भारत सरकार GOVERNMENT OF INDIA
खान मंत्रालय MINISTRY OF MINES
भारतीय खान ब्यूरो INDIAN BUREAU OF MINES
क्षेत्रीय खान नियंत्रक के कार्यालय
OFFICE OF THE REGIONAL CONTROLLER OF MINES

REGD. PARCEL
Phone: 0674-2352463
TeleFax: 0674-2352490
E-mail:ro.bhubaneshwar@ibm.gov.in
Plot No.149, Pokhariput
BHUBANESWAR-751020

No. MS/FM/44-ORI/BHU/2017-18 / 2990

Date: 14.03.2018

To

Shri D R Patnaik, Mine Owner,
At/PO- Baneikala,
Dist – Keonjhar, Odisha- 758034

Sub: Approval of Review of Mining Plan of Murgabeda Iron Ore Mine along with Progressive Mine Closure Plan (PMCP), over an area of 15.378 ha in Keonjhar district of Odisha State, submitted by Shri D R Patnaik under Rule 17 of Mineral Concession Rules, 2016.

Ref: - i) Your letter No. Nil dated 06.02.2018.
ii) This office letter of even no. dated 06.02.2018.
iii) This office letter of even no. dated 06.02.2018 addressed to Director of Mines, Government of Odisha copy endorsed to you.
iv) This office letter of even no. dated 21.02.2018.
v) Your Qualified Person letter No. PMP/IBM/09/2017-18 dated 26.02.2018.

Sir,

In exercise of the power delegated to me vide Gazette Notification No. S.O. 1857(E) dated 18.05.2016, I hereby **Approve** the Review of Mining Plan including Progressive Mine Closure Plan of Murgabeda Iron Ore Mine over an area of 15.378 ha of Shri D R Patnaik in Keonjhar district of Odisha State submitted under Rule 17 of Mineral Concession Rules, 2016. This approval is subject to the following conditions:

I. The Review of Mining Plan is approved without prejudice to any other law applicable to the mine area from time to time whether made by the Central Government, State Government or any other authority and without prejudice to any order or direction from any court of competent jurisdiction.

II. The proposals shown on the plates and/or given in the document is based on the lease map /sketch submitted by the applicant/ lessee and is applicable from the date of approval.

III. It is clarified that the approval of aforesaid Review of Mining Plan does not in any way imply the approval of the Government in terms of any other provision of Mines & Minerals (Development & Regulation) Act, 1957, or the Mineral Concession Rules, 2016 and any other laws including Forest (Conservation) Act, 1980, Environment (Protection) Act, 1986 or the rules made there under, Mines Act, 1952 and Rule & Regulations made there under.

IV. Indian Bureau of Mines has not undertaken verification of the mining lease boundary on the ground and does not undertake any responsibility regarding correctness of the boundaries of the leasehold shown on the ground with reference to lease map & other plans furnished by the applicant / lessee.

V. At any stage, if it is observed that the information furnished, data incorporated in the document are incorrect or misrepresent facts, the approval of the document shall be revoked with immediate effect.

VI. If this approval conflicts with any other law or court order/ Direction under any statute, it shall be revoked immediately.

VII. The validity of this document is subject to the extension of Mining Lease by the State Government as per the provision of MMDR Amendment Act 2015 and shall expire on 31.03.2021.

VIII. Next Financial Assurance shall be due for submission on 31.03.2021.

भवदीय / yours faithfully,

14/03/18

(HARKESH MEENA)
क्षेत्रीय खान नियंत्रक / Regional Controller of Mines

Encl: - One copy of Review of Mining Plan

Copy for kind information to:-

1. The Director of Mines, Directorate of Mines, Government of Odisha, Heads of the Department Building, Bhubaneswar– 751001, Odisha along with one copy of Review of Mining Plan by REGISTERED PARCEL.
2. Shri Pradeept Mohapatra, Post Box No.1, P.o- Joda, At – Unchabali, Bamebari, Dist – Keonjhar, Odisha – 758034.

(HARKESH MEENA)
क्षेत्रीय खान नियंत्रक / Regional Controller of Mines

TEXT

REVIEW OF THE MINING PLAN

(Submitted Under Rule 17(2) of MCR, 2016)

WITH

PROGRESSIVE MINE CLOSURE PLAN

(Submitted Under Rule 23 Of MCDR, 1988)

In respect of

MURGABEDA IRON ORE MINE OVER 15.378 HA IN VILLAGE DEOJHAR, KEONJHAR DISTRICT, ODISHA

FOR THE FINANCIAL YEAR
(2016 - 17 to 2020-21)

IBM REGN NO	ML NO	MINE CODE	LAND DETAILS		CATEGORY OF MINE	DATE OF EXECUTION	DATE OF EXPIRY
			RESERVE FOREST	NON-FOREST			
IBM/5243 /2011	--	30ORI08039	13.904HA	1.474	'A' - FM	03.07.1976	02.07.2026

AS PER THE MMDR ACT 2015 THE VALIDITY OF THE LEASE PERIOD IS EXTENDED UPTO 02.07.2026

Prepared on behalf of

SRI D.R.PATNAIK
(MINING LESSEE)

ADDRESS	AT:BANEIKELA PO:BANEIKELA DIST: KEONJHAR PIN:758034
PHONE	(06767) /272304
FAX	(06767) /272304
EMAIL	miom.drp@gmail.com

Prepared By

SRI PRADEEPT MOHAPATRA
(QUALIFIED PERSON)
UNCHABALI, BAMEBARI
JODA, KEONJHAR, ODISHA

SRI D.R.PATNAIK (MININGLESSEE)	REVIEW OF THE MINING PLAN IN RESPECT OF MURGABEDA IRON ORE MINE OVER AN AREA OF 15.378HA IN KEONJHAR DISTRICT. ODISHA

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(PRADEEPT MOHAPATRA)
QUALIFIED PERSON

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(PRADEEPT MOHAPATRA)
QUALIFIED PERSON

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(PRADEEPT MOHAPATRA)
QUALIFIED PERSON

SRI D.R.PATNAIK (Mining Lessee)	REVIEW OF THE MINING PLAN IN RESPECT OF MURGABEDA IRON ORE MINE OVER AN AREA OF 15.378HA IN KEONJHAR DISTRICT, ODISHA

SUMMARY OF PROPOSALS AT A GLANCE PERIOD: 01.04.2018 TO 31.03.2021

Exploration

Year	2018-19			2019-20			2020-21			Total		
No. of Boreholes (Core/RC/DTH) with meterage	No	Type	Meterage	No	Type	Meterage	No	Type	Meterage	No	Type	Meterage
	12	core	691	12	Core	562	--	--	--	24	Core	1253
No of Pits/Trenches with dimensions	No	Dimension (LXWXD)		No	Dimension (LXWXD)		No	Dimension (LXWXD)		No	Dimension (LXWXD)	
	NIL	NA		NIL	NA		NA	NA				
Any other Exploration activity	NIL			NIL			NA					

Excavation (Iron Ore Zone)

Year	2018-19	2019-20	2020-21	Total
Top Soil in m^3	NIL	NIL		NA
ROM in Tons	2000000	1999998	2000000	5999998
Clean Ore in Tons	1823351	1331610	1388284	4543245
Mineral Rejects in Tons	176649.5	668388	611717.5	1456755
Fines in Tons	1100000	1099999	1100000	3299999
Tailings/Slimes in tons	--	--	--	--
OB/Waste Material in m^3	30844.55	43930	42422	117197

Area Utilisation

Year	At the end of plan period (31.03.2021)
Area under Mining(in Ha)	11.821
Area under Waste Dumping (in Ha)	NIL
Area under Mineral Reject (in Ha)	0.733
Area under Top Soil stack (in Ha)	Nil
Area under Tailings/Slimes/Fines if any	
Area already Reclaimed and Rehabilitated(in Ha)	Nil
Infrastructure development(in Ha)	0.846
Construction of road	0.16
Plantation/green belt	0.514

Stacking (Iron Ore Zone)

Year	2018-19	2019-20	2020-21	Total	Remarks
Top Soil in m^3	Nil	Nil	Nil		
Mineral Reject in Tons along with Average Grade (above threshold value)	70659.79cum (53.65Fe %)	267355.2 cum (53.65 Fe %)	244686.96Cum (53.65 Fe %)	582701.952	
Tailings/Slimes stack (Quantity and Average Grade)	--	--	--	--	
Fines stack (Quantity and Average Grade)	---	---	---		
Waste Material in m^3					
Generation	30844.55cum	43930 cum	42422cum	117197	
Road maintenance (100%)	30844.55cum	43930 cum	42422cum	117197	

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Environmental Protective Measures

Plantation for Virgin area (green cover)					
Year	2018-19	2019-20	2020-21	Total	Remarks
Numbers	Nil	Nil		NA	
Area	Nil	Nil		NA	

Plantation over waste dumps					
Year	2018-19	2019-20	2020-21	Total	Remarks
Numbers	Nil	Nil	Nil	NA	
Area	Nil	Nil	Nil	NA	
Reclamation of mine out area (Backfilling)	Nil	Nil	Nil	NA	

Plantation over back filled area				
Year	2018-19	2019-20	Total	Remarks
Numbers	Nil	Nil	NA	
Area	Nil	Nil	NA	
Reclamation of mine out area (Water Reservoir/ Pisciculture)	Nil	Nil	NA	

Plantation on Safety zone (green cover)					
Year	2018-19	2019-20	2020-21	Total	Remarks
Numbers	192	192	192	576	
Area	0.12	0.12	0.12	0.36	

Plantation on bench					
Year	2018-19	2019-20	2020-21	Total	Remarks
Numbers	--	960	480	1440	
Area	--	0.60	0.30	0.90	

	Construction of:			
Year	2018-19	2019-20		Total
Fencing of Mineralized Area / Mineralized Dumps / Underground Openings/ Lease Area (ha)	NIL	NIL	NIL	
Check Dams numbers	Maintenance	Maintenance	NA	
Retaining Wall In meters	Length=350m Width =1m Height =2m	Maintenance		Length=350m Width =1m Height =2m
Garland Drain In meters	Length=780m Width =1.5m Height =1m	Maintenance		Length=580m Width =1.5m Height =1m
Settling Ponds (Numbers)	1 no around the dump	Maintenance	NA	

FA details			
Amount	Bank	Validity	BG No.
Rs. 42,22,200	Bank of Baroda	31.03.2021	BG NO-0048 IGPER 000218 dated 30.03.2011

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INTRODUCTORY NOTE

Murgabeda iron ore mine over an area of 15.378 Ha was initially granted and executed in favour of Sri Niranjan patnaik for a period of 30 years w.e.f. 03.07.1976 to 02.07.2006. The copy of the lease deed is enclosed as **Annexure-I**. The Mining Lease was subsequently transferred in favour of Sri Diptiranjan Patnaik on 02.11.1982 with prior approval of the central Govt. vide order no III(A)MG-160/82-11125/MG dated 20.09.1982. The copy of the transferred deed is enclosed as **Annexure-II**. The lease was expired on 02.07.2006 as per the executed lease deed. Therefore, the lessee has filed the application on 24.05.2005 under Rule 24(A) (6) of MCR 1960 for Renewal of the Mining Lease for a period of 20 years w.e.f. 03.07.2006. The copy of the RML application in form-J along with the Form-D is enclosed as **Annexure-III.**

However, under Section 8(A) of the M&M (D&R) Act, 1957 as amended by the MMDR Amendment Act, 2015, on and from the date of commencement of the Mines and Minerals (Development and Regulation) Amendment Act, 2015 all mining lease shall be granted for the period of fifty years. On the expiry of the lease period, the lease shall be put up for auction as per the procedure specified in this Act. Hence, the validity of the Mining Lease period shall be up to 02.07.2026.

APPROVED

LAND DETAILS:

Area (hectares)		15.378 Ha
Details of forest land		13.904Ha. (Reserve forest- 12.513Ha + Revenue Forest 1.391Ha)
Non – forest		1.474Ha

INDIN BUREAU OF MINES
भुवनेश्वर/BHUBANESWAR

Broken up prior to 25.10.1980

The total forest area over 13.904Ha has been broken prior to 25.10.1980 which includes 1.214Ha of safety zone. The broken up area of 14.074Ha as per sabik kissam in the mining lease has been verified jointly by DFO, Keonjhar and DDM, Joda. The authenticated broken up plan has been attached as Plate No – II(C). The detail of broken up land use pattern is as follows:

Sl. No	Pattern of Utilisation	Area			Total
		Reserve Forest	Revenue Forest	Non-forest	
1	Mining with road	12.367	0.169	0.170	12.706
2	Over burden dump	--	1.222	--	1.222
3	Magazine	0.146	--	--	0.146
	Total	**12.513**	**1.391**	**0.170**	**14.074**

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STATUS OF STATUTORY CLEARANCES

The lessee has obtained all the statutory clearances like Mining Plan approval from IBM, Forest and Environment Clearance from MoEF, Consent to Operate from SPCB.

FOREST CLEARANCE:

Application for forest clearance over an area of 13.904Ha has been filed under section 2 of FC Act 1980. Considering the application, Stage-I forest clearance has been granted by Ministry of Environment, Forest. The copy of the Stage-I Forest clearance is enclosed **as Annexure-IV**. The compliance of Stage-I forest clearance is under consideration by the MoEF, GOI. For compliance of stage –I clearance, a sum of Rs 1,01,49,980.00 has been paid at CAMPA fund as Net Present Value NPV. Further a sum of Rs 0.53Cr has been deposited as Penal Compensatory Afforestation (PCA) against the broken safety zone.

SURFACE RIGHT AREA

The collector-cum-district Magistrate, Keonjhar has granted surface Right over an area of 14.074ha vide his letter No 10006 dated 02.08.1976. The copy of the letter of surface Right is enclosed **as Annexure-V).**

ENVIRONMENTAL CLEARANCE:

The State Environment Impact Assessment Authority (SEIAA), Odisha has granted the Environmental Clearance for the production capacity of 2.0MTPA capacity vides the letter No-SEIAA/342 dated 04.09.2010. The copy of the Environmental Clearance is enclosed as **Annexure-VI.**

MINING PLAN/SCHEME OF MINING:

The Scheme of Mining under Rule 12 of MCDR 1988 was approved vide letter no 314(3)/2010/ MCCM /(CZ)/MS/54 dated 07.04.2011. The validity of Mining Plan was expired on 31.03.2016. (Ref **Annexure - VII.**). Since, the validity was to be expired the lessee submitted the Scheme of Mining under Rule 12 of MCDR 1988 for the period 2016-17 to 2020-21 on 27.11.2015. The copy of the submission letter is enclosed as **Annexure - VIII.** However, the said scheme of Mining got rejected by IBM vide letter No MS/FM/28 ORI/BHU-2015-16/3536 dated 09.02.2016 indicating that the lease is declared as lapsed w.e.f 18.04.2012 by Govt of Odisha letter No 233/IIIASM/06/2010/S&M Bhubaneswar dated 07.01.2015. But the lessee is now submitting the review of the Mining Plan under Rule 17(2) of MCR 2016 because of the following reason:

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1. Challenging the aforesaid order of the State Govt. Lessee filed Revision application before the Revisional authority, Ministry of Mines, GOI on dated 12.01.2015 vide RA no 22/05/2015 RC-1. The Revisional Authority on 11.05.2016 has disposed of the said application by setting aside the order dated 07.01.2015 passed by the State and remanded back to the State Govt. for suitable reconsideration in line with the Hon'ble Apex Court direction dated 04.04.2016 in WPC 114 of 2014(Common Cause –Vs- UoI & Ors) on the provisions of lapsing expeditiously. The copy of the order is enclosed as **Annexure–IX**
2. Further, Hon'ble Apex Court in its judgment passed on dated 02.08.2017 in WPC 114 of 2014 (Common Cause –vs - UoI & Ors) held in Para-225:

   " Subject to and only after compliance with statutory requirements and full payment of compensation and other dues, the mining lease holders can re-start their mining operation."
3. Accordingly, all the required statutory clearances have been obtained such as Environment Clearance, Forest Clearance and also paid the compensation and dues as demanded in compliance of Hon'ble Apex Court order.
4. Further, on 16.11.2017 Hon'ble High court of Orissa while disposing of the writ petition in WPC 7840 OF 2017 filed by the Lessee seeking compliance of R.A Order dated 11.05.2016 directed the State to comply the same.(Ref Annexure-IX)
5. In compliance with the order dated 16.11.2017 of Hon'ble High Court, the State Govt. in Steel & Mines Dept. has issued a notice vide No.332/SM dated 12.01.2018 for hearing afresh the lapsing proceeding. The Lessee appeared and hearing held on 27.01.2018 and 30.01.2018.Further on 07.02.2018, the State in Steel & Mines Dept. issued notice to appear on 26.02.2018 and to submit status report of approved mining plan and compliance report for Stage-II FC (**ANNEXURE-XI**). In this regard, we have already submitted the compliance report for Stage-II FC and yet to submit the approved mining plan so that hearing can be concluded and supplementary lease deed be executed as per amended MMDR Act 2015.

Mining Leases held in the name of the Lessee

Sl. No.	Name of lease	Area in hects	Name of mineral	District / State
1.	Thakurani Iron and Manganese mine	121.385	Fe & Mn	Keonjhar, Orissa
2.	Murgabeda Iron ore mine	15.370	Fe	Keonjhar, Orissa

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1.0 GENERAL

(a)	**Name of Lessee**	Sri D.R.Patnaik
	Rule 45 registration No	IBM/5243/2011
	Address	Baneikela,
	District	Keonjhar
	State	Odisha
	Pin code	Pin-758034
	Phone	(06767) /272304
	Fax	(06767) /272304
	Mobile	
	Email id	miom.drp@gmail.com
(b)	**Status of the lessee**	The lessee is a Private Individual
(c)	**Minerals which is included in the prospecting license**	Not Applicable
(d)	**Minerals which is included in the lease deed**	Iron ore
(e)	**Minerals which is applicant intend to mine**	Iron ore
(f)	Name of the Recognized person under Rule 22C of MCR 1960 or a person employed under clause (c) of Sub Rule (1) of Rule 42 of MCDR, 1988 (Applicable) for scheme of Mining. As per Rule 15 of MCR 2016, the Qualified Person who have prepared the Mining Plan is furnished below:	
	Address	Sri Pradeept Mohapatra Post Box No-1, Joda, At- Unchabali, Keonjhar, Odisha.
	Phone	---
	Fax	---
	Email	E mail – pmohapatra_07@yahoo.com
	Mobile No	+919438149715
	Registration No	Not Applicable
	Date of Grant/Renewal	Not Applicable
	Valid up to	Not Applicable

(Self-certified copies of working experience along with certificates in support of educational qualifications required as per the Rule 15 of MCR 2016 is attached as Annexure- X)

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2.0 LOCATION AND ACCESSIBILITY

(a)	**Lease Details**		
	Name of the Mine	Murgabeda Iron ore Mine	
	Latitude	22^0 06' 26.147860" to 22^0 06' 50.867450"N	
	Longitude	$85^0$27'58.505080" to $85^0$28'09.838231"E.	
	Date of Grant of Lease	03.07.1976	
	Date of execution of Lease	Murgabeda iron ore mine over an area of 15.378 Ha was initially granted and executed in favour of Sri Niranjan patnaik for a period of 30 years w.e.f. 03.07.1976 to 02.07.2006.	
	Period/Expiry date	Under Section 8(A) of the M&M (D&R) Act, 1957 as amended by the MMDR Amendment Act, 2015, on and from the date of commencement of the Mines and Minerals (Development and Regulation) Amendment Act, 2015 all mining lease shall be granted for the period of fifty years. Hence, the validity of the Mining Lease period shall be up to 02.07.2026.	
	Name of the Lease holder	Sri Diptiranjan Patnaik (Mining Lessee)	
	Postal Address	A/6, Commercial Estate, civil town ship Pin – 769 004, Dist– Sundargarh (Odisha)	**Mines office Address** Vill : Murgabeda Post - Deojhar, District: Keonjhar Pin-758038 (Odisha).
	Telephone	0661- 2400139	
	Fax	–	
	Email id	uimm.ip@gmail.com	
	Mobile No	–	
(b)	Details of Applied Lease area with location map (fresh area/mine)	As per the land schedule, the pre-operational land use pattern is given as follows:	
Total Area (hectares)		:	15.378 Ha
Details of forest land		:	13.904Ha. (Reserve forest- 12.513Ha + Revenue Forest
Non – forest		:	1.474Ha

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The other details of the lease area are as below:

Total Lease area applied for renewal	:	Not applicable
District & State	:	Keonjhar, Odisha
Taluka	:	Barbil
Villages	:	Murgabeda
Whether the area falls under Coastal Regulation Zone (CRZ)? If yes, details thereof.	:	Area does not fall under Coastal Regulation Zone.
Existence of public road/ railway line, if any nearby and approximate distance	:	The leasehold of Murgabeda Iron ore Mine over 15.378Ha is well connected with Road and Railways. a) Road link The ML area is approachable from National High way No-215 at Beleipada, Joda is 8km away from the ML area. a) Rail link The nearest Railway station is at Deojhar located at a distance of 3km from the ML area. Besides Deojhar, the Nuamundi Railway station is also located nearby the mines. b) Air link Bhubaneswar airport (300 km away) is the nearest airport from the area. There is an airstrip and helipad near Bhadrasai, Barbil.
Topo sheet No. with Co-ordinate of the lease area	:	For compliance of CCoM's circular No. 2/2010 dated 06.04.2010 of IBM the lessee has undertaken DGPS survey of the ML boundary. The Geo-reference cadastral map has been authenticated by ORSAC. Based on the DGPS survey, the latitude 22^0 06' 26.147860" to 22^0 06' 50.867450"N and longitude $85^0$27'58.505080" to $85^0$28'09.838231"E. The details of co-ordinates of the Boundary pillars as per DGPS survey are as follows:

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SL NO	PILLAR	LONGITUDE			LATITUDE			CO-ORDINATE	
		Degree	Minute	Second	Degree	Minute	Second	Northing	Easting
1	1	85	27	58.505080	22	6	26.482630	2445506.9262	341790.9752
2	2	85	27	59.897370	22	6	32.326870	2445686.2606	341832.6866
3	3	85	28	0.038910	22	6	32.923910	2445704.5814	341836.9278
4	4	85	28	0.683420	22	6	35.611300	2445787.0446	341856.2307
5	5	85	28	1.387960	22	6	38.624080	2445879.4976	341877.3545
6	6	85	28	2.067260	22	6	41.462360	2445966.5913	341897.7007
7	7	85	28	2.888030	22	6	44.880770	2446071.4858	341922.2866
8	P	85	28	4.217620	22	6	50.867450	2446371.1948	341984.5000
9	O	85	28	4.876100	22	6	50.860900	2446487.3742	341982.0266
10	N	85	28	5.903850	22	6	50.588580	2446509.2180	341984.4026
11	13	85	28	6.053160	22	6	50.040040	2446509.7438	342035.8310
12	M	85	28	6.248340	22	6	49.444300	2446322.9065	341992.5455
13	L	85	28	5.887910	22	6	49.514410	2446229.2431	342014.5814
14	K	85	28	5.344770	22	6	49.749050	2445870.9853	342078.8489
15	J	85	28	4.619470	22	6	49.954200	2445822.6553	342083.9220
16	I	85	28	4.467060	22	6	49.064160	2445663.9365	342099.9782
17	H	85	28	4.490210	22	6	48.081450	2445608.7484	342124.8533
18	G	85	28	5.095550	22	6	47.521530	2445571.5814	342137.0480
19	F	85	28	5.128330	22	6	47.530950	2445493.4738	342104.4494
20	E	85	28	5.748140	22	6	47.030930	2445496.2161	342041.3113
21	D	85	28	6.017410	22	6	45.556820	2445496.9967	342009.1593
22	C	85	28	6.285680	22	6	44.339030	2445502.4500	341895.1590
23	B	85	28	7.149440	22	6	44.421440	2445504.2672	341847.5737
24	14	85	28	8.421350	22	6	38.413270	2445506.9262	341790.9752
25	15	85	28	8.615320	22	6	36.843610	2445686.2606	341832.6866
26	16	85	28	9.231240	22	6	31.688540	2445704.5814	341836.9278
27	17	85	28	9.838231	22	6	29.775324	2445787.0446	341856.2307
28	18	85	28	9.838231	22	6	28.594125	2445879.4976	341877.3545
29	19	85	28	9.447060	22	6	26.147860	2445966.5913	341897.7007
30	20	85	28	7.243180	22	6	26.216370	2446071.4858	341922.2866
31	21	85	28	6.121110	22	6	26.231230	2446371.1948	341984.5000
32	22	85	28	2.141670	22	6	26.371220	2446487.3742	341982.0266
33	23	85	28	0.480760	22	6	26.414720	2446509.2180	341984.4026
(c)	Attach a general location map showing area and access routes.	The location plan is attached as **Plate No-I**							

3.0 DETAILS OF APPROVED MINING PLAN/SCHEME OF MINING.

3.1 Date and reference of earlier approved Mining Plan/Scheme of Mining

The details of approved Mining Plan/Scheme of Mining in chronological order are as summarized below:

Documents approved	Under Rule	Period	Approval
Mining Plan	24A of MCR 1960	03.07.2006 – 2010 - 2011	Approved vide letter No MP/OTF-MECH/20-ORI/BHU/ 2007-08 dated 15.02.2008.
1st Mining Scheme	12 of MCDR' 1988	2011-12 to 2015-16	Approved vide their letter No 314(3)/2010/MCCM/(CZ)/MS/54 dated 07.04.2011.

