புறப்பாளையம் கிராமம் 423

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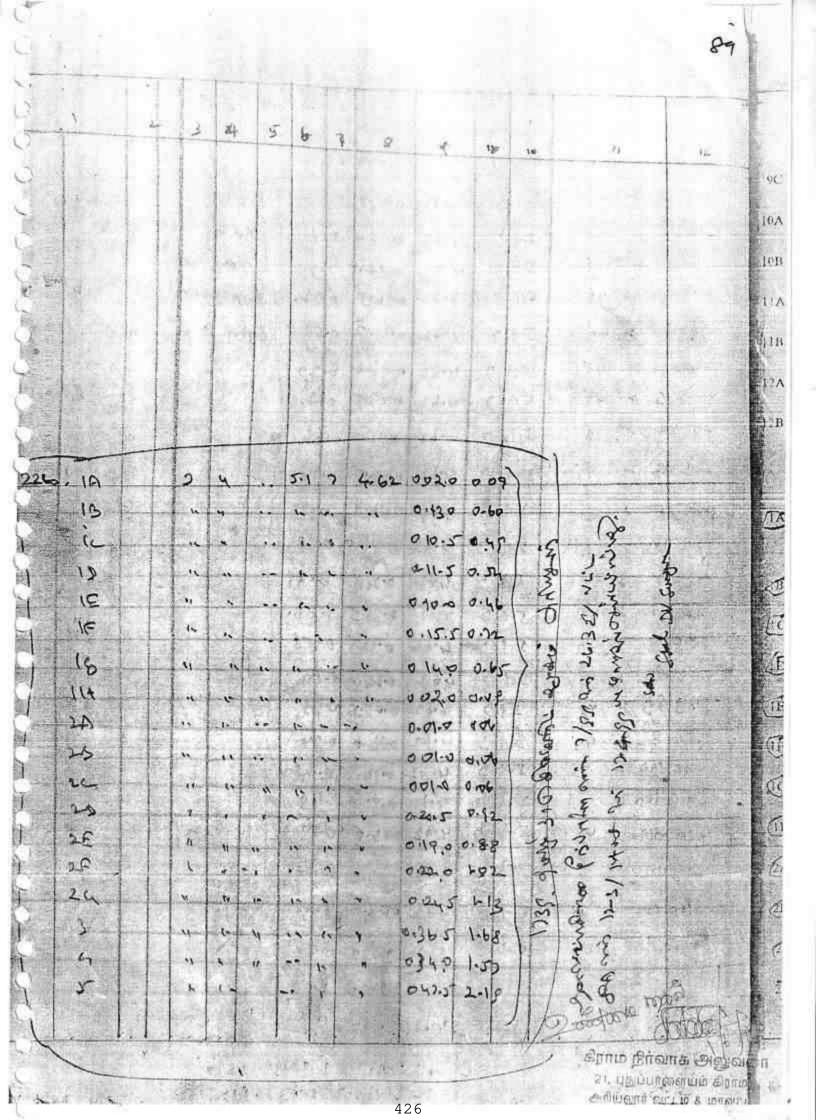
21. புதுப்பான பயர் கிராமம் அரியலார் வடி மக்கா பம்

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. D	=lim	σ	7_{L}	#	5-1	-7	4	62	0	13.0	0	60	338 க. சந்திரகாக	***
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j)	-1170	o .	iq		5-1	7	4	62	0	11.5	0	54	942 சா மருதை முய்யார்	
	-Tak	T.O.	ij	2/	5-1	7	4	62	0	100.0	0	46	253 சா. கூந்தப் பெருமான	
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கீராம நிர்வாக அலுவலா

21. புதுர்பானையும் தொடிம் ுர் அடிப்பி 3 மான்டும்

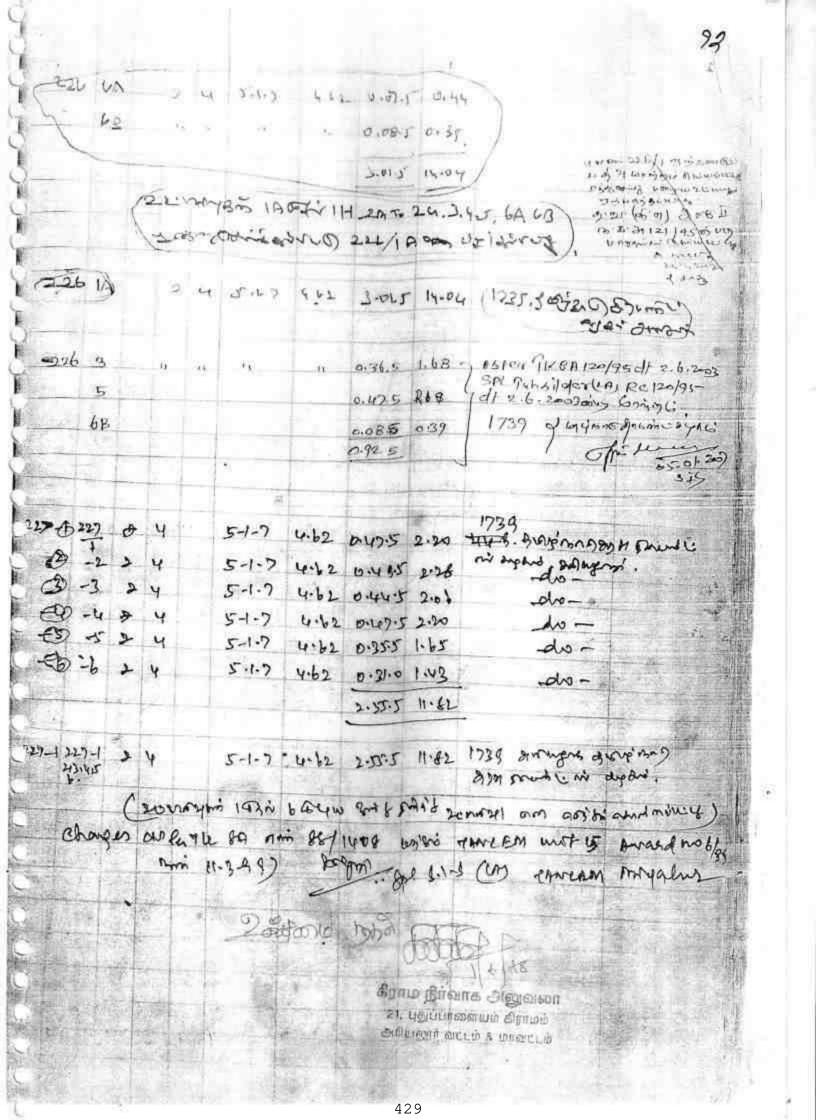
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கராம் நாவாக அறுவமா

21, புரப்பானையம் கிராமம் 428



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The same	4.4	-411	11	4	127	5-1	7	4	62	0	10.0	0	46	742	இர (rokal) சிரமாரி	
	4E	-400	u	19	20	5.1.	7	4	62	0	10_0	0	46	194	ெ கருப்புச்சமி	
	5	-5	ı	q	10.	5-1	7	4	62	0	17.5	0	80	869	மு பெரியசாக்	
	6A	-6m	ρ.		1511	5-1	7	4	62	0	09.0	0	42	194	செ அருப்புசாயி	
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	Ø	-1	y.	i d	•••	5-1	7	4	62	0	06-0	0	28	574	ஆ - செங்கமலத் தாமாள்.	
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கிராம் நீர்வாக அலுவண்

21. புதுப்பாளையம் கிராமம் 430

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9.00	9 ₈₁₀	6	er.		5-1	7	4	62	.0.	0.16	0	06	1524	ென் ஹெ. பல்க மூக்கு (1), வெடு கொண்டபர கோண்டுர் (2), வெ. நாரா	
(B)	9111	σ	ų		5-1	7	4	62	0	04.5	0	20	722	யனாக் கோனார் (3)- வெ. பச்சமுத்து	
10	-9,11	σ	9	•••	5-1	7	4	62		25.5	1	18	956		
(A)	-10:1#	σ	4		5-1	7.	4	62	0	05.5	0	26	722	வெ பச்≇முத்து	
D.	-10em	5 7	ų.		5-1	7	4	62	0	14.0	0.	64	548	க்- தங்கராக	
T)	EH.	u	iq	•	5-1	7	4	62	0	11.5	0	54	548	க. தங்கராக.	
	=12	σ	ц		5-1	7		62	0	15.5	0	71	195	இனவர் கணே கண் காப்பாளர் தாவார் பெரியம் மான்,	
£	• =13cm	a -	ŷ		5 1	7	1	62	0	04.0	0	18	956	க மாணிக்கம்.	
B	-13am	đ	4		5-1	7	4	62	0	10.0	D	46	548	க தங்கராக	
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4n)	-14iin_	σ	y y		5-1	7		62	0	06-5	-0	31	956	±. யாணிக்கம்	
÷D.	- (Sur	σ	4		5-1	7		62		09-0		42	1	வெ நாராய ணக் கொளார்	
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கீராம் நிர்வாக அலுவல் 21. புதப்பாளையம் கிராமம் 432

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	(FB)	-15um	,,,	.,		5-1	7	4 62	0	07+5	0 35	667 கொதுரையணக் கோயரர்-	
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கீராம் நீர்வாக அலுவலர் 21. புதுப்பாளையும் கிராமுக் 433

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ú	(a	-1.Fear	D	11		5 1			4 62	(05	5	0	26		அ- சீவிவாச மாமணாச்.	
a	2	-12	Ü	4	W	5-2	9	0	3 09	(24	5	0	76		அ- சீனியாக தார்வாகர்.	
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\$30	34	-19 <i>un</i>	ar .	4		5-2	9	3	09	0	14.5		0	45	667 6	бы даун гэмэ Сапенай	
(4)		I 4µ#	τ	4		51	7	4	62	0	08 (0	37		9வ. அரச் எனன்	
(a)	0 -	J4Dr	tr	4		5~1	7	4	62	0	08.0		0	38	324 g	ு கோகில≴ ம்மாள்,	
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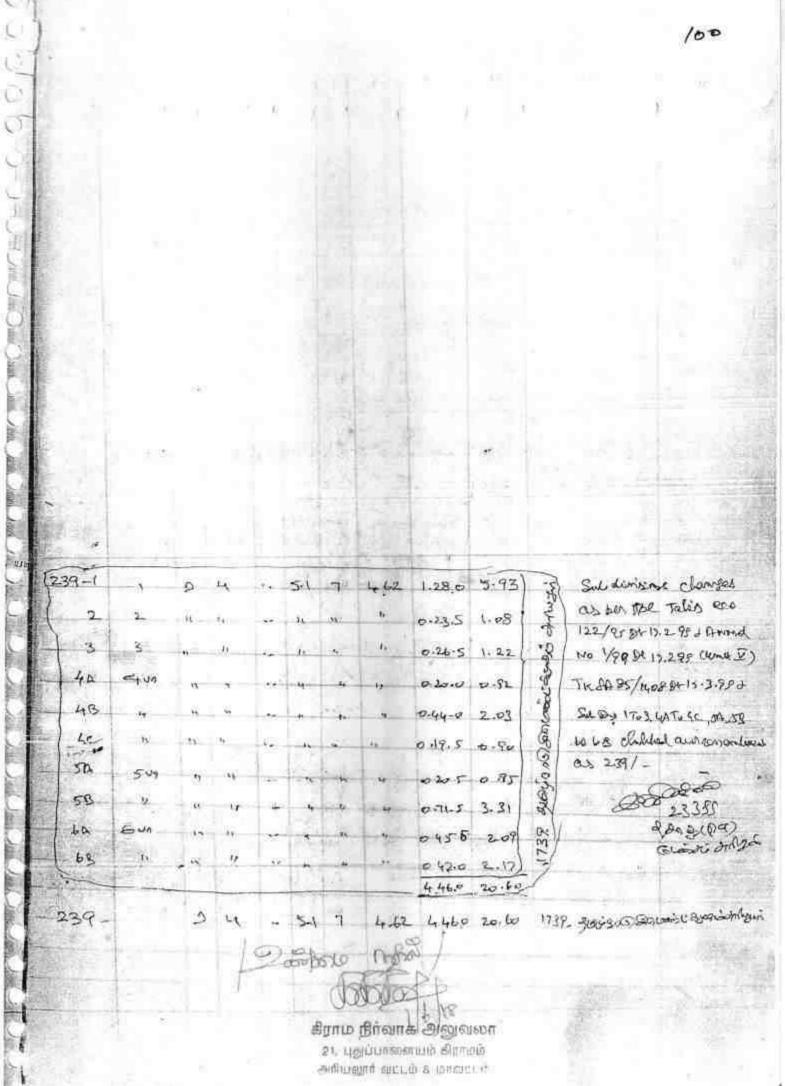
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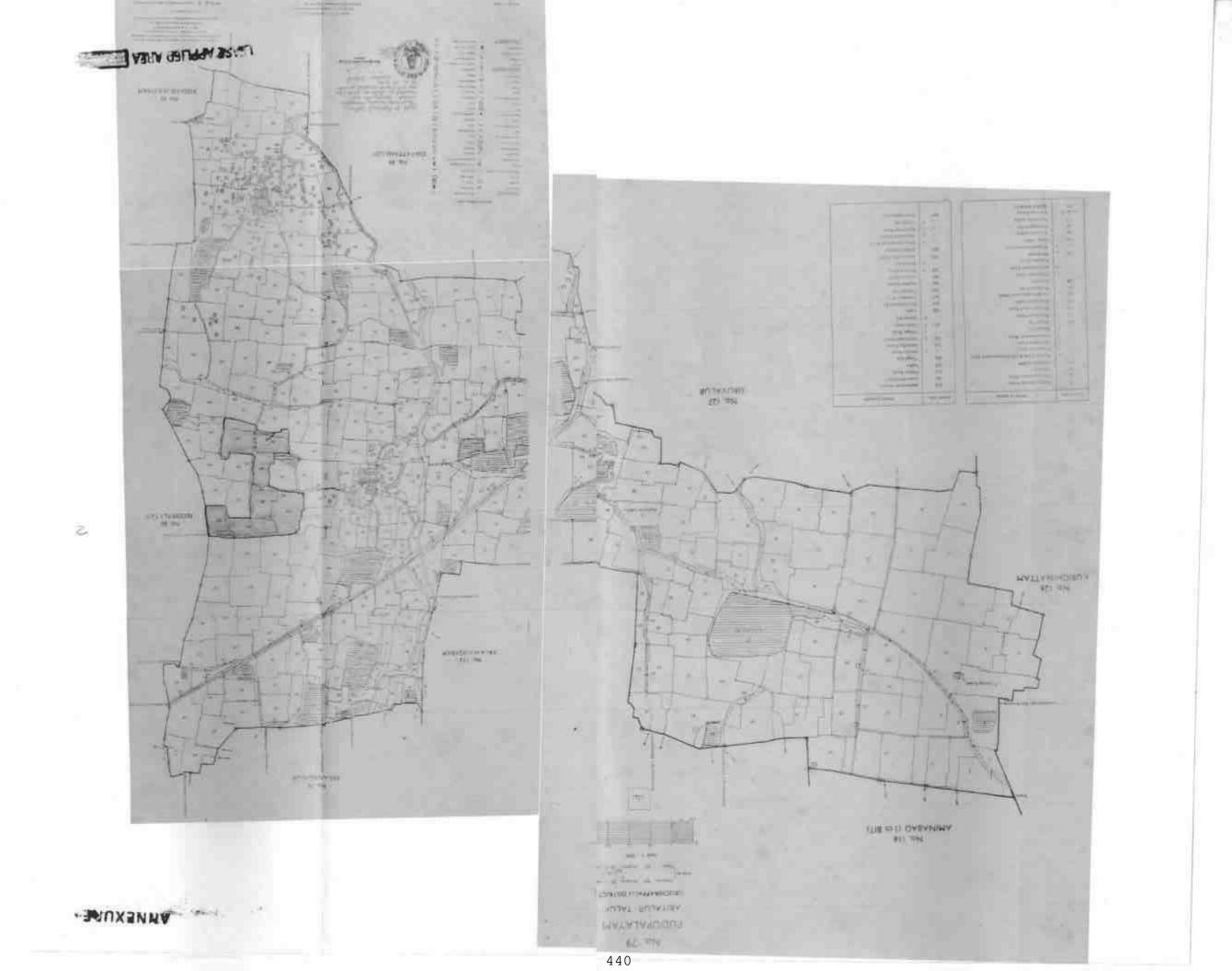
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ANNEXURE-IIID



ANNEXURE-IV

"The following Boreholes Data was used for preparation of Reserves"

REPORT ON THE DETAILED GEOLOGICAL INVESTIGATION FOR LIMESTONE IN PUDUPALAYAM AND ADJOINTED 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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- 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)
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 - IV Graphical Presentation of behaviour of quality of core and sludge samples
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 B. selected Bore Holes

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%, R₂0₃ 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 calp 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 widd 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 cretuceous 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, Periyanagalur, 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 Periyanagalur, 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 . A4 Fore 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 metres of wagon drilling were corried 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.

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 nance the demarcation line has been assumed on the basis of 1:1 0.8. to one ratio and 30 metres of depth as the economical limit of mining.

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 SiO₂ in high grade types content is about 4.5%. The total iron content reported as Fe₂O₃ 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. 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 (78 to 92%) of the Limestone as well as the low iron content makes it also quitable 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 Periyanagalur 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. Topo raphy 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 Periana elur Odei flows to the west and the Reddipalayan Odei flows to the east of the area, these seasonal. streams ultimately draining into the Marudaiyar River which borders the area in the south. 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 Vallipiringiyam to main high-ay, north of Fudunalayam village and on the cart tract leading from Pudupalayam village to Vallipiringivam are outcrops of limestone sean

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, maise, atc. 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.

is a shele and generally represents a change in lithology through a pebble bed layer. In addition, in many bore holes a green eiltetone 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 chart 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.

Tabla

The rock formations of this area are of marine sedimentary origin and are referable to the Amiyalur stage of the upper cvetaceous namical and more particularly to Maestrichtian stage.

rount and Custernary

Alluvium and soil, kanbar

--- Unconformity ---

Arivalur stage (Rellankurichi formation)

- 1. Early limestone
- 2. Black and éreen siltstone
- 3. Conglomerate bed
- 4. Shell limestone and Arenaceous limestone

Maastrichtian 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, semiconsolidated 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.

7. 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 Periyanagalur 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 charasteristic 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 archean rocks. (Localaties: 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 Periathirukonam 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 Linestone 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 borsholes and 29 wagon drill holes besides a few trial bits 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 cary 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 thic mess, 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 semples 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. 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 16.5 metres. 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

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 up to 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 Coments Corporation at Alangulam and at Ariyalur In addition to these thewagon 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 consti-In carrying out the above composite tuents. analysis for constituents like Al 203. Fo 202. SiO, 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 CaCO3 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 SiO2 content as much as 12% perhaps indicating admixture with detrital sands. Fe₂0₃ 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 The total carbonates generaly range between 75 and 85%. In respect of other constituents like MgO, Fe₂O₃, Al₂O₃, 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
- 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 couthern 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 SiO₂ 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 lows: contact of the Limestone. Samples were collected only from the floors of the pit in view of the shallow depth. TCO₃ 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. Must of the deposits occur av y from the main Kilpalavur—Jayamkondam highway. They of are finer grained and with exceptional/Reddipalayam area contain only small quantity of macro fossils

and replacement by chert is of limited nature, in these blocks.

Reserves of Limestone

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 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 r gular 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 0.B. to 0 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, 13, 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 over-burden. 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. 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 preponderence 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 is ranges from 7 to 17 and an average of 8 metres is taken as the depth of persistance 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 1,500 x (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

 $27.50 \times 10,000 \times 2.5 \times 8 = 5,500,000$ 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 x
$$\frac{70}{100}$$
 = 14.77 million tonnes

Southern Block

The Southern Block comprises the following R.S.Nos.

Pudu-alayam village

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.

 $100 \times 10,000 \times 11 \times 2.5 = 27,500,000$ 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 papers 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 or 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, there'y 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 requence as traced from Ariyalur Town to Pudupalayam. Firstly the northern portions of the deposit are characterised by at least three dist .ct strata of limestone; although the two upper most are of limited thickness and extent. Further formation of kankar and secondary limestone are more prevalant in the northern portions. In the northern and central portions like Kallankurichi and Periyanagalur 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 dipt of the beds are uniform and low /iz. 3 to 4° towards ENE or E and the persistence of limestone dipwar. is characteristic in all the places, as is brought out by the intersation of beds in all the more 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 meanding 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 preportions 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 CaCO₃ 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 inferant 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 there 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 Periyanagalur.

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 form 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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	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Reddipalayam, Udaiyar-
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		chirapalli district.

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Physical characteristics of Ariyalur Limestone

APPENDIX - IV

Physical characteristics of Ariyalur Limestone

The Cretaceous limestones from

Periyanagalur 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.

APPENDIX - II

Chemical Analyses of samples of limestones collected from Pudupalayam and Reddipalayam by the previous workers

(A. Padmanabhan and T.M. Sridharan,

ANALYSIS OF LIMESTONE OF REDDIPALAYAM

		Trace	2.01
Ca0		54.05	49.83
A1203		0.77	1.09
Fe203	cent)	1.18	0.63
R203	(in per	1.95	1.72
Acid insolu- bles		2.40	3.81
re Loss on ignition		40.43	41.17
Moisture	1	0.05	0.04
Sample	1 1 1 1	GrL 30	OrL 31

APPENDIX - III

Geological Logs of diamond drill holes

																				`								
Reddipalayam	Loss on ignition	1 1 1	: :	: :	:	:	:	•	(• . • .)	:		. 4	- 0	0	25.05	ě	25.93	2.7	:	:	•		•	:	:	•	•	
		; ! ! ;	: :	•	•		:	:	•	•	: 00	. 23	0.76		1,16	•	n.14	0.96	•	•	i	•	•	:	:	•	•	:
Village:	CaO	! ! ! :	:	•	•	•	•		•	:	.0	0	7	_	29.60		32.00	-	•	:	•	•	:	•	:	•	:	•
R.S.No.327	A1203 cent)	:	:	•		:	:	:	•	:	0	0	0	5			5.44	œ	•	:	•	•	•	:	:	:	:	•
R.S	Fe ₂ 0 ₃ in per ce	:	:	•	•	:	•	•	:	:				4.80	6.72		5,44	S.	•	•	:	•	:	:			•	
No.PPM.6	SiO ₂ (i		•	•	•	•	:	:		:	2.	6.3	2.1	21.65	9.9		29.62	5.5	•	••	:	:	:	:	•			
Drill Hole	TC03	9.40	٠, د د	· •	· a) 'C	, TC	, r	+ X	· -		7.	2.0	4.	6.4	4.6	6.4	2.0	0	5	0	0	Q.	N.	8	00	9	0
promoto 1	in metres To	1.95	• •		rı	,		α			·-	2.	S	3.0	4.0	5.0	5,5	9.9	7.5	3,6	0,0	0.	2	5.0	4.7		. u	, C
ord mod	Depth i	0.00		٠.	٠.	n,	r.	٠.	0		0	5.	2.1	2.5	3.0	4.0	5.0	5.5	9.9	9.7	3.6	0:0	0:	2.0	5.0	6	- c	. α 1 υ
0	Sample Number	SS31	: 07	U	UZ	U2	U)	UZ	CO	S	W	S	23	23	3	2	ट्ट	5	5	32	32	53	33	322	322	5	S	38

Boro HoloNo.PPM-12.

Village: Pudupalayam Taluk: Ariyalur District: Tiruchi R.S.No. 235

Natura of hole: Vertical Reduced lavel: 55.185 m.

Depth From	in metres	Neture of rock types
0.00	1.00	Soil '
1.00	2.25	Silty sendstone with soil
2.25	3.00	Grey coloured fine siltstone with yellow coloured marle
3.00	8.00	Pine grained siltstone
8.00	8.50	Core loss

Core recovery: 20%

Village: Pudupalayam	TCo ₃ cent).	12.50 57.20 51.80 14.00 1.80 1.80 1.80 1.80 2.40 2.40 2.40 5.50 6.50 5.50 5.50 5.50	4)
R.S.No.225) (in		
No. PPM.15	in metres To	22.22.25.000.000.000.000.000.000.000.000	
Diamond Drill Hole	Depth Depth From	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	! ! ! ! ! !
Sludge sample	Sample Number	\$\$\$1 \$\$\$2 \$\$\$3 \$\$\$3 \$\$\$5 \$\$\$3 \$\$\$10 \$\$\$13 \$\$\$15 \$\$\$15 \$\$\$15 \$\$15 \$\$\$25 \$\$25 \$25	1 1 1 1 1

REPORT ON THE DETAILED PROPECTING FOR LIME STONE IN PUDUPALAYAM AND REDDIPALAYAM VILLAGES, ARIYALUR TALUK, TRICHIRAPPALLI DISTRICT

(PHASE—V)

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Assistant Director
(Geology and Mining)

July, 1994

DEPARTMENT OF GEOLOGY AND MINING, MADRAS—600 032

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C. .	MAPS	
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EN ¥I	2. Geological and Bore hole map	
	3. Geological Cross sections	

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-Ito Phase-III) and assessed the limestone reserves both quantitatively and qualitatively. Based on the above prosperting 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 prosperting 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 occuring in this area. The area is also served with village cart-tracts connecting hamlets of Pudupalayam and Reddipalayam villages.

TOPOGRAPHY, CLIMATE AND VEGITATION

- 3.1. The area taken for prospecting within the revenue limits of Pudupalayam and Reddipalayam villages in 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, corriander, 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, beloning 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 Maestrichitian period. The limestone bed lies conformably over a conglomerate bed as could be seen along the (western) lower contacet 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 referrable to Kallamedu formations. The upper contact of the limestone is mostly concealed. The occurance 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.

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 publised. 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 apended 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 borehold locations, utmost care has been followed to avoid the bosehole 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 represendative 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 constitutions and details are furnished (Annexure-I).

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 grians 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 various 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 conglomegrate bed is indicative of a break in the deposition in the area. As observed in the geological cross sections, there is no limestne 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 concoidal fracture. The chert bed is also found to occur intervening the lime stone bed in particular places. The chert might have been formed by precipitation from silica rich solutions derived from the sandstones occuring in the area.

d. Shell Limestone

0

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0

0

3

The limestone occuring 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 Inoceramous. The shell lime stone occuring in the area is compact and being sedimentary origion, absorbes 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 formining a signle unit of limestone, the reserves and estimated for the entire limestone bed excountered 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 occurance in the area is of a signal 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 intially 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 intially 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.

QUALITY OF LIMESTONE

- 9.1. As discussed in the foregoing paragraph, the limestone occurring 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 Sioz content of the samples analysed ranges between 5 to 7% with required

Al₂O₃. 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 Valaja agaram area posed problems in the process of cement manufacture for TA JCEM. The iron content of the limestone available in the area prospected in Pudupala, im - 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 Periyanagalur-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 carriedout 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 estern 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 chemially uniform with high calcium content and low iron percentage. Therefore, the limestone available in the area is of high grade variety suitable for blending.
- 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

59 60

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 Geologya & Mining

P. DHESHVGII.

KALLANKURIGHI LIMESTONE MINES

TAKHLNADU CEMENTS CORPORATION LTD., ARIYALUR CEMENT WORKS

ARIYALUR - 621 729

Treath Anyalu	Pudupalayam
έχ. · · ·	

: 233 : Vertical

S.F.No. Nature of the Hole

Awage		: rudupalayam							L	Hedriced Level	: +52.375 M
Depth in Metres	Metres	Lithology	Sample No.	TCos	[0]	Siož	Fe ₂ O ₃	Al ₂ O ₃	CaO	MgO	Remarks
0.00 - 0.60		Black Soil	÷		-1	2.		•02			
. 60.	10.35	0.60 - 10.35 Kankary limestone	PD6-3/1	1.21		*					
0.35 -	14.30	10.35 - 14.30 conglomerate	PD6-3/1	12.21	•	•	·				
4.30 -	17.20	14.30 - 17.20 Pale green sand stone					•	•			
17.20 - 20.20	20.20	-op.	PD6-3/1	12.10						•	
20.20 -	22.70	20.20 - 22.70 line grained sand stone	PD6-3/1	23.44				-			
22.70 -	26.50	26.50 Buff colured grey sand stone	PD6-3/1	14,88	*		•				

Bore hole closed at the depth of 26.50 metres

Bore Hole No. PD/6-4

S.F.No.

