



KOTTAMETA LIMESTONE BLOCK

MALKANGIRI DISTRICT, ODISHA

Volume I- Text

Preferred Bidder
DALMIA CEMENT (BHARAT) LIMITED

Dalmiapuram – 621 651; Tamilnadu

Lease Area for grant : 801.171 Ha
(Forest Area-462.247 Ha & N.F. Area-338.924 Ha)

MINING PLAN

(Under Rule 16 (1) of MCR, 2016)

&

PROGRESSIVE MINE CLOSURE PLAN

(Under Rule 23 of MCDR 2017)

Category of the Mine – “A (Fully Mechanized)”

Prepared by

| | |
|---|---|
| P. S. Acharya Qualified Person | S. M. Patro Qualified Person |
| GEMTECH Consultants Pvt. Ltd, | |
| K-8/625, Kalinga Nagar, Ghatikia | |
| Bhubaneswar – 751019 (Odisha) | |
| Tel No – 9437008179 (M) | Tel No – 9861093020 (M) |

May – 2017





भारत सरकार
खान मंत्रालय
भारतीय खान ब्यूरो
क्षेत्रीय खान नियंत्रक का कार्यालय

REGD. PARCEL
E- mail: ro.bhubaneswar@ibm.gov.in

No. MP/FM/34-ORI/BHU/2017-18

Plot No. 149, Pokhariput
Bhubaneswar – 751 020
Date:08.06.2017

To

✓ Shri U R Raju, Executive Director,
Dalmia Cement (Bharat) Ltd,
11th & 12th Floor, Hansalaya Building,
15, Barakhamba Road, New Delhi-110001

Sub: Approval of Mining Plan of Kottameta Limetstone Block along with Progressive Mine Closure Plan (PMCP), over an area of 801.171 ha in Malkangiri district of Odisha State, submitted by M/s Dalmia Cement (Bharat) Ltd under Rule 16(1) of Mineral Concession Rules, 2016.

- Ref: - i) Your letter No. Nil dated 02.05.2017.
ii) This office letter of even no. dated 03.05.2017.
iii) This office letter of even no. dated 03.05.2017 addressed to the Director of Mines, Govt. of Odisha, copy endorsed to you.
iv) This office letter of even no. dated 15.05.2017.
v) Your Qualified Person letter No. Nil dated 29.05.2017.

Sir,

In exercise of the power delegated to me vide Gazette Notification No. S.O. 1857(E) dated 18.05.2016, I hereby **Approve** the Mining Plan including Progressive Mine Closure Plan of Kottameta Limetstone Block over an area of 801.171 ha of M/s Dalmia Cement (Bharat) Ltd in Malkangiri district of Odisha State submitted under Rule 16(1) of Mineral Concession Rules, 2016. This approval is subject to the following conditions:

- I. The Mining 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 and without prejudice to any order or direction from any court of competent jurisdiction.
- II. The proposals shown on the plates and/or given in the document is based on the lease map /sketch submitted by the applicant/ lessee and is applicable from the date of approval.
- III. It is clarified that the approval of aforesaid Mining Plan does not in any way imply the approval of the Government in terms of any other provision of Mines & Minerals (Development & Regulation) Act, 1957, or the Mineral Concession Rules, 2016 and any other laws including Forest (Conservation) Act, 1980, Environment (Protection) Act, 1986 or the rules made there under, Mines Act, 1952 and Rule & Regulations made there under.

- IV. Indian Bureau of Mines has not undertaken verification of the mining lease boundary on the ground and does not undertake any responsibility regarding correctness of the boundaries of the leasehold shown on the ground with reference to lease map & other plans furnished by the applicant / lessee.
- V. At any stage, if it is observed that the information furnished, data incorporated in the document are incorrect or misrepresent facts, the approval of the document shall be revoked with immediate effect.
- VI. If this approval conflicts with any other law or court order/ Direction under any statute, it shall be revoked immediately.

Encl: - One copy of
of Mining Plan

भवदीय / yours faithfully,



(HARKESH MEENA)

क्षेत्रीय खान नियंत्रक / Regional Controller of Mines

Copy for kind information to:-

1. Shri P S Acharya, Gemtech Consultants Pvt Ltd, K-8/625, Kalinga Nagar, Ghatikia, Bhubaneswar-751029.
2. The Director of Mines, Directorate of Mines, Government of Odisha, Heads of the Department Building, New Capital, Bhubaneswar- 751001, Odisha along with one copy of Mining Plan by **REGISTERED PARCEL**.

(HARKESH MEENA)

क्षेत्रीय खान नियंत्रक / Regional Controller of Mines



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Category of the Mine – “A (Fully Mechanized)”

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| P. S. Acharya Qualified Person | S. M. Patro Qualified Person |
| GEMTECH Consultants Pvt. Ltd, | |
| K-8/625, Kalinga Nagar, Ghatikia | |
| Bhubaneswar – 751019 (Odisha) | |
| Tel No – 9437008179 (M) | Tel No – 9861093020 (M) |



May – 2017



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Bhubaneswar
29.05.2017



 P. S. Acharya S. M. Patro
 Qualified Persons



INTRODUCTION

(a) Dalmia Cement (Bharat) Limited, one of the biggest players in cement manufacturing in the Country, has been successfully declared as the "Preferred Bidder" under Rule 9(4)(b)(iii) of the Mineral (Auction) Rules, 2015 for grant of a mining lease for Kottameta Limestone Block over an area of 801.171 Ha in Malkangiri district, Odisha through the e-auction conducted by the Government of Odisha. As required under rule 10(1) of the Mineral (Auction) Rules, 2015, the bidder M/S Dalmia Cement (Bharat) Limited has made the requisite upfront payment of Rs 2,38,15,692/- in shape of e-chalan dated 13.01.2017 and accordingly, the Government of Odisha has issued a Letter of Intent vide letter No. IV(MISC)SM-09/2017/850/SM, dt. 27.01.2017 under rule 10(2) of the Mineral (Auction) Rules, 2015 for grant of Mining Lease for the said block in Malkangiri district to the preferred bidder (Annexure-1).

(b) Kottameta Limestone Block is a part of the Jeypore-Bastar basin of Puranas over a stable basement of Archaean formations. The block was initially prospected during 1963-66 by the Directorate of Mining & Geology, Odisha and the preliminary estimate indicated 71 million tonnes of cement grade limestone. The Directorate of Mining & Geology subsequently took up a detail assessment of grade wise resources during 1981-84 at the request of Industrial Development Corporation of Odisha Limited (IDCOL) and established a total indicated resource of 98.69 million tonnes of limestone with average CaO content of 45.865%.

(c) M/s Dalmia Cement Bharat Limited is a Company under Dalmia Bharat Group. The cement manufacturing facility of the Group was first established in 1939 in South India and over the years, the group has grown to a prolific conglomerate covering the geographical boundaries of South, West and East India, making it one among the biggest players in cement in the Country with a total installed capacity of 25 million tonnes per annum. With an objective for future growth and to cater to the growing needs of Eastern and Southern parts of the Country, the Company now plans to establish a green field cement manufacturing project of 1.6 million tonnes per annum capacity based on the resources of the Kottameta Limestone block in the State of Odisha.

(e) The Company does not hold any mining lease/prospecting license/Reconnaissance permit in the State of Odisha. However, its group Company M/S OCL India Limited hold three mining lease in Odisha as under. Declaration to this effect by the lessee is at

Annexure-2.

अनुमोदित
APPROVED

GEMTECH CONSULTANTS Pvt. Ltd.
K-8/625, Kalinga Nagar, Ghatikia, Bhubaneswar-751029

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P.S. Acharya

S.M. Patro

Qualified Persons

क्षेत्रीय खान नियंत्रक
REGIONAL CONTROLLER OF MINES
भारतीय खान ब्यूरो
INDIAN BUREAU OF MINES
भुवनेश्वर/BHUBANESWAR

Mining Plan with PMCP of Kottameta Limestone Block of Preferred bidder M/S Dalmia Cement (Bharat) Limited over 801.171 Ha in Malkangiri District, Odisha



| Sl. No. | Lease Name | State/ District | Date of Execution | Area (Ha) | Mineral | Period of validity | Present (status) |
|---------|--------------------------------------|-------------------|-------------------|-----------|------------|--------------------|------------------|
| 1. | Lanjiberna Limestone & Dolomite Mine | Sundargarh Odisha | 01.03. 1990 | 893.55 | Lst & Dolo | 29.02. 2040 | Working |
| 2. | Bhikampali Qtzite Mine | Jharsuguda Odisha | 27.02. 2001 | 4.897 | Quartzite | 26.02. 2031 | Working |
| 3. | Lanjiberna- Kukuda Mine | Sundargarh Odisha | 21.08. 1978 | 93.798 | Lst & Dolo | 20.08. 1998 | Non Working |

(e) The total Limestone block over 801.171 Ha comprises of 462.247 Ha of forest land (Gramya jungle + jungle) and 338.924 Ha of non forest land (Govt. waste land : 190.058 Ha & Private S.T. land : 148.866 Ha), as provided by the Directorate of Mines, Government of Odisha in the land schedule of the Block (**Annexure-3**). The bidder shall obtain all statutory clearance required under the provisions of the Acts and Rules and shall execute the Mining Lease deed with Government of Odisha.

(f) The Letter of Intent issued by the State Government and subsequent grant of mining lease over the Kottameta Limestone Block are subject to the provisions of the Act and the Rules made there under, as amended from time to time. For satisfying the conditions specified in section 5(2)(b) of the Mines and Minerals (Development & Regulation) Act, 1957, the preferred bidder M/S Dalmia Cement (Bharat) Limited is now submitting a Mining Plan for approval under rule 16 (1) of Minerals (Other than Atomic and Hydro Carbons Energy Minerals) Concession Rules, 2016. The status of other statutory clearances to be obtained before and after execution of the lease deed till commencement of mining operation is tabulated below:

| Sl.No. | Particulars | Status |
|--------|--|---|
| 1. | Approval of Mining Plan from IBM | Submitted for approval |
| 2. | Forest Clearance from MOEF & CC | To be obtained by the preferred bidder after approval of Mining Plan. |
| 3. | Wild life clearance from MOEF & CC | -do- |
| 4. | Consent to Establish from SPCB | -do- |
| 5. | Environmental clearance from MOEF & CC | -do- |
| 6. | Permission for explosive license from PESO | -do- |
| 7. | Permission for mine opening from DGMS | -do- |
| 8. | Permission of installation/ trial operation of equipment from DGMS | -do- |
| 9. | Ground water clearance from CGWB & State Govt. | -do- |
| 10. | Railway siding approval from Railway authorities | -do- |
| 11. | Approval for diesel storage from PESO | -do- |
| 12. | Power line from State Discom | -do- |
| 13. | Clearances relating to work under an existing transmission line or shifting of the transmission line | -do- |

Mining Plan with PMCP of Kottameta Limestone Block of Preferred bidder M/S Dalmia Cement (Bharat) Limited over 801.171 Ha in Malkangiri District, Odisha

1.0 GENERAL

| | | | | |
|----|---|---|--|--|
| a) | Name of Applicant/ Lessee/ Registration No. under Rule 45 | : | M/s Dalmia Cement (Bharat) limited (Preferred bidder). Regn. No. IBM/929/2011 | |
| | Address of the Lessee | : | Regd. office – Dalmia Cement (Bharat) Limited, Dalmiapuram 621651,(Tamil Nadu) Corporate office & address for communication– Dalmia Cement (Bharat) Limited, 11 th & 12 th Floors, Hansalaya Building, 15, Barakhamba Road, New Delhi-110001. Address Proof is at Annexure – 4. | |
| b) | Status of the Lessee | : | Public Limited Company. Copy of certificate of Registration of the Company and Memorandum of Association is attached as Annexure – 5. Latest list of Board of Directors with their addresses duly certified by competent authority and interest or concern in other firms/ Companies of all the Directors duly certified by the competent authorities of the Company are attached as Annexure – 6. | |
| | Name of the nominated owner | : | Shri U.R.Raju, Executive Director, Incubation. Board Resolution & Power of Attorney in favour of Shri U.R.Raju is enclosed as Annexure – 7. Identity Proof of Shri U.R.Raju, nominated owner is at Annexure - 8. | |
| c) | Minerals which are included in the letter of intent | : | Limestone | |
| d) | Minerals which the applicant intends to mine | : | Limestone. | |
| e) | Name of Qualified persons under rule 15 of MCR,2016 preparing the Mining Plan. | : | Sri P. S. Acharya (Annexure-9) | Sri S.M.Patro (Annexure-9) |
| | Address of the Qualified Persons | : | GEMTECH Consultants Pvt. Ltd., K-8/625, kalinga Nagar, Ghatikia, Bhubaneswar – 751 029(Odisha). | |
| | Phone/ Fax & Email | : | 9437008179 gemtech_consultant@yahoo.co.in | 9861093020 gemtech_consultant@yahoo.co.in |

2.0 LOCATION AND ACCESSIBILITY

a) Lease details (Existing Mine)

Not Applicable since the block is yet to be granted under Mining Lease & only Letter of Intent has been issued in favor of the preferred bidder.

b) Details of applied / lease area with location map (fresh area/ mine)

| Forest | | Non-forest | |
|--|----------------|--|--------------------------|
| Forest (Gramya Jungle + Jungle) | 462.247 Ha. | (i) Govt. waste land (ii) Tenancy land (ST land) | 190.058 Ha 148.866 Ha |
| Total | 462.247 | Annexure-3 & Plate-2B | 338.924 Ha |
| Total Lease area / applied area | | : 801.171 Ha | |
| District & State | | : Malkangiri, Odisha | |
| Taluka | | : Malkangiri | |
| Villages | | : Katamater | |
| Whether the area falls under Coastal Regulation Zone (CRZ)? If yes, details thereof. | | : Area does not fall under Coastal Regulation Zone. | |
| Existence of public road/ railway line, if any nearby and approximate distance | | : The deposit lies at a distance of 150 km from Jeypore on K.K Railway line The distance from the district headquarter is about 40km via Sikhapalli and Dharampalli. | |
| Toposheet No. with latitude & longitude of all corner boundary point/ pillars | | : S. I. Topo Sheet No.65 F/11. The co-ordinates of all the corner points of the Block as provided by the State Government are as below. | |

The State Government of Odisha have informed that during demarcation of the area, the boundary pillars have been duly posted. Since this is a problematic area, those might have been disturbed. However at the time of handing over of the area, survey demarcation shall be done and boundary pillars shall be erected which will satisfy the conditions under CCOM circular No. 2/2010 dt. 06.04.2010 and its addendum regarding geo-referenced mining lease map, after the mining lease is executed by the preferred bidder. DGPS survey of the boundary points of the intended lease area has been done by the Directorate of Geology officials and submitted (**Plate No -2A**). The co-ordinates of all the boundary points as per DGPS readings are as below:

| Pillar No. | Latitude | Longitude | UTM CO-ORDINATES | |
|------------|-----------------|-----------------|------------------|---------------|
| | | | Easting | Northing |
| 1 | 18°20'46.32144" | 81°39'34.86060" | 569699.5225 | 2028614.79702 |
| 2 | 18°20'53.76444" | 81°41'38.08968" | 573315.42631 | 2028857.00693 |
| 3 | 18°20'17.73492" | 81°41'37.45248" | 573300.9445 | 2027749.56222 |
| 4 | 18°20'17.29176" | 81°41'02.05584" | 572262.05402 | 2027732.01166 |
| 5 | 18°19'27.10956" | 81°41'00.44700" | 572220.61893 | 2026189.48054 |
| 6 | 18°19'28.18920" | 81°39'55.68264" | 570319.42272 | 2026215.6272 |
| 7 | 18°19'40.76796" | 81°39'41.81076" | 569910.82909 | 2026600.75211 |
| 8 | 18°20'17.34936" | 81°39'08.01756" | 568914.87145 | 2027721.5023 |



P.S. Acharya



S.M. Patro

Qualified Persons

c) Attach a general location plan showing area and access routes, preferably on a Survey of India topographical map or a cadastral map or forest map as the case may be:

The intended lease area is marked on a revenue map in the scale of 1:3960 (16" = 1 mile) and attached as **Plate No. 2A/ 2B**. The area is also marked in a survey of India topographical map in the scale 1:50000 showing all features within 5 Km from the lease boundaries (**Plate No. 1**).



3.0 DETAILS OF APPROVED MINING PLAN / SCHEME OF MINING (if any)

Not Applicable since the area is yet to be granted to the preferred bidder after fulfillment of all conditions stipulated in the Letter of Intent.



PART - A

1.0 GEOLOGY AND EXPLORATION

a) Briefly describe the topography, drainage pattern, vegetation, climate, rainfall data of the mining lease area:

i) **Topography:** The area represents a part of the Jeypore-Jagdalspur plateau and exhibits slightly undulating to plain topography. However, at several places flat topped low mounds and narrow discontinuous ridges break the monotony. The southern edge of the area is represented by dissected hills. The geomorphology is largely lithologically controlled. The district is characterized by varied geomorphological features. Based on Landsat data interpretations and field studies, the geomorphic units of the district are broadly identified as - Structural Hills, Denudational Hills, Residual Hills, Shallow and Moderately weathered pediplain, Pediment - Inselberg complex, Inselberg, Flood plains, Structural Valley, Linear Ridge and Bazada. The limestone and phyllite being comparatively soft form the plain country, whereas, hard quartzite, being resistant to weathering and erosion, stand out as dome shaped hillocks and discontinuous, narrow, linear ridges. The general slope of the ground is towards west. The highest elevation of 218 m at the south central part and lowest elevation at 188 m in SW part is recorded in the intended lease area, maintaining overall slope of the ground towards west.

ii) **Drainage System:** The drainage system of the area is controlled by Sabari River flowing to the west of the block and its tributaries. However ephemeral streams flowing in the southern and eastern part of the area controls the drainage.

iii) **Vegetation:** The major plain country constitutes the cultivated land, clustered around the water courses. The southern hill ranges are densely clad with mixed forest. The plain area adjacent to Sabari River is also thickly forested, mostly with teak plants. The low lying dome shaped hillocks and narrow ridges are covered with shrubby and thorny undergrowth.

iv) **Climate & Rainfall :** The district has a subtropical climate. South west monsoon is the principal source of rainfall. Rainfall pattern is uneven and erratic. The average annual rainfall gradually increases from South Western to North Eastern parts of the district. The average annual rainfall varies from 874.1 mm to 2236.6 mm. The agricultural definition of drought takes into account the negative departure of seasonal rainfall from the mean seasonal rainfall. A perusal of the frequency of occurrence of drought indicates that mild to normal drought condition prevails in Malkangiri District.

The climate of the district is tropical with hot and dry summer and pleasant winter. The summer season extends from March to middle of June followed by the rainy season from June to September. The winter season extends from November till the end of February.

Meteorological data of 2016 collected for Malkangiri district by IMD (Annexure-14) indicates that the maximum temperature rises up to 42.4⁰ C during April. In the summer months of April and May, hot winds from the west are generally experienced in the afternoon. December is the coldest month with lowest temperature during winter being 15.8⁰C. Monsoon generally lasts from the end of May to October. Occasional showers are received in the month of April, November and December. The humidity is quite high during the rainy season. December and January are the coldest months of the year when the mercury falls to around 15.8⁰ C.

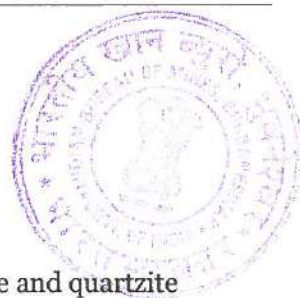
The monsoon breaks over the area from the mid of June and continues till the end of September. The maximum rainfall of 816.6 mm in a month was recorded in August, 2006. The average rain-fall of the region is about 1612 mm. The monthly rainfall (mm) of Malkangiri district as recorded by IMD is given below:

| Y/M | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec | TOTAL |
|------|-----|------|------|-------|-------|-------|-------|-------|-------|-------|-------|------|--------|
| 2006 | 0.0 | 0.0 | 4.4 | 94.0 | 76.5 | 103.6 | 512.3 | 816.6 | 443.2 | 5.4 | 180.6 | 0.0 | 2236.6 |
| 2007 | 0.0 | 0.0 | 0.0 | 48.0 | 119.0 | 301.4 | 209.1 | 348.0 | 356.4 | 397.7 | 0.0 | 0.0 | 1779.6 |
| 2008 | 0.0 | 19.0 | 64.0 | 9.0 | 22.3 | 160.1 | 441.2 | 232.6 | 123.4 | 52.4 | 0.0 | 0.0 | 1124.0 |
| 2009 | 0.0 | 0.0 | 0.2 | 0.8 | 15.6 | 44.6 | 409.6 | 274.0 | 132.2 | 31.6 | 45.4 | 0.0 | 954.0 |
| 2010 | 9.9 | 2.0 | 0.0 | 28.1 | 55.0 | 239.7 | 717.0 | 472.7 | 179.4 | 98.0 | 72.1 | 38.9 | 1912.8 |
| 2011 | 0.0 | 0.0 | 0.0 | 41.0 | 7.2 | 116.6 | 178.8 | 274.2 | 238.3 | 18.0 | 0.0 | 0.0 | 874.1 |
| 2012 | 3.0 | 0.0 | 0.0 | 109.5 | 35.2 | 168.7 | 495.8 | 611.5 | 417.1 | 109.8 | 105.9 | 0.0 | 2056.5 |
| 2013 | 0.0 | 14.8 | 0.0 | 75.0 | 69.2 | 295.9 | 529.0 | 322.6 | 266.9 | 168.5 | 10.0 | 0.0 | 1751.9 |
| 2014 | 0.0 | 2.6 | 13.2 | 15.8 | 76.4 | 75.2 | 499.8 | 373.8 | 344.4 | 229.8 | 25.6 | 0.0 | 1656.6 |
| 2015 | 0.4 | 2.5 | 11.1 | 74.7 | 40.1 | 591.6 | 196.6 | 405.0 | 384.8 | 38.8 | 24.7 | 0.6 | 1770.9 |
| Av. | 1.3 | 4.1 | 9.3 | 49.6 | 51.7 | 209.7 | 418.9 | 413.1 | 288.6 | 115.0 | 46.4 | 4.0 | 1611.7 |

b) Brief description of Regional Geology with reference to location of lease area:

(i) The area forms a part of the Jeypore-Bastar basin of Puranas. The broad stratigraphy of the region constitutes a stable basement of Archaean formation over which the para-metamorphites of Purana Formation occur unconformably. The stratigraphy of the area can be enumerated as follows:

| | | |
|-------------|------------------------|---|
| Recent | ----- | Alluvium and soil |
| Sub-recent | ----- | Laterite |
| Post Purana | ----- | Quartz vein |
| | | Phyllite & calc-phyllite |
| | | Limestone |
| Puranas | | Maroon shale and intercalated shale and quartzite |
| | | Quartzite and gritty to conglomeratic quartzite |
| | -----Unconformity----- | |
| Archaean | ----- | Granite gneiss |



The area has suffered regional metamorphism up to the granulite facies and has experienced numerous phases of magmatic intrusions, accompanied by progressive and retrogressive metamorphism, repeated folding and shearing. As a result original structures, textures and mineral compositions have been completely obliterated by new structures and mineral assemblages.

(ii) Description of rock types:

Granite gneiss:

The oldest rock unit in the area is the Archaean granite gneiss which occurs extensively around the para-metamorphites of Puranas. Granite gneisses occur on the eastern side of Sabari River around west of Kottameta, west of Uskalvagu, south of Dharampali, around Irlagundi etc. These are grey in colour and texturally vary from medium to coarse gneissic to coarse blasto - porphyritic types and exhibit considerable variation from massive to granular types to foliated types. Mineralogically, the rocks contain variable amount of quartz, feldspar, biotite with or without garnet. Besides, granite gneiss, the other litho unit of Archaean age is represented by biotite gneiss. There occur rafts of quartz schist within the gneisses. The strike of the gneisses is variable, viz. N 75°E – S75°W with 20° dip to N 85°W – S 85°E with vertical dips. In the majority of the cases, the strike is similar to that of the Eastern Ghats. Granites occur in limited patches in the central and western parts of the district.

Under microscope, the rock is coarse grained, inequigranular with plagioclase and orthoclase as phenocrysts alongwith microcline micropertthites. Quartz, though of uniform grain size, occurs in aggregates and are recrystallised with sutured boundaries. Hornblendes are altered to chlorite and epidote. Sericitisation of orthoclase is found in some sections.

The next younger group of rocks representing distinct para-metamorphites of Purana age those lie unconformably over the Archaean basement can be broadly classified into three distinct litho units, such as: Lower Arenaceous, Middle Calcareous and Top Argillaceous.

Gritty to conglomeratic quartzite:

The lowest member of litho unit is represented by a band of gritty to conglomeratic quartzite indicating an unconformable relationship with the underlying Archaeans. The gritty to conglomeratic quartzite horizon is rather thin, rarely exceeding more than one meter in thickness and occurs as discontinuous lenses at the base of the horizon. Exposures of conglomeratic quartzites are characterised by coarse angular to sub - angular grains of quartz, jasper and fragments of slate, set in a quartzose groundmass.

Quartzite:

Quartzites form a distinct horizon and occur as narrow continuous arcuate ridges with mutually converging dips indicating a basin structure. Exposures of quartzites are found on the western bank of Sabari River near Inter-state boundary, west of Nandiveda where the river takes westerly course. It is compact, massive, and medium to fine grained, grey to greenish grey and brown in colour. Mineralogically they contain mostly quartz with minor proportion of feldspar, sericite and iron oxide. It exhibits a variable strike of N-S to NNE-SSW with easterly to westerly dip of 5° to 15° respectively. Alternate compositional bands of grit and fine grained quartzite are observed at several places, suggesting rhythmic sedimentation in a pulsating basin. In the north western part of the area near Inter-state boundary alternate bands of quartzite and shale are noticed along Sabari river section.

Petrographically, quartzites are fine to medium grained. The predominant mineral is found to be anhedral quartz. The other minerals are feldspar, muscovite and opaque iron oxides. The cementing materials are siliceous to ferruginous and recrystallised. Some sections exhibit long needle shaped crystals of calcite as cementing materials.

Shale:

Shale do not form a distinct horizon in the area. Generally, they are interbanded with quartzite. Exposures of shale occur in the bank of Sabari River near the Inter-Sate boundary. Shales occur as small mounds with alternate bands of quartzite. The shales are not continuous and often they pinch out laterally. In several bore holes, the drill cores exhibit intercalation of shale and quartzite towards the top of the arenaceous fraction with individual band varying in thickness from a few millimeter to two centimeters. The shales are brown to maroon, grey and greenish grey in colour and are non-fossiliferous. They

exhibit N-S to NNE-SSW strike with horizontal to sub-horizontal dip towards east. Contortions and micro-drag folds are found in the shale.

Limestone:

The lower arenaceous fraction passes upward abruptly into calcareous fraction which is represented by limestone. The contact of limestone and shale is marked at places by a thin brecciated zone, consisting of angular grains of shale, quartzite and chert embedded in a calcareous mass that suggest reworking of the sediments after diagenesis. Outcrops of limestone occur all along the Sabari River section from the Inter-State boundary on the north to north - west of Nandiveda. Besides, exposures of limestone are also observed to west in the forest and south - west of Kottameta, in the fallow land around Nandiveda. Broadly the limestone occurring in the area can be divided into two categories such as lower high calcic marbilitic to sub-marbilitic light coloured limestone and upper high silica phyllitic limestone. The lower calcic marbitic to sub-marbilitic limestone occurs all along the Sabari river section and in the forest adjacent to the river. This limestone is hard, compact and fine to medium grained with light grey, white, buff, purple and greenish grey in colour. In marbilitic variety, the colour variation is very prominent and they occur as distinct bands. Paper thin partings of grayish black phyllite are observed in this variety of limestone. The upper high silica phyllitic limestone occur far east of the Sabari river in the forest around Kottameta. This limestone is light grey to grayish black in colour, hard with frequent partings of grey phyllite. Solution cavities are frequent in both the varieties of limestone. The limestone exhibit a strike of N-S to NNE-SSW with dip varying from 5° to 15° due east.

Under microscope, limestone is fine to medium grained exhibiting granular to banded structure. The predominant minerals are recrystallised calcite with micro-bending and buckling effects. Opaque bands of sericite alternate with calcitic layers. Minor quantities of quartz occur as interstitial grains in a few sections.

