MINING PLAN&
PROGRESSIVE MINE CLOSURE PLAN

(UNDER RULE 16(1) of MCR 2016& 23of MCDR 2017)

VOLUME – I (TEXT & ANNEXURE)
IN RESPECT OF

DEVADARI IRON ORE MINE

DEVADARI RANGE, SANDUR TALUK,

BELLARY DISTRICT, KARNATAKA STATE

LEASE AREA: 470.40 HECTARES

FOREST: 470.40 HECTARES (SM BLOCK STATE FOREST)
NON-FOREST: NIL HECTARES

CATEGORY OF MINE - 'A' (OPENCAST, FULLY MECHANISED, CAPTIVE, GOVT. SECTOR UNDERTAKING)

APPLICANT

KIOCL LIMITED (A GOVT. OF INDIA ENTERPRISE)

PREPARED BY

S.R. VIRSEN& S. HAREESH BABU
MECON LIMITED, P.O. -DORANDA, RANCHI – 834002, JHARKHAND

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(S. R. Virsen, Mining Engineer)
(Qualified Person)

(S. Hareesh Babu, Mining Engineer)
(Qualified Person)

ಕೆಐಒಸಿಎಲ್ ಅಮಿಟೆಡ್
(ಭಾರತ ಸರ್ಕಾರದ ಉದ್ಯಮ)
ನೊಂದಾಯಿತ ಕಾರ್ಯಾಲಯ :
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ಬೆಂಗಳೂರು - ೫೬೦ ೦೩೪.
ದೂರವಾಣಿ : ೦೮೦-೨೫೫೩೧೪೬೧ ರಿಂದ ೭೦
ಫ್ಯಾಕ್ಸ್ : ೦೮೦-೨೫೫೩೨೧೫೩-೫೯೪೧
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के आई ओ सी एल लिमिटेड
(भारत सरकार का उद्यम)
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KUDREMUKH

ISO 9001, 14001 ಮತ್ತು OHSAS 18001 ಸಂಸ್ಥೆ
ISO 9001, 14001 तथा OHSAS 18001 कम्पनी
ISO 9001, 14001 & OHSAS 18001 COMPANY

Indian Bureau of Mines Govt. of India

CONSENT LETTER / UNDERTAKING / CERTIFICATE FROM THE LESSEE

01. The Mining Plan in respect of Devadari Iron Ore Mine over an area of 470.40 hectares in villages Nandhihalli, Narsapura and Ranjitpura in Ballari District, Karnataka state submitted under Rule 16(1) of MCR 2016 has been prepared by the following Qualified Persons from M/s MECON Limited.

This is to request the Regional Controller of Mines, Indian Bureau of Mines, Bangalore to make any further correspondence regarding any correction of the mining plan with the said qualified persons at his address as given below:

S.R. Virsen, Manager (Mining),
MECON Limited, P.O – Doranda, Ranchi – 834002, Jharkhand
Tel: 0651 – 2483441, 2483645, Fax. 0651 – 2482189, 2482214
Email: srvirsen@meconlimited.co.in
&
S.Hareesh Babu, Manager (Mining)
MECON Limited, P.O – Doranda, Ranchi – 834002, Jharkhand
Tel: 0651 – 2483441, 2483645, Fax. 0651 – 2482189, 2482214
Email: s.hareeshbabu@meconlimited.co.in

We hereby undertake that all modification/ updating as made in the said mining plan by the said qualified persons be deemed to have been made with our knowledge and consent and shall be acceptable on us and binding in all respect.

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

03. It is certified that the Progressive Mine Closure Plan of Devadari Iron Ore Mine of M/s KIOCL Limited over an area of 470.40 hectares 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 lessee will approach the concerned authorities.

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

04. The provision of Mines Act, Rules and Regulations made there under have been observed in the mining plan of Devadari Iron Ore Mine over an area of 470.40 hectares in Ballari district of Karnataka State belonging to M/s KIOCL Limited and where specific permissions are required the lessee will approach the DGMS. Further standards prescribed by DGMS in respect of miner's health will be strictly implemented.