The copies of the respective approval letters are enclosed as **Annexure- VII.**

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3.2 Details of Last Modifications if any

After the approval of Mining Plan and 1st Scheme of Mining, there was no modification of Mining Plan or Scheme of Mining.

3.3 Review of earlier approved proposal in respect of exploration, excavation, reclamation etc

(a) Exploration:

Exploration work proposed as per the scheme approved vide letter No 314(3)/2010/ MCCM/(CZ)/ MS/54 dated 07.04.2011.	Actual exploration work done by the lessee during the scheme period.	Causes of deviation from the proposed programme.
A total of 14 bore holes were proposed within the ML during the year 2011-16 to know the lateral and depth persistence of the ore body and to convert the entire resources into Proved mineral reserves.	No bore holes have been drilled during 2011-12 and 2015-16.	Due to non-availability of forest clearance the bore holes could not be drilled in the area earmarked location as proposed in the approved Scheme of Mining.

Year	Location	No of bore holes	Depth of the hole
2011-12	NIL	NIL	Up to the end of Mineralization and also to known the quality of Ore
2012-13	PBH-1 to 6	6	
2013-14	PBH- 7 to 14	8	
2014-15	NIL	NIL	
2015-16	NIL	NIL	
Total		14	

Year	No of bore holes
2011-12	Nil
2012-13	Nil
2013-14	Nil
2014-15	Nil
2015-16	NIL
Total	

(b) Mine Development:

Development work proposed as per the Scheme approved vide letter No 314(3)/ 2010/MCCM/(CZ)/MS/54 dated 07.04. 2011.	Actual development work done during the scheme period.	Causes of deviation from the proposed programme.
In the approved scheme of Mining it was proposed to work in the existing quarry during 2011-16 in which development of 310608.4 Cu.m was proposed.	The waste generation was nil during this year.	Development work could not be carried out during 2011-12 to 2015-16 due to want of forest Clearance.

Year	I/Waste Cu.m	O.B Waste Cu.m	Total Waste Cu.m
2011-12	35299	--	35299
2012-13	53523	--	53523
2013-14	74527.2	--	74527.2
2014-15	99587.4	--	99587.4
2015-16	47671.8	--	47671.8
Total	310608.4		310608.4

Year	I/Waste Cu.m	O.B Waste Cu.m	Total Waste Cu.m
2011-12	Nil	Nil	Nil
2012-13	Nil	Nil	
2013-14	Nil	Nil	Nil
2014-15	Nil	Nil	Nil
2015-16	Nil	Nil	Nil

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(C) Exploitation:

Exploitation works proposed as per the Scheme approved vide letter No 314(3)/2010/MCCM/ (CZ)/ MS/54 dated 07.04.2011.	Actual exploitation work done by the lessee during the scheme period.	Causes of deviation from the proposed programme.
In the approved Scheme of Mining it was proposed to work within the existing Quarry, during 2011-16 in which development of 2447400 Cu.m was proposed. **Year** / **Proposed production of Ore (cum)** 2011-12: 320896 2012-13: 441523 2013-14: 576038 2014-15: 789085 2015-16: 319858 **TOTAL: 2447400**	The production was nil during this year. Year / Achievement (MT) 2011-12: Nil 2012-13: Nil 2013-14: Nil 2014-15: Nil 2015-16: Nil **TOTAL: Nil**	Development work could not be carried out within forest land during 2011-12 to 2015-16 due to want of forest Clearance.

(d) Afforestation:

Year wise afforestation programme proposed as per the mining plan approved vide letter No 314(3)/2010/MCCM/(CZ)/ MS/54 dated 07.04.2011.	Actual afforestation made during the scheme period.	Causes of deviation from the proposed programme.
Total 3600 saplings were proposed to be planted within the lease area over 0.788Ha and 5000 plants covering an area of 2.712ha were proposed at outside the lease area in the approved scheme of mining during the year 2011-12 to 2015-16. The proposal of inside the lease area was as follows: **Year** / **Area(Ha)** / **No of saplings** 2011-12: 0.150 / 700 2012-13: 0.188 / 800 2013-14: 0.150 / 700 2014-15: 0.150 / 700 2015-16: 0.150 / 700 **TOTAL: 0.788 / 3600**	**Year** / **Achievement** 2011-12: Nil 2012-13: Nil 2013-14: Nil 2014-15: Nil 2015-16: Nil **TOTAL**	The mining operation was closed during 2010.

(e) Mine Reclamation:

Year-wise reclamation scheme as proposed as per the mining plan approved vide letter No 314(3)/2010/MCCM/(CZ)/ MS/54 dated 07.04.2011.	Actual reclamation done during the scheme period.	Causes of deviation from the proposed programme.
No reclamation by backfilling was proposed in the approved scheme of mining.	Not applicable.	-

3.4 Status of compliance of violations pointed by IBM.

3.4.1 Review of the compliance position of conditions and stipulations imposed, if any, while approving the Mining Plan / Mining Scheme:

S.No	IBM POINTS	Reply
IV	The provisions of the Mines Act – 1952 and Rules & Regulations made there under including submission	The provisions of the Mines Act – 1952 and Rules & Regulations made there under including submission of notice of

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	of notice of opening, appointment of Manager and other statutory officials as required by the Mines Act 1952 shall be complied with	opening, appointment of Manager and other statutory officials as required by the Mines Act 1952 is complied with.
VI	The approval of mining operations and associated activities is restricted to the mining lease area only. The mining lease area is as shown on the statutory plans under Rule 28 of MCDR - 1988, by the lessee/RQP/applicant and Indian Bureau of Mines has not undertaken verification of the mining lease boundary on the ground.	The mining operations and associated activities is restricted to the mining lease area only and also within the broken up forest area.
IX	The approval of Mining Plan is subject to the compliance of CCOM's Circular No.2/2010 regarding Geo-referenced cadastral map within 6 months from the date of approval failing which the approval of the document shall be deemed to have been withdrawn with immediate effect.	For compliance of CCOM's Circular No.2/2010, the lessee has submitted the Geo-referenced cadastral map in IBM.
XII	Yearly report as required under rule 23E(2) of MCDR,'88 setting forth the extent of protection and rehabilitation works carried out as envisaged in the approved progressive mine closure plan and if there is any deviations, reasons thereof shall be submitted before 1st July of every year to the Regional Office, IBM, Bhubaneswar.	Yearly report as required under Rule 23E (2) of MCDR, 1988 setting forth the extent of protection and rehabilitation works is being sent regularly.
XIV	The financial assurance submitted by you for Rs3,84,450/- (Three Lakhs Eighty Four Thousand Four Hundred and Fifty only) is valid up to scheme period and next financial assurance shall be submitted on or before 31/03/2018.	The financial assurance is submitted in the form of Bank Guarantee valid up to Scheme period i.e. up to 31st March 2016.
XVI	A copy of Environment Impact Assessment-Environment Management Plan (EIA-EMP) as approved by MOEF (Ministry of Environment & Forest) shall be submitted to IBM immediately after approval by MOEF.	A copy of Environment Impact Assessment-Environment Management Plan (EIA-EMP) as approved by MOEF along with approval letter is already submitted to Indian Bureau of Mines
XVII	The Environmental Monitoring Cell established by the company shall continue monitoring ambient air quality, dust-fall rate, water quality, soil sample	The Environmental Monitoring Cell is established to continuously monitor ambient air quality, dust-fall rate, water quality, soil sample analysis and noise

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	analysis and noise level measurements at various stations established for the purpose both in the core zone and buffer zone as per requirement of Environment Guidelines and keeping in view IBM's circular No. 3/92 & 2/93 season wise every year by engaging the services of an Environmental Laboratory approved by MOEF/CPCB. The data so generated shall be maintained in a bound paged register kept for the purpose and the same shall be made available to the inspecting officer, on demand.	level measurements at various stations established for the purpose both in the core zone and buffer zone as per requirement of Environment Guidelines and keeping in view IBM's circular No. 3/92 & 2/93 season wise every year by engaging the services of an Environmental Laboratory approved by MOEF/CPCB. The compliance reports of the same is being sent regularly to statutory authorities

3.4.2 REVIEW OF COMPLIANCE OF VIOLATIONS POINTED OUT AFTER INSPECTION MADE UNDER MCDR, 1988.

IBM issued MCDR violation vide letter No-T/Misc/show-cause/I/BBS-2015 dated 30.01.18. The detail violation and reply are furnished below:

Rule	Matter	Reply
45(5)	The holder of the Mining Lease shall submit online returns in respect of each mine to the Regional Controller of Mines or any other authorised official of the Indian Bureau of Mines in the following manner, (b) a monthly return which shall be submitted before the tenth day of every month in electronic form along with signed print copy of the same if it is not digitally signed in respective form. (c) An annual return which shall be submitted before the 1st day of July each year for the preceding financial year in electronic form, along with a signed print copy of the same if it is not digitally signed in the respective form.	The lessee replied vide letter no MIM/75/2018 dated 08.02.2018. The IBM violation and compliances are enclosed as **Annexure XI**

3.5 Details of any suspension/closure/prohibitory order issued by any Government agency under any Rule or court of Law.

The mine was operated on the basis of working permission which was expiring on 17.04.2010. Hence, the Forest Range officer, Barbil had issued a closure notice vide his letter no 461 dated 14.04.2010.

3.6 In case the MP/SOM is submitted under Rule 9 and 10 of the MCDR 1988 or under Rule 22(6) of the MCR' 1960 for approval of Modification, specify reason and justification for modification under these Rule.

Not Applicable

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CHAPTER – I

1.0 GEOLOGY AND EXPLORATION

a) Briefly describe the Topography, Drainage pattern, Vegetation, Climate, Rainfall data of the Mining Lease area.

Topography

The lease area under reference is marked by a north-south trending hill range. The highest altitude in the area is 658.0m at south-western corner of the applied M.L area and the lowest altitude is 555m is at the north-eastern corner. General slope of the area is towards east. There is no perennial nala within the M.L area. A seasonal nala flows from west to east.

Drainage pattern

As far as drainage pattern is concerned, dendritic pattern can be observed regionally in the lease area and its surrounding area. There is no perennial nala flowing within the lease area. A seasonal nala is flowing within the lease area in the southern part of the lease area. The perennial nala namely murga – nala is flowing at a distance of 1km away from the lease

Vegetation

Within the virgin land Sal is the most important species found within the lease area. In associates of Sal (*Shoroa robusta*), naturally grown plant species like *Shorea Robusta*, *Maduca Indica*, *Diospyros melanoxyion*, *Schleichera oleosa*, *Zyzipus marutiana*, *Cassia*, Adina, etc., are commonly observed.

The details of vegetation within the lease area are given below:

Local Name	Botanical Name	Family Name
Trees		
Asan	*Terminalia tomentosa*	Combretaceae
Bel	*Aegle marmelos*	Rutaceae
Char	*Buchnania lanzan*	Anacardiaceae
Dhaura	*Anogeissus latifolia*	Combretaceae
Jamun	*Syzygium cuminii*	Myrtaceae
Kasi	*Bridelia retusa*	Euphorbiaceae
Kendu	*Diospyrus melanoxyion*	Ebenaceae
Mahul	*Madhuca indica*	Sapotaceae
Sal	*Shorea robusta*	Dipterocarpaceae
Piasal	*Pterocarpus marsupium*	Papilionaceae
Bara	*Ficus Benghalensis*	Moraceae

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Local Name	Botanical Name	Family Name
Dhatki	*Woodfordia Fruticosa*	Lythraceae
Dhaman	*Grewia tiliaefolia*	Tiliaceae
Mundi	*Mitragyna parviflora*	Rubiaceae
Sisso	*Delbergia sisso*	Papillionaceae
Sunari	*Cassia fistula*	Casalpiniaceae
Bahada	*Terminalia belerica*	Combretaceae
Barakoli	*Zizyphus maurtiiana*	Rhamnaceae
Bana Bhalia	*Semicarpus anacardium*	Anacardiaceae
Kusum	*Schleichera oleosa*	Sapindaceae
Haldu	*Adina cordifolia*	Rubiaceae
GRASSES		
Khara grass	*Imperata cylindrica*	Gramineae
SHRUBS / HERBS		
Anantamula	*Hemidesmus indicus*	Asclepidaceae
Dhatki	*Woodfordia fruticosa*	Lythraceae
CLIMBERS		
Atundi	*Combretum decandrum*	Combretaceae
Bichhuati	*Tragia plukenetii*	Euphorbiaceae

CLIMATE

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

The meteorological data has been obtained from the EIA/EMP report prepared for the project based on which the Environment Clearance has been granted for project by MoEF, Govt of India.

(i) Temperature:

The climate of the study area is characterized by an oppressively hot summer with high humidity. Summer generally commences in the month of March. Temperature begins to rise rapidly attaining the maximum in the month of May. During the summer maximum temperature can go up to 47.4^{0}C. The weather becomes pleasant with onset of monsoon in June and remains as such up to the end of October. The temperature in the month of December is lowest i.e. 7^{0}C.

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(ii) Relative Humidity

The air is dry except during the South – West monsoon season. The maximum humidity ranges from 55% to 76% with annual average of 64.83% while the minimum humidity ranges from 26% to 43% with an annual average of 34%.

(iii) Rainfall Data

The rain fall data has been obtained from IMD for the financial year 2006-2012. Based on the data the rain minimum Annual rainfall is 1254.2mm during 2010 and the maximum rain fall is 1871.6mm during 2013. The average rainfall is 1503.3mm. The detail year wise rainfall data from 2006 to 2012 is as follows:

ANNUAL RAINFALL DATA (KEONJHAR DISTRICT)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
2006	0	0	19	50.1	173.9	199.3	287.1	568.2	247	67.4	36	0	1648
2007	2	94.1	20.6	32.8	110.4	242.9	404.6	355.9	316.5	28.5	77.3	0	1685.6
2008	62.5	11.9	12.7	35.2	96.2	605.1	175.6	193.8	429.1	4.6	15	0	1643.7
2009	0	0	2.8	0.5	133.1	103.5	386	333.4	195.2	123.2	26.8	0	1304.5
2010	1.3	1.3	71	0.4	122.1	114.4	289.2	233.1	238.1	125.2	28.6	29.5	1254.2
2011	0	32.8	31.3	121.2	117.6	359.9	157.5	318.7	677.5	55.1	0	0	1871.6
2012	94.7	7.80	0.00	46.3	9.5	169.7	225	283.6	212.7	66.3	0	0	1115.6
Average	22.9	21.1	22.5	40.9	109.3	256.4	275.0	326.7	330.9	67.2	26.2	4.2	1503.3

b) Brief description of regional Geology with reference to location of the lease area.

The ML area is a south-eastern part of the Singhbhum-Keonjhar-Bonai belt, a narrow NNE – SSW trending folded synclinorium of 60 Km long and 25 Km wide. This deposit occupies a south-central position on the eastern limb of the synclinorium. This Precambrian horse-shoe shaped belt is well known for its large reserves of iron and manganese ore.

The belt was first reported by Jones in 1934 and has been studied in details by several eminent geoscientists since then. The major litho types discernible in the Singhbhum-Keonjhar-Bonai belt are schists, tuffs, phyllites, shale and Banded Iron formation including banded hematite Jasper (BHJ), banded hematite chert (BHC) and banded hematite quartzite (BHQ).

Regional Geology

The Pre-Cambrian iron ore formations of the iron ore series has been deciphered to be an asymmetrical synclinorium pitching towards north. The famous "Horse Shoe" shaped synclinorium as described by Jones and others open at the north and closes at the south of Malangtoli. The superimposed folding is noticed within the synclinorium and the general strike is NNE - SSW with

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westerly dip. The stratigraphic succession has undergone evolutionary changes as per the interpretation of various geologists hence the regional Stratigraphy as postulated by Prof. Sarkar and Saha in 1983 as mentioned in following Table wherein the geo-chronological data are also included.

	Alluvium Laterite (Iron bearing at places) Newer Dolerites Kolhan Group
---------- Unconformity ----------	
	Singbhum Granite (Intrusive in to Iron Ore Group-IOG) Epidiorite (Intrusive) Upper tuffs & Volcanics Iron bearing shale
Iron Ore Group	BIF with Iron Ores Lower tuffs and grey wacke Quartzite
---------- Unconformity ----------	
	Older metamorphic gneisses Older metamorphic supra crustal Group

Lithology (Regional)

The different lithological units present can be broadly categorized into three major groups, namely -

(a) Basic volcanic rocks - Lavas - Dolerites.

(b) Iron Ore formations (BIF), strati form such as BHJ/BHQ.

(c) Argillaceous formations such as shale.

Geology (Local)

The available field studies conducted indicates that the local structural elements are compatible with the general regional trend of the western limb of the synclinorium. The main rock types found in this mines are BHJ, Hematite (Massive, Laminated ores), Conga and ferruginous laterite. In the ML area, iron ore found as mainly hard massive and laminated variety. The strike varies from N15^{0}E – S15^{0}W to N15^{0}E – S15^{0}W. The dip is generally westerly but varying from 35^0 to 45^{0}and in few isolated locations the dip amount is 60^0. These normally conform to the regional trend of the rock.

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Lithological successions

The lithological succession established as observed within the leasehold area are compatible with other locations on the western limb of the synclinorium. The general lithological succession is as follows:

Soil & Alluvium.

Conga Iron ore/Lateritic Iron ore

Massive iron ore (Hard Laminated iron ore/ Soft laminated Iron ore)

Upper shale with float iron ore

BHJ

(c) Shape and size of the mineral/ore deposit:

The lessee has drilled 13 core type bore holes and 10DTH type holes from 2009-10 onwards. The maximum depth attained is 56.65m (MBH -1) drilled during 2009-10 and the minimum depth is 11.5m (MBH-4) drilled during 2009-10. There is existence of a quarry within the ML area and the floor of the quarry is 728.166m. This quarry gives detail information about the detail configuration of ore body. Considering the information of existing quarry, bore hole data, the shape and of the mineral deposit is 656m x 212m x 56.65m.

Control of mineralization

The possible parameters of control of mineralization may be attributed to

(a) Regional and local tectonics, (b) Leaching and metasomatic replacement of BHQ and there by leading to iron ore formations, as evidenced by the presence of unleached portion of the ore and BHQ in the ore body.

Description of rock types

The important litho units found within Murgabeda Iron ore mines are soil & Alluvium, conga iron ore/lateritic iron ore, Hard Laminated/soft laminated iron ore, float iron ore with shale, BHQ & Hematite found in Murgabeda Iron Ore Mines of Sri D.R.Patnaik is of iron ore series of Singhbhum- Bonai synclinorium.

(i) Soil and Alluvium

Soil and Alluvium occurs at lower altitude in the northern part of the lease area.

(ii) Conga Iron ore/ Lateritic iron ore

Iron ore occurs in the form of brecciated laterite (Conga).It is exposed in the eastern part of the lease area. Iron ore pebbles are cemented with lateritic reddish, brown, porous, concretionary materials.

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(iii) Massive Iron Ore

Hematite is a massive and steel gray colour ore ranging from 55% to 65% Fe. Porous laminated variety is also available ranging from low to medium grade of iron content. Iron ore found within the M.L area are of massive, hard and soft laminated variety.

(iv) **Upper shale with float iron ore**

Float iron ore occurs in the southern part of the lease area along with shale.

(iv) Banded Hematite Jasper (BHJ)

BHJ is found in the covers a small area. Alternate band of hematite and Jasper is the main characteristic of BHJ. The BHJ is very hard to disintegrate the hematite portion.

d) Name of the prospecting/exploration agency

The lessee had entrusted the job to M/s Thriveni Earth Movers pvt Ltd to undertake drilling within the lease area. Accordingly, 13 core drill and 10 DTH holes were drilled within the lease area to prove the depth ward occurrence of ore body.

e) Details of prospecting / exploration already carried out

(i) *Number of pits and trenches indicating dimensions, spacing etc. along and across the strike/ foliations with reference to geological plan.*

Mining operation in this lease area is going on after the lease was executed. Continuation of mining operation in the area has opened up one quarry. This existing quarry almost covering 10.805Ha. The detail of the existing quarry is as follows:

Quarry Name	Length (m.)	Width (m)	Area (m^2)	No of Benches in Ore	No of Benches in OB	Top RL (m.)	Bottom RL (m.)
Existing Quarry	650	166	10805	16	0	658	550

(ii) *Number of boreholes indicating type (core type/DTH), diameter, spacing, inclination, collar level, depth etc with standard borehole logs duly marking on geological plan/sections.*

The Lessee had executed exploration work from time to time and accordingly estimation of resources of iron ore has been done within the lease area. The present day quarry is a result of past prospecting and recent exploration data. The details of exploration carried out by the lessee in the lease area are as follows.

Year	No of bore hole	Type of bore hole	Total Depth (M)
2009-10	7nos	Core	287.40
	10	DTH type	165.00
2010-11	6nos	Core type	146.50
Total	23		598.90

BH wise information of drilled BH to be given in tabulated from indicating year, Collar coordinate, collar RL, type (Core/DTH/RC), section number, diameter, spacing, inclination, depth, whether mineralized or non-mineralized etc

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BH. No	Year	Collar Co-Ordinate		Collar R.L	Type	Section Number	Dia (mm)	Spacing	Inclination	Depth	Mineralized/Non-Mineralised
		Northing	Easting								
MBH-1	2009-10	1334.554	791.642	596.251	core	2445820	47mm	100-200	90°	56.65	Mineralised
MBH-2	2009-10	1239.30	807.121	594.536	core	2445770	47mm	100-200	90°	55.25	Mineralised
MBH-3	2009-10	1094.541	809.684	586.852	core	2445620	47mm	100-200	90°	49.15	Mineralised
MBH-4	2009-10	1387.241	863.489	579.258	core	2445870	47mm	100-200	90°	11.10	Mineralised
MBH-5	2009-10	1032.571	797.878	615.28	core	2445570	47mm	100-200	90°	45.10	Mineralised
MBH-6	2009-10	1257.505	876.631	586.817	core	2445770	47mm	100-200	90°	35.60	Mineralised
MBH-7	2009-10	1182.119	956.895	563.119	core	2445670	47mm	100-200	90°	35.60	Mineralised
DTH-1	2009-10	1179.703	857.158	593.559	DTH	2445670	100mm	100-200	90°	20	Mineralised
DTH-2	2009-10	1365.106	793.62	597.978	DTH	2445870	100mm	100-200	90°	15	Mineralised
DTH-3	2009-10	1348	835.808	593.318	DTH	2445870	100mm	100-200	90°	18	Mineralised
DTH-4	2009-10	1561.008	848.4350	563.722	DTH	2446070	100mm	100-200	90°	18	Mineralised
DTH-5	2009-10	1609.122	836.865	556.708	DTH	2446120	100mm	100-200	90°	15	Mineralised
DTH-6	2009-10	1613.687	858.800	553.21	DTH	2446120	100mm	100-200	90°	12	Mineralised
DTH-7	2009-10	1424.146	904.067	562.986	DTH	2445920	100mm	100-200	90°	16	Mineralised
DTH-8	2009-10	1035.831	960.823	576.60	DTH	2445570	100mm	100-200	90°	17	Mineralised
DTH-9	2009-10	1307.129	930.1307	560.11	DTH	2445820	100mm	100-200	90°	17	Mineralised
DTH-10	2009-10	1307.129	930.1307	560.11	DTH	2445920	100mm	100-200	90°	17	Mineralised
BH-1	2010-11	100	100	595.24	Core	2445620	47mm	100-200	90°	33.10	Mineralised
BH-2	2010-11	150	50	601.129	Core	2445670	47mm	100-200	90°	15.10	Mineralised
BH-3	2010-11	200	100	593.175	Core	2445720	47mm	100-200	90°	25.10	Mineralised
BH-4	2010-11	250	200	561.984	Core	2445770	47mm	100-200	90°	28.10	Mineralised
BH-5	2010-11	550	100	564.826	Core	2446070	47mm	100-200	90°	23.10	Mineralised
BH-6	2010-11	450	150	564.581	Core	2445970	47mm	100-200	90°	22.00	Mineralised

Outcome of the completed holes during FY 2010-11

Synthesis of exploration data has been made on the basis of scale of mapping, existing quarry, bore holes drilled, samples collected & analyzed in various phases.

