INTRODUCTION

(a) OCL INDIA LIMITED (formerly "Orissa Cement Limited") is the flag ship company of 'Dalmia Group' of companies, set up and operating from eastern India. The emergence of 'Dalmia' group on the industrial scene of India can be traced back to pre-independence era. Prominent among the early entrepreneurs who laid the industrial foundation of India was Dalmia family. Established in 1932 with a sugar factory, the Dalmia group gradually diversified into a broad spectrum of activities and was involved in many pioneering ventures. Against the said background Sjt. Jaidayalji Dalmia, an industrialist of farsighted vision set up a cement plant at Rajgangpur during 1950-51 at the request of Government of Odisha to manufacture super grade cement for use in the construction of the prestigious Hirakud Dam. Orissa cement Ltd was incorporated on 11.10.1949 and its cement plant went on steam during 1952. The modest initial capacity of 4.01 lakh tonnes per annum of cement manufacturing was subsequently increased to 7.0 lakh tonnes annually after change over to environment friendly dry process technology in 1988. The company in the mean time changed its name from Orissa Cement Ltd to OCL India Limited w.e.f. 15.01.1996 to reflect its multifarious activities. During subsequent years, the manufacturing capacity of the plant was gradually increased through stages of expansion cum modernization of the plant design and the present capacity of the plant stands at 2.9 million tonnes per annum.Keeping in view of the overall improvement of macro-economic factors of the country, the Company presently foresees an upsurge in India's infrastructural development and thereby a potential surge in cement demand. The Company therefore plans to add fresh capacity through establishment of one new unit of 2.25 MTPA cement plant in Rajgangpur plus 3MTPA of additional clinker capacity.With this addition, the company's total capacity in Rajgangpur will rise to 6.25 MTPA of cement production and 5.9 MTPA of clinker production.

(**b)**The Kukuda Limestone & Dolomite Mines area belonging to Birmitrapur stage of the Gangpur series of Dharwars and originally the lease was granted in favour of OCL India Limited (Formerly " Orissa Cement Limited") over an area of 365.573

hectares by the Government of Orissa for a period of twenty years w.e.f. 21.08.1978 to 20.08.1998. Thereafter the OCL has applied for transfer of the mining lease in favour of its subsidiary company M/s Konark Mineral Limited (KML). Vide permission bearing No. GP6053/MG dated 03.04.1980 of the Government of Odisha, the aforesaid mining lease was transferred in favour of KML. Thereafter retaining a compact block of 93.798 hectares the rest of mining lease area were surrendered to the Government vide permission bearing No. 4500/MG dated 02.04.1986.

On 14.08.1997 KML filed an application for renewal of mining lease for a further period of twenty years. The Government of Odisha vide it's letter No.5369/SM dated 27.05.2000 renewed the mining lease for a further period of twenty years w.e.f. 20.08.1998 to 19.08.2018. The mining lease of KML was executed on 23.01.2001 for a further period of 20 years w.e.f. 20.08.1998 to 19.08.2018.**(Annexure -1)**

On 13.05.2002 KML applied for transfer of the mining lease in favour of the OCL . vide Government sanction No. 6897 dated 11.07.2005 the mining lease was transferred from KML to OCL. On 16.09.2005 the mining lease over an area of 93.798 hectares was executed in favour of OCL and the same was registered on 08.11.2005.(**Attached as annexure-2**)

On 01.09.2008 the OCL has filed revival application over 93.798 hectares by depositing Rs.500/- through treasury challan and prayed for condoning the delay for not filing the revival application in time. The Deputy Director of Mines, Rourkela recommended for revival of the mining lease to the Collector, Sundargarh vide his letter No.21494 dated 30.12.2008, who in turn recommended for revival of the mining lease vide his letter No.647 dated 17.06.2009 to the Director of Mines, Odisha, Bhubaneswar. DDM-Rourkela vide his letter No. 2126 dated 09.10.2015 informed OCL regarding lapsing of ML over an area of 93.798 hect. w.e.f. 15.09.2007 as per proceedings of Department of Steel and Mines, Govt. of Odisha in the proceeding No.8813 dated 08.09.2015. OCL submitted an application for revival of ML to the Principal Secretary, Steel & Mines, Govt. of Odisha vide it's letter No. LKM/10A/236 dated 27.11.2015 alongwith fee of Rs.500/-.OCL filed a Revision application bearing No. 22/84/2015/REI of 2015 U/s 30 of MMDR Act, 1957 before

thee Mines Tribunal under Ministry of Mines, Govt. of India. The Mines Tribunal vide it's order dated 11.05.2016 observed that lapsing is not automatic provision and cause for discontinuation of mining operation has to be preceded by scrutiny and steps fulfilling the maxim of natural justice. (Copy of the Revival Application & Mines Tribunal Order dated 11.05.2016 is attached as **Annexure-3**) In view of the above, all the cases were remanded back to State Govt. for suitable reconsideration in line with Hon'ble SC's direction on the provisions of lapsing expeditiously. Addl. Secretary, Department of Steel and Mines vide his letter No. 3035 dated 05.04.2017 issued a show cause notice to OCL to reply within a period of two weeks why the lease shall not be declared as lapsed. OCL filed its show cause reply vide it's letter No. LKM: 110/22 dated 11.04.2017 and appeared before Steel & Mines in each appearing date.

Joint Secretary to Govt, Steel & Mines, Bhubaneswar issued order vide proceeding No 254/S&M, Bhubaneswar dated 09.01.2018 for lapsing the above said lease. After receiving the above order , OCL has submitted revival application on 16.02.2018 before the Principal Secretary to Govt. Department of Steel & Mines, Bhubaneswar along with required requisite fees of Rs 1,00,000/- (Rupees One Lakh only) in shape of treasury challan no 22 dated 16.02.2018 which is under consideration. OCL has been appearing before Steel & Mines in each appearing date (Last Personnel Hearing Notice dated 18.12.2018 is attached as **Annexure-4**)

The additional merit of the said lease area are:

i. Bore Hole analysis reviles that the chemical composition of Limestone available in the lease are superior and can be helpful as a blending material
ii. Therefore it has been planned to submit an application for common boundary working under Regulation III (3) of the Metalliferous Mines Regulations 1961 with an objective to optimize blending as well as to extract Limestone which otherwise would have blocked due to common boundary.
iii. The above actions will help Limestone extraction to the highest extent possible and serve the greater purpose of Mineral Conservation.

(c) Surface Right Area

Out of the total lease area 93.798Ha, surface right has been granted over an area of 12.76Ha. Surface Right permissions along with land schedule are enclosed as **Annexure-5** and the plan showing surface right areas granted so far is shown in surface plan (Plate No - 03). The total mining lease over 93.798 Ha comprised of 3.828 Ha of forest land (DLC), 83.296 Ha private land and 6.674 Ha of govt. Land (non forest).

1.0 GENERAL

a)	Name of the Applicant / Lessee	**M/s OCL INDIA LIMITED**
	Address of the Lessee District: State: Pin Code: Phone & Mobile No: Fax: e-mail:	OCL India Limited., At/Po :Rajgangpur Sundargarh Odisha 770017. Tel:(06624) 221212, 06624 - 220933, ocl_rajgangpur@dalmiacement.com
	IBM Registration Number	IBM/393/2011
b)	Status of applicant /Lessee	Public Limited Company. Copy of incorporation of the Company is attached as **Annexure – 6**.
	Name of Directors with full address & phone No, fax & email details Name of the nominated owner	List of Board of Directors with their addresses duly certified by competent authority are attached as **Annexure – 7.** Shri Amandeep, Wholetime Director. Board Resolution in favour of Shri Amandeep as nominated occupier of the cement works pursuant to section 2(n) of the factories Act and nominated owner of the all mines pursuant to section 76 of the Mines Act is enclosed as **Annexure – 8.**
c)	Minerals which are included in the lease deed	Limestone & Dolomite

d)	Minerals which the lessee intends to mine	Limestone. In the process, some Dolomite production is envisaged.
e)	Name of Qualified persons under rule 15 of MCR,2016 preparing the review of mining plan and his qualifications & experience	1. Dr. Udayanath Sahoo M.Sc, M.Phil, Ph.D (Geology) with 8 years 05 month field experience 2. Rajib Banerjee M.Sc (Geology) with 9 years of experience.
	Address of the Qualified Persons	OCL INDIA LTD Rajgangpur-770017 Dist: Sundargarh (Odisha)
	Phone/ Fax & Email Fax No.	Mob No of Dr.Udayanath Sahoo;9438200240 Email : sahoo.udaya@dalmiacement.com Mob No of Rajib Banerjee ; 8114378390 Email : banerjee.rajib1@dalmiacement.com (Copy of experience,qualification certificates & photo ID of qualified persons are enclosed asAnnexure-18)

2.0 LOCATION AND ACCESSIBILITY

a) Lease details

i)	Name of mine	Kukuda Limestone & Dolomite Mines
ii)	Lat/ Long of any boundary point	PillarNo.-9, Lat:$22^0$15'11.98076" Long: $84^0$31'35.61254
iii)	Lease No & Mine code	Lease No 123059015402 & Mine Code 38ORI13030
iv)	Date of Grant of lease and date of Execution of lease	Original Mining lease was granted and executed on 21.08.1978 for a period of twenty years w.e.f. 21.08.1978 to 20.08.1998. Ist RML (Renewal of Mining Lease) was executed on 23.01.2001 for a further period of 20 years w.e.f. 20.08.1998 to 19.08.2018. Validity of Mining Lease shall be extended upto 19.08.2028 under Section 8-A of the MMDR Amendment Act 2015
v)	Name of the lease holder	OCL INDIA LIMITED
vi)	Location of mines	
	Village	Lanjiberna, Bihabandh, Kukuda
	Tehsil/ Taluka	Rajgangpur
	Police Station	Rajgangpur
	District	Sundargarh (Odisha)
	PIN	770023

Vii)	Postal Address for mines	OCL India Limited.,
	Post	Lanjiberna
	Tehsil	Rajgangpur
	District	Sundargarh
	State	Odisha
	Pin code	770023
	Phone/Mobile	06624 - 220933 / 9437965489
	Fax	06624 - 220933,
viii)	E-mail	ocl_rajgangpur@dalmiacement.com

b) Details of lease area with location map

	Forest	**Non-Forest**	
	DLC: 3.828 Ha	i) Govt. land	6.674 Ha
		ii) Tenancy land (agricultural & village settlement)	83.296 Ha
	Total:3.828 Ha		**89.97 Ha**
	Total lease area		93.798 Ha
	District		Sundargarh
	State		Odisha
	Taluka		Rajgangpur
	Village		Lanjiberna,Bihabandh, Kukuda
	Whether the area falls under Coastal Regulation Zone (CRZ)? If yes, details thereof.	Area does not fall under Coastal Regulation Zone.	
	Nearest distance from any boundary pillar to the nearby National park/ wild	There is no national park, biosphere reserve, sanctuary, habitat for migratory birds,archeological site, Defense Installation,	

	life sanctuary/protected area(to be given if located within 10 km from the radius of lease area.	airports within 10km of the periphery of core/ buffer zone. No natural water course is there inside the area.
	Existence of public road/ railway line, if any nearby and approximate distance	This mine is 7 km from SH-10 (which connects Rourkela & Sambalpur.) Mine is 18 km by road from Rajgangpur and 50 km from Rourkela. Rajangpur and Sonakhan are nearest railway stations under South Eastern Railway at a distance of 18 km & 25 km respectively.
	Approach route from District Head Quarters to area / mines site.	District Head Quarter at Sundargarh is at 58 km distance and connected by 2 lane Bituminous road from mines site.
	Toposheet No. With latitude & longitude of all corner boundary points/pillars.	Lease area is featured in SOI Toposheet Nos. F 45 G11& F45G12.