Place:Bangalore
Date: 20.02.2018

For KIOCL Limited

Signature of Lessee

विद्यानंद. एन
VIDYANANDA. N
निदेशक (उत्पादन एवं परियोजनाएँ)
Director (Production & Projects)

CERTIFICATE FROM QUALIFIED PERSONS

The provisions of the Mineral Conservation & Development Rules 2017 have been observed in the preparation of **Mining PlanforDevadariIron Ore Mine over an area of 470.40ha** of **M/s KIOCL Limited**in Ballari District of Karnataka Stateand whenever specific permissions are required, the applicant will approach the concerned authorities of Indian Bureau of Mines.

The information furnished in the mining plan is true & correct to the best of our knowledge.

Place: Ranchi **Name of the Qualified Person: S.R. Virsen (Mining Engineer)**
Date: 23.02.2018

Place: Ranchi **Name of the Qualified Person: S.Hareesh Babu (Mining Engineer)**
Date: 23.02.2018

LIST OF DRAWINGS

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4	Geological & Pit Sections	MEC/11/16/Q7EB/04
5	Surface Plan	MEC/11/16/Q7EB/05
6	Pit Development Plans	MEC/11/16/Q7EB/06 (5 sheets)
7	Environment Plan	MEC/11/16/Q7EB/07
8	Reclamation Plan	MEC/11/16/Q7EB/08
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(S. R. Virsen, Mining Engineer)
(Qualified Person)

(S. Hareesh Babu, Mining Engineer)
(Qualified Person)

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(S. R. Virsen, Mining Engineer)
(Qualified Person)

(S. Hareesh Babu, Mining Engineer)
(Qualified Person)

INTRODUCTION:

KIOCL LIMITED (Formerly Kudremukh Iron Ore Company Limited) is a Government of India undertaking established in the year 1976 and is operating Iron ore Pellet plant and Pig Iron plant at Panambur, Mangalore, Karnataka.

The Government of Karnataka has reserved an area of 470.40 ha in favour of M/s KIOCL Limited, for Iron and Manganese Ore in Devadari Range, Sandur Taluk, Bellary District, Karnataka.

In pursuance of the approval of the Central Government, Government of Karnataka issued a notification no. CI 294 MMM 2015, Bengaluru, dated 23.01.2017 by reserving an area of 470.40 ha in favour of M/s KIOCL Limited, for iron and manganese ore in Devadari Range, Sandur Taluk, Bellary District, Karnataka. The said reservation shall be subject to provisions of Sub-Sections (2A), (2B) and (2C) of Section 17A of the MMDR Act, 1957 as amended through the MMDR Amendment Act, 2015. A copy of the notification is enclosed as *Annexure–1*.

The proposed area is bounded by latitudes 15° 1' 18.18627"N & 15° 3' 43.60179"N and longitudes 76° 34' 35.0174"E & 76° 36' 12.77452"E and falls under Topo sheet No. 57 A/12.

The total lease area falls under forest land. As per the terms and conditions of the above notification, the Mining Lease shall be executed only upon submission of all the required statutory clearances under MM (D&R) Act, 1957; Forest (Conservation) Act, 1980; Prevention of (Air and Water Pollution) Act, 1986 and other applicable Act and Rules.

The Department of Mines & Geology, Govt. of Karnataka vide their letter no. DMG/MLS/Res.KIOCL/2016-17/10301 dated 02.02.2017 informed KIOCL to produce approved mining plan from IBM and other statutory approvals from regulatory bodies. A copy of the correspondence from DMG to M/s KIOCL is enclosed as *Annexure–1A*.

The present submission to IBM is for approval of the Mining Plan under rule 16(1) of MCR 2016, which is a pre-requisite for execution of the lease deed.