Phyllite and calc - phyllite:

The limestone horizon is overlain by calc-phyllite. The calc-phyllites do not appear to be continuous; rather they are lens shaped and frequently pinch out laterally. This fact is marked in several boreholes where the top of the limestone is found to be phyllite instead of calc-phyllite. Exposures of calc-phyllite are observed in the far eastern part of the area, in the narrow valley, west and WSW of Kottameta. The calc-phyllite occurs conformably over the limestone horizon. Megascopically, they exhibit alternate thin calcic and phyllitic layers with a soapy feel.

Under microscope, the calc-phyllites are coarse grained, equigranular showing parallel mineral bands in a calcareous matrix. The calcite grains in the matrix are elongated and parallel to the mineral bands. The predominant minerals are calcite, chlorite and quartz with some plagioclase feldspars of calcic nature. Though the chlorite layers are parallel, they are not of uniform width.

The sedimentary facies are completed by the formation of phyllite above the calc-phyllite. It is the youngest lithological unit of Purana formation. The phyllites occupy a major part of the central region of the basin. Exposures of phyllite are observed around the village Kottameta, north and NNE of the village. They are dull grey to brown and at places show silvery grey colour. They often exhibit well developed bedding cleavage and impart a greasy feel. Deformation in the form of contortions and micro-drag folds are very common in phyllites. They exhibit a variable strike of N-S to NE-SW having a dip of 5° to as high as 25° due east.

Under microscope, the rock is very fine grained, recrystallised and foliated. The minerals present are sericite, quartz and opaque iron oxides. These minerals are distributed along the foliation planes.

Quartz vein:

Intrusion of quartz veins are found at several places invading the rocks mentioned earlier. The dimension of the quartz veins vary from thin sheets to massive as observed in the forest south west of Kottameta and in B.H. No.09014 etc. these quartz veins are white to brownish white in colour.

Laterite:

Lateritisation of shale, phyllite and quartzite are observed in the area. At some places, the phyllitic limestones are found to be partially lateritised.

Alluvium and soil:

The major part of the area is covered by alluvium and soil. Thickness of soil in the northern part is hardly one meter which gradually increases towards south. Similarly, the thickness of soil and alluvium gradually increases from west to eastward. In the northern part and adjacent to Sabari River, the soil is sandy and lateritic in nature and earthy brown to light grey in colour due to their derivation from shale and quartzite.

c) **Detail description of Geology of the lease area (Applicable for Mining Plan for grant & renewal and not for SoM / Modifications in the approved mining plan/ scheme of mining):**

The preliminary investigation in the block was conducted by the Directorate of Mining & Geology, Odisha in 1963-66. Subsequently, at the request of the I. D. C. Ltd, Directorate of Mining & Geology took up detailed exploration of the limestone deposit around Kottameta, Nandiveda and Uskalvagu in Malkangiri sub-division of Malkangiri district from 1981 to 1984. The report of the findings of explored northern block named as Kottameta limestone block covered by General Exploration (G2) stage of UNFC is enclosed as **Annexure-10**.

The entire area was initially mapped in 1:10,000 scale for delineating disposition of the limestone bodies and to chalk out a detailed exploration programme. Out of this, an area of about 8.005 sq km was geologically mapped in 1:2000 scale in the northern limestone bearing zone. Within this 8.005 sq km block, an area of 5.115 Km² has been found to be mineralized i.e. limestone bearing. A base line was laid in N-S direction i.e. along the general strike direction of the formations, starting from the inter-state boundary in the north. The origin point of the base line has been taken as the inter-state boundary pillar located on the bank of Sabari River south west of Posugada i.e. the point where the inter-state boundary takes an easterly course leaving the Sabari River. From this point, the line was extended southward by theodolite and this line is named as '10' line. Further, grid lines parallel and perpendicular to this were laid at 200 meters interval. Thus a grid plan of 200 m square was drawn in the field. For assigning the local coordinates, the N-S grid lines lying on the eastern side of the above '10' grid line were designated as 11, 12, 13 etc and on western side as 09, 08, 07 up to 0/0 line having the grid interval of 200 meters. Similarly, the E-W grid line passing through the origin mentioned earlier was termed as '0/0' grid line and lines parallel to and south of it at 200m interval were designated as 01, 02, 03 grid lines and so on. Thus, local coordinates of a grid intersection were expressed by four digits, the first two digits denoting the N-S grid lines which cross each other there. With reference to the triangulation point Δ 273 m located on Gargarkonda hill in Chhatishgarh, the R.Ls of each grid intersection points were recorded at 200m interval and contour plan with one meter interval was prepared. On the grid plan involved litho units were plotted in 1:2000 scale. Thus, a large scale plan covering an area of 8.005 sq km was prepared and bore hole points were marked on it.

(i) Description of the Limestone deposit:

Outcrops of limestone are seen extensively in the area from the Inter-State boundary on the north to WNW of Dharampali on the south over a strike length of about 7.5 km. Across the

strike, it occurs from Sabari river on the west, to west of Kottameta on the east. The width of the limestone horizon varies from 0.5 to 2.5km. It occurs as distinct horizon between the lower shale and quartzite and upper phyllite. Continuous exposures of limestone are found all along the Sabari river section and adjacent to it. Besides, detached out-crops of limestone occur in the paddy field. In general, the limestones exhibit low relief, the maximum being 2.5m. Thickness of overburden is less in the northern part of the area and gradually increases to south, where the alluvium is observed to be as high as 7 meters. The strike of the limestone varies from N-S to NNE-SSW with a low dip varying from 5° to 15° due east.

(ii) Classification: Broadly the limestone horizon can be classified into two varieties, namely (1) the lower high calcic limestone and (2) the upper siliceous limestone.

1. High Calcic Limestone: The lower part of the limestone horizon is rich in calcium oxide and has got very low content of silica. Almost continuous exposures of this variety of limestone are observed in the western part of the area in the Sabari River section. This limestone rests unconformably over shale and quartzite. In general, the shale and limestone contact is sharp barring a few exceptions as seen from some of the drill cores. The high calcic variety can further be sub-divided into two sub-groups, such as marbilitic and non-marbilitic types.

The lower most fraction of this horizon constitutes marbilitic variety. Generally it is fine grained, compact with sub-conchoidal fractures and exhibits a variety of colour bandings ranging from ivory white to light purple, cream, buff, green and light grey. The marbilitic variety gradually grades upward into semi-marbilitic variety imperceptibly. In both the varieties, paper thin partings of grey to black phyllites are observed at several places. The thickness of the marbilitic to semi marbilitic variety ranges from 6.70 m to 33.95 m as observed in drill cores. A portion of the pure marbilitic variety corresponds to the specification of B.F. grade as revealed from the chemical analysis. But it is not continuous and often pinches out laterally and grades into cement grade for which resource has not been estimated separately.

The semi-marbilitic variety gradually grades upward into non-marbilitic variety which also contains high percentage of calcium oxide, although a bit less than the marbilitic variety. This is massive and light grey in colour, fine to medium grained and compact in nature.

2. Siliceous limestone:

The upper part of the limestone is a distinct horizon of dark grey high silica limestone without any sharp contact with lower one. This variety of limestone occurs around west and south west of Kottameta. It is grey to grayish black in colour, very hard, compact and fine grained. Frequent discontinuous bands of grey to dark grey phyllite alternate with the limestone, which render the limestone siliceous. This variety is highly siliceous and very low in lime content.

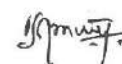
The lower marbilitic to semi-marbilitic varieties analyse more than 46% CaO and is termed as high grade limestone. A part in of the semi-marbilitic and the lower massive light grey variety limestone is termed as intermediate grade and the CaO content ranges from 40-46%. The upper siliceous limestone is termed as low grade waste as the CaO content ranges between 24 to 40% with high silica ranging between 17.90% to as high as 42.80%.

The upper siliceous limestone grades upward into calc-phyllite or phyllite. In case of calc-phyllite, the contact is gradational, whereas the contact between siliceous limestone and phyllite is sharp.

The different horizons encountered in the block with their minimum/maximum & average thickness, as determined from the bore hole data are as below:

| Formations | Min. thickness (m)/ BH No. | Max. thickness (m)/ BH No. | Av. thickness (m) |
|---------------------|----------------------------|----------------------------|-------------------|
| OB Soil | 0.17 m / BH 0809 | 21.50 m / BH 0412.5 | 3.77 m |
| Phyllite | 0.50 m / BH 0420 | 38.15 m / BH 0413 | 14.77 m |
| Siliceous Lst. | 1.19 m /BH 0219 | 26.32 m / BH 0613 | 11.00 m |
| Intermediate Gr Lst | 1.00 m / BH 0609 | 34.00 m / BH 0220 | 13.86 m |
| High Grade Lst | 2.00 m /BH 0512 | 31.77 m / BH 0416 | 11.90 m |

(iii) Associated Minerals: The associated mineral in the limestone is mostly sericite. Its incidence gradually increases from lower high calcic limestone to upper siliceous limestone. The presence of sericite renders a great fissility to limestone. The other associated mineral is quartz which occurs as veinlets. Besides, occasional crystals of pyrite also observed in some drill cores. Solution cavities are frequent in the limestone which is either open or filled with sandy to phyllitic soil. The cavities are common in the high calcic limestone. The dimension of the cavities vary from 5 cm to as high as 8.00 m as observed in the bore hole No.0422.



P.S. Acharya



S.M. Ratro

Qualified Persons



d) (i) Name of Prospecting / exploration agency :

Directorate of Geology, Department of Steel & Mines, Government of Odisha.

(ii) Address : Bhu-Bigyan Bhawan, Bhubaneswar-751 001.

(iii) E mail Address / Phone No: directorgeology_odisha@yahoo.co.in, dir.geology@orissaminerals.gov.in/ Phone No. 0674-2392374.

e) Details of prospecting/ exploration already carried out:

i) No. of pits and trenches indicating dimensions, spacing etc along and across the strike/ foliation with reference to geological plan.

No trial pits or trenches have been sunk in the block.

ii) No. of boreholes indicating type (Core/RC/DTH), diameter, spacing, inclination, collar level, depth etc with standard bore hole logs duly marking on geological plan/ sections.

Initially, systematic drilling was carried out at 400 meter grid interval. Since, limestone beds exhibit a sub-horizontal dip, vertical boreholes were drilled up to the datum level, taken as 150 m and all bore holes were drilled either beyond the limestone horizon up to quartzite or maximum up to the datum level if the limestone continues.

In the second phase, infilling boreholes were drilled in a 200 meter square grid pattern. In a few places bore holes at 100m interval were also drilled where the sub-surface picture was not clear. Altogether 101 bore holes comprising 4005.56 meters of drilling was achieved in the mineralized area of 6.012 sq km.

The summary of exploration done during the investigation is as below:

| Block | Field Season 1981-84 | | | | |
|-----------------|----------------------|-------------|-------------|-------------|---------------------|
| | Total holes drilled | Type of BHs | Spacing | Inclination | Total meter drilled |
| Kottameta Block | 101 | Core | 200m x 200m | Vertical | 4005.56 |

**Mining Plan with PMCP of Kottameta Limestone Block of Preferred bidder M/S Dalmia Cement
(Bharat) Limited over 801.171 Ha in Malkangiri District, Odisha**

The basic data of boreholes drilled during the investigation and considered for resource and grade estimation are as below:

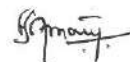
| BH No. | Collar RL | Inclination | Depth Drilled | Water Level (m) | Bottom RL | Formations | |
|--------|-----------|-------------|---------------|-----------------|-----------|--|-------------------------|
| | | | | | | LS Formations | Soil/OB |
| 0014 | 199.750 | Vertical | 26.300 | 5.60 | 173.450 | HgLS 11.05-25.75 | Soil 11.05 |
| 0015 | 200.810 | Vertical | 29.800 | --- | 171.010 | MgLS 17.05-18.81 HgLS 18.81-28.75 | Soil 2.30 Ph 2.30-17.05 |
| 0016 | 202.030 | Vertical | 31.700 | --- | 170.330 | MgLS 15.35-24.03 HgLS 24.03-31.35 | Soil 15.35 |
| 0017 | 204.740 | Vertical | 42.500 | --- | 162.240 | HgLS 27.50-42.35m | Soil 2.20 Ph 2.20-27.50 |
| 0018 | 206.260 | Vertical | 46.800 | --- | 159.460 | MgLS 16.00-19.26 LgLS 19.26-23.26 MgLS 23.26-26.26 LgLS 26.26-30.26 HgLS 30.26-37.26 LgLS 37.26-41.00 | Sandy Soil 16.00 |
| 0221 | 209.420 | Vertical | 39.800 | | 169.620 | NO LS | Soil 2.30 |
| 0019 | 207.130 | Vertical | 29.300 | 12.00 | 177.830 | NO LS | Soil 1.20 |
| 0112 | 194.910 | Vertical | 11.450 | 4.00 | 183.460 | HgLS 1.20-8.63m | Soil 1.20 |
| 0113 | 196.880 | Vertical | 15.700 | 4.00 | 181.180 | LgLS 2.70-6.88 HgLS 6.88-15.29 | Soil 2.70 |
| 0114 | 198.550 | Vertical | 30.450 | 3.85 | 168.100 | HgLS 3.25-6.00 MgLS 6.00-13.00 HgLS 13.00-20.85 | Soil 1.65 Ph 1.65-3.25 |
| 0115 | 199.770 | Vertical | 29.000 | 6.10 | 170.770 | MgLS 5.65-7.77 HgLS 7.77-27.75 | Soil 5.65 |
| 0116 | 201.180 | Vertical | 43.000 | 5.00 | 158.180 | MgLS 6.25-11.00 HgLS 11.00-14.00 MgLS 14.00-19.00 HgLS 19.00-34.38 | Soil 2.00 Ph 2.00-6.25 |
| 0117 | 202.790 | Vertical | 39.790 | 7.20 | 163.000 | LgLS 4.40-13.40 MgLS 13.40-27.79 HgLS 27.79-38.79 | Soil 2.70 OB 2.70-9.40 |
| 0118 | 203.650 | Vertical | 49.650 | 6.00 | 154.000 | LgLS 8.25-17.00 MgLS 17.00-24.06 LgLS 24.06-33.00 HgLS 33.00-46.50 | Soil 1.10 Ph 1.10-17.10 |
| 0119 | 204.750 | Vertical | 47.400 | 8.40 | 157.350 | MgLS 10.75-23.75 LgLS 23.75-34.75 HgLS 34.75-47.15 | Soil 9.35 |
| 0120 | 207.280 | Vertical | 54.000 | 8.90 | 153.280 | MgLS 33.00-45.00 LgLS 45.00-53.30 | Soil 1.75 Ph 1.75-33.00 |
| 0121 | 210.470 | Vertical | 54.050 | 14.00 | 156.420 | HgLS 20.70-27.47 MgLS 27.47-45.47 NA 45.47-54.05 | Soil 0.90 Ph 0.90-20.70 |
| 0122 | 217.100 | Vertical | 67.250 | 13.90 | 149.850 | MgLS 30.95-62.90 LgLS 62.90-66.10 | Soil 1.80 Ph 1.80-30.95 |
| 0124 | 217.690 | Vertical | 40.200 | 12.20 | 177.490 | Outside ML/No Ls | Soil 4.00 Ph 4.00-40.20 |
| 0210 | 195.020 | Vertical | 30.600 | 5.35 | 164.420 | MgLS 4.20-7.40 Sandy soil 7.40-30.60 | Soil 4.20 |
| 0211 | 194.880 | Vertical | 14.100 | 6.00 | 180.780 | HgLS 2.10-12.30 | Soil 2.10 |
| 0212 | 194.020 | Vertical | 12.600 | 3.00 | 181.42 | HgLS 0.95-10.90 | Soil 0.95 |
| 0213 | 195.580 | Vertical | 15.300 | 3.30 | 180.28 | MgLS 1.50-4.58 HgLS 4.58-13.70 | Soil 1.50 |

**Mining Plan with PMCP of Kottameta Limestone Block of Preferred bidder M/S Dalmia Cement
(Bharat) Limited over 801.171 Ha in Malkangiri District, Odisha**

| BH No. | Collar RL | Inclination | Depth Drilled | Water Level (m) | Bottom RL | Formations | |
|--------|-----------|-------------|---------------|-----------------|-----------|---|----------------------------|
| | | | | | | LS Formations | Soil/OB |
| 0214 | 197.390 | Vertical | 21.650 | 3.65 | 175.740 | LgLS 2.75-5.39 HgLS 5.39-21.05 | Soil 2.75 |
| 0215 | 198.040 | Vertical | 17.000 | --- | 181.040 | MgLS 1.75-5.04 HgLS 5.04-15.35 | Soil 0.75 Qtz 0.75-1.75 |
| 0216 | 199.340 | Vertical | 26.050 | 4.90 | 173.290 | MgLS 1.00-4.34 HgLS 4.34-24.55 | Soil 1.00 |
| 0217 | | Vertical | | 4.75 | 170.170 | MgLS 5.75-12.27 HgLS 12.27-16.27 MgLS 16.27-19.27 HgLS 19.27-28.70 | Soil 5.75 |
| | 200.270 | | 30.100 | | | | |
| 0218 | 200.640 | Vertical | 24.100 | 5.85 | 176.540 | MgLS 1.60-7.64 HgLS 7.64-23.00 | Soil 1.00 Ph 1.00-1.60 |
| 0219 | 203.190 | Vertical | 37.750 | 9.25 | 165.440 | LgLS 10.00-11.19 MgLS 11.19-37.50 | Soil 9.00 Ph 9.00-10.00 |
| 0220 | 206.450 | Vertical | 56.600 | --- | 149.850 | LgLS 6.10-16.45 MgLS 16.45-50.45 HgLS 50.45-56.60 Ls continues | Soil 3.60 Ph 3.60-16.45 |
| 0309 | 193.670 | Vertical | 41.300 | 1.50 | 152.370 | MgLS 0.50-23.67 LgLS 23.67-31.67 HgLS 31.67-40.41 | Soil 0.50 Ph 0.50-1.67 |
| 0310 | 196.355 | Vertical | 54.700 | 9.20 | 141.655 | LgLS 6.00-12.50 MgLS 12.50-29.35 HgLS 29.35-33.35 MgLS 33.35-36.35 HgLS 36.35-41.35 MgLS 41.35-54.70 Ls continues | Soil 2.00 Ph 2.00-4.00 |
| 0311 | 197.900 | Vertical | 61.650 | 9.20 | 136.250 | LgLS 5.85-19.2 MgLS 19.20-44.90 LgLS 44.90-48.90 HgLS 48.90-61.15 | Soil 5.85 Ph 5.85-19.20 |
| 0312 | 197.790 | Vertical | 33.350 | 8.15 | 164.440 | HgLS 21.75-32.70 | Soil 1.50 Ph 1.50-21.75 |
| 0313 | 197.420 | Vertical | 20.100 | 5.95 | 177.320 | MgLS 7.10-10.42 HgLS 10.42-19.80 | Soil 7.10 |
| 0314 | 197.130 | Vertical | 18.250 | 4.45 | 178.880 | LgLS 3.13-5.13 MgLS 5.13-7.13 HgLS 7.13-17.94 | Soil 1.00 Ph 1.00-3.13 |
| 0315 | 197.000 | Vertical | 28.500 | 6.15 | 168.500 | HgLS 3.75-28.00 | Soil 3.75 |
| 0316 | 198.040 | Vertical | 40.000 | 3.60 | 158.040 | MgLS 2.93-17.00 HgLS 17.00-28.60 | Soil 1.17 Ph 1.17-2.93 |
| 0317 | 200.120 | Vertical | 29.500 | 7.35 | 170.620 | HgLS 3.70-8.12 MgLS 8.12-17.12 HgLS 17.12-29.00 | Soil 3.70 |
| 0318 | 202.520 | Vertical | 26.700 | 8.50 | 175.820 | HgLS 3.60-13.35 HgLS 13.35-21.95 | Soil 1.40 Ph 1.40-3.60 |
| 0319 | 205.730 | Vertical | 48.500 | 10.00 | 157.230 | LgLS 5.73-13.73 MgLS 13.73-24.73 HgLS 24.73-28.73 MgLS 28.73-32.73 HgLS 32.73-35.73 MgLS 35.73-41.73 MgLS 41.73-46.73 | Soil 4.90 Ph 4.90-5.73 |
| 0320 | 206.630 | Vertical | 50.400 | 16.00 | 156.230 | MgLS 11.15-27.00 LgLS 27.00-35.00 MgLS 35.00-40.00 HgLS 40.00-48.95 | Soil 1.70 Ph 1.70-11.15 |
| 0321 | 209.220 | Vertical | 55.800 | 14.80 | 153.420 | LgLS 24.90-29.22 MgLS 29.22-37.22 LgLS 37.22-48.22 HgLS 48.22-55.65 | Soil 2.35 Ph 2.35-26.22 |

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(Bharat) Limited over 801.171 Ha in Malkangiri District, Odisha**

| BH No. | Collar RL | Inclination | Depth Drilled | Water Level (m) | Bottom RL | Formations | |
|--------|-----------|-------------|---------------|-----------------|-----------|---|------------------------------|
| | | | | | | LS Formations | Soil/OR |
| 0322 | 213.610 | Vertical | 63.250 | 16.60 | 150.360 | MgLS 19.40-40.61 | Soil 8.05 Ph 8.05-19.40 |
| 0324 | 225.500 | Vertical | 44.400 | 18.10 | 181.100 | Outside ML/No LS | Soil 13.65 Ph 13.65-44.40 |
| 0326 | 229.700 | Vertical | 16.150 | 8.25 | 213.550 | No LS | Soil 0.50 Ph 0.50-16.15 |
| 0408 | 190.970 | Vertical | 28.150 | 3.00 | 162.820 | LgLS 0.65-4.97 HgLS 4.97-8.97 LgLS 8.97-18.97 HgLS 18.97-27.90 | Soil 0.65 |
| 0409 | 194.580 | Vertical | 38.000 | 7.05 | 156.580 | MgLS 1.50-6.58 HgLS 6.58-10.58 MgLS 10.58-23.58 LgLS 23.58-25.58 MgLS 25.58-29.58 HgLS 29.58-36.90 | Soil 1.50 |
| 0410 | 197.065 | Vertical | 50.550 | 8.90 | 146.515 | LgLS 2.90-7.06 MgLS 7.06-21.06 HgLS 21.06-25.06 MgLS 25.06-33.06 LgLS 33.06-38.06 HgLS 38.06-41.06 | Soil 2.90 |
| 0411 | 198.820 | Vertical | 52.000 | 9.80 | 146.820 | LgLS 8.82-18.82 MgLS 18.82-44.82 LgLS 44.82-49.60 | Soil 1.80 Ph 1.80-8.82 |
| 0411.5 | 199.410 | Vertical | 52.300 | 8.80 | 147.110 | LgLS 4.40-23.41 MgLS 23.41-38.41 LgLS 38.41-40.41 MgLS 40.41-47.41 LgLS 47.41-52.30 LS continues | Soil 0.50 Ph 0.50-14.41 |
| 0412 | 199.990 | Vertical | 50.750 | 14.30 | 149.240 | LgLS 19.99-25.99 MgLS 25.99-34.99 HgLS 34.99-43.99 MgLS 43.99-50.75 LS continues | Soil 8.80 Ph 8.80-19.99 |
| 0412.5 | 200.920 | Vertical | 50.850 | 11.00 | 150.070 | LgLS 25.92-33.45 HgLS 33.45-46.92 MgLS 46.92-49.92 LgLS 49.92-50.85 LS continue | Soil 21.50 Ph 21.50-25.92 |
| 0413 | 201.570 | Vertical | 40.650 | 19.50 | 160.920 | No LS | Soil 2.50 |
| 0918 | 207.470 | Vertical | 19.650 | 12.10 | 187.820 | No LS | Soil 11.00 |
| 0413.5 | 201.320 | Vertical | 35.450 | --- | 165.870 | No LS | Soil 1.80 |
| 0414 | 201.170 | Vertical | 53.250 | 9.50 | 147.920 | MgLS 27.40-48.17 HgLS 48.17-53.25 LS continues | Soil 6.00 Ph 6.00-27.40 |
| 0415 | 200.610 | Vertical | 22.950 | 8.70 | 177.660 | MgLS 14.40-21.78 | Soil 14.40 |
| 0416 | 200.970 | Vertical | 45.300 | 8.25 | 155.670 | HgLS 6.90-27.97 MgLS 27.97-31.75 HgLS 31.75-34.97 Ph 34.97-35.97 HgLS 35.97-43.45 | Soil 4.35 Ph 4.35-6.90 |



P.S. Acharya



S.M. Patro

Qualified Persons

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| BH No. | Collar RL | Inclination | Depth Drilled | Water Level (m) | Bottom RL | Formations | |
|--------|-----------|-------------|---------------|-----------------|-----------|--|-------------------------|
| | | | | | | LS Formations | Soil/OB |
| 0417 | 201.620 | Vertical | 42.050 | --- | 159.570 | MgLS 8.80-13.62 HgLS 13.62-25.62 MgLS 25.62-31.62 HgLS 31.62-41.50 | Soil-8.80 |
| 0418 | 203.950 | Vertical | 51.400 | 11.35 | 152.550 | MgLS 13.60-18.95 HgLS 18.95-48.95 | Soil 1.50 Ph 1.50-13.60 |
| 0419 | 207.260 | Vertical | 55.200 | 14.65 | 152.060 | LgLS 9.26-20.26 MgLS 20.26-27.26 HgLS 27.26-34.26 MgLS 34.26-43.26 HgLS 43.26-54.20 | Soil 0.35 Ph 0.35-9.26 |
| 0420 | 207.050 | Vertical | 54.200 | 11.60 | 152.850 | MgLS 2.25-14.05 HgLS 14.05-24.05 MgLS 24.05-31.05 HgLS 31.05-46.00 | Soil 1.75 Ph 1.75-2.25 |
| 0421 | 209.650 | Vertical | 56.550 | 16.85 | 153.100 | LgLS 14.60-21.65 MgLS 21.65-27.65 HgLS 27.65-29.65 LgLS 29.65-40.65 HgLS 40.65-54.65 | Soil 2.75 Ph 2.75-14.60 |
| 0422 | 213.550 | Vertical | 64.150 | --- | 149.400 | MgLS 25.00-27.55 LgLS 27.55-56.66 | Soil 1.50 Ph 1.50-25.00 |
| 0508 | 190.960 | Vertical | 11.600 | 4.30 | 179.360 | LgLS 0.20-4.96 HgLS 4.96-11.50 | Soil 0.20 |
| 0509 | 194.790 | Vertical | 26.750 | --- | 168.040 | LgLS 3.20-6.79 MgLS 6.79-9.79 LgLS 9.79-12.79 MgLS 12.79-18.69 HgLS 18.79-26.62 | Soil 3.20 |
| 0510 | 196.380 | Vertical | 41.550 | 9.30 | 154.830 | MgLS 4.40-29.38 HgLS 29.38-41.47 | Soil 4.10 |
| 0511 | 198.420 | Vertical | 53.400 | 7.55 | 145.020 | LgLS 4.70-13.42 MgLS 13.42-40.42 LgLS 40.42-46.42 HgLS 46.42-53.40 LS Continues | Soil 3.50 Ph 3.50-4.70 |
| 0512 | 198.880 | Vertical | 50.100 | 8.60 | 148.780 | LgLS 3.50-23.88 MgLS 23.88-35.88 HgLS 35.88-37.88 MgLS 37.88-50.10 LS Continues | Soil 0.50 Ph 0.50-3.50 |
| 0514 | 202.500 | Vertical | 70.150 | 9.75 | 132.350 | LgLS 21.00-47.00 MgLS 47.00-62.00 HgLS 62.00-64.00 MgLS 64.00-70.15 LS continues | Soil 1.50 Ph 1.50-21.00 |
| 0517 | 205.085 | Vertical | 40.000 | 12.30 | 165.085 | No LS | Soil 6.80 Ph 6.80-40.00 |
| 0515 | 204.185 | Vertical | 40.250 | 9.00 | 163.935 | No LS | Soil 2.90 Ph 2.90-40.25 |
| 0516 | 204.725 | Vertical | 33.250 | 11.00 | 170.905 | No LS | Soil 1.75 Ph 1.75-33.25 |
| 0518 | 205.400 | Vertical | 57.700 | 11.45 | 147.700 | LgLS 12.00-30.40 MgLS 30.40-56.50 | Soil 1.75 Ph 1.75-12.00 |
| 0520 | 206.835 | Vertical | 51.000 | 13.00 | 155.835 | LgLS 17.85-28.00 MgLS 28.00-50.95 Outside ML | Soil 1.30 Ph 1.30-17.85 |
| 0522 | 211.920 | Vertical | 37.500 | --- | 174.420 | Outside ML/No LS | Soil 2.50 Ph 2.50-27.50 |