Vertical Nature of the Hole Reduced Level : Ariyalur : Pudupalayam District Taluk Village

Danth in Matros	ofroc.	*ECTOTA!	Some No	100	Č		(;			
	2	(Bosonia)	California NO.	1003	3	2010	F6203	Al2O3	CaO	MgO	Remarks
0.00,	- 1	Soil		100	and sold lysts.			٠		Sa	-Sample No. 2 to Sanalyse
0.50 - 3.	3.00	Hard limestone			1			1/4		for	- for High trade limestone and
3.00 - 5.	5.25	Chert	PD/6-4/1	69.0	,					1	- the weighted average is as
5.25 - '6.	5.10	6.10 Yellow Shell limestone	PD/6-4/2	93.86	41,46	292	1.15	0.75	51.96	0.67 follows:	lows:
6.10 - 9.	9,15	-op-	PD/6-4/3	87.42	38.90	5.88	2.00	1.89	49.88	T.	TG01 - 86 55
9.15 - 12	12.20	-op-	PD/6-4/4	84.02	37,86	6,31	4.04	2.27	47.19	O BB O	
12.20 - 74	14.70	-dp-	PD/6-4/5	86,10	38,54	7.08	1.42	2.06	49.51	0.69 SiO2	
14.70 - 17	02.2	17.70 Conglomerate	PD/64/6	46,96			•	'		0	
17.70 - 30	00.00	30.00 Buff coloured sand stone	PD/6.4/7	32.21	'						

Bore hole closed at the depth of 30 metres

: Tiruchirapalli

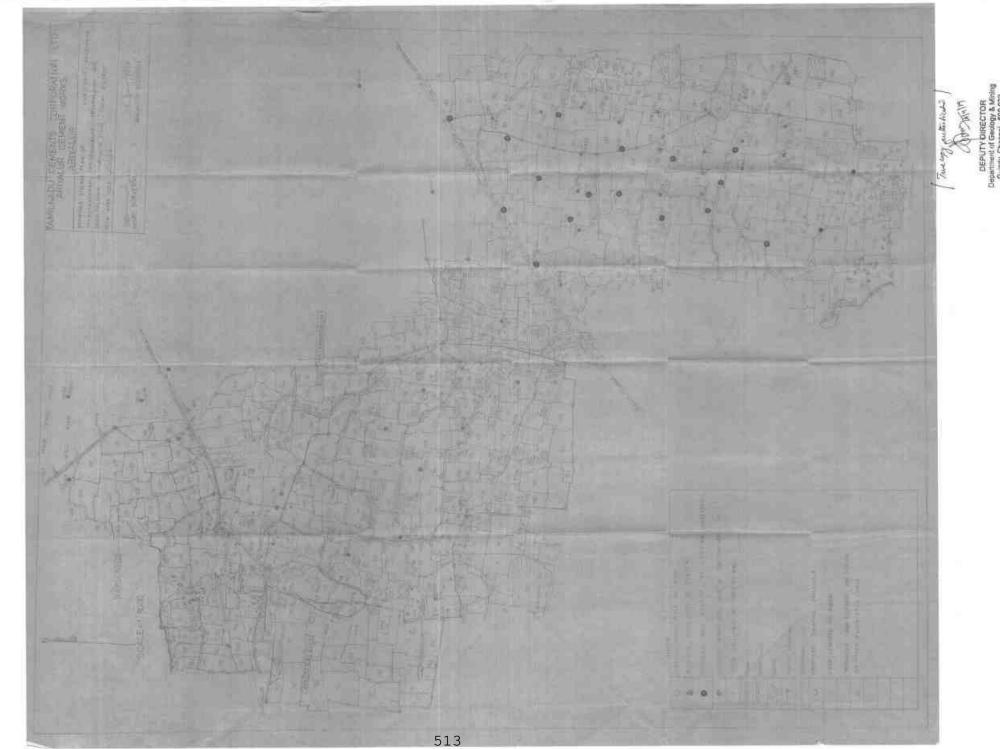
Bore Hole No. PD/7-3

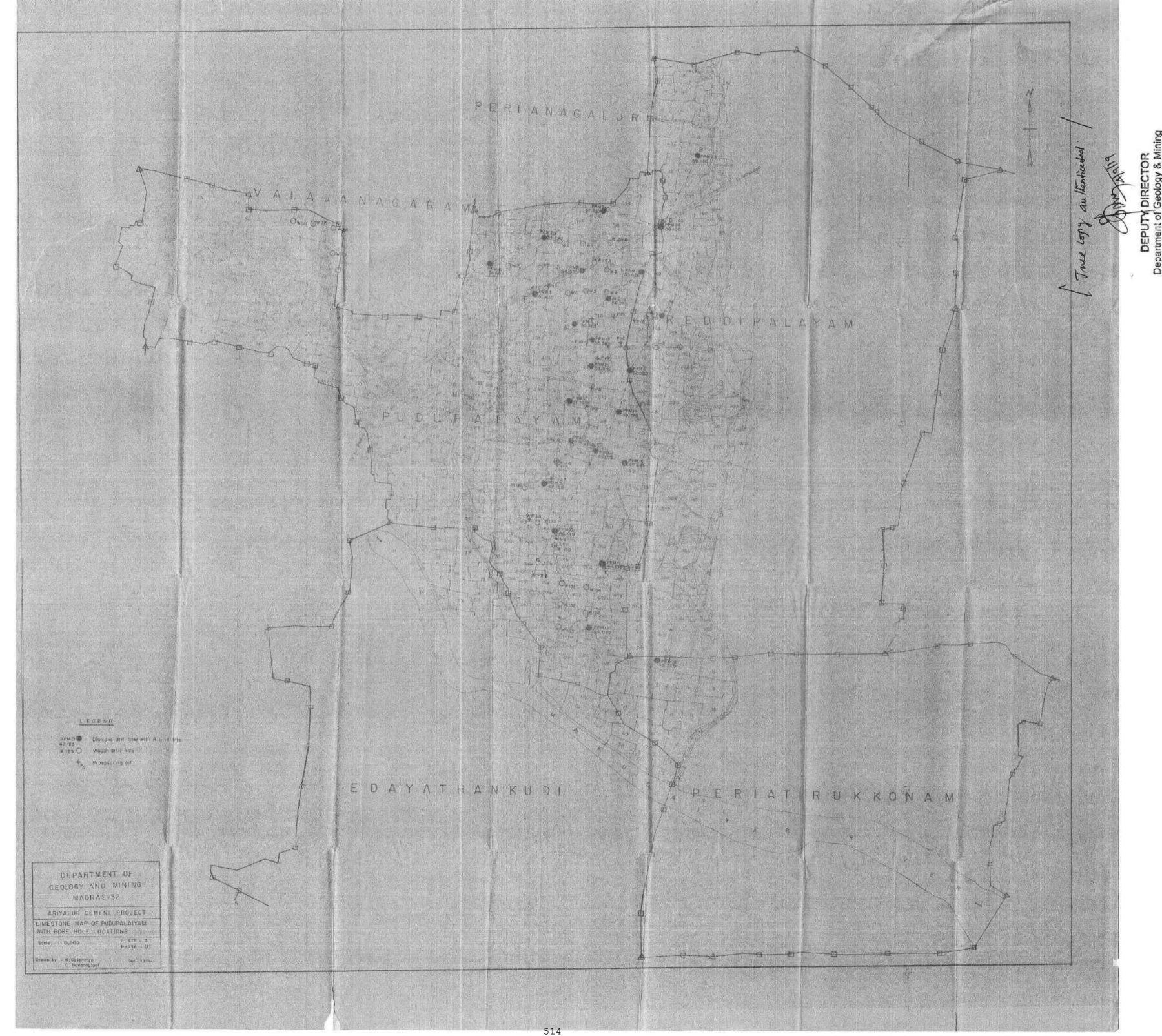
**								7	ame of	Marure of the Hole . Varior
octan in metres	SLithology	Sample Mo	1			6	5	œ	Reduced I evel	
0.25	Clayey 8	Campia NO.	3	ľOj	SiO2	Fe ₂ O ₃	Alaoa	CeO	1	M 069.094 · +20.690 M
1.30	Kankary limestone	100						Can	ogw Ogw	Remarks
2.60	e c	10/12/UT	88,67	40.68	5.60	2.01	030	0,00		Sample Nos. 1 to 4 analyse
3.70	-op-	2/2/10	86.68	39.05	6.62	2.51	1 70	10,40	0.45	8.45 High grade limestone with iron
6.25	-00-	PD/7-3/3	88,99	40.32	5.16	1.65	172	48.55	0.33	0.33 less than 3%
7.75	Buff coloured limestone	00/1/3/4	86.41	39.88	5.86	2.65	1 01	17.00	0,33	
10.00	-do-	r U/1-3/5	73.44	34.49	13.11	5.16	88	17.83	0.77	
2.75	10.00 - 12.75 Conglomerate	. 0,0,1,00	•		•	-	8	16.03	0.61	
17.25	Buff coloured sand stone		10.00	•	-		1	,	1	
24.60	-op-		19.20	•	•	,	1	-	1	
9.50	26.50 Grey sand stone	PD/7.3/8	8.70			1	-	+	1	
		nio io	10.60			-	1	+	•	

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m

Village	Pudupalayam							ZŒ	Nature of the H Reduced Level	Nature of the Hole : Vertical Reduced Level : +49.350 M
Depth in Metres	res Lithology	Sample No.	TCo3	0	SiO2	Fe ₂ O ₃	Al2O3	CaO	MgO	Reg
0.00 - 1.20	0 Soil Cover)	
1,20 - 1,80	0 Hard limestone	PD/7-3A/1	94.72	41.51	. 2.93	0.97	0.66	52.70	0.12	
1.80 - 3.30	O Yellow limestone	PD/7-3A/2	91.94	40.65	3.93	1.62	1.08	51.18		
3.30 - 6.20	-op- 0	PD/7-3A/3	83.72	37.50	7.77	3.66	1.76	46.22	0.71	
6.20 - 9.20	-00-	PD/7-3A/4	93.94	38,05	6.90	4.44	2.07	47.23	The state of the s	
9.20 - 12.00	-do-	PD/7-3A/5	77.15	35.05	10.69	5.66	2,19	42.84	0.59	
12.00 - 15.20	20 Conglomerate	PD/7-3A/6	13.67			1		1		
15.20 - 28.	28.70 Yellow and Buff Finegrained sand stone	PD/7-3A/7	13.67			,		Y		
28.70 - 30.30	30 Grey fine grained sand stone	PD/7-3A/8	.8.97	,	Ġ	•		•		
		er er	Bore	Bore Hole No. PD/7-4	lo. PD/7	4-7	Bo	re hole c	slosed a	Bore hole closed at the depth of 30.30 metres
District : Taluk : Village :	Tiruchirapalli Ariyalur Pudupalayam	er er	 		,	254	1	N.S. R.	S.F.No. Nature of the Hole Reduced Level	: 245 he Hole : Vertical evel : 449 455 M
Depth in Metres	es * Lithology	Sample No.	TCo3	107	SiOs	FP.00	A Local	000	0	000000000000000000000000000000000000000
0.00 - 1.30	Soil Cover						2031	000	000	Hemarks
1.30 - 9.70	Sand stone	PD/7-4/	2.21						•	
9.70 - 14.00	-do-	PO/7-4/	2.02					-		
14.00 - 18.50	yo -do-	PD/7-4/	11.70		-	,				
18.50 - 26.30	-do-	PD/7-4,'	5,43			7				
26.30 - 30,50	-op- 0:	PD/7-4/	000	2			-			

ANNEXURE-IVA





ANNEXURE-V



GLOBAL LAB AND CONSULTANCY SERVICES

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TC - 6060

TEST REPORT

Report Number: ULR - TC606019000000377P Report Date: 17.08.2019

S F No. 222/1 222/2A,225 etc., Extent: 23.35.0 Ha Pudupalayam Village, Ariyalur Taluk Ariyalur District.
on Ambient - Good
2 Kg
Client
-
16.08.2019
17.08.2019
W-07533787

SI. No.	TEST PARAMETERS TEST METHOD		UNIT	RESULTS
4	Calcium as CaO	IS 1760 (Part 3) :1992 (Reaffirmed - 2006)	%	50.12
2	Magnesium as MgO	IS 1760 (Part 3) :1992 (Reaffirmed - 2006)	%	0.28
3	Iron as Fe₂O₃	IS 1760 (Part 3) :1992 (Reaffirmed - 2006)	1/6	1.01
4	Alumina as Al ₂ O ₃	IS 1760 (Part 3) :1992 (Reaffirmed - 2006)	%	0.81
5	Silica as SiO₂	IS 1760 (Part 2) :1991 (Reaffirmed - 2006)	%	8.78
6	Loss On Ignition	IS 1760 (Part 1) :1991 (Reaffirmed - 2006)	%	38.12
7	*Calcium as CaCO ₃	By Calculation	%	89.47
8	*Magnesium as MgCO ₃	By Calculation	%	0.59
9	*Lime Saturation Factor	GLCS/SOP/M/033	9/6	1.65

Note: "Not covered under NABL scope

Prepared

Verified
*****End of Report*****
Page 1 of 1

Laboratory Co.

Authorised Signatory
Dr.P. THANGARAJU
Managing Partner

For Global Lab and Consultancy Services

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 only 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 on E-mail request with report number and report date along with report copy.

ANNEXURE-VA



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TC - 6060

TEST REPORT

Report Number: ULR - TC606019000000378P 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.: 222/1, 222/2A,225 etc., Extent: 23.35.0 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	8
Sample Code	GLCS / 1772	Date of Analysis	16.08.2019
Sample Receipt Date	16.08.2019	Date of Completion	17.08.2019
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SI. No.	TEST PARAMETERS	TEST METHOD	UNIT	RESULTS
1	Calcium as CaO	IS 1760 (Part 3) :1992 (Reaffirmed - 2006)	%	46.24
2	Magnesium as MgO	IS 1760 (Part 3) :1992 (Reaffirmed - 2006)	%	0.48
3	Iron as Fe ₂ O ₃	IS 1760 (Part 3) :1992 (Reaffirmed - 2006)	%	0.99
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)	%	14.03
6	Loss On Ignition	IS 1760 (Part 1): 1991 (Reaffirmed - 2006)	%	36.67
7	*Calcium as CaCO ₃	By Calculation	%	82.54
8	*Magnesium as MgCO ₃	By Calculation	%	1.00
9	*Lime Saturation Factor	GLCS/SOP/M/033	%	1.05

Note: * Not covered under NABL scope

Prepared

End of Report* Page 1 of 1

Consu Laboratory

Authorised Signatory Dr.P. THANGARAJU Managing Partner

For Global Lab and Consultancy Services

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 only 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 on E-mail request with report number and report date along with report copy.

ANNEXURE-VI



GERTIFICATE OF INCORPORATION

No. 7081 of 1976

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.

TAMIL NADU CEMENTS CORPORATION LIMITED

MEMORANDUM OF ASSOCIATION

Given under my hand at MADRAS this Twenty second

day of Magha one thousand nine hundred and seventy six One thousand eight hundred and ninety seven (Saka).

The Registrar of Companies Tamil Nadu

(A. G. SIRSI)
Registrar of Companies,
Tamil Nadu.



Copposition and ada Box

TAMIL NADU CEMENTS CORPORATION LIMITED

1. The name of the Company is Tamil Nadu Cements Corporation Limited.

. The registered office of the Company will be situated in the State of Tamil Nedu.

 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 Davelopment 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. Truchirapalli District with all the rights and at Ariyalur. Truchirapalli District with all the rights and at Ariyalur. Nadu industrial Development Corporation 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 bys-products thereof and building materials generally and | or bys-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 company or company or company or company or company or company 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 cament of all

kinds, Concrito, a bearos, gypsiuh, coul, just, hossian klothinguruny bags, paper bags, lime, plasters, whiting, clay, bauxite, 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. Tw 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.
- To carry on the trade or business of engineers, founders, smiths, metal workers, machinists, manufacturers of plant and machinesy required or utilised by cement factories, quaries and mines.
- The objects incidental or ancillary to the attainment of the main objects are:
- 1. To acquire by concession, grant, purchase, barter, and either solely or jointly with others, any lands, buildings, and either solely or jointly with others, any lands, buildings, and concessions and in particular any water rights or concessions for the purpose of obtaining motive power, and any machinery, plant, utensile, 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.
- 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.
- To enter into partnership or into any arrangement for share of profits, union of interests, co-operation, joint adven-

ment, Local Body, authority, persons, or agriphany ment, Local Body, authority, persons, persons, or agriphany ment, Local Body, authority, person, persons, or angage in carrying on or engaged in or in any business or transaction to carry on or engage in or in any business or transaction to carry on or engage in or in any business or transaction capable of being conducted so as, directly or indirectly, to carry or or being conducted so as, directly or indirectly, to capable of being conducted so as, directly or indirectly, to capable of being conducted so as, directly or indirectly, to appear the Company and to sall, hold re-laste, and securities of any such Company and to sall, hold re-laste, with or without guarantee, or otherwise doal with the same.

- 5. To acquire, be interested in, construct, maintain, carry out, impreve, work, alter, control and manage any roads, bridges, tunnels, water-works, water-rights, canals irrigation works, gas works, coal mines, electric works, irrigation works, gas works, contraces, stamping works, smelting works, and factories, warehouses and other works and conveniences which the Company may think conducive to any of veniences which may seem calculated, directly or inthe objects or which may seem calculated, directly or indirectly, to promote the Company's interests and to contridite to and take part in constructing, maintaining, corrying buts to and take part in constructing, maintaining, corrying buts to and take part in constructing, maintaining, corrying 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 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.
- 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, business, pools, combines, syndicates industrial, trading or manufacturing as may be considered to be conductive to the profit turing as may be considered to be conductive to the profit and interest of the Company and to acquire, promote and/or and interest of the Company or undertaking and to carry subsidies interests in any industry or undertaking and to carry on any other business (industrial, trading, manufacturing or 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 prolitable.

- 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.
- 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 parily 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

"15. To apply or join in supplying us, and obtain now, any Parliament or Legislative Authority, Government local munnicipal or other authority or body, or with any landholders or other persons for authority or body, or with any landholders or other persons for any Acts of Parliament or other Acts of or other persons or authority that may seem conductive to the Company's object or any of them or may seem expedient, to obtain pany's object or any of them or may seem expedient, to obtain cany provisional order or Act of Parliament for enabling the any provisional order or Act of Parliament for enabling the any provisional order or Act of Parliament for enabling the any provisional order or Act of Parliament for enabling the any mudification of the Company's constitution, or for any enter 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 imposidence or alteration or cancellation of sny taxes or duties of tariff, which may seem calculated directly or indirectly to traitff, 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 either gratuitously or otherwise.
- 18. To draw, make, issue, accept and to endotas, 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 filt.
- 20. To land or deposit moneys belonging to an antrusted 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,

- 21. To make advances upon opport 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. It, and in particular for shares, debentures and other securities of any other company having objects altogether or in part similar to those of the 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 promium 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 ax-

cribe or contribute or otherwise to assist or to guarantee money to charitable, benevolent, religious, scientific, natioany public, general or useful objects, to any political party or hospitals and dispensaries, medical and other attendance and nal or other institutions or objects or for any exhibition, or for bonus, payments towards insurance or other payment; or by creating and from time to time subscribing or contributing to, aiding or supporting trusts, or convaniences and by providing or subscribing or contributing towards places of instruction and recreation, other assistance as the Company shall think fit, and to subsprovident and other associations, institutions, funds, or connections of such person by building or contributing to the building of houses, dwellings or chawls, or by grants of and the wives, widows and families or the dependents or employees of the Company or its predecessors in Edsiness for any political purpose to any individual or body. money, pension, allowances,

- 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 banefit 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, promoto, subsidise and otherwise assist any company or companies, syndicate or other concern for the purposa of setting up any Industry or running and industrial undertaking, acquiring any property or furthering any of the objects of this Company.

works, necessary or convenient log-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, imporovement, 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 inparticular by laying out and preparing the same for building purposes, constructing, altaring, putilling down, decorating maintaining fitting up, and improving buildings and by planting, paving draining (farming cultivating and latting 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 by 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 Cantral 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.

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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 loperations.

42. To create any depreciation fund, reserve fund, sinking fund, insurance fund, or and special or other fund, whether for depreciation or for repairing, 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, calenders, almanaes and 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.

the Company for streets, parks pleasure grounds, allotments and other conveniences and to present any such land so laid to the public or to any persons or Company conditionally or unconditionally as the Company thinks fit.

- 46. To estabilish, 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 olse where 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 convertors, metallurgists, and to buy, sell, manufacture, repair, convert, after, 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 ancitlary 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 desires in all kinds of metals, materials, 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.

rurs of agricultural and other memory and accessories, rolling, and tools, aquipments, apparatus and accessories, 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.

The liability of the members is limited.

The share capital, of the Company is Rs. 1255 croras.

The share capital, of the Company is Rs. 1,000/eddyled in to 1,80,000 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 of reduce its capital as equity and preference shares and 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 wise over any other shares, or to subject the same to any restrictions or limitations of conditions, and to any the regulation of the Company as far as necesary to give effect to the same and upon the substanticipate in profits in any manner.

We the several persons, whose names and addresses are subscribed heroto, 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

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Sd) A. Duaralpandian Tamilinad Cements, Spl. Officer for

C. V. R. PANIKAR

150-A, Anna Salai, Madras-2

Chairman & M.D. TIDCO.

S/o Thiru L. A. Panikar

150-A, Anna Salai, Madras-2

S. GUHAN

S/o Dr. K. S. Sanjivi

S. GUHAN

Govt, of Tamil Nadu

Finance Secretary

A. PADMANABAN

(Sd) S. Ramamurthy, Production Manager, Tamilinad Cements, Alangulam

A. S. PADMANABAN

S/o A. P. Subramaniam

4. A. S. PADMANABAN

A. PADMANABAN

ONE

Secretary (Industries)

S/o D. Anandam

Govt. of Tamil Nadu

(Sd) G. Muthukrishnan Deputy Secretary, TIDCO, Madras-2

ONE

K. P. GEETHAKRISHNAN

S/o Dr. K R. Parthasarathy,

K. P. GEETHAKRISHNAN

Ramanathapuram Dt.

Alangulam,

Tamilnad Coments,

General Manager,

150-A, Anna Salai, Madras-2

K, PALANIMANICKAM

Director (Finance) TIDCO

K. PALANIMANICKAM

(Sd) A. Duraipandian Tamilinad Cements, 150-A, Anna Salai, Special Officer for Madras-2

A. M. THANGARAJ

150-A, Anna Salai, Madras-2

Development Manager,

S/o Kulandaiya

TAMIL NADU GEMENTS GORPORATION LIMITED ARTICLES OF ASSOCIATION





Dated at Madras this Nineth day of February, 1976

Saven

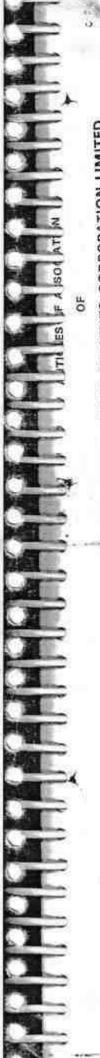
Total

150-A, Anna Salai, Madras-2

Sjo Thiru E, Asirvatham

Secretary, TIDCO

7. A. M. THANGARAJ



TAMIL NADU CEMENTS CORPORATION LIMITED

Definitions: —In these articles unless the context otherwise requires—

- "The Company" means the Tamil Nadu Cements Corporation Limited.
- . "The Act" means the Companies Act, 1956(Central Act of 1956).
- "The Office" means the Registered Office for the time being of the Company.
- 'TIDCO" means Tamilinadu Industrial Dovelopment
 Corporation Limited.
- Y. "The Register" means the register of members to be kept pursuant to Section 150 of the Act.
- VI. "Dividend" includes bonus.
- "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.
- "Persons" includes any Company or Association or Body of individuals whether incorporated or not.
- Xii. **Month" means a calendar month.

shares

graphy and othermodes representing or reproducing words in a visible form.

- has obtained probate or letters of administration as "Executor" or "Administrator" means a person who the case may be, from a competent court. ×K
- for the time being in force for the management of the "Regulation of the Company" means the regulations ⋛
- "Seal" means the common seal for the time being of the Company. XVI.
- "The Chairman" means the Chairman of the Board of Directors for the time being of the Company. XVII.

Unlass the context therein requires the words or expressions contained in these articles shall bear the same meaning as in the Act.

The Company is a Public Limited Company: ri

a Public Company.

Table, A' to

apply:

Company to be

The right of transfer of shares shall be restricted as hereinafter provided. 0

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

sentatives shall subject to any exercise of the statutory powers The regulations for the management of the Company of the Company in reference to the repeal or alteration of or addition to its regulations by special resolution as prescribed or comitted by the Act, be such as are contained in those Articles. 0.00,00,000 and for the observance of the members thereof and their repre-

> governed by these Company to be

Regulations.

5. The Capital of the Company Is Rs. 12:50:99:900 (Rupees twelve Crosss and liberaless) divided in to 1-25:000 one lakil and twenty live thousand) equity shares of Rs. 1,000 Rupees one thousand) each

Capital

Allotment of shares 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.

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 preference share may with the sanction of a special resolution Subject to the provisions, if any in that behalf of the Memorandum of Association of the Company and without 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 be issued on the terms that it is, or at the option of the Company is liable to be redeemed.

debentures or debenture stock of the Company so that if the commission in respect of shares shall be paid or payable amount or rate of commission shall not exceed 5 per cent of the price at which the shares are issued and 21 per cent of the price The Company may at any time pay a commission to any tely or conditionally for any shares, debentures or debenture subscriptions (whether absolute or conditional) for any shares out of capital or out of profits, the statutory conditions and requirements shall be observed and complied with and the at which debentures or debenture stock are issued in each case pirson for subscribing or agreeing to subscribe whether absolustock of the Company or procuring or agreeing to procure subscribed or to be subscribed. The commission may be paid or satisfied in cash or in shares, debentures or depenture stock of the Company, 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

Commission.

Share Certificates.

tilleate and delivery of a Share Cettificate 194 one of several joint-holders shall be sufficient delivery to all.

Every certificate of shares shall specify the number

Particulars on

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. Share Certificates. Issue of new Share Certificate in place or lost or destroydecrepit, worn out of one defaced, torn or old,

pit, worn out, or there is no further space on the back thereof for endorsement of transfer, then, upon the surrender therof to the Company, it may order the same to be cancelled and issue a 11. If any Share Certificate is defaced, form or old, decrenew 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 expenses incurred by the Company in Investigating evidence, as evidence and indemnity and the payment of out-of-pocket the Directors think fit.- 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 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 ment thereof to the time of actual payment but the Board of Directors may waive payment of such interest, wholly or in part. on or before the day appointed for payment thereof, the holder Board of Directors shall fix from the day appointed for the pay14. (1) If a member fails to pay any call, or instalment of at any time thereafter during such time as any part of the call or a call, on the day appointed for payment thereof, the Board may

ment of so much of the call or instalment as is with any interest which may have accrued.

(a) The notice aforesaid shall

on or before which the payment required by the notice of fourteen days from the date of service of the notice) name a further day (not being earlier than the explry is to be made; and (0)

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.

been given may, at any time, thereafter before the payment If the requirements of any such notice as aforesaid are not complied with any share in respect of which the notice has required by the notice has been made, be forfeited by a resoluon 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 aforeasaid, the Board may cancel the forfeiture on such terms as it thinks fit. (1) A person whose shares have been forfeited shall cease to be a member in respect of the forfeited shares but shall notwith-standing 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.

forfeiture. Effects of

> (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.

arant is a Director, the Manager or the Secretary of the company and that a share in the Company has been duly forfeited on a 16. (1) A duly verified declaration[in writing that the decldate stated in the declaration shall be conclusive evidence the facts therein stated as against all persons claiming to entitled to the share.

Declaration of for feiture.

> exacute a transfer of the share in favour of the person to whom (2) The Company may receive the consideration, if any, given for the share or any sale or disposal thereof andmay the share is sold or disposed of.

> > Forfaiture of shares,

Calls on shares.

cation of the purchase money, if any, nor shall his title to the The transferee shall not be bound to see to the applishare be affected by any irregularity or invalidity in the proces-

dings in reference to the forfeiture sale or disposal of the shares.

Provisions regardapply in the case of sums payable at a ing forfeiture to non-payment of fixed time.

Payment in anticlpation of calls may carry interest.

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.

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 calls then made upon the share in respect of which such advance so much thereof as from time to time exceeds the amount of 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, ropay the amount so advanced upon giving to such member three months' notice in writing.

The joint holders of a share shall be jointly and severally liable to pay all calls in respect thereof.

Company's lien on

share.

liability to pay.

Joint holders

whether presently payable or not) called or payable at a fixed 20. The Company shall have the first and paramount lien on every share (not being a fully paid share) for all moneys time in respect of that share, and the Company shall also have a 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 o: in part exempt the provisions of this article. The Company's lien on all shares (other than fully paid shares) standing registered in the name of a single person, for all moneys presently ilen, if any, on the share shall extend to all dividends payable thereon.

lien, but no sale shall be made unloss a sum in respect of of Directors think fit, any shares on which the Company has a The Company may sell, in such manner as the Board

Enforcement of

lien by scale,

demanding payment of such part of amount in respect of which the lien exists as is presently payable has been given to the 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. proceeds of sales.