This Mining Plan is approved subject to the conditions / stipulations indicated in the Mining Plan approval letter No. [illegible] Date: 28/3/2018

क्षेत्रीय खान नियंत्रक
Regional Controller of Mines
भारतीय खान ब्यूरो
Indian Bureau of Mines,
बेंगलूर / Bangalore - 560 022

(S.R. Virsen, Mining Engineer)
(Qualified Person)

(S. Hareesh Babu, Mining Engineer)
(Qualified Person)

1.0 GENERAL

a) Name of Applicant/ Lessee/ Rule 45 registration No.	**Shri N. Vidyananda,** **Director (P&P) & Nominated Owner** **KIOCL Limited,** **II Block, Koramangala,** **BANGALORE – 560 034, Karnataka** A list of Board of Directors is enclosed as *Annexure–2*. A copy of the extracts of Minutes of Meeting of Board of Directors nominating the Owner of the mine is enclosed as *Annexure–3*. A copy of photo ID & address proof of the nominated owner of the mine is enclosed as *Annexure–4*.
Registration No. under Rule 45	IBM/140/2011 (*Annexure–6)*
Correspondence & Registered Address	KIOCL Limited, II Block, Koramangala, Bangalore – 560 034
District	Bangalore
State	Karnataka
Pin Code	560 034
Phone	080-25531371
Fax	080-25532153
Gram	-
Telex	-
e-mail	bnbd@kioclltd.com
b) Status of the applicant	
Private individual	No
Cooperative Association	No
Private Company	No
Public Company	No
Public Sector Undertaking	**Yes**
Joint Sector Undertaking	No
Other (pl. specify)	Not Applicable
Certificate of Incorporation is enclosed as *Annexure–5*.	
c) Mineral(s) which is/ are include in the prospecting license (For fresh grant)	Not applicable
d) Mineral(s) which is/ are include in the lease deed	Lease deed yet to be executed
e) Mineral(s) which the Applicant/ Lessee intends to mine	Iron & Manganese

f) Name of the Qualified Person under rule 15(1) of MCR, 2016 preparing Mining Plan:

Name of the QP preparing the mining plan	**S.R. Virsen,** Mining Engineer	**S. Hareesh Babu**, Mining Engineer
	Copy of the proof of qualification & experience of qualified persons satisfying the requirements under rule 15(1) of MCR, 2016 who have prepared this document are enclosed as *Annexure–7*.	
Address	**S.R. Virsen,** Manager (Mining), RM & Mining, MECON Ltd,	**S. Hareesh Babu**, Manager (Mining), RM & Mining, MECON Ltd,

(S.R. Virsen, Mining Engineer)
(Qualified Person)

(S. Hareesh Babu, Mining Engineer)
(Qualified Person)

	Doranda,Ranchi – 834002, Jharkhand.	Doranda,Ranchi – 834002, Jharkhand.
Phone	0651 – 2483645, 2483441	0651 – 2483645, 2483441
Fax	0651 - 2482189, 2482214	0651 - 2482189, 2482214
e-mail	mining@meconlimited.co.in	mining@meconlimited.co.in
Telex	-	
Registration No.	-	
Date of grant / renewal	-	
Valid upto	-	

(S.R. Virsen, Mining Engineer)
(Qualified Person)

(S. Hareesh Babu, Mining Engineer)
(Qualified Person)

2.0 LOCATION AND ACCESSIBILITY

a) Lease Details (Existing Mine)

Name of Mine	Devadari Iron Ore Mine (470.40 ha)
Latitude /Longitude of any boundary point.	The Devadari Iron Ore Mine in Bellary District of Karnataka falls under Toposheet No. 57A/12 of Survey of India and the DGPS co-ordinate of boundary pillars are given below:

Table -01

Boundary Points	Latitude			Longitude		
	Deg.	Minute	Seconds	Deg.	Minute	Seconds
K-1	15	3	40.28617	76	34	51.84298
K-2	15	3	43.60179	76	35	1.17191
K-3	15	3	36.10806	76	34	58.20739
K-4	15	3	21.37078	76	34	58.65607
K-5	15	2	47.71624	76	35	28.94230
K-6	15	2	12.76851	76	35	41.47882
K-7	15	2	11.40840	76	35	38.33516
K-8	15	2	1.55724	76	35	16.86221
K-9	15	1	43.87313	76	35	25.66061
K-10	15	1	45.61693	76	35	29.81225
K-11	15	1	52.66011	76	35	44.33083
K-12	15	1	53.17863	76	35	45.55638
K-13	15	2	4.35311	76	35	41.33034
K-14	15	2	6.16494	76	35	49.15563
K-15	15	2	6.77428	76	35	54.73619
K-16	15	2	2.02297	76	35	59.86533
K-17	15	1	27.29247	76	36	12.77452
K-18	15	1	24.16575	76	35	56.15146
K-19	15	1	18.18627	76	35	46.68113
K-20	15	1	24.78307	76	35	18.07498
K-21	15	1	38.92441	76	35	3.93295
K-22	15	1	53.01734	76	35	0.72610
K-23	15	1	57.09202	76	35	8.60315
K-24	15	2	24.07555	76	34	55.43883
K-25	15	2	26.93733	76	35	1.78332
K-26	15	2	45.81296	76	34	53.62723
K-27	15	2	43.29713	76	34	46.41503
K-28	15	3	5.03724	76	34	35.01740
K-29	15	3	10.12273	76	34	39.09602
K-30	15	3	15.23864	76	34	36.78984

The key plan is enclosed as **Drg. No. MEC/11/16/Q7EB/01** (**Plate No. 01**).

Date of grant of lease	The Govt. of Karnataka had issued ML Notification on 23/01/2017 for reserving an area for iron & manganese ore in favour of KIOCL Ltd. Lease will be executed after approval of this submitted mining plan and grant of environment clearance and forest clearance etc.
Period/Expiry Date	Not applicable. ML Notification has been issued by the State Government of Karnataka.
Name of lease holder	KIOCL Limited (A Govt. of India Enterprise)

(S.R. Virsen, Mining Engineer)
(Qualified Person)

(S. Hareesh Babu, Mining Engineer)
(Qualified Person)

Correspondence & Registered Address	KIOCL Limited, II Block, Koramangala, Bangalore – 560 034
Tel.	080-25531371
Fax	080-25532153
e-mail	bnbd@kioclltd.com
Mobile	+91 96111 27688

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

Table -02

Forest (Specify)	Area, (ha)	Non Forest (Specify)	Area, (ha)
Forest Land	470.40	Non-Forest Government land	NIL
		Grazing land	NIL
		Private land	NIL
		Others	NIL
Grand Total	**470.40**	**Grand Total**	**NIL**

Table -03

Total lease area / applied area	470.40ha
District & State	District: Ballari & State: Karnataka
Taluka	Sandur
Village(s)	Nandhi halli, Narsapura, Ranjitpura villages
Whether the area falls under Coastal Regulation Zone (CRZ)? If yes, details thereof	No

The area of Devadari Iron Ore Mining Lease is shown in the Key Plan as **Drg. No. MEC/11/16/Q7EB/01** (**Plate No. 01**).

Existence of public road/railway line, if any nearby and approximate distance

The area is well connected by road & rail. The Devadari Iron Ore mine is located west of Donimalai township of M/s NMDC, which is 10 km south east of Sandur, Tehsil headquarters and 60 km from Bellary, Dist. Headquarters and 50 km from Hospet town. The proposed area can be approached by asphalted road from Bellary upto Donimalai Township and further by an unmetalled road to the proposed Devadari mining lease. Donimalai town can be also approached by asphalted road from Sandur.

The Donimalai Township is already connected by direct bus services from the state capitals Bangalore and Hyderabad. The nearest railhead for passenger services is Toranagallu at a distance of 22 km from Donimalai Township.

The distance of the proposed project from Bangalore and Hyderabad by road is about 360 km and 460 km respectively. The Chennai outer harbor is connected by a 600 km BG railway line from Ranjitpura railway station and it is connected to western coast via Sanvardom by about 389 km.