**Mining Plan with PMCP of Kottameta Limestone Block of Preferred bidder M/S Dalmia Cement
(Bharat) Limited over 801.171 Ha in Malkangiri District, Odisha**

| BH No. | Collar RL | Inclination | Depth Drilled | Water Level (m) | Bottom RL | Formations | |
|--------|-----------|-------------|---------------|-----------------|-----------|---|------------------------------|
| | | | | | | LS Formations | Soil/OB |
| 0524 | 217.290 | Vertical | 67.500 | 19.50 | 149.790 | MgLS 32.29-41.29 HgLS 41.29-52.29 MgLS 52.29-57.29 LgLS 57.29-67.50 Outside ML | Soil 2.00 Ph 2.00-32.29 |
| 0608 | 191.050 | Vertical | 6.450 | --- | 184.600 | MgLS 1.60-3.05 HgLS 3.05-6.00 | Soil 1.60 |
| 0609 | 194.600 | Vertical | 31.000 | 3.65 | 163.600 | LgLS 2.40-4.60 MgLS 4.60-5.60 HgLS 5.60-30.29 | Soil 2.00 |
| 0610 | 194.850 | Vertical | 29.550 | 37.20 | 165.300 | MgLS 2.15-15.85 LgLS 15.85-22.85 MgLS 22.85-27.85 HgLS 27.85-29.55 LS continues | Soil 1.50 Ph 1.50-2.15 |
| 0611 | 194.540 | Vertical | 50.000 | 6.25 | 144.540 | MgLS 2.70-15.54 HgLS 15.54-19.54 MgLS 19.54-25.54 LgLS 25.54-33.54 MgLS 33.54-36.54 HgLS 36.54-50.00 LS continues | Soil 2.70 |
| 0613 | 196.270 | Vertical | 48.950 | 6.70 | 147.320 | LgLS 4.95-31.27 MgLS 31.27-48.95 | Soil 1.00 Ph 1.00-4.95 |
| 0710 | 191.730 | Vertical | 20.850 | 5.30 | 170.880 | MgLS 0.70-3.73 LgLS 3.73-13.73 HgLS 13.73-18.95 | Soil 0.70 |
| 0712 | 194.580 | Vertical | 40.600 | 10.80 | 153.980 | LgLS 4.50-5.58 MgLS 5.58-7.58 HgLS 7.58-9.58 MgLS 9.58-13.58 HgLS 13.58-15.58 MgLS 15.58-21.58 LgLS 21.58-27.58 HgLS 27.58-39.42 | Soil 4.50 |
| 0714 | 210.930 | Vertical | 52.050 | 12.10 | 158.880 | LgLS 33.93-43.93 MgLS 43.93-52.05 LS continues | Soil 15.15 Ph 15.15-33.93 |
| 0716 | 214.550 | Vertical | 65.300 | 10.50 | 149.250 | MgLS 29.00-52.55 LgLS 52.55-65.30 | Soil 2.30 Ph 2.30-29.00 |
| 0718 | 207.100 | Vertical | 58.050 | 15.35 | 149.050 | MgLS 20.05-42.10 LgLS 42.10-46.10 | Ph 0.00-20.05 |
| 0720 | 208.130 | Vertical | 58.150 | 17.25 | 149.980 | MgLS 30.50-40.13 HgLS 40.13-44.13 MgLS 44.13-53.13 Outside ML | Soil 1.00 Ph 1.00-30.50 |
| 0809 | 190.780 | Vertical | 20.800 | 9.70 | 169.980 | LgLS 0.17-5.78 MgLS 5.78-8.78 LgLS 8.78-15.78 HgLS 15.78-20.50 | Soil 0.17 |
| 0811 | 191.030 | Vertical | 29.850 | 8.17 | 161.180 | MgLS 1.00-5.03 LgLS 5.03-21.03 MgLS 21.03-24.03 HgLS 24.03-29.35 | Soil 1.00 |
| 0813 | 197.060 | Vertical | 53.150 | 8.50 | 143.910 | LgLS 3.45-15.06 MgLS 15.06-26.06 HgLS 26.06-28.06 MgLS 28.06-30.06 HgLS 30.06-33.06 MgLS 33.06-46.06 HgLS 46.06-53.15 LS continues | Soil 1.00 Ph 1.00-3.45 |

**Mining Plan with PMCP of Kottameta Limestone Block of Preferred bidder M/S Dalmia Cement
(Bharat) Limited over 801.171 Ha in Malkangiri District, Odisha**

| BH No. | Collar RL | Inclination | Depth Drilled | Water Level (m) | Bottom RL | Formations | |
|--------|-----------|-------------|-----------------|-----------------|-----------|---|---------------------------------|
| | | | | | | LS Formations | Soil/OB |
| 0910 | 189.500 | Vertical | 22.800 | 7.65 | 166.700 | LgLS 1.10-9.50 MgLS 9.50-11.50 LgLS 11.50-16.50 HgLS 16.50-21.50 | Soil 1.10 |
| 0912 | 191.170 | Vertical | 41.170 | 6.30 | 150.000 | HgLS 0.40-9.17 MgLS 9.17-18.17 LgLS 18.17-26.17 HgLS 26.17-40.50 | Soil 0.40 |
| 0914 | 194.340 | Vertical | 23.100 | --- | 171.240 | Ph 1.80-23.10 | Soil 1.80 |
| 0916 | 202.880 | Vertical | 52.300 | 12.75 | 150.680 | MgLS 17.00-26.88 LgLS 26.88-29.88 MgLS 29.88-34.88 LgLS 34.88-52.20 | Soil 12.25 Ph 12.25-17.00 |
| 1011 | 191.215 | Vertical | 25.000 | 9.80 | 166.215 | LgLS 3.50-7.23 MgLS 7.23-16.40 HgLS 16.40-23.57 | Soil 3.50 Cavity 12.23-16.40 |
| 1013 | 192.160 | Vertical | 54.100 | 5.80 | 138.060 | LgLS 3.60-6.16 MgLS 6.16-29.16 LgLS 29.16-31.16 MgLS 31.16-36.16 LgLS 36.16-43.16 HgLS 43.16-54.10 | Soil 0.25 Ph 0.25-3.60 |
| 1112 | 189.400 | Vertical | 34.550 | 8.50 | 154.850 | HgLS 1.55-5.40 MgLS 5.40-16.40 LgLS 16.40-20.40 HgLS 20.40-33.95 | Soil 1.55 |
| 1114 | 187.930 | Vertical | 45.800 | 2.20 | 142.130 | LgLS 27.93-36.93 MgLS 36.93-45.80 LS continues | Soil 7.05 Ph 7.05-27.93 |
| 1118 | 200.940 | Vertical | 51.100 | --- | 149.840 | LgLS 33.15-38.40 MgLS 38.40-51.10 LS continues | Soil 10.65 Ph 10.65-33.15 |
| | | | 4005.560 | | | | |

Standard borehole logs prepared by the Directorate of Geology, Government of Odisha are attached as part of assessment report of Directorate of Geology attached as Annexure-10. All the boreholes have been marked on geological plan and sections (Plate-4, 5A & 5B).

iii) Details of samples analysis indicating type of samples (surface/ sub surface from pits/ trenches/ borehole etc.

In general, core samples were collected at one meter interval and whenever there is a distinct variation in the megascopic character of the limestone for a minimum core length of 0.50 m, separate samples were collected. The cores were splitted longitudinally into two halves and one part of the core was utilized for preparation of assay samples and the other half was preserved in the core boxes.

Primary core samples were processed and analyzed by wet chemical analytical method of standard acid digestion in the Government Laboratories of the Directorate of Mines, Govt. of Odisha. Composite samples were also prepared simultaneously from the primary samples and for each five nos. of primary samples one composite sample was prepared or in other

words each composite sample represents 5 meter interval. A total of 2466 nos. of samples were collected from 101 boreholes for chemical analysis. All the samples were analyzed for six radicals i.e. LOI, SiO₂, CaO, MgO, Fe₂O₃, Al₂O₃.

iv) Expenditure incurred in prospecting operations:

The detail investigation was carried out by the Directorate of Geology, Government of Odisha during the Field season 1981-84. No records of expenditure are available with the Preferred bidder.

f) Surface Plan of the lease area:

Based on the topographical survey of the area, Surface plan of the lease area has been prepared on 1:2000 scale with contour interval of 1 m and grid lines at 200 m interval. Since the extent of the area is large and surface plan on 1:2000 scale does not fit in to Ao scale, the lessee has sought permission for relaxation of scale of the plans to 1:5000 to the Chief Controller of Mines, Nagpur vide letter dt. 14.02.2017 (**Annexure-11**). The surface plan accordingly has been prepared in 1:5000 scale. All surface features as indicated under rule 32(1)(a) of MCDR, 2017 have been marked in the Surface plan (**Plate- 3**).

g) Geological Plan of the lease area:

Geological plan of the lease area has been prepared on 1:5000 scale taking the surface plan as the base plan (**Plate- 4**). The exploration already carried out, proposed exploration to be undertaken, litho units with structural features, ore zone etc have been marked on the geological plan along with other features indicated under rule 32(1)(b) of MCDR, 2017.

h) Geological Sections of the lease area:

Geological cross sections of the limestone block (11 nos.) have been prepared on 1:2000 scale along E-W grid lines at 200m interval from boundary to boundary (**Plate-5A & 5B**).

i) Broadly indicate the future programme of exploration with due justification:

Exploration by way of core drilling initially at 400 m grid interval and subsequent infilling core bore holes at 200 m grid interval was conducted by Directorate of Geology, Government of Odisha during 1981-84. In a few places, bore holes at 100m interval were also drilled where the sub-surface picture was not clear.

The preferred bidder, after fulfilling all conditions of LOI and execution of lease deed with the State Government, shall undertake detailed exploration by undertaking survey and geological mapping at 1:2000 scale or at larger scale as required followed by drilling of core boreholes at 200 m or closer interval in the entire potentially mineralized area with a view to convert the resources in to G1 category as per UNFC guidelines during the plan period of five

Mining Plan with PMCP of Kottameta Limestone Block of Preferred bidder M/S Dalmia Cement (Bharat) Limited over 801.171 Ha in Malkangiri District, Odisha

years as per the exploration norms specified in the Minerals (Evidence of Mineral Contents) Rules, 2015. These entire bore holes shall be drilled up to the end of mineralization or up to 60m to 70m depth. Besides, a few trenches will be sunk for collection of bulk samples for physical tests. Year wise location of proposed bore holes and trenches has been shown in Geological Plan in different colours (**Plate No-4**). The year wise program of exploration is given below:

| Year | No. of boreholes | Depth of BHs | Total length to be drilled (m) | No. of Pits and Dimension | No. of trenches and Dimensions |
|----------------------|------------------|--|--------------------------------|---------------------------|--------------------------------|
| 1 st Year | 27 | 60m to 70m or till end of mineralization | 1620 | ---- | ---- |
| 2 nd Year | 28 | | 1700 | ---- | 2 Nos (15m x 6m x 6m) |
| 3 rd Year | 28 | | 1700 | ---- | ---- |
| 4 th Year | 28 | | 1690 | ---- | ---- |
| 5 th Year | 28 | | 1680 | ---- | ---- |
| Total | 139 | | 8390 | ----- | 2 Nos (1080 CuM) |

The proposed drill holes are planned within the block and the drilling programme will be taken up as soon as the surface right is granted/negotiated with the villagers. The details of proposed bore holes are as below:

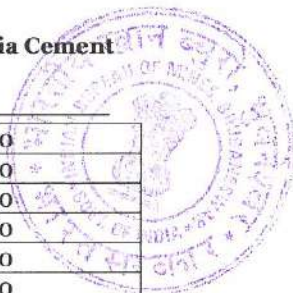
| Sl.No. | Year | Section Line No. | PBH No. | SRL (m) | Proposed Depth (m) |
|----------------|----------------------|------------------|---------|---------|--------------------|
| 1 | 1 st Year | 1 1' | 0115.5 | 200.60 | 60 |
| 2 | | 1 1' | 0116.5 | 202.03 | 60 |
| 3 | | 2 2' | 0215.5 | 198.55 | 60 |
| 4 | | 2 2' | 0216.5 | 199.60 | 60 |
| 5 | | 2 2' | 0217.5 | 200.72 | 60 |
| 6 | | 2 2' | 0223 | 213.50 | 60 |
| 7 | | 3 3' | 0315.5 | 198.00 | 60 |
| 8 | | 3 3' | 0316.5 | 198.93 | 60 |
| 9 | | 3 3' | 0317.5 | 201.18 | 60 |
| 10 | | 3 3' | 0323 | 214.32 | 60 |
| 11 | | 4 4' | 0415.5 | 201.30 | 60 |
| 12 | | 4 4' | 0416.5 | 201.71 | 60 |
| 13 | | 4 4' | 0417.5 | 202.91 | 60 |
| 14 | | 4 4' | 0423 | 213.88 | 60 |
| 15 | | 5 5' | 0515.5 | 204.34 | 60 |
| 16 | | 5 5' | 0516.5 | 204.77 | 60 |
| 17 | | 5 5' | 0517.5 | 205.21 | 60 |
| 18 | | 8 8' | 0820 | 204.24 | 60 |
| 19 | | 8 8' | 0821 | 199.00 | 60 |
| 20 | | 9 9' | 0919 | 201.68 | 60 |
| 21 | | 9 9' | 0920 | 197.07 | 60 |
| 22 | | 10 10' | 1019 | 196.00 | 60 |
| 23 | | 10 10' | 1020 | 200.87 | 60 |
| 24 | | 10 10' | 1021 | 197.90 | 60 |
| 25 | | 11 11' | 1119 | 200.09 | 60 |
| 26 | | 11 11' | 1120 | 199.22 | 60 |
| 27 | | 11 11' | 1121 | 196.00 | 60 |
| Total (27 BHs) | | | | | 1620 |

**Mining Plan with PMCP of Kottameta Limestone Block of Preferred bidder M/S Dalmia Cement
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| | | | | | |
|----------------|----------------------|--------|--------|--------|------|
| 28 | 2 nd Year | 0 0' | 0018.5 | 207.61 | 60 |
| 29 | | 0 0' | 0020 | 207.89 | 60 |
| 30 | | 0 0' | 0021 | 209.91 | 60 |
| 31 | | 1 1' | 0113.5 | 197.65 | 60 |
| 32 | | 1 1' | 0114.5 | 199.15 | 60 |
| 33 | | 1 1' | 0117.5 | 203.01 | 60 |
| 34 | | 1 1' | 0118.5 | 203.95 | 60 |
| 35 | | 1 1' | 0119.5 | 205.72 | 60 |
| 36 | | 1 1' | 0120.5 | 208.85 | 60 |
| 37 | | 2 2' | 0213.5 | 196.37 | 60 |
| 38 | | 2 2' | 0214.5 | 197.43 | 60 |
| 39 | | 2 2' | 0218.5 | 201.81 | 60 |
| 40 | | 2 2' | 0219.5 | 204.93 | 60 |
| 41 | | 3 3' | 0313.5 | 198.00 | 60 |
| 42 | | 3 3' | 0314.5 | 198.00 | 60 |
| 43 | | 3 3' | 0318.5 | 204.10 | 60 |
| 44 | | 4 4' | 0414.5 | 200.92 | 60 |
| 45 | | 4 4' | 0418.5 | 205.71 | 60 |
| 46 | | 5 5' | 0513 | 201.74 | 70 |
| 47 | | 5 5' | 0514.5 | 203.73 | 60 |
| 48 | | 5 5' | 0519 | 205.72 | 60 |
| 49 | | 6 6' | 0619 | 208.11 | 60 |
| 50 | | 6 6' | 0620 | 206.14 | 60 |
| 51 | | 6 6' | 0621 | 203.80 | 60 |
| 52 | | 7 7' | 0717 | 212.09 | 70 |
| 53 | | 7 7' | 0719 | 211.73 | 60 |
| 54 | | 8 8' | 0819 | 210.00 | 60 |
| 55 | | 9 9' | 0917 | 207.99 | 60 |
| Total (28 BHs) | | | | | 1700 |
| 56 | 3 rd Year | 0 0' | 0022 | 211.67 | 60 |
| 57 | | 0 0' | 0023 | 215.08 | 60 |
| 58 | | 0 0' | 0024 | 216.66 | 60 |
| 59 | | 1 1' | 0112.5 | 196.11 | 60 |
| 60 | | 1 1' | 0121.5 | 211.86 | 70 |
| 61 | | 1 1' | 0123 | 217.79 | 60 |
| 62 | | 2 2' | 0212.5 | 195.70 | 60 |
| 63 | | 2 2' | 0220.5 | 207.99 | 60 |
| 64 | | 2 2' | 0222 | 211.57 | 60 |
| 65 | | 3 3' | 0312.5 | 198.00 | 60 |
| 66 | | 3 3' | 0319.5 | 205.95 | 60 |
| 67 | | 3 3' | 0320.5 | 207.81 | 60 |
| 68 | | 3 3' | 0321.5 | 211.29 | 60 |
| 69 | | 4 4' | 0419.5 | 207.42 | 60 |
| 70 | | 4 4' | 0420.5 | 208.94 | 60 |
| 71 | | 4 4' | 0421.5 | 211.63 | 60 |
| 72 | | 5 5' | 0512.5 | 200.09 | 60 |
| 73 | | 6 6' | 0614 | 199.08 | 60 |
| 74 | | 6 6' | 0615 | 202.83 | 60 |
| 75 | | 6 6' | 0616 | 207.64 | 60 |
| 76 | | 6 6' | 0617 | 208.59 | 60 |
| 77 | | 6 6' | 0618 | 208.75 | 60 |
| 78 | | 7 7' | 0715 | 209.78 | 60 |
| 79 | | 7 7' | 0716.5 | 217.64 | 70 |
| 80 | | 8 8' | 0817 | 209.94 | 60 |
| 81 | | 8 8' | 0818 | 210.16 | 60 |
| 82 | | 9 9' | 0916.5 | 207.99 | 60 |
| 83 | | 10 10' | 1018 | 198.60 | 60 |
| Total (28 BHs) | | | | | 1700 |

**Mining Plan with PMCP of Kottameta Limestone Block of Preferred bidder M/S Dalmia Cement
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| | | | | | |
|----------------|----------------------|--------|--------|--------|------|
| 84 | 4 th Year | 1 1' | 0109 | 193.99 | 60 |
| 85 | | 1 1' | 0110 | 193.99 | 60 |
| 86 | | 1 1' | 0111 | 193.99 | 60 |
| 87 | | 2 2' | 0209 | 194.35 | 60 |
| 88 | | 2 2' | 0210.5 | 194.89 | 60 |
| 89 | | 2 2' | 0211.5 | 195.31 | 60 |
| 90 | | 3 3' | 0310.5 | 196.98 | 70 |
| 91 | | 3 3' | 0311.5 | 198.00 | 60 |
| 92 | | 4 4' | 0410.5 | 197.79 | 60 |
| 93 | | 5 5' | 0510.5 | 198.01 | 60 |
| 94 | | 5 5' | 0511.5 | 198.89 | 60 |
| 95 | | 6 6' | 0610.5 | 194.00 | 60 |
| 96 | | 6 6' | 0611.5 | 194.00 | 60 |
| 97 | | 6 6' | 0612 | 194.86 | 60 |
| 98 | | 7 7' | 0712.5 | 197.31 | 60 |
| 99 | | 7 7' | 0713 | 199.37 | 60 |
| 100 | | 7 7' | 0714.5 | 205.99 | 60 |
| 101 | | 8 8' | 0814 | 200.49 | 60 |
| 102 | | 8 8' | 0815 | 204.94 | 60 |
| 103 | | 8 8' | 0816 | 206.14 | 60 |
| 104 | | 9 9' | 0914.5 | 199.81 | 60 |
| 105 | | 9 9' | 0915 | 200.46 | 60 |
| 106 | | 10 10' | 1015 | 193.92 | 60 |
| 107 | | 10 10' | 1016 | 199.46 | 60 |
| 108 | | 10 10' | 1017 | 194.67 | 60 |
| 109 | | 11 11' | 1115 | 191.88 | 60 |
| 110 | | 11 11' | 1116 | 196.96 | 60 |
| 111 | | 11 11' | 1117 | 200.00 | 60 |
| Total (28 BHs) | | | | | 1690 |
| 112 | 5 th Year | 3 3' | 0308 | 194.57 | 60 |
| 113 | | 3 3' | 0309.5 | 195.73 | 60 |
| 114 | | 4 4' | 0407 | 192.61 | 60 |
| 115 | | 4 4' | 0408.5 | 192.60 | 60 |
| 116 | | 4 4' | 0409.5 | 195.95 | 60 |
| 117 | | 5 5' | 0507 | 192.00 | 60 |
| 118 | | 5 5' | 0508.5 | 193.07 | 60 |
| 119 | | 5 5' | 0509.5 | 195.64 | 60 |
| 120 | | 6 6' | 0607 | 191.21 | 60 |
| 121 | | 6 6' | 0608.5 | 193.37 | 60 |
| 122 | | 6 6' | 0609.5 | 194.00 | 60 |
| 123 | | 7 7' | 0708 | 191.15 | 60 |
| 124 | | 7 7' | 0709 | 191.37 | 60 |
| 125 | | 7 7' | 0710.5 | 191.77 | 60 |
| 126 | | 7 7' | 0711 | 191.95 | 60 |
| 127 | | 8 8' | 0810 | 189.14 | 60 |
| 128 | | 8 8' | 0810.5 | 188.21 | 60 |
| 129 | | 8 8' | 0811.5 | 193.56 | 60 |
| 130 | | 8 8' | 0812 | 195.06 | 60 |
| 131 | | 9 9' | 0910.5 | 190.34 | 60 |
| 132 | | 9 9' | 0911 | 190.85 | 60 |
| 133 | | 9 9' | 0912.5 | 192.85 | 60 |
| 134 | | 9 9' | 0913 | 195.99 | 60 |
| 135 | | 10 10' | 1011.5 | 190.00 | 60 |
| 136 | | 10 10' | 1012 | 190.29 | 60 |
| 137 | | 10 10' | 1014 | 191.47 | 60 |
| 138 | | 11 11' | 1112.5 | 188.00 | 60 |
| 139 | | 11 11' | 1113 | 188.00 | 60 |
| Total (28 BHs) | | | | | 1680 |

j) **Reserves and resources as per UNFC with respect to threshold value notified by IBM:**

(j.1) Method of Resource estimation: The resources in the Kottameta block was computed by vertical cross sectional method and 89 out of 101 boreholes were taken into consideration making '20' N-S grid line as the eastern boundary as per occurrence of limestone. The resource estimation has been further verified by borehole influence method. At first, profile sections were drawn along E-W grid lines and boreholes falling in each section were plotted. Then the thickness of different grades of limestone as mentioned earlier, were marked out on each boreholes and the boreholes are correlated with each other in each section. For estimation of resource, 150 meters RL was taken as datum level and the maximum ratio of limestone to overburden was kept at 1:2. The cross sectional area for each grade of limestone was determined from cross section by planimeter and the grade-wise volume of the block was determined using the formula

$$V = (S_1 + S_2) / 2 \times L$$

Where V= Volume,

S₁ & S₂ denotes the area of two adjacent sections

L represents distance between two cross sections.

In Kottameta block, marginal block along 'o' grid line was not taken into consideration as the boreholes lie adjacent to the interstate boundary. Further, area adjacent to the river bank has not been duly considered for estimation of resource. The grade wise in situ resource has been computed by multiplying the total volume with specific gravity of the limestone which was determined to be 2.7 (average). The bulk density was based on the test result of the limestone samples conducted during field season 1981-84 at the Govt. Laboratory, as certified by the Director of Geology in his letter No. 1437 dt. 01.03.2017 (**Annexure-12**). In order to arrive at measured resource, a recovery factor of 60% has been applied to the in situ resource to account for voids, mining loss etc and the voids have not been considered for sectional area calculation. This assumption was based on the figure of 76% average core recovery. Further discount of 15% has been taken to account for mining losses, possible voids between sections in accordance with the norm specified by the erstwhile Cement Research Institute of India (presently the National Council of Cement & Building materials).

(j.2) Cut off grade considered: Due to general high SiO₂ content, limestone analyzing 40% CaO corresponds to the maximum permissible limit of SiO₂ i.e. 14%. Hence, limestone containing 40% CaO has been taken as the cut off grade so that the average grade will be + 46% CaO. Further, the limestone analyzing more than 40% CaO is sub-divided into namely

high grade analyzing > 46% of CaO and intermediate grade with 40% to 46% of CaO content. Those limestone analyzing 35 - 40% CaO and with SiO₂ content 18% (max) can be termed as "Blendable grade" or "mineral rejects" as per the threshold value notified by IBM. The assay logs of the composite samples indicate that such limestone with 35-40% CaO has SiO₂ content ranging between 18% to around 35%. Due to this, the quantity of such limestone (mineral rejects) has not been separately assessed. During the ensuing plan period, attempts will be made to mine and stack the blendable grade mineral rejects with 35-40% CaO and less than 18% SiO₂ separately. Both high and intermediate grade limestone are suitable for manufacture of cement after proper blending. Quantity of Interbands with CaO ranging from 24-40% CaO has been separately determined and is considered as mine waste and shall be stacked separately for future utilization.

(k) Estimation of Reserves/ Resources:

(k.1) Resources estimation by State Government: The resources of different grades of limestone of indicated category in the block i.e. up to '11' E-W grid line has been estimated to be as follows: (Table-1 & 2).

Table-1

Calculation of indicated resource of high grade limestone (+46% CaO) in Kottameta Block by cross sectional method

| Section line | Average cross sectional area in sq m | Distance between sections in m | Volume in Cu.m | Insitu indicated resource in million tonnes | Recovery Factor % | Indicated resource in million tonnes |
|--------------|--------------------------------------|--------------------------------|----------------|---|-------------------|--------------------------------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 00 | 15,570 | 200 | 31,14,000 | 8.40 | 60 | 5.04 |
| 01 | 20,900 | 200 | 41,80,000 | 11.28 | 60 | 6.77 |
| 02 | 23,730 | 200 | 47,46,000 | 12.81 | 60 | 7.68 |
| 03 | 27,185 | 200 | 54,37,000 | 14.67 | 60 | 8.80 |
| 04 | 17,605 | 200 | 35,21,000 | 9.50 | 60 | 5.70 |
| 05 | 7,225 | 200 | 14,45,000 | 3.90 | 60 | 2.34 |
| 06 | 6,400 | 200 | 12,80,000 | 3.45 | 60 | 2.07 |
| 07 | 4,125 | 200 | 8,25,000 | 2.22 | 60 | 1.33 |
| 08 | 7,100 | 200 | 14,22,000 | 3.83 | 60 | 2.30 |
| 09 | 8,100 | 200 | 16,20,000 | 4.37 | 60 | 2.62 |
| 10 | 4,630 | 200 | 9,26,000 | 2.50 | 60 | 1.50 |
| 11 | 1,810 | 200 | 3,62,000 | 0.97 | 60 | 0.58 |
| 11 blocks | | | | | | 46.73 |

Table-2

Calculation of indicated resource of intermediate grade limestone (40%-46% CaO) in Kottameta Block by cross sectional method

| Section line | Cross sectional area in sq m | Average cross sectional area in sq m | Distance between sections in m | Volume in cu.m | Insitu indicated resource in million tonnes | Indicated resource in million tonnes |
|--------------|------------------------------|--------------------------------------|--------------------------------|----------------|---|--------------------------------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 00 | 3,660 | 8,155 | 200 | 16,31,000 | 4.40 | 2.64 |
| 01 | 12,650 | 14,745 | 200 | 29,49,000 | 7.96 | 4.77 |
| 02 | 16,840 | 24,335 | 200 | 48,67,000 | 13.14 | 7.88 |
| 03 | 31,830 | 34,440 | 200 | 68,88,000 | 18.59 | 11.15 |
| 04 | 37,050 | 27,785 | 200 | 55,57,000 | 15.00 | 9.00 |
| 05 | 18,520 | 14,590 | 200 | 29,18,000 | 7.87 | 4.72 |
| 06 | 10,660 | 8,050 | 200 | 16,10,000 | 4.34 | 2.60 |
| 07 | 5,440 | 6,450 | 200 | 12,90,000 | 3.48 | 2.08 |
| 08 | 7,460 | 5,970 | 200 | 11,94,000 | 3.22 | 1.93 |
| 09 | 4,480 | 7,370 | 200 | 14,74,000 | 3.97 | 2.38 |
| 10 | 10,260 | 6,920 | 200 | 13,84,000 | 3.73 | 2.24 |
| 11 | 3,580 | | 200 | 3,58,000 | 0.96 | 0.57 |
| | | | | | | 51.96 |

* Specific gravity of limestone is taken as 2.7(Average).