The lessee has drilled 13 core type bore holes and 10DTH type holes from 2009-10 onwards. The maximum depth attained is 56.65m (MBH-1) drilled during 2009-10 and the minimum depth is 11.10m (MBH-4) drilled during 2009-10. There is existence of a quarry within the ML area and the floor of the quarry is 728.166m. The quarry gives detail information about the ore body configuration and quality of ore. Further, the lessee has collected samples from different benches to know the quality of ore. The samples have been analyzed by a NABL accredited Laboratory. Considering these factors it has been considered under G1 category. The area covered under exploration as per UNFC norms are furnished below:

Item of information	Lease area explored as per UNFC norms (in Ha) as on date. 18.01. 2018 *Total Lease area* = A+B+C+D+E					Remarks/Comments including reasons for not carrying out the exploration as per UNFC norms.
	G1 Level (mineralized)	G2 Level (mineralized)	G3 Level (mineralized)	Explored and found non-mineralized with level of exploration (Remarks)	Unexplored lease area	
	A	B	C	D	E	
Area as per level of exploration	13.10	0.878	--	--	1.40	However, most of the earlier bore holes have not drilled up to the end of the mineralisation. Therefore, it has been planned to drill 24 no of bore holes within the area covered under G1 to prove the mineralisation at depth.
No. of BH Drilled	23					
No. of BH considered for Resource Estimation.	23	50m influence from G1	--	--		
Meterage Drilled	586.75	--	--			
Grid Interval	100 x 100	100 x 200	--	--	--	
Scale of Mapping	1:1000	1:1000	--	--	1:1000	

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(iii) Details of sample analysis indicating type of sample (surface, sub-surface from pits/ trenches/bore holes etc) complete chemical analysis for entire strata for all radicals may be undertaken for selected samples from a NABL accredited Lab or Government Laboratory or equivalent.

Face sampling have been done by a NABL accredited lab. The samples have been analysed from the face of the existing quarry to know the quality of iron ore. The details of sample location points with Fe% are furnished below:

Sample No	Location	Fe%
1	2445570/341855	64.15
2	2445585/341955	65.22
3	2445660/341895	64.76
4	24458575/341885	66.12

The analysis report from NABL accredited laboratory is enclosed as **Annexure – XII**

Expenditure incurred in various prospecting operation.

The lessee had engaged M/s Thriveni Earth Movers Pvt Ltd for exploration work and accordingly the said job was undertaken by the agency. A total of 23 boreholes have been drilled within the lease area during the year 2009-10 to 2010 -11. The work order has been enclosed as Annexure- in support of this exploration work.

f) The surface plan of the lease area may be prepared on a scale of 1 : 1000 or 1 :2000 with contour interval of maximum 10m depending upon the topography and size of the area duly marked by grid lines showing all features indicated under Rule 28(1)(a) of MCDR 1988

The surface plan of the lease area has been prepared on a scale of 1:2000 with contour interval of maximum 5m duly marked by grid lines showing all features indicated under Rule 28(1) (a) of MCDR 1988.

g) Geological Plan

The surface plan has been prepared on a scale of 1:2000 with a contour interval of 5m. Geological plan has been prepared taking the surface plan as base plan. A detail geological mapping has been undertaken during the preparation of the plan. Further, borehole data and information of the existing quarry has been incorporated within the plan. **(Ref Plate No- V)**.

h) Geological Sections:

Twelve (12) no of Geological cross sections from lease boundary to lease boundary have been prepared on a scale of 1:2000 and given in Plate No- VI.

i) Future Exploration (taking into account of the future tentative excavation)

It is proposed that exploration in the lease area shall be carried out as per the rule 27 (3) and CCOM circular no. 3/2010 vide letter no. M-11012/1/2009-CCOM Nagpur, dated, 14/07/2010 by putting 24

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numbers of boreholes during the ensuing scheme period at a grid interval of 100m x 100m to covet the entire area. It is proposed to drill up to a depth of average 100m or up to the bottom of mineralization. The detail of proposed exploration programme during this plan period is given in Table below and location of these boreholes is shown in Geological Plan (**Plate No– V**).

Sl.No	Year	BH NO	Northing	Easting	Collar RL	Core /RC /DTH	Meterage	Inclination	Forest/non-forest	Diverted forest	Surface right area	Purpose of BH
1	2018 -19	PBH - 1	2445620	341830	648.63	Core	70	Vertical	Forest	Diverted forest	Granted SR	To prove mineralisation
2		PBH - 2	2445620	341930	609.91	Core	60	Vertical	Forest	Diverted forest	Granted SR	To prove mineralisation
3		PBH - 3	2445520	342030	596.5	Core	55	Vertical	Forest	Diverted forest	Granted SR	To prove mineralisation
4		PBH - 4	2445570	342080	579.96	Core	46	Vertical	Forest	Diverted forest	Granted SR	To prove mineralisation
5		PBH - 5	2445620	342030	581.73	Core	74	Vertical	Forest	Diverted forest	Granted SR	To prove mineralisation
6		PBH - 6	2445620	341930	596.52	Core	66	Vertical	Forest	Diverted forest	Granted SR	To prove mineralisation
7		PBH - 7	2445620	341830	630.79	Core	71	Vertical	Forest	Diverted forest	Granted SR	To prove mineralisation
8		PBH - 8	2445670	342080	583	Core	57	Vertical	Forest	Diverted forest	Granted SR	To prove mineralisation
9		PBH - 9	2445720	341905	611.21	Core	56	Vertical	Forest	Diverted forest	Granted SR	To prove mineralisation
10		PBH - 10	2445720	341930	594.18	Core	46	Vertical	Forest	Diverted forest	Granted SR	To prove mineralisation
11		PBH - 11	2445720	342030	577.5	Core	49	Vertical	Forest	Diverted forest	Granted SR	To prove mineralisation
12		PBH - 12	2445820	342030	560.5	Core	41	Vertical	Forest	Diverted forest	Granted SR	To prove mineralisation
13	2019-20	PBH - 13	2445820	341930	603	Core	109	Vertical	Forest	Diverted forest	Granted SR	To prove mineralisation
14		PBH - 14	2445870	341880	606.26	Core	47	Vertical	Forest	Diverted forest	Granted SR	To prove mineralisation
15		PBH - 15	2445870	342030	567	Core	35	Vertical	Forest	Diverted forest	Granted SR	To prove mineralisation
16		PBH - 16	2445870	341930	586	Core	45	Vertical	Forest	Diverted forest	Granted SR	To prove mineralisation
17		PBH - 17	2446020	341930	562	Core	37	Vertical	Forest	Diverted forest	Granted SR	To prove mineralisation
18		PBH - 18	2446020	342005	559.2	Core	25	Vertical	Forest	Diverted forest	Granted SR	To prove mineralisation
19		PBH - 19	2446120	341930	565	Core	37	Vertical	Forest	Diverted forest	Granted SR	To prove mineralisation
20		PBH - 20	2446120	341980	560.8	Core	27	Vertical	Forest	Diverted forest	Granted SR	To prove mineralisation
21		PBH - 21	2446195	341980	550.2	Core	50	Vertical	Forest	Diverted forest	Granted SR	To prove mineralisation
22		PBH - 22	2446270	341910	558.2	Core	50	Vertical	Forest	Diverted forest	Granted SR	To prove mineralisation
23		PBH - 23	2446370	341915	556.5	Core	50	Vertical	Forest	Diverted forest	Granted SR	To prove mineralisation
24		PBH - 24	2446470	341980	550	Core	50					

Cumulative No of Proposed Bore Hole

Forest area	NON-FOREST AREA	DIVERTED AREA	UN DIVERTED AREA	SURFACE RIGHT AREA	NON-SURFACE RIGHT AREA
24	0	21	3	21	3

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j) Reserve and Resources as per UNFC with respect to threshold value notified by IBM may be furnished in a tabular form as given below: (Area explored under different level of exploration may be marked on geological plan and UNFC code for the area considered for consideration of different categories of reserve/resources estimation may also be marked on geological cross sections).

Geological Resource

Reserve/resources estimated in the previous approved scheme of Mining

Earlier Method of estimation of Resource

Cross-sectional area measured from the sections was multiplied with length of influence of each section, tonnage conversion factor and incidence factor to yield the resource under Measured and indicated categories.

Mineable reserves were calculated in the same manner as the geological reserve duly allowancing the reserves blocked under 7.5m wide safety zone along the lease boundary and the ultimate pit slope.

The surface geological plan and the corresponding cross sections and 6 additional boreholes drilled during 2010-11 were the basis to determine the additional reserves/resources during the previous approved scheme period. The updated Reserve of Iron Ore as on **01.04.2011** as per the approved Mining plan is given below:

Summary of Geological & Mineable Reserves assessed as on 01.04.2011

Geological Reserves

Category	+ 58%Fe		Total	+ 45 - 58%Fe			Total	Total resource
	In situ	In Float		In situ	In Float	Direct Mining		
proved	6692461	0	6692461	629879	0	2455452	3085331	9777792
probable	1352596	47190	1399786	127303	17618	1118085	1263006	2662792
Total	**8045057**	**47190**	**8092247**	**757182**	**17618**	**3573537**	**4348337**	**12440584**

Mineable Reserves

Category	+ 58%Fe		Total	+ 45 - 58%Fe			Total	Total resource
	In situ	Float		In situ	Float	Direct Mining		
Proved	5090921	0	5090921	479146	0	1993831	2472976	7563897
Probable	1112428	0	1112428	104699	0	1032966	1137665	2250093
Total	**6203349**	**0**	**6203349**	**583845**	0	**3026797**	**3610641**	**9813990**

Depletion of reserve during 2011-12 to till date.

During the last scheme period, production of iron ore was nil.

Residual Reserve as on 1.09.2015

As the production of iron ore was nil, the residual geological resource and Mineable reserve is same as given in the table.

UP DATED RESERVES

During the last scheme period (2011-16) no bore holes have been drilled. Therefore, no additional reserve has been established. However, the reserve has been up dated/ changed considering different basis and parameters as per UNFC norms. The reason for re-estimation of resource has been discussed in the table below.

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Sl No.	As per approved scheme of mining	In this Review of the Mining Plan
1	In the approved scheme of Mining, probable reserves were calculated by considering 3m depth from the proved limit.	As per the UNFC norm reserve should not be taken below the proved limit without any data. Hence in this plan no depth wise calculation for probable reserve has been considered. The resources under G3 level have been considered based on the ore body extension laterally beyond probable limit.
2	In the approved scheme of Mining, resource under measured and indicated category was not considered.	As we know that the proved and probable reserve are part of measured and indicated resource respectively, in this scheme of mining the resource has been considered under measured and indicated category and out of which proved and probable reserve has been estimated.

The basis and parameters considered for resource/reserve estimation is explained below:

Basis of Resource estimation

Estimation of resources and reserve of iron ore of the area have been made based on the iron ore exposure within the quarry and exploration carried out in the area. Resource and reserve estimation for both in situ iron ore and float ore has been undertaken in this scheme.

Parameters considered for Resource Estimation

- As per guidelines of IBM threshold value of iron ore is considered as 45% Fe and calculation of reserves is done under different range of Fe% i.e. 45 to 58% Fe and 58 % Fe above.
- While above 58 % Fe ore is termed as saleable iron ore, below that up to 45% Fe is termed as sub grade iron ore. Ore containing less than 45% Fe is considered as mineral waste.
- Considering the above factors the grade – wise calculation of updated iron ore reserves, in the ML area in all the deposits are done.
- Surface plan and geological Plan in 1: 2,000 scale was prepared on 01.09.2015. The Mining lease area has been re-surveyed. Based on the survey, it is observed that there is 20m difference in the elevation from the earlier plan.
- Considering the geological plan, 12 numbers of cross sections are prepared in 1: 2000 scale covering the total area and from lease boundary to boundary.
- The existing 22 numbers of bore holes are the measure parameter for estimation of reserve.
- Position of holes are well shown on the cross sections and the lithology as encountered in each of the bore holes were plotted indicating the run wise grade of ore encountered in the hole. The ore zones are plotted in each of the bore holes of respective cross sections and are connected to arriving sectional area of different grade of the ore zone for that section.

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- The recovery factor within saleable ore zone has been considered as 85% and sub-grade iron ore is 10%. Within sub-grade ore zone the recovery of sub-grade ore has been considered as 90% and remaining 10% has been considered as waste.
- The tentative tonnage factor for saleable iron ore has been considered as 3.5 MT/m^3.
- The tentative tonnage factor for sub-grade iron ore has been considered as 2.8 MT/m^3.
- Reserve estimation of float iron ore has been carried out by surface area method. The bulk density and recovery factor for float iron ore are considered as 3.0MT/cum and 50% respectively.
- Measured mineral resources zone is the part of already explored area (G1). Further, the existing quarry along with drilled boreholes within the ML area is considered for estimation of mineral reserve under G1 category. A lateral influence of 50m has been taken in the both side of borehole matching with the depth for estimation of mineral reserve under **G1** category.
- In some part of the area assessment has been made considering the geological factor like dip of the host rock, litho unit etc. Therefore, indicated resource assessment has been made within the ML area. A lateral influence of 50m has been taken from the G1 limit matching with the depth of the bore hole for calculation of resources **under G2 category.**
- The resource under G3 level has been considered based on the ore body extension laterally beyond probable limit.

(k) DETAIL CALCULATION OF RESERVES/RESOURCES SECTION WISE

Method of Resource Estimation for in situ iron ore:

Resource/Reserve assessment has been made by cross sectional area method. Cross sectional area measured in sections are multiplied with the respective length of influence of each section giving the volume. As the volume so calculated is combination of saleable ore, sub-grade ore and intercalated waste, a recovery factor has been applied to get the volume of each saleable ore, sub-grade ore and waste. The volume (cum) so calculated for saleable ore and sub-grade ore is then converted into tonnage under different category.

A symbolic representation may be outlined to calculate the reserve as below:

G = CLRT

Where

G	=	Geological reserve in metric tons
C	=	Cross sectional area in square metres
L	=	Length of influence in metres
R	=	Recovery Factor
T	=	Tonnage Conversion factor

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Method of Resource Estimation for float iron ore:

Surface area method has been adopted to calculate the resource/reserve within the float ore zone. The quantum of reserve arrived by multiplying the surface area with the average thickness of ore zone, bulk density and recovery factor.

Category of Resources

Measured Resource (331)

A 'Measured Mineral Resource is that part a Mineral Resource for which tonnage, densities, shape, physical characteristics, grade and mineral content has been estimated with a high level of confidence is based on detailed and reliable exploration, sampling and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes. The locations are spaced closely enough to confirm geological and/or grade continuity.

The mineralized zone has been demarcated based on the surface exposures as well as existing quarry and exploration carried out in the area. Laterally 50m influence from the borehole drilled and in vertically up-to the end of the mineralized zone from the drilled borehole has been taken for estimation of resources. The thickness of the ore body is variable from section to section. Thus, geological axis has been considered under G1 category.

Indicated Resources (332)

An 'indicated Mineral Resource' is that part a Mineral Resource for which tonnage, densities, shape, physical characteristics, grade and mineral content has been estimated with a lower level of confidence is based on general exploration.

The indicated resource has been taken another 50m from the proved limit considering the lateral extension of ore body at depth matching with the measured limit.

Inferred Resources (333)

An 'inferred Mineral Resource ' is that part of a Mineral Resource for which has no detail information about the tonnage, densities, shape, physical characteristics, grade and mineral content has been obtained. The resource under G3 level has been considered based on the ore body extension laterally beyond probable limit.

Gist of up dated Geological Resources

Category	+ 58%Fe		Total	+ 45 - 58%Fe			Total resource
	In situ	In Float		In situ	In Float	Total	
Measured (331)	6270556.3	0	6270556.3	3009118	0	3009118	9279674
Indicated (332)	275187.5	47190	322377.5	129220	17618	146838	469215.5
Inferred (333)	1188512.5	0	1188512.5	656432	0	656432	1844945
Total	**7734256**	**47190**	**7781446**	**3794770**	**17618**	**3812388**	**11593834**

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The section wise calculation details of resources for various categories are given below:

Measured Resource (331) from In-situ Iron ore zone

Sections Line Along	Area in Sq.m		Length of Influence (m)	> 58% Fe				45% to 58% Fe			Total Quantity of ore (+45% Fe) (Tonne)
	> 58% Fe	45% to 58% Fe		Volume in Cu.m	ore in Tones	Sub Grade In Tones	Intercalated waste in Tones	Volume in Cu.m	Sub Grade In Tones	Intercalated waste in Tonn	
a	b	c	d	e=bxd	f=ex85%x3.5	g=ex10% x 2.8	h=ex5%x 2.2	i=cxd	j=ix90%x2.8	k=ix10%x2.2	l=f+g+j
2446120	470	570	50	23500	69912.50	6580	2585	28500	71820	6270.00	148312.50
2446070	586	974	50	29300	87167.50	8204	3223	48700	122724	10714.00	218095.50
2446020	500	0.0	50	25000	74375.00	7000	2750	0.00	0.00	0.00	81375.00
2445970	1590	1230	50	79500	236512.50	22260	8745	61500	154980	13530.00	413752.50
2445920	930	2380	50	46500	138337.50	13020	5115	119000	299880	26180.00	451237.50
2445870	990	1325	50	49500	147262.50	13860	5445	66250	166950	14575.00	328072.50
2445820	5290	3330	50	264500	786887.50	74060	29095	166500	419580	36630.00	1280527.5
2445770	6935	4185	50	346750	1031581.2	97090	38142	209250	527310	46035.00	1666981.2
2445720	3110	1190	50	155500	462612.50	43540	17105	59500	149940	13090.00	656092.50
2445670	6030	880	50	301500	896962.50	84420	33165	44000	110880	9680.00	1092262.5
2445620	5210	2490	50	260500	774987.50	72940	28655	124500	313740	27390.00	1161667.5
2445570	7510	460	70	525700	1563957.5	147196	57827	32200	81144	7084.00	1792297.5
TOTAL				2107750	6270556.2	590170	231852.5	959900	2418948	211178	9279574.2

Indicated Resource (332) from In-situ Iron ore zone

Sections Line Along	Area in Sq.m		Length of Influence (m)	> 58% Fe				45% to 58% Fe			Total Quantity of ore (+45% Fe) (Tonne)
	> 58%Fe	45% to 58% Fe		Volume in Cu.m	ore in Tones	Sub Grade In Tones	Intercalated waste in Tones	Volume in Cu.m	Sub Grade In Tones	Intercalated waste in Tones	
a	b	c	d	e=bxd	f=ex85%x3.5	g=ex10%x2.8	h=ex5%x2.2	i=cxd	j=ix90%x2.8	k=ix10%x2.2	l=f+g+j
2446020	660	0.0	50	33000	98175.00	9240.00	3630.0	0.00	0.00	0.00	107415.00
2445620	1190	820	50	59500	177012.5	16660.0	6545.0	41000.	103320.0	9020.00	296992.50
TOTAL				92500	275187.50	25900.00	10175.0	41000	103320.00	9020.00	404407.50

Indicated Resource (332) from Float Iron ore zone

Area in m^2	Avg. Thickness (m)	Total volume (m^3)	Recovery of saleable ore @ 50% (cum)	Recovery of saleable ore in tonne @ 3MT/m3	Recovery of sub-grade ore @ 20% (cum)	Recovery of sub-grade ore in tonne	Volume of waste @ 30%(cum)
14300	2.0	31460	15730	47190	6292	17618	9438

Inferred Resource (333) from In-situ Iron ore zone

Sections	Area in Sq.m		Length of Influence (m)	> 58% Fe				45% to 58% Fe			Total Quantity of ore (+45% Fe) (Ton)	Total Quantity of waste (Ton)
	> 58% Fe	45% to 58% Fe		Volume in Cum	ore in Tones	Sub Grade In Tones	Intercalated waste in Tonex	Volume in Cum	Sub Grade In Tones	Intercalated waste in Tones		
a	b	c	d	e=bxd	f=ex85%x3.5	g=ex10%x2.8	h=ex5%x2.2	i=cxd	j=ix90%x2.8	k=ix10%x2.2	l=f+g+j	m=i+j+g+r
2445970	0.0	730	50	0.00	0.00	0.00	0.00	36500	91980.00	8030.00	91980.00	8030
2445720	530.0	410	50	26500	78837.50	7420.00	2915.00	20500	51660.00	4510.00	137917.50	7425
2445620	1020.0	1600	50	51000	151725.	14280.00	5610.00	80000	201600.00	17600.00	367605.00	23210
2445570	4600.0	1130	70	322000	957950	90160.00	35420.00	79100	199332.00	17402.00	1247442.0	52822
TOTAL				399500	1188512.5	111860.	43945.00	216100	544572.00	47542.00	1844944.5	91487

MINEABLE RSERVE

Mineral reserve is that part of reserve which can be calculated based on taking ultimate pit slope of the working leaving 7.5m from the lease boundary. While assessing the mineral reserves of the deposit measured and indicated categories of mineral resources have been considered and accordingly the mineral reserves are calculated assuming loss due to pit slope and its proximity with the lease boundary.

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It is worth mentioning here that, in the southern part of the lease area common with Deojhar iron ore mines permission from DGMS has been obtained to work within the safety zone area of 7.5m. Hence, there will be no blockage under the safety zone of 7.5m in the said area.

The ore blocked under 331 category has been considered as the resource under 221 category and the remaining reserve are under the 121 category as per UNFC .Similarly the ore blocked under 332 category has been considered under the resource of 222 and the remaining reserves are under 122 category.