Toposheet No. with latitude & longitude of all corner boundary point/pillar

Devadari Iron Ore Mine is covered by Survey of India Toposheet no. 57A/12. The DGPS co-ordinates of boundary pillars is given below:

Table -04

Boundary Points	Latitude			Longitude		
	Deg.	Minute	Seconds	Deg.	Minute	Seconds

(S.R. Virsen, Mining Engineer)
(Qualified Person)

(S. Hareesh Babu, Mining Engineer)
(Qualified Person)

Boundary Points	Latitude			Longitude		
	Deg.	Minute	Seconds	Deg.	Minute	Seconds
K-1	15	3	40.28617	76	34	51.84298
K-2	15	3	43.60179	76	35	1.17191
K-3	15	3	36.10806	76	34	58.20739
K-4	15	3	21.37078	76	34	58.65607
K-5	15	2	47.71624	76	35	28.94230
K-6	15	2	12.76851	76	35	41.47882
K-7	15	2	11.40840	76	35	38.33516
K-8	15	2	1.55724	76	35	16.86221
K-9	15	1	43.87313	76	35	25.66061
K-10	15	1	45.61693	76	35	29.81225
K-11	15	1	52.66011	76	35	44.33083
K-12	15	1	53.17863	76	35	45.55638
K-13	15	2	4.35311	76	35	41.33034
K-14	15	2	6.16494	76	35	49.15563
K-15	15	2	6.77428	76	35	54.73619
K-16	15	2	2.02297	76	35	59.86533
K-17	15	1	27.29247	76	36	12.77452
K-18	15	1	24.16575	76	35	56.15146
K-19	15	1	18.18627	76	35	46.68113
K-20	15	1	24.78307	76	35	18.07498
K-21	15	1	38.92441	76	35	3.93295
K-22	15	1	53.01734	76	35	0.72610
K-23	15	1	57.09202	76	35	8.60315
K-24	15	2	24.07555	76	34	55.43883
K-25	15	2	26.93733	76	35	1.78332
K-26	15	2	45.81296	76	34	53.62723
K-27	15	2	43.29713	76	34	46.41503
K-28	15	3	5.03724	76	34	35.01740
K-29	15	3	10.12273	76	34	39.09602
K-30	15	3	15.23864	76	34	36.78984

c) Attach a general location map showing area and access routes. It is preferred that the area be marked on a Survey of India topographical map or a cadastral map or forest map as the case may be. However, if none of these are available, the area may be shown on an administrative map:

The same has been shown in the Key Plan as **Drg. No. MEC/11/16/Q7EB/01 (Plate No. 01)**.

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

3.1 Date and reference of earlier approved MP/ SOM:

Not applicable

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

Not applicable

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

Not applicable

3.4 Give status of compliance of violations pointed out by IBM.

Not applicable

3.5 Indicate and give details of any suspension/closure/prohibitory order issued by any Government agency under any rule or Court of law:

Not applicable, since the lease application is fresh.

3.6 In case the MP/SOM is submitted under rules 9 and 10 of the MCDR'88 or under rule 17(3) of the MCR 2016 for approval of modification, specify reason and justification for modification under these rules:

Not applicable.

(S.R. Virsen, Mining Engineer)
(Qualified Person)

(S. Hareesh Babu, Mining Engineer)
(Qualified Person)

PART – A

1.0 GEOLOGY AND EXPLORATION

a) Briefly describe the topography, drainage pattern, vegetation, and climate and rainfall data of the area applied/mining lease area.

i. Physiographic & Drainage

The Devadari block is located in Devadari Range, Sandur Taluk, Bellary and falls within the latitude from 15° 01' 18"N to 15° 03' 43"N and longitude 76°34' 31"E to 76° 36' 12"E. The terrain elevation of the study area ranges between 720 m and 1000 m MSL. Physiography of the area is characterized by the elongated ridges trending NNW-SSE, which are similar to the regional tectonic trend. The western ridge is named as Ramandurga range and the eastern ridge is named as Donimalai range and the E-W trending South East extension of Ramandurga range is called Kumaraswamy range. The lease area of 470.40 ha is lying between M/s JSW Mines (VS Lad Mine) in the north and M/s BMM mine in the centre and Kumaraswamy Iron Ore Mine (NMDC) in the south.