** 60% recovery of insitu resource has been taken to account for voids, mining loss etc.

To summarize, the resources of high grade limestone (+46 % CaO) is estimated to be 46.73 million tonnes and that of Intermediate grade limestone (40-46% CaO) is 51.96 million tonnes. Thus the total resources of cement grade limestone in Kottameta block has been computed to be 98.69 or 98 million tonnes up to the datum level considered.

This has been corroborated with the resources, computed by borehole influence method. In this method, the resources of high grade (+46 % CaO) and intermediate grade (40-46% CaO) limestone were estimated to be 50.23 and 52.72 million tonnes respectively (Ref: Ann-III of investigation report by State Government submitted as **Annexure-10**). Thus the total resources are 102.95 or 103 million tonnes. The difference in the figures of resources by the two methods is only about 5%.

Beside the resources of limestone, the quantity of soil and phyllite which form overburden and as interbands have been estimated separately which come to 13.89 and 23.62 million tonnes respectively. The quantity of low grade siliceous limestone with CaO ranging from >24 to 40% and SiO₂ ranging from 15-50% has been estimated to be 49.38 million tonnes.

(k.2) Grade of Limestone:

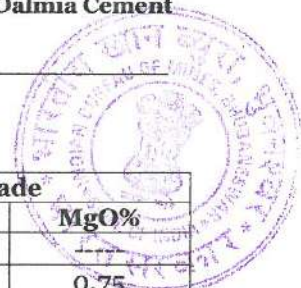
Average grades of limestone in Kotametta Block have been calculated taking into account 40% CaO as the cut off grade for cement grade limestone. Further the limestone above cut off grade is divided into two varieties, namely, high grade and intermediate grade corresponding to >46% CaO and 40-46% CaO respectively. In computing the average grade, the weighted average of CaO of each borehole was first determined. Then the average grade of each cross section is calculated by weighing the borehole averages of the boreholes lying in a cross section against the cross sectional area. Lastly the average grade of CaO is determined by weighing with volume of individual block bounded by two cross sections. Similarly the average grades of MgO, SiO₂, Al₂O₃ and Fe₂O₃ have been computed. Thus, the average grade of cement grade limestone of the Kottameta Block i.e. up to '11' E-W grid line has been computed as follows:

| Parameters | High grade of CaO > 46% | Intermediate grade 40- 46% CaO | Average grade |
|--------------------------------|----------------------------|-----------------------------------|---------------|
| CaO | 48.89% | 42.84% | 45.865 % |
| MgO | 0.63% | 0.88% | 0.75 % |
| SiO ₂ | 9.44% | 18.05% | 13.75 % |
| Al ₂ O ₃ | 1.54% | 2.08% | 1.81% |
| Fe ₂ O ₃ | 0.48% | 1.02% | 0.75% |

The details of calculation of grade are given in Ann -VIII & IX of the report on investigation submitted as **Annexure-10**.

(l.1) Area explored under different categories of UNFC: Summary of the lease area explored as per UNFC norms indicating area covered under different levels is as below and the areas have been shown in geological plan and sections (Plate Nos- 4 and 5A,5B).

| Name of the Mineral – LIMESTONE, Preferred Bidder : M/S Dalmia Cement (Bharat) Limited | | | | | | |
|--|---|--------------|----------|--|-----------------------|---|
| Item of information | Area explored as per UNFC norms (in Ha) Total Area =A+B+C+D+E (801.171 Ha) | | | | | Remarks/Comments including reasons for not carrying out as per UNFC norms |
| | G1 Level | G2 Level | G3 Level | Explored & found non-mineralized with level of exploration | Unexplored Lease area | |
| | A | B | C | D | E | F |
| Block area as per level of exploration | ---- | 511.506 Ha | ---- | 289.665 | ---- | Entire area has been covered under G2 level exploration |
| No. of BHs drilled (Total 101 BHs) | ---- | 85 | ---- | 9 | ---- | 7 BHs drilled outside Block area |
| No. of BH considered for present resource estimation | ---- | 85 | ---- | 9 | ---- | -Do- |
| Meterage drilled (m) (Total 4005.56 m) | ---- | 3388.64 | ---- | 302.02 | ---- | 314.90 m drilled outside Block area |
| Grid interval | ---- | 200m x 200m | ---- | 200m x200m | ---- | |
| Scale of mapping | ---- | 1:2000 scale | | | | |
| Reserve estimated after above exploration | | | | | | 97.51 million tonnes |
| Remaining resource after above exploration | | | | | | 1.18 million tonnes |
| Total Reserve / Resources after above exploration | | | | | | 98.69 million tonnes |



(1.2) Mineral Resources based on level of exploration:

| Level of exploration | Resources in million tonnes | Grade | |
|-------------------------|-----------------------------|--------|-------|
| | | CaO% | MgO% |
| G1-Detailed Exploration | ----- | ----- | ----- |
| G2-General Exploration | 98.69 | 45.865 | 0.75 |
| G3-Prospecting | ----- | ----- | ----- |
| G4-Reconnaissance | ----- | ----- | ----- |

(1.3) Mineral Reserves:

The reserves of limestone within the Kottameta limestone block has been re estimated after applying results of pre-feasibility study (**Annexure-13**) and economic evaluation of deposit based on various factors such as :

- Mining method, recovery factor, mining losses, voids etc.
- Cut off grade, ultimate pit depth proposed.
- Mineral/ ore blocked dues to benches, barriers, pillars, road, river, nala, reservoir, electric line and other statutory barriers etc where necessary permissions are not available.

The detail calculations for re-estimation of mineable reserves based on the above factors are as below:

Table-3: Calculation of indicated reserves of high grade limestone (+46% CaO) in Kottameta Block by cross sectional method

| Section line | Average cross sectional area in sq m | Distance between sections in m | Volume in Cu.m | Insitu indicated reserves in million tonnes | Recovery Factor % | Indicated reserves in million tonnes |
|--------------|--------------------------------------|--------------------------------|----------------|---|-------------------|--------------------------------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 00 | 12304 | 200 | 2460800 | 6.64 | 60 | 3.99 |
| 01 | 20833 | 200 | 4166600 | 11.25 | 60 | 6.75 |
| 02 | 23683 | 200 | 4736600 | 12.79 | 60 | 7.67 |
| 03 | 27134 | 200 | 5426800 | 14.65 | 60 | 8.79 |
| 04 | 17573 | 200 | 3514600 | 9.49 | 60 | 5.69 |
| 05 | 7212 | 200 | 1442400 | 3.89 | 60 | 2.34 |
| 06 | 6383 | 200 | 1276600 | 3.45 | 60 | 2.07 |
| 07 | 4125 | 200 | 825000 | 2.22 | 60 | 1.33 |
| 08 | 7067 | 200 | 1413400 | 3.82 | 60 | 2.29 |
| 09 | 8100 | 200 | 1620000 | 4.37 | 60 | 2.62 |
| 10 | 4630 | 200 | 926000 | 2.50 | 60 | 1.50 |
| 11 | 1810 | 200 | 362000 | 0.97 | 60 | 0.58 |
| 11 blocks | | | | | | 45.64 |

Table-4: Calculation of indicated reserves of intermediate grade limestone (40%-46% CaO) in Kottameta Block by cross sectional method

| Section line | Cross sectional area in sq m | Distance between sections in m | Volume in cu.m | Insitu indicated reserves in million tonnes | Recovery Factor % | Indicated reserves in million tonnes |
|--------------|------------------------------|--------------------------------|----------------|---|-------------------|--------------------------------------|
| 1 | 2 | 3 | 4 | 5 (4*2.7) | 6 | 7 (60% of 5) |
| 00 | 8148 | 200 | 1629600 | 4.40 | 60 | 2.64 |
| 01 | 14490 | 200 | 2898000 | 7.82 | 60 | 4.77 |
| 02 | 24332 | 200 | 4866400 | 13.14 | 60 | 7.88 |
| 03 | 34433 | 200 | 6886600 | 18.59 | 60 | 11.15 |
| 04 | 27785 | 200 | 5557000 | 15.00 | 60 | 9.00 |
| 05 | 14468 | 200 | 2893600 | 7.81 | 60 | 4.68 |
| 06 | 7953 | 200 | 1590600 | 4.29 | 60 | 2.57 |
| 07 | 6447 | 200 | 1289400 | 3.48 | 60 | 2.08 |
| 08 | 5970 | 200 | 1194000 | 3.22 | 60 | 1.93 |
| 09 | 7333 | 200 | 1466600 | 3.96 | 60 | 2.37 |
| 10 | 6920 | 200 | 1384000 | 3.74 | 60 | 2.24 |
| 11 | 1742 | 200 | 348400 | 0.94 | 60 | 0.56 |
| | | | | | | 51.87 |

* Specific gravity of limestone is taken as 2.7(Average).

** 60% recovery of insitu resource has been taken to account for voids, mining loss etc.

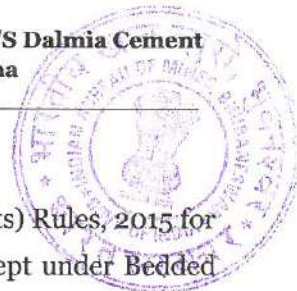
(1.3) UNFC Classification for limestone:

Geological and mineable reserves/ resources of Limestone in the block under different categories has been estimated and allocated UNFC codes based on the extent of exploration.

| Classification | UNFC Code | Reserves/ Resources of Limestone Quantity in Million Tonnes | Grade |
|-------------------------------------|-----------|---|-------------------------------|
| A Total Mineral Reserves | | | |
| Proved Mineral Reserve | 111 | ----- | ----- |
| Probable Mineral Reserve | 122 | 45.64 | High grade > 46% of CaO |
| | | 51.87 | Intermediate grade 40-46% CaO |
| | | 97.51 | >40% CaO |
| B. Total Remaining Resources | | | |
| Pre-Feasibility Mineral Resource | 222 | 1.09 | High grade > 46% of CaO |
| | | 0.09 | Intermediate grade 40-46% CaO |
| Measured Mineral Resources | 331 | ----- | ----- |
| Indicated Mineral Resources | 332 | ----- | ----- |
| Inferred Mineral Resources | 333 | ----- | ----- |
| Reconnaissance Mineral | 334 | ----- | ----- |
| Sub Total (B) | | 1.18 | >40% CaO |
| Total Reserves + Resources | | 98.69 | >40% CaO |

* Tonnage of Cement grade Limestone has been arrived by computing average bulk density of 2.7

These data are variable and may be established on time series. Thus the tonnages arrived are tentative.

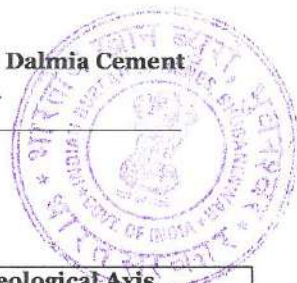


(1.4) Justification of assigning codes under UNFC

As per the exploration norms under Minerals (Evidence of Mineral Contents) Rules, 2015 for adoption of UNFC classification, the Kottameta limestone block can be kept under Bedded Stratiform and tabular deposit of regular habit, based on its nature of occurrence. The justifications of assigning codes under UNFC are as below:

(i) **Probable Mineral reserves (122): Economically mineable part of indicated mineral resource.**

| Classification/ UNFC Code | Economic Axis | Feasibility Axis | Geological Axis |
|--|--|---|---|
| Probable Mineral Reserves (122) | E1 (Economic) | F2 (Pre-feasibility Study) | G2 (General exploration) |
| | <p>1. Exploration is detailed with close spaced drilling at 200 x 200m grid to decipher the ore body behaviour. Mining Plan for working the deposit is being prepared and pre-feasibility report has been prepared indicating the economic viability of the deposit.</p> <p>2. Probable Mineral Reserves of 97.51 million tonnes of cement grade limestone in the block has been estimated by exploration.</p> <p>3. Specific end use grades of reserves (above economic cut-off grade).</p> <p>4. Specific knowledge of forest/ non- forest and other land use data is available.</p> | <p>1. Geology is detailed with exploration by moderate to close spaced drilling completed.</p> <p>2. Pre-Feasibility Report has been prepared and mining plan submitted with mining methods, production plan and likely recoveries. (Annexure - 14).</p> <p>3. Base line data on environment of the area has been collected.</p> <p>4. Limestone available in the block shall be utilized for cement manufacture.</p> <p>5 Site services such as office, canteen, rest shelter etc. shall be constructed after getting all statutory clearances.</p> <p>6. Economic viability has been established by preliminary study of cash flow forecast, capital cost estimation and utilization for cement manufacture.</p> <p>7. Statutory provisions relating to labor, land, mining, taxation etc shall be done.</p> | <p>1. Geological mapping has been done on 2:1000 scale.</p> <p>2. Geological plan has been prepared showing topographical and geological features, contacts of limestone & other formations, location of exploratory holes etc.</p> <p>3. Geological sections have been prepared showing the mine developments and exploratory hole data.</p> <p>4. Probable Mineral Reserves estimated for the ore proved at depth by drilling and considering 200 m grid density.</p> <p>5. 2466 no of core samples analyzed being drawn from 101 (one hundred and one) exploratory core bore holes. All the samples have been analyzed in Government laboratory of the State Government.</p> |



(ii) Pre-Feasibility Mineral Resources (222)

| Classification/ UNFC Code | Economic Axis | Feasibility Axis | Geological Axis |
|--|---|--|---|
| Pre-Feasibility Mineral Resources (222) | E2 (Potentially Economic) 1. Detailed Exploration with close spaced drilling at 200 x 200m grid has been done to decipher the ore body behavior. Mining Plan for working the deposit is being prepared and pre-feasibility report has been prepared indicating the economic viability of the deposit. 2. Pre-feasibility Mineral Resources of 1.18 million tonnes of cement grade limestone in the block has been estimated which will be blocked due to mining benches barriers, pillars, road, river, nala, reservoir, electric line and other statutory barriers etc where necessary permissions are not available. 3. Specific knowledge of forest/ non- forest and other land use data is available. | F2 (Pre-Feasibility Study) 1. Geology is general with exploration by moderate to close spaced drilling completed. 2. Pre-Feasibility Report has been prepared and mining plan submitted with mining methods, production plan and likely recoveries. (Annexure - 13). 3. Base line data on environment of the area has been collected. 4. Site services such as office, canteen, rest shelter etc. shall be constructed after getting all statutory clearances. | G2 (General exploration) 1. Geological mapping has been done on 2:1000 scale. 2. Geological plan has been prepared showing topographical and geological features, contacts of limestone & other formations, location of exploratory holes etc. 3. Geological sections have been prepared showing the mine developments and exploratory hole data. 4. Pre-feasibility Mineral Resources estimated for the ore proved at depth by drilling and considering 200 m grid density, but the same is presently non mineable due statutory constraints. |



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.

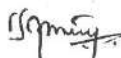
(i) Kottameta limestone block in Malkangiri district has been explored by the Directorate of Geology, Govt. of Odisha under General exploration (G2) level of UNFC and an indicated resource of 98.69 million tonnes of cement grade limestone with an average grade of 45.865 % CaO and 13.97% SiO₂ has been established. The block has been presently auctioned by the State Government and M/S Dalmia Cement (Bharat) Limited has been selected as the Preferred bidder under rule 10(1) of the Mineral (Auction) Rules, 2015. Mining operations by the preferred bidder will start after fulfilling all conditions stipulated in the letter of intent issued by the State Government vide their letter dt. 27.01.2017 and execution of the mining lease deed.

(ii) The limestone deposit in the block occurs as a number of distinct bands like lower marbilitic to semi-marbilitic variety termed as high grade limestone analyzing more than 46% CaO which is overlain by intermediate grade limestone with CaO ranging between 40-46% and upper siliceous limestone termed as low grade waste with CaO ranging between 24-40%. The upper siliceous limestone grades upward in to calc-phyllite or phyllite. Opencast mechanized method of mining shall be adopted at different levels of the working pit to get a proper blend of limestone suitable for cement manufacturing.

(iii) The mining operation in the block is planned to be started during 3rd year of plan period after obtaining all statutory clearances like surface right permissions, consent to operate from State Pollution Control Board, explosive license etc from the authorities. Open cast mechanized system of mining shall be practiced to mine the limestone deposit adopting a system of bench formation with deep hole blasting keeping in mind the quality, cost, safety and conservation of mineral.

(iv) Sequence of different mining operation proposed:

- Open cast mechanized system of mining shall be in practice to mine the limestone deposit adopting a system of bench formation with deep hole blasting keeping in mind the quality, cost, safety and conservation of mineral. Use of rock breaker for secondary breaking of boulders shall be adopted and the materials shall be loaded and sent to crusher and the crushed materials to the plant or to the consumers by dumper and Excavator combination.
- Blasting shall be done by using emulsion explosives as booster and ammonium nitrate fuel oil mixture as a column charge in the ratio of 25:75 for charging of blast holes. Use of Nonel


P.S. Acharya


S.M. Patra
Qualified Persons

and delay detonators in a hole shall be practiced to reduce sound, ground vibration, back break, fly rock within the safe limit. The fragmentation shall be kept reasonably well and the oversize shall be limited below 10%.

- Loading of limestone from quarry shall be monitored at different ratio for proper pre blending at mine head. The blasted ROM shall be loaded by Hydraulic Excavators of 4.0 to 4.5 m³ bucket size in to dumpers of 35t capacity and the material shall be transported to the crushing plant. The waste material/ mineral rejects comprising of phyllites with shale intrusions and clay and phyllitic limestone which are separable at pit mouth shall be loaded into dumpers and sent to the dumping area earmarked for the purpose.
- A road grader shall be utilized for maintenance of haul roads.
- The crushed limestone comprising of both high grade and intermediate grade shall be dispatched to the proposed cement plant for proper blending and shall be utilized for cement manufacturing. Part of the limestone produced from the block can also be sold to other cement plants and end use industries as and when required.

(v) The mine shall be operating in two shifts to meet the limestone requirement. Transportation of limestone to factory or to the consumers will also continue to be done in two shifts.

b) Year wise tentative excavation in Cubic Meters indicating development, ROM, pit wise as in table below:

I. Insitu Tentative Excavation

With a view to systematically mine the deposit, it has been planned to commence mining operation in north central part of the Block and accordingly the developmental work has been planned. The opening of the pit at the proposed location has been selected so that different grades of limestone i.e. intermediate grade as well as high grade are obtained simultaneously for blending with a view to achieve optimum recovery of ore from the deposit and to ensure systematic development of the deposit, conservation of mineral and protection of environment. The calc phyllite / phyllitic rock, the low grade siliceous limestone associated with phyllitic bands and soil mixed rejects comprise the total waste and shall be removed and disposed off to the stack/ dumping area during the mining of limestone from the quarry. The bore holes drilled in the block indicates that the overburden soil with thickness varying from 0.17 m to around 20.0 m is mainly of reddish brown phyllitic in nature. Out of this, the top soil with nutrient value might be around 0.3 m to 0.5 m thick which shall be scrapped and stacked separately for future plantation purpose.

The ROM comprises of the usable high calcic marbilitic limestone (>46% CaO) and non-marbilitic limestone (CaO between 40 & 46%) with average SiO₂ content of the blend below

**Mining Plan with PMCP of Kottameta Limestone Block of Preferred bidder M/S Dalmia Cement
(Bharat) Limited over 801.171 Ha in Malkangiri District, Odisha**

14%. The total ROM production shall be progressively increased to 2.5 million tonnes during the plan period of five years after execution of the mining lease.

During the plan period, it has been programmed to undertake developmental works including land acquisition, obtaining various permissions from the authorities, exploration etc during 1st and 2nd years. The excavation program from the block shall be started during the 3rd year of the plan period to achieve the targeted development and production by mechanized means. The mine working shall be confined in the ear marked area as shown in the development plans (**Plate-6A, 6B & 6C**). The quarry will be developed at different levels. The height of the benches will be kept at 9m and the width of the working benches shall be around 12-16 m. Haulage roads at 1:16 gradient shall be maintained for easy movement of machinery and transport vehicles.

Salient features of the proposed quarry are summarized below:

| Particulars | |
|--------------------------------------|-------------------------------------|
| Co-ordinates | N2027760-N2028794 / E571173-E571784 |
| Qry Length & width(m) | 894m x 210m |
| Top & Bottom bench RL | 203m / 173m |
| Height of Benches (m) | 9m |
| Width of benches (m) | 12m – 16m |
| Individual bench slope | 80° |
| Overall pit slope during plan period | 37° |
| No. of Benches | 3 |

The details of year wise, pit wise and bench wise tentative excavation of waste development, ROM production are given overleaf and are summarized below:

| Year | Pit No. | Total Tentative Excavation (CuM) | Top Soil (CuM) | OB/SB/ IB (CuM) | ROM (CuM) | | Mineral reject | ROM/ Waste Ratio |
|----------------------|----------|---------------------------------------|----------------|-----------------|----------------|----------------------|----------------|------------------|
| | | | | | Ore (CuM) * | Mineral Reject (CuM) | | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| 1 st Year | Quarry-1 | Land Acquisition & Developmental work | | | | | | |
| 2 nd Year | Quarry-1 | Land Acquisition & Developmental work | | | | | | |
| 3 rd Year | Quarry-1 | 484200 | 7000 | 290720 | 186480 | Nil | Nil | 1:1.60 |
| 4 th Year | Quarry-1 | 1091200 | 14200 | 520200 | 556800 | Nil | Nil | 1:0.96 |
| 5 th Year | Quarry-1 | 2071600 | 27200 | 1115120 | 929280 | Nil | Nil | 1:1.23 |
| Total | | 3647000 | 48400 | 1926040 | 1672560 | Nil | Nil | 1:1.18 |

* Tentative tonnage of the ore to be produced shall be arrived by computing the approximate bulk density and recovery factor as these data are variable and can be established on time series. In the present case, the bulk density considered is 2.7, based on the test result of the limestone samples conducted during field season 1981-84 at the Govt. Laboratory, as certified by the Director of Geology in his letter No. 1437 dt. 01.03.2017 (**Annexure-12**).

अनुमोदित
APPROVED

GEMTECH CONSULTANTS Pvt. Ltd.
K-8/625, Kalinga Nagar, Ghatikia, Bhubaneswar-751029

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[Signature]

P.S.Acharya

S.M.Patra

Qualified Persons

क्षेत्रीय खान नियंत्रक
REGIONAL CONTROLLER OF MINES
भारतीय खान ब्यूरो
INDIAN BUREAU OF MINES
BHUBANESWAR

II. Dump rehandling (for the purpose of recovery of mineral)

The lessee has presently no plans for rehandling of existing dumps for the purpose of recovery of minerals during the plan period.

During the plan period, the total quantity of low grade siliceous limestone (24-40% CaO with SiO₂ > 18%) likely to be generated is 48,000 M³. In addition to these, around 19,26,440 M³ of overburden comprising of 18,78,040 M³ of reddish brown phyllitic soil, calc phyllite/ phyllite and interstitial waste from ore zone and around 48,400 M³ of top soil is likely to be generated during mining operation. In order to have better utilization of the low grade siliceous limestone, attempts shall be made during plan period to examine the feasibility of upgrading these rocks. In case these rocks are not suitable for up gradation and use for cement manufacture, the lessee shall find avenues to utilize these materials along with other waste materials for use in civil construction & road building purposes and may sell these rocks on 'as is where is' basis to outside agencies. The lessee shall obtain necessary permission from Department of Steel & Mines, Govt. of Odisha for disposal of this off-grade rejected siliceous limestone.

In addition to the siliceous limestone, a part of soil/ clay mixed stone which is high in alumina contents might be found suitable as an additive for cement manufacturing process. In such an event, the lessee may utilize a part of these materials after obtaining necessary permissions.

c) Individual year wise development plans and sections showing pit layouts, dumps, stacks of mineral reject, if any:

The year wise development plans and sections showing pit layouts, dumps etc have been prepared and attached as **Plate Nos.6A,6B,6C and Plate-7**. The pit/ haul road as well as the main entry road etc shall be properly maintained and can be briefly discussed below:

Mining Roads: Considering the geological and other techno-economic parameters, it has been planned to keep the crushing and loading complex in the lease area. The mine shall be advanced along the strike of deposit with its working faces along it. The mine workings are planned up to the RL of 173 m though continuation of limestone has been established up to 134 mRL. Three types of roads namely (a) Main entry road to the block (b) Mine official road (c) Quarry haul road shall be provided. The main entry road to the block shall be developed to connect the mine office. The mine official road shall be developed to connect the mine office with the workshop, crushing and loading plant complex, dump and stacking yards and the quarry. These roads are planned to have a width of more than 20 m with a uniform gradient of 1 in 20. These roads shall be well illuminated with light poles installed for the purpose. Downward and upward traffic shall be separated. The quarry haul roads (> 12m

wide) connect different working levels with the mine official road at different places of mine working. These roads are temporary in nature and shall cease to exist once the working on the level finishes as per the plan of working. To facilitate the material handling, the alternate benches having no independent access to mine official road shall be connected by ramps of 12 m width and 1 in 12 gradients. These ramps shall also be of temporary in nature and their position shall change with advancement of faces.

d) Salient features of the proposed method of working with category of mine:

Open cast fully mechanized (category 'A') system of mining shall be in practice to mine the limestone deposit adopting a system of bench formation with deep hole blasting keeping in mind the quality, cost, safety and conservation of mineral. Use of rock breaker for primary breaking of boulders in quarries near village settlements shall be adopted and the materials be loaded and sent to crusher by dumpers and Excavator combination. Deployment of machinery for production of limestone and development of quarries are calculated below.

d.1 Extent of mechanization

d.1.1 Drill machines for blast holes required to be deployed in the present scheme period

To ensure safety, productivity and for effective dust collection system and to develop eco friendly mining in the area, it has been proposed to introduce Hydraulic drills in the mines. The following basis of calculation has been done for required quantity of material handling in the mines.

| | |
|---|--|
| Specification of blast hole drill | |
| Diameter of blast hole drill | 150 mm |
| Air consumption | 24 CuM/min |
| Drilling parameters | |
| Dia. of blast hole (D) | 150 mm |
| Height of the bench | 9 m |
| Additional drilling required (sub grade) (A) | 0.5 m |
| Length of the hole (H + A) | 9.5 m |
| Burden (B) | 3.2 m |
| Spacing (S) | 3.7 m |
| Yield per meter of drilling | $9 \times 3.2 \times 3.7 = 106.56 / 9.5 = 11.22 \text{ M}^3$ |
| Total quantity of material handling (maximum in 5 th year) | 2071600 M ³ |
| Volume of material requires drilling and blasting, as per the nature of the deposit would be around 60% of the total excavation as the Overburden comprises of weathered phyllites) | 1242960 M ³ |
| Handling of stone required per shift considering 310 mine working day in a year and two shift working | 2004.8 or say 2005 M ³ |
| Total meterage of drilling required per shift | $2005 \text{ m}^3 \div 11.22 \text{ m}^3 = 178.70 \text{ or } 179 \text{ m}$ |