Boundary pillars have been erected as per the addendum of Circular No. 2/2010 dt. 06.04.2010. The co-ordinates of all the boundary pillars as per DGPS readings are as below:

Table-1

DGPS SURVEY CO-ORDINATES OF ML PILLAR OF KUKIUDA MINES				
Pillar No	LONGITUDE	LATITUDE	EASTING	NORTHING
1	84° 32' 42.75701"	22° 15' 0.30502"	247005.627	2462561.269
2	84° 32' 42.56002"	22° 15' 8.14602"	247003.897	2462802.615
3	84°32'42.34642"	22°15'16.56777"	247001.984	2463061.826
4	84°32'42.36868"	22°15'17.19952"	247002.937	2463081.253
5	84° 32' 29.00904"	22° 15' 16.29404"	246619.871	2463059.600
6	84° 32' 16.02402"	22° 15' 15.29102"	246247.460	2463034.802
7	84° 32' 2.93301"	22° 15' 14.44003"	245872.122	2463014.741

8	84° 31' 49.14203"	22° 15' 13.22201"	245476.522	2462983.691
9	84°31'35.61176"	22°15'11.98192"	245088.395	2462951.881
10	84°31'35.55813"	22°15'11.48939"	245086.611	2462936.752
11	84° 31' 36.29900"	22° 15' 2.40300"	245103.268	2462656.841
12	84° 31' 36.85460"	22° 14' 55.31906"	245115.581	2462438.626
13	84° 31' 46.73307"	22° 14' 56.06704"	245398.913	2462456.997
14	84° 31' 58.11600"	22° 14' 56.92801"	245725.377	2462478.170
15	84° 32' 5.70603"	22° 14' 57.50209"	245943.037	2462492.291
16	84° 32' 16.93410"	22° 14' 58.35107"	246265.046	2462513.186
17	84° 32' 24.73911"	22° 14' 58.94205"	246488.886	2462527.716
18	84° 32' 32.42103"	22° 14' 59.52303"	246709.212	2462542.020

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 lease area is marked on a revenue map in the scale of 1:3960 (16” = 1 mile) and attached as **Plate No. 02**.Lease 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).** DGPSsurveyed map in compliance to CCOM’s circular No. 2/2010 and its addendum dated 21.09.2011 & 11.06.2011 for the mining lease area has been submitted as **Plate No. 3**

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

3.1 Date & reference of earlier approved Mining Plan/ Scheme of Mining:

The Scheme of Mining for the period from 1998-99 to 2002-03 over 93.798 Ha area was approved under Rule 24A,MCR-1960 by IBM vide letter No. BBS/SNG/LSt/MP-8, date.31.05.1999

3.2 Details of last modifications if any (for the previous approved period) of approved MP/ SOM, indicating date of approval, reason for modification:-

No modification done

3.3 Review of earlier approved proposal (if any) in respect of exploration, excavation, reclamation etc.:

	Details of last modifications, if any (for approved MP/RMP, indicating date of approval, reason for modification of previous approved period)					
	Modification (MP/SOM)	Rule under which modified	Reasons for modifications	Area	Date of approval	Period of modification
	No modification done					

3.4	Give status of compliance of violations pointed out by IBM for last 5 years				
	Date of inspection/ Violation dateif based on office	Violation letter no.	Rule violated (Details of violation)	Compliance status	
	Nil	NA	NA	NA	
3.5	Whether IBM has suspended the mining operations in the said mineduring last five years period? If yes give details below:				
	Date ofSuspensionof miningoperations	Suspension Letter No.	Deviation ofRules forwhich thesuspensionorder issued.	Compliance status/LetterNo. and Date ofrevocation of suspensionorder by IBM	
	NA	NA	NA	NA	

3.6	Indicate and give details of any suspension /closure/prohibitoryorder issued by any Government agency (other than IBM) under any rule or Court of law during the last five years period
	1. Dy. Director of Mines, Rourkela issued the lapsing letter no 2126 dated09.10.2015 to OCL with reference to proceeding No 8813 dated 08.09.2015 of Steel & Mines, Odisha. 2. OCL has submitted a Revision application under Section 30 of MMDR Act, 1957 before Ministry of Mines on 07.12.2015. vide Revision Application No 22/84/2015/REI of 2015 3. Final Order No: 105/2016 to 160/2016 Date 11.05.2016 reference to Revision Application No. 22/18/2013 RC-I & 55 others and Revision Authority remanded back to the State Government for suitable reconsideration. 4. Addl. Secretary, Department of Steel and Mines vide his letter No. 3035 dated 05.04.2017 issued a show cause notice to OCL to reply within a period of two weeks why the lease shall not be declared as lapsed. OCL filed its show cause reply vide it's letter No. LKM: 110/22 dated 11.04.2017 and appeared before Steel & Mines in each appearing date. 5. Joint Secretary to Govt, Steel & Mines, Bhubaneswar issued order vide proceeding No 254/S&M, Bhubaneswar dated 09.01.2018 for lapsing the above said lease. After receiving the above order , OCL has submitted revival application on 16.02.2018 before the Principal Secretary to Govt. Department of Steel & Mines, Bhubaneswar along with required requisite fees of Rs 1,00,000/- in shape of treasury challan no 22 dated 16.02.2018. The revival application is under consideration. OCL has been appearing before Steel & Mines in each appearing date. Next Personnel Hearing date is on 10.01.2019.
	Details of revocations order if any - Nil
	In case the Mining Plan is submitted for modifications in the earlier approved proposal under Rule 17(3) of Minerals (Other than Atomic and Hydro-Carbon Energy Minerals) Concession Rule 2016, indicate/ specify reasons and justification for modification.
	Not applicable

PART-A

1.0 GEOLOGY AND EXPLORATION

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

i) **Topography**-The mining leasehold area is situated in Gangpur group of meta sediments which has later deformed into major Syn-clinorium and is presently characterized by gently dip towards NNE to SSW, an elevation up to 280 m. Physiographically, the area under study can be described as a typical ridge and valley topography. The relatively harder formations form the low lying linear ridges having an East-West trend.

ii) **Drainage pattern**-The main drainage of the area is through the perennial Sankh river flowing due east about 6 km away from the mining leasehold area. To the north the important tributary is Jharia Nala while to the South Nakti Nala and Pada Nala joins the Sankh river and forms the main drainage channels. All the nalas are mostly seasonal. The Naktijor flows about 2.5 - 3 km South of the lease area.

iii) **Climate**-The region is tropical wet and dry. The south-west monsoon normally sets in the study area by first week of July. There are three major seasons in study area namely:

Summer season	:	March to June
Rainy season	:	July to September
Winter Season	:	October to February

The annual mean maximum temperature in the region varies from 27.6 ^{0}C (December) to 41.8 ^{0}C (May) while annual mean minimum temperature varies from 12.0 ^{0}C (December & January) to 27.1 ^{0}C (May).

iv) **Rain fall-**The yearly rainfall data of the lease area is recorded. The maximum rainfall is 1240 mm in 2012. Maximum monthly rainfall was recorded as 524 mm in the month of September, 2011. It has been observed that rainfall during the months from July to September contributes the majority (more than 60%) of the rainfall. However, significant quantity of rain falls during October and November months also in this period. Maximum daily rainfall recorded as 239.4 mm while the maximum hourly rainfall recorded as 60.20 mm within the period of Jan'2011 to Mar-2018 is given below.

Table-2

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2011	20.4	5	7.2	9.8	19.6	77.6	23.4	253.8	523.6	65.6	42.6	133.4	1182
2012	30.7	39.5	12.4	41	64	154.6	378.6	171	34.6	26	182.3	106	1240.8
2013	98.2	56.4	56.6	4.4	13.4	103	140.6	213.6	283.6	180.2	23.5	53.6	1227.1
2014	36.8	1.8	1.3	8.1	15.7	8.9	372.1	16.8	12.4	37.3	4.3	7.1	523.5
2015	86.1	0.5	1.5	3.8	0.5	48	219.8	359.9	20.3	0.8	0.5	4.1	745.8
2016	0.5	8.6	17	0.5	0	0	153.6	236	132.4	0.8	0.6	0	550
2017	0	0	1.05	2.4	18.2	157.2	250.6	148.6	102.6	66.6	5.6	0.2	753
2018	0	2.2	2.2	13.8	28.8	161.2	243.0	715.0	174.0	35	12	11	1398
Av	**34.1**	**14.3**	**12.4**	**10.0**	**18.8**	**78.5**	**219.8**	**200.0**	**158.5**	**53.9**	**37.1**	**43.5**	**888.9**
Max	**98.2**	**56.4**	**56.6**	**41**	**64**	**154.6**	**378.6**	**359.9**	**523.6**	**180.2**	**182.3**	**133.4**	**1240.8**
Min	**0**	**0**	**1.3**	**0.5**	**0**	**0**	**23.4**	**16.8**	**12.4**	**0.8**	**0.5**	**0**	**523.5**

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

i) The area under reference occurs in the southern limb of the Gangpur synclinorium. Kukuda limestone deposit forms a part of the Biramitrapur formation of Gangpur group and occupies the central part of the area. The Gangpur group of rocks consists of conglomerates, quartzites, phyillites, schists with calcareous, carbonaceous and manganiferous horizons. The trend of the deposit is almost E-W direction the dip angles varies from 45^0-$75^{0.}$

ii) The Regional geological succession as established by G.S.I. in the area is given below:

Recent	Superficial laterite and alluvium.
Gondwana	Himagiri sand stone (Kamthi-Raniganj)
	Barakars
	Talcher
----------Uncomfirmity----------	
Upper Dharwar (Iron ore series)	Granite , pegmatite and vein Quartz.
	Basic igneous rocks (now amphibolite peridotite)
	Mica schists phyllitic zone .
	Sheared conglomerate zone of thrust (Raghunathpali stage).
Middle Dharwar	Mica-schists and phyllytes with a zone of Carbonaceous rock (lainagar stage).
	Calcite marble and Dolomitic marble (Biramitrapur stage)
	Mica schists and phyllites with a zone of Carbonaceous rock (kumarmunda stage).
	Phyllites with granitic rocks (Goriajor stage)
---------- Base not seen ----------	

The Gangpur group of rocks commences with Raghunathpalli formation at the base and is followed upwards by rocks of Lainagar, Biramitrapur, Kumarmunda and Goriajhor formations. Biramitrapur formation possesses enormous deposits of limestone and dolomite. The general strike of the rocks varies from E-W to NE-SW with a very steep dip. All the rocks are fractured and jointed.

The rocks are tectonically disturbed to higher degrees. Though the widely accepted consensus being in the favour of an anticlinorium plunging east, the studies by Kanungo and Mahalik suggest the sequence to be otherwise. On an average, the rock

formation strikes E-W with an average dip varying from sub-horizontal to 75° towards north with local changes in dip direction.

In mineral composition, the rock shows all stages of transition from crystalline limestone to calcareous shale, phyllite, micaschist and from pure dolomite to calciphyres, tremolitic marble and tremolite schist. Limestone is generally fine to medium grained and grey in colour carrying smaller amounts of impurities like mica, quartz and pyrite. Dolomite is is generally white to light bluish grey, finegrained and compact. Main occurences of limestone and dolomite deposits are at Raiboga, Birmitrapur, Hatibari, Purnapani, Bhojpur, Gatitangar, Bimta, Panposh, Jagda, Dublabera, Lanjiberna, Kukuda, Bihabandh, Kunjirma, Ramabahal, Thnmura-Khatkuribahal sapai river valley etc.

b.2 Local Geology of the formation within the area.

The mining leasehold area is located south of Quarry No.2 of Lanjiberna Limestone Quarry of OCL India Limited. It is thus important to present a brief outline of the local geology of the above quarry which forms a part of the local geology of the present mining leasehold area also.

The limestone and dolomite deposits of Lanjiberna outcrop in a plain country. The deposit consists of three bands viz.

1. The northern band of high magnesia limestone and dolomite
2. The Central band consisting of dolomite and impure limestone
3. The southern band consisting of good limestone

It is this southern band which has extended to the present leasehold area. At the N-W corner of KML area and beyond, the phenomenon of higher values of dip to 80 degree is predominant.

Kukuda area contains limestone due to the high inclination of the deposit towards south. It is evident from examination of the formation at Quarry 2 of Lanjiberna that the limestone bands have extended to Kukuda. This phenomenon has been shown in the Geological Plan at Plate No.04.

The limestone in the southern band is generally of high grade and more or less uniform quality whereas there are intermittent thin bands of magnesium and other complex siliceous materials in between good limestone bands in the northern side. Limestone in the southern band steeply dips and goes to considerable depth-base of which is yet unknown.

The mining leasehold area is almost entirely covered with soil. The different rock types such as phyllite, quartz intrusions, limestone and dolomite.Based on the topographical survey and field observations made by the applicant, the geological plan showing all relevant aspects as far as possible has been presented in Plate No-04. For the purpose of realistic assessment of the mineral reserves as well as convenience in mining and overall planning the entire mining leasehold area is divided into three areas namely areas1, 2 and 3 as shown in the above drawings.

Area-1, contains the proved category of limestone, which future exploration will be conducted in areas -2 and area- 3. The surface areas will be about 30.47, 36.58 and 26.74 hectares respectively

Structure

The mining area reveals a higher degree of complexity of structure which has not only influenced the behavior of limestone bands along strike and dip direction, but have also induced mineralogical changes caused under deformations. The broad structural features of the area are significance for mine designing are discussed below:

Due to structural changes, there has been formation of joints, fissures, cracks, and fractures in limestone through which water was percolated resulting in formation of solution cavities.

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):

Discussed in Para (b.2) above

d) Name of prospecting / Exploration agency-

Diamond core drilling with logging and sample preparation has been carried out through M/S- SPS Geo-Mining Solution Private Limited, A-401, Star Plaza, 43/3 Feeder Road, Belghoria, Kolkata-700056 under supervision of the Lessee. Copy of the last work order to M/S SPS Geo-Mining Solution Pvt. Ltd and their invoices are attached asAnnexure-9.

e) Details of prospecting/ exploration already carried out as on 01.04.2018

i) In the year 2017-18, 2-nos of bore holes of about 140 mts have been explored within the lease area.

ii) Number 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.

Detail exploration work has been carried out within the lease area in the year 2017-18 with a grid interval of <=100 m x 100 m in mineralized area to 200 m x 200 m as on 01.04.2018 is given below:A summary of total exploration carried out in the lease area as on 01.04.2018 is given below:

Sl No	Year of Exploration	Number of BHs	Type of BHs	Diameter(mm)	Inclenation	Metera ge	No of samples	Grid interval	Scale of Exploration
1	2017-18	2	Core	54	Vertical	140	140.45		G1 & G2
Total		**2**				**140**	**140.45**		

The bore holes drilled during the year **2017-18** at an interval 100m x 100m is given below and the form -I & J of the same bore holes is attached in **Annexure- 10** .