There are no rivers or perennial streams in the lease area. The lease area is above the water table and only monsoon water has to be taken care. The utilisation of rain water will be planned during mine operation.

ii. Vegetation

The lease area falls under Swamimalai Block, Kumaraswamy reserve Forest Range. The tree species found within the core zone represent the common type of flora species along with small shrubs and bushes. Due to mining activities, community structure of the vegetation will not change. The impact on forest due to proposed mining is very minimal and the vegetation around the area is mixed open jungle of neither commercial nor medicinal value. With the provision of retention walls, garland drains and vegetation of dumped areas, there shall be reduction in soil erosion. This in turn will improve the natural vegetation by improving the species density.

The project authorities hope to reclaim majority of mining lease area with better environmental quality indices. Thus, the project shall ultimately contribute to the improvement of the environmental quality of the region.

iii. Climate & Rainfall of the Lease Area

The region has a tropical climate which lies on the border of semi-arid type of Bellary and Hospet, the climate is cooler than surroundings due to its elevation. This region receives approximately 750 mm of rainfall in general, but occasionally has seen more than 1000 mm of rainfall. The predominant rainy season in this area is between July and October. Rain also occurs occasionally in the months of November and January due to northeast monsoon. The maximum temperature is around 42^{0}C in summer while minimum temperature is around 15^{0}C in winter, which occasionally goes to as low as 6^{0}C.

b) Brief descriptions of Regional Geology with reference to location of lease/applied area.

Regional Geology

The Sandur Schist Belt is a spindle shaped doubly plunging synform covering an area of 960 sq.km. The main litho-units are of meta-volcanics represented by meta basalt, rhyolite and tuff (phyllite) and meta sedimentary represented by banded Haematite Chert +/ - magnetite and manganiferous phyllite. Well-

(S.R. Virsen, Mining Engineer)
(Qualified Person)

(S. Hareesh Babu, Mining Engineer)
(Qualified Person)

developed pillow structures in basaltic rocks have been identified in many parts of the area. The basin is known for its iron and manganese ore. The basin has recorded polyphase granitic intrusion.

The Regional Stratigraphic Succession given by Biswas and Roy (1976) is as follows:-

Laterite	
Dolerite and gabbro	
Pegmatite and quartz veins	
Equigranular grey and pink granite, Porphyritic grey and pink Granite, meta gabbro and meta dolerite, meta pyroxenite	Toranagallu and Anantapur granite (Closepet granite)
c)	
Shale and tuffaceous shale, bedded chert, meta- andesite, Meta-rhyolite and meta basalt	Nandihalli Formation
Banded ferruginous quartzite with inter bedded ferruginous Shale and meta basalt	Donimalai Formation
Phyllitc, tuffaceous phyllite, greywacke, micaceous quartzite Andalusite bearing argillite and conglomerate, mangano- Phyllite, ortho quartzite	Deogiri Formation
Meta basalt and rhyolite -	Yeshwantnagar Formation.
Bellary gneiss and Gargi gneiss	Pennisular Gnessic Complex. (Peninsular Gneiss)

c) Detailed description of geology of the lease area such as shape and size of the mineral/ore deposit, disposition various litho-units indicating structural features if any etc. (Applicable for Mining Plan for grant & renewal and not for Scheme of Mining/ Modifications in the approved mining plan/scheme of Mining).

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Geology of the Study Area

The detailed geological mapping has been carried out on 1:2000 scale for an area of 470.40 ha lying between M/S. JSW Mines in the north and M/S BMM mine in the south east and Kumaraswamy Range (NMDC) in the south. Detailed geological mapping, bed rock /random sampling have brought out three litho-units viz. meta basalt, banded haematite chert and ferruginous Shale/phyllite.

Local Stratigraphy at the Mining Block

In the study area of 470.40 ha, the litho units of Donimalai Formation are occurring: The stratigraphic sequence are as follows: the top most /youngest litho unit is the Banded Hematite Chert which is underlain by ferruginous Shale and Shale. The oldest/ lowermost unit is Meta basalt which is underlying the shale unit.