**Mining Plan with PMCP of Kottameta Limestone Block of Preferred bidder M/S Dalmia Cement
(Bharat) Limited over 801.171 Ha in Malkangiri District, Odisha**

| | |
|---|--------|
| Performance of Hydraulic drill per shift (Per hour 30m and considering 6.5 hours effective hours in each shift) | 195 m |
| Requirement of drill machine per shift | 1 |
| Total roll strength required with one stand by | 2 nos. |



d.1.2 Excavators required to be deployed in the plan period

Hydraulic excavators of bucket capacity of 4.0-4.5 M³ shall be deployed in the proposed mine. Working in the mine at different benches is required in order to maintain uniform quality from the mines and at the same time developing the waste and mineral reject bands. It is estimated to maintain average Cao at 44.0% to 45 % in ROM. In view of this, a number of 4.0-4.5 M³ capacity excavators shall be deployed to make proper pre blending of limestone as well development of the pit. The detail calculation of requirement of the excavators of 4.0 M³ capacity as per proposed system is described below:

| Particulars | | Limestone (blendable grade) Production | OB/Waste excavation |
|---|---|---|---|
| Capacity of the bucket of excavator (C) | = | 4.0 CuM | 4.0 CuM |
| Bucket fill factor + efficiency factor (f) | = | 0.80 | 0.80 |
| Bulk density of the blasted stone (BD), assuming swell factor as 0.7 | = | 1.9 | 1.9 |
| Handling of excavator per pass in tonnes (CxfxBD) | = | 6.08 Tonnes | 6.08 Tonnes |
| Dumper to be utilized | = | 35 tonne | 35 tonne |
| Loading time by excavator in to dumper | = | 35÷6.08=5.76 pass x 28 sec time per pass = 161.3 secs or 2.70 minutes. | 35÷6.08=5.76 pass x 28 sec time per pass = 161.3 secs or 2.70 minutes. |
| Time cycle per one dumper trip: | | | |
| i) Loading time | = | 2.70 minutes | 2.70 minutes |
| ii) Spotting time, Positioning etc | = | 1.00 minutes | 1.00 minutes |
| iii) Time taken up & down (Av. Lead 1.5 + 1.5 = 3 Km for crusher, 2.0 + 2.0 = 4 Km for dump area & speed 20 Kmph) | = | 9.00 minutes | 12.00 minutes |
| iv) Weighment / Spotting time at crusher/ Dump area | = | 2.00 minutes | 1.00 minutes |
| Total cycle time of one dumper | = | 14.7 minutes | 16.7 minutes |
| Hence dumper trips per hour | = | 4.08 trips | 3.59 trips |
| Requirement of dumper per hour | = | 60 minute / 14.7 minute per dumper = 4.08 Nos per excavator | 60 minute/16.7 minute per dumper = 3.59 Nos per excavator |
| Total handling per hour of excavator | = | 35 x 4.08 x 4.08 = 582.62 tonnes / hr. | 35 x 3.59 x 3.59 = 451.08 tonnes/ hr. |
| Total handling per shift of excavator (Considering 6.5 hours effective hours) | = | 582.62 x 6.5 = 3787.03 tonnes or 1993.17 M ³ or say 1993 M ³ | 451.08 x 6.5 = 2932.02 tonnes or 1543.17 M ³ or say 1543 M ³ |

| Requirement of excavators for handling of Limestone / waste | | | |
|--|---|--|--|
| Maximum handling of limestone / waste per annum | = | 929280 M ³ (5th year) | 1142320 M ³ (5th year) |
| Handling of materials per day @ 310 working days in a year | = | 2998 M ³ | 3685 M ³ |
| Handling of materials per shift considering two shifts in a day. | = | 1499 M ³ or say 1500 M ³ | 1842.5 M ³ or say 1842 M ³ |
| Excavators required | = | 1500 ÷ 1993 = 0.75 or 1 nos. | 1842 ÷ 1543 = 1.19 no . or say 1 no. |
| Total Requirement of Excavator | = | 2 nos. | |
| One additional loader of 6 M ³ bucket capacity shall be provided for re-handling of limestone stacked in the stack yard. This can be utilized as a standby excavator for mines operation. | | | |

d.1.3 Haulage and transport equipment required in the present modified plan period

A. Haulage within the lease hold area:

For transportation of limestone to crusher and removal of waste/ mineral rejects from the mines to dumping/ stacking area, 35 tonne capacity dumpers have been selected. The average lead distance for the dumpers from the quarries to the crusher and dumping area has been considered to be 1.5 km and 2.0 km respectively. Accordingly, the time cycle of one dumper has been calculated to be 14.5 and 16.5 minutes respectively. The requirement of dumpers matching to the required excavators is thus calculated as below:

| Particulars | | For Limestone Production | For OB/Waste & MR excavation |
|--|---|----------------------------------|------------------------------------|
| Heaped Capacity of the dumpers | = | 35 tonnes | 35 tonnes |
| Likely capacity with feel factor of 85% | = | 29.75 tonnes | 29.75 tonnes |
| Lead distance from quarry to crusher/ dump area | = | 1.50 Km | 2.00 Km |
| Time cycle of one dumper | = | 14.7 minutes | 16.7 minutes |
| Working time per tipper per shift | = | 6.5 Hrs or 390 minutes | 6.5 Hrs or 390 minutes |
| Number of trips per tipper per shift | = | 390 ÷ 14.7 = 26.53 or 26 trips | 390 ÷ 16.7 = 23.35 or 23 trips |
| Tonnage per shift per tipper | = | 26 x 29.75 = 773.5 tonnes | 23 x 29.75 = 684.25 tonnes |
| Total handling per shift of excavator | = | 3787 tonnes | 2932 tonnes |
| Tipper requirement (attached to one 0.91 CuM excavator) | = | 3787 ÷ 773.5 = 4.9 or say 5 nos. | 2932 ÷ 684.25 = 4.28 or say 5 nos. |
| Tipper requirement for limestone production & OB/ Waste / MR removal | = | 1 x 5 = 5 nos. | 1 x 5 = 5 nos. |
| Total roll strength required with stand by (+20%) | = | 12 nos. | |

B. Transport from mine head to destination (Plant):

The ultimate transport of limestone from the Kottameta Limestone mine to the proposed cement plant to be located at around 4.5 km. away near Matapaka village and to the other consumers shall be presently done by road transport in two shift basis. In future, the



transportation of crushed limestone to the plant can be done by cross country belt conveyor (CCBC) in three shift basis.

d.1.4 Miscellaneous equipments

A. Bull dozers

1 No. of bulldozers is required to assist the operation of the working quarry along with the ancillary jobs like dozing in the dumps, maintenance of roads, dozing at the faces, site preparations, collection of materials etc., which shall be provided in the mine.

B. Rock breaker

One no. of rock breaker of 80 tonne capacity shall be in use for primary breaking of boulders in the quarry.

C. Road Grader

One no. of road grader shall be in use for maintenance of haul roads.

d.1.5 List of machinery required in the mines

The machinery requirement particularly for drilling, excavation and transportation has been worked out and listed as below:

| Sl. No | Machinery/ Make | Capacity of each unit | No. of units required | Provision for standby | Total Requirement | Electrical/non electrical |
|--------|-------------------------------|-----------------------|-----------------------|-----------------------|-------------------|---------------------------|
| 1. | Hydraulic excavators | 4.0-4.5 CuM | 2 | 0 | 2 | Non Electrical |
| 2. | Loader | 6.0 CuM | 1 | 0 | 1 | Non Electrical |
| 3. | Dumpers/ Tippers | 35 tonne | 10 | 2 | 12 | Non Electrical |
| 4. | Drill machine with compressor | 150 mm | 1 | 1 | 2 | Non Electrical |
| 5. | Rock breaker | 80 tonne | 1 | - | 1 | Non Electrical |
| 6. | Dozer | 270 HP | 1 | - | 1 | Non Electrical |
| 7. | Road Grader | - | 1 | - | 1 | Non Electrical |
| 8. | Water sprinkler | 16 Kl | 1 | - | 1 | Non Electrical |
| 9. | Diesel Tanker | 16 Kl | 1 | - | 1 | Non Electrical |
| 10. | Explosive Van | 6-9 tonne | 1 | - | 1 | Non Electrical |
| 11. | Weigh Bridge | 50 tonne | 2 | - | 2 | Electrical |

d.2 Blasting

Controlled blasting with 'V' pattern firing shall be in practice which is much safe and fragmentation is good and throw is within control. Sequential blasting shall be done by using electric delay detonator or NONEL system of initiation to reduce vibration and fly rock. Rock breaker shall be used to avoid secondary blasting.

Proper charging, stemming and controlled blasting with NONEL system of initiation is proposed for getting optimum blast results and minimization of hazards while preventive measures like marking of danger zone, arrangement of warning signals by hooting etc shall

be adopted. Blasting shelters will be provided within the blasting zone. Vibration monitoring at sensitive locations shall be carried out scientifically to check adverse effects if any during blasting. The blasting parameters shall be as below.

d.2.1 Broad Blasting Parameters

Necessary measures shall be taken to optimize drilling and blasting parameters so that the generation of oversize boulders is brought down to less than 5 percent. The broad blasting parameters during mining operations shall be as below:

| | |
|---|-------------------------------------|
| Height of bench | 9 m |
| Sub-drilling | 0.5 m |
| Depth of Blast hole | 9.5 m |
| Burden | 3.2 m |
| Spacing | 3.7 m |
| Hole diameter | 150 mm |
| Diameter of the cartridge | 120 mm |
| Yield per hole (Loosening of rock mass per hole): | 106.56 M ³ or 287 tonnes |
| Powder Factor Projected | 7 tonnes / Kg of explosive |

d.2.2 Drilling and charging pattern

Sufficient no. of holes in a multi row pattern (2 to 3 rows) shall be drilled in a staggered manner. Usually the explosives charge length is limited to $2/3^{\text{rd}}$ of the hole depth (8.5m) and the explosive quantity works out to 40 Kgs to have powder factor of 7 tonnes / Kg of explosive. Deck charging shall be adopted to distribute the explosive charge to desired length of column. Booster charges shall be kept at different decks as per need and the column charge shall be that of SME/ANFO.

Use of NONEL and multi delay detonators in a hole shall be practiced to produce better fragmentation effect, fly rock within safe limit with reduced vibration etc.

d.2.3 Charge per round

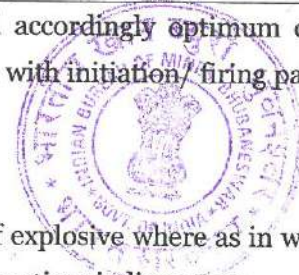
Sufficient no of holes in a multi row pattern utilizing NONEL in a hole shall be in practice for primary blasting. Maximum number of holes (30 to 40 holes per round) shall be blasted in one blast to give 7000 to 9500 tonnes of blasted material for loading by excavator.

d.2.4 Blasting pattern, manner and sequence of firing

'V' pattern firing shall be in practice which is much safe and fragmentation is good and throw is within control. Sequential blasting shall be done by using electric delay detonator or NONEL in the system of blasting to reduce vibration and fly rock.

Since Kottamateru village and few hutments are there near the limestone block, a scientific study on blasting induced vibration study shall be carried out by any reputed scientific

institution, immediately after opening of the mine and accordingly optimum charge per delay and most suitable drilling and blasting design along with initiation/ firing pattern shall be considered.



d.2.5 Powder factor

Powder factor in limestone is considered 7 tonnes / Kg of explosive where as in waste it is 7 to 7.5 tonnes / Kg of explosive as per the normal mining practices in limestone.

d.2.6 Secondary blasting

Overall fragmentation in blasting shall be reasonably well. Maximum 5-10% of oversize boulders (more than 1000 mm) are expected. Rock breaker shall be deployed to break the oversize boulders.

d.2.7 Storage of Explosives

One explosive magazine with total capacity of 10 tonnes is planned to be constructed in the mining lease area for storage of explosives after obtaining necessary permissions from Chief Controller of Explosives and local administration. Storage facilities for Ammonium Nitrate Diesel oil and mixing of ANFO shall be created at convenient approved sites. An explosive van of 6-9 Ts capacity shall be provided for transport of explosives. Handling of explosives and blasting operations shall be done by qualified blasters and blaster helpers under the supervision of an Asst. Manager. The Asst. Manager will be helped by qualified foreman to have effective supervision.

d.2.8 Fly rock Problems & Precautions:

Fly rock fragments during blasting may create problems to nearby men and machinery. Therefore, precautionary measures to be adopted are as below:

- a) Proper blast design results in lower ground vibrations and avoids the fly rock.
- b) Controlled blasting technique with SME/SMS Nonel system of initiation.
- c) Drill holes will be located in weaker planes.
- d) No loose materials will be kept on the bench floors during blasting.
- e) Optimum stemming length and stemming material will be chosen.
- f) Safe ratio (stemming length to burden of hole) shall be kept at more than 0.6.
- g) Proper compaction of the stemming material will be undertaken before blasting.

d.2.9 Safety Precautions

- Boards displaying (in local language & english) blasting time will be kept at the places where required.
- Blasting time will be fixed and intimated to all concerned.

- At the time of blasting, security guards will be deployed in order to block the vehicle movement on the public road.
- In order to indicate the blasting operation, red flags will be kept where ever required.
- A Siren will be blown at the beginning and end of the blasting operation.

e) Layout of mine workings, pit road layout, layout of faces and sites for disposal of overburden/ waste along with ground preparation prior to disposal of waste, rejects etc.

As already discussed in previous paragraphs, the mining operations shall be commenced in the Kottameta block during the 3rd year of lease execution in the north central part bounded between N2028382-N2028606 / E571173-E571292 .

Plate No. 3 presents the surface layout covering various surface features presently. Mine planning has been programmed in the main pit designated as Quarry-1 for limestone requirement of 2.50 million tonnes per annum which will be achieved progressively during the 5th year of the plan period. As discussed in para 2.0A (b) I, the usable limestone for dispatch to plant comprises of high calcic marbilitic limestone (+46% CaO) and non-marbilitic limestone (40-46% CaO). The low grade siliceous limestone with CaO content above threshold value but with high silica content is presently considered as mineral waste and are planned to be stacked separately. The calc-phyllites and phyllites with shale intrusions and clay are considered as OB/waste along with the waste to be generated from the ore zone (40% of the ROM).

Mining benches shall be kept at 9 m height in average. Working bench width shall be maintained at around 12-16 m (i.e. 3 times the width of the largest machines plying on that bench as per statute) and shall be ultimately reduced to around 6-8 mt in final stage. 150 mm dia meter holes are to be drilled by operating the Hydraulic drills. Rock breaker shall be used for breaking of big boulders of size more than 1.0 mt. The year wise layout of mine workings with other details is tabulated below:

(e.1) Development during 3rd year of the plan period (Plate -6A)

| Description | Particulars |
|--|-------------------------------------|
| Co-Ordinate at the end of Year | N2028382-N2028606 / E571173-E571292 |
| R.L of the quarry floor at the end of the year (m) | 173 m |
| Bench levels to be worked (m) | 191m / 182m / 173m |
| No of benches to be worked | Three |
| Height of the benches (m) | 9 m |
| Width of the benches (m) | 12-16 m |
| Length /Width of quarry (m) Av. | 224 m / 116 m |
| Length of haul road with gradient | 550 m , 1:16 |
| No. of ramps if any | Two |
| Direction of advancement of the faces | North-South & East-West |
| Overall slope of the quarry at the end of the year | 37° |
| Total excavation during the year (CuM) | 484,200 CuM |
| Production of usable limestone (CuM/Tonnes) | 186,480 CuM/ 503496 Tonnes |

Mining Plan with PMCP of Kottameta Limestone Block of Preferred bidder M/S Dalmia Cement (Bharat) Limited over 801.171 Ha in Malkangiri District, Odisha

| | |
|---|--|
| Waste generation (Cu.m) | 297,720 CuM |
| Stripping ratio (waste/ ore) M ³ /M ³ | 1:1.60 |
| Site for disposal of waste (Co-ordinates) & area covered in Ha. | N2026200-N2026414 / E572023-E572215, 3.045 Ha |

Detail section wise calculation of limestone & generation of waste/ MR during 3rd year

| Production of usable limestone (3 rd year) | | | | | | | | | |
|---|--|--------------------|---------------|---|--------------------|-----------------------------|--------------------|--------------------------|---|
| Section Line No. | Cross sectional area (m ²) | | Influence (m) | Net Volume (m ³) (60% of ROM) | | Quantity (Tonnes) @ 2.7 TCF | | Total Limestone (Tonnes) | Waste (IB) from Ore zone (m ³) 40% of ROM |
| | High grade | Intermediate grade | | High grade | Intermediate grade | High grade | Intermediate grade | | |
| 1-1' | 802 | 752 | 200 | 96240 | 90240 | 259848 | 243648 | 503496 | 124320 |
| 2-2' | 0 | 0 | 200 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3-3' | 0 | 0 | 200 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4-4' | 0 | 0 | 200 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 802 | 752 | | 96240 | 90240 | 259848 | 243648 | 503496 | 124320 |

| Generation of OB / waste (3 rd year) | | | | | | | | | |
|---|--|------------|------------|---------------|---------------|--------------------------|--------------|--------------|---------------|
| Section Line No. | Cross sectional area (m ²) | | | | Influence (m) | Volume (m ³) | | | |
| | Top soil | OB Soil | Phyllites | Phyllitic Lst | | Top soil | OB Soil | Phyllites | Phyllitic Lst |
| 1-1' | 35 | 345 | 487 | 0 | 200 | 7000 | 69000 | 97400 | 0 |
| 2-2' | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3-3' | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4-4' | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 35 | 345 | 487 | 0 | | 7000 | 69000 | 97400 | 0 |

(e.2) Development during 4th year of the plan period (Plate -6B)

| Description | Particulars |
|---|--|
| Co-Ordinate at the end of Year | N2028170-N2028606 / E571173-E571437 |
| R.L of the quarry floor at the end of the year (m) | 173 m |
| Bench levels to be worked (m) | 191m / 182m / 173m |
| No of benches to be worked | Three |
| Height of the benches (m) | 9 m |
| Width of the benches (m) | 12-16 m |
| Length /Width of quarry (m) Av. | 444m / 148m |
| Length of haul road with gradient | 781 m , 1:16 |
| No. of ramps if any | Two |
| Direction of advancement of the faces | South - East |
| Overall slope of the quarry at the end of the year | 37° |
| Total excavation during the year (CuM) | 484,200 CuM |
| Production of usable limestone (CuM/Tonnes) | 186,480 CuM/ 503496 Tonnes |
| Waste generation (Cu.m) | 297,720 CuM |
| Stripping ratio (waste/ ore) M ³ /M ³ | 1:1.60 |
| Site for disposal of waste (Co-ordinates) & area covered in Ha. | N2026200-N2026555 / E571893-E572222, 7.692 Ha |

Mining Plan with PMCP of Kottameta Limestone Block of Preferred bidder M/S Dalmia Cement (Bharat) Limited over 801.171 Ha in Malkangiri District, Odisha

Detail section wise calculation of limestone & generation of waste/ MR during 4th year

| Production of usable limestone (4 th year) | | | | | | | | | |
|---|--|--------------------|---------------|---|--------------------|-----------------------------|--------------------|--------------------------|---|
| Section Line No. | Cross sectional area (m ²) | | Influence (m) | Net Volume (m ³) (60% of ROM) | | Quantity (Tonnes) @ 2.7 TCF | | Total Limestone (Tonnes) | Waste (IB) from Ore zone (m ³) 40% of ROM |
| | High grade | Intermediate grade | | High grade | Intermediate grade | High grade | Intermediate grade | | |
| 1-1' | 674 | 437 | 200 | 80880 | 52440 | 218376 | 141588 | 359964 | 88880 |
| 2-2' | 1487 | 2042 | 200 | 178440 | 245040 | 481788 | 661608 | 1143396 | 282320 |
| 3-3' | 0 | 0 | 200 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4-4' | 0 | 0 | 200 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 2161 | 2479 | | 259320 | 297480 | 700164 | 803196 | 1503360 | 371200 |

| Generation of OB / waste (4 th year) | | | | | | | | | |
|---|--|------------|------------|---------------|---------------|--------------------------|--------------|--------------|---------------|
| Section Line No. | Cross sectional area (m ²) | | | | Influence (m) | Volume (m ³) | | | |
| | Top soil | OB Soil | Phyllites | Phyllitic Lst | | Top soil | OB Soil | Phyllites | Phyllitic Lst |
| 1-1' | 14 | 85 | 199 | 0 | 200 | 2800 | 17000 | 39800 | 0 |
| 2-2' | 57 | 252 | 0 | 209 | 200 | 11400 | 50400 | 0 | 41800 |
| 3-3' | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4-4' | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 71 | 337 | 199 | 209 | | 14200 | 67400 | 39800 | 41800 |

(e.3) Development during 5th year of the plan period (Plate -6C)

| Description | Particulars |
|---|--|
| Co-Ordinate at the end of Year | N2027760-N2028794 / E571173-E571784 |
| R.L of the quarry floor at the end of the year (m) | 173 m |
| Bench levels to be worked (m) | 203m / 173m |
| No of benches to be worked | Three |
| Height of the benches (m) | 9 m |
| Width of the benches (m) | 13.5 m |
| Length /Width of quarry (m) Av. | 894m x 210m |
| Length of haul road with gradient | 1056 m , 1:16 |
| No. of ramps if any | Two |
| Direction of advancement of the faces | South-East |
| Overall slope of the quarry at the end of the year | 37° |
| Total excavation during the year (CuM) | 484,200 CuM |
| Production of usable limestone (CuM/Tonnes) | 186,480 CuM/ 503496 Tonnes |
| Waste generation (Cu.m) | 297,720 CuM |
| Stripping ratio (waste/ ore) M ³ /M ³ | 1:1.60 |
| Site for disposal of waste (Co-ordinates) & area covered in Ha. | N2026200-N2026793 / E571893-E572227, 12.761 Ha |

Detail section wise calculation of limestone & generation of waste/ MR during 5th year

| Production of usable limestone (5 th year) | | | | | | | | | |
|---|--|--------------------|---------------|---|--------------------|-----------------------------|--------------------|--------------------------|---|
| Section Line No. | Cross sectional area (m ²) | | Influence (m) | Net Volume (m ³) (60% of ROM) | | Quantity (Tonnes) @ 2.7 TCF | | Total Limestone (Tonnes) | Waste (IB) from Ore zone (m ³) 40% of ROM |
| | High grade | Intermediate grade | | High grade | Intermediate grade | High grade | Intermediate grade | | |
| 1-1' | 0 | 0 | 200 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2-2' | 392 | 527 | 200 | 47040 | 63240 | 127008 | 170748 | 297756 | 73520 |
| 3-3' | 2042 | 2091 | 200 | 245040 | 250920 | 661608 | 677484 | 1339092 | 330640 |
| 4-4' | 1705 | 987 | 200 | 204600 | 118440 | 552420 | 319788 | 872208 | 215360 |
| Total | 4139 | 3605 | | 496680 | 432600 | 1341036 | 1168020 | 2509056 | 619520 |

| Generation of OB / waste (5 th year) | | | | | | | | | |
|---|--|-------------|------------|------------------|------------------|--------------------------|---------------|---------------|------------------|
| Section Line No. | Cross sectional area (m ²) | | | | Influence (m) | Volume (m ³) | | | |
| | Top soil | OB Soil | Phyllites | Phyllitic Lst | | Top soil | OB Soil | Phyllites | Phyllitic Lst |
| 1-1' | 0 | 0 | 0 | 0 | 200 | 0 | 0 | 0 | 0 |
| 2-2' | 14 | 139 | 0 | 31 | 200 | 2800 | 27800 | 0 | 6200 |
| 3-3' | 71 | 529 | 485 | 0 | 200 | 14200 | 105800 | 97000 | 0 |
| 4-4' | 51 | 956 | 338 | 0 | 200 | 10200 | 191200 | 67600 | 0 |
| Total | 136 | 1624 | 823 | 31 | | 27200 | 324800 | 164600 | 6200 |

(e.4) Summary of Production of Limestone with generation of waste during the Plan period

| Year | Production of Limestone (Tonnes) | Generation of waste (CuM) | Stripping ratio (CuM:CuM) |
|----------------------|-------------------------------------|------------------------------|------------------------------|
| 1 st Year | | Developmental work | |
| 2 nd Year | | Developmental work | |
| 3 rd Year | 503,496 | 297,720 | 1:1.60 |
| 4 th Year | 1,503,360 | 534,400 | 1:0.96 |
| 5 th Year | 2,509,056 | 1,142,320 | 1:1.23 |

(e.5) Disposal of OB/waste/rejects along with ground preparation prior to disposal of waste

The waste materials to be generated during mining operation during the plan period shall be dumped in the southern part of the intended mining lease area which is found to be non-mineralized as per the exploration data conducted by the Directorate of Geology (Ref: BH Nos. 0918). It has been planned to keep the waste materials comprising of overburden phyllitic soil, phyllites, shale and quartzite etc to be generated during the plan period over the earmarked area covering an area of 12.761 Ha. Besides these waste materials, around 48,000 CuM of low grade phyllitic limestone with high silica content is likely to be generated which will be stacked separately at the earmarked place over 0.871 Ha. Part of these materials can be sorted out and blended with usable limestone as and when required, if found suitable. The proposed dump and stack shall be suitably terraced, sloped and raised to a height of 10m in each step. Maximum height of the dump shall be kept at 30m with two terraces. Retaining walls and garland drains with settling tanks shall be built and maintained regularly.

Since both the waste dumping and low grade siliceous limestone stacking areas are adjacent to each other, a boundary wall with some space will be left between the two to prevent mixing of the two types of rocks.

Prior to dumping and stacking of waste materials at the earmarked places, a few confirmatory bore holes have been proposed to be drilled in this area during 1st and 2nd years of the plan period to establish non-mineralization of the area. Proper haulage roads will be constructed before starting the mining operation. The layout of mine workings during the plan period along with dumping proposals have been shown in development plans

and sections and Dump plan i.e. Plate Nos. 6A to 6C & Plate-7. Apart from these, the position of the mine at the end of plan period along with site for waste disposal, ultimate pit limit (UPL) etc is shown in Plate Nos. 8.

f) Conceptual Mine Planning

(f.1) Life of the mine

Mining activities shall be carried out within the auctioned lease hold area of 801.171 hectares. Probable mineral reserve (122) of 97.51 million tonnes of usable grade limestone (+40% CaO) has been estimated in the block. Beside these, pre feasibility mineral resources (222) of 1.18 million tonnes of usable grade limestone are non mineable under prevailing mining constraints like pit slopes/ bench formation etc which can be mineable after technological developments.

During the plan period of first five years, the total production of usable grade limestone has been planned to be 4.516 million tonnes. It has been planned to increase the production level to around 3.00 million tonnes per annum after the plan period. Therefore, with the proposed production at around 3.00 million tonnes per annum during conceptual period, the balance probable mineral reserve will last for about 31 years i.e. 36 years after the lease is executed. With the proposed exploration programme during the plan period, the reserves are likely to be increased and accordingly, the life of the mine may be increased by few more years.

(f.2) Long term design features of the mine

The mine will be worked by mechanized open cast method. To avoid secondary blasting, deployment of Rock breaker for primary breaking of large sized stones shall be adopted. Considering the production of the mines at 3.00 million tonnes per annum during conceptual period, quarry scheduling shall be made so as to reach the ultimate pit limit from one end to other.

Each bench of 9 m is proposed to be worked at an angle of 80° from horizontal and bench width shall be kept at 9.0 m in final stage at every bench level. These parameters will result in an ultimate pit slope of 45° from horizontal. Accordingly to work up to the desired level, ultimate pit limit has been worked out and delineated in the geological plan and also in Conceptual plan (Plate Nos. 4 & 8).

(f.3) Exploration

The total lease area of 801.171 hectares shall be covered under detail exploration by systematic survey, geological mapping at 1:2000 scale or at larger scale if required and drilling of core bore holes at 200 m or closer grid interval to bring the limestone resources/ reserves under G1 category during the plan period of five years as per the exploration norms specified in the Minerals (Evidence of Mineral Contents) Rules, 2015. The contact of ore and non ore zone shall be deciphered after completion of these bore holes and accordingly, the geological

sections shall be modified. Some of the bore holes are proposed to be drilled to a lower level to prove the continuation of ore body in depth to support the production at depth as and when required. Further exploration during the conceptual period shall be worked out after completion of the drilling work during the plan period.

(f.4) Development of the deposit

In order to have optimum exploitation of reserve, maximum possible lateral extension with depth ward continuation shall be done. Necessary efforts shall be undertaken to utilize the low grade siliceous limestone (presently considered as waste due to high silica content by optimization in the process with the help of Quarry Scheduling Optimization (QSO) and proper pre-blending at the quarry to reduce overall cost. The mechanized mining will continue at Kottameta up to the conceptual stage.

(f.4.1) Ultimate extent and size of the pit

During conceptual period, the main quarry shall be worked up to the UPL to win the mineable reserves within the lease area considered under mineral reserves. The ultimate pit will have haul roads and benches as per the following specifications:

- Bench Height - 9m
- Bench slope - 80°
- Bench width - 9m
- Ultimate pit limit at depth - 134 mRL
- Ultimate Slope - 45°
- Haul Road Width - 15m
- Gradient - 1 in 16

The ultimate size of the pit with its co-ordinates, top & bottom RLs with depth of working are tabulated as below:

| S.L NO | Pits to be Combined | Ultimate size of Pits (mts) | Ultimate Co-ordinates | Top RLs (mts) | Bottom RLs (mts) |
|--------|---------------------|-----------------------------|-------------------------------------|---------------|------------------|
| 1 | Main Pit | 3932 m x 2138 m | N2026204-N2028760 / E569227-E573180 | 218 m | 134 m |

(f.5) Waste Management

The quantity of waste including mineral rejects likely to be generated during conceptual period is as below:

| Particulars | OB Soil | Phyllite | Siliceous Limestone | Waste from ore zone | Total waste |
|---|---------|----------|---------------------|---------------------|-------------|
| Estimated Quantity (million CuM) * | 6.976 | 10.293 | 18.310 | 24.399 | 59.978 |
| Qty to be generated during plan period (million CuM) ** | 0.510 | 0.302 | 0.048 | 1.115 | 1.975 |
| Quantity during conceptual period (million CuM) | 6.466 | 9.991 | 18.262 | 23.284 | 58.003 |

* Ref: Ann. I, II, IV, V and VI of the Report on Investigation of Kottameta block by Directorate of Geology (Annexure-10).