Application of

dediby any irregularity or invalidity in the proceedings in refeof the purchase money, nor shall his title to the shares be affecof the shares and he shall not be bound to see to the application the sale) be paid to the persons entitled to the shares at the sums not presently payable as existed upon the shares prior to mu.22m. The proceeds of the sale shall be received by the amount in respect of which the lien exists as is presently payable, and the residue if any shall (subject to a like lien for date of the sale. The purchaser shall be registered as the holder Company, and shall be applied in payment of such part of the ence to the sale. with the factor of

d 23. Subject to section 111 of the Act, the Board of Directors may in their absolute discretion refuse to register anycproposed transfer of shares. If the Board of Directors refuse to register the transfor of any shares they, shall whithin two months of the date on which the instrument of transfer is delivered to the Company send to the transferes and the transferor notice of the refusal.

gnath part of any persons, whether or not it shall have express or implied notice thereof. Directors shall be entitled to treat the person whose name as ordered by a court, of competent jurisdiction or as by law appears on the register of members as the holder of any share, as the absolute owner thereof and accordingly shall not (except reguired) by bound to recognise any benami trust or equity or Aquitable contingent or other claim to or interest in such share

28. The instrument of transfer of any share in the Comand the transferor shall be deemed to remain holder of the share until the name of the transferes is entered in the register of members in respect thereof.

bound to recognise any interests in Company not

Notice of refusal to register trans-

Registration of

shares other than that of the regis-tered holders.

Execution of transfer.

- (a) The instrument of transfer is in the prescribed from and complies with all the formulaties prescribed under section 108 (1A) of the Act,
- 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 (3)
- The instrument of transfer is in respect of only one class of shares. Ē
- Every instrument of transfer shall be loft 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 in transfor 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 persons depositing the same.

evidence of title to Transfer to be left

be given.

at office and

- power of the Company to register as shareholder any persons Nothing contained in Article 33 shall prejudice any to whom the right to any shares in the Company has been fransmitted by operation of law,
- The Company shall not charge any fees for transfers or transmissions in respect of any number of shares of the Company,

No Fee on transfer.

operation of law.

Transmission by

The register of members or the register of debensure in the aggregate 45 days in any year but not exceeding 30 days holders may be closed for any period or periods not exceeding 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.

debenture holders

members and

may be closed.

When register of

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 transferse named in an ordinary transfer presented for registration.

provision of Section 111 of the

subject to the

Director's right to refuse registration

into shares of such amount, as may be specified in the meeting increase the share capital by such sum, to be divided resolution.

direct and if no such direction be given as the Board of Subject to such directions as may be issued by annexed thereto at the Company may in its general meeting terms and conditions and which such rights and privileges TIDCO in this behalf, new shares shall be issued upon such Directors shall determine:

new shares may be On what condition

issued.

be issued carrying voting right or rights in the Company as to dividend, capital or otherwise which are disproportionate to the rights atraching to the holders of other shares (not being Provided that no shares (not being Preference shares) shall dreference shares). except so far as otherwise Provided by the conditions of issue, or by these articles, any capital raised by the creation and shall be subject to the provision herein contained with reference to the Payment of calls and instalments, transfer and of new shares shall be considered part of the original capital transmission, lien, voting, surrender and otherwise.

and after the expiration of such time or on receipt of an intim ation from the member to whom such notice is given that he declines to accept the shares offered the Board of Directors may dispose of the same in such manner as they think most to which the member is entitled and limiting a time within which the offer if not accepted will be deemed to be declined 36. The new shares shall be offered to the members in offer shall be made by notice specifying the number of shares proportion to the existing shares held by each member and such beneficial to the Company. 37. Subject to the provisions of Sections 100 to 104 of the Act, and to such directions as may be issued by TIDCO in resolution reduce its capital by paying off capital or cancelling capital which has been lost or is unrepresented by available assets, or is superfluous or by reducing the liability on the shares or otherwise as may seem expedient, and capital may be this behalf, the Company, may, from time to time by special

original capital shares to rank with shares in riow far new

New shares to be

offered to Members. Reduction of Capital.

Sub-division and consolidation of shares.

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 he required by the Act.

Power to modify.

preference shares or otherwise, is divided into different classes of shares, all or any of the right and privilege attached to each class may, subject to the provisions of Sections 109 and 107 39. If at any time, the capital, by reason of the issue of between the Company and by any Person purporting to contact on behalf of that class; provided such agreement is (a) racified of the Act be modified, aprogated or dealt with by agreement firmed by a resolution passed at a separate general meeting and supported by the votes of aleast three fourths of the holders of shares of that class and all the provisions hereinafter in writing by the holders of shares of that class of at least three fourths of the nominal issue value of them or (b) concontained 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 payer of medification which the Company would have if the Article were omitted

Subject to the approval of TIDCO, the Board of ment of any sum or sums of money for the Purposes of the Directors may from time to time, borrow, or secure the pay-Company by means of altesolution passed at a meeting of the 40. Board.

Power to barrow.

of TIDCO, secure the repayment of such moneys in such which money may be borrowed. Conditions on

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The Board of Directors may, subject to the approval

manner and upon such terms and conditions in all respect as they think (it and in particular, by the issue of bonds, perpetual,

charge or other security on the undertaking of the whole or any or redesmable debentures or debenture stock or any mortage,

part of the property of the Company (both present and future)

including its uncalled capital for the time being.

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. 42. ö otherwise and the Board of Directors may, subject to the Raid off upon the footing that it may be called up again provisions of the Act, accept surrender of shares,

Subject to the approval of TIDCO and the provisions 866ds of other securities may be issued at a discount. Premium or otherwise, and with any 1 pecial privileges as to redemption. surrendor, drawings, allotment of shares, attending general mindings of the Company, appointment of Directors and 81'Section 117 of the Act, any debentures debenture stock. otherwise. uni: 43,

stall take the same subject to such prior charge and shall not outh 44: Whenever any uncalled capital of the Company is charged all persons taking any subsequent charge thereon the entitled by notice to the shareholders or otherwise to obtain spriority over such prior charge.

Maliforn end

Barrway of indemnity to secure the Directors or Persons so If the Directors or any of them or any other Parsons affecting the whole or any part of the assets of the Company becoming liable as aforesaid from any loss in respect of such sgall become Personally liable for the payment of any sum Drimarily, due from the company, the Directors may execute or cause to be executed any mortgage, charge or security over or iability. 46.

Egyppany shall in each calendar year hold in addition to any meetings an Annual General, Meeting. Not, more than 15 months shall, elapse between the date of one Annual Geberal 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 SFSection 166 of the Act. All meetings of the Company other Ab. 'The first Annual General Meeting of the Company field the Annual General Meetings shall be called Extraordinary shall be held within eighteen months of its incorporation. Meetings. 47. Subject to the provision of Section 169 of the Act shall; on the requisition of the holders of not less than one tanth 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 soms then due have been paid forthwith the Board of Directors may whenever they think fit and they

Securities may be assignable free from equities. Issue at discount etc., or with special privilege. have priority over any prior charge.

Persons not to

Indemnity may be given. General Meetings.

nary meeting to be When extraordi-

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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 doposite 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 requisitionists or a majority of them in value may themselves convenes the meeting, but any meeting so convened and be held within three months from the date of the deposit of the requisition.
- quisitionists 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.

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.

Notice of meeting.

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.

49. The accidental omission to give notice to, or the nonidealt of notice by, any member or other person to whom it should be given shall not invalidate the proceedings at the meeting.

Omission to give

notice.

for receive and consider the profit and less 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 desmed special business.

Business of Annual

General Meeting.

51. Five members present in person shall be a quorum. Quorum.

the Company, may from time to time, appoint one are more persons (who need not be a member or members of the Company, to represent them at all or any meetings of the Company, to represent them at all or any meetings of the Company.

Right of TIDCO to

as their represen-

(7) Any one of the persons appointed under sub-clause (7) of this Article who is personally present at the meeting shall be deemed to be a member entitled to vote and be present in person and shall be entitled to represent TIDCO at all or any such meetings and to vote on their behalf whether on a show of hands or on a poli.

o 1.(3) an TIPEQ may, from to time cancel any appointment made under sub-clause (1) of this Article and make fresh appointment, assess is mis-

(4) Any person appointed by TIDCO under this Acticle may it so authorized, by such order, appoint a proxy, whether appointly or generally.

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.

Chairman of general meeting.

If quorum not present when meeting to be dissolved and when to be adjourned.

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.

How questions to

be decided at

meeting.

What is to be evi-

dence of passing

of a resolution, where poll not

demanded.

E8. 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 decided on a show of hands, domanded by a member presentin person or proxy or by duly authorized representative and unless a poll is so demanded, a deciaration by the Chairmanthat a resolution has or has not, on a show of hands, been carried or carried unanimously or by a particular mejority 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 plumbar or proportion of the vote recorded in favour of or agaings 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 atonce, 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.

Poll.

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.

Power to adjourn General Meeting. 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.

The demand of a poll shall not prevent the continuting of a meeting for the transaction of any business other than the question on which a poll has been demanded. The Chairman of any meeting shall be the sole judge of the validity of every vote tendered at such meeting. The Chairman of essent at the taking of political be the sole judge chairman of essent at the taking of political be the sole judge of the wildity of every vote tendered at such polit.

All 62. Upon a show of hands every member present in an expension shall have one vote and upon a poil every member present in person or by proxy or by duly authorised representative shall have voting rights in proportion to his share of the bald or Beldiup Squity capital of the Company.

அர்த்தேற்கு proxy shall not be entitled to vote on a show of nanda- ''i'ii

Voting by proxy on show of hands. Vots in respect of Shares of Deceas-

ed and Bankrupt

Members,

any share may vote at any general meeting in respect thereof any share may vote at any general meeting in respect thereof it the same minner 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 dase may be, at which he proposes to vote, he shall satisfy the Board of Of Directors of his right to such shares, unless the Board of Directors shall have previously admitted his right to such shares are 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 sofely entitled thereto, and if more than one such joint holders be precent, 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 mamber of unsound mind, or in respect of whom an order has been made by any court having jurisdiction in lunacy may vate 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.

Votes in respect of shares of Members of Unsound Minds.

Busined may proceed not withstanding demand of

Chairman's Decision conclusive. Votes of Members.

Joint Holders.

In what cases Poll taken without

adjournment.

Proxies permitted.

Instrumentappointing Proxy to be in writing.

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.

Instrument Appointing Proxy to be deposited at Office.

489. The instrument appointing a proxy, and the power of attorney or other authority, if any, under which it is signed, or a notarially 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 poli not less than 24 hours before the time appointed for taking of the poll and in default the instrument of proxy shall not be trusted as valid.

When vote by

70. A vote given in accordance with the terms of an proxy valid though instrument of proxy shall be valid notwithstanding the previous Authority revoked, 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 at which

Form of Proxy.

No Member entitled to vote etc., while call due to Company.

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.

vote except at the meeting or poll at which such vote shell be tendered, and every vote whether given personally or by proxy, not disallowed at such meeting or poll, shall be deemed valid to all purposes of such meeting or poll whatsoever.

77. (a) Until otherwise decided by the Company in a General Meeting, the number of Directors shall not company by less than three and more than fifteen. The

Number of Directors.

> Directors are not required to hold any qualification shares.

Specific Constitution 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.

those who have been longest in office since the persons their last election, but as between the persons their last election, but as between the persons their who became Directors, on the same day, those other it who retire shall unless they otherwise agree among themselves, by determined by lot.

TOTAL OF A TIDEO shall have the power to remove any limit. Director appointed by them, at any time in their total or the transfer of the trans

o note (M) The following shall be the first Directors of the

1. Thiru C. V. R. Panikar, 1 A. S. Chairman and Managing Director. TIDCO, Madas-2.

 Thiru K. P. Geethakrishnan, I. A. S. Director (Finance), TIDCO, Madras-2.

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- Third A. Padmanabhan, 1, A. S.
 Secretary to Government of Tamilhadu,
 Industries Department, Madras-9.
- 4. Thiru S. Guhan, I. A. s.
 Special Secretary to Govt. of Tamilnadu,
 Finance Department. Madras-9
- Thiru B. Vijaya Raghavan, I. A. S. Secretary to Govt. of Tamilhadu, Public works Department, Madras-9.
- Thiru K. Venkatosan, I. A. S.
 Director of Industries and Commerça.
 Chepsuk, Madras-5.
- 7. Thiru R. A. Seetharam Das., 1. A. S.
 Chairman and Managing Director.
 Tamilindu Harijan Housing and
 Development Corporation Ltd..
 Madras-6
- 8. Thiru P. Sivalingam, B. E. (HONS).
 M. 5. (Calif) F. L. E. (IND)
 Chief Engineer,
 public works Department.
 Chepeuk, Madras-5.

Nominee

by the Company to the Industrial Development Bank of India (IDBI), Industrial Finance Corporation of India (IFCI), The IFCI, ICICI, or any other Finance Corporation or tained in these Articles, so long as any monies remain owing or to any other Finance Corporation or Credit Corporation or "the Corporation") continue to hold Debentures in the Comas the Corporation holds Shares in the Company as a result to any other Financing Company or Body out of any loans or any other Financing Corporation or Credit Corporation or any other Financing Company or Body (each of which other Financing Company Body is hereinafter in this Article referred to as pany by direct supscription or private placement, or so long of underwriting or direct subscription or so long as any (g) Notwithstanding anything to the contrary con-Industrial Credit and Investment Corporation of India (ICICI) granted by them to the Company or so long as IDBI, IFCI, ICICI, Comoration or any Credit

It is a company urising out of the Company remains his ext. By, the Company or behalf of the Company remains outstanding, the Corporation ahalf have a right to appoint from outstanding, the Corporation expersons as a Director or Directors (Ing. to time, any parson or persons as a Director or Directors whole time, on the same tendinalist referred to as "Nominee Directors" on the same tendinalist retained to as "Nominee Directors" on the Same tendinalist retained to as "Nominee Directors" on the Same tendinalist retained to as "Nominee Directors" on the Same tendinalist retained to as "Nominee Directors" on the Same tendinalist of their places.

satisfaction of the liability of the Company arising out of the censing to hold Debentures Shares in the Company or on the vacute such office immediately the moneys owing by the company to the Corporation is paid off or on the Corporation or Bireat subscription or the liability of the company aribing out of the Guarantee is outstanding and the Nomines Director's soluppinted in exercise of the said power shall ipso facto ation holds Shares in the Compay as a result of under writing ation holds Debentures in the Company as a result of direct subscription or private placement or so long as the Corpormedsaid office only so long as any moneys remain awing by the Company to the Corporation or so long as the Corpor-Geolisied to the same rights and privileges and be subject paye. The Nomines Director/s so appointed thall hold than same, obligations as any other Director of the Com-Corporation such Nominee by rotation of recipits. Subject as-alonesaid, the Nominee Director/s shall the Corporation such Nominee Director/s, shall no red to hold any share qualification in the Company to remove from office the Nomines Director/s. At the The Board of Directors of the Company shall have no rector/s shall not be liable to retirement Guarantee furnished by the Corporation. the option of the

The Nomineo Directoris 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 Directoris is/are memberls as also the minutes of such meetings. The Corporation shall also the minutes of such meetings.

Corporation and some shall accordingly be paid by the Company directly to the Corporation. Any expenses that may also be paid or reimbursed by the Company to the Corporare entitled, but if any other fees, commission, monies of relation to such Nominee Director/s shall accrue to the be incurred by the Corporation or such Nominee Director(s) in connection with their appointment or Directorship shall pay to the Nominee Director/s sitting and expences which the other Directors of the Company emuneration in any from is payable to the Directors of the Company, the fees, commission, monies and remuneration ation or as the case may be to such Nominee Director/s.

officer of the Corporation the sitting fees, in relation to such the same shall accordingly be paid by the Campany directly Nomines Director/s shall also accrue to the Corporation and Directoria Provided that if any such Nominee to the Corpostion,

to such Nominee Directoris shall also accrue to IDBI and the Provided further that if such Nominee Directorie is an officer of the Reserve Bank of India, the sitting fees in relation same shall accordingly be paid by the company directly to 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 agement of the affairs of the Company, Such whole time Director/s shall be entitled to receive such remuneration exercised or available to a whole time Director in the Manfees, commission and monies as may be approved by the Corporation. 75. If the office of any Director other than one appointed by TIDCO, becomes vacant before the expiry of the period of may be filled up by the Board of Directors, at a meeting of the Board. Any person so appointed shall hold office only upto directorship in the normal course, the resulting casual vacancy the date to which the Director in whose place he was appointed would have held office if the viicancy had not occurred as aforesaid.

Casual vacancy.

in by TIDCO and such Director shall hold office In case of the Director appointed by TIDCO, the vacangy

ad would have held office if the vacancy had not date to which the Dir ctor in whose place he was

as aforesaid.

Additional Director. additional Director shall hold office upto the data of the THE BOTA (a above. Any person so appointed as an time. fixib nor dixeased the maximum number of Directors fixed harminger brectors and additional Directors together poont, any person as an additional Director provided that 6. The Board of Directors may, from time to haxe Annua P Gureral Meeting of the Company.

Vacation of office , by Directors.

(A) So The office of a Director shall be vacated if :

and he is found to be of unsound mind by a Court 196 Campgient, Jurisdiction.

be they applied to be abjudicated an insolvent.

despitation to imprisonment for not loss than he is convicted by a Court of any offence volving/smoral-turpitude and is sentenced he is adjudged an insolvent Six months, O. II.

of which he is a Director accepts a loan or any pany in contravention of Section 295 of the his benefit or on his account) or any firm in which he is a partner or any private Company guarantee or security for a loan from the Comof three months, which ever is longer withhe (whether by himself or by any person, for to absents himself from three consecutive meetings of the Board for a continuous period meetings of the Board of Directors or from all

he acts in contravention of section 299 of the

Act

he becomes disqualified by an order of Court under Section 203 of the Act or;

he is removed in Pursuance of Section 284

2) Not-Striktunding anything in clauses (d). (e) to send (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 aloresaid, 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.

a. If a Director is absent from Tamil Nadu for a Poriod 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.

78.

Alternate Director.

b. An alternate Director appointed as sforesaid 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.

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 rotire.

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

Powers to remove Directors by ordinary resolution

period of office and by an ordinary resolution apprecia.

In person in his stead; the person so appointed shall be selected to state a simple time as if he had become a color of the day on which the Director in whose place he is colored as precion.

ė,

Str. of The Directors shall be entitled to such sitting fees at ending meeting of the Board of Directors or a Committee Sab-Epimpittee thereof, as may be fixed by the Board of states frot exceeding Rs. One hundred sinch

travelling allow

Directors.

by In addition to the remuneration payable to them in physical of the Act, the Directors may be paid all travelling. Total and other expenses properly incurred by them (I) in according to the connection of Directors attending 19 and returning from meetings of Board of Directors attending 19 and returning from meetings of Board of Directors of the Company.

BX - The business of the Company shall be managed by degret of bijectors who may pay all expenses incurred in during the Company registered and may exercise all such warn of the Company as are not, by the Act or any statutory additioning thereof for the time being in force or by these fifties, required to be exercised by the Company in general formal subject nevertheless to the provisions of these defines to the provisions of the Act, and to such regulations and not inconsistent with the provisions, as may be present not inconsistent with the provisions, as may be present not inconsistent with the provisions, as may be present not inconsistent with the provisions, as may be present not inconsistent with the provisions, as may be present on the Directors which would have been valid if that regulation had not been made.

Addid 76% and the other powers conferred by these Articles but subject to the provisions of section 292 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 tems and conditions as they think fit:

Web (2) to authorise the undertaking of works of a capital nature, subject to the condition that all cases involving a

General Power of Company vested in Board of Directors. Specific powers to the Board of Directors.

WAR DELIVER THE TAXABLE PROPERTY.

General Meeting to increase or reduce number of Directors.

Powers of

539

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capital expenditure exceeding rupees ten lakhs shall be referred to TIDCO for their approval before authorisation;

(3) to pay for any property, rights or priviloges acquired by, or services rendered to the Company either wholly or partially in dath 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 servents 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 saleries or empluments 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 R.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 incororated 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 trustees;

(7) to institute, conduct, defend, compound or absindent any lagal 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 ewards;

(9) to make and dive 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 atterney or agent of the Company with such powers (including power to subdelegate) 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;

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 safe and such other powers, covenants and provisions as shall be agreed upon;

(14) Subject to the approval of TIBCO, 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 byelaws for the regulation of the business of the Company, its officers and servants:

(15) 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 dependants 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;

Local Board for managing any of the affairs of the Company in State of Tamil Nadu and to appoint any Persons to be members time to time and at any time to delegate to any person so any specified locality in the State of Tamil Nadu or out of the of such Local Board and to fix their remuneration, and from from time to time and at any time to establish any time being vested in the Directors other than their power to appointed any of the powers, authorities and discretion for the make call; and to authorize 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 :

Company as they may consider expedient for or in relation to (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 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.

the Board to be the Managing and J or wholetime Director think fit for the conduct or management of the business of the Chairman for such period and upon such terms as it may Company subject to the control and supervision of the Board the Board and are not required to be done by the Board of Directors of the Company at the General Meeting 84. (1) TIDCO may appoint any one of the Directors of of Directors. The Mahaging 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 / under the Act. them by ò

Appointment of Managing Director/Whole-time Director/

Chairman

The Managing Director and/or whole time Director or Chairman shall be paid such salary and allowanges as may be fixed by TIDCO.

In the absence of the Managing Director on leave of ampower 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 otherwise, the Board may with the Previous approval of TIDCO, three months, the previous approval of TIDCO shall not be necessary, The Directors shall cause minutes to be made in books provided for the purpose-

(a) of all appointments of officers made by the Directors;

of the names of the Directors present at each meeting of the Directors and of any Committee of the Directors; 9

made in the Books. Directors to cause Minutes to be

> the Company and of the Directors and of the all resolutions and proceedings at all meetings of 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. ō 3

The seal of the Company shall not be affixed to any of Directors and except in the Presence of atleast two Directors and Secretary or such other person as the Board may appoint instrument except by the authority of a resolution of the Board 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 (any fraction contained in that one third being rounded off as as they think fit. One third of the total strength of Directors, one) or minimum two disinterested directors whichever higher shall be a quorum.

Directors and Meeting of

doorum.

fered office or anywhere else within the State of Tamil Nadu if Place of meeting.

and may be hold at the regis-

be decided by majority of votes. The Chairman shall have a Board of Directors and questions arising at any meetings shall second or casting vote. Director may summon mesting. How questions to be decided ?

A Director may at any time convene a meeting of the

it is in the interest of the Company.

Power of quorum.

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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.

quorum is present shall be compétent to exercise all or any of

A meeting of the Board of Directors at which a

Chairman of Directors' Mestings.

Directors' meetings and determine the period for which he is to 91. TIDCO may nominate a Director as Chairman of the 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 Conirman of the meeting.

Powers of Chair-

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 to act in accordance with the proposal or decision without period of two months, the Board of Directors shall be entitled further reference to TIDCO.

time, revoke such delegation. Any Committee so formed shall, in the exercise of the powers so delegated, conform to any tions 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 regulations that may, from time to time, be imposed upon it by 93. The Board of Directors may, subject to the restricthe Board of Directors.

Powers of Com-

Delegation of

I 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 A Committee may elect a chairman of their mostinus. their members to be Chairman of the meeting.

Director. provided that nothing in this article shall be deemed 95. All acts done by any meeting of the Board of Directors or of a Committee of Directors, or by any person discovered that there was some defect in the appointment of person had been duly appointed and was qualified to be a such Directors or persons acting as aforesaid, or that they or to give validity to acts done by a Director after his appointment has been shown to the Company to be invalid of to have acting as a Director, shall notwithstanding that it be afterwards any of them were disqualified, be as valid as if every such terminated.

96. Save as otherwise expressly provided in the Act, a. Recolution without **Board Meeting** resolution in writing signed by all the Directors then in vote on the resolution shall be as valid and effectual as if it india or by a majority of such of them as are entitled to had been passed at meeting of the Directors duly called and constituted.

Subject to such directions as may, from time to time Reserve Fund. 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 lit, and employ the reserve funds or any part therof in the business of the Company and without being bound to keep the same separate on such invastments (other than shares of the Company) as 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 or for special dividends, or for repairing, improving 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 upthey may think fit from time to time, deal with and vary reserve fund to meet contingencies or for equalising divi-Company, lor of the and and maintaining any of the property capital o amortisation other

defective Appoint Directors of Committees valid not When actions of with-standing ment

for payment of dividend subject to any special rights relating thereto fund and amortisation of capital shall with the approval of ect to the provisions of these presents as to the reserve TIDGO be divisible among the members in proportion to the created or authorised to be created by these presents subto Company available The profits of t

Provided always that any capital paid up on a share during the period in respect of which a dividend is dec-

> Capital paid up in advance.

Declaration of dividends.

Dividends out of profits only and not to carry interest.

deemed net profit. When to be

Interim Dividend.

Debts may be deducted.

smount of capital held by them respectively.

fared shall only entitle the holder of such share to an apportioned amount of such dividend as from the date of 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 intenst, confer a right to participate in profits. payment.

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, 101. No dividend shall be payable otherwise than out undistributed profits of the Company and no dividend shall of the profits of the year or other period or any other carry interest as against the Company.

102. The declaration of the Board of Directors as to the amount of the net profits of the Company shall be conclusive. 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.

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. 6

business of an ordinary general mosting which declares a Any general meeting declaring a dividend may make a call on the members of such amount as the meeting fixes, but to him and the call be made payable at the same time as the dividend, and the dividend may, if so arranged botween the making of a call under this clause shall be deemed ordinary the call on each member shall not exceed the dividend payable Company and the members, be set off against the call, 105 dividend. 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.

partly in cash.

107. A transfer of shares shall not pass the right to any dividend declared thereon after transfer and before the registration of the transfer.

Effect of transfer.

108. The Board of Directors may retain the dividends payable upon the shares in respect of which any person is person under that clause is entitled to transfer, until such person shall become a member in respect of such shares or under Article 23 entitled to become a member or which any shall duly transfer the same.

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 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 shall be made payable to the order of the person to whom it is first in the register in respect of the jaint-holding; or to such person and to such address as the shareholder or joint-holder may in writing direct, and overy cheque or warrant so sent

Dividends or Bonus payable wholly or

Dividend and Call

together.

certain cases. Retention in

Dividend to Joint Holders Payment by Post.

Appointment of

ルートワラコー きょううのとも 大大

have power: the accounts. Auditor-General of Attitions right to Comptroller and Powers of the

The auditors of the Company shall be entitled to Company at which any accounts which have been examined or make any statement or explanation they desire with respect to The auditors of the Company shall be appointed or receive a notice of and to attend any general meeting of the reported on by them are to be laid before the Company and may Wappointed 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.

123. The Comptroller and Auditor-General of India shall

in pursuance of Article 121 heraof and to give to direct the manner in which the Company's accounts shall be pudited by the auditors appointed such auditors instructions in regard to any matter felating to the performance of their functions as 3

form, as the Comptroller and Auditor-General 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 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 india may by general or special order, direct. 9

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 124. The auditors aforesaid shall submit a copy of their the same time and in the same manner as the audit report.

> Auditor-General of audit report by the

Comptroller and

India to be placed

before ordinary

meetings.

Accounts to be deemed finally

sottled

Comments upon or

supplement to

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

or omission are found out in the accounts as approved by the General Meeting, necessary rectification should be made only in the accounts of the Company for the succeeding financial

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 therapf and in like manner may vary and annual any such directive. The Board of Directors shall give immediate effect to directives so issued,

Right of TIDCO.

member either personally or by sending it by post, to him to his 127. A notice may be given by the Company to any 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. 128. A holder of registered shares, who has no registered the Company an address, which shall be deemed his registered place of address may, from time to time, notify in writing to place of address, within the meaning of Article 127,

to him, a notice addressed to him and advertised in newspapers 129. If a member has no registered address and has not supplied to the Company an address for the giving of notices 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.

holders of a share by giving the notice to the joint holder 130. A notice may be given by the Company to the joinnamed first in the register in respect of the share. 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.

How notices to be served on members.

registered place of address by a holder shares having no Notification of of registered address.

When notice may Advertisement. be given by

Notice to joint holders.

deceased or a bankrupt member How notice to be sentatives of a given to repre-

general meeting o whom notice of general me to be given.

giving of notice to them, and also to (b) every person entitled he Company except those members who having no registered addrass have not supplied to the Company an address for the 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 same manner hereinbefore authorised to (a) every member of Notice of every general meeting shall be given in the nas due notice. Every person, who by operation of law, transfer or notified to and registered by the Company, shall be duly given 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 hiddings and little to the share being to the person from whom he derives his title to such share.

Transferees, etc.

bound by prior

notice.

The algnature to any notice to be given by the Company may be written or printed, Where a given number of days notice or notice of service shall, unless it is otherwise provided, be counted in extending over any other period is required to be given the day such number of days or other period. If the Company shall be wound up and the assets available for distribution among the members as much shall such assets shall be distributed so that, as nearly as may be the losses shall be borne by the members in proporation 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 espectively. 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 haid up or which ought to have been paid up on the shares held by them respectively. But this clease shall be without prejudice to the rights of the holders of shares issued upon be insufficient to repay the whole of the paid up capital, special terms and conditions.

any matter which may be in the nature of a trade secret, mystery of trade or secret process which may relate to the No member shall be entitled to require discovery or any information respecting any detail of Company's trading or

of the members of the Company to communicate to the public. opinion of the Directors it will be inexpendient in the in conduct of the business of the Company and

of his duties; and the amount for which such indemnity is provided shall immediately attach as a lien on the property of or servant of the Company shall be indemnifed by the Company funds of the Company to pay all costs, losses and expenses which any such officer or servant may incur or become Hable to, by reason of any contract entered into, or act or thing done the Company, and have priority as between the members over against, and it shall be the duty of the Directors out of the by him as such officer or servant or in any way in the discharge 138. Subject to the provisions, of Section 201 of the Act. every Director, Manager, Auditor, Secretary and other officer all other claims

be liable for the acts, receipts, neglects or defaults of any 139. No Director, or other officer of the Company shall other Director or Officer of the Company or for joining in misfortune whatever which shall happen in the execution of he duties of his office or in relation thereto, unless the same 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 css or damage arlising from the bankruptcy, insolvency or ortuous act of any person with whom any moneys securities or effect shall be deposited or for any other lost, damage or any receipt or other act for conformity or for any loss or nappens through his own negligence, default, misfeasance, preach of duty, or breach of trust.