GIST OF MINEABLE RESERVE

Category	+ 58%Fe		Total	+ 45 - 58%Fe			Total	Total resource
	In situ	In Float		In situ	In Float	Direct Mining		
Probable Reserve (121)	4957391	0	4957391	466578	0	1972908	2439486	7396877
Probable Reserve (122)	275187.5	47190	322377.5	25900	17618	103320	146838	469215.5
Total	**5232579**	**47190**	**5279769**	**492478**	**17618**	**2076228**	**2586324**	**7866093**

The section wise calculation details of mineable reserve under different categories are given below:

Probable Reserve (121) from in situ ore zone

Sections Line Along	Area in Sq.m		Length of Influence (m)	> 58% Fe				45% to 58% Fe			Total Quantity of ore (+45% Fe) (Tonne)
	> 58% Fe	45% to 58% Fe		Volume in Cu.m	ore in Tones	Sub Grade In Tones	Intercalated waste in Tones	Volume in Cu.m	Sub Grade In Tones	Intercalated waste in Tones	
a	b	c	d	e=bxd	f=ex85%x3.5	g=ex10%x2.8	h=ex5%x2.2	i=cxd	j=ix90%x2.8	k=ix10%x 2.2	l=f+g+j
2446120	380	430	50	19000.0	56525.00	5320.00	2090.00	21500.00	54180.00	4730.00	116025.0
2446070	440	760	50	22000.0	65450.00	6160.00	2420.00	38000.00	95760.00	8360.00	167370.0
2446020	365	0.0	50	18250.0	54293.75	5110.00	2007.50	0.00	0.00	0.00	59403.75
2445970	1450	1190	50	72500.0	215687.50	20300.00	7975.00	59500.00	149940.00	13090.0	385927.5
2445920	660	2030	50	33000.0	98175.00	9240.00	3630.00	101500.0	255780.00	22330.0	363195.0
2445870	640	1300	50	32000.0	95200.00	8960.00	3520.00	65000.00	163800.00	14300.0	267960.0
2445820	3750	2830	50	187500.	557812.50	52500.00	20625.00	141500.0	356580.00	31130.0	966892.5
2445770	5710	2462	50	285500.	849362.50	79940.00	31405.00	123100.0	310212.00	27082.0	1239514.
2445720	2840	1190	50	142000.	422450.00	39760.00	15620.00	59500.00	149940.00	13090.0	612150.
2445670	5020	640	50	251000.	746725.00	70280.00	27610.00	32000.00	80640.00	7040.00	897645.
2445620	4750	2490	50	237500.	706662.50	66500.00	26125.00	124500.0	313740.00	27390.0	1866802.5
2445570	5230	240	70	366100.	1089147.50	102508.00	40271.00	16800.00	42336.00	3696.00	1233991.5
TOTAL				**1666350**	**4957391.2**	**466578.00**	**183298.5**	**782900.0**	**1972908.0**	**172238.**	**7396877.25**

Probable Reserve (122) from in situ ore zone

Section s Line	Area in Sq.m		Length of Influence (m)	> 58% Fe				45% to 58% Fe			Total Quantity of ore (+45% Fe) (Tonne)	Total Quantity of waste (Tonne)
	> 58% Fe	45% to 58% Fe		Volume in Cu.m	ore in Tones	Sub Grade In Tones	Intercalated waste in Tones	Volume in Cu.m	Sub Grade In Tones	Intercalated waste in Tones		
a	b	c	d	e=bxd	f=ex 85% x 3.5	g= e x 10%x 2.8	h=e x 5% x 2.2	i=c x d	j=i x 90% x 2.8	k =ix10% x 2.2	l=f+g+j	t=i + l + o + r
2446020	660	0.0	50	33000.0	98175.00	9240.00	3630.0	0.00	0.00	0.00	107415.0	3630
2445620	1190	820	50	59500.0	177012.5	16660.00	6545.0	41000.	103320.	9020.0	296992.5	15565
TOTAL				**92500.0**	**275187.5**	**25900.00**	**10175.**	**41000.**	**103320**	**9020.0**	**404407.5**	**19195**

Probable Reserve (122) from Float Iron ore zone

Area in m^2	Avg. Thickness (m)	Total volume (m^3)	Recovery of saleable ore @ 50%(cum)	Recovery of saleable ore in tonne @ 3MT/m3	Recovery of sub-grade ore @ 20% (cum)	Recovery of sub-grade ore in tonne	Volume of waste @ 30% (cum)
14300	2.0	31460	15730	47190	6292	17618	9438

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I) **Mineral Reserves/ Resources:**

Mineral Resources: (Mineral resources has been estimated purely based on level of exploration, with reference to the threshold value of minerals declared by IBM)

Level of Exploration	Resources in Million tonne	Grade
G1-Detail Exploration	9279674	+ 45 % Fe
G2-General Exploration	469215.5	
G3-Prospecting	1844945	
G4- Reconnaissance	–	
Total	**11593834**	

Resources and Reserves within the lease have been arrived after applying results feasibility/pre-feasibility study and economic evaluation of deposit based on various factors such as:

Mining Method

Opencast fully mechanized method has been proposed to be adopted for achieving the targeted production. The existing quarry shall be developed by deploying shovel and dumper combination during the mining operation. Mining operation will be done from the Top to the bottom of the existing quarry. The details of salient description of present mining method are as follows:

Method of Mining	Opencast mechanized method (A-FM).
Type of ore	Laminated hard and soft ore, massive boulder type
Laminated hard and soft ore , massive boulder type	With the help of excavator and Dumper combination.
Bench height and width	Height 10m height width - 10m or more than the height.
Overall slope angle	28^0
Transportation of Ore	By dumper through haulage road to the Crusher at 1:16 gradient.

Recovery factor:

The recovery factor for saleable iron ore has been considered at 85% and 50% in in situ and float iron ore zone respectively. Similarly, recovery of sub-grade iron ore in in situ and float iron ore zone has been considered at 10% and 20% respectively. However, the details of recovery factor will be as follows

Ore zone	Marketable	Sub-grade	Intercalated Waste
In situ Iron ore zone	85% (+45% Fe)	10% (+45% to - 58% Fe)	05%< 45% Fe
In Float ore zone	50% (+45% Fe)	20% (+45% to - 58% Fe)	30%< 45% Fe

Cutoff grade

The threshold value is considered at 45%Fe and calculation of reserves is done under different range of Fe% i.e. 45 to 58% Fe and +58% Fe. While above 58% Fe ore is termed as saleable iron ore, below that up to 45% Fe is termed as sub grade ore. Ore containing less than 45% Fe is considered as mineral waste.

Ultimate pit depth proposed.

The maximum depth up to which the quarry can be developed economically is considered as the ultimate or conceptual extent of the quarry. Based on the present geological information and mine ability of ore the ultimate pit limit has been marked. The depth of ultimate pit limit has been shown up to the probable limit in the iron ore zone.

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Mineral/ ore blocked dues to benches:

During mining operation certain resources have been blocked under UPL, lease boundary safety zone, and blocked area within bench slope. The ore in these blocked areas are non-mineable. Although feasibility study has been carried out and the quantity is established, because of the above mentioned blockages the quantity falls under F-2 category. By considering these blockages, due to above mention various factors, the mineable reserve has been estimated.

Tonnage Factor

As per the approved Scheme of Mining, the tonnage factor of saleable ore has been considered as 3.5MT/m3 and for sub-grade ore as 2.8MT/m3. The tonnage factor of waste has been considered as 2.2MT/m3.

RESOURCES AS PER UNFC

Total Resources	Category	Code	Quantity (MT) (+45 % to 58% Fe)	Quantity (MT) (+58% Fe)	Quantity (MT) (+45% Fe)
	(A+B)		**4344469**	**7249366**	**11593835**
(A) Mineral Reserve	Proved	111	--	--	--
	Probable	121	2439486	4957391	7396877
		122	146838	322377.5	469215.5
	Total		**2586324**	**5279769**	**7866093**
(B) Remaining Resources	Feasibility Mineral resources	211	--	--	--
	Pre-Feasibility Mineral resources	221	569632	1313165	1882797
		222	0	0	0
	Measured Mineral Resources	331	--		--
	Indicated Mineral Resources	332	--	--	--
	Inferred Mineral Resources	333	1188512.5	656432	1844945
	Reconnaissance Mineral Resources	334	--	--	--
	Total (B)		**1758145**	**1969597**	**3727742**

Note: It may not be possible to quantify grade wise reserves, as normally there is considerable variation in size and grade distribution within the ore zone, which results variable recovery factor and bulk density. Thus tonnages arrived are tentative.

JUSTIFICATION OF UNFC

Under UNFC, the reserves have been categorized by attributing 3-digit codes of (E) economic axis, (F) feasibility axis and (G) geological axis. The key parameter considered for mineral reserve/resource estimation under the axes of UNFC are (a) Exploration already done (drilling & analysis of ore samples), (b) Reserves updated as on date, (c) Processing technique adopted/to be adopted for saleable ore, (d) Approval of mining plan/scheme of mining with PMCP, (e) Forest Clearance, (f) Environmental Clearance and (g) Prevailing cost of mining/tonne of ore and sale value.

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Justification for Entire Area

Economic Axis	Feasibility Axis	Geological Axis	Code
E1 (Economic)	**F2 (Pre-Feasibility Study)**	**G1 (Detailed exploration)**	
The explored part of the area has been considered under G1 category. However, the reserve estimated under this category is coming under exceptional economic or conditional Economic category. Therefore, mineable reserve from the measured resource has been kept under E1 Axis.	Geological information has been detailed. Part of the ML area has been explored in detail through bore hole and by exposures in the existing quarry. The level of exploration in this part is high and hence falls under G1 category. The mining plan/Scheme of mining is approved. Land use pattern is detailed. Reclamation & rehabilitation proposal has been shown. However, due to non-availability of Forest Clearance the reserve has been considered under F2 axis.	Geological mapping has been done on 1:2000 scales. Geological plan has been prepared showing the detailed topographical -cum-geological details including surface features, extent of deposit, location of borehole etc. Geological sections have been prepared based on the borehole data and mine development. Samples collected from the boreholes have been analysed. Total 22nos of boreholes were drilled up to 2010-11 for a total meterage of 586.75 m in G1 zone. Further, the existing quarry within the ML area is considered for estimation of mineral reserve under G1 category. A lateral influence of 50m has been taken on the both side of borehole and existing quarry for estimation of mineral reserve under G1 category.	121
E1 (Economic)	**F2 (Pre-feasibility study)**	**G2 (General exploration)**	
Part of the area has been considered under G2 category.	Geological information has been detailed. Part of the ML area has been explored in detail through bore hole and exposures in the existing	Geological mapping has been done on 1:2000 scale. Geological plan has been prepared showing the	

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However, the reserve estimated under this category is coming under exceptional economic or conditional Economic category. Therefore, mineable reserve from the measured resource has been kept under E1 Axis.	quarry. The level of exploration in this part is low in comparison to G1 and coming under G2 category. Land use pattern is detailed. The scheme of mining is approved. Environment Clearance is obtained for the production of 2.0 MTPA of iron ore. Reclamation & rehabilitation proposal has been shown. However, due to non-availability of Forest Clearance the reserve has been considered under F2 axis.	detailed topographical -cum-geological details including surface features, extent of deposit, location of borehole etc. Geological sections have been prepared based on bore hole data and mine development. In some part of the area assessment has been made considering the geological factor like dip of the host rock, litho unit etc. Therefore, indicated resource assessment has been made within the ML area. A lateral influence of 50m has been taken from the G1 limit for calculation of resources under G2 category.	122
E2 (Intrinsically Economic)	**F2 (Pre- feasibility study)**	**G1 (Detailed exploration)**	
The blocked ore of 331 category within entire area due to blockage under safety zone of ML boundary, road cannot be mined out. Hence, the reserve of this category has been kept under the E2 category of UNFC norms.	Geological information has been detailed. Part of the ML area has been explored in detail through bore hole and existing quarry. The level of exploration in this part is low in comparison to G1 category. The mining plan/Scheme of mining is approved. Environment Clearance is obtained for 2.0MTPA capacity. Land use pattern is detailed. Reclamation & rehabilitation proposal has been shown. However, due to non-availability of Forest Clearance at present the reserve is not mineable and is placed under F2 category.	Geological mapping has been done on 1:2000 scales. Geological plan has been prepared showing the detailed topographical -cum-geological details including surface features, extent of deposit, location of borehole etc. Geological sections have been prepared based on the bore hole data and mine development. Samples collected from the boreholes have been analysed. Total 22 nos. of boreholes were drilled up to 2010-11 for a total metreage of 586.75 m in G1 zone. Further, the existing quarry within the ML area is considered for estimation of mineral reserve under G1 category. A lateral influence of 50 m has been taken on the both side of borehole and existing quarry for estimation of mineral reserve under G1 category.	221

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E3 (Economic)	F3 (Inferred study)	G3 (Prospecting)	
The unexplored part of the ML area has been considered under G3 category. Resource estimation has been made based only by geological interpretation. Exact grade of estimation of the resource has not been ascertained. Feasibility study has not been undertaken. Hence, the resources have been considered under E3 category.	Definite identification of the ore body geometry has not been determined till date. Estimation for manpower deployment has to be made in the next Mining Plan. Economics of the resources has not been evaluated. Statutory obligations has to be given due attention during the mining of this possible resources. Feasibility study has not been undertaken. Hence, the resources have been considered under F3 category.	This category of mineral resource has been marked within the unexplored part of the entire area. The resource under G3 level has been considered based on the ore body extension laterally beyond probable limit. Bore hole have been proposed at unexplored part of the lease area. These boreholes will be drilled up to end of the mineralization. Sampling and sample analysis will be done of each bore holes to convert the resource under G1 category. Hence, at present the resource has been kept under G3 category.	333

Refer **Annexure No – XIII** for Feasibility report

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CHAPTER-II

2.0 MINING

a) BRIEFLY DESCRIBE THE EXISTING AS WELL AS PROPOSED METHOD FOR EXCAVATION WITH ALL DESIGN PARAMETERS INDICATING ON PLANS /SECTIONS.

(i) Salient Description of Present Mining Methods

Mining operation in Murgabeda Iron ore mine was stopped since 2010. During the time of operation opencast fully mechanized method was adopted to achieve the targeted production. The existing quarry is being developed by deploying shovel and dumper combination during the mining operation. Mining operation could not be started during last scheme period due to want of statutory clearances. However, there was proposal to adopt Fully Mechanised method of Mining in the approved scheme of Mining. The salient mining method as proposed in the last approved scheme of mining are furnished below:

Sl no	Particulars	Description
1	Method of Mining	Opencast Fully Mechanised Method
2	Bench parameter	Height : 10m Width : More than the height
3	Overall quarry slope	< 30^0
4	Deployment of machinery	Drill type : Pneumatic drill (DP 1100),Drill dia-100mm Excavator- 1.7cum, Dumper : 20t Mineral processing: 250 tph crusher and screen (2nos)
5	Road development	10m Haul road with gradient 1:16

Different features created due to mining activity:

Numbers of features have been created like quarries; dump, sub-grade stacks etc due to earlier mining activity. The details of features are as follows:

Existing Quarry:

Mining operation in this lease area is going on after the lease was executed. Continuation of mining operation in the area has opened up an existing quarry within the lease area. The detail of the quarry is as follows:

Quarry Name	Length (m.)	Width (m)	Area (m^2)	No of Benches in Ore	No of Benches in OB	Top RL (m.)	Bottom RL (m.)
Existing Quarry	650	166	10805	16	0	658	550

Existing Dump

During the process of mining, so far three dumps have been created covering 1.222 ha area within the lease area. However, as per the CCom's circular regarding threshold value of iron ore is 45%Fe. Consequently, the earlier waste dump has been designated as sub-grade dump based on the analysis result. **(Ref Annexure-XII)** However, the detail recovery factor with grade shall be arrived by undertaking drilling and sampling, which can be done after the resumption of mining operation. The detail of this dumps are as follows:

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Name of the dump	Grid location	Avg. Length (m)	Avg. width (m)	Area (m2)	Area Ha	Avg. height (m)	Volume (m3)	Quantity (2.8MT/m3)
Sub-grade dump-1	2445512-2445754 and 341810 - 341851	110	18	1980	0.198	16.6	32868	92030.4
Sub-grade dump-2	2445807-2445864 and 341923-341961	52	15.4	800.8	0.080	16.3	13053.04	36548.512
Sub-grade dump-3	2445808-2446004 and 341897-341937	238.73	30.7	7329.01	0.739	22.1	161971.1	453519.201

Status of Reclamation or Rehabilitation

None of the mining area has been exhausted till date. Therefore, reclamation of mined out land has not been carried out till date. Planning has been made to continue the production in active quarry till the exhaust of quarry. There is no possibility of reclamation / rehabilitation by back-filling of mined out area during the scheme period. As the quarry is on the hill slope, bench plantation will be carried out over the dead benches.

PROPOSED METHOD OF MINING:

This review of the mining plan has been prepared for the financial year 2016-17 to 2020-21. Since, two years i.e. 2016-17 and 2017-18 has been lapsed, the entire proposal has been envisaged for the period 2018-19 to 2020-21. During the plan period, it has been planned to obtain a maximum production of 2.00 million tonne of iron ore per annum. The mine will be developed by opencast mining method with mechanized means deploying machinery like wagon drill machine, rock breaker, hydraulic / diesel operated shovel, dumper/tipper etc. The existing benches of top pit will be worked from top down ward in the North easterly direction.

Strategy for Development :

It has been planned in the existing pit during ensuing scheme period, by developing the existing benches in a systematic and scientific manner with bench height of 10m and width more than 10m.

Haul Road:

The layout of roads for haulage of ore/ waste and access to different installation in the mine will be developed complying with the statutory regulations stipulated in the Metalliferrous Mines Regulations, 1961. Overburden and sub-grade ore will be transported to the respective site of dumping and stacking located in the lease area. Fifteen(15m) wide haul road will be developed in the lease area as per need at a gradient up to 1:16. Regular maintenance will be done throughout the mine life to protect the road from damage and vehicles from wear & tear.

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Site Services:

As far as day to day mine operation is concerned, the infrastructure such as site office, weigh bridge, rest shed, First-aid centre, blasting shed security house, magazine, guard house etc are already made available in the lease area.

Machineries to be deployed.

The mine will be operated in a three shift basis. Process of excavation and loading of overburden/waste will be done by deploying hydraulic excavators and dumpers. Excavators of 1.7m^3 capacities will be deployed for excavation & loading of ROM ore and dumpers of 30t capacity shall be deployed for transportation of ore and OB. Hard iron ore will be loosened through drilling & blasting. For the purpose, DTH drill like DP1100 of 105mm dia, compressor of 450cfm etc will be used during ensuing scheme period to achieve the targeted production. For maintenance of OB dumps dozers will be deployed. Loading & un-loading of sorted & sized ore is loaded by mechanized method.

Transportation

Ore will be transported from quarry site to screen and crushing site for processing by use of 30 ton dumpers and waste materials will be dispatched from quarry to dumping site by using same capacity dumpers.

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

I. In situ Tentative Excavation (cum)

Year	Pit no	Total tentative Excavation (Cum)	Top Soil (Cu m)	OB/SB/IB (Cum)	ROM (Cu m)		Mineral rejects (cum)	ROM /Waste Ratio (cum/cum)
					Ore (Cum)	Mineral Reject (Cum)		
1	2	3	4	5	6	7	8	9
2016-17*	Existing quarry	--	--	--	--	--	--	--
2017-18*		--	--	--	--	--	--	--
2018-19		622461.6	Nil	30844.55	520957.3	70659.792		1 : 0.052
2019-20		691745.2	Nil	43930.0	380460.0	267355.20		1 : 0.067
2020-21		683761.5	Nil	42422.0	396652.5	244687.0		1 : 0.066
Total		**1997968.0**		**117196.6**	**1298070**	**582702**		

Note: Tentative tonnage of the ore may be arrived by computing approximate bulk density and recovery factor as these data are variable and may be established on time series.

At present in this document, the tonnage factor and recovery factor has been considered as per exploration input from the drilled bore-hole data and time series data as below:

Ore Recovery Factor :

Saleable ore incidence	85% of total excavation (+55% Fe)
Sub-grade ore generation	10% of total excavation (45-55% Fe)
Intercalated waste	05% of total excavation (-45% Fe)

Tonnage Factor: Saleable ore = 3.5 t/ cum
Sub-grade ore = 2.8 t/ cum
Waste = 2.2 t/cum

अनुमोदित
APPROVED

14/03/18
क्षेत्रीय खान नियंत्रक
REGIONAL CONTROLLER OF MINES
क्षेत्रीय खान ब्यूरो
INDIN BUREAU OF MINES
भुवनेश्वर/BHUBANESWAR

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Thus, tentative tonnage proposed to be produced per year is arrived as below:

II. In situ Tentative Excavation (MT)

Year	Pit no.	Intercalated waste (MT)	Side Burden (MT)	Total Waste MT	ROM (MT)		Total ROM (MT)	ROM /Waste Ratio (MT/MT)
					Ore * (MT)	Mineral reject (MT)		
1	2	3	4	5	6	7	8	
2016-17*	Existing quarry	--	--	--	--	--	--	
2017-18*		--	--	--	--	--	--	
2018-19		2067858	Nil	67858.01	1823351	176649.5	2000000	1 : 0.033
2019-20		2096644	Nil	96646	1331610	668388	1999998	1 : 0.048
2020-21		2093330	Nil	93328.4	1388284	611717.5	2000000	1 : 0.046
Total		**6257833**		**257832.5**	**4543245**	**1456755**	**6000000**	

***Since the financial year 2016-17 and 2017-18 has been lapsed the proposal has been made for the financial year 2018-19-2020-21.**

C. Enclose Individual year wise development plans and sections showing pit layouts, dumps, stacks of mineral reject, if any, etc. in case of 'A' category mines

On account of exposures of iron ore and its limited depth of occurrence, opencast method of mining will be continued on three shift basis with the deployment of DTH drills, associated compressors, dumpers, excavators and other auxiliary equipment for development, production, processing, protection of environment and safety. Separate year wise development plan along showing pit layouts, dumps, stacks of mineral rejects along with sections are attached.

It has been decided to maintain the production target at around 2.00 MTPA tonnes ROM ore per annum for which environmental clearance exists. Accordingly year wise production planning is projected based on the following parameters.

(i) The width of the benches will be kept at more than 10m whereas the height shall be kept at 10m.

(ii) The slope of the individual bench will be 85^0 while the overall slope will be < 30^0.

(iii) The recovery factor for salable grade ore (>58% Fe) has been taken as 85% as per the computation of bore hole data as well as the past mining experience.

(iv) Tonnage factor of 3.5 has been applied to the volume of ore (>58% Fe) while for sub grade ore, the same has been taken as 2.8.

Development during the year 2016-17

Since the financial year has been lapsed, the proposal has been omitted.

Development during 2017-18

Since the financial year has been lapsed, the proposal has been omitted.

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Development during 2018-19

During this year, the benches developed during 2017-18 have been selected for further movement from top downwards in the north easterly direction. The details of production and generation of waste has been furnished in the following table. The haul road has been proposed to be developed at more than 10m width and maintained for transportation of ore & waste. The gradient of haul road will be maintained at 1:16. As working is confined within the existing quarries generation of top soil is observed to be nil. The details of development, during 2018-19 year of planned period are explained below:

Particulars		Description
Bench Geometry	Height	10m
	Width	10m or more than the height of the Bench In the ultimate stage the bench development will be done by keeping 10m height and 10m width.
	Bench slope angle	85^0
Quarry development	Name of the existing quarry to be developed	There exists one quarry which shall be developed during the ensuing plan period.
	Grid Location of proposed Excavation	From- 2445510 to 2445860 East direction. From 3417870 to 341995 North direction.
	Name of the section along which development will be done	Development shall be done along six numbers of sections namely 2445570, 2445620, 2445670, 2445720, 2445770 and 2445820
	Direction of advancement	Towards North east
	Top RL (m)	645
	Bottom RL (m)	585
	Overall quarry slope angle	30^0
	Production of saleable ore (MT)	1823351
	Production of sub grade ore (MT)	176649.5
	Generation of waste (MT)	67858.01or 30844.55 cum
	Stripping Ratio(MT/cum)	1:0.015

The section wise and RL wise calculation of production details are given below:

Section Line Along	RL	Area in Sq.m		Length of influence (m)	> 58% Fe				45% to 58% Fe			Total Quantity of ore (>45% Fe) (Tonne)	Total Quantity of waste (Tonne)
		> 58% Fe	45% to 58% Fe		Volume in Cu.m	ore in Tones	Sub Grade in Tones	Intercalated waste in Tones	Volume in Cu.m	Sub Grade in Tones	Intercalated waste in Tones		
	a	b	c	d	e=bxd	f=ex85% x3.5	g=ex10% x2.8	h=ex5%x 2.2	i=cxd	j=ix90 %x2.8	k=ix10% x2.2	l=f+g+j	t=i+l+o+r
2445820	595	640.0	40.0	50	32000.00	95200.00	8960.00	3520.00	2000	5040	440.00	109200	3960.00
2445770	605	60.0	0.0	50	3000.00	8925.00	840.00	330.00	0.00	0.00	0.00	9765.00	330.00
	595	480.62	0.0	50	24041.00	71521.98	6731.48	2644.51	0.00	0.00	0.00	78253.46	2644.51
	585	1180.0	0.0	50	59000.00	175525.0	16520.00	6490.00	0.00	0.00	0.00	192045	6490.00
2445720	615	40.0	0.0	50	2000.00	5950.00	560.00	220.00	0.00	0.00	0.00	6510.00	220.00
	605	115.0	0.0	50	5750.00	17106.25	1610.00	632.50	0.00	0.00	0.00	18716.25	632.50
	595	405.0	0.0	50	20250.00	60243.75	5670.00	2227.50	0.00	0.00	0.00	65913.75	2227.50
	585	1070.0	0.0	50	53500.00	159162.5	14980.00	5885.00	0.00	0.00	0.00	174142.5	5885.00
2445670	625	20.0	0.0	50	1000.00	2975.00	280.00	110.00	0.00	0.00	0.00	3255.00	110.00
	615	75.0	0.0	50	3750.00	11156.25	1050.00	412.50	0.00	0.00	0.00	12206.25	412.50
	605	126.0	0.0	50	6300.00	18742.50	1764.00	693.00	0.00	0.00	0.00	20506.50	693.00
	595	400.0	0.0	50	20000.00	59500.00	5600.00	2200.00	0.00	0.00	0.00	65100.00	2200.00
	585	1640.9	0.0	50	52000.00	154700.0	14560.00	5720.00	0.00	0.00	0.00	169260.0	5720.00
2445620	625	120.0	0.0	50	6000.00	17850.00	1680.00	660.00	0.00	0.00	0.00	19530.00	660.00
	615	280.0	0.0	50	14000.00	41650.00	3920.00	1540.00	0.00	0.00	0.00	45570.00	1540.00