** Ref: Table under Para e.1, e.2 & e.3.

The lessee shall make all efforts to utilize part of the low grade siliceous limestone by sorting and selectively blending with usable limestone for cement manufacture. Similarly, part of the waste materials can also be utilized for road development etc. Some quantity of waste can also sold to outside parties for road making etc, after obtaining necessary permission from the authorities. The balance quantity of waste during the conceptual period shall be utilized for back filling/ spreading over the worked out areas in a progressive manner after some part of the lease area reaches UPL.

f.6 Reclamation & Rehabilitation measures

It has been estimated that the limestone block will be exhausted in around 36 years after the lease is executed. Priority will be given and scheduling will be made such that some part of the block is exhausted progressively. During the present plan period of five years, no part of the block where mining will be commenced shall touch ultimate pit limit. Reclamation of the pit by back filling can only be started during next review periods after parts of the mining area touches the UPL. By the end of conceptual period, an area over 24.322 Ha shall be reclaimed with the waste materials up to 170 mRL. The balance quarry area shall be reclaimed by proper fencing of the entire mined out area. Precautionary measures like retaining wall, garland drains etc shall be made at the base of the quarry/ dump to check and arrest flow of loose sediments with surface run offs. Terraces at every 10 m height shall be provided with inward slope so that water can be passed through, without affecting the walls of the waste dump. Each terrace shall have provision of berms at the outer end to reduce gully formation due to rainwater wash offs. Dump bench slopes shall be vegetated with grass for binding soil and to arrest erosion.

The reclamation and rehabilitation programme during the modified plan period and conceptual period in the mined out area shall be as below:

| Period | Total excavated area at the end of the year (Hectares) | Reclamation/ Rehabilitation by back filling (in hectares) | Reclamation/ Rehabilitation by fencing (in hectares) |
|--|--|---|--|
| End of plan period (1 st 5 years) | 16.303 | Nil | Nil |
| End of conceptual Period | 511.506 | 24.322 | 487.184 |

Besides, protective measures which shall be undertaken during the plan period which would be maintained regularly during conceptual period. The details of protective measures to be



constructed around proposed quarry and dump during plan period and conceptual period will be as follows:

| Period | Retaining wall (m) | | Garland drain | | Settling tank | Siltation Pond | Check Dam | Check filter |
|-------------------|--------------------|-------------------------|---------------|------------------------|--------------------|--------------------------|--------------------|--------------------|
| | Around Qry | Around dumps (OB/TS/LG) | Around Qry | Around dump (OB/TS/LG) | For Quarry & Dumps | For Quarry & Dumps | For Quarry & Dumps | For Quarry & Dumps |
| Plan Period | --- | 1550 | 956 | 2091 | 5 nos (8m x 5m) | 1 no. (15m x 8m) | 2 nos. (15m x 8m) | 2 nos. (8m x 5m) |
| Conceptual period | 1108 | | 1134 | | 3 nos (8m x 5m) | De siltation as required | | |

The existing roads which are mostly stable will be left as it is and avenue plantation will be done along the roadside. Besides that, year wise plantation over the dump terraces shall be started and in conceptual stage, total area will be covered. Green belt will be developed in entire degraded land as well as the land not utilized for any purpose.

f.7 Environmental aspects

During the coming years of mining in the lease hold area, it has been projected that an area of 40.485 hectares of land will be degraded for systematic development of the mine including ancillary activities during the 1st five year plan period and by end of conceptual period, a total area of 535.088 Ha of land will be degraded.

The plantation program during the coming years will include block and avenue plantation as shown in **Plate No. 11**. Continuous agaves or similar plantation will be done at the waste dumps and mined out areas.

Environmental monitoring with respect to air, water, noise, etc will be carried out as per norms and guidelines.

f.8 Land use pattern:

The existing land use shall be changed during the plan period and conceptual period since the quarries are to be developed and some fresh areas shall be utilized for mining and other activities. The present land use pattern vis a vis that in plan period and conceptual period are tabulated below:

**Mining Plan with PMCP of Kottameta Limestone Block of Preferred bidder M/S Dalmia Cement
(Bharat) Limited over 801.171 Ha in Malkangiri District, Odisha**



| Sl. No | Description | Existing (Ha) | | | Plan Period (Ha) | | | Conceptual (Ha) | | |
|------------------|--|----------------|----------------|----------------|------------------|----------------|----------------|-----------------|----------------|----------------|
| | | Forest | N.Forest | Total | Forest | N.Forest | Total | Forest | N.Forest | Total |
| 1. | Area under mining | 0.000 | 0.000 | 0.000 | 0.000 | 16.303 | 16.303 | 288.534 | 222.972 | 511.506 |
| 2. | Storage of topsoil | 0.000 | 0.000 | 0.000 | 0.000 | 0.888 | 0.888 | 0.000 | 0.000 | 0.000 |
| 3. | Waste dump site including Retaining wall, garland drain etc. | 0.000 | 0.000 | 0.000 | 0.000 | 13.632 | 13.632 | 0.000 | 0.000 | 0.000 |
| 4. | Mineral storage | 0.000 | 0.000 | 0.000 | 0.000 | 0.659 | 0.659 | 0.000 | 0.000 | 0.000 |
| 5. | Infrastructure (Workshop, crusher, admn. Building, magazine etc) | 0.000 | 0.000 | 0.000 | 0.181 | 3.062 | 3.243 | 0.181 | 3.062 | 3.243 |
| 6. | Roads | 1.234 | 1.343 | 2.584 | 2.279 | 2.432 | 4.711 | 0.942 | 1.135 | 2.077 |
| 7. | Railways | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8. | Tailing Pond | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 9. | Effluent Treatment Plant | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 10. | Mineral Separation Plant- Crushing Plant | 0.000 | 0.000 | 0.000 | 0.000 | 1.049 | 1.049 | 0.000 | 1.049 | 1.049 |
| 11. | Township area | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 12. | Others | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Sub Total | | 1.234 | 1.343 | 2.584 | 2.460 | 38.025 | 40.485 | 289.657 | 228.218 | 517.875 |
| 13. | Safety zone/ Green belt for magazine etc | 5.315 | 4.033 | 9.348 | 33.818 | 21.807 | 55.625 | 23.389 | 9.788 | 33.177 |
| 14. | Undisturbed land | 455.698 | 333.548 | 789.239 | 425.969 | 279.092 | 705.061 | 149.201 | 100.918 | 250.119 |
| Total | | 462.247 | 338.924 | 801.171 | 462.247 | 338.924 | 801.171 | 462.247 | 338.924 | 801.171 |

f.8.1 Post mining land use pattern

Post mining land use pattern has been envisaged as below:

| Sl. No | Use of land | Area in Hectares | Remarks |
|--------------|---|------------------|--|
| 1 | Excavated pit for Mining | 511.506 | To be reclaimed by plantation with proper fencing of the pits. |
| 2 | Roads | 2.077 | Will remain as it is and avenue plantation will be taken up. |
| 3 | Infrastructure including workshop, mineral separation plant etc | 4.292 | To be utilized for green belt development Thick plantation will be done. |
| 4 | Safety zone, Green belt etc. | 33.177 | Plantation to be taken up |
| 5 | Undisturbed land | 250.119 | Plantation |
| TOTAL | | 801.171 | |

f.9 Safety & Environmental Measures

- Comprehensive post plantation care is to be undertaken.
- Monitoring for ambient air, noise, dust and water are to be done regularly.
- Proper maintenance of the road surface will be done by spraying water periodically.
- Muffle blasting will be adopted so as to reduce fly rock movement.
- Proper manuring and watering at the plantation sites will be done to achieve 80% survival of planted saplings.



f.10 Prevention and regularization of wash offs from the excavated area during rains. –
To prevent and regularize the wash offs from the excavated areas during rains, garland drains and retaining walls shall be constructed on the lower slopes of the pit. Settling tank shall also be provided in order to allow clean water to escape from the lease area.

P.S.Acharya

S.M.Patro

Qualified Persons

3.0 MINE DRAINAGE

3.a) Minimum and maximum depth of water table based on observations from nearby wells and water bodies:

The Kottameta limestone block is located in a low lying area and exhibits slightly undulating to plain topography. However, at several places flat topped low mounds and narrow discontinuous ridges of hard quartzite stand out. The intended lease area has its highest elevation of 218 m at the south central part and lowest elevation at 188 m in SW part, maintaining overall slope of the ground towards west. A study of ground water condition of Malkangiri district by the Central Ground Water Board, Bhubaneswar in 2013 indicates that the general depth to water level in the district ranges from 0.57 to 10.97 m bgl in the month of May-June while it is 0.00 to 8.19 m bgl in the months of December-January. It has been observed from the exploratory drilling in the block area that the ground water level in bore holes varies from 2.20m bgl (BH 1114) to around 37.20m bgl (BH 0610).

3.b) Maximum and minimum depth of workings:

The maximum and minimum RLs of the mine working during the plan period would be as below:

| Particulars | Qry 1-3 |
|---------------------------|---------|
| Top of Quarry (m) | 203 |
| Floor level of Quarry (m) | 173 |

3.c) Quantity & Quality of water likely to be encountered, the pumping arrangements and places where the mine water is finally proposed to be discharged:

The maximum annual rainfall recorded during the period 2006 to 2015 was 2236.6 mm in 2006 and minimum 874.1 mm in 2011. About 85% of total rainfall was observed during the months of June to September, July & August being the rainiest. Maximum rainfall in a month recorded was 816.6 mm during August 2006. The maximum quantity of rain water likely to be accumulated can be calculated as below:

| | | | |
|-----|--|---|--|
| 1. | Maximum rainfall recorded in a month | : | 816.6 mm |
| 2. | Maximum rainfall in a day (considering 20 rainy days) | : | 40.8 mm |
| 3. | Total Quarry area during the plan period | : | 16.303 Hect. |
| 4. | Total rain water likely to be accumulated in a day | : | $163030 \text{ m}^2 \times 40.8 \text{ mm} = 6651.62 \text{ M}^3 \text{ or } 6652 \text{ M}^3$ |
| 5. | Likely recharge to ground water storage (around 15%) | : | $6652 \times 15\% = 998 \text{ M}^3$ |
| 6. | Likely evaporation (40%) | : | $6652 \times 40\% = 2661 \text{ M}^3$ |
| 7. | Balance rain water likely in the mines | : | 2993 M^3 |
| 8. | Sub surface strata (seepage) water likely to be released due to mining (10 M ³ / Hect.) | : | 163 M^3 |
| 9. | Surface run off of surrounding areas (around 40 Hect) | : | $45\% \text{ of } (400000 \text{ M}^2 \times 40.8 \text{ mm}) = 7344 \text{ M}^3$ |
| 10. | Total likely water to be pumped (7+8+9) | : | 10500 M^3 |

Since the mining operations have been contemplated up to a depth of 30 m from surface level, seepage of ground water level is likely during the mining operations. The detail Hydrogeological study of the area shall be carried out through reputed agencies to examine the adverse effects if

any on intersection of water table due to mining. Sumps will be made in the pit bottom with a holding capacity of around 0.5 Lakh M³ of water. Sufficient No. of pumps shall be provided for dewatering the water collected in the pits during rainy seasons to keep the workings free from water. Pumping capacity to the tune of 150 to 200 liters/sec and of capacity varying from 10 to 20 hp pump sets shall be installed in the pit as per the requirement. Garland drains around the proposed pit shall be provided to divert the surface run off of the surrounding area which will be passed through a series of settling tank/ siltation pond/ check dam and check filters to settle the suspended particles if any. Water pumped out from the pit shall also be channelized to this settling tank and shall also be passed through the siltation pond etc. The settling tank/ siltation pond etc has been proposed to be constructed in the western side of the proposed pit as shown in **Plate-8, 10 & 12**. The water pumped out is normal rainwater and do not contains any toxic or acidic constituents and no treatment is necessary. The stored water shall be utilized for water sprinkling, plantation etc and excess water shall be discharged to nearby fields for cultivation purpose as well as to the natural drainage outside the lease area. Regular maintenance of the garland drains with settling tanks, siltation pond, check dam and check filters shall be done. Periodical analysis of pumped out water shall be done and report of the same shall be maintained.

3.d) Regional and local drainage pattern, annual rain fall, catchment area and likely quantity of rain water to flow through the lease area, arrangement for arresting solid wash off etc.

3.d.1. The general drainage pattern in the district is dendritic to sub-parallel. The Kolab river along with its tributaries, the Potteru, Sileru and Sabari rivers is the most prominent river of the region. The Kolab river originates from the Sinkaram hills and follows a south westerly course after passing over Malkangiri district. The river joins the Godavari river in Khammam district of Andhra Pradesh.

The hydrogeology of the district varies widely depending upon the geological and geomorphic set up and soil characteristics. The major hydrogeological units may be categorized as – Consolidated formations and Unconsolidated to Semi-consolidated formations.

Consolidated formations - Almost the entire district is underlain by the consolidated formations, comprising granites, granite gneiss and its variants, charnockites, Khondalites, Schists, Quartzites, Limestones etc. These formations lack primary porosity and are rendered porous and permeable only when weathered and fractured. The weathered residuum forms the main repositories of groundwater, which occurs under water table conditions and circulates through deeper fractures and fissure.

Unconsolidated Formations - Alluvium is not well developed in the area. Small and local patches occur along the Sabari River which is nearer to Kottameta block. It is generally 2-5 m in depth. Its width varies from Zero to less than a Km. Most part of the banks of Sabari,



Sileru and Potteru Rivers are rocky with no tendency to deposit alluvium on either side. As such these are not useful for groundwater development because of its limited areal extent and thickness.

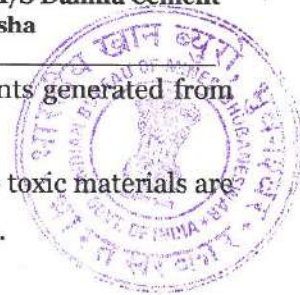
3.d.2. The annual average rainfall during the period 2006 to 2015 was recorded to be 1611.7 mm, maximum being 2236.6 mm in 2006 and minimum 877.1 mm in 2011. About 85% of total rainfall was observed during the months of June to September, July & August being the rainiest. Maximum rainfall in a month recorded was 816.6 mm during August 2006.

3.d.3. During the proposed mining operation, no nallah/stream shall be diverted. Run offs from the mining benches or from OB dumps during the rainy season shall be guided through channels with check collapses in benches. The benches will be designed properly so that there will be no accumulation of rain water and the bench slopes will drain the rain water towards the natural out flow. The rain water and seepage water in the mine pit shall be collected in the sump and shall be pumped out. The surface run off from the surrounding areas shall also be channelized through garland drains and shall be passed through settling tank/ siltation pond/ check dam and check filters to arrest the solid wash offs and suspended particles and the clean water be utilized for water sprinkling, plantation and cultivation purpose. Balance water if any shall be allowed to be discharged to the natural drainage outside the block. Considering the topography of the block area and the existence of Sabari river on the western part of the area, the rain water as well as mine water management plan for arresting the solid wash offs have been proposed by construction of retaining walls, garland drains, settling tanks, siltation ponds, check dams, plantation etc around the proposed mine pit and OB/waste dumps. The year wise protective measures to be undertaken are discussed in Para 8.3.5 (Progressive Mine Closure Plan) and has been shown in the Drainage Plan as well as in waste dump plan (Plate No. 7 & 12).

Following arrangements shall be undertaken for arresting solid wash off:

- Rain water shall be diverted to the settling ponds by constructing garland drains in the lower slopes of the quarry and OB dump.
- The water shall be allowed to properly settle down in the settling tank/ siltation pond/ check dam and check filters and part of the water shall be utilized for plantation and spraying on haul roads. Balance water, free from suspended particles, shall be allowed to flow outside lease area.
- Water from the vehicle workshop will be suitably treated to remove the suspended solids and oil/ grease.

- Septic tanks and soak pits will be provided for disposal of effluents generated from mine office.
- The ground water in the mine area is not likely to be affected as no toxic materials are present in the waste/ mineral rejects to be stacked within the lease.



3.d.4 Engineering details of retaining walls & Garland drains

The average rain fall during last ten years (2006-2015) in Malkangiri district is 1611.7 mm with rainy seasons during June to September months. The historic maximum rain fall recorded in the month of August 2006 is 816.6 mm. Since the proposed waste dumps are located in areas which is gently sloping, maximum flow of water in rainy season will not endanger the retaining walls. However, the following precautionary measures shall be taken while designing the retaining walls and garland drains.

Retaining Walls

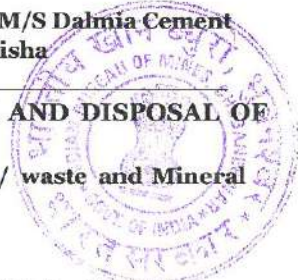
Retaining boulder wall (1.5 m high with 1.0m visible and 1.5 m width) of substantial strength shall be constructed all around the eastern side of waste dump with locally available boulders mixed with sand and cement, to arrest any rolling down of the dump materials. Perforation shall be left at around 10 m intervals to allow for passage of water.

Garland drains

Garland drains of 1.0 m deep and 1.0 m wide shall be constructed all along the eastern side waste dump followed by the retaining wall to prevent any wash off or leaching of dump materials during heavy rains. Side walls and the base shall be pitched with locally available boulders. Joints shall be filled up with cement and sand mixture so that water cannot percolate.

Settling Tank

The garland drain shall be channelized to settling tanks of 8 m long, 5 m width and 1.5 m deep. Side walls and base shall be packed with locally available boulders mixed with cement and sand.



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 Top soil (TS) & its disposal

The overburden soil in the block is mainly of reddish brown sandy and lateritic in nature which is devoid of any nutrient value. Out of this, the top soil with nutrient value might be around 0.2 m to 0.4 m thick which shall be scrapped and stacked separately for future plantation purpose.

(ii) Nature and quality of OB/SB/IB & its disposal

The waste material to be generated during the plan period mainly comprises of overburden phyllitic soil, phyllites etc within the ore zone. Besides these waste materials, around 48,000 CuM of low grade phyllitic limestone with high silica content is likely to be generated. The OB/SB/IB and mineral rejects which shall be removed in the process of development of the quarry during the plan period shall be as below:

| Year | Top soil (CuM) | | Waste (OB/SB/IB) (M ³) | | Low grade high siliceous limestone (M ³) | | | |
|----------------------|--|---------|------------------------------------|-----------|--|---------|----------|---------------|
| | Reuse/spreading | Storage | Back filling | Storage | Back filling | Storage | Blending | Beneficiation |
| 1 st Year | Preparatory work – No mining operation | | | | | | | |
| 2 nd Year | Preparatory work – No mining operation | | | | | | | |
| 3 rd Year | --- | 7,000 | --- | 290,720 | --- | Nil | ---- | ---- |
| 4 th Year | --- | 14,200 | --- | 478,400 | --- | 41,800 | ---- | ---- |
| 5 th Year | --- | 27,200 | --- | 1,108,920 | --- | 6,200 | ---- | ---- |
| Total | ---- | 48,400 | ---- | 1,878,040 | ---- | 48,000 | ---- | ---- |

(b) The proposed dumping ground within the lease area be proved for presence or absence of mineral and be outside the UPL unless simultaneous back filling is proposed or purely temporary dumping for a short period is proposed in mineralized area with technical constraints & justifications:

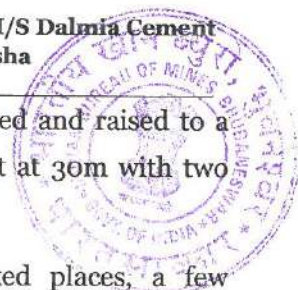
The waste materials to be generated during mining operation shall be dumped in the southern part of the intended mining lease area which is found to be non-mineralized as per the exploration data conducted by the Directorate of Geology (Ref: BH Nos. 0918). It has been planned to keep the waste materials comprising of overburden phyllitic soil, phyllites etc to be generated during the plan period over the earmarked area covering an area of 12.761 Ha. Besides these waste materials, around 48,000 CuM of low grade phyllitic limestone with high silica content is likely to be generated which will be stacked separately at the earmarked place over 0.871 Ha. During the course of mining operation, if sub grade limestone having CaO between 35 to 40% and SiO₂ - 18% (max) is encountered, these materials shall be separately stacked for blending with usable limestone as and when


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Qualified Persons


S.M. Patro

Qualified Persons



required. The proposed dump and stack shall be suitably terraced, sloped and raised to a height of 10m in each step. Maximum height of the dump shall be kept at 30m with two terraces.

Prior to dumping and stacking of waste materials at the earmarked places, a few confirmatory bore holes have been proposed to be drilled in this area during 1st and 2nd years of the plan period to establish non-mineralization of the area.

(c) Manner of disposal of wastes, configuration and sequence of year wise build up of dumps along with proposal for protective measures.

(i) Manner of disposal with configuration & build up of dumps: Dumping is proposed by retreating method maintaining the ultimate dump slope at 20-22° with individual terrace slopes not exceeding 30°. Each terrace is planned to have inward slope with catch drains at the inward side of the terrace. The catch drains of individual terrace is planned to connect to the garland drain outside the periphery of the dump. The proposed dump shall be suitably terraced, sloped and raised to a height of 10m in each step. Maximum height of the dump shall be kept at 30m with two terraces. The total waste materials likely to be generated during the plan period are 1,878,040 CuM. 15% of these waste materials can be utilized for road development and the balance quantity shall be kept at the earmarked place. Beside the wastes, around 48,000 CuM of low grade siliceous limestone which is below the threshold value at present is likely to be generated during the proposed plan period. Top soil to the tune of 48,400 CuM is also likely to be generated. These materials are planned to be kept in the earmarked areas in the south and south eastern part of the lease as shown in Plate No.7 & 11. The year wise build up of dump and mineral reject stack is tabulated below:

| (i/1) Year wise build up of waste dump during the plan period (Ref: Plate No. 7) | | | | | | | |
|--|--|----------------------|----------------------|---------------|---|----------------------|----------------------|
| Section line No. | Sectional areas of dump to be placed (m ²) | | | Influence (m) | Likely volume which can be placed (m ³) | | |
| | 3 rd Year | 4 th Year | 5 th Year | | 3 rd Year | 4 th Year | 5 th Year |
| 9A-9A' | 0 | 0 | 3190 | 100 | 0 | 0 | 319000 |
| 10-10' | 0 | 0 | 2983 | 100 | 0 | 0 | 298300 |
| 10A-10A' | 0 | 1652 | 1392 | 100 | 0 | 165200 | 139200 |
| 11-11' | 1414 | 1487 | 1979 | 100 | 141400 | 148700 | 197900 |
| 11A-11A' | 1509 | 1659 | 1480 | 100 | 150900 | 165900 | 148000 |
| Total waste which can be accommodated (m ³) | | | | | 292300 | 479800 | 1102400 |
| Waste to be dumped after utilizing 15% for road development (m ³) and considering a swell factor of 1.1 to the balance material. | | | | | 273300 | 448613 | 1030744 |

| (i/2) Year wise build up of low grade siliceous Limestone stack during the plan period (Ref: Plate No. 7) | | | | | | | |
|---|--|----------------------|----------------------|---------------|---|----------------------|----------------------|
| Section line No. | Sectional areas of dump to be placed (m ²) | | | Influence (m) | Likely volume which can be placed (m ³) | | |
| | 3 rd Year | 4 th Year | 5 th Year | | 3 rd Year | 4 th Year | 5 th Year |
| 6A-6A' | 0 | 851 | 134 | 50 | 0 | 42550 | 6700 |
| Total waste which can be accommodated (m ³) | | | | | 0 | 42550 | 6700 |
| Material to be stacked | | | | | 0 | 41800 | 6200 |

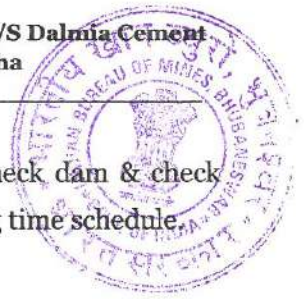
| (1/3) Year wise build up of Top soil stack during the plan period (Ref: Plate No. 7) | | | | | | | |
|--|--|----------------------|----------------------|---------------|---|----------------------|----------------------|
| Section line No. | Sectional areas of dump to be placed (m ²) | | | Influence (m) | Likely volume which can be placed (m ³) | | |
| | 3 rd Year | 4 th Year | 5 th Year | | 3 rd Year | 4 th Year | 5 th Year |
| 7-7' | 148 | 297 | 560 | 50 | 7400 | 14850 | 28000 |
| Total Top soil which can be accommodated (m ³) | | | | | 7400 | 14850 | 28000 |
| Top soil to be stacked | | | | | 7000 | 14200 | 27200 |

(ii) **Protective measures:** The site preparation works such as proper haulage roads, construction of retaining walls and garland drains with settling tanks/ siltation ponds/ check dam & check filters around the proposed dump and stacks shall be constructed well in advance prior to dumping of materials at the proposed sites and shall be maintained regularly. Since both the waste dumping and low grade siliceous limestone stacking areas are adjacent to each other, a boundary wall with some space will be left between the two to prevent mixing of the two types of rocks. The layout of mine workings during the plan period has been shown in **Plate No. 6A to 6C** and dumping proposals have been shown Dump plan with sections i.e. **Plate Nos. 7**. Apart from these, the position of the mine at the end of plan period along with site for waste disposal, ultimate pit limit (UPL) etc is shown in **Plate Nos. 8**.

The low grade siliceous limestone and top soil are planned to be kept at the earmarked area in the south east side of the lease. Stacking of these materials will be of temporary nature. During the course of mining operation, if sub grade limestone having CaO between 35 to 40% and SiO₂ - 18% (max) is encountered, these materials shall be separately stacked for blending with usable limestone as and when required.

Tentative locations of the waste dump, siliceous limestone and top soil stacks along with their area etc are tabulated below

| Particulars | Waste Dump | | | Siliceous Lst Stack | | Top soil stack | | |
|-----------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| | 3 rd year | 4 th year | 5 th year | 4 th year | 5 th year | 3 rd year | 4 th year | 5 th year |
| Co-ordinate | 2026200-2026414N/ 572023-572215E | 2026200-2026555N/ 571893-572222E | 2026200-2026793N/ 571893-572227E | 2027257-2027330N/ 572123-572237E | 2027257-2027330N/ 572109-572237E | 2027175-2027250N/ 572116-572241E | 2027175-2027250N/ 572165-572241E | 2027175-2027250N/ 572118-572241E |
| Av. Length | 224m | 374m | 592m | 110m | 126m | 74m | 76m | 120m |
| Width | 142m | 216m | 226m | 72m | 72m | 54m | 72m | 76m |
| Area | 3.045 Ha | 7.692 Ha | 12.761 Ha | 0.764 Ha | 0.871 Ha | 0.396 Ha | 0.541 Ha | 0.888 Ha |
| Top RL | 210 m | 210 m | 226 m | 210 m | 210 m | 202 m | 207 m | 210 m |
| No. of Terraces | One | One | Two | --- | --- | --- | --- | --- |



Retaining wall, Garland drain and Settling Tank/ siltation pond with check dam & check filters shall be constructed around the dump and stack as per the following time schedule.

| Period | Retaining wall length (m)* | | Garland drain length (m) ** | | Settling tank *** | Siltation Pond *** | Check Dam | Check filter |
|----------------------|----------------------------|-----------------------|-----------------------------|-----------------------|-------------------|--------------------|-------------------|-------------------|
| | Around waste dump | Around LG / TS stacks | Around waste dump | Around LG / TS stacks | For Dump & stacks | For Dump & stacks | For Dump & stacks | For Dump & stacks |
| 3 rd Year | 338 | 152 | 776 | 506 | 3 nos (8m x 5m) | 1 nos. (15m x 8m) | 1 nos. (15m x 8m) | 1 nos. (8m x 5m) |
| 4 th Year | 312 | 260 | 146 | 183 | 1 nos (8m x 5m) | Maintenance | | |
| 5 th Year | 410 | 78 | 406 | 74 | 1 nos (8m x 5m) | Maintenance | | |

- * Width & height of retaining wall to be kept at 1.5m & 1.5m respectively.
- ** Width and depth of garland drain to be kept at 1.0m & 1.0m respectively.
- *** Depth of settling tank & siltation ponds to be kept at 1.5m & 2.5m respectively.