SL.No	**Year of exploration**	**Grid interval (m)**	**Bore Hole I.D**	**(Co-ordinates)**		**Top RL (m)**	**Depth (m)**	**Bottom RL (m)**
			(No/Qy/	**Easting**	**Northing (**			

			Yr)	(X)	Y)			
1	2017-18	100x 100	BH/01/18	6600	4900	262	70	192
2	2017-18	100x 100	BH/02/18	6700	4900	258	70	188
							140. mts	

iii) Details of sample analysis indicating type of samples(surface/sub-surface from pits/trenches/boreholes)

Depending upon lithology and run of the core, samples were drawn after splitting the cores to halves. The core length of each sample varies from 0.5 to 1.0 mtrs. Samples have been mostly analyzed for the major components i.e. SiO2, Al2O3, Fe2O3, CaO, MgO & K2O. Composite sample for every 8 meter is also taken to know the bench wise average quality of limestone.

Phase	Year	No of core holes	Meterage	No of samples	6Parameters	Remarks
1	2017-18	2	140.45	142	142	Usedfor reserve & resource estimation.
Total			140.45	142	142	

The samples have been analyzed in Lessee's own laboratory at mine by XRF analyzer which is being calibrated regularly in line with the Quality control division of the plant for production of cement as per BIS standards. Around 10% of the logged samples have been analyzed in NABL LAB for cross check and 2 nos. of limestone samples, 2 nos. of sub grade (mineral rejects), 2 nos. of waste materials and 2 nos. of dolomitic stone collected from mine pits have been analyzed for Bulk density in accordance to BIS at the Government laboratory, Sambalpur to authenticate the analysis results as Annexure-12

iv) Expenditure incurred in prospecting operations:

A total of 02 boreholes have been drilled during the year 2017-18 with a running meterage of about 140 mts. The drilling as well as core logging and sample preparation has been done through M/S- SPSGeoMining Solution Pvt. Ltd, Kolkata. Analysis of samples and interpretation of data has been done departmentally. The expenditure involved for drilling, logging and sample preparation in 2017-18 is given below table.

Year	Meterage drilled	Core Drilling per mt.		Logging per mt.		Sample preparation per mt,		Total Cost (Rs)
		Rate	Cost (Rs)	Rate	Cost (Rs)	Rate	Cost (Rs)	

		(Rs)	(incl ST)	(Rs)		(Rs)		
2017-18	140	1800	2,52,000	100	14,000	160	22,400	2,88,400/

Copy of last work order issued to M/S SPS GeoMining Solution Pvt. Ltd along with some of their bills is enclosed asAnnexure-11.

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 5 m and grid lines at 100 m interval. All surface features as indicated under rule 32 (1) (a) of MCDR, 2017 have been marked in the Surface plan Plate No - 05.

g) Geological Plan of the lease area:

Geological plan of the lease area has been prepared on 1:2000 scale taking the surface plan as the base plan Plate No - 06. 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 (04 Nos) of the acquired area within the mining lease have been prepared on 1:2000 scale at every 100 m interval from boundary to boundary Plate No - 07.

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

Year wise exploration programme with due justification (duly marking on Geological plan year wise location in different colour) taking into consideration the future tentative exploration programme planned in next five years as in table below, and location of proposed holes has been shown in Geological Plan in different colourin Plate No - 06.

Propose year wise exploration programme from Dec-2018 to Mar-2023.

Year	No of bore holes (Core)	Grid interval (m x m)	Proposed Depth (mts)	Total metera ge	Grid interval	Status of land
Dec-2018 to Mar-19	08	100 x 100	75	600	4500N to 4700N 4600E to 6700E	Cultivated & Barren land
2019-20	19	100 x 100	75	1425	4800N to 4900N 6600E to 8000E	
2020-21	20	100 x 100	75	1500	4600N to 4700N 6800E to 7200E	
2021-22	20	100 x 100	75	1500	4500N to 4600N 6800E to 7600E	
2022-23	20	100 x 100	75	1500	4300N to 4500N 7300E to 8300E	
Total	87			6525		

Details year wise location of proposed holes has been shown in Geological Plan in different colours (Plate No-6). The year wise program of exploration is given below:

Table-4, Proposed year wise exploration programme

SL No	Year	BH. No	Northing	Easting	Collar RL	Core/DTH	Metrage	Inclination	Forest/ Non Forest/ Diverted Forest	Surface Right/ Non-Surface Right	Purpose of BH
1	FY 2018-19 (From 01.12.2018) 08 Nos.	BH3/18	4700N	6600E	264.80	Core	75	Vertical	Non Forest	Non-SR	For Exploration
2		BH4/18	4700N	6700E	264.21	Core	75	Vertical	Non Forest	Non-SR	For Exploration
3		BH5/18	4600N	6500E	272.54	Core	75	Vertical	Non Forest	Non-SR	For Exploration
4		BH6/18	4600N	6600E	268.71	Core	75	Vertical	Non Forest	Non-SR	For Exploration
5		BH7/18	4600N	6700E	267.32	Core	75	Vertical	Non Forest	Non-SR	For Exploration

6		BH8/18	4500N	6500E	282.70	Core	75	Vertical	Non Forest	Non-SR	For Exploration
7		BH9/18	4500N	6600E	273.17	Core	75	Vertical	Non Forest	Non-SR	For Exploration
8		BH10/18	4500N	6700E	269.37	Core	75	Vertical	Non Forest	Non-SR	For Exploration
9		BH1/19	4900N	6700E	259.10	Core	75	Vertical	Non Forest	Non-SR	For Exploration
10		BH2/19	4900N	6800E	259.04	Core	75	Vertical	Non Forest	Non-SR	For Exploration
11		BH3/19	4900N	6900E	258.80	Core	75	Vertical	Non Forest	Non-SR	For Exploration
12		BH4/19	4900N	7100E	257.70	Core	75	Vertical	Non Forest	Non-SR	For Exploration
13		BH5/19	4900N	7200E	257.30	Core	75	Vertical	Non Forest	Non-SR	For Exploration
14		BH6/19	4900N	7300E	257.28	Core	75	Vertical	Non Forest	Non-SR	For Exploration
15		BH7/19	4800N	6600E	263.14	Core	75	Vertical	Non Forest	Non-SR	For Exploration
16	**FY 2019-20**	BH8/19	4800N	6900E	260.24	Core	75	Vertical	Non Forest	Non-SR	For Exploration
17		BH9/19	4800N	7000E	259.87	Core	75	Vertical	Non Forest	Non-SR	For Exploration
18	**19 Nos.**	BH10/19	4800N	7100E	259.27	Core	75	Vertical	Non Forest	Non-SR	For Exploration
19		BH11/19	4800N	7200E	258.40	Core	75	Vertical	Non Forest	Non-SR	For Exploration
20		BH12/19	4800N	7300E	257.90	Core	75	Vertical	Non Forest	Non-SR	For Exploration
21		BH13/19	4800N	7400E	257.68	Core	75	Vertical	Non Forest	Non-SR	For Exploration
22		BH14/19	4800N	7500E	257.24	Core	75	Vertical	Non Forest	Non-SR	For Exploration
23		BH15/19	4800N	7600E	256.54	Core	75	Vertical	Non Forest	Non-SR	For Exploration
24		BH16/19	4800N	7700E	255.71	Core	75	Vertical	Non Forest	Non-SR	For Exploration
25		BH17/19	4800N	7800E	254.70	Core	75	Vertical	Non Forest	Non-SR	For Exploration
26		BH18/19	4800N	7900E	254.60	Core	75	Vertical	Non Forest	Non-SR	For Exploration
27		BH19/19	4800N	8000E	251.70	Core	75	Vertical	Non Forest	Non-SR	For Exploration
28	**FY 2020-21**	BH1/20	4700N	6800E	264.30	Core	75	Vertical	Non Forest	Non-SR	For Exploration

Dr.U.N.Sahoo, Rajib Banerjee
Qualified Persons

29	**20 Nos.**	BH2/20	4700N	6900E	263.20	Core	75	Vertical	Non Forest	Non-SR	For Exploration
30		BH3/20	4700N	7000E	262.24	Core	75	Vertical	Non Forest	Non-SR	For Exploration
31		BH4/20	4700N	7100E	261.80	Core	75	Vertical	Non Forest	Non-SR	For Exploration
32		BH5/20	4700N	7200E	259.98	Core	75	Vertical	Non Forest	Non-SR	For Exploration
33		BH6/20	4700N	7400E	258.47	Core	75	Vertical	Non Forest	Non-SR	For Exploration
34		BH7/20	4700N	7500E	258.14	Core	75	Vertical	Non Forest	Non-SR	For Exploration
35		BH8/20	4700N	7600E	257.44	Core	75	Vertical	Non Forest	Non-SR	For Exploration
36		BH9/20	4700N	7700E	255.87	Core	75	Vertical	Non Forest	Non-SR	For Exploration
37		BH10/20	4700N	7800E	255.29	Core	75	Vertical	Non Forest	Non-SR	For Exploration
38		BH11/20	4700N	7900E	254.97	Core	75	Vertical	Non Forest	Non-SR	For Exploration
39		BH12/20	4700N	8000E	254.41	Core	75	Vertical	Non Forest	Non-SR	For Exploration
40		BH13/20	4700N	8100E	253.97	Core	75	Vertical	Non Forest	Non-SR	For Exploration
41		BH14/20	4700N	8200E	252.70	Core	75	Vertical	Non Forest	Non-SR	For Exploration
42		BH15/20	4700N	8300E	252.34	Core	75	Vertical	Non Forest	Non-SR	For Exploration
43		BH16/20	4600N	6800E	265.27	Core	75	Vertical	Non Forest	Non-SR	For Exploration
44		BH17/20	4600N	6900E	264.24	Core	75	Vertical	Non Forest	Non-SR	For Exploration
45		BH18/20	4600N	7000E	263.41	Core	75	Vertical	Non Forest	Non-SR	For Exploration
46		BH19/20	4600N	7100E	262.84	Core	75	Vertical	Non Forest	Non-SR	For Exploration
47		BH20/20	4600N	7200E	262.39	Core	75	Vertical	Non Forest	Non-SR	For Exploration
48	**FY 2021-22** **20 Nos.**	BH1/21	4600N	7300E	262.18	Core	75	Vertical	Non Forest	Non-SR	For Exploration
49		BH2/21	4600N	7400E	261.34	Core	75	Vertical	Non Forest	Non-SR	For Exploration
50		BH3/21	4600N	7500E	260.72	Core	75	Vertical	Non Forest	Non-SR	For Exploration
51		BH4/21	4600N	7600E	259.87	Core	75	Vertical	Non Forest	Non-SR	For Exploration
52		BH5/21	4600N	7700E	257.87	Core	75	Vertical	Non Forest	Non-SR	For Exploration
53		BH6/21	4600N	7800E	257.31	Core	75	Vertical	Non Forest	Non-SR	For Exploration

54		BH7/21	4600N	7900E	255.32	Core	75	Vertical	Non Forest	Non-SR	For Exploration
55		BH8/21	4600N	8000E	254.87	Core	75	Vertical	Non Forest	Non-SR	For Exploration
81		BH14/22	4400N	7900E	261.73	Core	75	Vertical	Non Forest	Non-SR	For Exploration
82		BH15/22	4400N	8000E	260.12	Core	75	Vertical	Non Forest	Non-SR	For Exploration
83		BH16/22	4400N	8100E	259.41	Core	75	Vertical	Non Forest	Non-SR	For Exploration
84		BH17/22	4400N	8200E	258.19	Core	75	Vertical	Non Forest	Non-SR	For Exploration
85		BH18/22	4400N	8300E	257.43	Core	75	Vertical	Non Forest	Non-SR	For Exploration
86		BH19/22	4300N	8200E	261.24	Core	75	Vertical	Non Forest	Non-SR	For Exploration
87		BH20/22	4300N	8300E	261.23	Core	75	Vertical	Non Forest	Non-SR	For Exploration
Total						87	6525				

Exploration in the proposed drill holes which are planned outside the surface right area will be taken up as soon as the surface right is granted/negotiated with the villagers.

j) Resource and Reserves within the lease area estimated based on various factores such as-

i) **Bulk Density:** Based on the govt lab data following bulk density has been considered for resource computation:

- Murrum/ Clay – 1.6 gm/ cc
- Limestone/ Mineral reject/ Wsate/ Dolomitic stone (Reject) – 2.5 gm/ cc

ii) Threshold value of limestone: As per circular No.C-284/3/CMG/2017 of Indian Bureau of Mines, the notified and suggested threshold value for limestone is as below:

Mineral	**Notified threshold values**	**Cut off grade considered**
Limestone	CaO-34% (min), MgO-5% (max), SiO2-18% (max) and Alkalis-0.5% (max)	CaO – ≥38% MgO - ≤7%
Dolomite	MgO- 15% (min), SiO_2-6% (max), Total Insoluble- 12% (max)	MgO - >15%, SiO_2 <6%

iii) Cut-off grade: Based on these guidelines, the rock units of the area can be broadly classified as below:

- Soil mixed IB – Murrum, clay etc
- Cement Grade Limestone (LST) – CaO ≥ 38%, MgO ≤ 7%.
- Mineral rejects – CaO ≥ 34% &< 38%, MgO > 5% & ≤ 7%.
- Waste materials - CaO < 34% or MgO≥ 7%≤15%.
- Dolomite – MgO > 15% & SiO_2 <6%.

iv) Litho units : Due to high degree of deformation in the area, the various litho units have exhibited a complex structure with quality variation at short intervals. In order to assess the deposit more reliably, the limestone and dolomitic unit of the deposit has further been classified into smaller ranges on the basis of chemical composition as revealed during exploration. The classification of different calcareous units is as below:

Grade-I	CaO>=46%, MgO<2.8%	G1
Grade-II	CaO>=44%, MgO<=3.5%	G2
Grade-III	CaO>=40%, MgO<=5%	G3
Grade-IV	CaO>=38%, MgO>5% and <=7%	G4
BLST/ Mineral Rejects	CaO>=34%&<38%, MgO<7%	BLST/ SG
Waste materials	CaO<34% or MgO>7%	REJ
Dolomite	CaO>23%<=35%,MgO>=15%, SiO_2≤6%	DOL

v) Parameters for estimation of resources: The parameters considered for resource estimation can be summarized below:

Sl.No.	Litho-unit	Cut off grade considered	Average Recovery % from total excavation	Average Bulk Density considered
1.	Usable Limestone	CaO>38% & MgO<7%	52.0	2.5
2.	Mineral reject	CaO 34-38% & MgO<7%	3.0	2.5
Limestone (ROM)			55.0	2.5
3.	Waste/ Rejects including soil mixed IB	CaO<34% & MgO>7 % <15%	44.2	2.5

IB/Waste/ Dolomitic Stone			44.2	2.5
5.	Dolomite	MgO>15% & SiO_2<6%	0.8	2.5

Bulk density test result and average recovery factor based on field test for limestone, sub grade limestone (mineral reject), waste and dolomitic stone samples conducted by Govt. testing laboratory, Rourkella and M/S Earth & Environment Laboratory, (NABL accredited) is attached**(Annexure-12 & 13)**.