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	605	280.0	0.0	50	14000.00	46550.00	3920.00	1540.00	0.00	0.00	0.00	46570.00	1540.00
	595	330.0	0.0	50	16500.00	49087.50	4620.00	1815.00	0.00	0.00	0.00	53707.50	1815.00
	585	1130.0	0.0	50	56500.00	168087.5	15820.00	6215.00	0.00	0.00	0.00	183907.5	6215.00
2445570	635	170.0	0.0	70	11900.00	35402.50	3332.00	1309.00	0.00	0.00	0.00	38734.50	1309.00
	625	200.0	0.0	70	14000.00	41650.00	3920.00	1540.00	0.00	0.00	0.00	45570.00	1540.00
	615	250.0	0.0	70	17500.00	52062.50	4900.00	1925.00	0.00	0.00	0.00	56962.50	1925.00
	605	310.0	0.0	70	21700.00	64557.50	6076.00	2387.00	0.00	0.00	0.00	70633.50	2387.00
	595	930.0	0.0	70	65100.00	193672.5	18228.00	7161.00	0.00	0.00	0.00	211960.5	7161.00
	585	1330.0	0.0	70	93100.00	276972.5	26068.00	10241.00	0.00	0.00	0.00	303040.5	10241.00
TOTAL					612891.0	1823350	171609.4	67418.01	2000	5040	440.00	2000300	67858.01

Development during 2019-20

During this year, the benches developed during 2018-19 have been selected for further movement from top downwards in the north easterly direction. The details of production and generation of waste has been furnished in the following table. The haul road has been proposed to be developed at 10m width and maintained for transportation of ore & waste. The gradient of haul road will be maintained at 1:16. As working is confined within the existing quarries generation of top soil and overburden is observed to be nil. The details of development, during 2019-20 year of planned period are explained below:

Particulars		Description
Bench Geometry	Height	10m
	Width	10m or more than the height of the Bench
		In the ultimate stage the bench development will be done by keeping 10m height and 10m width.
	Bench slope angle	85^0
Quarry development	Name of the existing quarry to be developed	There exists one quarry which shall be developed during the ensuing scheme period.
	Grid location of proposed Excavation	From- 2445510 to 2446150 East direction. From 3417870 to 341983 North direction.
	Name of the section along which development will be done	Development shall be done along eight (8) numbers of sections namely 2445570, 2445620, 2445670, 2445720, 2445870, 2445920, 2445970 and 2446020
	Direction of advancement	Towards North east
	Top RL (m)	575
	Bottom RL (m)	555
	Overall quarry slope angle	30^0
	Production of saleable ore (MT)	1331610
	Production of sub grade ore (MT)	668388
	Generation of waste (MT)	96646 or 43930 cum
	Stripping Ratio(MT/cum)	1:0.021

The section wise and RL wise calculation of production details are given below:

Section Line Along	RL	Area in Sq.m		Length of Influence (m)	> 58% Fe				45% to 58% Fe			Total Quantity of ore (+45% Fe) (Tonne)	Total Quantity of waste (Tonne)
		> 58% Fe	45% to 58% Fe		Volume in Cu.m	ore in Tones	Sub Grade in Tones	Intercalated waste in Tones	Volume in Cu.m	Sub Grade in Tones	Intercalated waste in Tones		
	a	b	c	d	e=bxd	f=ex65% x3.5	g=ex10% x2.8	h=ex5%x 2.2	i=cxd	j=ix90%x 2.8	k=ix10% x2.2	l=f+g+j	t=i+l+o+r
2446120	555	160	0	50	8000	23800	2240	880	0	0	0	26040	880
2446070	565	180	10	50	9000	26775	2520	990	500	1260	110	30555	1100
	555	240	230	50	12000	35700	3360	1320	11500	28980	2530	68040	3850
2446020	575	150.0	0.0	50	7500	22313	2100	825	0	0	0	24413	825
2445970	585	170.0	0.0	50	8500	25288	2380	935	0	0	0	27668	935
	575	336.0	0.0	50	16800	49980	4704	1848	0	0	0	54684	1848
2445920	595	0.0	80.0	50	0	0	0	0	4000	10080	880	10080	880

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	585	0.0	330.0	50	0	0	0	0	16500	41580	3630	43884	3630
	575	170.0	420.0	50	8500	25288	2380	935	21000	52920	4620	80588	4555
2445870	605	70.0	0.0	50	3500	10413	980	385	0	0	0	11390	385
	595	170.0	0.0	50	8500	25288	2380	935	0	0	0	27668	935
	585	290.0	210.0	50	14500	43136	4060	1595	10500	26460	2310	79656	3905
	575	0.0	490.0	50	0	0	0	0	24500	61740	5390	61740	5390
2446820	575	0.0	960.0	50	0	0	0	0	48000	120960	10560	120960	10560
	585	0.0	980.0	50	0	0	0	0	49000	123480	10780	123480	10780
2445770	575	1310.0	0.0	50	65500	194863	18340	7205	0	0	0	213203	7205
2445720	575	1210.0	250.0	50	60900	179988	16940	6655	12500	31500	2750	228428	9405
2445670	575	1010.0	0.0	50	50500	150236	14140	5555	0	0	0	164376	5555
2445620	575	1190.0	350.0	60	59900	177013	16660	6545	17500	44100	3850	237773	10395
2445570	575	1640.0	0.0	70	114800	341530	32144	12628	0	0	0	373674	12628
TOTAL					447600	1331610	125328	49236	215500	543060	47410	1999998	96946

Development during 2020-21

During this year, the benches developed during 2019-20 have been selected for further movement from top downwards in the north easterly direction. The details of production and generation of waste has been furnished in the following table. The haul road has been proposed to be developed at 15m width and maintained for transportation of ore & waste. The gradient of haul road will be maintained at 1:16. As working is confined within the existing quarries generation of top soil is observed to be nil. The details of development, during 2019-20 year of planned period are explained below:

Particulars		Description
Bench Geometry	Height	10m
	Width	10m or more than the height of the Bench
		In the ultimate stage the bench development will be done by keeping 10m height and 10m width.
	Bench slope angle	85^0
Quarry development	Name of the existing quarry to be developed	There exists one quarry which shall be developed during the ensuing scheme period.
	Grid Location of proposed Excavation	From- 2445510 to 2446150 East direction. From 3417870 to 342072 North direction.
	Name of the section along which development will be done	Development shall be done along seven numbers of sections namely 2445770, 2445820, 2445870, 2445920, 2445970 2446020 and 2446070
	Direction of advancement	Towards North east
	Top RL (m)	565
	Bottom RL (m)	555
	Overall quarry slope angle	30^0
	Production of saleable ore (MT)	1388284
	Production of sub grade ore (MT)	130662
	Generation of waste (MT)	93328 or 42421cum
	Stripping Ratio(MT/cum)	1:0.021

The section wise and RL wise calculation of production details are given below:

Section Line Along	RL	Area in Sq.m		Length of influence (m)	>58% Fe				45% to 58% Fe			Total Quantity of ore (+45% Fe) (Tonne)	Total Quantity of waste (Tonne)
		>58% Fe	45% to 58% Fe		Volume in Cu.m	ore in Tones	Sub Grade in Tones	Intercalated waste in Tones	Volume in Cu.m	Sub Grade in Tones	Intercalated waste in Tones		
	a	b	c	d	e=b×d	f=e×85%×3.5	g=e×15%×2.8	h=e×5%×2.2	i=c×d	j=i×90%×2.8	k=i×10%×2.2	l=f+g+j	l+h+k
2446820	565	420.0	0.0	50	21000	62475	5880	2310	0	0	0	68355	2310
	555	430.0	0.0	50	21500	63963	6020	2365	0	0	0	69983	2365
2445570	565	250.0	270.0	50	12500	37188	3500	1375	13500	34020	2970	74708	4345
	555	420.0	220.0	50	21000	62475	5880	2310	11000	27720	2420	96075	4730

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2446920	565	220.0	420.0	50	11000	32725	3080	1210	21000	53920	4620	85725	8630
	555	0.0	400.0	50	0	0	0	0	20000	50400	4400	50400	4400
2446870	565	610.0	0.0	50	30500	90738	8540	3355	0	0	0	99278	3359
	555	0.0	160.0	50	0	0	0	0	8000	20160	1760	20160	1760
2446820	565	758.0	448.0	50	37900	112753	10612	4169	22400	56448	4928	179813	8097
	555	890.0	442.0	50	44500	132388	12460	4895	22100	55692	4862	230540	9757
2446770	565	1148.0	260.0	50	57000	169575	15960	6270	12500	31500	2750	217035	9920
	555	930.0	507.90	50	46500	138338	13020	5115	25395	63995	5587	215353	10702
2446720	565	960.0	0.0	50	48000	142800	13440	5280	0	0	0	156240	5280
2446670	565	780.0	20.0	50	39000	116025	10920	4290	1000	2520	220	129465	4510
2446620	565	885.0	680.0	50	43250	128669	12110	4758	34000	85680	7480	226459	12238
2446570	565	666.0	9.0	50	33008	98175	9240	3630	0	0	0	107415	3630
TOTAL					466693	1388264	130662	51332	190895	481955	41997	2990091	93328

Extent of Mechanization.

Proposed Machines for deployment:

Drilling

The benches having 10 m height will be drilled for blast holes by 115mm dia DTH drills fed by compressed air at 12.5 cum/min at 14.5 kgf/sq.cm pressure.

(a) Wagon drill for blast holes

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)	:	115 mm
Height of the bench (H)	:	10 m
Additional drilling required (sub grade) (A)	:	1.0 m
Length of the hole (H + A)	:	11 m
Burden (B)	:	3.0 m
Spacing (S)	:	3.5 m
Volume of earth to be broken/loosen per hole	:	B x S x H = 3.0 x 3.5 x 10 = 105 Cum
Powder factor	:	7.5 tonnes / kg
Meterage of drilling per drill (crawler LM100 I/R drill) for primary blasting in ore zone		
Out of the total volume of excavation in the year, 85% of the hard ore shall be excavated by drilling and blasting and remaining 15% shall be excavated directly by using excavator.		
Total volume of material (Max in 2019-20 year)	:	691745.2Cum
Drilling & Blasting required (85% of total volume)	:	587983 Cum
Number of holes to be drilled	:	587983 ÷ 105 = 5599 holes
Number of holes to be drilled per day of 300 days in a year	:	5599 ÷ 300 = 18.66 holes say 18 holes
Total meterage of drilling per day	:	18 x 11 = 198m

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Requirement of drills		
Drilling penetration rate of the wagon drill	:	10 m / hr
Effective drilling hr/ one shifts (8 hrs/ shift)	:	8hrs
Meterage of drilling to be effected / day	:	10 x 8 = 80 m
Number of drills required	:	198 ÷ 80 = 2.475 or say 2 numbers

(b) Requirement of air compressors

Number of wagon drills will be in operation	:	2 number
Dia of each wagon drill	:	115 mm
One 115 mm dia wagon drill requires compressed air	:	12.5 Cum/min
Compressor unit required	:	2+1(Stand By) = 3 number

Excavators required to be deployed in the present plan period

In the mining block, the ROM ore along with waste materials shall be excavated by utilizing a 2.1Cum capacity excavator and the materials shall be transported to the screening & crushing plant by dumpers/tippers of 30 ton capacity. A part of the ROM material shall also be directly fed to the mobile crusher and screen plants deployed near the quarry faces. Accordingly, the excavator requirements for the lease area have been calculated.

(a) Excavators

Specification of excavators	
Bucket capacity (C1)	2.1 Cum
Bucket fill factor (F)	0.85
Time cycle pass at 90^0 swing (T1)	40 Seconds
Swell factor (S)	0.8
Production efficiency factor (e)	0.8
Job management factor (f)	0.7
Working days per year	300 days
Number of working shifts per day	2 shifts
Working hours per shift	8 hours
Effective working hours per shift	6 hrs
Effective working hours per two shift	12 hrs
Seconds in hour	3600
Out put /Excavator/Hr(C1*F*S*e*f*3600/40) in Cu.m	102.816
Out put / Excavator/Shift(102.816*6hrs)	616.896
Out put / Excavator/day(606.896* 2 days)	1233.792
Out put / Excavator/year(1233.792Cum*300 days)	370137.6
Maximum Excavation during 18-19	691745.2Cum
Number of excavator required(691745.2 /370137.6)	1.9 nos, say 02 nos
Total no. of excavator required including 01 no standby	2+1=3 nos

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Transportation

During proposed plan period, about 117196.6 cum of waste shall be generated, which is very negligible in yearly basis. Hence, it has been planned to utilize the waste for road maintenance. Moreover, 704235 cum of sub-grade shall be generated during plan period. The sub-grade shall be sent to the designated place for blending and future use. The ore stack yard and sub-grade stack yard shall be within a distance of 0.5km from the working benches. Considering the described factors the dumpers/tippers has been calculated. For calculation of number of dumper requirement, 1.0 Km has been taken into consideration as lead in an average for both ore and waste hauling.

Dumper / Tipper Parameters

Dumper / Tipper Parameters	
Parameters	**Ore Zone**
Dumper Capacity	30t
Bucket capacity	$2.1m^3$
Bucket fill factor	0.85
Swell factor	0.8
Tonnage factor	$3.5\ t/m^3$
Tonnes per pass	2.1 x 0.85 x 0.8 x 3.5 = 5.0 t
No. of passes/ Dumper.	Average tonnage rating of dumper/tonnes per pass=30/5=6 passes

Dumper / Tippers requirement

Loading time	12 x 40= 480 sec.
Lead	1.5 km
Load travel time	(3600 x 1.5)/20 =270sec.
Dumping time	60 sec.
Empty travel time	(3600 x 1.5)/25 = 216 sec.
Spotting time	60sec.
Dumper cycle time	480+270+60+216+60=1026 sec.
Number of trips / Dumper/Hr	3600/1026=3.5 Trips.
Output/Dumper/Hr	30*3.5=105 mt
Out put / Dumper/Shift	105*6=630 mt
Out put / Dumper/day	630*2 = 1260 mt
Out put / Dumper/year	1260*300 =378000 mt
Maximum Excavation during 18-19	691745.2Cum*3.5 =2421108.2mt
Total no. of dumper required	6.4 nos, say 7 nos

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Proposed method of mining and deployment of machinery

Method of Mining	:	Open cast mechanized mining with top slicing method by using Shovel and Dumper combination.
List of Machinery	:	The following machineries are/will be in use during the proposed plan period.

Sl.No	Machinery	Capacity	Make	No. of Units
1.	Excavator	2.1 Cum	L & T	2+1=3
2	Dumper	30t	VOLVO	7
3	Loader	6t	XL-90	5
4	I/R Drill (LM 100) Crawler	115 mm Dia	DP-1100	2 +1=3
5	Rock Breaker	--	Hydraulic	2
6	Mobile screen plant	200TPH	Fintec	2
7	Mobile Crusher	200 TPH	Terex pegson	2
8	Motor Grader	120 HP	--	1
9	Water & Diesel tanker	--	--	2nos (each)
10	Light mast			6nos
11	Dozer	--	BEML	1No
12	Weigh bridge	50t		1no
13	Light vehicles		Mahindra Bolero	5no

Additionally one 300tph crushing/screening unit has been proposed for processing of ROM.

BLASTING

As the nature of the ore is hard, about 85% of the total excavation will be obtained through blasting within iron ore zone. The proposed mining will have 10.0m height benches in iron ore zone. Drilling will be done for blast hole by 105mm dia DTH in iron ore zone fed by compressed air. The parameters with blasting details are furnished below:

Parameters		Drilling/ Blasting details
Diameter of Holes	:	115 mm
Burden	:	3.0 m
Spacing	:	3.5 m
Depth of Hole including sub grade drilling	:	11 m
Main explosive	:	Power gel, detonator, safety fuse, Nitrate mixture
Dia. of cartridge	:	80-83 mm Nobel gel, Ammonium nitrate
Powder factor	:	7t/ Kg
Maximum production capacity	:	2096644T
Blasting @ 85% of total excavation	:	1782147T
Annual consumption of explosive	:	1782147/7 = 254592kg or 254.592T
Type of blasting	:	Primary
Blasting Pattern		Staggered pattern
Loading of explosive		Manually

Staggered pattern of drilling and row to row sequence with the help of ordinary delay detonators will be adopted for the blasting purpose. During blasting of multi-rows or more numbers of holes in a single row, provision of delay detonator and NONEL/RAYDET shall be utilized in order to control ground vibration.

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Secondary blasting

Secondary blasting is not proposed. The big size boulders will be fragmented with the help of rock breaker.

Type of explosive and detonator to be used

Nitrate mixture such as Power gel explosive will be used for blasting. Electric detonator and Nonel system will be used for initiation / ignition. The use of Nonel system of initiation will have the following advantages :

- ✓ High blasting efficiency
- ✓ Minimize ground vibration
- ✓ Control fly rocks
- ✓ Better fragmentation
- ✓ Safe to handle

Storage and transportation of explosives

The blasting will be carried out by outsourcing from market by agreement under Rule 22

d) Describe briefly giving salient features of the proposed method of working indicating category of mine.

During plan period, the existing pits have been selected for development. The lessee has obtained Environment Clearance for the production of 2.0 million tone of ROM per annum. Based on that, it has been planned for the production of ROM of same quantity during next Scheme period. During this year it has been planned to develop the quarry from one end i.e. from the safety zone boundary so that the reclamation work by bench plantation can be done from 2019-20 onwards. The existing benches of the quarry will be developed both laterally and depth ward. The lateral bench movement will be done due north-east direction.

The benches will be developed in a systematic manner with 10m height. The width shall be maintained at more than the height. The layout of roads for haulage of ore/ waste and access to different installation in the mine will be developed complying with the statutory regulations stipulated in the Metalliferrous Mines Regulations, 1961. Overburden and sub-grade ore will be dispatched to the dumping and stacking. Sites located in the lease area. Eight meter wide haul road will be developed in the lease area as per need at a gradient up to 1:16. The mine will be operated in a three shift basis. Process of excavation and loading of overburden/waste will be done by deploying hydraulic excavators and dumpers. Excavators of 2.1m^3 capacities will be deployed for excavation & loading

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of ROM ore and dumpers of 30t capacity shall be deployed for transportation of ore and OB. Hard iron ore will be loosened through drilling & blasting. For the purpose, DTH drill like DP1100 of 115mm dia, compressor of 450cfm etc will be used during ensuing scheme period to achieve the targeted production. For maintenance of OB dumps dozers will be deployed. Loading & un-loading of sorted & sized ore is loaded by mechanized method.

e) Describe briefly the Layout of Mine Workings, Pit road layout, the layout of faces and sites for disposal of overburden/waste along with ground preparation prior to disposal of waste, reject etc. **(A reference to the plans and sections may be given. UPL or ultimate size of the pit is to be shown for identification of the suitable dumping site.)**

LAY OUT OF MINE WORKING

Development of pit will be done by moving the existing benches both laterally and depth ward. The lateral bench movement will be done due north-east direction. At the end of scheme period the dimension of the proposed quarries will be as follows:

Name of the quarry	Dimension(m x m)	Top RL	Bottom RL
Proposed quarry	650m x 166m	645	555

PIT ROAD LAYOUT

The existing benches of the proposed quarry will be utilized for haul road. The bench width has been kept at more than the height. However, the after putting the berms of 1.5m width and 1.0m height, the haul road will be kept at 8.5m with gradient of 1:16. In case of ramp the gradient will be maintained at 1:12.

Layout of Haul road

Existing Haul road

Earlier, 20t dumpers were being used for transportation of ore and waste. For the safety point of view, the main haul road was kept at 8m. The gradient of haul road was kept at 1:16.

Haul road for proposed excavation:

To obtain required production, the benches will be developed in a systematic manner i.e. the height and width of the benches will be kept at 10m and more than height respectively. The layout of main roads for haulage of ore/ waste and access to different installation in the mine will be developed complying with the statutory regulations stipulated in the Metalliferrous Mines Regulations, 1961. It has been proposed to deploy 30t dumper during plan period. Hence, the requirement of width of main haul road will be 15m. The gradient of haul road has been kept at 1:16 where as in the ramp the gradient has been kept at 1:12. Regular maintenance will be done throughout the mine life to protect the road from damage and vehicles from wear & tear.

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LAYOUT OF FACES

Name of the quarry	Description	2018-19	2019-20	2020-21
Existing quarry	Face RL	645 to 585	575 to 555	565 to 555
	Bench size	650 x 175	650 x 175	650 x 184
	Direction of advancement	Due north east and east	Due north east and east	Due north east and east
	Length of Advancement	130 m	Avg.135m	Avg. 90m
	Total area covered under pit (including existing pit)	11.375 Ha	11.375 Ha	11.915 Ha

Site for disposal of waste along with ground preparation

About 117196.6 cum of waste shall be generated during plan period of five years, which is very negligible when compared with the total excavation. The annual average quantity of waste shall be 39065cum. Hence, it has been planned to use these waste for construction of road and its maintenance in and around the lease, putting the berm over the benches etc. Consequently, there will not be any proposed dump during plan period of five years.

Site for disposal of mineral rejects along with ground preparation

During scheme period of 3 years, about 520269.60cum shall be generated. The proposed mineral rejects/sub grade will be stored temporarily within quarry floor where further bench movement will not be done. Before stacking, the ground will be leveled and a boulder wall and garland drain will be constructed to retain the subgrade ore safely.

e) Conceptual Mine planning up to the end of lease period taking into consideration the present available reserves and resources describing the excavation, recovery of ROM, Disposal of waste, backfilling of voids, reclamation and rehabilitation showing on a plan with few relevant sections.

The development and production proposal in the mining plan has been projected for three years till the end of 2020-21. For getting the required production the development proposal has been made over the existing quarry. Based on the mineable reserve, the life of the mines has been calculated.

- The total mineral reserve of iron ore is estimated to be 7866093 MT
- Proposed production during the plan period is 6000000 MT
- Remaining reserve within the lease area will be 7866093 MT – 6000000MT = 1866093MT.
- Considering the production of iron ore @ 2.0 million tonne per annum, life of the mine will be 1866093/2000000 = 0.93 years.

Therefore, the life of the mines is 4 years which includes 3 years of planned period.

However, it has been proposed to drill around 24 numbers of holes at a grid interval of 100m X 100m during plan period. Therefore, the life of mines may change depending upon outcomes of proposed exploratory drill holes, cut-off grade, method of working and market demand.

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- **TIME FRAMES FOR COMPLETION OF EXPLORATION WITHIN THE LEASE HOLD AREA**

The plan period is going to be expired on 31.03.2021. During this scheme period it has been envisaged to do 12 nos of bore holes. These proposed bore holes will be completed by 31st March 2020.

- **ULTIMATE EXTENT & SIZE OF THE PIT**

As earlier explained in the chapter-3, the lessee has drilled 22nos holes within the ML area. However, these bore holes have not drilled up to the end of the mineralization. Considering the present exploration data the ultimate pit limit has been fixed.

The proposed planning for the scheme period has been envisaged in the existing quarry with lateral and depth ward extensions. With the progress of mining work, while entering into the lower levels of the mine, adequate number of ramps at 1:16 gradient are proposed to be constructed to facilitate movement of dumpers.

The present mining operation has resulted in a broken up area to the extent of 14.074Ha while at the end of the plan period, the broken up area due to mining operations would be around 15.378 Ha. The average length and width of the pit at the end of the plan period will be 650 m and 166 m respectively. During the conceptual period, same area will be utilized. Fresh area is not available during the conceptual period. Hence, the area to be degraded during scheme period shall be utilised during the conceptual period. The ultimate size of the quarry will be somewhat irregular and the average length and width of the pit will be 650m and 166m respectively. The ultimate extent and size of the pits will be as follows:

Length (m)	Width (m)	Area		Bottom RL in m
		(m^2)	Hectares	
650	183	119150	11.915	545m

Final slope angle at the close of mine:

The final slope angle would be kept at 45° with the erection of quarry bench of 10m height and 10m.width. [Ref. Plate – VIII (A)].

Ultimate pit limit boundaries

The ultimate pit limit of conceptual stage has been derived based on the following parameters.

- Ultimate pit slope
- Safety zone area (7.5m from ML boundary)
- Geologically proved non-mineralised area.

The conceptual plan has been prepared indicating the ultimate pit limit. However, these boundaries have been arbitrarily fixed & this will change with the outcome of exploration and the rate of production level as per the consumer's demand.

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- **ULTIMATE CAPACITY OF DUMP**

Details of existing waste dump:

Due to earlier mining operation one dump has been created with one terrace covering an area of 0.733Ha.