Individual respondibility of Directors,

Distribution of

Secreey Clause.

How time to be

counted

How notice to

C.V.R. PANIKAR S/o Thirdi I. A. PANIKAR.	Chairman & M. D. TIDCO 150 - A. Anna Salal Madras - 2.	C. V. R. PANIKAR	(8d) A. Duralpandlan Special Officer, Taminad Coments, 150, A. Anna Salai,
S. GUHAN Sjo Dr. K.S. Sanjivi	S. GUHAN Finance Secretary, Sjo Dr. K.S. Sanjivi Govt. of Tamil Nedu S. G.	S. GUHÁN	
A. PADMANABAN S/o Thiru D. Anandam	Secretary, Industries, Govt. of Tamil Nadu	A. PADMANABAN	
A. B. PADMANA. SA THIU A. P. Subra.	General Manager, Tamilined Cements Alangulam	A. S. PADMA- NABAN	(Sd.) S. Ramamurthy. Production Manager, Temilinad Caments, Alangulam.
K. P. GEETHA- KRISHNAN Slo Dr. K. R. Partha- sarathy.	Director (Finance) TIDCO 150 - Anna Salai, Madras 2.	K. P. GEETHA- KRISHNAN	Sd) G. Muthukrishnan Dy. Secretary, TIDCO, 150 - A. Anna Salai, Madras - 2.
K. PALANI- MANICKAM Sjo Thiru Kulandiya	Development Manager, TIDCO, 150 - A, Anna Salai, Madras - 2.	N. PALANI MANICKAM	(Sd) A. Duraipandian, Special Officer. Taminad Cements, 150 - A. Anna Salai, Madras - 2.

PARAGRALL.

and their addresses, description and occupation

Signature of subscribers

Address, description and occupation, if any

5. No. subscriber

Dated this day of Ninth February, 1976,

Secretary, TIDCO, (Sd) 150 - A. Anna Salai, A.M. THANGARAJ Madras - 2.

7. A.M. THANGA-RAJ S/o Thiru E. Asiivatham

ANNEXURE-VIA

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-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, Vridhachalam
	288	The Board considered and approved the proposal and passed the following resolutions:
		"RESOLVED THAT the Unit Heads of Alanguiam Cement Unit, Ariyalur Cement Unit and Stoneware Pipe Factory, Vridhachalam be and are hereby delegated powers:
		 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.
		 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)

Russley



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, CHENNAL-S-

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 Arlyalur&Alangulam Cement Units and Strone Pipe Factory, Vridhachalam.
	289	The Board approved and ratified the Nomination of the Principal Secretary/ Managing Director as owner of the Captive Mines of Ariyalur, Alangularn Cement Unit and Stoneware Pipe Factory, Vridhachalam and passed the following resolutions:
(4)		"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:
		 Alangulam Lime Stone Mines, Gopalapuram Lime Stone Mines & Pandapuli 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.
		 Kallankruchi Lime Stone Mines (KSLM) 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.
		 Panikuppam Clay Mines, Tharanipalayam Clay Mines & Karal 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)

Randry





TAMILNADU CEMENTS CORPORATION LIMITED

(A GOVERNMENT OF TAMILNADU UNDERTAKING)
L.L.A.Building, 735, Anna Salai, Chennai – 600 002
Phone: 28525461, 28525471, 2841953

E-mail: personnel@tancem.com/WEBSITE:www.tancem.com Fax: 044-28523991

PROCEEDINGS OF THE PRINCIPAL SECRETARY / MANAGING DIRECTOR, TANCEM

PRESENT: TMT D.SABITHA, I.A.S.

Proc.No.2593/A1/2018

Date 28.04.2018

Sub: Estt-TANCEM-Ariyalur Cement Works - Thiru T Ravichandran, Dy. General Manager (Technical), Ariyalur- to carry out the functions of the Unit Head, Ariyalur Cement Works, Ariyalur - Orders 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.

SO/-

Principal Secretary/MD

To

Thiru T.Ravichandran, Dy General Manager (Technical), Ariyalur Cement Works, Ariyalur.

Copy to:

- GM (Tech.)/ G.M (Mkt)
- Z. All HODs CO
- 3. All Units
- 4. Notice Board

(Forwarded by order)





47 45

HEADS OF A LANGUIAM 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.
- 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 breath of contract like late delivery etc., upto a value of %.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 No.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.
- To approve debit slips supported by vouchers and sanction order wherever necessary.
- 10. To declare and dispose of as unserviceable, obsolate or surplus articles or stores or plans etc., and sanction w/off of lesses due to theft, negligence, fraud or other causes up to a limit of 8.5,000 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:
 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 proceedure defailed in the appendix enclosed/Appendix-I.
- the scrutinised by the unit level tender committee and purchases beyond 8.2.5 lakhs and upto 8.5/- lakhs and it be scrutinised by the tender committee, including of conlopment 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.
- 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 26. factory and Mines.
- To execute all deeds and contract documents for contracts entered into with civil, electrical and other works applicables including materials suppliers. 27 .
- To sign documents and deeds before Government and other author ities for telephone, postal except motor vehicles 28 . 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.
- To act as Agent of all mines of the respective factory 30. 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.
- 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. 31.
- 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.

TELESTICATION OF THE STATE OF T

sd/- xxx, secy-cum-F.C. Sd/- xxx/M/A/ sd/- xxx/M.D.

/true copy/

Special Tahsildar (L.A) Unif-It. M/s. Tamil Nadu Cements Corputated

ARIYALUR-621 713. 45



(11) Purchases exceeding M.5/- lakhs shall be referred to 11. M.D. for approval alongwith the recommendations of the tender committee inclusive of Development Manager and the Secretarycum-Financial Controller of the R.O. Managing Director will be the competent authority to decide revenue purchases coating more than N.5/- lakhs. However any purchases exceeding N.7.5 lakhs will be decided by the Executive Sub-Committee of the Board of Directors.

Capital expenditure other than Civil:

To incur capital expenditure other than on civil items upto a limit of %.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 : To accord technical sanction without any limit. 13 .

To accord administrative approval upto 8.50,000/- with tender excess of 5% only subject to the quarterly allotment 14. of budget estimates.

To accept tenders for works in respect of which the 15, estimates prepared as per State public works Department schedules does not exceed %.50,000/- provided the tender excess is with in 5% of the estimate.

To award works on nomination upto R10,000/- 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 16. end of every month.

ADMINISTRATION :

CANASCEUTICALITACION DE LA CANASCE CONTRACTOR DE LA CONTR

To appoint persons upto the scale of \$500-40-900 in case of Board scales subject to the budgetary provision and sanction of posts by Managing Director.

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.

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. 19.

To declare progation for all employee's for he is the 20. appointing authority.

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 21.

To sanction all kinds of leave for the Officers, Staff and Workers attached to the Unit except preparatery to retirement and encashment of leave in the event of resignation/retirement.

To accord sanction for and regular dearness allowance and other allowances from time to time as per wage board award Covernment, orders as the case may be.

award Government orders as the case may be.

(Contd ...3)

ANNEXURE-VIB

BOARD OF DIRECTORS

SI.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 MACU LINCERTAKING)
Corporate Office: L.L.A. Building, No. 756, Arma Salai, Chennal - 600 602.
Fax: 044-265-2591 / Website: www.tancem.com
CW: U40250TN18765GC007081

Phone: 26525461 26525471 26591735 26525230

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 limeianikar mines owned by TANCEM.

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 Plans, 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 Gureau of Mines and Directorate General of Mines Safety.

(D.SABITHA, 1.A.S) Nominated Mines Owner/ Addl. Chief Secretary/CMD

ANNEXURE-VII



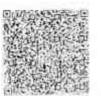
இந்திய அரசாங்கம் Government of India

geberggeit glasGtjó Ravichundran Thangavel

Father THANGAVEL

mas anabore toommet, are a Male

2278 8111 9370



அதார் - சாதாரண மனிதனின் அதிகாரம்



Unique Identification Authority of India

приний ког делеблик лин го. Синтеприденци. Съблука "Ментеритичной Съблука Биз-Карисандай дийр вито Address S/O Thangavel, NO 123, MAYAR MUTHU STREET, KK NAGAR Trachirappalik, K. magar, Tumir Nada, 520021

2278 8111 9370



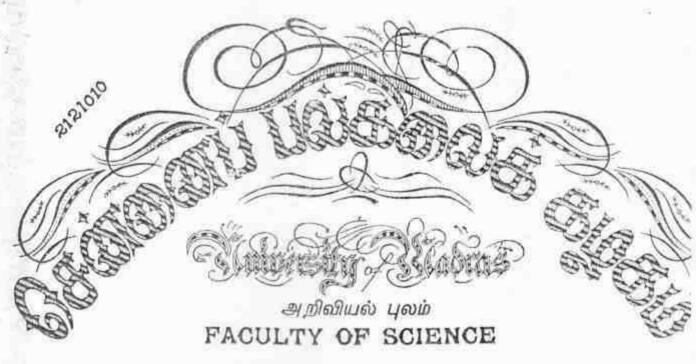




UNIT HEAD
TAMILNADU CEMENTS CORPN.LTD...
ARIYALUR WORKS.
ARIYALUR - 521 779



ANNEXURE-VIII



் சென்னைப் பல்கலைக் கழகப் சூரவை 1994 ஆம் ஆண்டு ஏப்ரல் மாதம் கடக்த களிமவியல் தோலை வ தங்களாக என்பவர் சிதல் வகுப்பில் தோச்சி இபற்றார் என்று தக்க தேர்வாளர்கள் சான்றனித்தபடி அறிவியல் நிறைஞர் என்னும் பட்டத்தை அவகுக்குப் பல்கலைக் கழக இலசசினையிடன் உழகுகுகிறது.



Given under the seal of the University

r. P. THANGARAJU, M.Sc. Ph.D. T.

"gymeni Caika V. C.

Coinnario, Chepaule

9 4 60 5 50 507, Madias 25-01-1999

148 emeni. Registras

E 6 -

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 / Foremen's / Over man's / Sirdar's / Mate's / Short firer's/ Blaster's Certificate of competency (Restricted) examination under the Metalliferous Mines Regulations 1961.

1 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.

Or THEINDILAY LIME STONE MINES

(Signature with date and official Seal)

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.
Ouglified Person

	Particulars of practical Experience	Place of Experience (b)	Period of practical experience(c)		Total Experience (e)		
	(n)		From	To	Yr.	Month	Day
	As a Traince in Drilling Operation	Semi Mechanised Opencast working	02.05,1994	15.07.1995	(0)	02	14
02.	As a Trainee in Blasting Operation.		16.07.1995	10.12.1996	01	0.4	25
03.	Exploration		11.12.1996	31,01,1998	01	0.1	20
04.	Surveying		01.02.1998	25.06.1998	.00	04	25
05.	Sampling Quality control and		26.06,1998	20.07.1999	0.1	00	24
D6.	Supervision in HEMM Operation		21,07,1999	30.12.1999	00	05	10
		GRAND TOTAL			05	07	28

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	

Signature of Candidate

OF THENMALAI LIME STONE MINES

Signature of Manager with Dasat Schass)

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

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

(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

LOCATION OF THE AREA

EXTENT : 23.35.0 ha.

S.F.NOs. : 222/1, 222/2A, 225, 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.

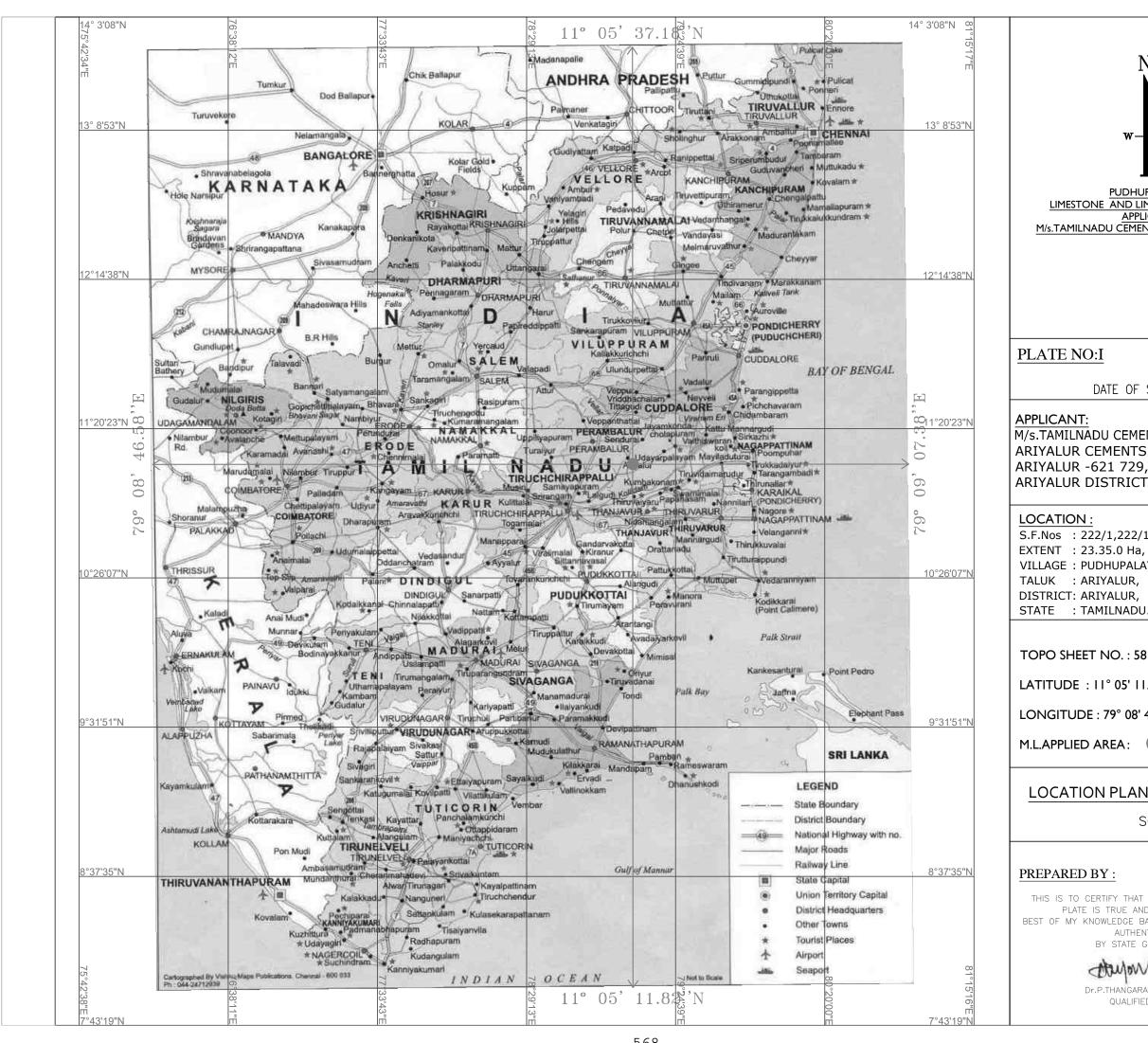
E-mail: geothangam@gmail.com.

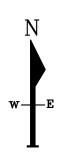
[VOLUME -II - PLATES]

PLATES

LIST OF PLANS AND SECTIONS

SI.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	





PUDHUPALAYAM LIMESTONE AND LIMEKANKAR DEPOSITE, APPLICANT: M/s.TAMILNADU CEMENTS CORPORATION LTD,

PLATE NO:I

DATE OF SURVEY: 06.08.2019

APPLICANT:

M/s.TAMILNADU CEMENTS CORPORATION LTD. ARIYALUR CEMENTS FACTORY, ARIYALUR -621 729, ARIYALUR DISTRICT.

LOCATION:

S.F.Nos : 222/1,222/11A etc., EXTENT : 23.35.0 Ha, VILLAGE: PUDHUPALAYAM, TALUK : ARIYALUR, DISTRICT: ARIYALUR,

INDEX

TOPO SHEET NO.: 58 M/04

LATITUDE: 11° 05' 11.82"N to 11° 05' 37.18"N

LONGITUDE: 79° 08' 46.58"E to 79° 09' 07.38"E

M.L.APPLIED AREA:



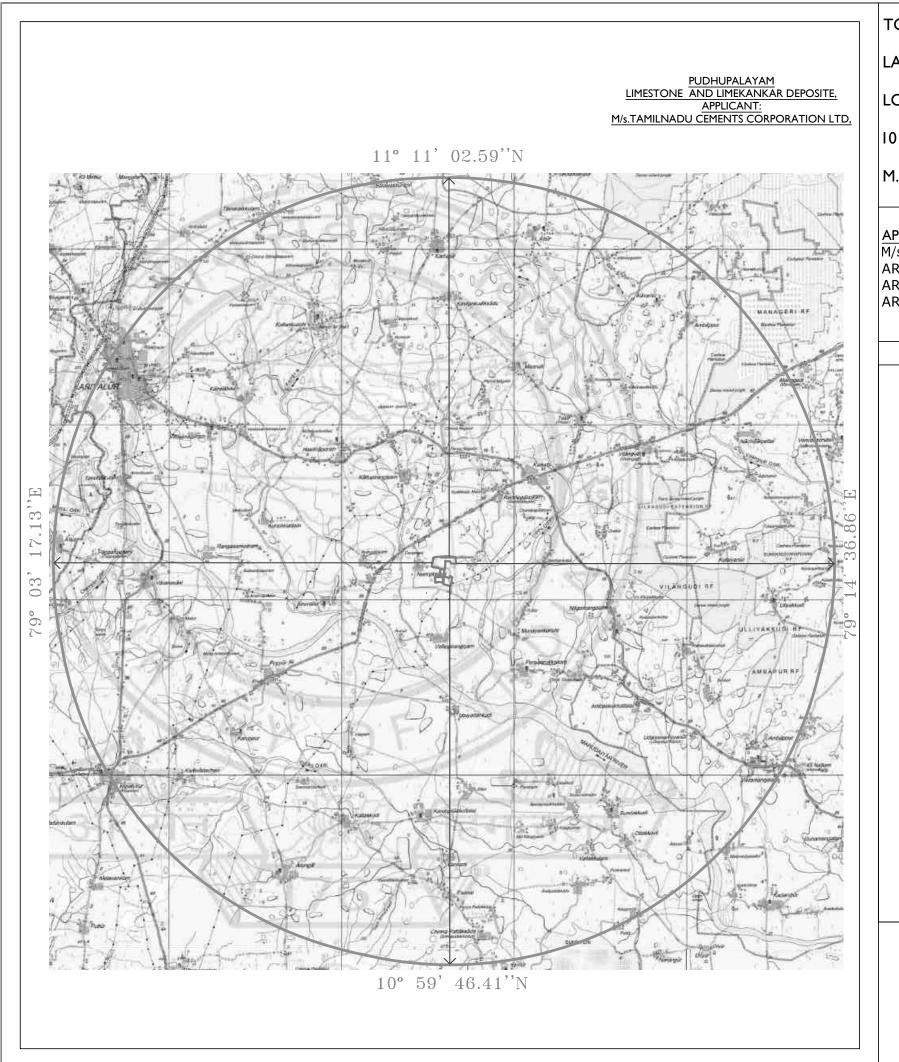
LOCATION PLAN

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 LEASE MAP AUTHENTICATED BY STATE GOVERNMENT





TOPO SHEET NO.: 58 M/04

LATITUDE: 11° 05' 11.82"N to 11° 05' 37.18"N

LONGITUDE: 79° 08' 46.58"E to 79° 09' 07.38"E

10 KM RADIUS :

M.L.APPLIED AREA:

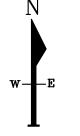


PLATE NO:I-B

DATE OF SURVEY: 06.08.2019

APPLICANT:

M/s.TAMILNADU CEMENTS CORPORATION LTD. ARIYALUR CEMENTS FACTORY,

ARIYALUR -621 729, ARIYALUR DISTRICT.

LOCATION:

S.F.Nos : 222/1,222/11A etc.,

EXTENT: 23.35.0 Ha, VILLAGE: PUDHUPALAYAM,

TALUK : ARIYALUR,

DISTRICT: ARIYALUR, STATE: TAMILNADU.

INDEX

CONVENTIONAL SYMBOLS Express highway: with foll, with bridge; with distance stone Roads, melated: according to importance Roads, double carriageway: according to importance..... Streams, with track in bed, undefined. Canal Dams: masgrey or rock-filled: earthwork: Weir River: dry with water channel, with island & rocks. Tidal river Submerged rocks, Shoat, Swamp, Reeds Wels lined unlined Tube-well Spring Tanks perennial dry. Embankments road or rail; tank. Broken ground Mineral line or tramway. Kiln: Cutting with tunnel. Contours with sub-features. Rocky slopes. Cliffs Sand trahires (1)flat. (2)sand-fulls(permanent). (3)dunes(shitting). Towns or Villages inhabited, deserted. Fort. Lighthouse. Lightstep, Buoye: Eighted, unlighted, Anchorage oxdots oxdots oxdots oxdots Palens: polinyra; other, Plantain. Confor. Bamboo. Other trees. Areas: cultivated, wooded: Surveyed tree. state demarcated undemarcated ___ district, subdivision; takell or tilkia; forest._____ △200 . BM 63-3 . BM 63-7 Rest house or inspection bungstow. Circuit house. Police station. # Camping ground. Forest: reserved; protected. Spaced names: administrative; tocality or tribal Hospital, Dispensory, Veterinory, Hospital / Dispensory Aerodrome, Helipad, Tourist site. Power line: with pylons surveyed; with poles unsurveyed.

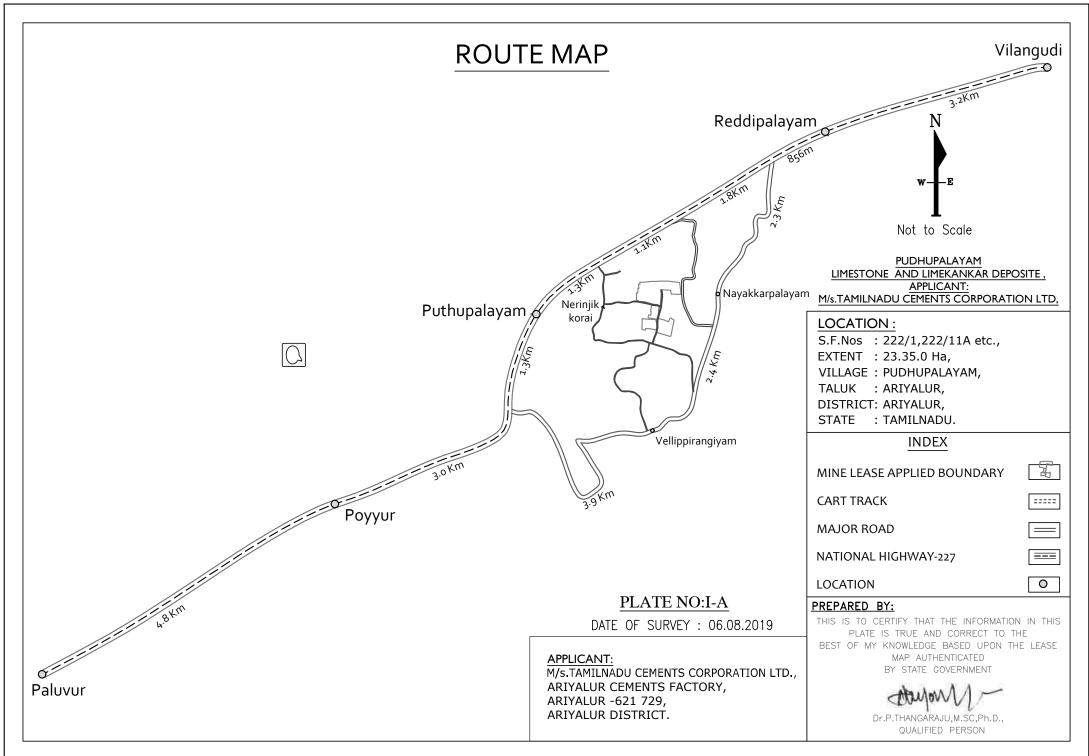
PREPARED BY :

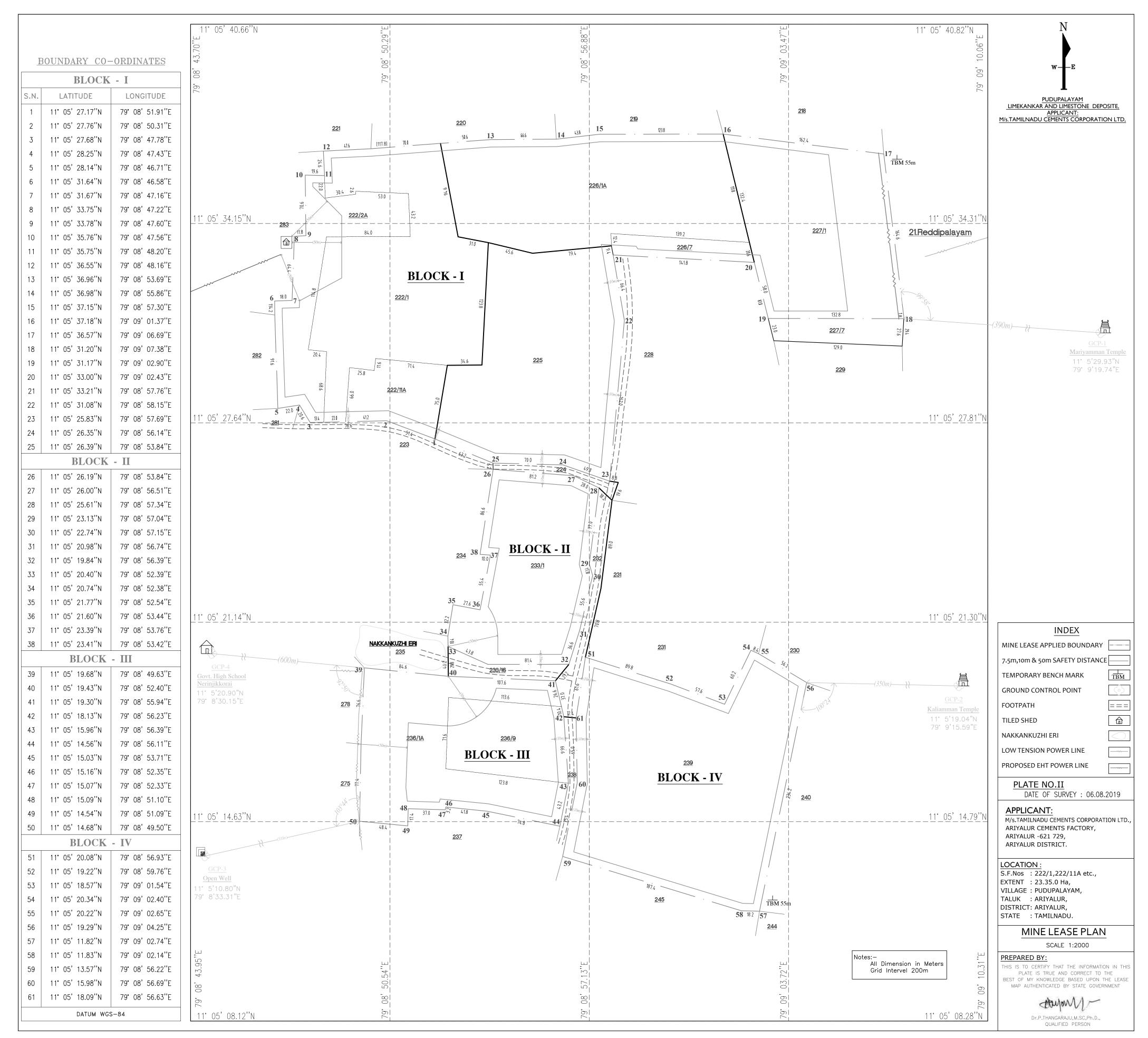
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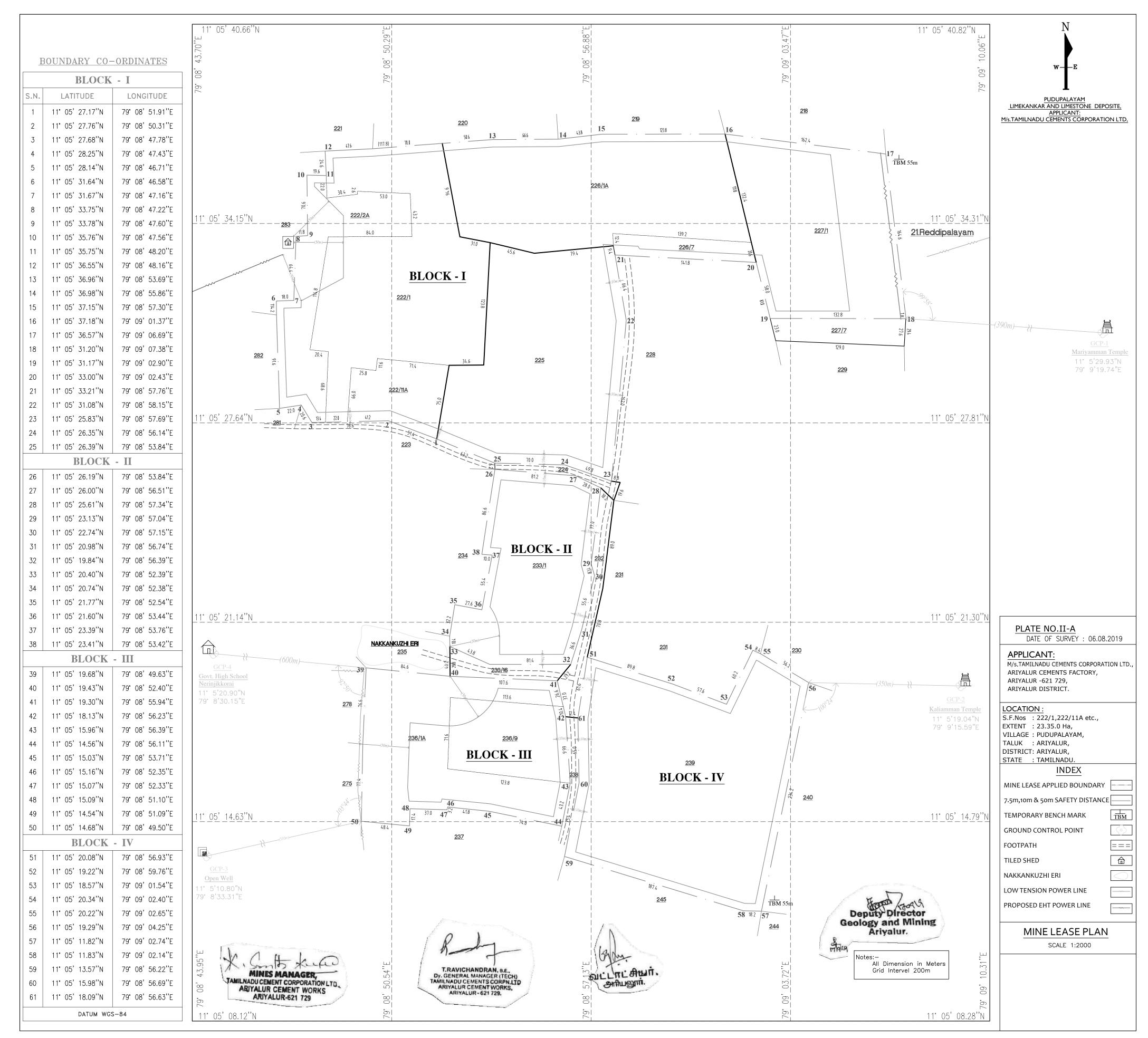
KEY PLAN