K. UNFC Classification.

As per UNFC classification, the area has been classified upon degree of exploration, its influence on mineability, feasibility of mining, complexity of the deposit and rock characteristics.

In the lease area, boreholes were drilled at 100 m x 100 m grid to 100 x 200 m grid intervals. Thus, as per UNFC's guidelines, the lease area falls under Proved Mineral Reserve (111) category, probable mineral reserve (121)and inferred mineral resource (333) Category and the justification behind the classification is as below.

K.i. Inferred Mineral resource (333)

Inferred mineral resource are those part of the mineral resources for which tonnage, grade and mineral content can be estimated with low level of confidence and inferred from geological evidence.

K.ii. ProbableMineralReserve(121)

Thatpartofanindicatedandinsome circumstancesmeasuredmineral reserve that as beenshownbyprefeasibilitystudytobenoteconomicallymineable.Possibly economicallyviablesubjecttochanges intechnological,economic, environmentaland/or otherrelevantcondition.

K.iii. Proved Mineral Reserve (111)

Proved mineral reserve is the economically minable part of a recoverable quantity assessed by a feasibility study or actual mining activity usually undertakes in areas of detailed exploration (measured recoverable quantity).

As per the UNFC field guidelines for Detailed Exploration (G1), geological survey by Detailed topographical-cum-geological map showing all surface geological features, extent of deposit, structure , location of boreholes has been prepared on scale 1:2000. Assay plan and geological cross sections considering boreholes data have been prepared. The granted ML area is explored in close spaced drilling at 100m to 100m regular grid interval up to 70 mts depth (190 mRL) depth of limestone intersected. Litho unit and meter wise core sampling and chemical analysis of ore: waste and assessment of recovery ratio carried out. The area between the grid line 6550E-6700E & 4800N 5000N and 6900E -7100E & 4800N- 4950N at a depth of 70 mts down excluding 5mts OB upto 190mRL from top surface is considered as "111" category (proved mineral reserve) as per UNFC classification

.L Detail calculation of Reserves/ Resources

The resource /reserves have been estimated under 6 broad chemical criteria based on cut off grade over sectional method and the grade parameters are as follows:
Limestone – CaO > 38% & MgO <7%; Mineral rejects (Sub grade limestone) - 34% <38% & MgO <7%; Reject – CaO < 34% or MgO >7% <15%; Dolomite – MgO >=15%, SiO_2<6%.

L. i . Total lease area explored under various categories as on 01.04.2018

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.

Total lease area : 93.798 Ha						
Item of information	Lease area explored as per UNFC norms (in Ha) as on 01.04.2018					Remarks / Comments including reasons for not carrying out the exploration as per UNFC norms.
	Total Lease area = A+B+C+D+E					
	G1 Level	G2 Level	G 4 Level	Explored and found non mineralized with level of exploration (Remarks)	Unexplored lease area	
	A	B	C	D	E	
Area as per level of exploration	1.92	2.75	89.128	2.75	86.378	
No. of BHdrilled	2	Influence	nil	-	-	
No. of BH considered for Resource Estimation	2					
Meterage	140	--	--	-	-	
Grid Interval	100mx	200m x				

	100m	200m				
Scale of Mapping	1 : 2000					
Reserve estimated after above exploration as on 01.04.2018					1.489 million tonnes	
Remaining Resource after above exploration as on 01.04.2018					0.283 million tonnes	
Total Resource after above exploration as on 01.04.2018					1.772 million tonnes	

Total lease area explored under various categories as on 01.04.2018

L.ii. Reserves / resources as per UNFC category

Reserves have been computed on mineable pit with haul road and bench as per the following specification:

- Bench Height - 8m
- Bench slope - 80 degree
- Bench width - 12m*
- Ultimate pit limit at depth – 190 mRL
- Ultimate Slope - 41.24 degree*
- Haul Road Width - 20m
- Gradient – 1 in 20 (5%)

Giving due regard to above parameters and mining constraints discussed above, a conceptual pit has been formed keeping at least 50m space at the bottom bench within the mineable boundary. Reserves and resources have been computed within the above pit & is given in table below. Calculation sheet of reserve/resource is attached as annexure-22

UNFC CLASSIFICATION AS ON 01.04.2018

Reserves/Resources (million Tonnes)		**Mineral Reserve**		**Inferred resource**	**Total**
		111	121	333	
Rejects	Soil mixed IB	0.044	0.00	0.00	0.044
	Waste materials(DLS)	0.819	0.103	0.211	1.133
	Dolomitic Stone	0.140	0.011	.001	0.152
Usable Limestone	Limestone	1.260	0.146	0.267	1.673
	Mineral Rejects (MR)	0.075	0.008	0.016	0.099
Total		**1.335**	**0.154**	**0.283**	**1.772**

Total (Limestone + MR)	**1.489**	**0.283**	**1.772**

Reserves / Resource as per UNFC as on 01.04.2018

Mineable reserves for the deposit is the mineable part of the mines area considered under proved, probable, inferred minerable resources and reconnaissance mineral resources (111 ,121 , 221,222,333 & 334) as per UNFC are given below,

Classification	code	Quantity (million tonnes)	Grade
Total Mineral Resources		**----**	Cement & Sub grade
A. Mineral Reserves			
Proved Mineral Reserves	111	1.335	Cement & Sub grade
Probable Mineral Reserves	121	0.154	-
	122	-	Cement & Sub grade
Sub Total (A)		**1.489**	Cement & Sub grade
B. Remaining Resources			-
Feasibility Mineral resources	211	-	-
Pre-Feasibility Mineral resources	221	-	Cement & Sub grade
Measured Mineral Resources	331	-	Cement & Sub grade
Indicated Mineral Resources	332	-	-
Inferred Mineral resources	333	0.283	Cement & Sub grade
Reconnaissance Mineral Resources	334	-	-
Sub Total (B)		**0.283**	Cement & Sub grade
Grand Total (A+B)		**1.772**	Cement & Sub grade

- The mineral rejects (sub grade limestone) is also high in magnesia and silica and low in CaO limiting its use in cement manufacturing. These mineral rejects may be utilized by judicious blending with limestone and high grade limestone for manufacturing of cement keeping mineral conversation point of view.
- In general limestone is rich in lime and low in silica provides scope for use low MgO limestone of marginal grade quality or use of sweetener with very low MgO and high lime whereby part of reject and sub grade can be utilized.

- As per UNFC guideline out of the available resources of 1.772million tonnes of cement grade and sub grade (mineral rejects) quantity, about 1.489 million tonnes is mineable under present circumstance.
- About 1.489 million tonnes is recoverable at a recovery ratio of 1: 0.75 (Limestone+ Mineral rejects (Sub Grade): (Reject+ Dolomite+ Soil mixed IB)
- Limestone from mines rich in lime and low magnesia while mineral rejects (sub grade) is poor in lime but rich in magnesia. It may be wholly used with limestone for cement manufacturing depending upon type of cement being manufactured.
- Resources / reserves discussed is purely based on threslold value of IBM

Occurrence of Dolomite

Occurrence of dolomite could not be traced in the form of any out outcrop within the mining leasehold area at Kukuda. However, in consideration of the regional geology and formation of minerals in the neighbouring quarry, it is likely that dolomite occurrence will be encountered. Hence we will explore for both limestone and dolomite and on availability, exploit too. Since dolomite bands occur in the neighbouring quarry 2 south side also, it is very much likely that Kukuda deposits will contain dolomite. However the status will be reviewed on completion of proposed exploration.

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) Kukuda limestone deposit is having a single limestone band extending from west to east direction adjecent to lanjiberna Q-2 of southern band heaving length of the lease 1892 mts and width 517 mts and within the gride line 6500E - 8400E & 4300N - 5000N.

ii) On southern band, there is a existing pit having area 0.173 Ha.

iii) There is an existing waste dump of hight 3mts and area 0.087 Ha within the lease area

iv) The entire lease area is a barren land excluding the existing pit area.

v) Within the lease area, there is an existing road of area 0.025 Ha.

vi) Only 2Nos of bore holes at an depth of 70 mts has been explored within the lease area.

Particulars	Qry-1
Co-ordinates of the existing pit	7100E-7200E and 4800N-4925N
Qry Length & width(m)	53 mts x 40m
Top & Bottom bench RL	No proper benchs due to mannual working
Depth of pit	Appx. 6 mts
Height of Benches (m)	No propoer benches
Width of benches (m)	No proper benches

Proposed Method of excavation.

i) The mine has been designed to work for 300 days in a year i.e in general shift(G-Shift) only having a duration of 8-hours.

ii) Within the lease area two bore holes have been explored and the rest part of the lease area is taken for exploration with in 3-years from Dec-2018 to 2021.Within the plan period, scientific development and working of the quarries are being restored to keeping in mind the quality considerations,long tern mining and mineral conservation aspects.

iii)The production of limestone during the plan period from Dec-2018 to Mar-2019 shall be 31,000 MT and from 2019 to 2023 shall be 1,00,000 MT per annum.

iv) The choice of a mining method primarily depends on the following factors :

- The nature and occurrence of the deposit.
- The physical and chemical characteristics of the deposit.
- The structural features of the deposit.
- Quantum of waste material vis-a vis mineral to waste ratio.
- Methodology adopted in vicinity for similar deposit.
- Availability of uninterrupted land as much as possible for smooth mining etc.

v) Sequence of different mining operation (present and proposed)

Open cast mechanized system of mining will be 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.

Blasting will be done by conventional explosives with SME & ANFO and Loading of limestone from quarries will be monitored time to time. The blasted ROM will be loaded by Hydraulic Excavators of 220 class of 1cubic mts bucket capacity to 10tonner capacity dump trucks and ultimately the material will be transported to the crushing plant/dump area. The waste material including dolomitic stone/dolomite/soil mixed IB will be loaded into dumpers and sent to stack/ dumping area earmarked for the purpose separately.

Excluded Portion

There are certain excluded portions within the mining leasehold area at Kukuda. These are located against individual plots at Plan No - 05 showing the Mining Lease Map. A coloured plan has also been adopted for easy identification and exclusion.

b) **Year wise tentative excavation in cubic meters indicating development,ROM, pit wise as in table below.**

b.i . Insitu Tentative Excavation

With a view to systematically mine the deposit at deeper levels, it has been planned to expand pit limit. Accordingly the developmental work has been planned. The high magnesia limestone & phylitic rock and dolomite associated with mixed limestone/phylitic bands as well as soil mixed rejects which comprises the total waste

are removed and disposed off to the stack/ dumping area during the mining of limestone from these quarries. The ROM comprises of the usable limestone of >38% CaO & MgO < 7% and mineral rejects with CaO between 34 & 38% & MgO 5-7% The mineral rejects in Kukuda mines are below the cut off grade and above threshold value and can be suitably blended with high grade limestone for manufacturing of cement. The average recovery percentages of different formations in the mine are found to be as below .

Sl. No.	Litho-unit	Cut off grade considered	Average Recovery % from total excavation
1.	Usable Limestone	CaO>38% & MgO<7%	52.0
2.	Mineral Reject (MR)	CaO 34-38% & MgO<7%	3.0
Limestone (ROM)			55.0
3.	Waste/ Rejects including soil mixed IB	CaO<34% & MgO>7% <15%	44.2
4.	Dolomite	MgO>15% & SiO_2<6%	0.8

Authenticated test report from M/S Earth & Environment Laboratory (NABL accredited) is submitted as **Annexure-12.** Representative samples of limestone, dolomite, reject materials and wastes from the mining pits have been analyzed by Government laboratory, Sambalpur and the test results are attached as **Annexure-13.**

After blending with the mineral rejects, the total ROM production shall be limited to 0.1 million tonnes per year (excluding 2018-19) subject to getting the necessary clearance from the authorities. The planning for the plan period has been made considering average MgO level up to 5.0 % and CaO level up to 43.5%.