Terraces shall be provided with inward slope so that water can be passed through, without affecting the walls of the waste dump. Each terrace shall have prevision of berms at the outer end to reduce gully formation due to rainwater wash offs. Dump bench slopes shall be vegetated with grass for binding soil and to arrest erosion.

5.0 USE OF MINERAL AND MINERAL REJECT:

5.a) Requirement of end use industry specifically in terms of physical and chemical composition:

Kottameta Limestone block has been allotted to the preferred bidder M/S Dalmia Cement (Bharat) Limited under Rule 9(4)(b)(iii) of the Mineral (Auction) Rules, 2015 for grant of a mining lease after fulfilling all the conditions. Though there was no condition regarding end use of the limestone in the auction documents, the preferred bidder has a proposal to set up a green field cement manufacturing project of 1.6 million tonnes per annum capacity based on the resources of this block. The preferred bidder shall also have the option to sell a part of its production to other cement plants and end use industries as and when required. The proposed cement plant of the preferred bidder shall be located at nearby village within a distance of around 4-5 km from the limestone block. The limestone requirement by the proposed plant shall be met from this intended lease. Necessary care shall be taken to judiciously blend the high and medium grade materials with that of low grade siliceous limestone keeping in view of conservation of minerals.

The proposed Cement plant of the preferred bidder DCBL shall manufacture a combination of Portland Slag Cement (PSC), Portland Pozzolona Cement (PPC) and Ordinary Portland Cement (OPC). The end use grade of limestone for the Cement plant shall be as below:

| | |
|------------------|------------------|
| CaO | 45.00% \pm 0.2 |
| MgO | max 4.00 % |
| SiO ₂ | 11.5% (maximum) |
| Total Alkali | 0.60% (max.) |
| Size | < 75 mm |

5.b) Requirement of intermediate industries involved in up gradation of mineral before its end use:

No proposal for any beneficiations of limestone is contemplated except the crusher to be used for crushing and reduction of ROM to output size 75mm. A crusher of 1000 TPH capacity is proposed to be installed within the intended lease area. The crushed materials from 1000 TPH crusher shall be dispatched to the factory and to the other consumers by road by road transport. In future, the transportation of crushed limestone to the plant can be done by cross country belt conveyor (CCBC) in three shift basis.

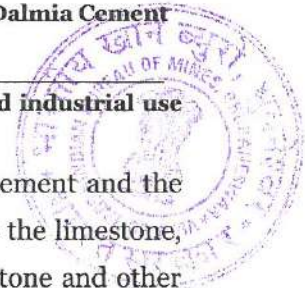


P.S. Acharya



S.M. Patro

Qualified Persons



5.c) Requirement of other industries, captive consumption, export, associated industrial use etc.:

The limestone raised from the mine shall be primarily for manufacture of cement and the specifications required for the plant are already discussed in para 5.a. Beside the limestone, the lessee may also find out the avenues to sell the low grade siliceous limestone and other waste rocks to outside agencies for use in civil construction and road building purposes after size reduction and classification of such rejected compact waste rocks in the interest of mineral conservation and utilization.

5.d) Physical and chemical specifications stipulated by buyers:

Not Applicable at present. This can be ascertained after the mine is developed and buyers for the materials are established.

5.e) Processes adopted to upgrade the ROM to suit the user requirements:

Different types of limestone bands occur within the block. The analysis of bore hole samples indicates that there are two distinct bands of cement grade limestone i.e. high grade marbilitic limestone (>46% CaO) and intermediate grade limestone (40-46% CaO) which can be blended for manufacture of cement.

As per the threshold value notified by IBM, the limestone analyzing 35 - 40% CaO and with SiO₂ content 18% (max) can be termed as "Blendable grade" or "mineral rejects". The assay logs of the composite samples indicate that such limestone with 35-40% CaO has SiO₂ content ranging between 18% to around 35%. Due to this, the quantity of such limestone has not been separately assessed. During the course of mining operation, attempts will be made to mine and stack the blendable grade mineral rejects with 35-40% CaO and less than 18% SiO₂ separately.

P.S. Acharya

S.M. Patro

Qualified Persons

6.0 PROCESSING OF ROM AND MINERAL REJECT:

6.a) Nature of Processing / beneficiation of the ROM or mineral reject:

The preferred bidder has no proposal for any beneficiations of ROM and mineral rejects except proper blending and processing the ROM in the crusher for crushing and reduction of ROM to output size 75mm. Brief description of the proposed 1000 TPH crusher are described below:

6.b) Material balance chart with a flow sheet of the processing procedure indicating feed, product, recovery and grade at each stage of processing:

The detail design of the crusher shall be finalized after physical tests on the bulk samples of limestone are carried out.

6.c) Disposal method for tailings or reject from the processing plant:

Since the processing of ROM ore involves only size reduction, no tailing or rejects are contemplated in the process.

6.d) Quantity and quality of tailings/ rejects to be disposed, size and capacity of tailing pond, toxic effect of tailings and process adopted to neutralize such effects before disposal etc.:

Not applicable since no tailings or rejects are likely to be generated.

6.e) Quantity and type of chemicals if any to be used in the processing plant:

No chemicals are to be used in the process.

6.f) Specify quantity and type of chemicals to be stored on site/ plant:

Not applicable as discussed above.

6.g) Quantity (CuM) of water required for mining and processing and sources of supply of water, disposal of water and extent of recycling:

Estimated water requirement for the mining project is 60 m³/d on an average level and 83 m³/d as peak requirement in extreme summer. Drinking water requirement is 10 m³/d on average level and 15 m³/d as peak requirement. Water requirement for the mining project shall be drawn by digging few bore wells and from the nearby water sources after obtaining necessary permission from the authorities. Water requirement for the total mining project is shown below:

| Activity | Avg. demand (m ³) | Peak demand (m ³) |
|--|----------------------------------|----------------------------------|
| 1. Dust suppression on haul roads and OB dumps | 30 | 40 |
| 2. Plantation | 15 | 20 |
| 3. Washing of machineries | 5 | 8 |
| 4. Drinking water | 10 | 15 |
| Total (Industrial) | 60 | 83 |

Maximum water requirement is mainly for dust suppression. Practically the water sprayed on the roads shall ultimately recharge the area. The proposed consumption of water will not have any adverse effect on water regime in comparison to the water recharging in the area.



7.0 OTHER:

a) Site services

The following site services and infrastructure facilities shall be created.

i) **Work shop:** A small work shop shall be established within the block at the earmarked place for repairs and maintenance of earth moving equipments. Major repairs will be carried out in nearby town at Malkangiri or at Jeypore.

ii) Administrative office/ Stores:

A store with facility for storage of machinery spares and other general stores items and an administrative office shall be provided in an advantageous location considering different aspects involved.

iii) Magazine:

A magazine for storage of explosives shall be provided within the intended lease area after obtaining necessary license from the authorities.

iv) Other site services:

Other site services such as rest shed, blasting shed, drinking water and first-aid center etc shall be established in the intended lease area.

(b) Employment Potential

| | | | |
|--------------|--|--|-----------|
| 1 | Manager | 1st class/second class Mine Manager's Certificate of Competency. | 1 |
| 2 | Assistant Manager | Second class Mine Manager's Certificate of Competency. | 2 |
| 3 | Geologist | M.S.C in geology. (as per Rule 55 of MCDR 2017) | 2 |
| 4 | Mining Engineer | B. E. in Mining Engineering (as per Rule 55 of MCDR 2017) | 2 |
| 5 | Mechanical Engineer | B. E. in Mechanical Engineering (as per Rule) | 1 |
| 6 | Foreman | Forman Certificate of Competency. | 2 |
| 7 | Surveyor | Competency certificate holder | 1 |
| 8 | Drill/ Compressor Operator | Literate & Experienced | 4 |
| 9 | Dozer/ rock breaker Operator | Literate & Experienced | 4 |
| 10 | Excavator Operator | Literate & Experienced with valid licence | 7 |
| 11 | Tipper Operator | Literate & Experienced with valid licence | 35 |
| 12 | Mining Mate | Mate's Certificate of Competency | 4 |
| 13 | Blaster | Blaster's Certificate of Competency | 2 |
| 14 | Administrative / technical supervisory staff | Graduates with computer knowledge | 5 |
| 15 | LVD/MVD | Literate & License Holder | 5 |
| Total | | | 77 |

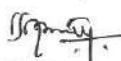


(b) Requirement of laborers:

The mine is under 'A' FM category. Requirement of workers is mainly for ancillary activities.

(c) Safety measures taken for miner's health

All workers shall be provided with safety equipments such as helmet, shoes, goggles, rope etc. It will be ensured at the mines entry gate / time office that workers carry those materials with them. Drilling workers in addition to above shall be provided with nose mask, ear plug etc with special type of shoes. Vocational training shall be given to all workers in batches at regular interval to freshen their mind on their own responsibility during working in mines. Detergents will be supplied with bananas and Molasses to the drilling crew. Health check up shall be done to all workers once in a year. Nearby hospital facility shall be provided to workers and their dependents on necessity. Under emergencies they will be shifted to specialized hospitals for treatment. Medicines shall be provided as per the prescription of the physician. Pure drinking water shall be provided to all workers and their dependents. For this tube wells are to be sunk in the nearby villages.


P.S. Acharya


S.M. Patro
Qualified Persons



8.0 PROGRESSIVE MINE CLOSURE PLAN UNDER RULE 23 OF MCDR 2017

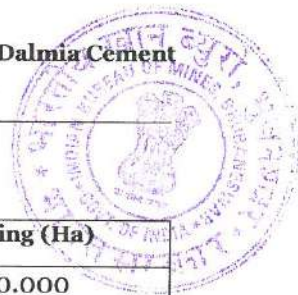
8.1 Environment Base line information

(i) The study of land environment forms the prime study since the changes brought in over this are permanent in nature and make visual effects which are easy to identify and recollect. For collecting the information over the land under reference, published baseline data, detailed study of topographical maps and village maps available over the surrounding area in the precincts of the mine and reconnaissance survey was undertaken. Information obtained from bore hole data were also correlated wherever necessary. From the above detailed studies, the following lead features have been recorded about the lease hold area in reference.

(ii) The intending mining lease area is roughly a strip of land measuring approximately 4262 m in length and 2442 m in width. The area is having slightly undulating to plain topography. However, at several places flat topped low mounds and narrow discontinuous ridges break the monotony. The southern edge of the area is represented by dissected hills. The intended lease area comprises of 462.247 Ha forest land (jungle & gramya jungle), 190.058 Ha Govt. waste land and 148.866 Ha tenanted ST land.

(iii) There are a number of scattered reserve forest areas within 5 Km radius (buffer zone) of the lease distributed in all directions. These are mainly Sukma RF (3.5 Km North west of the block), Kosabandar RF (2.85 Km north east of the block), Syadiman RF (4.8 Km south west of the block). Mixed forests are sparse mostly beneath the hilly reserved forests on moderate slopes and also on smaller hillocks. Villages are located all over the study area mostly on plain (or gently sloping) land. The Kottameta block is located in the central gently sloping area. General topography of the block represents a plain undulating terrain covered with reddish brown alluvium soil and laterite. The land area is gently sloping from East to West direction. The leasehold area has small mounds only on south central part with highest RL at 218 mrl and rest of the area on western part is flat or rather gently sloping.

- Mostly the mounds are barren with scanty vegetation.
- The lands in plains are gently sloping and mostly agricultural, raising one crop during rainy season. No large scale farming is being practiced.
- After the mining starts in the block, some growth of infrastructural facilities shall come to existence.



8.1.1 Existing land use pattern can be tabulated as below:

| Description | Existing (Ha) |
|---|---------------|
| Area under mining | 0.000 |
| Storage of topsoil | 0.000 |
| Overburden dumping including Retaining wall, garland drain etc. | 0.000 |
| Sub grade stacking/ Mineral storage | 0.000 |
| Infrastructure (Workshop, Admn. Building, magazine etc) | 0.000 |
| Roads | 2.584 |
| Narrow Gauge Transmission (NGT) | 0.000 |
| Tailing Pond | 0.000 |
| Effluent Treatment Plant | 0.000 |
| Mineral Separation Plant- Crushing Plant | 0.000 |
| Township area | 0.000 |
| Others (electrical transmission line) | 0.000 |
| Total | 2.584 |

8.1.2 Water regime, quality of air, ambient noise level, flora, climatic conditions

(a) Water regime

(i) The general drainage pattern in the district is dendritic to sub-parallel. The Kolab river along with its tributaries, the Potteru, Sileru and Sabari rivers is the most prominent river of the region. The Kolab river originates from the Sinkaram hills and follows a south westerly course after passing over Malkangiri district. The river joins the Godavari river in Khammam district of Andhra Pradesh.

The area under reference i.e. Kottameta block is devoid of any perennial or seasonal water course. Some small stream of rain water flows during the time of rain only. The drainage system of the area is controlled by Sabari River flowing to the west of the block. However ephemeral streams flowing in the southern and eastern part of the area controls the drainage. A study of ground water condition of Malkangiri district by the Central Ground Water Board, Bhubaneswar in 2013 indicates that the general depth to water level in the district ranges from 0.57 to 10.97 m bgl in the month of May-June while it is 0.00 to 8.19 m bgl in the months of December-January. It has been observed from the exploratory drilling in the block area that the ground water level in bore holes varies from 2.20m bgl (BH 1114) to around 37.20m bgl (BH 0610).

(ii) From the above, it can be inferred that the ground water seepage in the proposed pit is anticipated during mining operations.

(iii) Both the surface and seepage water to be accumulated in the mine pits shall be discharged through pumps which will be installed inside the working pit. The pumped out water shall be passed through a settling tank/ siltation pond to nearby cultivable land through long discharge drainage system.

(b) Air quality

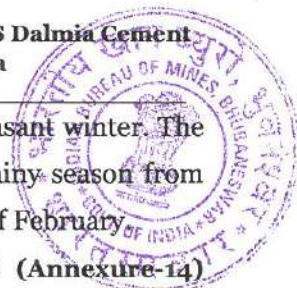
There is no dearth of fresh and free air in this region because of very scanty population, cattle breed etc. After the start of the mines, air pollution is likely which is to be controlled by measures to be taken to suppress dust in the activity area. Air pollution is normally defined as the presence in the atmosphere of substances or conditions which adversely affect living organism or habitats. The condition of air is normally disturbed due to gaseous emanations from machineries, dust generated during drilling, blasting, movement of vehicles, loading and crushing operations in the mines. Effective control measures are to be taken to minimize the pollution due to this effect. Regular air monitoring shall be carried out and all efforts shall be taken to keep the level of air pollution in the area below the permissible limits (National Ambient Air Quality norms).

(c) Ambient noise level

The area is free from heavy traffic and population of plying of other motor vehicles is limited. As such noise level due to this does not score much. Diesel powered machineries which are major source of noise in open cast environment shall be properly maintained as per maintenance schedule to prevent undesirable noise. Plantation around office building, nearby villages and mining area shall be done to reduce the ambient noise level to the minimum extent. Regular ambient noise level monitoring shall be carried out at the noise generating places, the locations of which are shown in Plate-10 & Plate-1.

(d) Climatic condition

The district has a subtropical climate. South west monsoon is the principal source of rainfall. Rainfall pattern is uneven and erratic. The average annual rainfall gradually increases from South Western to North Eastern parts of the district. The average annual rainfall varies from 874.1 mm to 2236.6 mm. The agricultural definition of drought takes into account the negative departure of seasonal rainfall from the mean seasonal rainfall. A perusal of the frequency of occurrence of drought indicates that mild to normal drought condition prevails in Malkangiri District.



The climate of the district is subtropical with hot and dry summer and pleasant winter. The summer season extends from March to middle of June followed by the rainy season from June to September. The winter season extends from November till the end of February. Meteorological data of 2016 collected for Malkangiri district by IMD (Annexure-14)

indicates that the maximum temperature rises up to 42.4⁰ C during April. In the summer months of April and May, hot winds from the west are generally experienced in the afternoon. December is the coldest month with lowest temperature during winter being 15.8⁰C. Monsoon generally lasts from the end of May to October. Occasional showers are received in the month of April, November and December. The humidity is quite high during the rainy season. December and January are the coldest months of the year, 2016 when the mercury falls to about 15.8⁰ C.

Relative Humidity

The annual relative humidity at 0830 hours varies from 69%(May) to 91% (September) while at 1730 hours, annual relative humidity varies from 38% (April) to 86%(September) (Annexure-14).

Rainfall

The monsoon breaks over the area from the mid of June and continues till the end of September. The maximum rainfall of 816.6 mm in a month was recorded in August, 2006. The average rain-fall of the region is about 1612 mm. The monthly rainfall (mm) of Malkangiri district during last 10 years as recorded by IMD is given below:

| Y/M | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec | TOTAL |
|------|-----|------|------|-------|-------|-------|-------|-------|-------|-------|-------|------|--------|
| 2006 | 0.0 | 0.0 | 4.4 | 94.0 | 76.5 | 103.6 | 512.3 | 816.6 | 443.2 | 5.4 | 180.6 | 0.0 | 2236.6 |
| 2007 | 0.0 | 0.0 | 0.0 | 48.0 | 119.0 | 301.4 | 209.1 | 348.0 | 356.4 | 397.7 | 0.0 | 0.0 | 1779.6 |
| 2008 | 0.0 | 19.0 | 64.0 | 9.0 | 22.3 | 160.1 | 441.2 | 232.6 | 123.4 | 52.4 | 0.0 | 0.0 | 1124.0 |
| 2009 | 0.0 | 0.0 | 0.2 | 0.8 | 15.6 | 44.6 | 409.6 | 274.0 | 132.2 | 31.6 | 45.4 | 0.0 | 954.0 |
| 2010 | 9.9 | 2.0 | 0.0 | 28.1 | 55.0 | 239.7 | 717.0 | 472.7 | 179.4 | 98.0 | 72.1 | 38.9 | 1912.8 |
| 2011 | 0.0 | 0.0 | 0.0 | 41.0 | 7.2 | 116.6 | 178.8 | 274.2 | 238.3 | 18.0 | 0.0 | 0.0 | 874.1 |
| 2012 | 3.0 | 0.0 | 0.0 | 109.5 | 35.2 | 168.7 | 495.8 | 611.5 | 417.1 | 109.8 | 105.9 | 0.0 | 2056.5 |
| 2013 | 0.0 | 14.8 | 0.0 | 75.0 | 69.2 | 295.9 | 529.0 | 322.6 | 266.9 | 168.5 | 10.0 | 0.0 | 1751.9 |
| 2014 | 0.0 | 2.6 | 13.2 | 15.8 | 76.4 | 75.2 | 499.8 | 373.8 | 344.4 | 229.8 | 25.6 | 0.0 | 1656.6 |
| 2015 | 0.4 | 2.5 | 11.1 | 74.7 | 40.1 | 591.6 | 196.6 | 405.0 | 384.8 | 38.8 | 24.7 | 0.6 | 1770.9 |
| Av. | 1.3 | 4.1 | 9.3 | 49.6 | 51.7 | 209.7 | 418.9 | 413.1 | 288.6 | 115.0 | 46.4 | 4.0 | 1611.7 |

Wind Speed

The annual mean wind speed varied from 5.3 km/hr (December) to 9.3 km/hr (June).

Wind Direction

The predominant wind directions in the study region are from N, NE from October to March and from S, SE, SW, W from April to September at 830 hours. While at 1730 hours, the predominant wind direction were from S, SW, W from January to September while from

Mining Plan with PMCP of Kottameta Limestone Block of Preferred bidder M/S Dalmia Cement (Bharat) Limited over 801.171 Ha in Malkangiri District, Odisha

N, NE, SE, SW from October to December

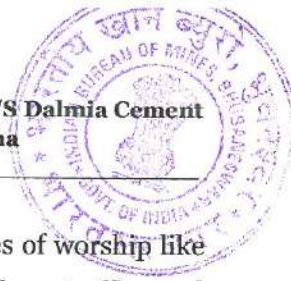
8.1.3 Human settlements

Observations have been made with in a region of 5 Kms around the area under reference and the census data of 2011 indicates the followings.

- ✓ No village or habitat exists within the intended lease area. Katameta is the nearest village lying in the eastern side of the block near BP-4. There are about 18 villages within the surrounding 5 Km buffer zone of the block, out of which 9 are in Odisha and 9 are in neighboring Chhattisgarh State. Sukma village in Chhattisgarh district is the biggest village situated at a distance of around 5 km north of the limestone block.
- ✓ The total population is about 61738 people within the surrounding 5 Kms area out of which the population in nearby Kotamateru village is 709.
- ✓ Majority of the population of these villages are observed to be workers engaged in the periodic cultivation and agricultural workers.
- ✓ The villagers are mostly scheduled tribes (83.37%) and the literacy is low at 29.30%.
- ✓ Male to female ratio is 100:104.92.

The census data of 2011 for the surrounding villages within 5 km radius are summarized as below:

| State | Name | Total Population | Male | Female | S.C. | S.T. | Literates | Total Worker | Main Cultivator | Main Agri. Laborers | Main Other Worker |
|---------------------------------------|--------------------------|------------------|--------------|--------------|-------------|--------------|--------------|--------------|-----------------|---------------------|-------------------|
| Odisha | Akharpali | 430 | 202 | 228 | 0 | 426 | 52 | 258 | 0 | 0 | 0 |
| | Kotamateru | 709 | 323 | 386 | 0 | 703 | 74 | 326 | 0 | 0 | 0 |
| | Koyagiri | 411 | 205 | 206 | 0 | 411 | 82 | 233 | 199 | 0 | 4 |
| | Matapaka | 845 | 422 | 423 | 4 | 839 | 230 | 481 | 94 | 11 | 15 |
| | Nandiwada | 555 | 277 | 278 | 0 | 555 | 128 | 218 | 126 | 0 | 0 |
| | Dharmapalli (Durumaguda) | 153 | 79 | 74 | 0 | 153 | 46 | 110 | 43 | 0 | 1 |
| | Pujariguda | 133 | 67 | 66 | 0 | 133 | 41 | 81 | 39 | 17 | 1 |
| | Pujariguda | 368 | 178 | 190 | 0 | 5 | 162 | 213 | 77 | 7 | 3 |
| | Uskalbag | 576 | 272 | 304 | 9 | 563 | 187 | 306 | 285 | 0 | 11 |
| C'Garh | Borguda | 624 | 296 | 328 | 7 | 603 | 183 | 419 | 211 | 12 | 12 |
| | Gongla | 906 | 424 | 482 | 0 | 268 | 375 | 506 | 89 | 17 | 39 |
| | Kosa Bandar | 437 | 204 | 233 | 0 | 436 | 94 | 304 | 187 | 0 | 3 |
| | Kudukras | 313 | 171 | 142 | 0 | 287 | 101 | 149 | 77 | 1 | 1 |
| | Kumharras | 1309 | 612 | 697 | 0 | 732 | 495 | 758 | 273 | 16 | 51 |
| | Mangipal | 343 | 168 | 175 | 0 | 334 | 46 | 193 | 4 | 73 | 2 |
| | Permaras | 567 | 271 | 296 | 12 | 498 | 267 | 344 | 49 | 14 | 22 |
| | Pushpali | 2094 | 1081 | 1013 | 282 | 1760 | 780 | 1077 | 536 | 42 | 17 |
| | SUKMA | 50965 | 24745 | 26220 | 303 | 42964 | 14320 | 29890 | 12020 | 2215 | 1180 |
| Total | | 61738 | 29997 | 31741 | 617 | 51670 | 17663 | 35866 | 14309 | 2425 | 1362 |
| Percentage to total population | | | 48.59 | 51.41 | 1.00 | 83.69 | 28.61 | 58.09 | 23.18 | 3.93 | 2.21 |



8.1.4 Public buildings, places of worship and monuments

No public buildings are existing within the intended lease area. Few places of worship like church and temple exist in some of the villages in the buffer zone. Hospital, post office and high school facilities are there at Sukma village in Chhattisgarh which is around 5 Km from the block.

8.1.5 Indicate any sanctuary is located in the vicinity of leasehold

Natural park, wildlife sanctuary, forest, national monument or tourist interest do not exist in the lease area as well as in buffer zone also.

8.2 Impact Assessment

Advanced technological innovations and improvements have been brought in the exploration and exploitation of minerals in quick successions, on need base. However, the improve methods made available for the environmental preservation is rather slow. The environmental impact is defined as an alteration of environmental conditions or creation of environmental parameters those may upgrade or degrade the environment especially the land, water and air region of the area. The other connected aspects like noise, vibration and impacts on socio- economic considerations have also to be studied. A comprehensive analysis of the different environmental impacts due to mining is to be understood well. The physical, chemical and bio-logical effects and their influences on national, social, cultural and aesthetic domains of the region should be considered. A careful evaluation of the impact will not only help in preventing unnecessary/unwanted damage to eco system but will also lead to planning and management of adopting proper environment restoration programmes.

8.2.1 Land area indicating the area likely to be degraded due to quarrying, dumping, roads, workshop, processing plant etc.

| Sl. No. | Description | Existing (Ha) | End of Plan Period (Ha) |
|------------------|--|----------------|-------------------------|
| 1. | Area under mining | 0.000 | 16.303 |
| 2. | Storage of topsoil | 0.000 | 0.888 |
| 3. | Waste dump site including Retaining wall, garland drain etc. | 0.000 | 13.632 |
| 4. | Mineral storage | 0.000 | 0.659 |
| 5. | Infrastructure (Workshop, Admn. Building, magazine etc) | 0.000 | 3.243 |
| 6. | Roads | 2.584 | 4.711 |
| 7. | Railways | 0.000 | 0.000 |
| 8. | Tailing Pond | 0.000 | 0.000 |
| 9. | Effluent Treatment Plant | 0.000 | 0.000 |
| 10. | Mineral Separation Plant- Crushing Plant | 0.000 | 1.049 |
| 11. | Township area | 0.000 | 0.000 |
| 12. | Others | 0.000 | 0.000 |
| Sub Total | | 2.584 | 40.485 |
| 13. | Safety zone/ Green belt for magazine etc | 9.348 | 55.625 |
| 14. | Undisturbed land | 789.239 | 705.061 |
| Total | | 801.171 | 801.171 |

(a) Air quality

Available meteorological data has been collected with respect to wind speed, wind direction, humidity, rainfall, temperature etc for the district. It has been found that the temperature of the entire area varied from 15.8° to 44°C during the year 2016. The humidity is quite high during the rainy season. The predominant wind direction recorded is from South- West. Regular environmental monitoring shall be conducted to assess / monitor air quality, noise level and soil quality. Parameters to be considered are SO_x, No_x, SPM and RSPM. The tentative locations within the core zone and buffer zone for air quality monitoring are as below:

| Stations | | | Location |
|----------|-------|------|---|
| Air | Noise | Soil | |
| A1 | N1 | S1 | Middle of the lease area near mine workings |
| A2 | N2 | S2 | Near Kotamater village |
| A3 | N3 | S3 | Near Mattapaka village |
| A4 | N4 | S4 | Near Nandivera village |
| A5 | N5 | S5 | Near Borguda village |
| A6 | N6 | S6 | Near Kudukras village |

* The tentative locations are subject to approval by MoEF in the TOR to be obtained by the preferred bidder in their application for environmental clearance.

(b) Water quality

(i) Regular environmental monitoring of water quality shall be conducted to assess / monitor water quality as per guide lines prescribed by CPCB/MoEF.

(ii) Mitigation Measures

The solid waste shall be stacked over the ground with appropriate slope management and the said area shall be protected with retaining wall and garland drain for flow of runoff water and contaminations thereby. Further, the stacking of wastes on dump is proposed to be done in a more scientific manner maintaining the chosen height. A retaining wall on eastern side of the dumping and stacking area shall be constructed to arrest surface runoff from the upward catchments and channelize the rainwater. With this, not only the runoff impacts are minimized, but also assist in harvesting the runoff for use in agricultural and plantation purpose. Garland drain shall be built in the periphery of dump and pit area. All the internal drains of the mining area shall be connected to the garland drain. Other area shall also be made with perfect slope to allow free flowing of rain water to garland drain. The total surface run off shall be collected in settling tanks of adequate size as mentioned above.