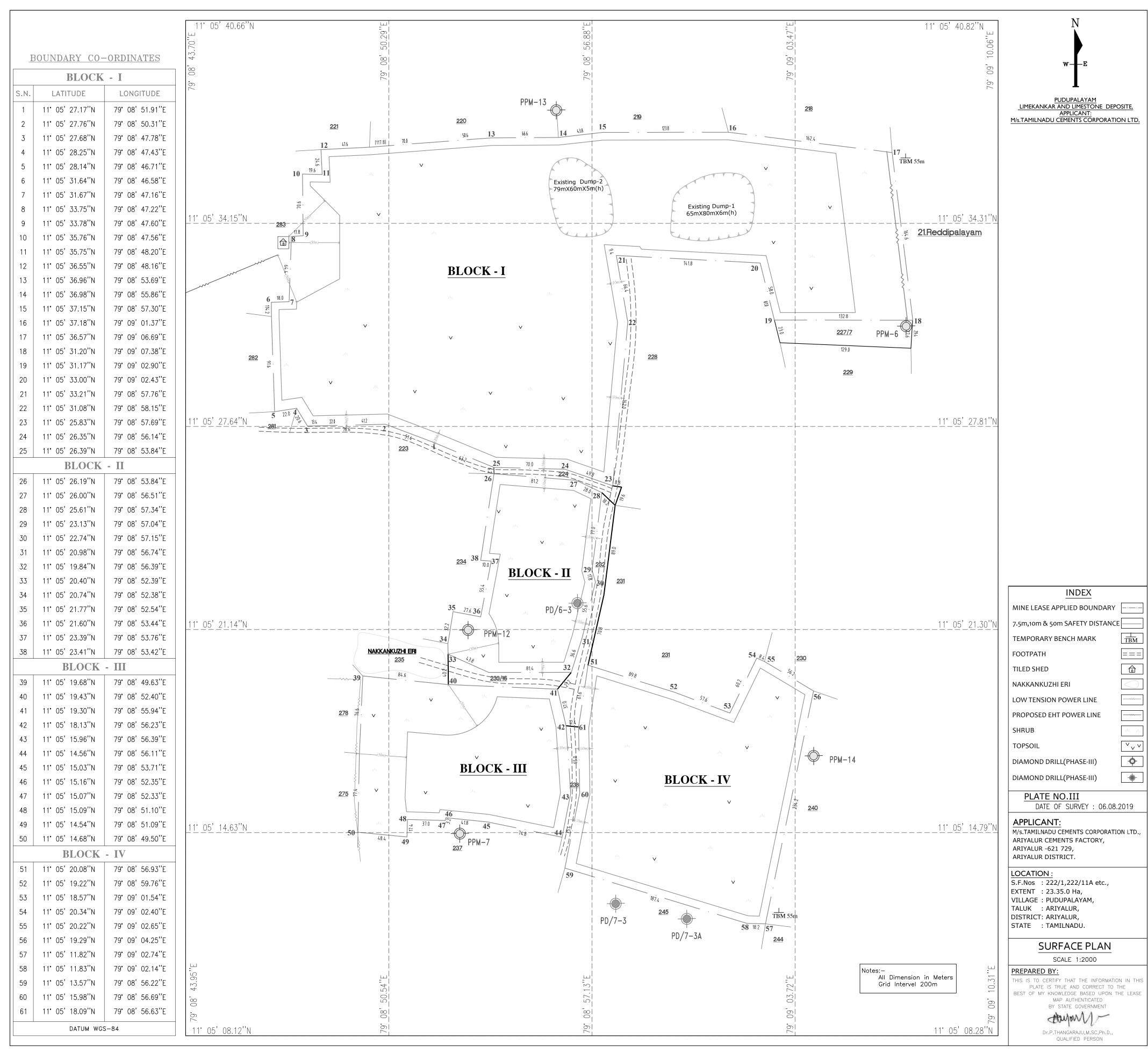
THIS IS TO CERTIFY THAT THE INFORMATION IN THIS
PLATE IS TRUE AND CORRECT TO THE
BEST OF MY KNOWLEDGE BASED UPON THE LEASE MAP
AUTHENTICATED
BY STATE GOVERNMENT