The quarries will be developed at different levels. The height of the benches will be kept at 8m and the width of the working benches shall be around 12m. Haulage roads at 1:20 gradient shall be maintained for easy movement of machinery and transport vehicles

Year wisetentative excavation in cubic meters of waste development, ROM production are given below:

Year	Pit No.	Total tentative Excavation (M^3)	Soil mixed IB (M^3)	Dolomitic stone/Reject (M^3)	IB/ Waste Material (M^3)	ROM (M^3)		Mineral Reject (m^3)	ROM / Waste ratio (M^3/ M^3)
						Ore (M^3) *	Mineral Reject (M^3)		
(1)	(2)	(3)= (4+5 + 6+7+8)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dec-2018-Mar-19	Q-1	23485	4000	112	5953	12680	740	0	
	Q-2	0	0	0	0	0	0	0	
Total		23485	4000	112	5953	12680	740	0	1 : 0. 75
2019-20	Q-1	75801.2	5800	301.2	28700	38720	2280	0	
	Q-2	0	0	0	0	0	0	0	
Total		75801.2	5800	301.2	28700	38720	2280	0	1 : 0. 85
2020-21	Q-1	0	0	0	0	0	0	0	
	Q-2	73535	5000	317.6	26197.4	39600	2420	0	
Total		73535	5000	317.6	26197.4	39600	2420	0	1 : 0. 75
2021-22	Q-1	0	0	0	0	0	0	0	
	Q-2	71827.6	2500	327.6	28200	38300	2500	0	
Total		71827.6	2500	327.6	28200	38300	2500	0	1 : 0. 76
2022-23	Q-1	0	0	0	0	0	0	0	
	Q-2	68868.8	2000	288.8	26500	37800	2280	0	
Total		68868.8	2000	288.8	26500	37800	2280	0	1 : 0. 72
Grand Total		**309917.2**	**15700**	**1347.2**	**115550**	**167100**	**10220**	**0**	**1 : 0. 77**

Tentative tonnage of the ore and mineral reject 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 2.5, based on the test result of two limestone samples, two sub grade limestone (mineral reject) samples, two waste samples and two dolomitic stone samples at the Govt. Laboratory(Annexure-12)

b.ii) Year wise production of limestone and Dolomite (in tonnes)

Year	Pit No	Excavation of limestone (in tonnes)	Excavation of Dolomitic stone (in tonnes)

		Usable limestone (>38% CaO)	Mineral Reject (34-38% CaO)	Total limestone (ROM)	Usable Dolomite (>15% MgO &<6% SiO_2)	Dolomitic stone (>15% MgO&>6% SiO_2)	Total Dolomitic stone (ROM)
Dec-2018-Mar-19	Q-1	31700	1850	33550	50	230	280
	Q-2	0	0	0	0	0	0
Total		**31700**	**1850**	**33550**	**50**	**230**	**280**
2019-20	Q-1	96800	5700	102500	153	600	753
	Q-2	0	0	0	0	0	0
Total		**96800**	**5700**	**102500**	**153**	**600**	**753**
2020-21	Q-1	0	0	0	0	0	0
	Q-2	99000	6050	105050	165	629	794
Total		**99000**	**6050**	**105050**	**165**	**629**	**794**
2021-22	Q-1	0	0	0	0	0	0
	Q-2	95750	6250	102000	166	653	819
Total		**95750**	**6250**	**102000**	**166**	**653**	**819**
2022-23	Q-1	0	0	0	0	0	0
	Q-2	94500	5700	100200	144	578	722
Total		**94500**	**5700**	**100200**	**144**	**578**	**722**
Grand Total		**417750**	**25550**	**443300**	**678**	**5150**	**3368**

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 PlateNos 8,9,10,11,12, & 13.The pit/ haul road as well as the main entry road, service road etc are being properly maintained and can be briefly discussed below:

Mining Roads: The mine is advanced along the strike of deposit with its working faces across to it. The mine workings has been planned up to the RL of 190m .Two types of roads namely village Road and Quarry Road have been provided. 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 main entry road are connected by ramps of 12 m width and 1 in 12 gradients. These ramps are also of temporary in nature and their position change with advancement of faces.

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

Open cast,Other than fully mechanized (category 'A' OTFM) system of mining will 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.

d .i. Extent of mechanization

The Salient features of the proposed method of working indicating caterory of mine

i)	Method of mining	Open cast mining
ii)	Bench parameters	8mts x 12mts
iii)	Bench height inOB/ore	8 mts
iv)	Bench width	12 mts
v)	Bench slope	75 Degree
vi)	Over all pit slope	43.5 degree
vii)	Bottom mRL proposed duringplan period	222 mRL
viii)	Grid reference ofproposed working location	6500E - 7700E & 4600N - 4984N

d.ii.) Drill machines required for blast holes to be deployed in the plan 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 a Hydraulic drill 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	115 mm
Air consumption	12.5 CuM/min
Pressure supplied up to	14.5 kg f/sq.cm.
Drilling parameters	
Dia. of blast hole (D)	110 mm
Height of the bench	8 m
Additional drilling required (sub grade) (A)	0.5 m
Length of the hole (H + A)	8.5 m
Burden (B)	3.2 m
Spacing (S)	3.7 m
Yield per meter of drilling	3.2 x 3.7=11.84 M^3
Total quantity of material handling (maximum in 2019-20)	72000 M^3
Handling of stone required in one day considering 300 mine working day in year	240M^3
Total meterage of drilling required per day	20 m
Performance of Hydraulic drill per hour	22 m
Requirement of drill machine per day	1 hrs

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

Hydraulic excavators of bucket capacity of 1 M^3 will be deployed in the mine .Higher capacity dumpers 10 tons will be used for optimum utilization of excavators. The details of requirement of the excavators as per proposed system are described below:

Particulars		**Limestone (ROM) / OB Production**
Capacity of the bucket of excavator (C)	=	1.0 CuM
Bucket fill factor + efficiency factor (f)	=	0.75
Bulk density of the blasted stone (BD)	=	1.6
Handling of excavator per pass in tonnes (CxfxBD)	=	1.2 Tonnes
Dumper being utilized	=	10 tonne

Loading time by excavator in to dumper	=	10÷1.2=8.33 pass x 40 sec time per pass = 330 secs or 5.55 minutes.
Time cycle per one dumper trip: i) Loading time ii) Spotting time, Positioning etc iii)Time taken up & down (Av. Lead 1.5 + 1.5 = 3Km for out side and , 2.0 + 2.0 = 4 Km for dump area & speed 20 Kmph) iv) Spotting time at unloading/ Dump area Total cycle time of one dumper V) No of dompers	 = = = = =	 5.55 minutes 1.00 minutes 12.00 minutes 2.00 minutes 14.5 minutes or say 15 minutes 4 Nos
Total handling per hour of excavator	=	10 x 3x 4= 120 tonnes / hr.
Total handling per shift of excavator (Considering 6.5 hrs effective hours in general shift)	=	120x 5.5 = 660 tons or 264 M^3

d.iv). Haulage and transport equipment required in the plan period

a) Haulage within the lease hold area:

For transportation of limestone to earmarked area and removal of waste from the mines to dumping area, 10 tonne capacity dumpers matching to 1.0 m^3 bucket capacity excavators has been selected.

The average lead distance for the dumpers from the quarries to the boulder stack area 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 20 and 22 minutes. The requirement of dumpers matching to the required excavators is thus calculated as below:

Particulars		**For Limestone Production**
Heaped Capacity of the dumpers	=	10 tonnes
Lead distance from quarry to crusher/ dump area	=	1.50 Km
Time cycle of one dumper	=	20 minutes

Requirement of dumper to excavator	=	3 nos.

d.v) Transport of limestone from mine head to destination :

The blasted limestone boulders from mines face will be transported by 10 tone dumpers to destination unloading point for further use.

d.vi) List of Machinery in the mines

The machinery requirement particularly for drilling, excavation and transportation will be done based on the capacity of the machines existing in the mine. A list of proposed machinery of different capacities is given below:

Sl. No.	Type of Machinery	Capacity of each unit	No. of units required	Electrical/non electrical
1	Shovel (Hydraulic)	1.00 CuM	1	Non Electrical
2	Dumpers	10Tonne	3	Non Electrical
3	JCB	.3 cubic mts	1	Non Electrical
5	Water Tanker	10 KL	1	Non Electrical
6	Hyd Drill	115 mm dia	1	Non Electrical
7	Rock breaker	350 Class	1	Non Electrical
8	Explosive Van	0.3 Tonne	1	Non Electrical
9	Tractor	60.00 HP	1	Electrical
10	Pumps	--	As required	Electrical
11	Other HEM Machinery	--	As required	Non Electrical

d.3) BLASTING

Sequential blasting will be done by using NONEL/ electronic detonator to reduce vibration and fly rock during the plan period.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 will be carried out scientifically to check adverse effects if any during blasting. The blasting parameters are as below.

Height of bench	8 m
Sub-drilling	0.5 m
Depth of Blast hole	8.5 m
Burden	3.2 m
Spacing	3.7 m
Hole diameter	115 mm
Diameter of the cartridge	83 mm
Yield per hole (Loosening of rock mass per hole):	237 tonnes
Powder Factor achieved/ Projected	6 Tonnes/Kg

Type of explosive to be used

It has been planned to use SME for blasting. The type of explosives which will be used is given below.

Cap Sensitive Slurry Explosive	
PG – C (83 mm)	IEL
Toe Blast (83 mm)	GOCL
Aquadyne (83 mm)	GOCL
PRIMER	
P G Boost - 100gr, 150gr	IEL
Imulboost- 100gr, 150gr	IDL
Non Cap Sensitive Slurry Explosive	
Expo Gel (83 mm)	Mahanadi Metal
P G –I (83 mm)	GOCL
Supergel (83 mm)	IEL
Detonator/Nonel	
Electric/ Electronic Detonator	ICI, IDL

d.4) Powder factor

Powder factor in limestone is 6 Tonnes/Kg of explosive where as in waste it is 6.5 to 7 tonnes/Kg of explosive as per previous experiences.

d.5)Safety Precautions

a) Boards displaying (in Odiya & English) blasting time will be kept at the places where required.
b) Blasting time will be fixed and intimated to all concerned.
c) At the time of blasting, security guards will be deployed in order to block the vehicle movement on the public road.
d) In order to indicate the blasting operation, red flags will be kept where ever required.
e) A Siren will be blown at the beginning and end of the blasting operation.

d.6) Disposal of OB/waste/rejects along with ground preparation prior to disposal of waste

The waste/ rejects during the mining period is planned to stack in the south side of quarry-1.The layout of mine workings during the plan period is shown in the development plans and sections i.e. Plate Nos. , 8, 9 10,11,12,13,14 & 15 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. 13,14& 15

e.1) Development & Production plan during 2018-19(Dec-2018 to Mar-2019) is given in plate No.8

Quarry proposed to be Worked	**Quarry-1**
Co-Ordinate at the end of Year	4904N to 4978N, 6529E to 6624E

Existing R.L of the quarry floor (m)	260 MRL
Bench levels to be worked (m)	262-254/254-246/ 246-238
No of benches to be worked	3
Height of the bench (m)	8m
Width of the benches (m)	12m (min)
Length /Width of quarry (m) Av.	95 x 72
Length of haul road with gradient	110 m (1:20)
No. of ramps if any	1
Direction of advancement of the faces	South
Overall slope of the quarry at the end of the year	37º
Production of Limestone with Mineral Rejects (tonnes)	33550
Production of Limestone with Mineral Rejects (CuM)	13420
IB/ Waste generation (Cu.m)	10065
Stripping ratio (waste/ ore) M^3/M^3	1:0.75
Site for disposal of waste (co-ordinates)	4545N to 4663N 7384E to 7438E

Development & Production plan during 2019-20,(Plate No. 9),

Description

Quarry proposed to be Worked	**Quarry-1**
Co-Ordinate at the end of Year	4841N to 4978N

	6529E to 6624E
Existing R.L of the quarry floor (m)	260 mRL
Bench levels to be worked (m)	262-254/254-246/246-238/238-230
No of benches to be worked	4
Height of the bench (m)	8m
Width of the benches (m)	12m (min)
Length /Width of quarry (m) Av.	135 X 95
Length of haul road with gradient	155m (1:20)
No. of ramps if any	2
Direction of advancement of the faces	South
Overall slope of the quarry at the end of the year	33 degree
Production of Limestone with Mineral Rejects (tonnes)	102500
Production of Limestone with Mineral Rejects (CuM)	41000
IB/ Waste generation (Cu.m)	34801
Stripping ratio (waste/ ore) M^3/M^3	1:0.85
Site for disposal of waste (co-ordinates)	4537N to 4661N 7433E to 7500E

Development & Production plan during 2020-21(Plate No. 10)

Quarry proposed to be Worked	**Quarry-2**
Co-Ordinate at the end of Year	4853 N -4943N, 6805 E- -7050E

Existing R.L of the quarry floor (m)	258 MRL
Bench levels to be worked (m)	
No of benches to be worked	2
Height of the bench (m)	8m
Width of the benches (m)	12m (min)
Length /Width of quarry (m) Av.	205 x 71 M
Length of haul road with gradient	235 m (1:20)
No. of ramps if any	1
Direction of advancement of the faces	South-West
Overall slope of the quarry at the end of the year	32º
Production of Limestone with Mineral Rejects (tonnes)	105050
Production of Limestone with Mineral Rejects (CuM)	42020
IB/ Waste generation (Cu.m)	31515
Stripping ratio (waste/ ore) M^3/M^3	1:0.75
Site for disposal of waste (co-ordinates)	4530N to 4652N 7500E to 7560E