(iii) To assess the water quality, water samples are proposed to be collected from selected and fixed locations of core and buffer zone. Water samples are to be analyzed for physio-chemical and biological characteristics. Values of physio-chemical parameters for surface and ground water should be observed and should be within the stipulated standards. Regular environmental monitoring of surface and ground water shall be conducted to assess / monitor water quality as per guide lines. Tentative Selected location areas are as below:

| Station | Location * |
|---------|---|
| SW1 | Upstream of Sabari river near lease boundary. |
| SW2 | Downstream of Sabari river near lease boundary. |
| S/GW1 | Middle of the lease area |
| S/GW2 | Near Kottamater village |
| S/GW3 | Near Mattapaka village |
| S/GW4 | Near Nandivera village |
| S/GW5 | Near Borguda village |
| S/GW6 | Near Kudukras village |

* The tentative locations are subject to approval by MoEF in the TOR to be obtained by the preferred bidder in their application for environmental clearance.

(c) Noise Levels

Ambient noise monitoring shall be carried out in the study region at core & buffer zone locations corresponding to AAQ monitoring locations. The noise levels (Leq) at the located / fixed points in mine (core) and buffer zone shall be conducted as prescribed by IBM / CPCB for day & night time. Regular monitoring to be conducted to assess / monitor noise level as per guide lines and in case it is above prescribed limit, mitigation measures are to be taken up.

(d) Vibration levels (due to blasting)

Blasting for loosening the hard material in the mines shall be done in a very low scale. Nonel method shall be adopted to control vibration to zero level.

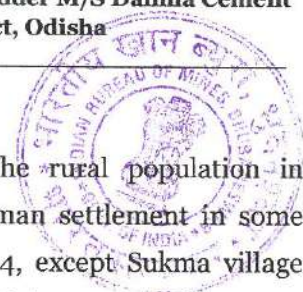
(e) Acid mine drainage - Not applicable

(f) Surface subsidence

Areas susceptible to natural hazard which could cause the project to present environmental problems are earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions. Benches shall be regularized keeping the width of bench more than height.

(g) Socio economics

The socio-economic profile of the study area has been presented based on secondary data available from various agencies such as Hand Books of Census 2001.



Population

Population density of buffer zone is about 449.15/sq. km. The rural population in surrounding region of the lease area are widely scattered in human settlement in some eighteen villages of different size range of population 133 – 2094, except Sukma village where the total population recorded is 50965. The inhabitants of the area are mostly of scheduled tribe category.

Literacy rate

The literacy rate in the villages of the buffer zones area is approximately 28.61%.

Sex Ratio

The population of surrounding villages in buffer zone is around 61,738 with male : female ratio at around 1 : 1.06 around the lease area.

Occupational Pattern

The distribution of workers is given on the basis of Census 2011. The workers in the study area comprises of workers (58.09%), cultivators (23.18%) and agricultural laborers (3.93%)

Infrastructural Facilities

The study area is having well developed facilities for primary educational and health care, drinking water, post and telegraph offices, approach roads and irrigation etc.

Education

A few of the villages surveyed during study period have primary and middle school. The villages which have no High schools are having this facility within 5 to 10 km from the intended lease area. Based on the survey made in the study area, it has been found that the educational facilities have been gathering strength gradually.

Medical and Public Health

Medical facilities available within the study area include dispensaries, hospitals, Health centers, Public health sub-centers etc. Full fledged hospital facilities are available in Sukma village in Chhattisgarh district at a distance of around 5 Km from the intended lease area.

Drinking Water

Drinking water is available in all the villages. The main source of drinking water is through hand pump, well and tank water.

Communications

Road transport is the main communication linkage in the study area. About 55% villages in the study area have access to bus service.

Road Network

Transport and Communication facilities are considered as an administrative necessity as well as a public convenience. However, a well-knit transportation system is a pre-requisite for the social and economic development of any district. The linking of one place with the other



by road is very essential to provide good transport system. The study area has good road network. About 70% of the villages have pucca approach road.

Power and Electricity

Almost 40% villages in the study area have power supply.

Cropping Pattern

Agriculture is the main occupations of the vast majority of the population. However because of forest cover and rugged terrain conditions of the district, agriculture is by and large confined to Kharif Season. Rabi cultivation is practiced at places, where irrigation facilities are available. No uniform cropping pattern seems to be followed in the district. Shifting or 'Podu' cultivation is practiced on high hill slopes. Paddy is the main crop sown during the Kharif seasons. Apart from paddy, other important Kharif crops are Maize, Ragi, millet and different type of pulses.

(g) Historical monuments

No Natural Park, wildlife sanctuary, national monument or tourist interest exist in the lease area as well as in buffer zone. Hence, there will be no negative impact on this account is there.

(h) Acid mine drainage : Not applicable as this is a opencast mines

(i) Surface subsidence : Not applicable as this is a opencast mines

8.3 Progressive reclamation Plan

To maintain ecological balance and to check harmful effects due to mining and allied activities at Kottameta limestone block, environmental control measures shall be integrated into the process of mine planning. Many of the areas of environmental management planning require multidisciplinary approach. Therefore the measures envisaged in the report are to be regarded as guidelines and depending upon the continuing advice to be taken from experts of relevant fields like forestry, soil chemistry, ground water etc. The suggested schemes are to be detailed and if necessary to be modified from time to time to meet statutory requirements. The changes warranted as per site specific conditions are to be accounted for, during actual implementation. Further, in the light of experience likely to be gained during the years of operation, proposed schemes may require periodic modification/ updating. In this chapter all technical, biological and socio-economic control measures have been envisaged and these pertain to as per following paragraph on different heads.

8.3.1 Mined-Out Land

(i) The total quantity of waste from the proposed pit during the plan period is estimated to be 1,878.040 CuM while that of low grade siliceous limestone is estimated to be 48,000 CuM. The waste materials are proposed to be stored at the

earmarked area in the southern side of the intended lease area over an area of 12.761 Ha since the area has been proved to be non-mineralized. The low grade siliceous limestone is also proposed to be stacked over the earmarked place over 0.871 Ha in the south eastern part of the lease area.

During the present plan period of five years, no part of the block where mining will be commenced shall touch ultimate pit limit. Reclamation of the pit by back filling can only be started during next review periods after parts of the mining area touches the UPL. By the end of conceptual period, an area over 24.322 Ha shall be reclaimed with the waste materials up to 170 mRL. The balance quarry area shall be reclaimed by proper fencing of the entire mined out area. Precautionary measures like retaining wall, garland drains etc shall be made at the base of the quarry/ dump to check and arrest flow of loose sediments with surface run offs. Terraces at every 10 m height shall be provided with inward slope so that water can be passed through, without affecting the walls of the waste dump. Each terrace shall have provision of berms at the outer end to reduce gully formation due to rainwater wash offs. Dump bench slopes shall be vegetated with grass for binding soil and to arrest erosion.

Retaining walls and garland drains with settling tanks/ siltation ponds/ check dam & check filters shall be maintained regularly. Since both the waste dumping and low grade siliceous limestone stacking areas are adjacent to each other, a boundary wall with some space will be left between the two to prevent mixing of the two types of rocks.

The low grade siliceous limestone and top soil are planned to be kept at the earmarked area in the south east side of the lease. Stacking of these materials will be of temporary nature and part of the materials shall be sorted out and blended with usable limestone as and when required, if found suitable.

Retaining wall, Garland drain and Settling Tank/ siltation pond with check dam & check filters shall be constructed around the dump and stack as per the following time schedule.

| Period | Retaining wall length (m)* | | | Garland drain length (m) ** | | | Settling tank *** | | Siltation Pond *** | |
|----------------------|----------------------------|-------------------|-----------------------|-----------------------------|-------------------|-----------------------|---------------------|---------------------|----------------------|----------------------|
| | Around working pit | Around waste dump | Around LG / TS stacks | Around working pit | Around waste dump | Around LG / TS stacks | For working pit | For Dump & stacks | For working pit | For Dump & stacks |
| 3 rd Year | --- | 338 | 152 | --- | 776 | 506 | --- | 3 nos 8m x 5m | --- | 1 nos. (15m x 8m) |
| 4 th Year | --- | 312 | 260 | --- | 146 | 183 | --- | 1 nos (8m x 5m) | --- | --- |
| 5 th Year | --- | 410 | 78 | 956 | 406 | 74 | 1 nos (15m x 8m) | 1 nos. (8m x 5m) | 1 nos. (15m x 8m) | --- |



- * Width & height of retaining wall to be kept at 1.5m & 1.5m respectively.
- ** Width and depth of garland drain to be kept at 1.0m & 1.0m respectively.
- *** Depth of settling tank & siltation ponds to be kept at 1.5m & 2.5m respectively.

Beside these, 2 Nos of check dams and 2 nos of check filters shall be built to arrest suspended particles if any before discharging the water outside the block or for utilization of the same for plantation and cultivation purposes.

Terraces shall be provided with inward slope so that water can be passed through, without affecting the walls of the waste dump. Each terrace shall have provision of berms at the outer end to reduce gully formation due to rainwater wash offs. Dump bench slopes shall be vegetated with grass for binding soil and to arrest erosion.

(ii) The plantation program during the plan period will include block and avenue plantation as shown in **Plate No. 10 & 11**, in consultation with forest officials.

(iii) Environmental monitoring with respect to air, water, noise, etc will be continued as per norms and guidelines.

8.3.2 Topsoil Management

The overburden soil in the block is mainly of reddish brown sandy and lateritic in nature which is devoid of any nutrient value. Out of this, the top soil with nutrient value might be around 0.2 m to 0.4 m thick which shall be scrapped and stacked separately for future plantation purpose.

8.3.3 Tailings Dam Management

Not applicable since no beneficiation is involved during the process.

8.3.4 Acid mine drainage, if any and its mitigative measures. -

Not applicable since this will be an opencast mine.

8.3.5 Surface subsidence mitigation measures through backfilling of mine voids or by any other means and its monitoring mechanism.

No surface subsidence is anticipated during the plan period. However, progressive back-filling of mine voids shall be done during conceptual period as suggested in para 8.3.1 (a) above.

The information on protective measures for reclamation and rehabilitation works year-wise may be provided as per the following table.

Mining Plan with PMCP of Kottameta Limestone Block of Preferred bidder M/S Dalmia Cement (Bharat) Limited over 801.171 Ha in Malkangiri District, Odisha

Summary of Year-wise Proposal for Item No 8.3

| Items | Details | Cumm as on date | Proposed (Year) | | |
|---|--|-----------------|----------------------|----------------------|----------------------|
| | | | 3 rd Year | 4 th Year | 5 th Year |
| Dump management | Area to be afforested (Ha) | - | Nil | Nil | Nil |
| | No of saplings to be planted | - | 1500 | 1500 | 1500 |
| | Cumulative no of plants | - | 1500 | 3000 | 4500 |
| | Cost including watch and care during the year (Lakhs) | - | 1.125 | 1.125 | 1.125 |
| Management of worked out benches | Area available for rehabilitation (ha) | - | Nil | Nil | Nil |
| | Afforestation done(ha) | - | Nil | Nil | Nil |
| | No of saplings to be planted in the year | - | Nil | Nil | Nil |
| | Cumulative no of plants | - | Nil | Nil | Nil |
| | Any other method of rehabilitation (specify) | - | Nil | Nil | Nil |
| | Cost including watch and care during the year (L) | - | Nil | Nil | Nil |
| Reclamation and Rehabilitation by backfilling | Void available for Backfilling (L x B x D) pit wise /slope wise | - | Nil | Nil | Nil |
| | Void filled by waste /tailings | - | Nil | Nil | Nil |
| | Afforestation on the backfilled area | - | Nil | Nil | Nil |
| | Rehabilitation by making water reservoir | - | Nil | Nil | Nil |
| | Any other means (specify) | - | Nil | Nil | Nil |
| Rehabilitation of waste land within lease | Area available (ha) | - | Nil | Nil | Nil |
| | Area rehabilitated | - | Nil | Nil | Nil |
| | Method of rehabilitation | - | NA | NA | NA |
| Others (specify) | Besides, retaining wall, garland drain, settling tank shall be constructed and re-constructed. Details are as follows. | | | | |

| Particulars | Year wise protective measures | | | |
|---|--------------------------------|---|-------------------------------|---|
| | 2 nd Year | 3 rd Year | 4 th Year | 5 th Year |
| Retaining wall (m) | --- | 490 | 572 | 488 |
| Garland Drain (m) | --- | 1282 | 329 | 1436 |
| Settling tanks | --- | 3 (8m x 5m x 1.5m) | 1 (8m x 5m x 1.5m) | 2 (8m x 5m x 1.5m) |
| Siltation Ponds | --- | 1 (15m x 8m x 2.5m) | --- | 1 (15m x 8m x 2.5m) |
| Check dam & check filter | --- | 1 check dam (15m x 8m) & 1 check filter (8m x 5m) | --- | 1 check dam (15m x 8m) & 1 check filter (8m x 5m) |
| De silting of settling ponds | --- | As required | | |
| Afforestation on dumps (Area/Nos) | --- | 1.0 Ha/1500 | 1.0 Ha/1500 | 1.0 Ha/1500 |
| Afforestation within lease area (Ha/ No. of Plants) | Safety zone-4.3 H/6450 plants, | Safety zone-4.3 H/6450 plants | Safety zone-4.3 H/6450 plants | Safety zone-4.263 H/6400 plants |

8.4 Disaster Management and Risk Assessment

Action plan for high risk accidents like landslides, subsidence flood, fire, seismic activities, tailing dam failure etc. and emergency plan proposed for quick evacuation, ameliorative measures to be taken etc. The capability of lessee to meet such eventualities and the assistance to be required from the local authority are also described.

As far as the nature of deposit and method of mining (opencast) is concerned, there is no possibility of landslide, subsidence, flood, inundation, fire, seismic activity and tailing dam failure etc.

8.4.1 Measures to be taken for controlling any unforeseen disaster and risk etc

- (i) Ultimate slope of the quarry shall be kept at $\geq 30^{\circ}$ and the waste dump at $\geq 30^{\circ}$.
- (ii) The overall drainage system of the region is controlled by Sabari River flowing to the west of the block. Ephimeral streams flowing in the southern and eastern part of the area controls the drainage. There were no floods in the past & not expected in future too, as the area is located in high altitudes.
- (iii) Though earthquake is felt several times in Orissa, damage to man & material has been severe till date.
- (iv) One explosive magazine with total capacity of 10 tonnes shall be constructed in the earmarked area for storage of explosives. Handling of explosives and blasting operations shall be done by qualified blasters and blaster helpers under the supervision of an Asst. Manager. The Asst. Manger shall be assisted with a qualified foreman to have effective supervision. To control fly rock fragments during blasting which creates problems to nearby men and machinery, precautionary measures shall be adopted which are as below.
 - Proper blast design resulting in lower ground vibrations and fly rocks.
 - Controlled blasting technique with SME/SMS (Nonel system of initiation).
 - Drill holes will be located in weaker planes.
 - No loose materials will be kept on the bench floors during blasting.
 - Optimum stemming length and stemming material will be chosen.
 - Safe ratio (stemming length to burden of hole) shall be kept at more than 0.6.
 - Proper compaction of the stemming material will be undertaken before blasting.
- (v) Safety Precautions shall be practiced in the area and boards displaying (in Odiya & English) blasting time will be kept at the places where required. Blasting time will be fixed and intimated to all concerned. At the time of blasting, security guards will be deployed in order to block the vehicle movement on the public road. In order to indicate the blasting

operation, red flags will be kept where ever required. A Siren will be blown at the beginning and end of the blasting operation.

(vi) Small-scale fire may occur, which will be extinguished by fire extinguisher. Sufficient quantity of sand and water shall be kept in the magazine premises.

(vii) Area under reference has no proposal of beneficiation / washing plant. Therefore, tailing dam is not necessarily required and the question of failure of tailing dam does not arise.

8.5 Care and maintenance during temporary discontinuance

An emergency plan for the situation of temporary discontinuance due to court order or due to statutory requirements or any other unforeseen circumstances may indicate measures of care, maintenance and monitoring of status of discontinued mining operations expected to re-open in near future.

(a) During temporary discontinuance due to unforeseen reasons such as court order, natural calamity, mine related accident, any type of failure in fulfillment of statutory requirement or local issues or any other unforeseen circumstances, slope failure etc shall have to be implemented forthwith.

(b) Emergency plan to be taken up, which will include the followings

- Intimation to local mine and legal administrative authorities concerned (IBM, DGMS, Directorate of Mines, Circle Mining Office & others) regarding the temporary discontinuance.
- Explanation to the local community, on the cause of temporary discontinuance and possibility of reopening of mine in future.
- Listing and proper storing of machines, materials, assets and documents.
- Care and maintenance of machinery as per machine operating manuals.
- Tightening of security to keep the machine and materials safe & secured.
- Monitoring of status of unplanned discontinued mining operation in respect of bench height, width, individual bench slope angle, over hang, under cut, misfire or any other parameters, whose levels either in form of higher side or lower side, is dangerous for further mine working.
- Repair & maintenance of haul road.
- Regular monitoring of air, water, noise & others in the permitted area.

Mining Plan with PMCP of Kottameta Limestone Block of Preferred bidder M/S Dalmia Cement (Bharat) Limited over 801.171 Ha in Malkangiri District, Odisha

(c) Necessary plan & section at the time of discontinuance of mines are to be prepared and kept ready. Those are

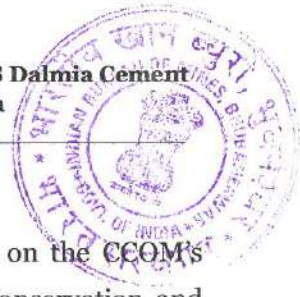
- Projection of benches, in the plan and sections, which is safe for future working.
- Management of misfire. Fly rock movement, maintenance of machinery & others which are risk free and not dangerous for further working.
- Intimation to concerned authorities for reopening, once the mine is risk free.

(d) **Name of persons, designation with address and phone along with respective responsibilities detailed under disaster management para.**

Responsibilities under disaster management shall be allotted to the Mines Manager to be recruited after the mining lease is executed by the preferred bidder and the mining operation in the area starts. The same will be communicated to Indian Bureau of Mines and other concerned officials in due course.

The Organization chart with their responsibilities in respect of Emergency plan / disaster management shall be as below:

| Sl. No. | Designation | Responsibility |
|---------|--------------------------|---|
| 1 | Owner/ Agent of the Mine | Overall administration of the mining activities. |
| 2 | Mines Manager | Administrative & supervision of the rescue work. Information to the fire brigade to deal with emergency and concerned district officials. |
| 3 | Asst. Mines Manager | Disaster control, sounding the alarm at danger, accident and information to the manager regarding the situation. |
| 4 | Foreman | Labour management & mob control, Information to the security personnel to evacuate all the persons from the area in case of fire except the fire brigade personnel. |
| 5 | Mate | -do- |



8.6 Financial Assurance

The amount calculated for the purpose of Financial Assurance is based on the CCOM's Circular no. 4 of 2006 and as stated in Rule 27 (1) & (2) of Mineral Conservation and Development Rules, 2017. The area considered for calculation of financial assurance is as below.

| Sl. No. | Head | Area put on use at start of plan period (Ha) | Additional requirement during plan period (Ha) | Total Area (Ha) | Area considered as reclaimed & fully rehabilitated (Ha) | Net area considered for calculation (Ha) |
|--------------------|--|--|--|-----------------|---|--|
| 1 | Area under mining | 0.000 | 16.303 | 16.303 | 0.000 | 16.303 |
| 2 | Storage for top soil | 0.000 | 0.888 | 0.888 | 0.000 | 0.888 |
| 3 | Waste dump site | 0.000 | 13.632 | 13.632 | 0.000 | 13.632 |
| 4 | Mineral storage | 0.000 | 0.659 | 0.659 | 0.000 | 0.659 |
| 5 | Infrastructure, workshop, administrative building etc. | 0.000 | 3.243 | 3.243 | 0.000 | 3.243 |
| 6 | Roads | 2.584 | 2.127 | 4.711 | 0.000 | 4.711 |
| 7 | Railways | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8 | Tailing pond | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 9 | Effluent Treatment Plant | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 10 | Mineral Separation Plant-Crushing Plant | 0.000 | 1.049 | 1.049 | 0.000 | 1.049 |
| 11 | Township area | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 12 | Others Narrow Gauge Transmission (NGT) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Grand Total | | 2.584 | 37.901 | 40.485 | 0.000 | 40.485 |

This being a Category A mine, financial assurance for 40.485 Ha is to be calculated at the rate of 300,000.00 per Ha. This amounts to Rs 1, 21, 45,500/- (Rupees one crore twenty one lakh forty five thousand five hundred only).

As per the second proviso of rule 27(1) of MCDR, 2017 read along with rule 10(4) of Minerals (Auction) Rules, 2015, the successful bidder has to sign an Mine Development and Production Agreement with the State Government and therefore the requirement of Financial Assurance by the preferred bidder M/S Dalmia Cement (Bharat) Limited is not applicable.

अनुमोदित
APPROVED

PART –B

A. CONSENT LETTER/ UNDERTAKING/ CERTIFICATE FROM THE APPLICANT

01. The Mining Plan in respect of Kottameta Block for Limestone over an area of 801.17 Ha in village Katamater, Tahsil & P.O. Malkangiri, District Malkangiri of Odisha State of the preferred bidder **M/s Dalmia Cement (Bharat) Limited**, under rule 16(1) of Minerals (Other than Atomic and Hydro Carbons Energy Minerals) Concession Rules, 2016, has been prepared by the Qualified Persons (QPs) Sri P.S.Acharya and Sri S.M.Patro recognized under rule 15 of MCR, 2016.

This is to request the Regional Controller of Mines, Indian Bureau of Mines, Bhubaneswar region (Odisha) to make any further correspondence regarding any correction of the Mining Plan with the said recognized persons at their addresses below:-

| | |
|--|-------------------------------|
| P. S. Acharya, Qualified Person | S. M. Patro, Qualified Person |
| GEMTECH Consultants Pvt. Ltd, | GEMTECH Consultants Pvt. Ltd, |
| K-8/625, 1 st Floor, At - Kalinga Nagar, Post – Ghatikia. | |
| Bhubaneswar - 751029 (Odisha) | |
| Tel No – 9437008179 (M) | Tel No – 9861093020 (M); |

We hereby undertake that all modifications/ updating as made in the said Mining Plan by the said qualified persons be deemed to have been made with our knowledge and consent and shall be acceptable on us and binding in all respects.

02. It is certified that the **CCOM Circular No-2/2010** will be implemented and complied with by the authorized agency approved by the State Government.

04. It is certified that the Progressive Mine Closure plan of Kottameta Block for Limestone of the preferred bidder **M/s Dalmia Cement (Bharat) Limited** over an area of 801.17 Ha complies with all statutory rules, Regulations, Orders made by the Central or State Government, Statutory organizations, Court etc which have been taken into consideration and wherever any specific permission is required, the lessee 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.

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Dalmia Cement (Bharat) Limited

11th & 12th Floors, Hansalaya Building, 15, Barakhamba Road, New Delhi-110 001, India
t 91 11 23465100 f 91 11 23313303, w www.dalmiacement.com, CIN : U65191TN1996PLC035963
Registred Office : Dalmiapuram, Dist. Tiruchirapalli, Tamil Nadu-621 651, India
A **Dalmia Bharat Group** company, www.dalmiabharat.com

05. The provisions of **Mines Act, Rules and Regulations** made there under have been observed in the Mining Plan over an area of 801.17 Hectares in Malkangiri District in Odisha State belonging to Kottameta Block for Limestone, 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 miner's health will be strictly implemented.

Place: Delhi
18.05.2017


(U. R. RAJU)
Executive Director
Dalmia Cement (Bharat) Limited

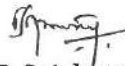


B. Certificate from Qualified Persons

The provisions of the Mineral Conservation and Development Rules, 2017 have been observed in the preparation of the Mining Plan of Kottameta Limestone Block over an area of 801.171 Ha of preferred bidder M/s Dalmia Cement (Bharat) Limited, in village Katameter Post office – Malkangiri District Malkangiri of Odisha State and whenever specific permissions are required, the applicant will approach the concerned authorities of Indian Bureau of Mines.

The information furnished in the Mining Plan is true and correct to the best of our knowledge.

Bhubaneswar
29.05.2017

 
P. S. Acharya S. M. Patro
Qualified Persons



**Mining Plan with PMCP of Kottameta Limestone Block of Preferred bidder M/S Dalmia Cement
(Bharat) Limited over 801.171 Ha in Malkangiri District, Odisha**

10.0 List of the Plans and Sections submitted

| Sl No | Plate No | Description | Scale |
|-------|----------------|---|------------|
| 1 | Plate No.1 | Key Plan | 1 : 50,000 |
| 2 | Plate No.2(A) | Village map of the auctioned block to be granted under lease. | 1:3960 |
| 3 | Plate No.2(B) | Cadastral Area Map of the auctioned limestone block in Katamater village | 1:3960 |
| 4 | Plate No.2(C) | Borehole Plan showing the Geology of the block prepared by Directorate of Geology, Odisha | 1:5000 |
| 5 | Plate No.3 | Surface Plan | 1 : 5000 |
| 6 | Plate No.4 | Geological Plan | 1 : 5000 |
| 7 | Plate No.5(A) | Geological Sections (0-0' to 5-5') | 1 : 2000 |
| 8 | Plate No.5(B) | Geological Sections (6-6' to 11-11') | 1 : 2000 |
| 9 | Plate No.6 (A) | Development Plan & sections for 3 rd year | 1 : 2000 |
| 10 | Plate No.6 (B) | Development Plan & sections for 4 th year | 1 : 2000 |
| 11 | Plate No.6 (C) | Development Plan & sections for 5 th year | 1 : 2000 |
| 12 | Plate No.7 | Waste Dump, Top soil & phyllitic limestone stack plan & sections | 1 : 1000 |
| 13 | Plate No.8 | Conceptual Plan | 1 : 5000 |
| 14 | Plate No.9(A) | Conceptual Sections (0-0' to 5-5') | 1 : 2000 |
| 15 | Plate No.9(B) | Conceptual Sections (6-6' to 11-11') | 1 : 2000 |
| 16 | Plate No.10 | Environment Plan | 1 : 5,000 |
| 17 | Plate No. 11 | Financial Area Assurance Plan | 1 : 5000 |
| 18 | Plate No.12 | Surface Water Drainage Plan | 1 : 5000 |



11.0 List of Documents Annexed

| Annexure No. | Particulars | Pages | |
|--------------|---|-------|--------|
| | | From | To |
| Annexure -1 | Letter of Intent issued by Government of Odisha vide letter dated 27.01.2017. | 1/1 | 1/3 |
| Annexure -2 | Declaration by the lessee regarding Mining leases held in the State of Odisha. | 2/1 | 2/1 |
| Annexure -3 | Land schedule of the Kottameta limestone block prepared by the Directorate of Mines. | 3/1 | 3/14 |
| Annexure -4 | Address proof of the lessee - Electricity bill/ NDMC receipt. | 4/1 | 4/2 |
| Annexure -5 | Certificate of Registration and Memorandum of Association of the Company. | 5/1 | 5/71 |
| Annexure -6 | List of Board of Directors and interest & concerns of the Directors in other Companies. | 6/1 | 6/4 |
| Annexure -7 | Board Resolution in favour of Sri U.R.Raju, appointing him as the authorized signatory. | 7/1 | 7/1 |
| Annexure -8 | Identity proof of Sri U.R.Raju, authorized signatory. | 8/1 | 8/1 |
| Annexure -9 | Qualification and experience certificates of the Qualified Persons Sri P.S.Acharya & Sri S.M.Patro who have prepared the mining plan. | 9/1 | 9/4 |
| Annexure -10 | Report of findings of Kottameta Block prepared by the Directorate of Geology, Government of Odisha. | 10/1 | 10/304 |
| Annexure -11 | Letter of the lessee to CCOM, IBM, Nagpur dt. 14.02.2017, requesting for scale relaxation of the plans. | 11/1 | 11/1 |
| Annexure -12 | Copy of letter No.1437 dt. 01.03.2017 from Director of Geology regarding bulk density of the limestone samples. | 12/1 | 12/1 |
| Annexure -13 | Pre feasibility report of the Kottameta limestone block. | 13/1 | 13/21 |
| Annexure -14 | Meteorological data for the year 2016 collected from Indian Meteorological Department (IMD). | 14/1 | 14/2 |
| Annexure -15 | Few photographs of the intended lease area. | 15/1 | 15/3 |