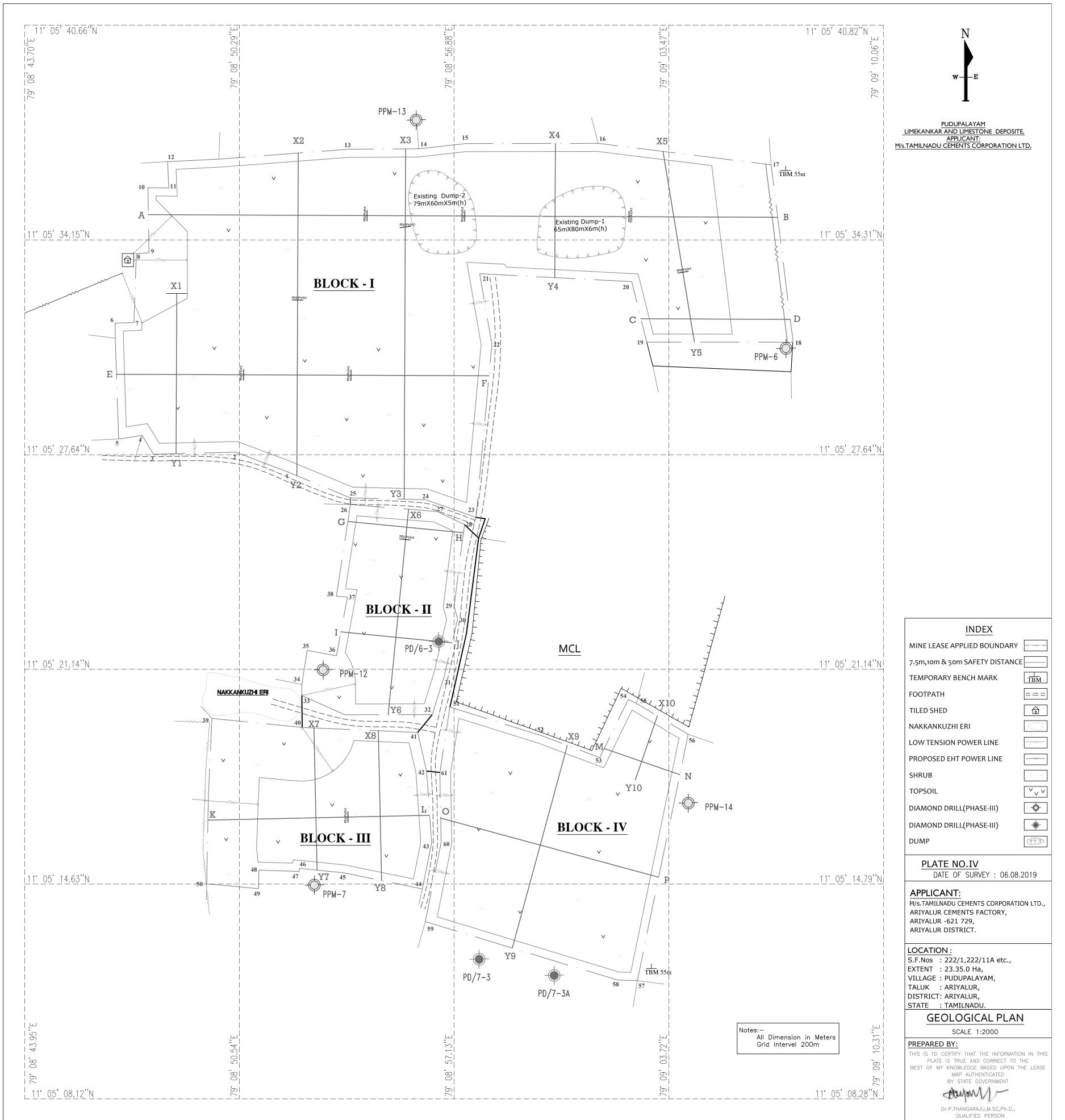


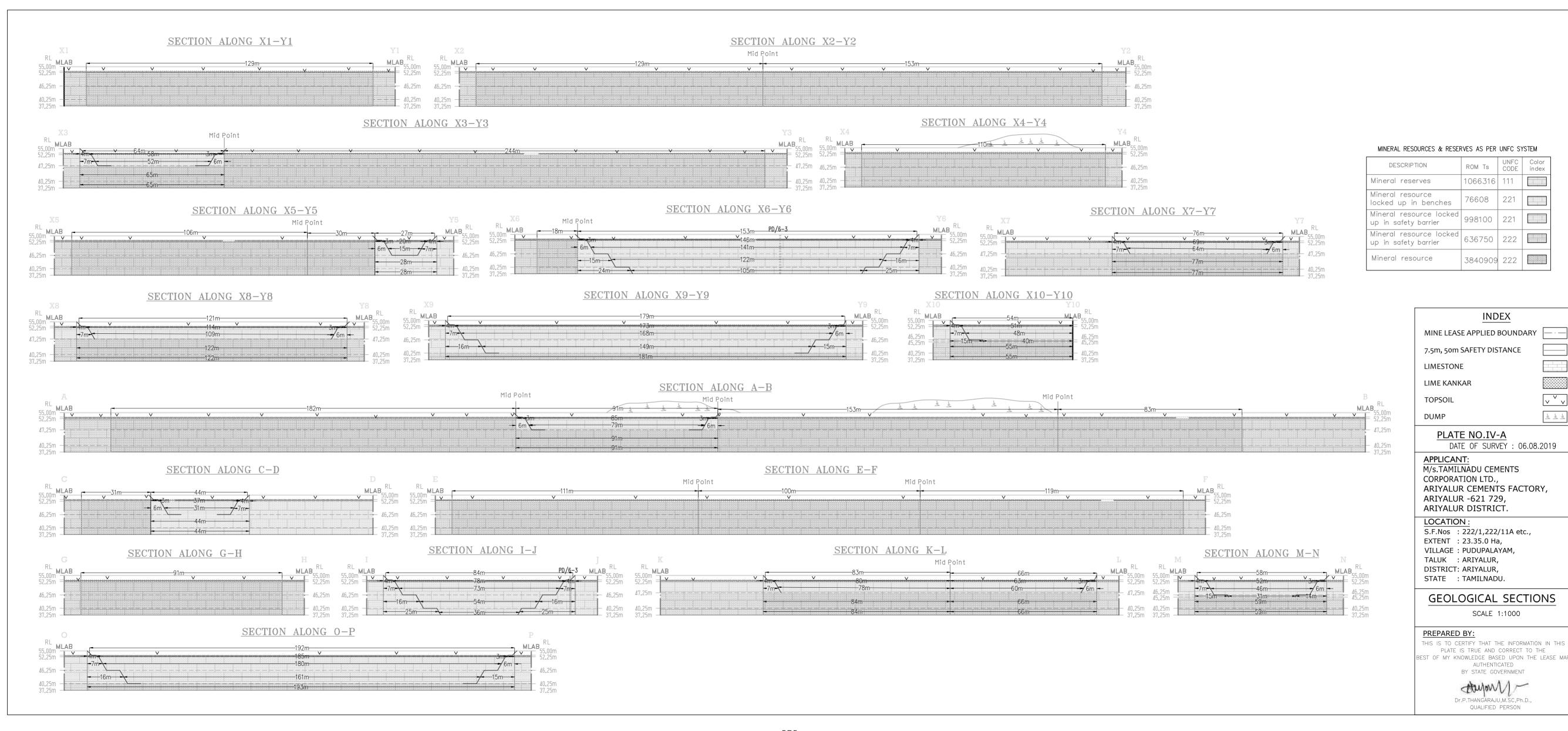


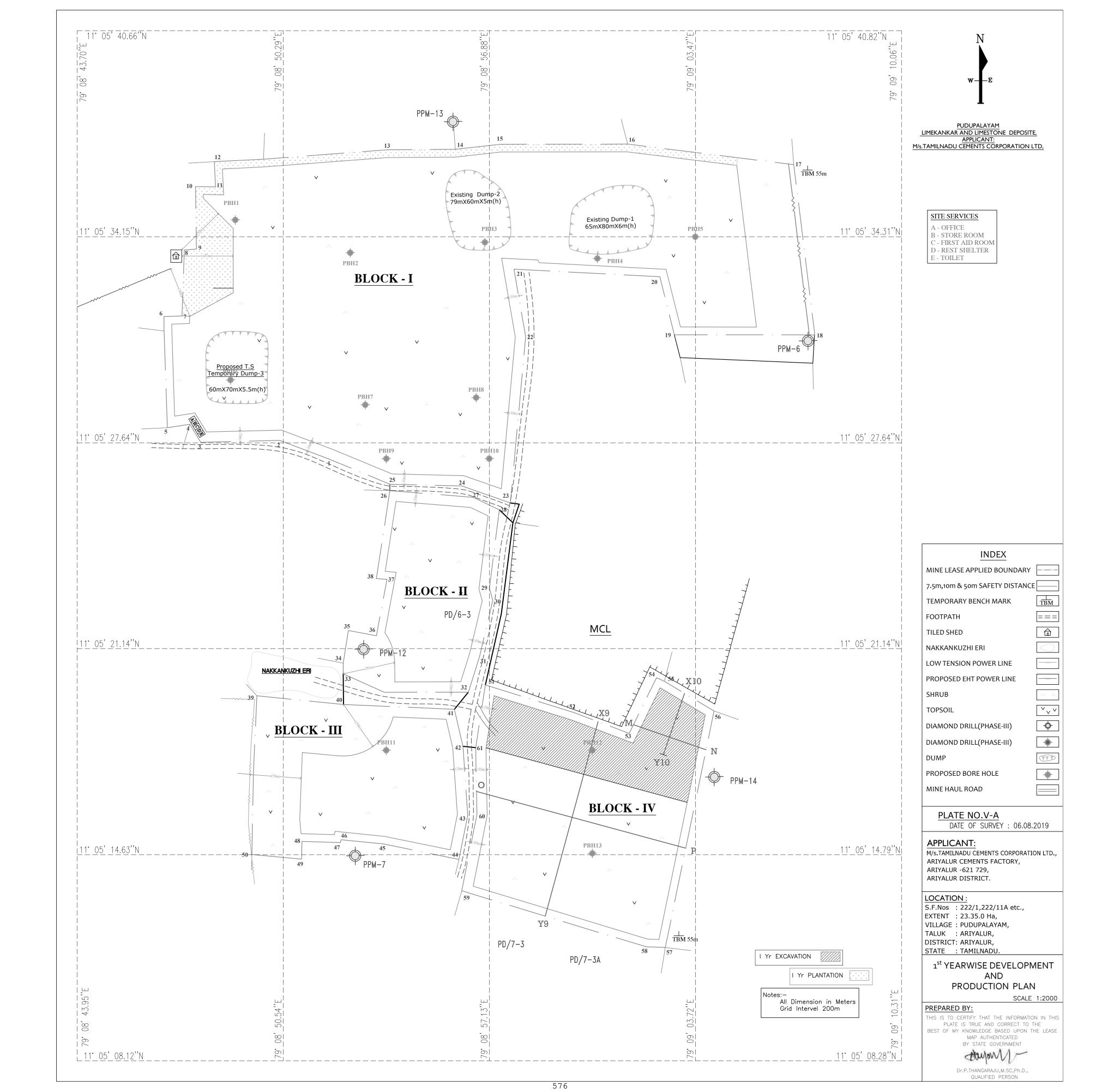


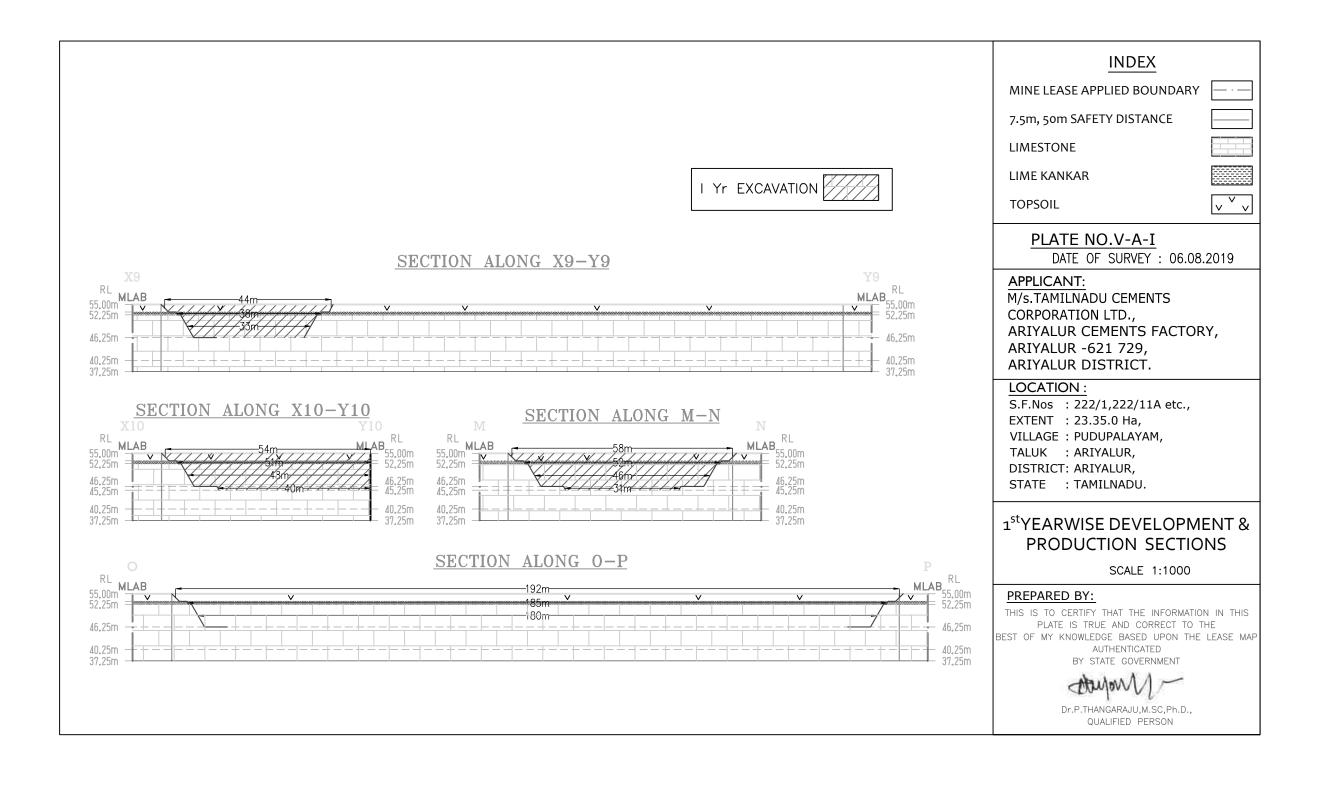


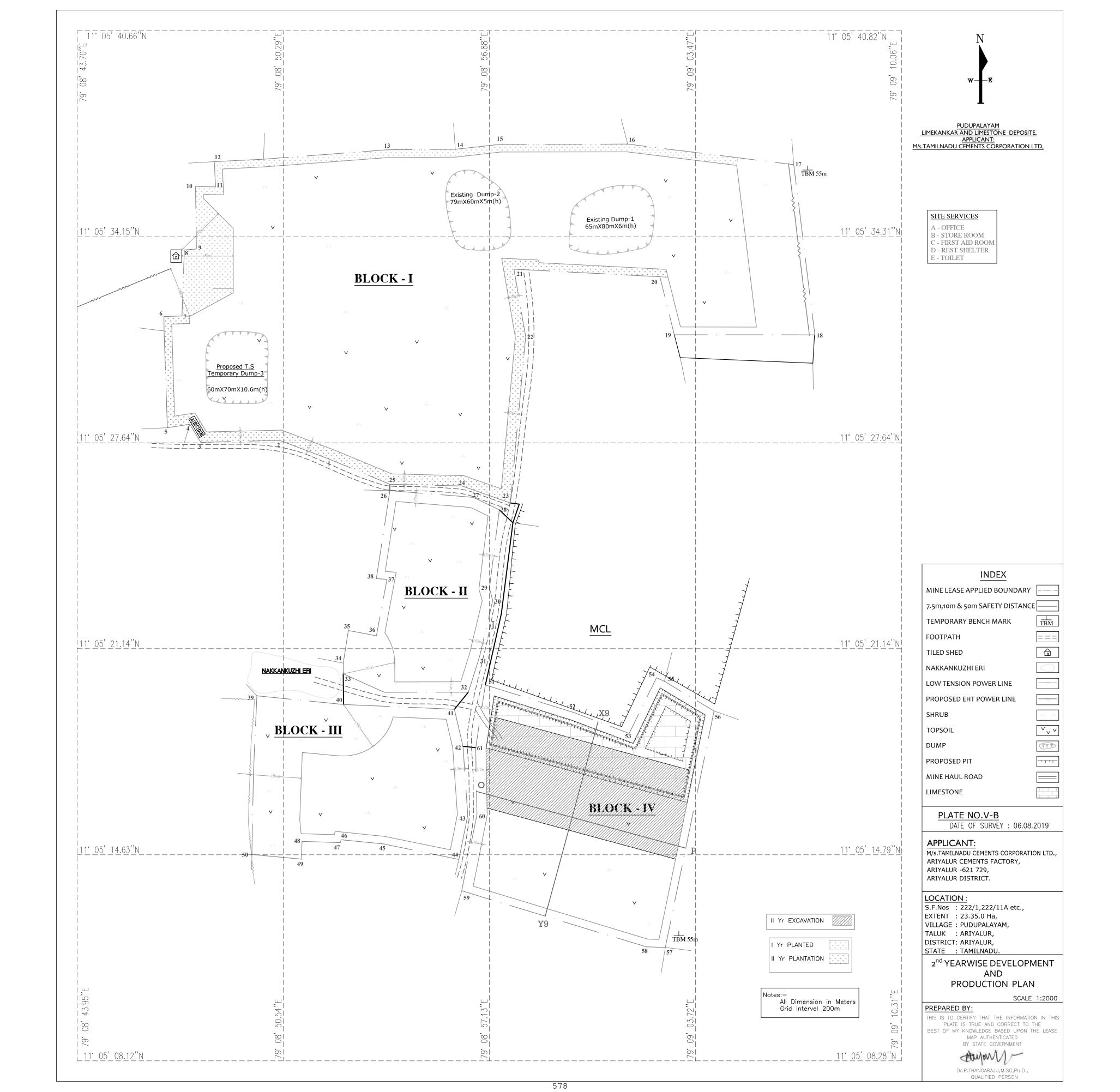


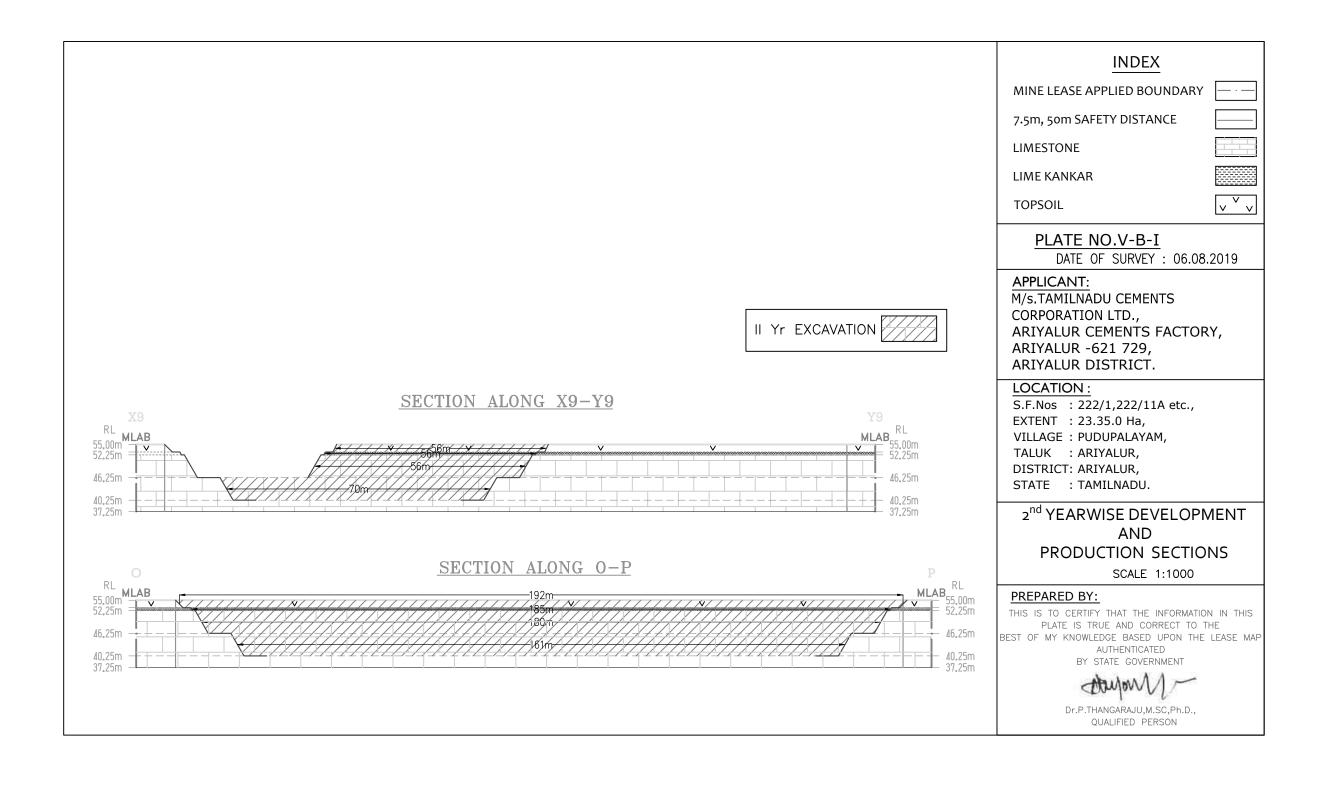


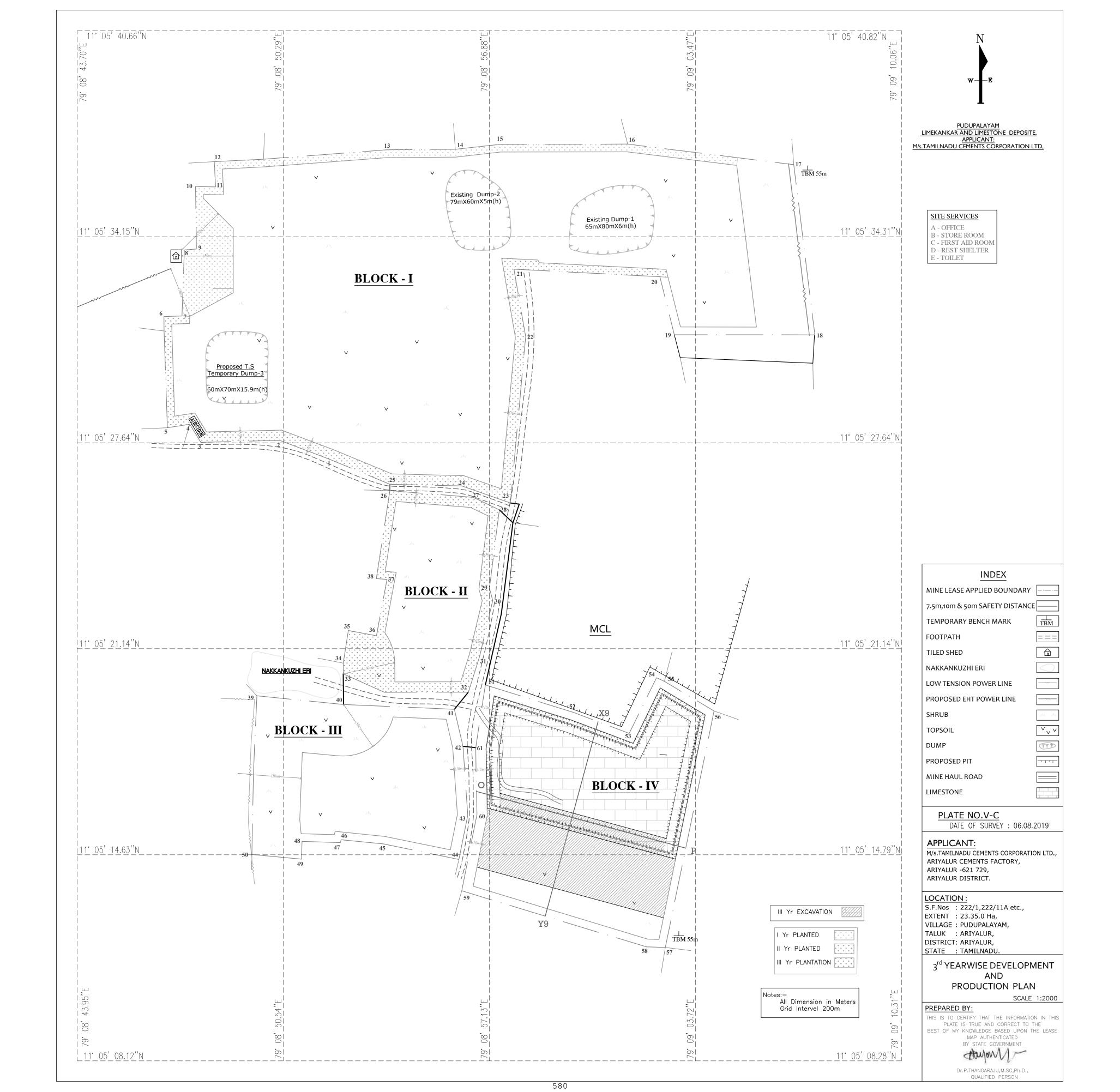


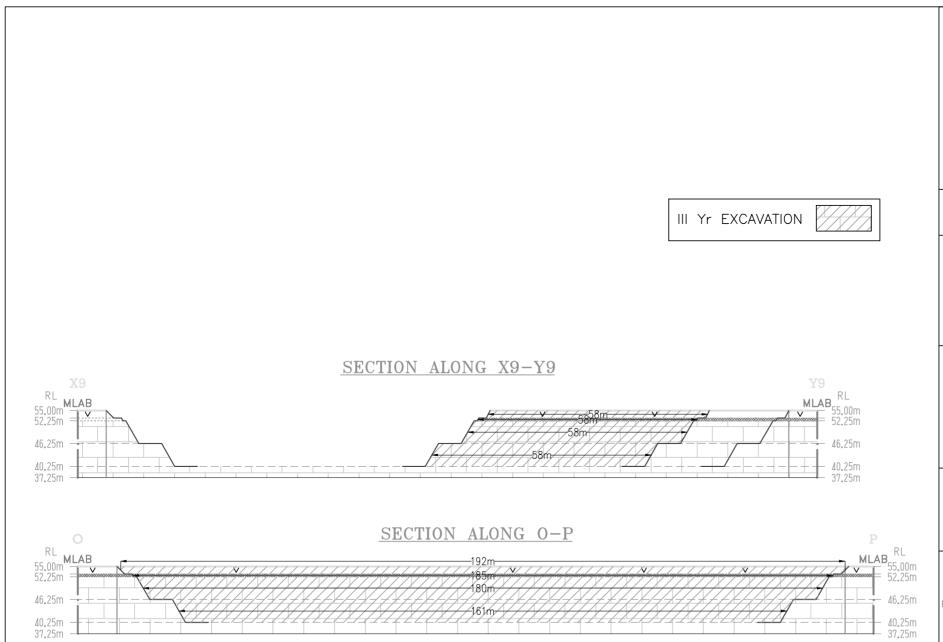












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MINE LEASE APPLIED BOUNDARY

APPLIED BOUNDARY — · —

7.5m, 50m SAFETY DISTANCE

LIMESTONE

LIME KANKAR

TOPSOIL

PLATE NO.V-C-I

DATE OF SURVEY: 06.08.2019

APPLICANT:

M/s.TAMILNADU CEMENTS
CORPORATION LTD.,
ARIYALUR CEMENTS FACTORY,
ARIYALUR -621 729,
ARIYALUR DISTRICT.

LOCATION:

S.F.Nos : 222/1,222/11A etc.,

EXTENT : 23.35.0 Ha, VILLAGE : PUDUPALAYAM, TALUK : ARIYALUR,

DISTRICT: ARIYALUR, STATE : TAMILNADU.

3rdYEARWISE DEVELOPMENT & PRODUCTION SECTIONS

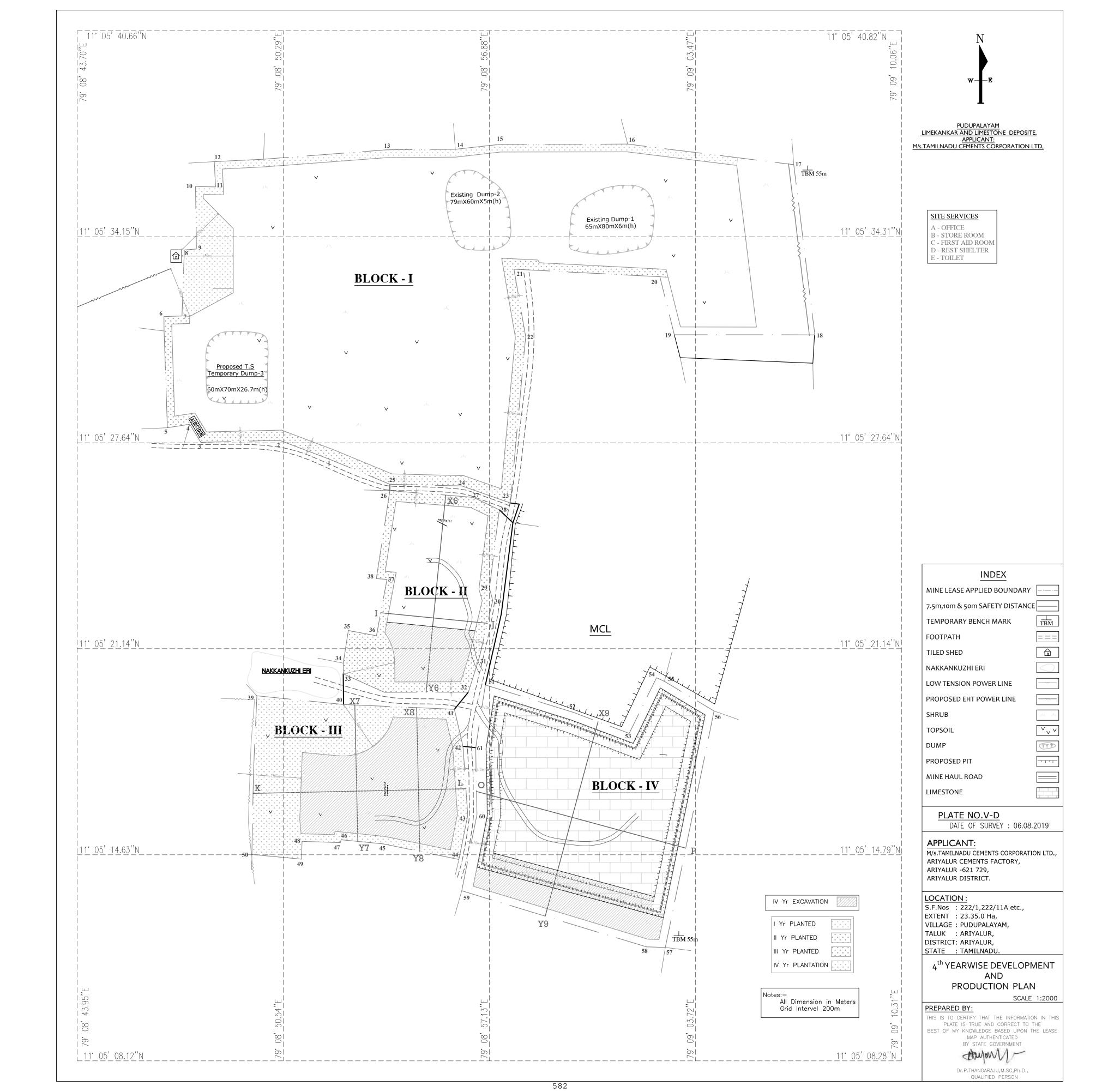
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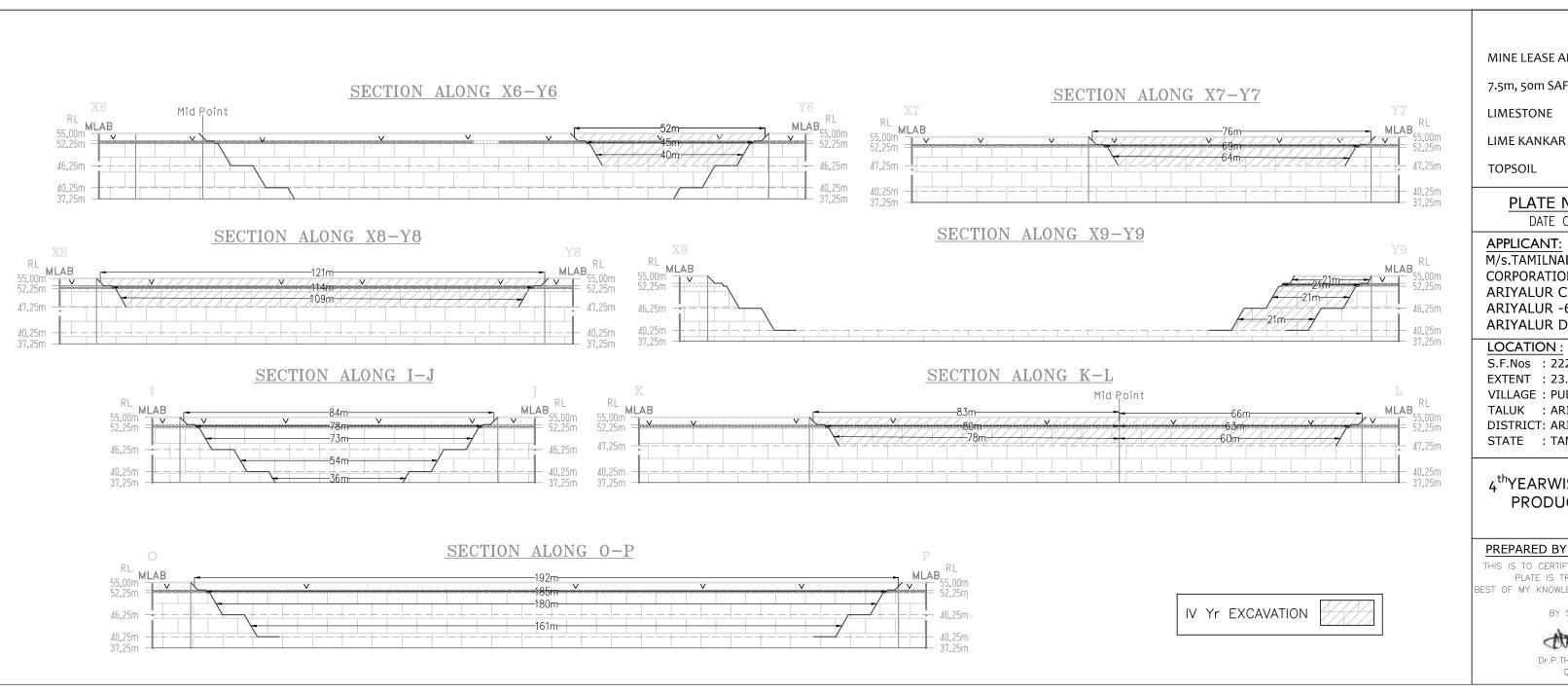
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PLATE IS TRUE AND CORRECT TO THE
BEST OF MY KNOWLEDGE BASED UPON THE LEASE MAR
AUTHENTICATED
BY STATE GOVERNMENT



QUALIFIED PERSON





INDEX

MINE LEASE APPLIED BOUNDARY

7.5m, 50m SAFETY DISTANCE

PLATE NO.V-D-I

DATE OF SURVEY: 06.08.2019

APPLICANT:

M/s.TAMILNADU CEMENTS CORPORATION LTD., ARIYALUR CEMENTS FACTORY, ARIYALUR -621 729, ARIYALUR DISTRICT.

LOCATION:

S.F.Nos : 222/1,222/11A etc.,

EXTENT : 23.35.0 Ha,

VILLAGE: PUDUPALAYAM,

TALUK : ARIYALUR, DISTRICT: ARIYALUR, STATE: TAMILNADU.

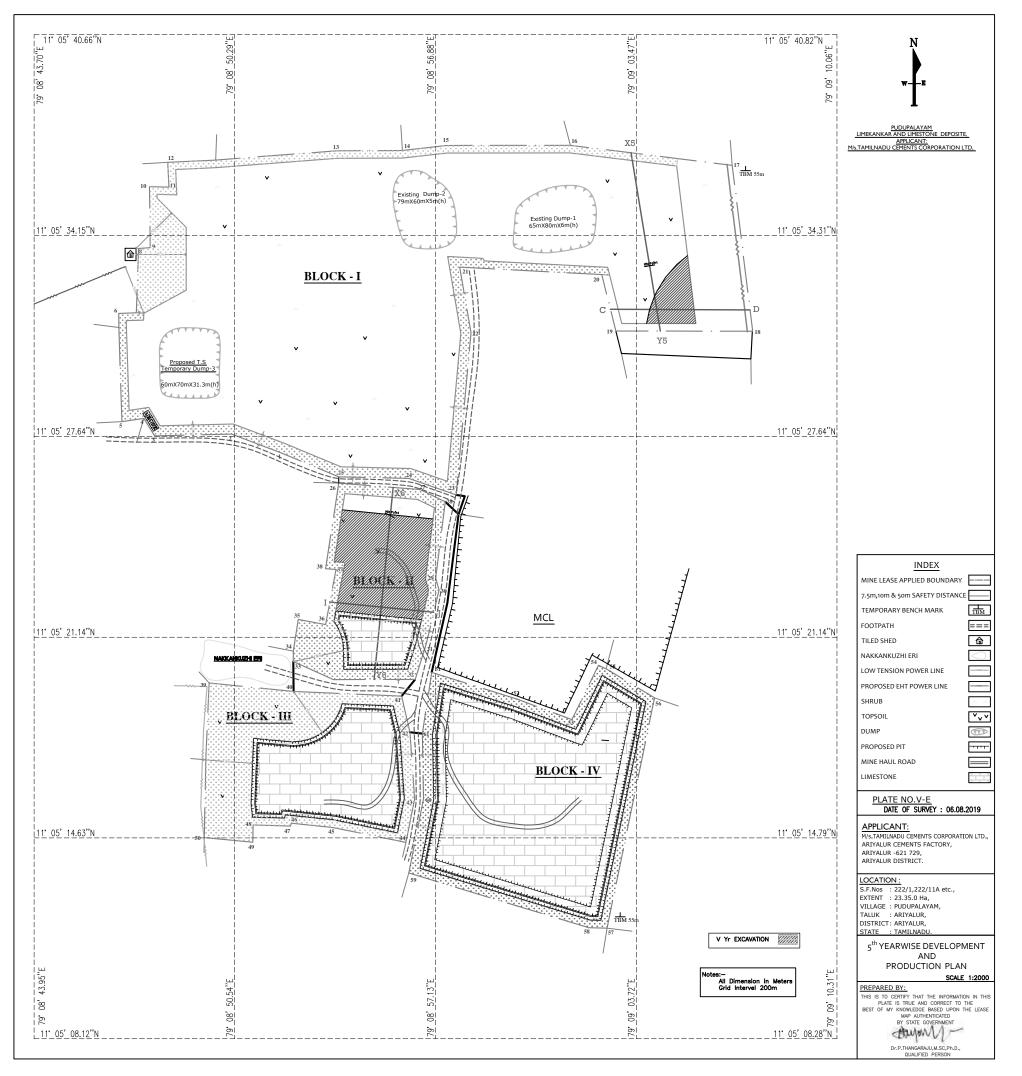
4thYEARWISE DEVELOPMENT & PRODUCTION SECTIONS

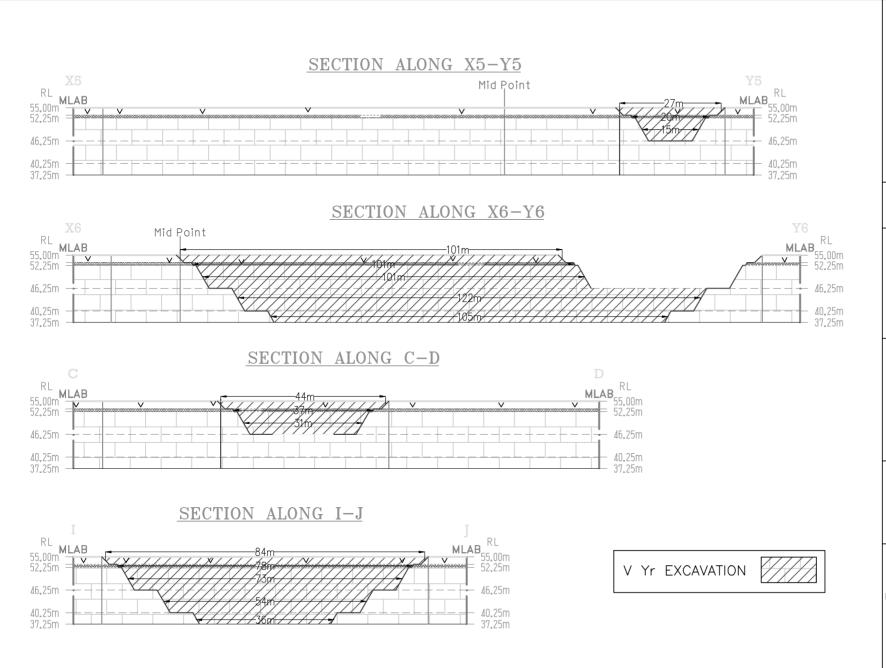
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INDEX

MINE LEASE APPLIED BOUNDARY

7.5m, 50m SAFETY DISTANCE

LIMF KANKAR

LIMESTONE

TOPSOIL



PLATE NO.V-E-I

DATE OF SURVEY : 06.08.2019

APPLICANT:

M/s.TAMILNADU CEMENTS
CORPORATION LTD.,
ARIYALUR CEMENTS FACTORY,
ARIYALUR -621 729,
ARIYALUR DISTRICT.

LOCATION:

S.F.Nos : 222/1,222/11A etc.,

EXTENT : 23.35.0 Ha, VILLAGE : PUDUPALAYAM, TALUK : ARIYALUR,

DISTRICT: ARIYALUR, STATE : TAMILNADU.

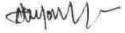
5thYEARWISE DEVELOPMENT & PRODUCTION SECTIONS

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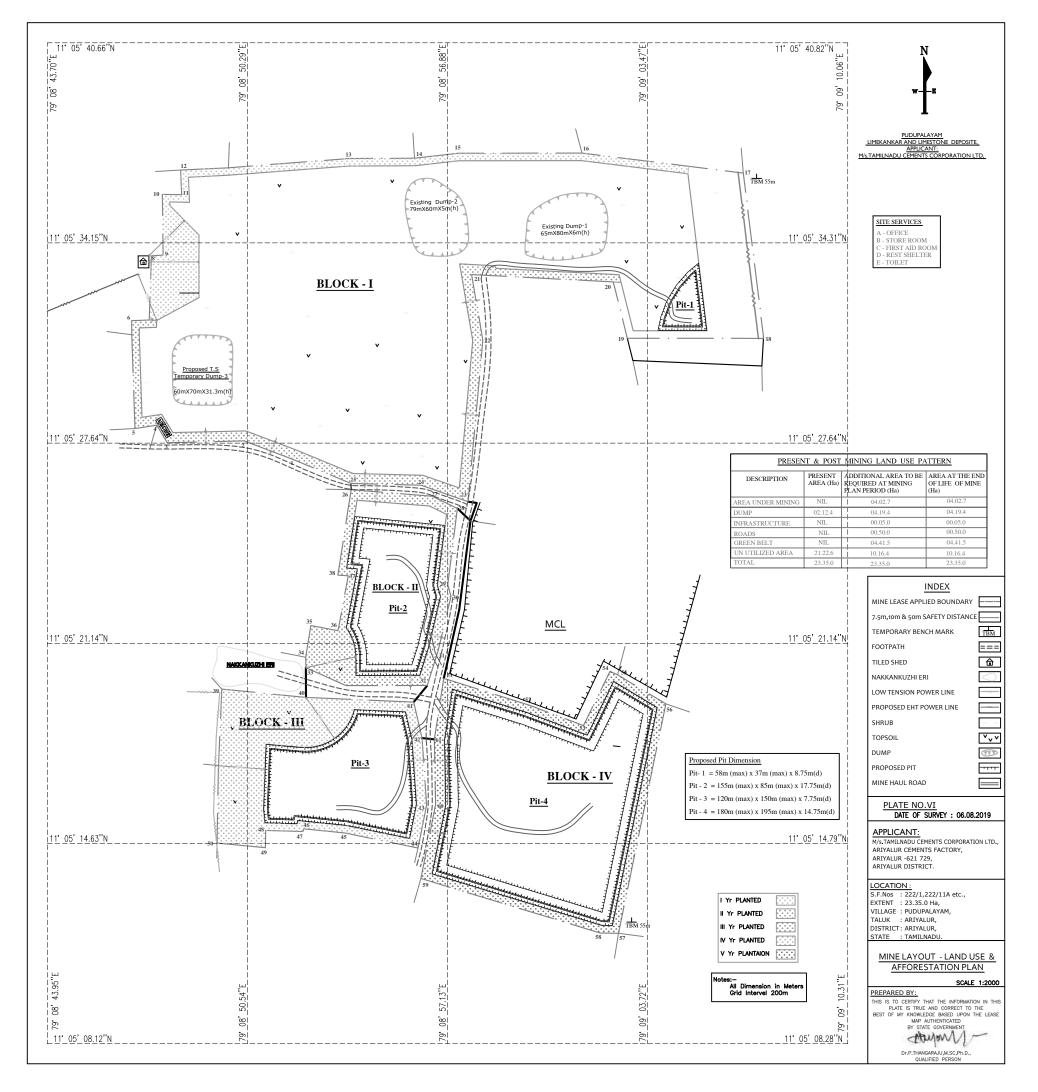
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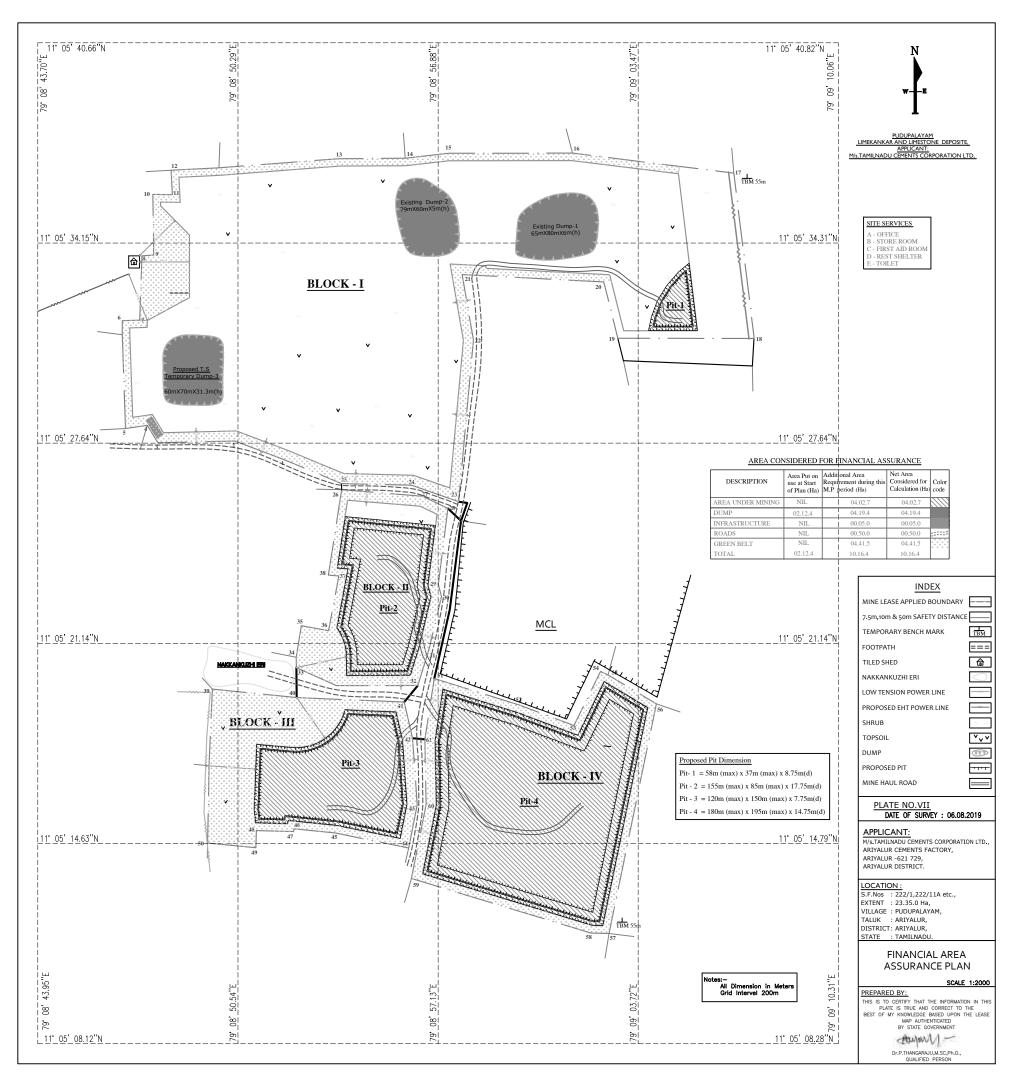
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PLATE IS TRUE AND CORRECT TO THE
BEST OF MY KNOWLEDGE BASED UPON THE LEASE MAP
AUTHENTICATED