Banded Haematite Chert Band (BHC): It is reddish brown/blackish brown in colour and is traced continuously/discontinuously in the study area. The types of iron ore occurring in the area are lateritic/laminated/lumpy/ biscuity, fines and blue dust.

Shale/ ferruginous shale (Argillites): It is of fine grained compact clay without any fissility and with or without Fe content.

Phyllite: Phyllite shows silky sheen and probably derived from meta basalt and tuff.

Meta basalt: Meta basalt is the predominant litho unit occurring in the valleys and mid slopes. It is greenish in colour, hard and compact, fine grained rocks with chlorite (after pyroxene) and plagioclase feldspar, Meta basalt is often associated with carbonates and limonite (oxidized Sulphide).

The rock types of the Mining lease area, bounded by the pillars K-1 To K-30, is Banded Hematite Chert (iron ore bearing unit) , Argillites and Meta Basalt of Donimalai formation. Though the work scope indicates identification of manganese ore hosting units also, geologically, the manganese ore bearing units are a part of Deogiri formation, which are older to the Donimalai formation. Geological Survey of India (GSI) has reported some occurrences of manganese in the SE and SW of the mining lease area. The controls of mineralization of Manganese are both stratigraphic (Deogiri formation) and structural (fold closures & faults).

Soil Profile at the Mining Block

The soil profile development in the study area has a direct correlation with the underlying litho units. The soil development is very thin and a reddish coloured soil of maximum 20-30 cm thickness is developed over the Banded Hematite Chert bands. The soil profile is well developed over the Shale horizon (argillites) and the soil here is clay type. The soil profile over the Shale is more than 1m thick. In the valley portions, occupied by Meta basalt, development of limonitic soil is observed which is spread over the valleys and mid slopes. In Meta basalt, the soil profile is moderately developed.

The Strike Length of the BHC Bands:

The study area consists of two block viz. North and South. The North block consists of three BHC bands viz. N1, N2 & N3.

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N2 & N3 are mineralised and having a strike length of 1600 meters each.

South block consist of 6 BHC bands viz. S1, S2, S3, S4, S5 & S3a.

North Block: Northern part (Just South of VS Lad Mine):

Sample nos. DK-20 to DK-28: Strike of the BHC bands is of N 20 W-S 20 E with a dip amount of 60° to 80° towards easterly. Strike length is of 300 m and represented by 9 samples. These samples are falling in the northern most part of the north block and the range of Fe (total) is of 24.29 to 35.79%. Since the values are of less than 45 % of Fe (total), it is of non-mineralized BHC Band.

North Block: Southern part:

The strike length is of 1600 m for mineralized western band (N3). Strike of the bedding is of N20W-S20E with a dip amount of 60° to sub-vertical. A total of 30 samples have been collected from the Central (N2) and Western (N3) BHC Band. The Strike length of Central BHC Band is of 1600 m. The samples collected from this block are of DK-11 to 19 (9 Samples), DK-29 to DK-39 (11 Samples) and DK-40 to 49 (ten samples). Four samples of Western BHC band have given a range of 57.58% to 65.58 % of Fe (t) and one sample has given 39.39% of Fe (t). Four samples of central band has given 35.19, 40.99, 48.49 and 53.88 Fe (t). Northern part of N2 for a strike length of 1000 meters has given above 45% Fe and designated as Hard Lumpy Ore (HLO).

From south to north 11 samples of central band (N2) (DK-29 to DK-39) have given a range of 38.59 to 65.78 with an average of 49.53 % of Fe (t). (The values of DK-29 and DK-30 are ignored because high values shown from trench and borehole core samples of GSI).

Ten samples (DK-40 to DK-49) were collected from the western band (N3) and have given Fe (t) with an average of 62.9 % and are of SLO.

SOUTH BLOCK: (SOUTH OF BMM MINES)

This block consists of 6 bands viz. S1, S2, S3, S4, S5 and S3a.

The area falls south of boundary pillars K-13 and K-14 & east and north east of boundary pillar K-11 and K-12.