Development & Production plan during 2021-22,(Plate No. 11)

Quarry proposed to be Worked	**Quarry-2**
Co-Ordinate at the end of Year	4809N--4943N, 6850-7050E
Existing R.L of the quarry floor (m)	259MRL

Bench levels to be worked (m)	262-254/254-246/
No of benches to be worked	2
Height of the bench (m)	8m
Width of the benches (m)	12m (min)
Length /Width of quarry (m) Av.	205 x 112
Length of haul road with gradient	278 m (1:20)
No. of ramps if any	1
Direction of advancement of the faces	South-West
Overall slope of the quarry at the end of the year	30º
Production of Limestone with Mineral Rejects (tonnes)	102000
Production of Limestone with Mineral Rejects (CuM)	40800
IB/ Waste generation (Cu.m)	31027
Stripping ratio (waste/ ore) M^3/M^3	1:0.76
Site for disposal of waste (co-ordinates)	4525N to 4645N 7560E to 7623E

Development & Production plan during 2022-23,(Plate No. 12)

Quarry proposed to be Worked	**Quarry-2**
Co-Ordinate at the end of Year	4799-4955N 6750-7050 E
Existing R.L of the quarry floor (m)	260 MRL

Bench levels to be worked (m)	262-254/254-246/ 246-238/
No of benches to be worked	3
Height of the bench (m)	8m
Width of the benches (m)	12m (min)
Length /Width of quarry (m) Av.	300 X 128M
Length of haul road with gradient	292 m (1:20)
No. of ramps if any	2
Direction of advancement of the faces	South-West
Overall slope of the quarry at the end of the year	34º
Production of Limestone with Mineral Rejects (tonnes)	100200
Production of Limestone with Mineral Rejects (CuM)	40080
IB/ Waste generation (Cu.m)	28788
Stripping ratio (waste/ ore) M^3/M^3	1:0.72
Site for disposal of waste (co-ordinates)	4625N to 4756N 6506E to 6626E

Disposal of OB/waste/rejects along with ground preparation prior to disposal of waste

.The waste/ rejects materials will be generated during the review period has been planned to stack over the exhausted southern part of the lease in between the grid line 4749N- 4738N and 6519E- 7505E, covering an area of 5.183 Ha.

The layout of mine workings during the plan period from 2018 to 2023 has been shown in development plans and sections i.e. Plate Nos. 8,9,10,11 & 12. The temporary Dumping has been proposed in the unexplored area earmarked in development plan during the plan period.. The said location will be explored/ proved to be barren in the year 2019-2020, if the proposed Dumping area is found to be mineralized, the Modification of Mining Plan will be submitted during the FY 2020-21.

f) Conceptual Mine Planning

f.1)Life of the mines

Within the mining lease area of 93.798 hectors. A proved and probable mineral reserve of 1.489million tonnes has been estimated as on 01.04.2018 up to the level of RL 190 m. Beside these0.283 million tonnes of resources under 333 category has been estimated.

Therefore, with the proposed production of mines at the rate of 0.03 million tonnes in the year Dec-2018-19 and 0.1 million tonnes from the period 2019-23.The total proved mineral reserve will be last for about 14.59 years excluding 2018-19 @ 0.1 million tonnes per year. i.e. the life of the mines go up to Sept-2034. After complation of the proposed exploration work, the existing reserve quantity will be increased and accordingly the life of the mines will be increased. Efforts are there to optimize MgO maximum up to 5.5 % by consuming blendable sub grade limestone (mineral rejects) by proper pre blending at quarry as per requirement of the plant. The mining details based on the present data can be summarized below:

Sl. No.	Particulars	Details
1.	Method of mining	Other than fully mechanized mining using HEMM including deep hole drilling & blasting
2.	Resource	0.283 million tonnes
3.	Total Mineable reserves	1.489 Million Tonnes
4.	Proposed Life of the Mine	14.55 years based on mineable reserve from 1.12.2018 (Note: The life of mine may be increased after further exploration in other parts of the lease area, conversion of mineral resources in mineable reserves & blending of sub grade limestone with high grade limestone at mine face)
5.	Bench Height	8m
6.	Bench slope	80 degree
7.	Bench width (ultimate)	12m*
8.	Ultimate pit limit at depth	190 mRL
9.	Ultimate Slope	65 degree*
10.	General Ground Level	260 mRL
11.	Water Table	0.92 m – 8.2 m bgl during post monsoon

f.2) Land use pattern

The present land use pattern vis a vis in the plan period and conceptual period are tabulated below:

Description	Existing (Ha)	Dec-2018-2019	2019-20	2020-21	2021-22	2022-23	Plan period (Ha)	Additional area for conceptual period (Ha	Conceptual (Ha)
Area under mining	0.173	0.600	0.640	1.300	0.930	1.638	5.108	10.06	15.34
Storage of topsoil	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Overburden dumping including Retaining wall, garland drain etc.	0.087	0.490	0.770	0.690	0.690	2.543	5.183	8.15	13.42
Sub grade stacking/ Mineral storage	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	00
Infrastructure (Workshop, crusher, admn. Building, magazine etc)	0.00	1.300	0.700	0.000	0.000	0.000	2.00	0.00	2.00
Mines Roads / haulage road	0.025	.100	0.00	0.000	0.000	0.000	0.1	0.00	0.125
Sub Total	**0.285**	**2.490**	**2.110**	**1.990**	**1.620**	**4.181**	**12.391**	**18.21**	**30.88**
Safety zone along the lease boundary	0	0	0	0	0	0	0	0	0
Safety zone for village	0	0	0	0	0	0	0	0	0
Undisturbed land for future mining/ dumping etc.	0	0	0	0	0	0	0	0	0
Total	**0.285**	**2.490**	**2.110**	**1.990**	**1.620**	**4.181**	**12.391**	**18.21**	**30.88**

f.3) Post mining land use pattern

Post mining land use pattern has been envisaged as below:

Sl. No.	Description	Land Use (In Ha.)				
		Plantation	Water Body	Public Use	Undisturbed	Total
1.	Top Soil Dump	-	-	-		
2.	External Waste Dump	13.42	-	-	-	13.42
3.	Excavation (voids)	2.28	13.05	-	-	15.33

Sl. No.	Description	Land Use (In Ha.)				
		Plantation	Water Body	Public Use	Undisturbed	Total
	a. Excavation (backfilled)					
4.	Road	0.125	-	-	-	0.125
5.	Infrastructure (Workshop, crusher, admn. Building, magazine etc)	-	-	2.00	-	2.00
6.	Afforested area including safety zone along ML boundary	1.125	-	-	-	1.125
7.	Safety zone of magazine used for plantation	-	-	-	-	-
8.	Safety zone for village	-	-	-	-	
9.	Safety zone for water channels (Peru Pichara)	-	-	-	-	-
10.	Town Ship Area	-	-			
11.	Mineral Storage	-	-	-	-	
12.	Others (electrical transmission line)	-	-	-	-	-
13.	Undisturbed Area	-	-	-	-	-
	Total	16.95	13.05	2.00	-	32.00

f.4) Safety & Environmental Measures

- Monitoring for ambient air, noise, dust and water will 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 watering at the plantation sites will be done to achieve 80% survival of planted saplings.

f.5) 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 will be constructed all around the pits. A series of

check dams and settling tanks are also provided at the end of each garland drain in order to allow clean water to escape from the lease area.

3.0 MINE DRAINAGE

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

The sub-surface water levels measured from the existing dug wells in the nearby area during the monthof November 2016 and February 2017 are given below:

Sl. No.	Location	Ground level in AMSL	GW level in AMSL		Ht. of water Col in m	
			Nov'2016	Feb'2017	Nov'2016	Feb'2017
1.	Kheramata vill. Dug well	243.23	239.83	236.98	4.61	1.76
2.	Lanjiberna Col. Dug well	247.83	244.68	244.48	8.25	8.05
3.	Dhaurada vill. Dug well	242.34	238.38	234.51	4.53	0.66
4.	Lanjiberna mines Workshop Dug well	245.03	242.51	240.43	3.62	1.54
5.	Lanjiberna vill. Dug well	255.14	253.46	252.44	3.32	2.30
6.	Katang vill. Dug well	264.89	262.17	259.09	5.23	2.15

b) Maximum and minimum depth of workings:

The maximum and minimum RLs of the two different quarries during the review period would be as below:

Particulars	**Quarry- 1**	**Quarry-2**
Top of Quarry (m)	260	260
Floor level of Quarry (m)	190	190

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 2011 to July- 2018 was 1240.8 mm in 2012 and minimum 523.5 mm in 2014. It has been observed that rainfall during the months from July to September contributes the majority (more than 60%) of the rainfall. However, significant quantity of rain falls during October and November months also in this period. The maximum quantity of rain water likely to be accumulated can be calculated as below:

1.	Maximum rainfall recorded in a month of Sept-2011	:	523.6 mm
2.	Maximum rainfall in a day (considering 15 rainy days)	:	34.9 mm

3.	Total Quarry area during the plan period	:	5.281 Ha
4.	Total rain water likely to be accumulated in a day	:	184.30 m3
5.	Likely recharge to ground water storage (around 15%)	:	184.3x15%=27.64
6.	Likely evaporation (40%)	:	73.6m3
7.	Balance rain water likely in the mines	:	83.4m3
8.	Sub surface strata (seepage) water likely to be released due to mining (10 M^3/ Hect.)	:	52.81m3
9.	Surface run off of surrounding areas (around 2 Hect)	:	684m3
10.	Total likely water to be pumped (7+8+9)	:	820.21m3

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.

The entire region under reference occurs within the watershed of river Sankha flowing west to east. Thus water from all the streams and rivers within the 10km buffer zone of Kukuda mines are finally drained into Sankha River. All the tributaries of river Sankha like Tambu, Jharia, Fakarpada, Mandira, Peru (Picharra) and Naktijor flow west to east except the river Barjor. Out of all, only one perennial Nallah Peru/Pichhra flows through the lease area in SSW-NNE trend. This nallah is located at a distance of 450 m to the west of Eastern Limit of the lease hold boundary and about 7000 m from the present activity area of the lease.

4.0 STACKING OF MINERAL REJECT/ SUB GRADE MATERIAL AND DISPOSAL OF WASTE:

a) Nature and quantity of top soil, Overburden/ Waste and Mineral Reject to be disposed off:

The waste material will be generated during the mining operation within the plan period is broadly classified into:

i) The soil mixed lumps / clay occurring as small isolated pockets and also in between bedding planes mixed with small quantity stone chips during blasting are called as waste.

ii) The dolomite/ dolomitic limestone/ phyllite are considered waste during mining operation.

The year wise generation of wastes during the plan period is tabulated below.

Year	Top Soil (M^3)	Waste from Mines (M^3)		Total waste material (M^3)
		Waste including clay mixed stone(M^3)	dolomitic stone / Reject(M^3)	
Dec-2018 to Mar-2019	Nil	9953	112	10065
2019-20	Nil	34500	301.2	34801.2
2020-21	Nil	31197.4	317.6	31515
2021-22	Nil	30700	327.6	31027.6
2022-23	Nil	28500	288.8	28788.8
Total	**Nil**	134850	1347.2	136197.2

The generation of mineral rejects (sub grade limestone) year wise and its utilization/ stacking during the plan period is tabulated below.

Year	Generation of Mineral reject of Limestone		Utilization in the process after blending (100%)		Storage/ Stacking (Nil)	
	CuM	Tonnes	CuM	Tonnes	CuM	Tonnes
Dec-2018 to Mar-2019	740	1850	740	1850	0	0
2019-20	2280	5700	2280	5700	0	0
2020-21	2420	6050	2420	6050	0	0
2021-22	2500	6250	2500	6250	0	0
2022-23	2280	5700	2280	5700	0	0
Total	10220	25550	10220	25550	0	0

hemineral rejects of limestone generated during the mining operation is directly blended with the usable limestone and therefore provision of its stacking has not been given

4.b. Propose for dumping during plan period.

The temporary Dumping has been proposed in the unexplored area earmarked in development plan during the plan period.. The said location will be explored/ proved to be barren in the year 2019-2020, if the proposed Dumping area is found to be mineralized, the Modification of Mining Plan will be submitted during the FY 2020-21. Retaining wall of 1145 m long all around the bottom periphery of waste dumps followed by garland drains of 1145 mshall be constructed during the plan period. Water in the rainy season that will be percolated through the wastes in the waste dump shall be drained to the garland drain and the retaining wall shall help in arresting movement of waste materials along with water. The garland drains shall be canalized in such a way that the water flows to an area which will be on non-ore bearing and a wasteland. Regular cleaning of the drain shall be done for easy flow of water. Besides the garland drains and the retaining walls, one settling pond of 10 m x 10m x 2m size will be constructed at the end of garland drain, which will accumulate water. Alum shall be added here for settlement of suspended solids. After suspended solids are settled, the water shall be discharged outside the lease area.

4.c.Engineering details of retaining walls & Garland drains

The average rain fall during last eight years (2011-2018) in Sundargarh district is 983.8 mm with rainy seasons during July to September months. The historic maximum rain fall recorded in the month of September 2011 is 523.6 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.

4.c.a Retaining Walls

Retaining boulder wall (2.0 m high with 1.2m visible and 1.0 m width) of substantial strength shall be constructed all around the south-west and northern 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.

4.c. b Garland drains

Garland drains of 1.5 m deep and 1.0 m wide shall be constructed all along the northern 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.