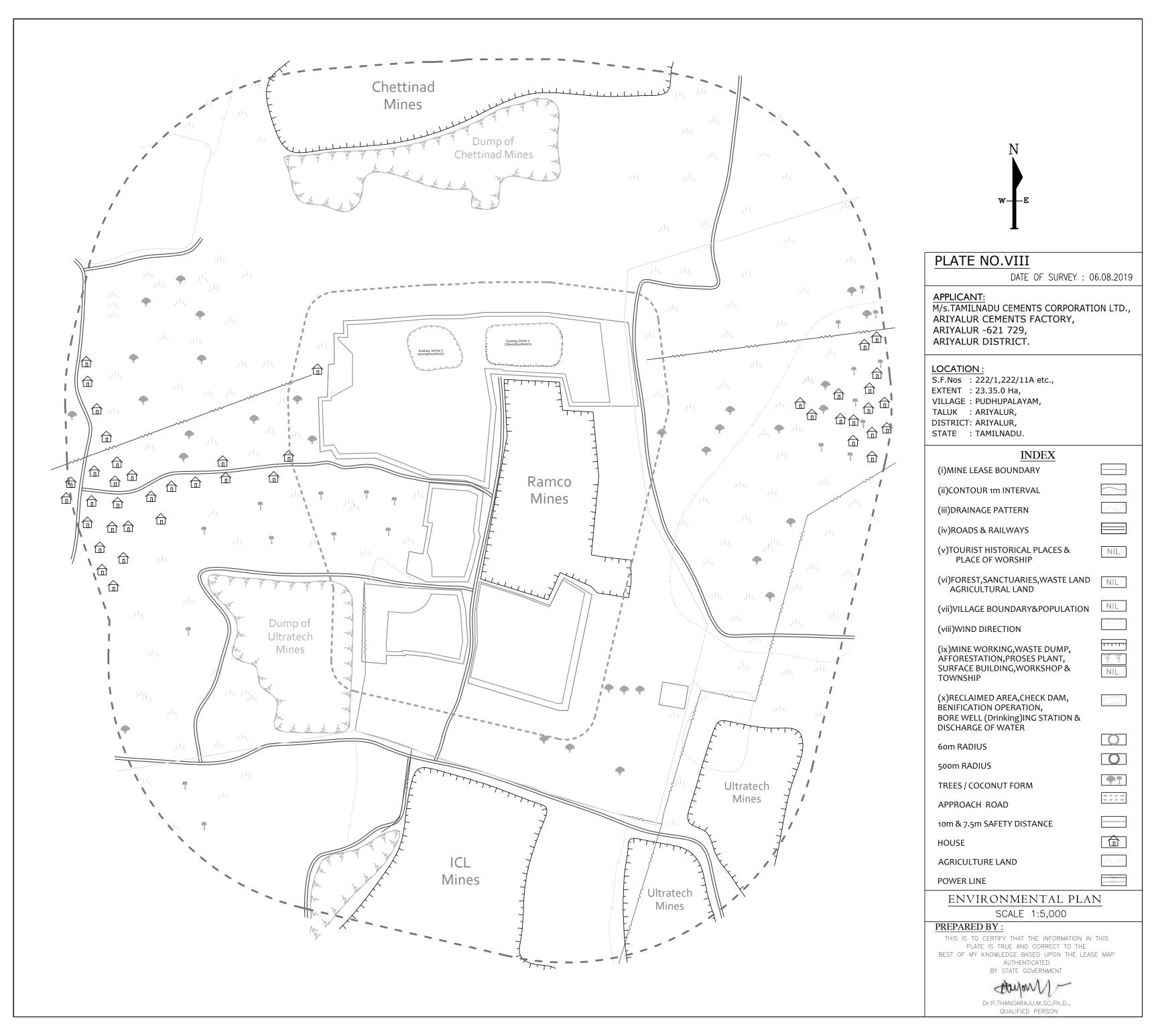
BY STATE GOVERNMENT

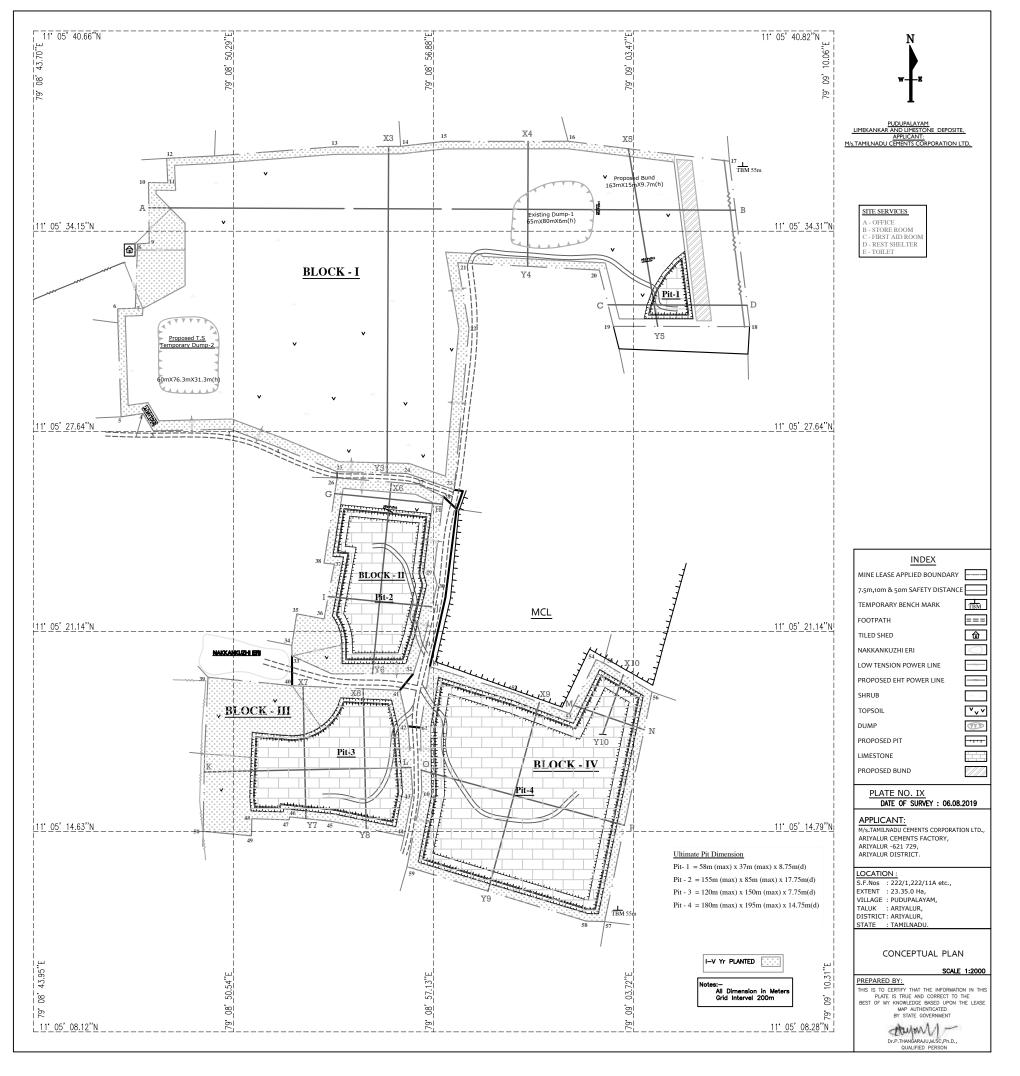


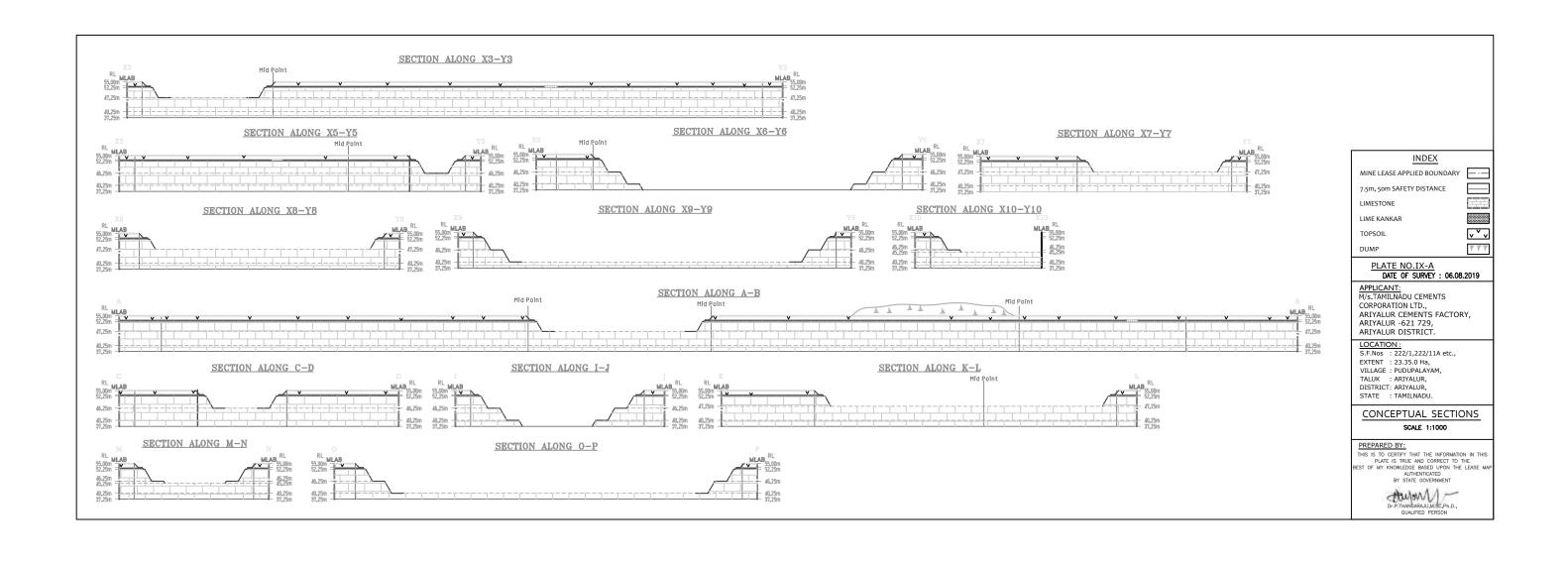
Dr.P.THANGARAJU,M.SC,Ph.D., QUALIFIED PERSON

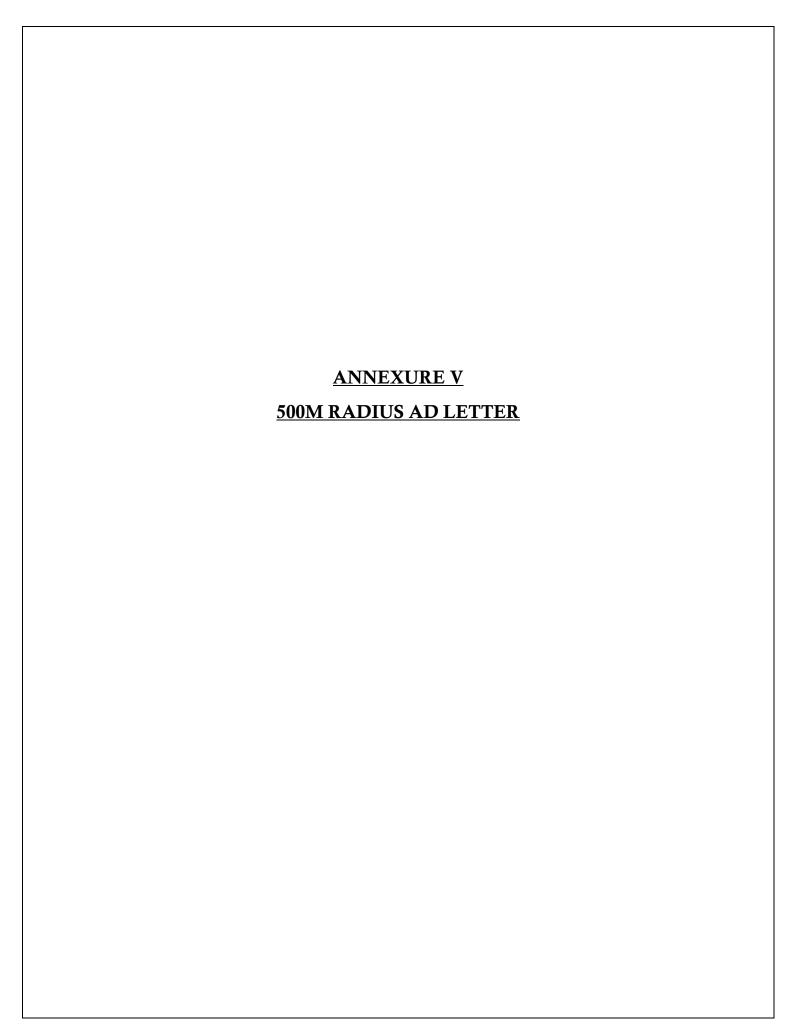












From

To

Tmt. B. Jothi, M.Sc., Deputy Director, Geology and Mining Department Ariyalur

Tvl. Tamilnadu Cements Corporation Limited, L.L.A Buildings, Ilnd Floor, 735, Anna Salai Chennai-600 002

Rc.No.163/G&M/2018 Da

Dated: 12.06.2020.

Sir/Madam,

Sub: Mines and Minerals - Major Mineral - Limestone - Ariyalur Taluk & District - Pudupalayam Village - S.F.Nos. 222/1, 222/2A etc., - Over an extent of 23.35.0 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:

- 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: 08.06.2018 (Received by this office 18.05.2018) enclosing the Mining Lease application under Rule 22(1) of MCR, 1960.
- District Collector Lr. Rc.No.163/G&M/2018, dated 07.02.2019 addressed to the Principal Secretary to Govt. through The Director of Geology and Mining, Chennai-32.
- Industries (MMA.2), Secretariat Department Lr.No. 3392/MMA.2/2019-1 dated 02-08-2019.
- Representation of Tvl. TANCEM Lr.No. TANCEM/ACW/GEO/ PPM-2/173/2020 08.06.2020.

Tvl. TANCEM Ltd, Chennai-02 have applied for mining lease for mining limestone & limekankar over an extent of 23.35.0 Ha. Of patta lands in S.F.Nos. 222/1, 222/2A 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 3nd 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. India Cements Pvt. Ltd	Ariyalur & Pudupalayam	265, 266 etc	29.29.5 G.O.No. 75 dated 04.08.2003	Limestone	09.02.1989 to 08.02.2009 Deemed to be extended upto 08.02.2039

2. Proposed Mines:

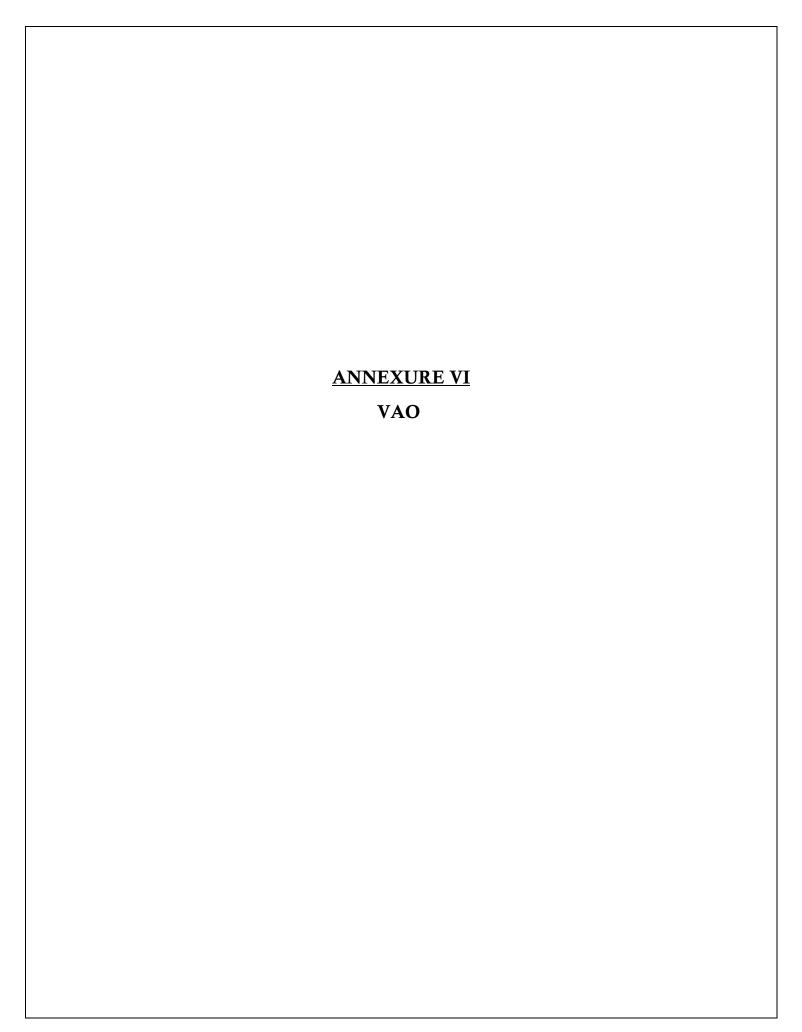
S.No	Name of the owner	Taluk & Village	S.F.Nos	Extent (In ha)	Mineral	Lease Period
1	Tvl. TANCEM	Ariyalur & Pudupalayam	144,217, 218 etc	22.96.0	Limestone & Limekanakar	
2	Tvl. TANCEM	Ariyalur & Pudupalayam	229,230 etc	23.02.5	Limestone & Limekanakar	
3	TVI. TANCEM	Ariyalur & Pudupalayam	350,351 etc	22.89.0	Limestone & Limekanakar	
4	Tvl. TANCEM	Ariyalur & Pudupalayam	221/1, 2A etc	23.35.0	Limestone & Limekanakar	

3. Expired and abandoned Mines:

S.No Name of Taluk &	S.F.Nos		Lease Period
the owner Village		(In ha)	

Deputy Director Geology and Mining, Ariyalur.

12/6/2000



அரியலூர் வருவாய் வட்டாட்சியர் அவர்கள் முன்பாக புதுப்பாளையம் கிராம அலுவலர் அளித்த வாக்குமுலம்:

திருவாளர்கள் தமிழ்நாடு சிமெண்ட்ஸ் லிமிடெட் நிறுவனத்தினர் அரியலூர் மாவட்டம் வட்டம் புதுப்பாளையம் கிராம புல எண்கள் 222,225,226,227,233,236,239 தனி பட்டா எண் 1739 23.35.0 ஹெக்டோ் நிலங்களில் சுண்ணாம்புக்கல் வெட்டி எடுக்க மொத்தம் திட்ட விஸ்தீரணம் அனுமதி கோரிய விண்ணபத்தின் மீது என்னால் 69 .07.2018 அன்று புலத்தணிக்கை செய்த போது நானும் உடன் இருந்தேன்.

கிராமத்தில் திருவாளர்கள் அரியலூர் புதுப்பாளையம் வட்டம் தமிழ்நாடு சிமெண்ட நிறுவத்தினரால் கிரயம் பெறப்பட்டு பட்டா எண் 1739 மேற்கண்ட புல எண்கள் பதிவாகி உள்ளது. பட்டா நிலங்களில் அரசுக்கோ அரசு சார்ந்த நிறுவனங்களுக்கோ நிலம் கையகம் செய்ய அரசாணை எதுவும் நிலுவையில் இல்லை.

திருவாளர் தமிழ்நாடு சிமெண்ட்ஸ் புதுப்பாளையம் கிராமத்தில் நிறுவனத்தினரால் சுண்ணாம்புக்கல் வெட்டி எடுக்க அனுமதி கோரியுள்ள நிலத்தில் 100 மீட்டருக்குள் இருந்து குடியிருப்புகளோ அங்கீகரிக்கப்பட்ட நத்தம் குடியிருப்புகளும் ஏதும் இல்லை. சுண்ணாம்புக்கல் கனிமம் உரிமம் அனுமதி கோரியுள்ள நிலங்களில் மத உணர்வை தூண்டும் கோவில், மசூதி , சர்ச் மற்றும் புராதான சின்னங்கள் போன்ற நிலையான அமைப்புகள் ஏதும் இல்லை. குத்தகை உரிமம் அனுமதி கோரும் நிலங்களில் புல எண் 233/1 ல் கிழக்கிலிருந்து மேற்கு நோக்கி தாழ்வழுத்த மின் கம்பிகள் செல்கின்றன.

பட்டா நிலங்களில் சுண்ணாம்புக்கல் மேற்கண்ட வெட்டி எடுக்க அரசு - அனுமதி அளிக்கும்பட்சத்தில் மேற்படி நிறுவனத்தினரால் பொதுமக்களுக்கு எவ்வித சுகாதாரக்கேடும் இல்லை. எனவே திருவாளர் தமிழ்நாடு சிமெண்ட்ஸ் நிறுவனத்தினருக்கு கண்ணாம்புக்கல் வெட்டி எடுக்க குத்தகை உரிமம் வழங்கலாம் 'என தெரிவித்துக் கொள்கிறேன்.

படித்தும் பார்த்தேன் சரி

ம் நிர்வாக் அலுவலர்

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அயியனூர் வட்டம்

நாகமங்கலம்.

ANNEXURE VII HYDROGEOLOGICAL 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, Advaitha 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

Thescope 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 $11^{\circ}04'33.03''$ to $11^{\circ}05'50.84''$ and East Longitudes $79^{\circ}08'29.82''$ to $79^{\circ}09'14.11''$. 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.

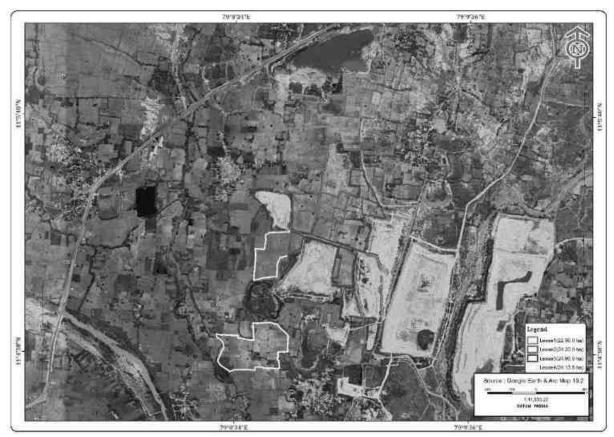


Figure 1: The lease area is superimposed on Google Earth

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**.

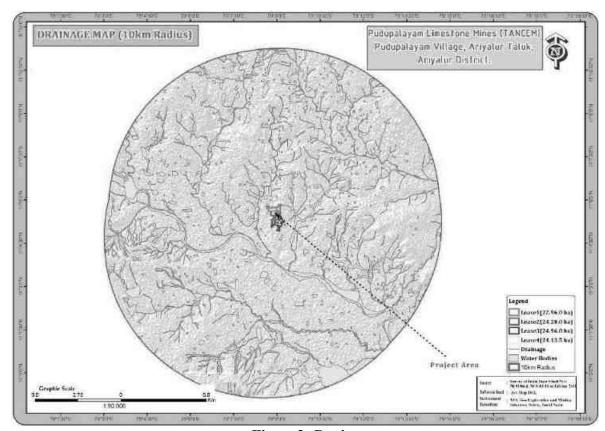


Figure2: Drainage

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 morethan25km/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**.

Table 1: 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.

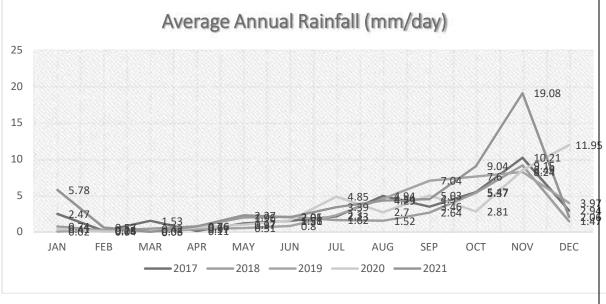


Figure 3: Monthly Rainfall Distribution in Ariyalur District for 2017-2021

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.**

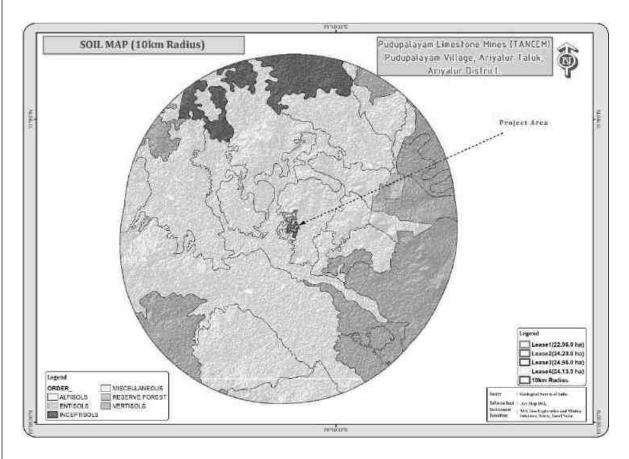


Figure 4: Soil

3.5Geomorphology

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**.

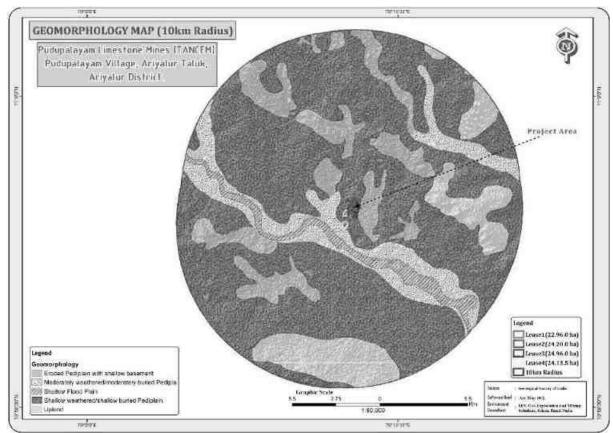


Figure 5: Geomorphology

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.

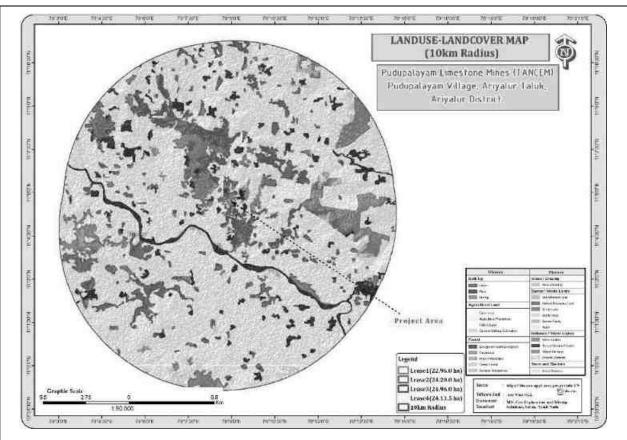


Figure 6: Landuse/land cover

3.7 Geology

3.7.1 Regional Geology of Ariyalur District-

The Cretaceous formation of the Ariyalur (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. The district of Ariyalur is one of the geologically important areas of Tamil Nadu known for fossils and Sedimentary deposits of Limestone. 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 sedimentary rocks of Cretaceous – Palaeocene age are well developed in the Ariyalur area, which consist both clastic and carbonate facies. The geological succession of the Ariyalur area is given in Table-2.

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 occasionalclay							
Maestrichtian	Ariyalur	Sillakudi	Sandstone with Occasional clay							
	Unco	nformity								
Upper Cretaceous	Tiruchirapalli	Anaipadi	Sandstone and clay							
	Unco	nformity								
Upper Cretaceous	Uttattur	-	Limestone, gypseous clay/shale with thin sandstone							
	Unco	nformity								
Upper Jurassic to Lower Cretaceous	-	Gondwana	Brownish, Micaceous & silty ferruginous sandstone							
	Unconfo	rmity / 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 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 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.

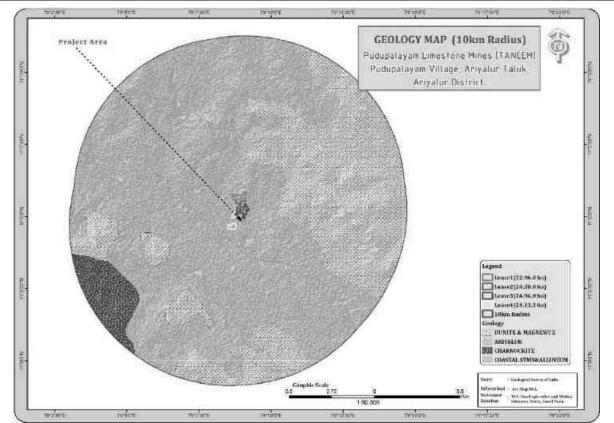


Figure 7: Geology

3.8Lineament

Lineament is good source of trapping and storing of water resources and provides recharge toward the increase in groundwater table. In flatlying 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.

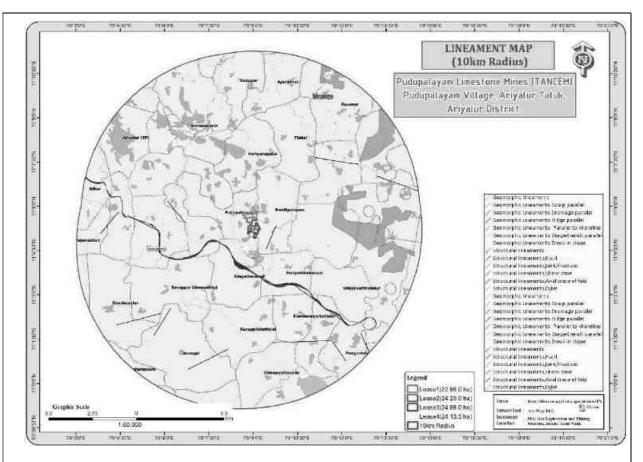


Figure 8: Lineament

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 subsurface 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:

$$R = Rs * L/A (in Ohm)$$

Where Rs is known as the specific resistivity (characteristic of the material and independent of its shape or size)

With Ohm's Law,

$$R = dV/I$$
 (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:

$$Rs = (A/L) * (dV/I) (in Ohm m)$$

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.

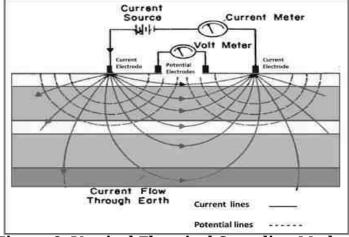


Figure 9: Vertical Electrical Sounding Method

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



Figure 10: 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.



Figure 11: 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.