Waste generation and its utilization during scheme period:

During this plan period, a total of 117196.6 cum of intercalated waste will be generated. The yearly average waste generation will be 39065cum which is very negligible. Hence, it has been planned to use this waste for construction and maintenance of road, putting berms etc.

Waste generation and management during conceptual period:

During conceptual period it is expected that about 8000cum of waste shall be generated. This quantity shall be generated within a period of one year. Hence, it has been planned to make use of this waste in road maintenance.

- **GENERATION OF SUBGRADE ORE AND ITS DISPOSAL**

Existing sub-grade stack

During the process of mining, so far one dump has been created covering 0.733ha area in the south eastern part of the lease area. Plantation over the slope of this existing dump has been undertaken for stabilisation. Further, protective measures like retaining wall and garland drain has been constructed around the dump. However, as per the CCom's circular regarding threshold value of iron ore is 45%Fe. Consequently, the earlier waste dump has been designated as sub-grade dump. The detail recovery factor with grade shall be arrived by undertaking drilling and sampling, which can be done after the resumption of mining operation.

- ***Proposed sub-grade stack***

During ensuing scheme period, a total of 1456754.88MT of subgrade ore will be generated. The year wise generation of sub-grade iron ore will be as follows:

Year	Quantity in cum	Quantity in MT
2016-17	--	--
2017-18	--	--
2018-19	63089.1	176649.48
2019-20	238710	668388.00
2020-21	218470.5	611717.40
Total	**520269.60**	**1456754.88**

Disposal of sub-grade iron ore

The generated sub-grade iron ore during plan period will be temporarily stacked at earmarked site and blended with high grade iron ore and sold to the consumers as per requirement. The location of sub grade iron ore stacked has been shown in the Reclamation Plan.

Conceptual generation of sub-grade ore and its utilization:

Beyond scheme period about 176058cum of sub-grade ore i.e. 45-55% Fe will be generated. These sub-grade ore will be sold to the market by blending with high grade iron ore. The sub-grade generated will be stored for a short period. However, temporary sub grade stack yard has been proposed during planned as well as beyond planned period.

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- ENVIRONMENTAL ASPECTS

LAND DEGRADATION / UTILIZATION

As on date the lessee has utilized 14.074ha of land for mining and allied activities. At the end of conceptual period a total of 14.074Ha will be utilized for mining, dumping, infrastructure development and allied activities. However, the present, proposed and end of conceptual period land use pattern is given below:

Sl No	Pattern of Utilization	Area put on use at start of Plan period (Ha)	Total area at the end of Plan period (Ha)	Total area at the end of Plan period (Ha)	Total area Requirement at the end conceptual period (Ha)
1	Mining with road	12.546	(-0.725)	11.821	12.554
2	Over burden/Dump	0	Nil	0	0
3	Mineral Storage	1.222	(-0.489)	0.733	0
4	Infrastructure (Office, Workshop, Magazine etc.)	0.146	0.700	0.846	0.846
5	Road	0.16	0	0.16	0.16
6	Green belt	0	0.514	0.514	0.514
7	Safety zone	1.304	0	1.304	1.304
	Total	**15.378**	**0**	**15.378**	**15.378**

Note: 1. Out of 12.546Ha of mining area, 0.211 ha included in the infrastructure and 0.514ha taken as safety zone.

2. Out of 1.222 ha 0.489 ha has been included in infrastructure.

Reclamation & Rehabilitation:

(a) Reclamation of mined out land during plan period:

It has been proposed to start the mining operation from one end of the existing quarry i.e. from the south western part of the lease area so that the reclamation by bench plantation can be proposed from 2019-20 onwards. A total of 0.90Ha of benches to be exhausted will be reclaimed during ensuing scheme period. The year wise bench plantation will be as follows:

YEAR	Bench Plantation	Bench RL	No of saplings	Type of saplings
2016-17	--	--	--	Mango, Karanj, Chakunda, Neem etc
2017-18	--	--	--	
2018-19	--	--	--	
2019-20	0.60	655-615	960	
2020-21	0.30	615-605	480	
Total	**0.90**		**1440**	

(b) Reclamation of mined out land at conceptual stage:

Considering the existing borehole data, it has been calculated that 12.554 hectare will be utilized for mining during the life of the mine. It has been proposed to start the mining operation from one end of

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the existing quarry i.e. from the south western part of the lease area so that the reclamation by bench plantation can be proposed from 2019-20 onwards. The above area will be progressively reclaimed and rehabilitated as and when areas devoid of iron ore come into being exhausted. Phase wise reclamation will be undertaken depending upon the exhaust of iron ore within the quarry. At ultimate stage the reclamation of mined out areas will be undertaken by means of bench plantation over 11.832Ha and 0.722 ha as water reservoir.

A series of check dams and settling tanks shall be provided at the end of each garland drain in order to allow clean water to escape from the lease area. Beside these, boulder pitching on both sides of the seasonal nala flowing through the ML area shall be done to prevent the mine wash offs joining the nala and protect the nala from sedimentation.

(c) Reclamation of other than quarry area at conceptual stage:

Other areas:

A total of 1.10Ha will be utilized under road and infrastructure development. At ultimate stage these areas will be reclaimed by means of plantation.

i) Afforestation:

Plantation in the area is being carried out and shall be carried out in the area. Till date 1.818 Ha has been covered under plantation. The survival rate varies from 60% to 70% due to bad soil type. During ensuing plan period it has been planned make plantation over an area of 1.90 Ha the details of plantation will be as follows:

YEAR	Safety Zone Plantation	Dump Plantation	Bench Plantation	Total	No of saplings	Type of saplings
	Area in Ha					
2016-17	--	--	--	--		mango, Karanj, Chakunda, Neem etc
2017-18	--	--	--	--		
2018-19	0.12	--	--	0.12	192	
2019-20	0.12	--	0.60	0.72	1152	
2020-21	0.12	--	0.30	0.42	672	
Total	**0.36**	**--**	**0.90**	**1.26**	**2016**	

At conceptual stage, plantation will be done over the exhausted dead benches in continuation with safety zone to develop a green belt. At the ultimate stage, about 14.978ha shall be covered under plantation.

POST MINING LAND USE:

At the ultimate stage, reclamation and post mining land use pattern of the area shall emerge as follows:

a) All the benches and floor of the mined out area of iron ore section so formed at this stage shall be rehabilitated by plantation.
b) The infrastructure shall be handed over to the local authority after negotiation. If negotiation fails, which has a very remote chance, the infrastructure shall be dismantled and the area shall be rehabilitated by plantation.

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c) The roads shall be kept as it is for the movement of local villagers or to be used by forest authority.

(d) The total forest area degraded at ultimate stage shall be rehabilitated and then handed over to the forest authority whereas non-forest area, after rehabilitation shall be handed over to the local authority in a useful manner.

The details of post mining land use will be as follows:

Post Mining Land Use Pattern of M.L. Area (Ha.)							
Sl. No.	Description	Land Use (Ha.)					
		Plantation	Back Filling Plantation	Water Body	Public Use	Undisturbed	Total
1	Mining	11.832	Nil	0.722	Nil	Nil	12.554
2	Dumping	Nil	Nil	Nil	Nil	Nil	Nil
3	Road, River, Nala, Agriculture etc.	Nil	Nil	Nil	0.16	Nil	0.16
4	Infrastructure	0.846	Nil	Nil	Nil	Nil	0.846
5	Stacking	Nil	Nil	Nil	Nil	Nil	Nil
6	Safety zone & Plantation	1.818	Nil	Nil	Nil	Nil	1.818
	Total	**14.496**	**Nil**	**0.722**	**0.16**	**Nil**	**15.378**

Therefore, from the above table it is observed that when the mine will be handed over to the society, at that time about 14.496 covered under plantation.0.722 ha under water body and 0.16ha will be left for public purpose.

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CHAPTER-III

3. MINE DRAINAGE

a) Minimum and Maximum depth of water table based on observations from the nearby well

The nearest habitations from the mine are Murgabeda, Deojhar, Beleipada etc. The wells at village murgabeda and Deojhar are indicating that the water level is encountering at RL 520m.

b) Indicate Maximum and Minimum depth of working

It has been proposed to develop the existing pits. At present the existing bottom RL of the Pit is 552.967m. During plan period the working will be done up to 555m.RL. At ultimate stage of mining the working will be done up to 545m.RL. Therefore, such depth of mining would not affect the ground water table as the level of ground water is at 520 MRL.

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

As almost the pit is located at slopes of the hill, there is no chance of inundation of pits. As stated above, the proposed working depth of quarries during the plan period excavation will not touch the water table. As such, question of encountered of water due to seepage does not arise.

(d) Describe regional and local drainage pattern. Also indicate annual rainfall, catchment area and likely quantity of Rainwater to flow through the lease area, arrangement for arresting solid wash:

Regional Drainage Pattern

As far as drainage pattern is concerned, dendritic pattern can be observed regionally in the lease area and its surrounding area. The drainage pattern is dendritic generally but since the region is fracture controlled, trellis pattern is also observed. The drainage density is moderately high indicating more run-off than infiltration.

A seasonal nala is flowing due east and joins with Sona River at a distance of about 8km from the lease area. The drainage pattern of the region is controlled by the River Baitarani.

Annual Rainfall

The rain fall data has been obtained from IMD for the financial year 2009-2013. Based on the data the rain minimum Annual rainfall is 971mm during 2010 and the maximum rain fall is 1820mm during 2013. However, the average rain fall data is calculated to be 1503.3 mm.

Catchment area and likely quantity of Rainwater to flow through the lease area:

The total area is 15.378Ha. However, the catchment area is coming around 13.245Ha or 132450sqm. An average rainfall of 1500 mm has been taken into consideration for the calculation of run-off. The details of runoff per annum and the quantity of Rainwater to flow through the lease area are as follows:

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- Run off co-efficient considered = 0.15
- Average annual rainfall = 1.5 m/yr
- Runoff = catchment area × Runoff coefficient × Annual rainfall
  = 132450 Sq. m × 0.15 × 1.5 m/ year = 29801.25 cu.m/yr

The area experiences high rainfall, the site will generate above volume of run offs during such rainy periods. The surface run off from the uncovered site would contain high concentration of suspended matter and eroded matter. This may result potential impact to surface water body.

Arrangement for arresting solid wash:

Existing Protective Measures:

About 100m long retaining wall has already been constructed within the Lease area within 2445870-2445970N. Further, the existing retaining wall will be maintained from 2018-19 onwards.

Proposed Protective Measures

Surface run off from pits and OB dump/sub grade dump site if directly discharged into the nala may cause siltation problem. However, the lessee has already constructed protective measures like Retaining wall, check dam, and settling pond within and outside the ML area to control erosion during monsoon season. It has been proposed to construct protective measures like retaining wall, garland drain etc. The details of proposed protective measures around the existing dump are given below:

year	Retaining wall			Garland drain			Settling pond			
	L(m)	W(m)	H(m)	L(m)	W(m)	D(m)	Nos	L(m)	W(m)	D(m)
2018 -19	250	1.0	2.0	360	1.0	1.5	--	--	--	--
2019-20				220	1.0	1.5	--	--	--	--
2020-21	Maintenance			--	--	--	--	--	--	--
Total	250	1.0	2.0	580	1.0	1.5	--	--	--	--

It has been planned to provide drainage system in the eastern part of the lease area with **720m** retaining wall, garland drain **750m** and one settling pond (the final discharge point) of **20m x 10m x 2m** during conceptual period. Rain water will be allowed to flow through garland drain and finally discharge through the settling pond.

Plantation for checking soil erosion

YEAR	Safety Zone Plantation	Dump Plantation	Bench Plantation	Total	No of saplings	Type of saplings
	Area in Ha					
2016-17	--	--	--	--		Mango, Karanj, Chakunda, Neem etc
2017-18	--	--	--	--		
2018-19	0.12	--	--	0.12	192	
2019-20	0.12	--	0.60	0.72	1152	
2020-21	0.12	--	0.30	0.42	672	
TOTAL	**0.36**	**0.0**	**0.90**	**1.26**	**2016**	

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CHAPTER-IV

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

a) Indicate briefly the nature and quantity of top soil, overburden / waste and Mineral Reject to be disposed of.

In the Murgabeda iron ore mine of Sri D.R.Patnaik, top soil generation is proposed to be nil. Waste is occurring in the form of intercalated waste. Intercalated waste found in between the ore zone having no or negligible mineral content less than the threshold value of iron ore (i.e. below 45% Fe) As per the bore hole data, two zones has been earmarked one is saleable ore zone (+58%Fe) and other is sub-grade ore zone (45-58%Fe). From the saleable ore zone 10% has been considered as sub-grade where as in the sub-grade zone 90% has been considered as sub-grade. The details of waste and sub-grade generation will be as follows:

Generation of waste (cum)

Year	Volume of waste(cum)
2018-19	30844.55
2019-20	43930
2020-21	42422
Total	**117196.55**

Generation of Sub-Grade ore/Mineral rejects (cum)

Year	Volume of sub-grade ore(cum)
2018-19	70659.792
2019-20	267355.2
2020-21	244686.96
Total	**582701.952**

Usage of Waste/Mineral rejects

Year	Topsoil (Cum)		Waste (OB/SB/IB)		Mineral Rejects (Cum)	
	Reuse/ spreading	Storage	Road maintenance	Dumping	Blending @90%	Storage @10%
2018-19	0	0	30844.55	Nil	63593.81	7065.979
2019-20	0	0	43930	Nil	240619.7	26735.52
2020-21	0	0	42422	Nil	220218.3	24468.7
Total	0	0	**117196.55**		**524431.8**	**58270.2**

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

Generation of waste

Year	Volume of waste(cum)	Road Maintenance@30%	Volume of waste to be dumped(cum)
2018-19	30844.55	9253.4	21591
2019-20	43930	13179	30751
2020-21	42422	12727	29695
Total	**117196.55**	**35159**	**82038**

The total waste generation during ensuing scheme period will be 117196.55cum. Out of which 30% i.e. 35159 cum will be utilized for road maintenance and remaining 70% i.e. 82038 cum will be dumped temporarily within Ultimate pit limit.

c) Attach a note indicating the manner of disposal of waste, configuration and sequence of year wise buildup of dumps along with the proposals for protective measures.

Configuration and sequence of year wise build up of dump

It has been planned to dispose of the waste material within the UPL during plan period temporarily. The details are shown in the reclamation plan. There will be one terrace of 10m height. The dumping will be carried out by re-treating fashion. The slope of the dump will be 37^0.The details of dumping are furnished below:

Year	Design capacity (cum)	Bottom RL(m)	Top RL (m)	Terrace Height (m)	Individual Dump slope
2018-19	21591	560	570	3	37^0
2019-20	30751			3	
2020-21	29695			4	
Total	**82038**				

Rate of yearly generation of sub-grade mineral with reference to threshold values and proposals for stacking during the remaining 3 years of scheme period:

Existing Sub-grade Stack:

During the process of mining, so far three dumps have been created covering 1.222 ha area within the lease area. However, as per the CCom's circular regarding threshold value of iron ore is 45%Fe. Consequently, the earlier waste dump has been designated as sub-grade dump based on the analysis result. **(Ref Annexure-XII)** However, the detail recovery factor with grade shall be arrived by undertaking drilling and sampling, which can be done after the resumption of mining operation. The detail of this dumps are as follows:

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Name of the dump	Grid location	Avg. Length (m)	Avg. width (m)	Area		Avg. height (m)	Volume (m3)	Quantity (2.8MT/m3)
				(m2)	Ha			
Sub-grade dump-1	2445512-2445754 and 341810 - 341851	110	18	1980	0.198	16.6	32868	92030.4
Sub-grade dump-2	2445807-2445864 and 341923-341961	52	15.4	800.8	0.080	16.3	13053.04	36548.512
Sub-grade dump-3	2445808-2446004 and 341897-341937	238.73	30.7	7329.01	0.739	22.1	161971.1	453519.201

Proposed Sub-grade stack

As per the threshold value, iron ore containing above 45%Fe and below 58%Fe which has not got the market at present, is considered as sub-grade iron ore. As per the bore hole data, two zones has been earmarked one is saleable ore zone (+58%Fe) and other is sub-grade ore zone (45-58%Fe). From the saleable ore zone 10% has been considered as sub-grade where as in the sub-grade zone 90% has been considered as sub-grade. The year wise of sub-grade iron ore/mineral rejects will be as follows:

Year	Volume of sub-grade ore(cum)
2018-19	70659.792
2019-20	267355.2
2020-21	244686.96
Total	**582701.952**

Disposal of sub-grade iron ore

The generated sub-grade iron ore during scheme period will be temporarily stacked and blended with high grade iron ore and sold to the consumers as per requirement. The location of sub grade iron ore stacked has been shown in the Reclamation Plan.

Utilization of sub-grade

Keeping in view of market scenario, the lessee will sold out the sub-grade material by blending with high grade iron ore produced from the mine. As per the existing practice, above 55%Fe shall be blended with +62%Fe to obtain the saleable ore. Hence, the iron ore containing 45-55% Fe shall be stacked separately temporarily. If any buyer wants, the same shall be despatched by blending this material also. However, the details of utilisation of sub-grade ore will be as follows:

Year	Topsoil (Cum)		Mineral Rejects (Cum)	
	Reuse/ spreading	Storage	Blending @90%	Storage @10%
2018-19	0	0	63593.81	7065.979
2019-20	0	0	240619.7	26735.52
2020-21	0	0	220218.3	24468.7
Total	0	0	**524431.8**	**58270.2**

Hence, a total of 58270.2cum of subgrade shall have to stack within the lease area. It has been planned to stack the sub-grade ore temporarily within the quarry floor. The details of location of sub-grade stack will be as follows:

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Year	Mineral Rejects (Cum)		Grid Location	Bottom RL (m)	Top RL (m)
	Blending @90%	Storage @10%			
2018-19	63593.81	7065.979	2445520-2445580 and 341970-342040	575	585
2019-20	240619.7	26735.52		585	595
2020-21	220218.3	24468.7		595	605
Total	**524431.8**	**58270.2**			

Protective Measures

Existing Protective Measures:

About 100m long retaining wall has already been constructed within the Lease area within 2445870-2445970N.

Proposed Protective Measures

Surface run off from pits and OB dump/sub grade dump site if directly discharged into the nala may cause siltation problem. However, the lessee has already constructed protective measures like Retaining wall, check dam, and settling pond within and outside the ML area to control erosion during monsoon season. It has been proposed to construct protective measures like retaining wall, garland drain etc. The details of proposed protective measures around the existing dump are given below:

Location	Retaining wall	Garland drain	Settling pond(1 nos)
Around Proposed Dump	100 m x1.0m x 2.0m	120m x 1.0m x 1.5m	10m x 8m x 2m
Around Proposed Sub grade stack	250m x 1.0m x 2.0m	560m x 1.0m x 1.5m	--

The year wise proposal of protective measures

year	Retaining wall			Garland drain			Settling pond			
	L(m)	W(m)	H(m)	L(m)	W(m)	D(m)	Nos	L(m)	W(m)	D(m)
2018 -19	350	1.0	2.0	480	1.0	1.5	--	--	--	--
2019-20				220	1.0	1.5	--	--	--	--
2020-21	Maintenance			--	--	--	--	--	--	--
Total	350	1.0	2.0	780	1.0	1.5	--	--	--	--

The existing retaining wall will be maintained from 2018-19 onwards.

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CHAPTER-V

5.0 USE OF MINERAL AND MINERAL REJECT

a) Describe briefly the requirement of end-use industry specifically in terms of physical and chemical composition

The iron ore produced from the mine was being sized to various sizes depending on the requirement of the market and were being supplied to Bhushan power and Steel, Electro steel ltd, Kalinga Iron Works etc. and to various sponge iron units for manufacture of Sponge Iron. The details of physical and chemical specification of different industries are furnished below:

Sl. No.	Constituents	B/F Grade	Electro steel	Jai Balajee	Sponge Grade
1.	Fe	63 - 65%	65% min	63% min	64% min
2.	SiO_2	---	3% max.	---	---
3.	Al_2O_3	---	---	---	---
4.	$SiO_2 + Al_2O_3$	6.5% max.	---	5% max.	5% max.
5.	Al_2O_3 / SiO_2	1.5% max.	---	1.1	---
6.	P	0.05% max.	---	---	0.03% max.
7.	S	0.02% max.	---	---	---
8.	Cu	0.04% max.	---	---	2% max
9.	CaO + MgO	---	---	0.5% max	0.3% max.
10.	MnO	---	---	---	0.02% max.
11.	Moisture	5% max.	1.5% max.	3% max.	

(b) Give brief requirement of intermediate industries involved in up-gradation of mineral before its end-use.

The intermediate industries involved in the up-gradation of mineral before its end use is beneficiation plant, sponge plant, pelletisation plant, pig iron plant etc.

c) Give detail requirements for other industries, captive consumption, export, associated industrial use etc.

The major consuming industry of iron ore from this mine were given below:

Name of the industry	Size Specification	Grade
Bhushan power and Steel Ltd	10-30mm/fines	62 to 63%Fe
Jaiswal Necco Ltd	5-18mm/fines	62-63%Fe
Electro Steel Ltd	10-30mm/fines	62-63%Fe
Aditya Sponge	5-18mm/fines	62-63%Fe
Ajaya Minerals	10-30mm/fines	62-63%Fe

Export:

In future if required the Iron ore will be supplied in the Export market with permission from concerned authorities.

Associated industrial use:

Iron ore produced from the lease hold will be mainly used in the steel industry, Ferro manganese industry, Ferro silicon plant, etc.

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d) Indicate precise physical and chemical specification stipulated by buyers

The lumpy ore mined was being supplied to various merchandise crusher owners and sponge iron plants like M/s Prakash Industries Ltd, Electro casting ltd, Orissa sponge Iron ore ltd, Jaibalajee, M/s SMC Power generation etc. The sized ore of 5-18 mm was being supplied to the sponge iron plants of Electro steel Casting Ltd, Gopal Sponge (p) ltd, etc. The precise physical and chemical specification stipulated by buyers was as follows:

Sl. No.	Constituents	Electro steel Casting Ltd	M/s SMC Power generation	Jaibalajee	Gopal sponge (p) ltd
1.	Fe	62.5% min	62-65%	62-65% min	63% min
2.	SiO_2	3% max.	---	---	---
3.	Al_2O_3	---	---	---	---
4.	$SiO_2 + Al_2O_3$	---	5% max.	5% max.	5% max.
5.	Al_2O_3 / SiO_2	---	--	---	---
6.	P	0.03% max.	0.03% max.	0.03% max.	0.03% max.
7.	MnO	---	---	0.02% max.	0.02% max.
8	Size	5-18mm	5-18mm	5-18mm	5-18mm

e) Give details of processes adopted to upgrade the ROM to suit the user requirements.

To upgrade the ROM to suit the user's requirement the lessee was doing processing of ROM by screening and crushing. After resumption of mining operation, iron ore will be processed by crushing and screening to upgrade the ROM to suit the user's requirement. The details of mineral processing by crushing and screening have been explained in chapter -VI.

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CHAPTER-VI

6.0 PROCESSING OF ROM AND MINERALREJECT

a) **If processing / beneficiation of the ROM or Mineral Reject is planned to be conducted, briefly describe nature of processing / beneficiation. This may indicate size and grade of feed material and concentrate (finished marketable product), recovery etc.**

Nature of Processing

During the mining operation the ROM was processed by crushing, screening, to get the finished product for dispatch. For this purpose two mobile screening and crushing unit of 200TPH capacity were deployed within the lease. During ensuing plan period same units shall be deployed for the processing of ROM. Besides these, it has been planned to deploy one additional 300TPH screening / Crushing unit for processing of ROM.

Beneficiation process:

From the blasted ore, the ROM ore is fed the Screening unit for the production of 0-10mm, 10-30mm, +30mm sized ore. The +30 mm ore sent to the crushing unit for production of 5-18mm, 0-5mm. So, the various finished products of the screening and crushing units are 0-10mm, 10-30mm, + 5-18mm and 0-5mm. Based on the previous processing practices and its analysis the recovery and Fe% of the finished product are as follows:

Screening Unit:

- +30 mm – 65% (+58%Fe)
- 10-30 mm – 15% (+45-58%Fe)
- 0-10 mm – 20 %
  - 0-10mm –16% (+45-58%Fe)
  - 0-10mm – 4%(-45%Fe)

Crushing Unit:

- 5-18 mm- 30 % (60-62%Fe)
- 0-5 mm – 35 % (58-60% Fe)

The flow sheet and Schematic diagram of the beneficiation process and the material balance are furnished in the next page.