4.c.c. Settling Tank

The garland drain shall be channelized to a settling tank of 10m long, 10m width and 2m deep. Side walls and base shall be packed with locally available boulders mixed with cement and sand. Engineering drawing of the retaining wall, garland drain and settling tank are provided in Plate No.14.

4.c.d Rate of yearly generation of sub grade ore with reference to threshold value and proposal of its stacking.

The sub grade limestone has been considered at CaO ≥ 34% &< 38%, MgO > 5% & ≤ 7%. After implementation of CADE & QSO, limestone up to Grade-IV, will be considered as cement grade Limestone. As such, the cut-off grade is CaO 38% & MgO 5.0 - 7.0%.

From chemical composition point of view, all sub grade ores with 34-38% CaO indicate their utilization in different proportion in different sequence of mining after judicious blending. In order to arrive at rational and economic exploitation plan, global reserve optimization has been done considering the ROM parameters of CaO. These materials will be regularly consumed from the blasted muck pile by proper pre blending at the quarry. Hence to avoid re handling and keeping the conservation of minerals in view, there will be no requirement to maintain the stacking of sub grade mineral in the surface.

5.0 USE OF MINERAL AND MINERAL REJECT:

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

Kukuda Limestone & Dolomite lease hold area is the captive mines of OCL India Limited for manufacturing of cement. The cement plant of OCL India Limited is located at Rajgangpur at a distance of 10 Kms. A belt conveyor by the side of track line has been established within company's own land. The entire limestone requirement by the plant is met from this captive mine of cement grade variety. Care will be taken to judiciously blend the materials with that of sub grade minerals keeping in view of conservation of minerals.

The Cement plant of OCL India Limited is presently manufacturing a combination of Portland Slag Cement (PSC), Portland Pozzolona Cement (PPC) and Ordinary Portland Cement (OPC). In view of assumed production of 60% PSC, 30% PPC and 10% OPC, the maximum limit of MgO% in limestone has been kept at 5.00% while that of CaO has been kept at 44 (+/-) 0.2 % to facilitate addition of silica correctives to suit the requirement of clinker, in view of low silica content of limestone. Thus the end use grade of limestone for the Cement plant can be summarized as below:

CaO	44.00% ± 0.2
MgO	max 5.0 %
SiO2	9.5% (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 crushers used for crushing and reduction of ROM to output size 75mm.

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

The limestone will be raised from the mine is entirely for captive use and the specifications required for the plant are already discussed in para 5.a. Beside the limestone. As the waste material is high MgO and high SiO2 bearing and will not be suitable to use by any other industries.

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

Not Applicable.

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

As discussed in paragraph 1.0 F (Part-A), limestone up to Grade-IV with a cut-off grade of CaO>38% & MgO 5.0 to 7.0%has been considered as Limestone. The sub grade limestone which has been defined as CaO with 34-38% and MgO, 5-7% may not be usable independently for cement manufacturing, but it is being used by judicious blending with high grade/ sweetener grade limestone considering the mineral conservation of view. The lessee during mining operation will take all measures to blend the sub grade materials and accordingly, no sub grade limestone is generated in the mine. The following pre blending practices will be maintained in the mines during mining operations.

5.e.1 Entire drill dusts will be collected from each hole individually for proper sampling. Around 2 Kg of representative drill dust will be collected from each holes are numbered and sent to quarry laboratory for its sizing and analysis. The analysis of each holes will be received after 4 hrs of the same day. The analyses will be studied for intercalation of rejects. Average analysis of each blasts will be calculated and recorded for further reference.

5.e.2 Care will be taken to generate more than 10, 000 tonnes of blasted materials in mines face at any time with known analysis comprising of 3-4 nos of blasts.

5.e.3 Toarrive at ROM parameters, simple arithmetic calculation in computer will be made and quantity to be removed from each blast will be calculated. Efforts will be taken to maintain quality norms in limestone pile within tolerable limit. Planning will be done to identify the blasted materials to be removed for clearance of face in order of priority.

6.0 PROCESSING OF ROM AND MINERAL REJECT:

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

The lessee has no proposal for any beneficiations of ROM and mineral rejects except proper blending and processing the ROM and mineral rejects in the crushers for crushing and reduction of ROM to output size 75mm.

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

No chemicals are to be used in the process.

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

Not applicable as discussed above.

.7.0 OTHERS

7.a SITE SERVICES

The following site services and infrastructure facilities have already been created.

7.a.1 Roads:

An all weather road (tar road + reject silica brick paved road) connecting the plant, quarry and quarry colony is available. Fair weather roads connecting different quarries, workshops, colony, office, hospital etc., are also maintained in reasonable good order.

7.a.2 Power Requirement:

The source of power is the Captive Power Plant installed at cement plant site. Also, Electric supply from WESCO is available upto 11 KV.

7.a.3 Post Office, Bank & Police Station :

Public call office has been opened up. For quick and effective internal communication

7.a.4. School :

An upper primary and one middle elementary school have been provided. Financial and other assistances in kind are generously made to the nearby colleges and other educational institutions.

7.b EMPLOYMENT POTENTIAL

During mining operation direct employment in the form of management (statutory and functional), supervisory personnel and other face workers including excavator operators/ helpers, loader operators/ helpers, dumper operators/ helpers, water tanker operators/ helpers, drill operators/ helpers & other mining supervisors will be made.

Sl No	Position	Numbers	Qualification/Experience

Supervisory Personnel			
1	Mines Manager (1st class)	1	First Class certificate of competency from DGMS
2	Graduate Mining Engineer	1	Degree in Mining Engineering with required qualification
3	Diploma Mining Engineer	2	Diploma in Mining Engineering
4	Geologist	2	Post Graduate degree in Geology with required qualification as per rule 55 (1) of MCDR,2017.
5	Mines Surveyor	1	Surveyor's certificate of competency
6	Mines Foreman & Mining mates	3	Foreman's competency certificate/ Mining Mate's certificate & supervisory experience.
7	Supervisory staff in workshop/ mineral processing etc.	5	Relevant supervisory experience.
8	Admn. Clerical supervisory staff.	3	Relevant supervisory experience.
9	Others (skilled/ semi-skilled & unskilled)	32	Degree/ Diploma in Electrical Engineering
Total		**50**	

The breakup of the employees is as below:

Highly skilled … 18

Skilled … 15

Semi skilled … 8

Unskilled … 9

Total … 50

8.0 PROGRESSIVEMINECLOSUREPLANUNDER RULE 23 OF

MCDR'2017

8.1 Environment Base line information

(i) The mining lease area is roughly a strip of land measuring approximately 1892 m in length and 517.55 m in width. Mining operations will be concentrated at the North to North-western side of the leasehold within 93.798 Ha of land. which includes under villages Kukuda, Lanjiberna and Bihaband where an old working quarry is situated of about 0.173 Ha.

(ii) About 10% of the total land of 93.798 hectares of mining leasehold area falls under Government owned land. There are certain excluded areas which will not be disturbed by KML. The balance are owned by Private individuals. Land Use pattern presents the land details. Most of the Government plots consist of small roads/ grazing land. Most of it are irregularly cultivated or barren land. The applicant has not degraded and land so far since there had been no mining yet.

iii) The leasehold area has small slight uphill up to 280 mRL at South-Western end of the lease. For rest of the land is having a gentle slope from South-West to North-East corner. Mostly the lease area is sub-horizontal land pattern varies RL from 260 mRL to 255 mRL.

- Mostly the hillocks are barren with scanty bushes hither-thither and do not serve as grazing land even.
- The area with in the surface right boundary is observed to be devoid of any forest growth and even unfit for cattle grazing. No wildlife habitat in this area since long back.

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

(a) Water regime

(i) The area under reference is devoid of any perennial or seasonal water course. The Nakti Jor flows about 2.5 to 3 km South of the lease area. The nullah becomes dry in the summer. Plate No - 01 has shown the above feature.

There had been no geohydrological survey in the area. Based on the data generated during studies of the nearby area, it is likely that the ground water table is below 140 m ground surface and the study indicates that the water table does not seem to have intersected the quarry zones.

Both the surface and seepage/ ground water accumulated in the mine pit.

(b) Air quality

There is no dearth of fresh and free air in this region because of very scanty population, cattle breed etc..Air pollution is normally define as the presence in the atmosphere of substances or conditions which adversely affect living organism or habitats.Regular air monitoring are being carried out by Lanjiberna mines and foun the existing level of air pollution in the area is below the permissible limits (National Ambient Air Quality norms) as it is revealed from the monitoring data generated.

(c) Ambient noise level

The area is free from heavy traffic and population and playing 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 are properly maintained as per maintenance schedule to prevent undesirable noise. As the plantation has been developed around office building, nearby villages and mining area , it has substantially reduced the ambient noise exposure level to the minimum extent. Regular ambient noise level monitoring is done by the near by Lanjiberna mines and found the results are within norms.

(d) Climatic condition

Climate of the region is tropical wet and dry. The south-west monsoon normally sets in the study area by first week of July. There are three major seasons in study area namely: Though the summer in March, April May is severe but the evening are pleasant because of the slow moving breeze. However, during the summer in evening hours, there are occasional heavy rains and on few occasions mostly accompanied by hail storms, thunder storms and high wind with velocities up to 80 km ph . The direction of the wind is mostly S E to N W direction with marginal changes. Whenever depression in Bay of Bengal near Cuttack /Puri region is experienced, high gales up to 80 km ph is felt for a short duration without much damage or harmful effects. Similarly whenever there is snowfall in Himalayan ranges, this region also faces a sudden drop in mercury and change of climate.

e) Temperature

The annual mean maximum temperature in the region varied from 27.6 ^{0}C (December) to 41.8 ^{0}C (May) while annual mean minimum temperature varied from 12.0 ^{0}C (December & January) to 27.1 ^{0}C (May).

f) Relative Humidity

The annual relative humidity at 830 hours varied from 41%(April) to 87% (August) while at 1730 hours annual relative humidity varied from 21% (April) to 81%(August).

g) Rainfall

The average annual rainfall during last six years was observed to be 1240.8 mm. Rain fall during July to September contributes the majority (more than 60%) of the rainfall.

h) Wind Speed

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

) **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 N, NE, SE, SW from October to December

8.1.3 Humansettlements

- Observations have been made with in a region of 5 Kms around the area under reference and recorded.
- The total population is about 3500 people within the surrounding 5 Kms area
- Majority of the population of these villages are observed to be engaged in the periodic cultivation and other house hold industries and business available with in the buffer zone which have become their main source of income.
- The villagers are mostly scheduled caste and scheduled tribes and the literacy is very low. Due to infrastructural facilities created by the mines, the literacy and the standard of living has shown good improvement.
- The villagers are mostly scheduled caste and scheduled tribes and the literacy is very low. Due to infrastructural facilities created by the mines, the literacy and the standard of living has shown good improvement.

8.1.4 Publicbuildings,placesof worshipandmonuments

No public buildings are existing within the present activity area. There are two villages outside of the surface right area which are more than 200 meters from the nearest mining activity area.

8.1.5 Indicateanysanctuary islocatedinthevicinity ofleasehold

National park, wildlife sanctuary, forest, national monument or tourist interest do not exist in the lease area as well as in buffer zone also. Outside of the mining lease area, few places of worship like church and temples exist which does not interfere with the present mining activity

.

8.2 ImpactAssessment

The environmental impact is defined as an alteration of environmental conditions or creation of environmental parameters those may upgrade or degrade the environ especially the land, water and air region of the area. As there is no mining activity is going on within the lease area.The physical, chemical and bio-logical effects and their influences on national, social, cultural and aesthetic domains of the region atre not disturbed.

8.2.1 Landareaindicatingthearealikelytobedegraded

The lease area (93.798 Ha) has 3.828 ha. of DLC forest land. Balance 89.97Ha is non-forest land. Out of 93.798 Ha lease area, only 5.16 Ha is activity area and rest 84.81 Ha land is non activity area.Out of the total lease area only 83.296 Ha is tenanted land and 6.674 Ha Govt. land. Activity wise land requirement has been shown in the land use table below.

(b) Land utilization break ups for the review period has been studied and the data for the same are furnished in Table following 8.2.1 (h) below. The table conclusively shows that the mining project will have effect on the topography of the area only.

(c) Mining will be extended in the Non forest area along eastern direction of the lease. Non Forest area is mainly fallow land due to poor fertility of the soil.

(d) Afforestation has been planned in safety zone area of (7.5 mts) of lease boundary of the mines.

(e) The planned afforestation in the conceptual period shall provide a better forest density than the existing scrubby forest. The afforestation has been planned in a manner which will actually increase the bio-diversity of the local ecosystem.

During the review period from 2018-19 to 2022-23, the following plantation program has been planned:

Year	Location	Area in Ha	No. of saplings
Dec-2018-19	Gap plantation, safety zone,	0.08	200
2019-20	Gap plantation, safety zone	0.10	250
2020-21	Gap plantation, safety zone	0.11	275
2021-22	Gap plantation, safety zone	0.09	225
2022-23	Gap plantation, safety zone	0.11	275

f) Landareaindicatingthearealikelytobedegradedduetoquarrying,dumping,

roads,workshop,processingplant,tailingpond/dam,townshipetc.