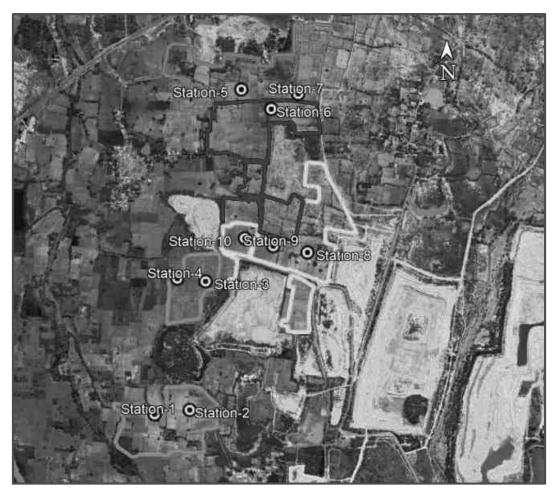


Figure 12: Geophysical Station located on Google image

Table3: GPS Co-ordinates of the VES Location

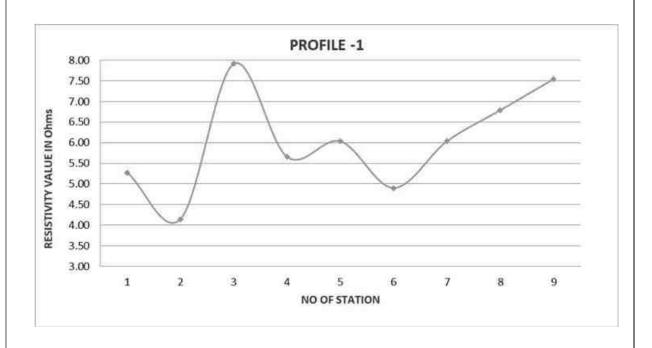
S.No	Latitude	Longitude
STATION-1	11° 04'41.16"N	79° 08'37.18"E
STATION-2	11° 04'41.59"N	79° 08'43.47"E
STATION-3	11° 05'04.74"N	79° 08'46.43"E
STATION-4	11° 05'05.15"N	79° 08'41.21"E
STATION-5	11° 05'38.76"N	79° 08'52.85"E
STATION-6	11° 05'38.20"N	79° 08'58.32"E
STATION-7	11° 05'38.30"N	79° 09'03.31"E
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.

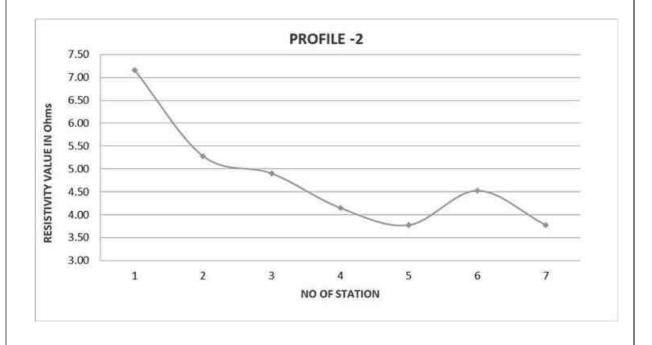
During the study the adjacent existing well, borewell are not examined because, the adjacent existing mines working in North, East and South side direction are not inforce of the groundwater table intersection.

5.2 Geophysical Profile Data and Graph

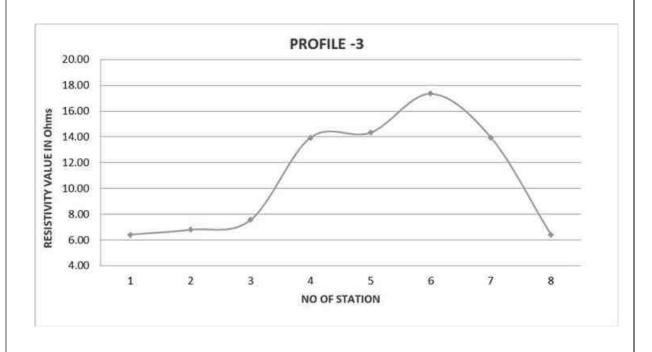
	PROFILE -1									
	GPS 11° 4'41.79"N, 79° 8'33.68"E									
S.NO	AB/2 (m)	MN/2(m)	Geometric Factor (K)	Resistance (R) Ohm	Apparent Resistivity Rho Ohm- meter					
1	50.0	10	377.0	0.014	5.28					
2	50.0	10	377.0	0.011	4.15					
3	50.0	10	377.0	0.021	7.92					
4	50.0	10	377.0	0.015	5.65					
5	50.0	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					



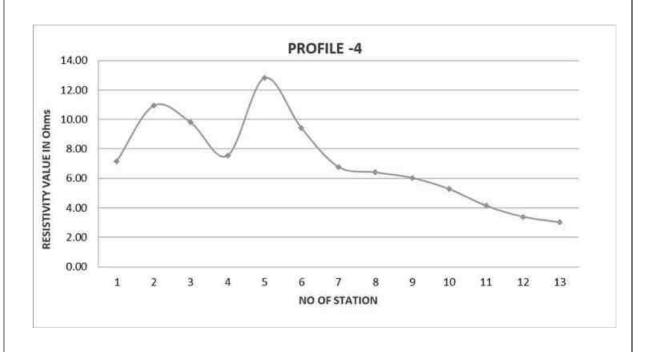
	PROFILE- 2								
	GPS - 11° 5'4.63"N, 79° 8'50.47"E								
S.NO	AB/2 (m)	MN/2(m)	Geometric Factor (K)	Resistance (R) Ohm	Apparent Resistivity Rho Ohm-				
					meter				
1	50.0	10	377.0	0.019	7.16				
2	50.0	10	377.0	0.014	5.28				
3	50.0	10	377.0	0.013	4.90				
4	50.0	10	377.0	0.011	4.15				
5	50.0	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					

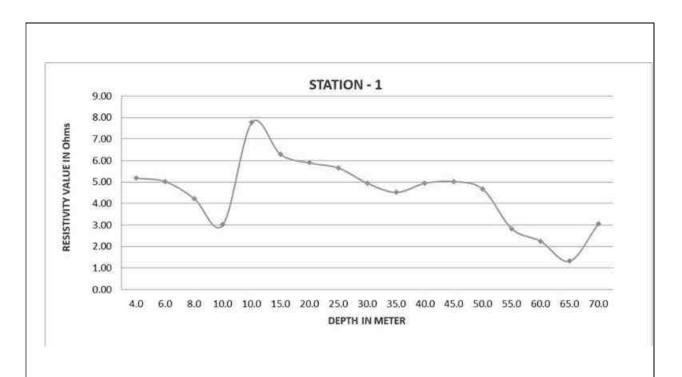


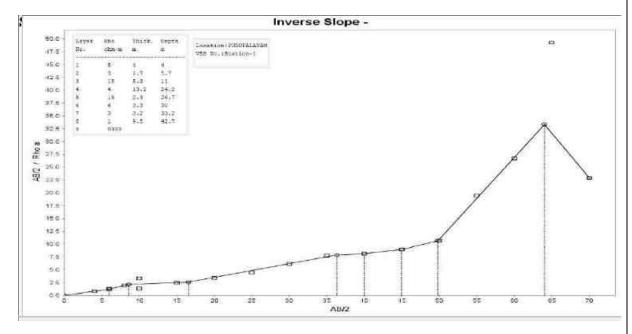
5.3 Geophysical Station Data and IGIS Graph

ST	Δ	TI	\cap	M	- 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

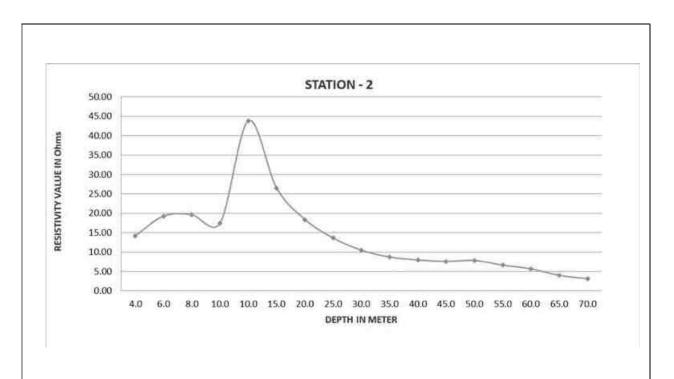


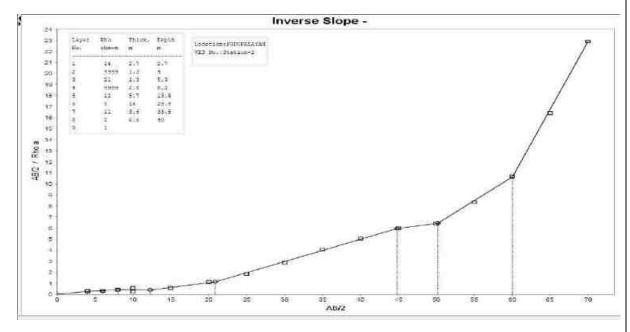


STATION - 2

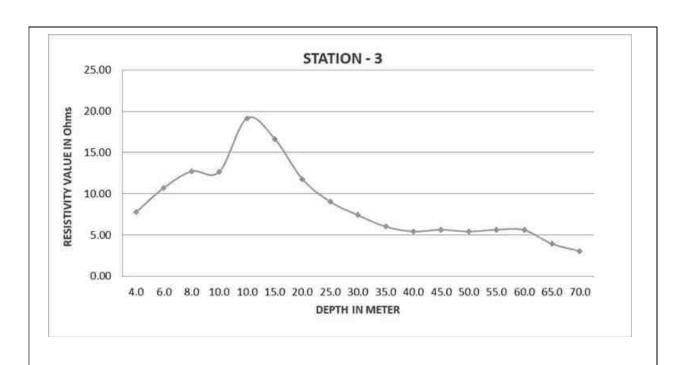
GPS - 11° 4'41.59"N 79° 8'43.47"E

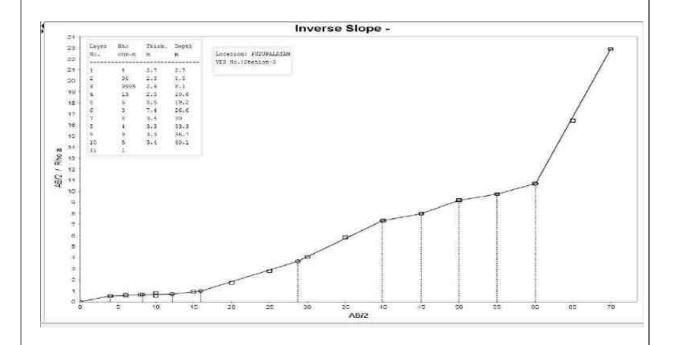
AB/2 (m)	MN/2(m)	Geometric Factor (K)	Resistance (R) Ohm	Apparent Resistivity Rho Ohm-meter
4.0	2	9.4	1.5	14.14
6.0	2	25.1	0.765	19.23
8.0	2	47.1	0.416	19.60
10.0	2	75.4	0.231	17.42
10.0	5	23.6	1.86	43.83
15.0	5	62.8	0.421	26.45
20.0	5	117.8	0.156	18.38
25.0	5	188.5	0.072	13.57
30.0	5	274.9	0.038	10.45
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



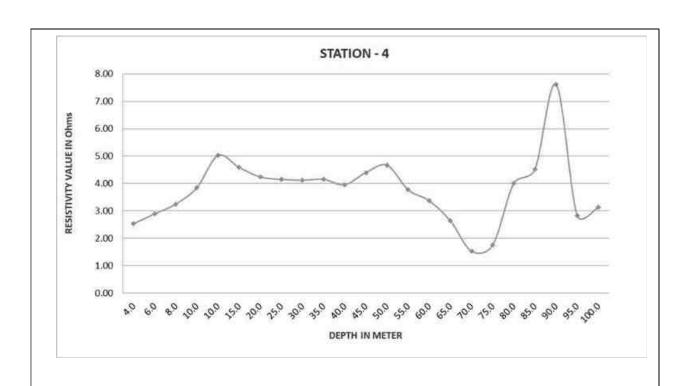


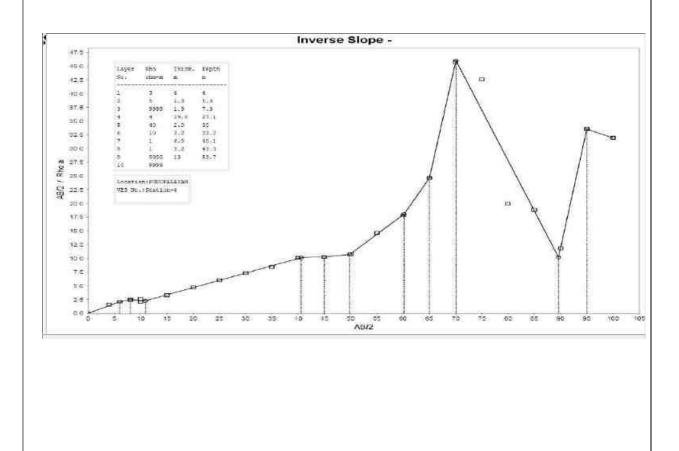
		STATION		
GPS - 11° 05'04.74"N 79° 08'46.43"E				
AB/2 (m)	MN/2(m)	Geometric Factor (K)	Resistance (R) Ohm	Apparent Resistivity Rho Ohm-meter
4.0	2	9.4	0.827	7.79
6.0	2	25.1	0.427	10.73
8.0	2	47.1	0.27	12.72
10.0	2	75.4	0.168	12.67
10.0	5	23.6	0.813	19.16
15.0	5	62.8	0.265	16.65
20.0	5	117.8	0.1	11.78
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

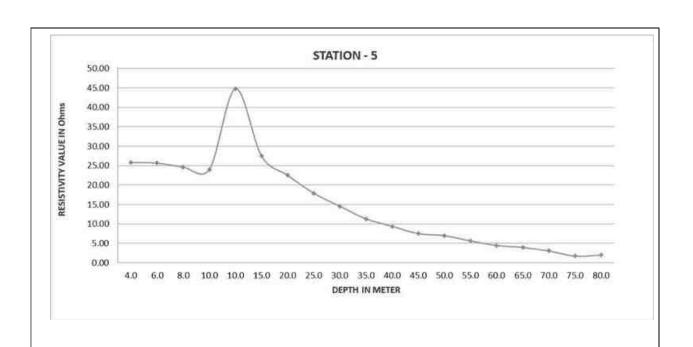


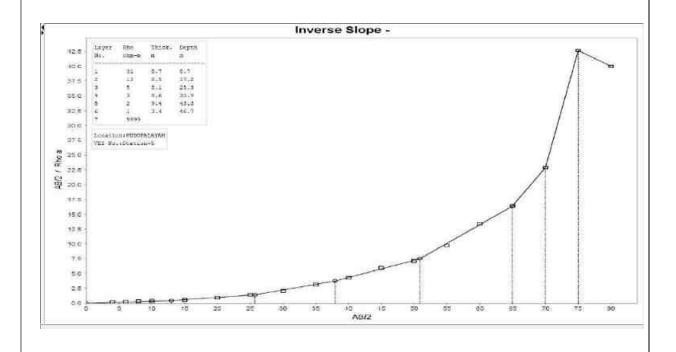


STATION - 5

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

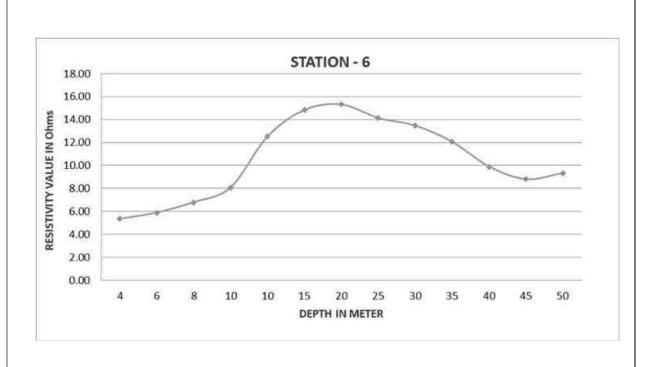


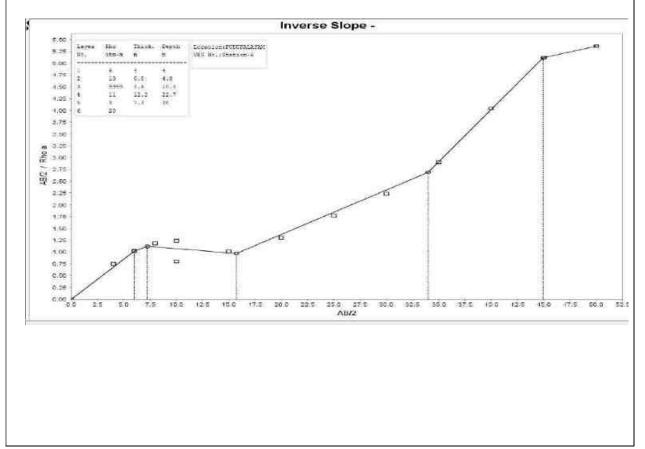


STATION - 6

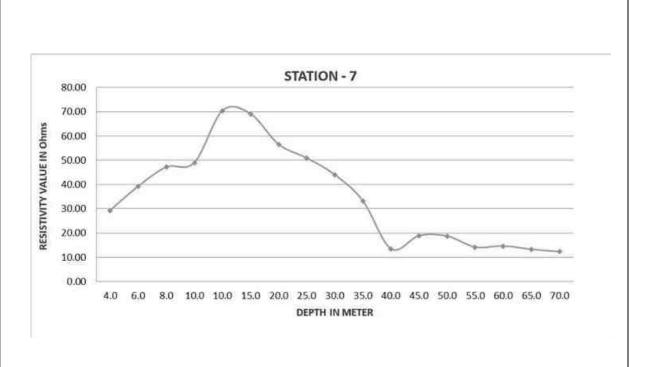
GPS - 11° 5'38.20"N 79° 8'58.32"E

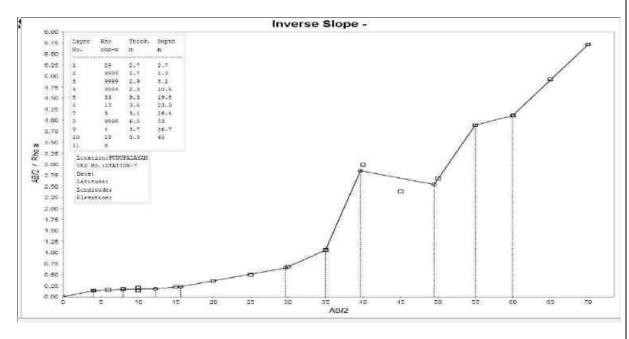
AB/2 (m)	MN/2(m)	Geometric Factor (K)	Resistance (R) Ohm	Apparent Resistivity Rho Ohm-meter	
4.0	2	9.4	0.566	5.33	
6.0	2	25.1	0.234	5.88	
8.0	2	47.1	0.144	6.79	
10.0	2	75.4	0.107	8.07	
10.0	5	23.6	0.531	12.51	
15.0	5	62.8	0.236	14.83	
20.0	5	117.8	0.13	15.32	
25.0	5	5 188.5	188.5	0.075	14.14
30.0	5	274.9	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	



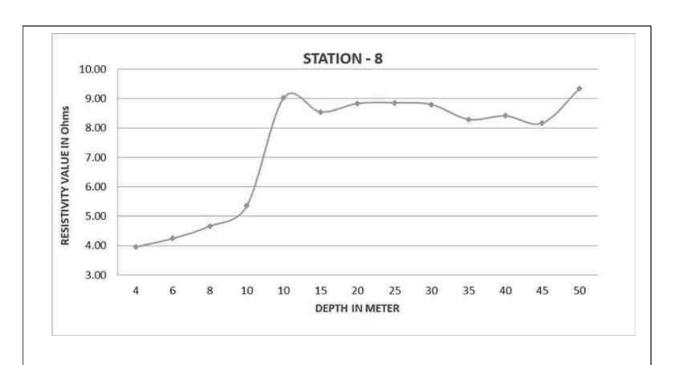


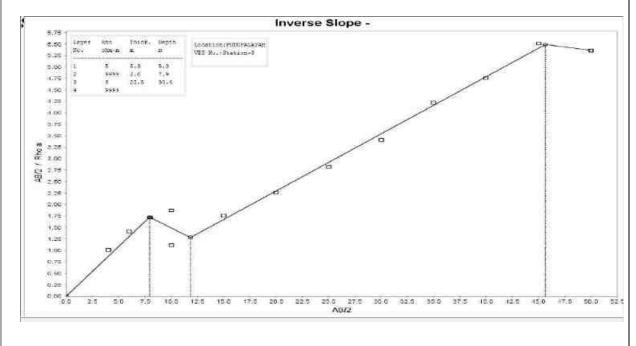
STATION - 7					
GPS - 11° 5'38.30"N 79° 9'3.31"E					
AB/2 (m)	MN/2(m)	Geometric Factor (K)	Resistance (R) Ohm	Apparent Resistivity Rho Ohm-meter	
4.0	2	9.4	3.11	29.31	
6.0	2	25.1	1.56	39.21	
8.0	2	47.1	1	47.12	
10.0	2	75.4	0.65	49.01	
10.0	5	23.6	2.99	70.45	
15.0	5	62.8	1.1	69.12	
20.0	5	117.8	0.48	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	



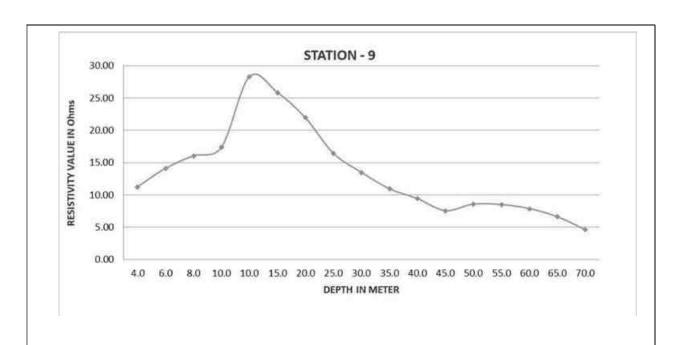


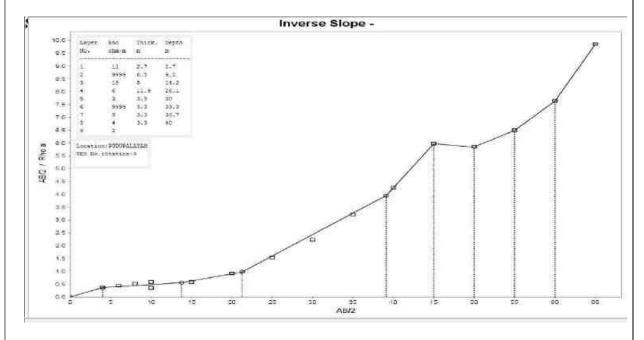
STATION - 8					
GPS - 11° 5'9.38"N 79° 9'4.83"E					
AB/2 (m)	MN/2(m)	Geometric Factor (K)	Resistance (R) Ohm	Apparent Resistivity Rho Ohm-meter	
4.0	2	9.4	0.42	3.96	
6.0	2	25.1	0.169	4.25	
8.0	2	47.1	0.099	4.67	
10.0	2	75.4	0.071	5.35	
10.0	5	23.6	0.383	9.02	
15.0	5	62.8	0.136	8.55	
20.0	5	117.8	0.075	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	



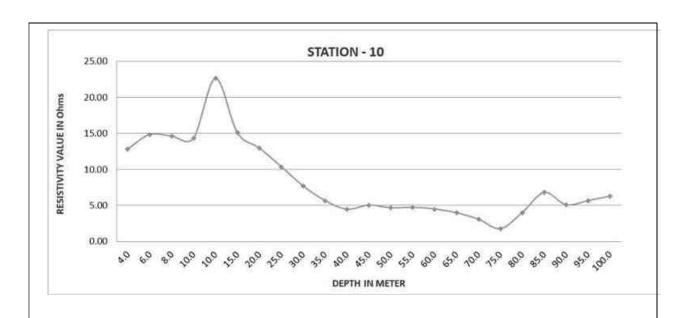


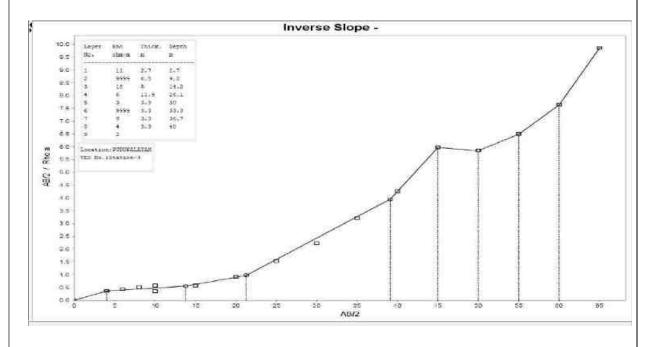
STATION - 9 GPS - 11° 5'10.65"N 79° 8'58.69"E **Apparent** Geometric Resistance Resistivity AB/2 (m) MN/2(m)Factor (K) (R) Ohm **Rho Ohm-meter** 11.22 4.0 2 1.19 9.4 6.0 2 14.07 25.1 0.56 2 47.1 8.0 0.34 16.02 2 10.0 75.4 0.23 17.34 5 1.2 28.27 10.0 23.6 15.0 5 62.8 25.82 0.411 20.0 5 117.8 0.186 21.91 25.0 5 188.5 0.087 16.40 5 30.0 274.9 0.049 13.47 5 0.029 35.0 377.0 10.93 40.0 5 9.40 494.8 0.019 45.0 5 628.3 0.012 7.54 5 0.01150.0 777.5 8.55 5 942.5 0.009 55.0 8.48 5 0.007 60.0 1123.1 7.86 5 1319.5 65.0 0.005 6.60 5 4.59 70.0 1531.5 0.003





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.

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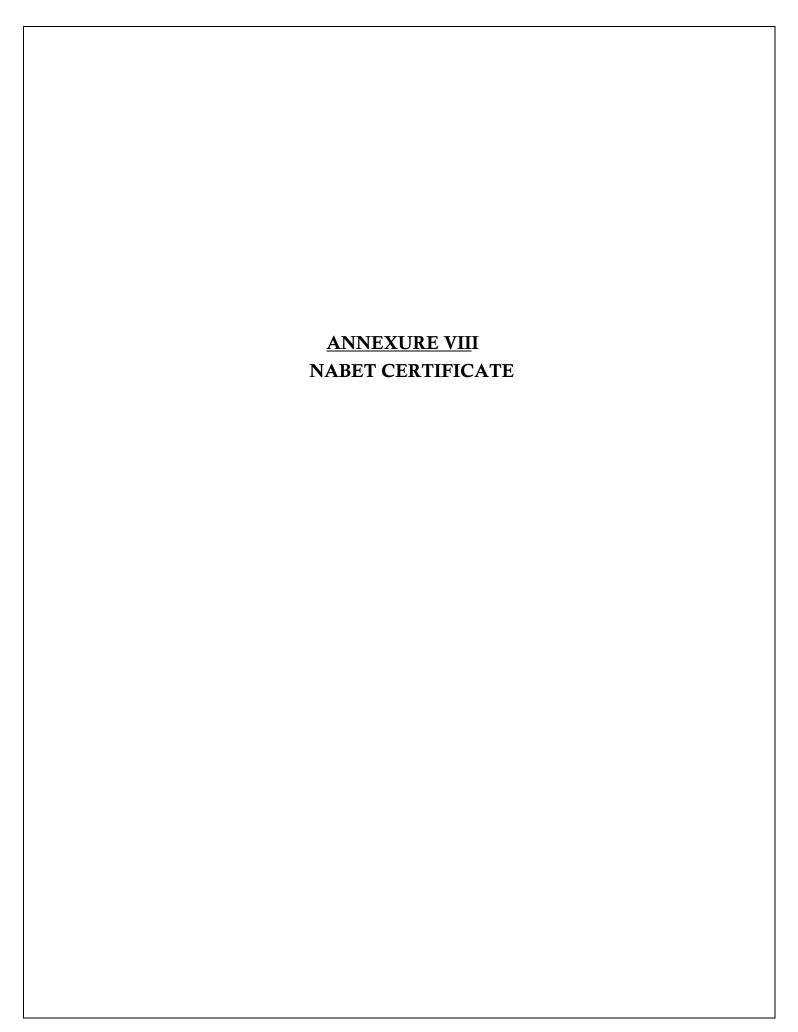
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No			MoEFCC	Cat.
1	Mining of minerals - including Open cast only	1	1 (a) (i)	В
2	Thermal power plants	4	1(d)	Α
3	Coal washeries	6	2 (a)	В
4	Metallurgical industries - Ferrous only	8	3 (a)	В
5	Synthetic organic chemicals industry (dyes & dye intermediates; bulk drugs and intermediates excluding drug formulations; synthetic rubbers; basic organic chemicals, other synthetic organic chemicals and chemical intermediates)	21	5 (f)	А
6	Airports	29	7 (a)	Α
7	Industrial estates/ parks/ complexes/areas, export processing Zones (EPZs), Special Economic Zones (SEZs), Biotech Parks, Leather Complexes	31	7 (c)	А
8	Building and construction projects	38	8 (a)	В
9	Townships and Area development projects	39	8 (b)	В

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.

Spring.

Sr. Director, NABET Dated: Jan. 19, 2022

Certificate No.
NABET/EIA/2124/SA 0147

Valid up to Sep. 15, 2023

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