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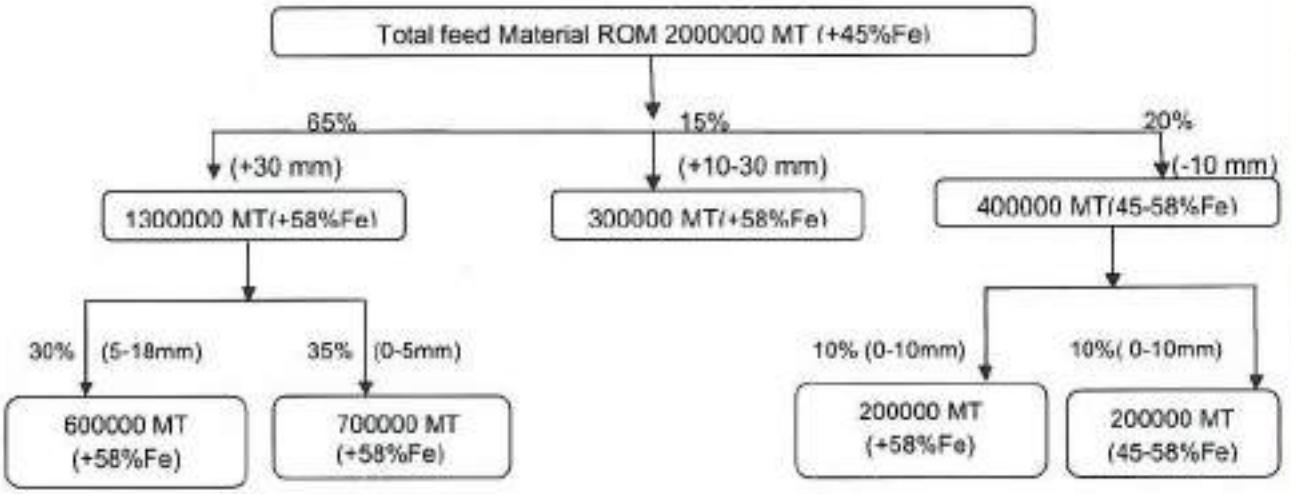
(b) Give a material balance chart with a flow sheet or schematic diagram of the processing procedure indicating feed, product, recovery, and its grade at each stage of processing.

Material Balance



The above material balance is tentative. This is based on the nature of formation and ore body.

c) Explain the disposal method for tailings or reject from the processing plant.

Not Applicable

d) Quantity and quality of tailings /reject proposed to be disposed, size and capacity of tailing pond, toxic effect of such tailings, if any, with process adopted to neutralize any such effect before their disposal and dealing of excess water from the tailings dam.

Not Applicable

e) Specify quantity and type of chemicals if any to be used in the processing plant.

Not Applicable

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

Not Applicable

g) Indicate quantity (cum per day) of water required for mining and processing and sources of supply of water, disposal of water and extent of recycling. Water balance chart may be given.

About 75 cum/day of water is required for mining and processing and sources of supply of water, disposal of water.

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CHAPTER-VII

7.0 OTHER

The utilities and auxiliary facilities provided for mining are described in detail in this chapter.

7.1 SITE SERVICE:

Mine office for general administration

A mine site office with departments of Planning & Geology and for overall management of total operations is provided at east central part of the lease.

Central Work shop:

The working block would have its maintenance facilities with requisite provision of storing for essential consumables and emergency spares. Equipments normally required for the workshop have been taken into account with cost provisions. To facilitate the maintenance of all equipment, there would be central workshop for electrical, mechanical and instrumentation repairs at a central location of the lease.

Stores:

- Central store shall be located at a convenient place to facilitate storage and issue of materials lifting, loading and un loading facilities.
- The existing explosive magazine located away from main activity will be utilised for the proposed mining activities. The magazine has provision of all types of fire protection devices such as deployment of extinguishers, water, sand buckets etc.

Fire fighting

Fire fighting arrangement shall be provided at the mine site office with different types of extinguishers to deal with all kind of fire like electrical, maintenance workshop and HEMM operations. The vulnerable areas are to be provided with alarms. Key persons will be trained in fire fighting.

First aid

Besides first aid room at the site office, first aid boxes at rest shelters and close to the working places shall be provided. All the personnel engaged in the mining activity will be trained in first aid. Ambulance provision already existing in the mine will continue to take emergency situations needing hospitals. Periodical medical tests have been carried out in regular intervals.

Canteen and rest room:

A canteen with rest room shall be provided within the lease area.

Safety and training:

Safety and training department with models, chats and class rooms for training shall have a library with mining journals, equipment manuals, operation and maintenance shall be provided.

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Time office and weigh bridge:

For statutory records, shift wise attendance of workers is to be maintained in the time office. Similarly, incoming and outgoing materials with weight measured are to be recorded after weighting in weigh bridges.

7.2 EMPLOYMENT POTENTIAL

As the entire mining operation shall be mechanized, employment shall be directly in the form of management (statutory and functional), supervisory personnel and other face workers which include excavator operators/ helpers, loader operators/ helpers, dumper operators/ helpers, water tanker operators/ helpers, drill operators/ helpers & other mining supervisors. The different category of employees currently engaged shall continue with the existing and additional manpower is given below.

Sl. No	Position	Numbers	Qualification/Experience
Supervisory Personnel			
1	Mines Manager	1	First Class certificate of competency from DGMS having minimum 10 years of experience
2	2nd Class Manager	2	Second Class certificate of competency from DGMS
3	Geologist		Post-Graduation in Geology having 10 years of experience
4	Mines Foreman	2	Foreman's competency certificate
5	Surveyor	1	Surveyor's certificate of competency
6	Mining Mate	2	Mate certificate of competency
7	Blaster	2	Blasting competency certificate
8	Clerical Staff	6	Literate & experienced
	Sub ordinate supporting staff	11	Literate & experienced

Sl. No	Position	Numbers	Qualification/Experience
Skilled/ Semiskilled Workers			
9	Other face workers/ operators/Helpers of HEMM	50	Literate & experienced
10	Engaged workers for miscellaneous jobs	10	Literate & experienced

Present Employment potential

At present 18 persons are employed directly by the lessee. There is no contractual employee since the mine is closed since 2010.

Proposed Employment potential

Direct	Contractual
36	170

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CHAPTER-VIII

8.0 PROGRESSIVE MINE CLOSURE PLAN

8.1 Environment Base line information: Attach a note on the status of baseline information with regard to the following.

The base line data as on date regarding land use pattern of the ML area has been produced in this chapter. However, the base line study for air, water, noise etc. was conducted during the year 2009-10. The mining operation was stopped since 2010. Therefore, the monitoring of environment has not been carried out beyond the year 2010. Hence the data of 2010 has been furnished within this chapter. The detail discussion on the base line data are given below:

- **Existing land use pattern indicating the area already degraded due to mining, roads, processing plant, workshop, township etc. in a tabular form.**

As on date the lessee has utilized 14.074ha of land for mining and allied activities. At the end of conceptual period a total of 14.074Ha will be utilized for mining, dumping, infrastructure development and allied activities. However, the present, proposed and end of conceptual period land use pattern is given below:

Sl No	Pattern of Utilization	Area put on use at start of Plan period (Ha)	Total area at the end of Plan period (Ha)	Total area at the end of Plan period (Ha)	Total area Requirement at the end conceptual period (Ha)
1	Mining with road	12.546	(-0.725)	11.821	12.554
2	Over burden/Dump	0	Nil	0	0
3	Mineral Storage	1.222	(-0.489)	0.733	0
4	Infrastructure (Office, Workshop, Magazine etc.)	0.146	0.700	0.846	0.846
5	Road	0.16	0	0.16	0.16
6	Green belt	0	0.514	0.514	0.514
7	Safety zone	1.304	0	1.304	1.304
	Total	**15.378**	**0**	**15.378**	**15.378**

Note: 1. Out of 12.546Ha of mining area, 0.211 ha included in the infrastructure and 0.514ha taken as safety zone.

2. Out of 1.222 ha 0.489 ha has been included in infrastructure.

- **Water regime, Quality of air, Ambient noise level, Flora, Climatic conditions**

(a) **Water Regime**

No spring exists within the area. There is a seasonal nala flowing through the leasehold area.

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(b) Quality of air

The methods of samples collection, equipment used and analysis procedure as followed during the year 2010 are given along with methodology of sampling, analyses and equipment used.

Sl. No.	Parameters	Instrument / Apparatus used	Method followed	Reference
1	Suspended particulate matter (SPM)	Respirable dust sampler (RDS/ HVS), Balance	Gravimetry	CPCB notification of 11.04.94
2	Respirable particulate matter (RPM)	Respirable dust sampler (RDS), Balance	Gravimetry	CPCB notification of 11.04.94
3	Nitrogen oxides NO_x	RDS/ HVAS with impinger tubes, spectrophotometer	Jacobs and Hochheiser modified method	CPCB notification of 11.04.94
4	Sulphur dioxide SO_2	RDS/ HVAS with impinger tubes, spectrophotometer	Improved west and Gaecke method	CPCB notification of 11.04.94
5	Lead in SPM	RDS/ HVAS, Atomic Absorption spectrophotometer (AAS)	Gravimetric followed by AAS	CPCB notification of 11.04.94
6	Carbon monoxide	CO analyser	NDIR method	CPCB notification of 11.04.94

(Stations from where samples collected Buffer zone during 2009-10)

Sl No	Location	Code	Direction and distance from project area
1	Core zone	A1	Within the lease
2	Murgabeda village	A2	0.8 km N
3	Village Mahadev	A3	1.0 km N
4	Village Baneikela	A4	5.4km S
5	Village Bhadrasai	A5	7.2 km SW

Results

Code	SPM (g/µm^3)				RPM (g/µm^3)			
	Max	Min	Av	C_{98}	Max	Min	Av	C_{98}
A1	141.6	96.2	112.3	142.3	80.2	41.3	62.3	79.6
A2	161.8	110.2	135.6	162.6	86.6	49.6	62.3	85.3
A3	123.2	82.3	112.3	124.6	65.6	41.2	53.8	64.6
A4	112.3	76.9	103.2	111.3	53.2	35.6	47.5	52.3
A5	119.6	81.9	109.5	118.6	62.3	42.6	52.3	61.3
Code	SO_2 (g/µm^3)				NO_x (g/µm^3)			
	Max	Min	Av	C_{98}	Max	Min	Av	C_{98}
A1	<10	<10	<10	<10	<10	<10	<10	<10
A2	<10	<10	<10	<10	11.3	<10	<10	11.3
A3	<10	<10	<10	<10	13.5	<10	<10	10.8
A4	<10	<10	<10	<10	<10	<10	<10	<10
A5	<10	<10	<10	<10	<10	<10	<10	<10

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(Stations from where samples collected Core zone and results)

Location	SO_2	NO_x	RPM	SPM	CO
Mines	<10	10.5	91.2	189.9	BDL
Crusher Plant	<10	13.7	156.3	365.9	BDL
Office/camp	<10	<10	96.5	194.3	BDL

The above results show that the AAQ is mostly within standards.

(c) Water quality

The buffer zone area has a number of rivers/nala, which are capable of meeting the requirement of water. Number of springs present in the hilly area having low discharge gets dried up in summer.

Hydrogeology and ground water

The study area falls in Keonjhar district of Orissa, which lies in the extreme NE portion of Orissa. The district displays a wide spectrum of geological formations from Achaean to recent period. The recent alluvial material is generally confined along the river courses. The Pleistocene laterite formation occupies the hilltops. The Precambrian group of rocks mostly granite occupy major portions of the districts and the study area. The study area is represented by iron ore group of Precambrian period.

The occurrence and movement of ground water is controlled mainly by geomorphic conditions in the study area. The ground water occurs within the weathered portions of hard rocks as well as in the unconsolidated alluvial sediments. The yield of these formations varies between low to medium range. The exploratory data from Central Ground Water Board has been studied in depth and salient hydrological features of these bore wells are represented in the following table.

Sl No	Location	Depth (m)	Geological formation	SWL (bgl)	Discharge	Draw down
1	Bhadrasahi	123.7	Granite	5.2	8.5	31.4
2	Murgabeda	175.5	Granite gneiss	12.17	10.0	21.1
3	Deojhar	171.4	Granite gneiss	8.0	10.0	6.31
4	Beleipada	103.7	Granite	3.3	8.0	23.8
5	Soyabahal	145.7	Granite	3.16	4.8	32.8

Source: CGWB Report

From the above it is evident that formations present in the area are capable of yielding around 5-10 LPS of water at suitable locations for which intensive investigation has been carried out prior to undertaking the job of tube well construction. The exploratory data indicates that secondary porosity in the hard rock zone at variable depths is the potential zones for occurrence of ground water.

The depth of water level over the study area is variable ranging between 3-12 m below ground depending upon geomorphology. The seasonal fluctuation of the water level as per studies by Central Ground Water Board ranges between 3 to 17 m over Sundergarh district. During field investigation the representative open wells were measured in the study area and the probable

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fluctuation of level have been enquired from local people. From the data collected it is observed that the depth of water level over the study area is highly variable ranging between 2 to 6 m below ground during post monsoon season. The seasonal fluctuation as reported is considerable and variable ranging between 4 to 26 m. annually. Such a condition in hilly terrain is not abnormal.

Groundwater Resources

The study area falls in the Jora Block of Keonjhar Dist. Partially. The general water resources estimation has been made by CGWB following the GEC Norms, and has been deduced on pro rate based upon the function of the blocks following failing in the study area. The result is given in the following Table.

Sl. No	Block	Fractional area of block tallying to study area	Total Blocks		Study area	
			Gross GW resources (MCM)	GW utilization (NCM)	GW resources (MCM)	Net use (MCM)
1	Jora	40%	96.79	3.09	38.7	1.2

Baseline Data of Water Quality

The quality of some water bodies in the study area has been examined to assess the water quality of the study area. The surface water and ground water quality was monitored once during the monitoring period and only the grab samples were collected. A total of 4 samples were collected for analysis. The summarized results of the analysis are given in the following Table.

Sl No	Location	Code	Significance
1	Tube well water at village Deojhar	GW1	Drinking water
2	Tube well water at village Soyabahal	GW2	Drinking water
3	Dug well water at village Dengula	GW3	Drinking water
4	Mahadev nala near village Mahadev	SW1	May carry surface run off from mine

NB: SW – Surface water, GW- Ground Water

It can be seen from the data that the average river water quality at the locations conforms to quality.

(d) Noise quality

The mining activities during the expansion of operational phase from 3rd year onwards are likely to have some increase in noise level of the area surrounding the ML area. The activities that are likely to contribute towards increase in noise level are plying of vehicles, drilling and blasting, hauling and transportation, crushing, and activity of people. Since this is a mechanized mine, the impact of this noise – inducing activities expected to be more than margin. The base line data of this noise level during day and night time is necessary to ascertain the impact of these noise- causing activities of the mining and allied activity on the surrounding environment. The mine lease area is surrounded by sparsely populated villages, Tensa town, Reserve Forests, and Samij nala, Gera nala, Sirki nala etc. To assess the baseline status of the noise level of the core and buffer zone of the mine area ambient

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noise monitoring was done at four locations as shown in the plan. Measurement have been carried out once during the study period at all the four monitoring stations. At each noise monitoring station, Leq. Noise level has been recorded at hourly intervals for 24 hours continuously by operating the noise-recording instrument for fifteen (15) minutes during each hour. The data regarding maximum, minimum, Ld, Ln, and average noise levels at those locations in buffer zone and in core zone is represented in the following Tables.

The abbreviation used is

Leq: it is equivalent sound pressure level which is equivalent to the same sound energy as the actual fluctuating sound measured in the same period.

Ld : Equivalent noise level measured over a period of time during day (6AM – 10 PM).

Ln : Equivalent noise level measured over a period of time during night time (10 PM – 6 AM).

Buffer zone

Station	Location	Day (6 Am to 10 PM)			Night (10 PM to 6 AM)		
		Max	Min	Av	Max	Min	avg
N1	Village Murgabeda	46.3	36.8	41.5	39.6	32.6	36.9
N2	Beleipada	48.8	42.4	44.8	45.4	37.6	39.2
N3	Village Murgabeda	46.4	36.0	41.1	40.1	33.0	37.2
N4	Village Mahadev	44.4	41.6	42.6	42.2	34.8	38.6

The values obtained are compared with standard ambient noise levels as prescribed under Environmental Protection Act 1986. It is observed that ambient noise level as recorded in the study area is generally within the stipulated noise standards.

(e) Flora & Fauna

Studies on flora and fauna of the area had been carried both for the core zone and buffer zone. Details of the studies were carried out for assessing the diversity pattern of the flora species. Faunistic-pattern of the area was also studied based on inquiries from the local population and forest officials.

Flora

The structure and composition of flora at any geographic location is reflection of prevailing climatology and physiographic conditions. This area is experiencing a warm climate with large variation during pre and post monsoon and humid climatic conditions with moderate subtropical monsoon.

Fauna

The forest area hosts a variety of faunal species. Fauna species in the study area is richer than core zone. Large size animals more active in the buffer zone.

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Natural/Forest

Core zone

At the time of execution of the lease, the total lease area was Abad Ajogya Anabadi land belonging to Forest category. Therefore the ML area was not coming under the Provisions of F.C. Act, 1980. However, as per the interim order of the Hon'ble Supreme court of India in W.P. (C) No. 202 dated 12.12.96 , the 'Pahad' Kisam land was included in the District Level Committee (DLC) affidavit as forest land.

Buffer zone

The general character of the vegetation of the area is tropophylous. Sal is the main species in almost all the forest blocks and constitutes more than 80% of the growing stock. The main reserve forests in the area are Thakurani RF. This covers 30% of the 10km radius area. The main species found in association with sal are Terminalia tomentosa, Terminalia chebula, Terminalia Billerica, Anogeissus latifolia, Diospyros melanoxylon, Madhuca indica, Syzygium cumini, Pterocarpous marsupium, Schleichera oleosa, Careya arborea, Bridelia retusa, Emblica officinalis, Adina cordifolia, Lagertroemia parviflora, Cleistanthus collinus, ougeinia oojeinensis, Buchananja lanzan etc.

Vegetation in the hamlets:

The species composition near the hamlets is different from those found in the natural environmental conditions. The vegetation structure surrounding the hamlets reflects a typical character of tribal habitation. The trees in the settlement area are catering to the needs of local population such as fodder, fuel-wood, fruit, timber, and for religious purposes. Some of the common species found in the hamlets comprise Mangifera indica, Ficus religiosa, Artocarpus hetertophyllus, Syzygium cumini, Madhuca indica, Terminalia chebula, Terminalia tomentosa etc.

Agriculture

As indicated above, bulk of water availability in the area is through heavy monsoon but the drainage channels carry base flows as can be made use of for irrigation of the agricultural lands even during dry months. Where such irrigation facilities are available both Kharif and crops are raised. The predominant crops raised during the rain fed Kharif season are paddy, maize, Jower, and those raised during the Rabi cropping season are paddy, wheat, gram, etc.

(f) Climatic conditions

The meteorological data has been obtained from the EIA/EMP report prepared for the project based on which the Environment Clearance has been granted for project by SEIAA, Govt of Odisha.

Temperature:

The climate of the study area is characterized by an oppressively hot summer with high humidity. Summer generally commences in the month of March. Temperature begins to rise rapidly attaining

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the maximum in the month of May. During the summer maximum temperature can go up to 47.4°C. The weather becomes pleasant with onset of monsoon in June and remains as such up to the end of October. The temperature in the month of December is lowest i.e. 7°C.

Relative Humidity

The air is dry except during the South – West monsoon season. The maximum humidity ranges from 55% to 76% with annual average of 64.83% while the minimum humidity ranges from 26% to 43% with an annual average of 34%.

Rainfall Data

The rain fall data has been obtained from IMD for the financial year 2009-2013. Based on the data the rain minimum Annual rainfall is 971mm during 2010 and the maximum rain fall is 1820mm during 2013. However, the average rain fall data is calculated to be 1503.3 mm.

Micro meteorological data

The micrometeorological conditions prevailing at site regulate the dispersion and therefore dilution of air pollutants in the atmosphere. Hence the study of micrometeorological conditions like wind speed, wind direction, mixing height, stability class etc. is considered as an integral part of environmental impact assessment studies. The area experiences sub-tropical climate worth abundant rainfall during monsoon months. The summers are not very hot due to very thick forest cover in the area. April-May is the hottest months and December-January are the coolest months. The area enjoys high precipitation during the monsoon season. In order to determine the micrometeorological conditions of the study area a temporary micro-meteorological monitoring observatory was set up at the site. The following parameters were recorded at hourly intervals continuously during study period.

- Wind speed
- Wind direction
- Relative humidity
- Air temperature
- Cloud cover

Wind speed and direction is measured by Anemometer, air temperature is measured by thermometer, relative humidity is measured by hygrometer and cloud cover is recorded through visual interpretation. The localized data generated in the study area have been compared with the data compiled from the nearest IMD observatory at Keonjhar. At the meteorological station, wind speed & direction, temperature, relative humidity and cloud cover were recorded at hourly intervals throughout the monitoring period. Total rainfall for the entire monitoring period was also recorded. Wind frequency distribution during daytime, night time and combined day and night at the Deojhar sites was observed. The predominant wind direction is NNW.

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- **Human Settlements**

The base line data for the population of the surrounding area is significant to the study as it enables to predict the population that may be impacted by the mining. During preparation of EIA/EMP report for the mines detail socioeconomic study was conducted. Based on that report EC has also been granted. The human settlements within the buffer zone have been taken into consideration. Based on the data of EIA/EMP, the population within the surrounding villages are given below:

Location	No of Population
Village Deojhar	1035
Beleipada	566
Village Mahadev	531
Village Murgabeda	667
Village Baneikela	2034

- **Public buildings, Places of worship & Monuments :**

No public buildings, monuments, places of historical importance exist in and around within 5Km radius of the lease hold area.

- **Indicate any sanctuary is located in the vicinity of leasehold**

No sanctuary exists in and around within 5Km radius of the lease holds area.

8.2.0 Impact Assessment: Attach an Environmental Impact Assessment Statement describing the impact of mining and beneficiation on environment on the following:

(i) Land area indicating the area likely to be degraded due to quarrying, dumping, roads, workshop, processing plant, tailing pond/dam, township etc.

Impact on land

Sl No	Pattern of Utilization	Area put on use at start of Plan period (Ha)	Total area at the end of Plan period (Ha)	Total area at the end of Plan period (Ha)	Total area Requirement at the end conceptual period (Ha)
1	Mining with road	12.546	(-0.725)	11.821	12.554
2	Over burden/Dump	0	Nil	0	0
3	Mineral Storage	1.222	(-0.489)	0.733	0
4	Infrastructure (Office, Workshop, Magazine etc.)	0.146	0.700	0.846	0.846
5	Road	0.16	0	0.16	0.16
6	Green belt	0	0.514	0.514	0.514
7	Safety zone	1.304	0	1.304	1.304
	Total	**15.378**	**0**	**15.378**	**15.378**

Note: 1. Out of 12.546Ha of mining area, 0.211 ha included in the infrastructure and 0.514ha taken as safety zone.
2. Out of 1.222 ha 0.489 ha has been included in infrastructure.

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Management of degraded land

Till date total broken up land is 14.074Ha. No additional land is required for the mining and allied activities during plan period as all the activities will be within the broken up land. It has been proposed to start the mining operation from one end of the existing quarry i.e. from the south western part of the lease area so that the reclamation by bench plantation can be proposed from 2019-20 onwards. A total of 0.90Ha of benches to be exhausted will be reclaimed during ensuing scheme period. The year wise bench plantation will be as follows:

YEAR	Bench Plantation	Bench RL	No of saplings	Type of saplings
2016-17	--	--	--	Mango, Karanj, Chakunda, Neem etc
2017-18	--	--	--	
2018-19	--	--	--	
2019-20	0.60	655-615	960	
2020-21	0.30	615-605	480	
Total	**0.90**		**1440**	

Reclamation of mined out land at conceptual stage:

Considering the existing borehole data, it has been calculated that 12.554 hectare will be utilized for mining during the life of the mine. It has been proposed to start the mining operation from one end of the existing quarry i.e. from the south western part of the lease area so that the reclamation by bench plantation can be proposed from 2019-20 onwards. The above area will be progressively reclaimed and rehabilitated as and when areas devoid of iron ore come into being exhausted. Phase wise reclamation will be undertaken depending upon the exhaust of iron ore within the quarry. At ultimate stage the reclamation of mined out areas will be undertaken by means of bench plantation and water reservoir.