Description	Existing (Ha)	Area likely to be degraded by end of proposed plan period (Ha)
Area under mining	0.173	5.108 Ha
Storage of topsoil	0	0.000 Ha
Overburden dumping including Retaining wall, garland drain etc.	0.087	5.183 Ha
Sub grade stacking/ Mineral storage	0	0.000 Ha
Infrastructure (Workshop, crusher, admn. Building, magazine etc)	0	2.00 Ha
Mines Roads / haulage road	0.025	0.100 Ha
Sub Total	**0.285**	**12.391 Ha**

8.2.2 Air quality

A small scale mining has been started at Kukuda- hence ambient conditions prevail and these are yet undisturbed. The stations located were surrounding the area. The SPM concentration varied from 18.8 to 177 µg/ cum in the buffer zone - minimum at the forest land.

Effective control measures as per the Govt norms will be carried out to minimize the mining and on road transportation effect. Regular air monitoring will be carried out and required mitigation plan will be complied after onset of Mining operation to keep air quality parameters within permissible limits.

(iii) Ambient noise level

The area is free from heavy traffic and population of plying of other motor vehicles is limited due to only the surrounding mining activity. Diesel powered machinery which are major source of noise in open cast environment. As the plantation there within lease and nearby villages and mining area, it has substantially reduced the ambient noise exposure level to the minimum extent. Regular ambient noise level monitoring will done after the onset of mining operation.

(iv)Climatic condition

Climate of the region is tropical wet and dry. The south-west monsoon normally sets in the study area by first week of July. There are three major seasons in study area namely: Though the summer in March, April May is severe but the evening are pleasant because of the slow moving breeze. However, during the summer in evening hours, there are occasional heavy rains and on few occasions mostly accompanied by hail storms, thunder storms and high wind with velocities up to 80 km ph . The direction of the wind is mostly S E to N W direction with marginal changes. Whenever depression in Bay of Bengal near Cuttack /Puri region is experienced, high gales up to 80 km ph is felt for a short duration without much damage or harmful effects. Similarly whenever there is snowfall in Himalayan ranges, this region also faces a sudden drop in mercury and change of climate.

v.) 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 N, NE, SE, SW from October to December

Vi) Historical monuments etc.

As explained in earlier paragraph, no natural park, wildlife sanctuary, forest, national monument or tourist interest do not exist in the lease area as well as in buffer zone also. Hence, impact assessment on this account does not required.

8.3 Progressive reclamation Plan

To maintain ecological balance and to check harmful effects due to mining and allied activities at KML mine, environmental control measures will be started into the process of mine planning. Many of the areas of environmental management planning require multidisciplinary approach. The changes will be 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 will be envisaged and these pertain to as per following paragraph on different heads.

8.3.1 Mined-OutLand

(a) There is no mining activity going on within the lease area.The existing pit with a depth of 6 mts has been mined out but the potentiality of limestone with in the pit is feasiable.Within the paln period there willbe no mined out land for back filling.The details of the is given below.

Particulars	Qry-1
Co-ordinates of the existing pit	7100E-7200E and 4800N-4925N
Qry Length & width(m)	53 mts x 40m
Top & Bottom bench RL	No proper benchs due to mannual working
Depth of pit	Appx. 6 mts
Height of Benches (m)	No propoer benches
Width of benches (m)	No proper benches

(b) protective measures shall also be undertaken during the review period and maintained regularly. The details of protective measures to be constructed around proposed dump during scheme period and conceptual period will be as follows:

Period	Retaining wall			Garland drain			Settling pond		
	L(m)	B(m)	H(m) Visible	L(m)	B(m)	D(m)	L(m)	B(m)	D(m)
Review Period	1145	1.0	1.2	1145	1.0	1.5	Maintenance		
Conceptual period	As per Requirement								
TOTAL	2045	1.0	1.2	2045	1.0	1.5	Maintenance		

(c) Environmental aspects

(i) Efforts are being taken to restrict/ reduce the degradation of land in the coming years by limiting the activities by depth ward extension of mining. However, due to restriction of the lease boundary and constraints in working at depth,

(ii) The plantation program during the up coming years will include block plantation as shown in Plate No. 12. Continuous agaves or similar plantation will be done at the safety zone area of the lease. Tentative plantation programme within the plan period has been given in para 8.2.1 (e) above.

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

(iii) Land use pattern

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

Description	Existing (Ha)	Dec-2018-2019	2019-20	2020-21	2021-22	2022-23	Plan period (Ha)	Additional area for conceptual period (Ha	Conceptual (Ha)
Area under mining	0.173	0.600	0.640	1.300	0.930	1.638	5.108	10.06	15.34
Storage of topsoil	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Overburden dumping including Retaining wall, garland drain etc.	0.087	0.490	0.770	0.690	0.690	2.543	5.183	8.15	13.42
Sub grade stacking/ Mineral storage	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	00
Infrastructure (Workshop, crusher, admn. Building, magazine etc)	0.00	1.300	0.700	0.000	0.000	0.000	2.00	0.00	2.00
Mines Roads / haulage road	0.025	.100	0.00	0.000	0.000	0.000	0.1	0.00	0.125
Sub Total	**0.285**	**2.490**	**2.110**	**1.990**	**1.620**	**4.181**	**12.391**	**18.21**	**30.88**
Safety zone along the lease boundary	0	0	0	0	0	0	0	0	0
Safety zone for village	0	0	0	0	0	0	0	0	0
Undisturbed land for future mining/ dumping etc.	0	0	0	0	0	0	0	0	0
Total	**0.285**	**2.490**	**2.110**	**1.990**	**1.620**	**4.181**	**12.391**	**18.21**	**30.88**

8.3.2 TopsoilManagement

The top soil quantity is negligible and occurring as small isolated pockets which gets mixed up with stone chips on blasting and not possible to separate it out. The soil recovered mixed with morrum or small quantity stone chips are utilized for plantation on safety zone. Hence, there is no fixed storage for the same.

8.3.3 TailingsDamManagement

Not applicable since no beneficiation is involved during the process.

8.3.4 Acidminedrainage,ifanyanditsmitigativemeasures.

Not applicable since this is an opencast mine.

8.3.5

Surfacesubsidencemitigationmeasuresthroughbackfillingofminevoidsorb y anyother meansanditsmonitoringmechanism.

Not applicable since no surface subsidence is anticipated during mining operation.

Summaryofyear-wiseproposalforitemno8.3

Items	Details	Cumulative as on	Proposal for protective measures for reclamation & rehabitation				
			2018-19	2019-20	2020-21	2021-22	2022-23
Dump management	Areaafforested(Ha)	-	NA	NA	NA	NA	NA
	Noofsaplingsplanted	-	NA	NA	NA	NA	NA
	Cumulativenoofplants	-	NA	NA	NA	NA	NA
	Costincludingwatchandcareduringtheyear	-	NA	NA	NA	NA	NA
Management ofworkedout benches	Areaavailableforrehabilitation(Ha)	NA	NA	NA	NA	NA	NA
	Afforestationdone(Ha)	NA	NA	NA	NA	NA	NA
	Noofsaplingsplantedin theyear	NA	NA	NA	NA	NA	NA
	Cumulativenoofplants	NA	NA	NA	NA	NA	NA
	Anyothermethodofrehabilitation(specify)	NA	NA	NA	NA	NA	NA
	Costincludingwatchandcareduringtheyear	NA	NA	NA	NA	NA	NA
Reclamation andRehabilitationby backfilling	VoidavailableforBackfilling(LxBxD) (in meter) pit wise/stopewise	NA	NA	NA	NA	NA	NA
	Voidfilledbywaste/tailings		NA	NA	NA	NA	NA
	Afforestationonthebackfilledarea	NA	NA	NA	NA	NA	NA
	Rehabilitationbymakingwaterreservoir	NA	NA	NA	NA	NA	NA
	Anyothermeans(specify)	NA	NA	NA	NA	NA	NA
Rehabilitation ofwasteland	Areaavailable(Ha)	NA	NA			NA	NA
	Arearehabilitated	NA	NA	NA	NA	NA	NA
	Methodofrehabilitation	NA	NA			NA	NA

withinl ease							
Others (specif y)	Retaining walls (m)		185	140	110	284	426
	Garland Drains (m)		185	140	110	284	426
	Settling Tanks		-	-	-	-	
	Plantation proposal (No of trees)		200	250	275	225	275

8.3.7 Disaster Management and Risk Assessment

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.

8.3.8 Measures taken for controlling any unforeseen disaster and risk etc

(i) Ultimate slope of the quarry is kept at $\leq 30^{O}$ and the waste dump at $\leq 30^{O}$.

(ii) The nearest river controls the drainage system and receives the entire rain & run-off water is Sankha at a distance of 7 km from the mine towards north. 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) Handling of explosives and blasting operations will be done by qualified blasters and blaster helpers under the supervision of an Asst. Manager. The Asst. Manager is assisted with a qualified foreman to have effective supervision. To control fly rock fragments during blasting in creating problems to nearby men and machinery precautionary measures will be adopted and shall be continued in future which are as below.

- Proper blast design results in lower ground vibrations and avoids the fly rock.
- 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 are being practiced and area also proposed 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 be occur, which will be extinguished by fire extinguisher. Sufficient quantity of sand and water are 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.

8.3.9 Careandmaintenance duringtemporarydiscontinuance

Anemergency plan for the situation of temporary discontinuance due to court order or due to statutoryrequirementsoranyotherunforeseencircumstances mayindicatemeasures of care, maintenance and monitoring ofstatus of discontinued mining operations expectedtore-openinnearfuture.

(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.

C) Necessary plan & section at the time of discontinuance of mines will 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,

(d) Name, designation and address of the person with respective responsibility has been stated as follows in respect of disaster management and risk assessment.

Name, designation and address of the person with respective responsibility has been stated as follows in respect of disaster management and risk assessment.

Name / Designation	Address	Responsibility
Sri B Jagadeesh kumar,Mines Manager	Kukuda Limestone Mine; PO : Lanjiberna, Tahasil : Rajgangpur, District : Sundargarh; PIN : 770023, Odisha Ph No-9438200195	Overall administrative & supervision of the rescue work. Information to the fire brigade to deal with emergency and concerned district officials.
Sri Debi Prasad Mishra Manager, mines	Kukuda Limestone Mine; PO : Lanjiberna, Tahasil : Rajgangpur, District : Sundargarh; PIN : 770023, Odisha Ph No-9437029647	Disaster control, sounding the alarm at danger, accident and information to the manager regarding the situation.
Sri K.P.Ojha Foreman	Kukuda Limestone Mine; PO : Lanjiberna, Tahasil : Rajgangpur, District : Sundargarh; PIN : 770023, Odisha Ph No-9437490353	Labour management & mob control Information to the security personnel to evacuate all the persons from the area in case fire except the fire brigade personnel.

8.4 Financial Assurance

Table indicating the break-up of areas in the Mining Lease for calculation of

Financial Assurance. The amount calculated for the purpose of Financial Assurance for mining and other activities as tabulated below :

Sl.No.	Head	Areaputon useatpresent(Ha)	Additional requirement duringReview period (Ha)	Total Area (Ha)	Areaconsidered asfully reclaimed& rehabilitated (Ha)	Netarea considered for calculation
1.	Areaundermining	0.173	5.108	5.281	0	5.281
2.	Storagefortopsoil	0.000	0.000	0.000	0	0.000
3.	Wastedumpsite	0.087	5.183	5.27	0	5.27
4.	Mineralstorage	0.000	0.000	0.000	0	0.000
5.	Infrastructure, workshop, administrative buildingetc.	0	2	2	0	2
6.	Roads	0.025	0.1	0.125	0	0.125
7.	Railways	0.000	0.000	0.000	0	0.000
8.	Tailingpond	0.000	0.000	0.000	0	0.000
9.	EffluentTreatment Plant	0.000	0.000	0.000	0	0.000
10.	MineralSeparation Plant	0.000	0.000	0.000	0	0.000
11.	Townshiparea	0.00	0.000	0.00	0	0.00
12.	OthersNarrow Gauge Transmission (NGT)	0.00	0.000	0.00	0	0.00
	Others (electrical transmission line)	0.00	0.000	0.00	0	0.00
GrandTotal		**0.285**	**12.391**	**12.676**	**0**	**12.676**

This being a Category- A (OTFM) mine, financial assurance for 12.676 Ha is calculated at the rate of 3,00,000.00 per Ha. This amounts to Rs 38,02,800/- (Rupees thirty eight lakhs two thousand eight hundred only). The lessee shall submit a financial surety in shape of Bank Guarantee for the amount to the Regional Controller of Mines of Indian Bureau of Mines, Bhubaneswar Region, Bhubaneswar.

The name & contact number of the person responsible during the emergency should be furnished. Besides, nearest fire stations, hospitals and police station is required to be mentioned for more informative.

Emergency Contact	Address	Contact No
Hospital	Dispensary of OCL India Limited At/PO : Lanjiberna, Tahasil : Rajgangpur, District : Sundargarh; PIN : 770023, Odisha	Dr Harekrusna Sethi Mob :- 9437962958
Hospital	CHC Kutra PO : Lanjiberna, Tahasil : Rajgangpur, District : Sundargarh; PIN : 770023, Odisha	Dr Madhuri Patel Mob :- 9438113626
Fire Station	Fire Station At/PO : Kutra Tahasil : Kutra District : Sundargarh; PIN : 770023, Odisha	Mr Lokeswar Patel Mob 9861192935
Police Station	Lanjiberna Out post Under Rajgangpur PS At/PO : Lanjiberna, Tahasil : Rajgangpur, District : Sundargarh; PIN : 770023, Odisha	Mr Pradeep Jena, IIC Rajgangpur Mob 9439750300