(ii) Air quality

Impact on Air Quality

Mining activities will have the impact on the air environment because of various operations like quarrying, sizing, sorting, deploying of tippers and diesel operated machineries and blasting

Air quality Management

Fugitive Emission Control

- Water sprinkling in dusty areas and in green belt/green cover around the mines area to arrest the fugitive emission.
- Water sprinkling system to be carried at haul roads and transportation routes in and around the mines.
- All the transportation trucks will be covered by tarpaulin.
- Crusher will be housed and all the conveyors covered properly.
- Control blasting technique and use of bottom initiation system (Nonel) will be adopted to control blast hazards and air pollution.
- The lessee is undertaking Monitoring of air quality in the surrounding area.**(Ref Annex- XIV)**

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(iii) Water quality

Impact on Air Quality

There will be less impact to the water bodies of the nearby areas. During monsoon, the water flowing from the mine workings and dumps will contain lot of slimes.

Water quality Management

The lease area under reference is marked by north-south trending hill range. The highest altitude in the area is 669.21m AMSL at south-western corner of the M.L area and the lowest altitude is 548m AMSL at the north-eastern corner. The general slope of the area is towards east. There is no perennial nala within the M.L area. A seasonal nala flows from west to east. The nearest habitations from the mine are Murgabeda, Deojhar, Beleipada etc. The wells at village murgabeda, and Deojhar are indicating that the water level is encountering at RL 520m. The lessee is undertaking Monitoring of water quality regularly.**(Ref Annex- XIV)**

d) Indicate Maximum and Minimum depth of working

It has been proposed to develop the existing pits. At present the existing bottom RL of the Pit is 552.967m. During ensuing plan period the working will be done up to 555m.RL. At ultimate stage of mining the working will be done up to 545m.RL. Therefore, such depth of mining would not affect the ground water table as the level of ground water is at 520 MRL.

Monitoring of water once in a year is proposed to know the water quality. It is also proposed to construct a garland drain of 780m x 1.0m x 1.5m size all around the existing waste dump, to prevent any wash-off from the dump. Some portion of the bottom of the final stage settling pits shall be filled up with sand so that clean water shall be discharged into the natural water body. The channel and settling pits proposed is shown in dump plan & sections. Boulder wall (Toe wall) is also proposed to be constructed to check the wash-off of waste material during monsoon.

(iv) Noise level

Impact on Noise level

Mining machinery like mechanical excavator, tractor compressor, drill rod etc. are the major sources of noise pollution. The core zone will be affected by blasting and deploying of tippers and machineries.

Management of noise level

The following are the noise control measures proposed to be undertaken in the mining facility. However the effect of noise pollution in the buffer zone shall be negligible.

- Encasement of noise generating equipment.
- In addition personnel working near high noise level generating sources will be provided with ear muffs.
- Effective preventive maintenance and vibration measurement of all rotating equipment and transport system will help in the improvement of noise reduction.
- Control blasting technique and use of bottom initiation system (Nonel) will be adopted to control blast hazards and Noise pollution.

Noise level study is undertaken by the lessee quarterly. The copy of monitoring report is attached as **Annexure-(XIV)**

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(v) Vibration level(due to blasting)

Loosening of rock mass will be done by the blasting of 11m deep and 110mm dia holes. Burden and spacing are proposed to be kept at 3.0m and 3.5m respectively. However, on the basis of vibration study, burden and spacing are to be varied. Milli second delay detonators are to be used to divide the resultant vibration package in to a number of small vibration levels. After repeated trials, correct amount of explosives will be loaded in the blast holes. Further, Control blasting technique and use of bottom initiation system (Nonel) will be adopted to control blast hazards like ground vibration.

(vi) Water regime

There will not be any adverse impact on any water regime.

Measures for minimising adverse effects on water regime

To protect the natural water course protective measures have been/will be undertaken. During monsoon months the rain water gets contaminated with particulate matter due to its flow over natural ground Soft laminated ore pieces. This contaminated water finds access into the nearby water courses. During rain, therefore, the water becomes muddy due to increase in the suspended solids content. Check dams will be erected around the proposed dump to arrest wash offs from it during rain to prevent water pollution.

(vii) Acid Mine Drainage

As on date there is no data about the acid Mine drainage within the surrounding water body.

(viii) Surface Subsidence

Not Applicable

(ix) Socio-Economic Benefit

Impact of Mining on socioeconomic condition of the surrounding villagers

It is a fact that the iron ore deposits of the State of Orissa are located in backward areas of the State where the general living condition of the people is below poverty line. Agriculture is not developed in the region to the extent it should have been. Only one crop is grown in a year due to lack of irrigation facilities. People, therefore, depend mostly on the iron ore and iron ore mines for their living. This has got a positive impact on the living condition of the local inhabitants. At least these people have been assured of their daily bread.

With the continuation of mining activity in the area, there will be improvement in the infrastructural facilities, employment potential, medical, education, trade and commerce. Thus, there will be overall improvement in the socio-economic status of the people of surrounding areas. The lessee has undertaken developmental activities in and around the surrounding areas.

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Socio-economic benefits arising out of mining

It is a fact that the iron ore deposits of the State of Orissa are located in backward areas of the State where the general living condition of the people is below poverty line. Agriculture is not developed in the region to the extent it should have been. Only one crop is grown in a year due to lack of irrigation facilities. People, therefore, depend mostly on the iron ore and iron ore mines for their living. With the continuation of mining activity in the area, there will be improvement in the infrastructural facilities, employment potential, medical, education, trade and commerce. Thus, there will be overall improvement in the socio-economic status of the people of the surrounding areas. This has got a positive impact on the living condition of the local inhabitants

(X) Measures for protecting historical monuments and for rehabilitation of human settlement likely to be disturbed due to mining activity:

There are no such monuments in the core zone or buffer zone. Since the human settlements are far away from the mineable area, planning for re-settlement / rehabilitation is not required.

8.3 Progressive reclamation Plan:

To mitigate the impacts and ameliorate the condition, describe year wise steps proposed for phased restoration, reclamation of lands already/to be degraded in respect of following items separately for 3 years period.

8.3.1. Mined-Out Land: Describe the proposals to be implemented for reclamation and rehabilitation of mined-out land including the manner in which the actual site of the pit will be restored for future use. The proposals may be supported with yearly plans and sections depicting yearly progress in the activities for land restoration/ reclamation/rehabilitation, afforestation etc., called "Reclamation Plan".

Existing:

Till date about 14.074ha has been utilised under the mining and none of the mined out area has been exhausted.

Proposed:

No additional area will be required for the mining and allied activities during plan period.

Reclamation & rehabilitation measures during ensuing scheme period.

It has been proposed to start the mining operation from one end of the existing quarry i.e. from the south western part of the lease area so that the reclamation by bench plantation can be proposed from 2019-20 onwards. A total of 0.90Ha of benches to be exhausted will be reclaimed during ensuing scheme period. The year wise bench plantation will be as follows:

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YEAR	Bench Plantation	Bench RL	No of saplings	Type of saplings
2016-17	--	--	--	Mango, Karanj, Chakunda, Neem etc
2017-18	--	--	--	
2018-19	--	--	--	
2019-20	0.60	655-615	960	
2020-21	0.30	615-605	480	
TOTAL	**0.90**			

Except bench plantation, and water reservoir, back filling is not possible during the scheme period. Considering the existing borehole data, it has been calculated that 12.554 hectare will be utilized for mining during the life of the mine. The said area will be progressively reclaimed and rehabilitated as and when areas devoid of iron ore come into being exhausted. Phase wise reclamation will be undertaken depending upon the exhaust of iron ore within the quarry.

Other than quarry area

Sl No	Pattern of Utilization	Area put on use at start of Plan period (Ha)	Total area at the end of Plan period (Ha)	Total area at the end of Plan period (Ha)
1	Over burden/Dump	0	0	0
2	Sub grade dump	1.222	(-0.489)	0.733
3	Infrastructure (Office, Workshop, Magazine etc.)	0.146	0.700	0.846
4	Road	0.16	0	0.16
5	Green belt	0	0.514	0.514
	Safety zone	1.304	0	1.304
	Total	**2.832**	**0.725**	**3.557**

Waste Management

Generation of waste

Year	Volume of waste(cum)	Road Maintenance@30%	Volume of waste to be dumped(cum)
2018-19	30844.55	9253.4	21591
2019-20	43930	13179	30751
2020-21	42422	12727	29695
Total	**117196.55**	**35159**	**82038**

The total waste generation during ensuing scheme period will be 117196.55cum. Out of which 30% i.e. 35159 cum will be utilized for road maintenance and remaining 70% i.e. 82038 cum will be dumped temporarily within Ultimate pit limit.

Sub grade Management

Utilization of sub-grade

Keeping in view of market scenario, the lessee will sold out the sub-grade material by blending with high grade iron ore produced from the mine. As per the existing practice, above 55%Fe shall be blended with +62%Fe to obtain the saleable ore. Hence, the iron ore containing 45-55% Fe shall be stacked

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separately temporarily. If any buyer wants, the same shall be despatched by blending this material also. However, the details of utilisation of sub-grade ore will be as follows:

Year	Topsoil (Cum)		Mineral Rejects (Cum)	
	Reuse/ spreading	Storage	Blending @90%	Storage @10%
2018-19	0	0	63593.81	7065.979
2019-20	0	0	240619.7	26735.52
2020-21	0	0	220218.3	24468.7
Total	0	0	**524431.8**	**58270.2**

Hence, a total of 58270.2cum of sub grade shall have to stack within the lease area. It has been planned to stack the sub-grade ore temporarily within the quarry floor. The details of location of sub-grade stack will be as follows:

Year	Mineral Rejects (Cum)		Grid Location	Bottom RL (m)	Top RL (m)
	Blending @90%	Storage @10%			
2018-19	63593.81	7065.979	2445520-2445580 and 341970-342040	575	585
2019-20	240619.7	26735.52		585	595
2020-21	220218.3	24468.7		595	605
Total	**524431.8**	**58270.2**			

8.3.2 Top Soil Management:

The generation of top soil will be nil.

8.3.3 Tailings Dam Management:

Not Applicable

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

Not Applicable

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

Not Applicable

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

Items	Details	2018-19	2019-20	2020-21
Dump management	Area to be afforested (ha)	Nil	Nil	Nil
	No of saplings to be planted	Nil	Nil	Nil
	Cumulative no of plants	Nil	Nil	Nil
	Cost including watch and care during the year (Rs.)	Nil	Nil	Nil
Management of worked out benches	Area available for rehabilitation (ha)	Nil	0.60	0.30
	Afforestation done (ha)	Nil	Plantation along with grass seedlings	Plantation along with grass seedlings
	No of saplings to be planted in the year	Nil	960	480nos
	Cumulative no of plants	Nil	960	1440 nos

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	Any other method of rehabilitation(specify)	Nil	Nil	Nil
	Cost including watch and care during the year		Rs 30000.00	Rs 20000.00
Reclamation and rehabilitation by backfilling	Void available for Backfilling (L x B x D) pit wise /stope wise (ha)	Nil	Nil	
	Void filled by waste / tailings (ha)	Nil	Nil	
	backfilled area to be afforested	Nil	Nil	
	Rehabilitation by making water reservoir	Nil	Nil	
	Any other means specify)	Nil	Nil	
Rehabilitation of waste land within lease (Along the safety zone by gap filling)	Area available (ha) (Along the safety zone by gap filling)	0.12	0.12	0.12
	Area to be rehabilitated	0.12	0.12	0.12
	Method of rehabilitation	Plantation 192 nos saplings	Plantation 192 nos saplings	Plantation 192 nos saplings
Others (specify)	Retaining wall (around existing dump)	350m x 1m x 1.5m	Maintenance	Maintenance
	Garland drain	480m x 2m x1m	220m x 2m x 1.0m	Maintenance
	Settling tank (near dump)	Maintenance	Maintenance	Maintenance
	Environment Monitoring	To be continued as per MoEF & CC guide line	To be continued as per MoEF guide line	To be continued as per MoEF guide line
	Schedule of monitoring	**Air** - Quarterly basis **Water** - quarterly basis **Noise** – 24Hours basis	**Air** - Quarterly basis **Water** - quarterly basis **Noise** – 24 hour basis	**Air** - Quarterly basis **Water** - Quarterly basis **Noise** – 24 hour basis

8.4 Disaster Management and Risk Assessment

No disaster is foreseen keeping in view last 30 years of mining record of the mines.

Risk assessment is a process whereby risks has been analysed, assessed and risk management priorities are evaluated. It is defined as the characterization of the potential adverse effect to human health & environment due to environmental hazards.

Objectives of risk assessment:-

- identifying hazardous activities
- assessment of risk level and severity in different operations
- identification of control measures
- setting monitoring process
- reduce the impact of mishaps of all kinds
- reduce the inherent potential for major accidents

Methodology of Risk assessment:-

- Collection of information & identification of hazard
- Classify their severity and probability of occurrence
- Identification of exposed risks
- Assess the risk and risk rating based on
  - Probability
  - Exposure
  - Consequence
- Prioritization of the risks
- Implementation of control measures
- Monitoring risk assessment
- Evaluation and correction

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Risk assessment is mainly based on the environmental impact of various parameters.

i) **Land contamination**:-

The potential for contamination during operation of mine site is, waste rock dump which is regard as contaminated land.

ii) **Aquatic toxicity:-**

The risk assessment in aquatic toxicity system is based on the total metal concentration in various chemical form or oxidation state. Iron ore does not contain appreciable concentration of toxic elements.

iii) **Acid mine drainage**:-

The mining of iron ore does not involved any processing operation by using chemicals. Hence there is no risk at mine site with regard to control of acid mine drainage

iv) **Tailing dam**:-

Not Applicable

v) **Human health**:-

The chemicals from tailing dam and waste heaps may severely affect the human health. However there is no tailing dam or any effluent generation during the mining of iron ore. Hence there is no risk involved to human health due to iron ore mining operation.

Factors of risks involved due to human induced activities in connection with mining operations are 1) Removal of O.B and side burden 2) Drilling 3) Blasting 4) Excavation of ore and 5) transportation of ore.

Other factors due to natural activities are 1) fire 2) water inundation 3) electricity and 4) natural calamities.

S.No	Factors	Causes of risks	Control measures
1	Removal of O.B	a) Top soil & O.B bench may slide due to its unconsolidated nature. b) Vibration due to movement of vehicles in the O.B benches	Over all O.B bench slope angle will be maintained not more than 45°.Bench height shall not exceed 10 m in O.B
2	Drilling	a) Due to high pressure of compressed air hoses may burst.	During preventive & Periodical maintenance and replacement of worn out accessories in the compressor and drill equipment
3	Blasting	a) Fly rock, ground vibration and noise etc., b) Improper charging of explosives	Burden and spacing will be kept optimum on trial basis and inclined drilling will be done. Explosive charge per delay will be minimized.
4	Excavation of Ore	a) Hauling and loading equipment are in such proximity while excavation b) Swinging of bucket over the body of tipper c) Driving of unauthorized person	Operator shall not operate the machine when person & vehicles are in such proximity Shall not swing the bucket over the cab and operator leaves the machine after ensuring the bucket is on ground Shall not allow any unauthorized person to operate the machine by effective

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			supervision
5	Transportation of ore	a) Operating the vehicle " nose to tail" b) Overloading of material c) While reversal & overtaking of vehicle d) Operator of truck leaving his cabin when it is loaded	It will be ensured that all these causes will be nullified by giving training to the operators. No over loading Audio visual reverse horn will be provided Proper training will be given
6	Fire due to electricity and Oil	a) Due to the short circuit of cables & other electrical parts. b) Due to the leakage of inflammable liquid like diesel, oil etc,	Commentator & electrical parts shall be cleaned frequently with the help of dry air blower. All fastening parts and places will be lighted.
8	Natural calamities	Unexpected happenings	The mine management is capable to deal with the situation

Disaster Management Plan:-

The management is able to deal with the situation efficiently to reduce confusion keeping in view of the likely sources of danger in the mine.

Structure of the Disaster Management Plan:-

i) **Outline of Disaster management plan** :-

The purpose of disaster management plan is to restore the normalcy for early resumption of mining operation due to an unexpected, sudden occurrence resulting to abnormalities in the course of mining activity leading to a serious danger to workers or any machinery or the environment.

ii) **System of communication**:-

An internal communication system for the department head and to their line of command with telephone will be provided. Also the telephone nos and addresses of adjoining mines, rescue station, police station, Fire service station, local hospital, electricity supply agency and standing consultative committee members are made available for the mine management.

iii) **Consultative committee**:-

A standing consultative committee will be formed under the head of Mines manager. The members consists of safety officer / medical officer / Asst. manager/ public relation officer/ Foreman/ and environmental engineer.

iv) **Facilities & Accommodation**:-

Accommodation and facilities for medical centre, rescue room and for various working groups will be provided.

v) **First Aid & medical facilities**:-

The mine management will have first aid for use in emergency situation. All casualties would be registered and will be given first aid. The centre will have facilities for first aid & minor treatment, resuscitation, ambulance and transport. It will have proper telephone / wireless set for quick communication with hospitals where the complicated cases are to be sent.

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vi) Stores and equipment :-

A detailed list of equipment available its type & capacity and items reserved for emergency.

vii) Transport services:-

A well-defined transport control system will be provided to deal with the situation.

viii) Functions of public relations group:-

To make a cordial relation with government officials and other social service organization and working groups. To liaise with representatives of the mine to ameliorate the situation of panic, tension, sentiments, grievances and misgivings created by any disaster. To ameliorate the injured, survivors and family members of affected persons by providing material, moral support and establishing contact with relatives of victims.

ix) Security :

Manning of security posts

x) Catering & Refreshment :

Arrangement to be made for the victims, rescue teams and others

Care and maintenance during temporary discontinuance:

If the mine will be discontinued temporarily for more than 120 days, notice will be given 30 days before the date of such discontinuance to the concerned authorities. During discontinuance period safety arrangement and fencing will be provided to avoid the entry of unauthorized persons. The accessibility to the mine from the surface will be prevented by providing fencing arrangement.

8.5 Emergency plan:

1) On realizing anything serious that may happen anywhere in the mine immediate action to inform nearest mining official will be taken.
2) On being informed about the emergency it will be verified for the correctness of information and telephone in particular to the Manager and other mining officials of the mine and managers of adjoining mine.
3) On receiving information of emergency situation intimation will be sent to the consultative committee which is already formed. Shift in-charge will ensure that all the materials and transport system to deal with emergency situation is alerted.
4) First aid facilities will be readily available.

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8.6 Financial Assurance

The extent used for mining and allied activities during the plan period is given below

Sl. No.	Head	Area put on use at start of plan A	Additional requirement during plan period B	Total C=(A+B)	Area considered as fully reclaimed & rehabilitated D	Net area considered for calculation E=(C-D)
1.	Area under mining	12.546	(-0.752)	11.821	Nil	11.821
2.	Storage for topsoil	Nil	Nil	Nil	Nil	Nil
3.	Waste dump site	Nil	Nil	Nil	Nil	Nil
4	Sub-grade dump	1.222	(-0.489)	0.733	Nil	0.733
5	Infrastructure (Workshop, administrative building)	0.146	0.700	0.846	Nil	0.846
6.	Roads	0.16	Nil	0.16	Nil	0.16
7.	Railway	Nil	Nil	Nil	Nil	Nil
8.	Tailing pond	Nil	Nil	Nil	Nil	Nil
9.	Effluent treatment plant	Nil	Nil	Nil	Nil	Nil
10	Plantation/green belt	Nil	0.514	0.514	Nil	0.514
11.	Township area	Nil	Nil	Nil	Nil	Nil
12.	Others (magazine)	Nil	Nil	Nil	Nil	Nil
	Grand Total :	**14.074**	**Nil***	**14.074**	**Nil**	**14.074**

Note: *1. Out of 12.546Ha of mining area, 0.211 ha included in the infrastructure and 0.514ha taken as safety zone.

2. Out of 1.222 ha 0.489 ha has been included in infrastructure.

As per Mineral Conservation and Development (Amendment) Rules – 2017 under Rule 27, the lessee will have to provide financial assurance of Rs.300000 per ha since it is an A-Category mine. Therefore, financial assurance estimated to be 14.074 x Rs.300000/- = Rs.42,22,200/- at the rate of Rs.300000/- per hectare.

8.7 Certificate and Undertaking

This is to certify that the Progressive Mine Closure Plan of Raikela Iron ore Mines shall comply all statutory rules, regulations, orders made by the State or Central Government, Statutory organizations, Court etc. Wherever any specific permission is required, the lessee will approach the concerned authorities. The lessee also undertakes to the effect that all the measures proposed in this closure plan will be implemented in a time bound manner.

8.8 Plans & Sections - This Progressive Mine Closure Plan is submitted as per the Rule 23 under MCDR 2017. Plans and sections for this plan have been referred to that of Mining Scheme, which is being submitted simultaneously for approval.

APPROVED

14/03/16

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

PRADEEPT MOHAPATRA
QUALIFIED PERSON

Pradeept Mohapatra

(QUALIFIED PERSON)

CERTIFICATE

The provisions of the Mineral Conservation and Development Rules 2017 have been observed in the preparation of the Review of the Mining Plan for Murgabeda Iron ore Mine over an area of 15.378Ha, of Sri D.R.Patnaik in Murgabeda village, Post office Belelpada, District Keonjhar of Odisha State and Whenever specific permissions are required, the applicant will approach the concerned authorities of Indian Bureau of Mines.

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

Place: Joda
Date: 25.02.2018

(Pradeept Mohapatra)
Qualified Person

Post Box No. – 1, PO :Joda, AT :Unchabali, Bamebari, DIST. :Keonjhar, Odisha: 758034,
MOB : 09438149715, Email : pmohapatra_07@yahoo.com

M/S. D. R. PATNAIK

Mines Owner

(A UNIT OF D.R.PATNAIK & ALTRADE GROUP)

CONSENT LETTER / UNDERTAKING / CERTIFICATE FROM THE LESSEE

01. The **Review of the Mining Plan** in respect of **Murgabeda Iron Ore Mine** of **Sri D.R.Patnaik over an area of 15.375 hectares** in Murgabeda village in Keonjhar District, of Odisha has been prepared under **Rule 17(2) of MCR 2016** by Qualified person; Shri Pradeept Mohapatra, M.Sc. (Geology) having relevant professional experiences of more than five years of working in a supervisory capacity in the field of mining after obtaining the Degree as per Rule 15 of MCR, 2016.

This is to request the Regional Controller of Mines, Indian Bureau of Mines, Bhubaneswar to make any further correspondence regarding any correction of the Review of the Mining Plan with the said recognized person at his address below:

Sri Pradeept Mohapatra
At- Unchabali, Po- Bamebari,
Via- Joda, Dist-Keonjhar, Odisha
E mail: pmohapatra_07@yahoo.com
Mobile No. - +919438149715

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

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

A/6, Commercial Estate, Civil Township, Rourkela - 769004, Odisha
Phone : +91-661-240-0139, 240-2227, 2401689, Fax : +91-661-240-2226, 240-1359

M/S. D. R. PATNAIK

Mines Owner

(A UNIT OF D.R.PATNAIK & ALTRADE GROUP)

03. It is certified that the Progressive Mine Closure Plan of **Murgabeda Iron Ore Mine of Sri D.R.Patnaik over an area of 15.375Ha** complies with all statutory Rules, Regulations, Orders made by the Central or State Government, Statutory Organization, Court etc. which have been taken into consideration and wherever any specific permission is required, the applicant will approach the concerned authorities.

    The information furnished in the Progressive Mine Closure Plan is true and correct to the best of my knowledge and records.

04. The provisions of Mines Act, Rules and Regulations made there under have been observed in the **Review of the Mining Plan** over an area of **15.375Ha in** Keonjhar district of Odisha State belonging to **Murgabeda Iron ore Mine** and where specific permissions are required, the Lessee will approach the DGMS. Further, standards prescribed by DGMS in respect of miners' health will be strictly implemented.

05. I do hereby undertake to complete the exploration within **Murgabeda Iron Ore Mine** over an area of **15.375 hectares as** proposed in the **Review of the Mining Plan** in a time bound manner.

Sri D.R.Patnaik
Mining Lessee
A/6, Commerical Estate,
Civil Township, Rourkela - 769004

Place :
Date :

A/6, Commercial Estate, Civil Township, Rourkela - 769004, Odisha
Phone : +91-661-240-0139, 240-2227, 2401689, Fax : +91-661-240-2226, 240-1359