Band S1: This is having a strike length of 500 m with a width of 50 m. Sample No. DK1 & DK2 have given 64.58 to 68.08 % Fe (t). Southern part has given <45% Fe (t) and designated as Hard Lumpy Ore (HLO) and Hard Ore (H).

Band S2: Sample no. DK-56 has given (soil + float ore) 27.11 % of Fe (t) and 32.52 % of SiO_2. Nine samples from band S2 (DK-57 to DK-65) have shown an average Fe (t) content of 58.67 %. These nine samples are part of the S2 BHC band. The Samples DK-66 to DK-70 and DK-71 to DK-75; a total of 10 samples were collected on a profile perpendicular to the strike of the band, (as being done in a trench sampling) and have given an average of 64.44 % of Fe (t). The strike length of the mineralized BHC band is of 1000 m with a width of 50 m (to know the exact widths of the outcrop, a number of trenches are recommended over the band).

Tentative ore resource is of 1000 m (SL) * 50 m (Width) * 70 m (Depth) * 3 (Sp. Gr) and the tentative reserve is of 21,00,000 tones.

Band S3: Sample number DK-84 to DK-96, 13 samples collected from south and south west and south east of BMM mines have given good values ranging from 58.98 to 66.08 % of Fe (t). Average Fe (t) content for the 13 samples is of

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59.20 %. DK-76, DK-77, DK-81 and DK-83 have shown <40 % of Fe (t) and lying between southern edge of the S2 BHC band and BMM mines. Strike length of the mineralised BHC band is of 300 m with a width of 145 m (to know the true width of the BHC band, trenches are recommended).

The tentative ore resource is of 300m (SL) *145 m (Width) *70 m (Depth) *3 (Sp. Gr) and the tentative resource is of 91,35,000 tonnes (9.135 million tonnes)

Remaining samples viz. DK-78, 79, 80 and 82 are showing +45 % of Fe (t) and lying near southern edge and close to the valley. These values are falling on the Band S3a and the extension band S3a can be probed by trench /drilling.

Band S4 (Old Workings for Manganese)

The sample no DK 101 to DK 105 has given 48.39 to 62.38 with an average of 54.36% Fe (t) and is of Soft Laminated Ore (SLO). The BHC band designated as S4 is running for a strike length of 300 m, width of 40m and depth of 50m with a specific gravity of 3. The tentative resource is of 18,00,000 tones and the ore is of Soft Laminated Ore.

Western Most Bands (Band S5):

Band S5 is a hard BHC band and resource is not estimated. South Western part of the area, six samples (DK-51 to DK-55) were collected and have shown a range of 19.79 to 42.59, Fe(t) and Manganese content with a range of 0.38 to 5.56%. DK-50 has shown Fe (t) 33.59 %, SiO2 39.41%, and Mn content is of 3.42 %. Manganese ore is mostly associated with Deogiri Formation (controlled by stratigraphy & our study area falls under Donimalai Formation which is known for iron ore mineralization only). Structurally controlled manganese is reported by GSI(Flexures along the faults and folds) in the southwest and south east of the area(away from the study area).The sample no DK 50 to 54 falls on S4 band extension and sample no.DK 55 and 56 fall on S5 band extension in the southern most part.

Band S3a is a small band with Soft Laminated Ore (SLO). On the road cutting, 300m north, this same band is exposed with a width of 60m plus of laminated ore. Road cutting is at a RL of 30 to 40m below our study area. Therefore the northern extension of S3A is seen at a lower RL. Extension of S3a onto our study area, may be a blind zone in our study area which is probably buried and lying at a depth of 30m to 40m or more.

The effects of Faulting (Dextral type) and high displacement would have resulted in the occurrence of the hidden ore body of S3a on its northern extension for a strike length of 300 m. (road is constructed through the displacement).

Float ore is seen west of S2 band. Thus, altogether, a total of 6 bands including S3a in south block and 3 bands in north block were delineated by detailed geological mapping.

The reserve of float ore occurring in the mining lease spread over northern, central and southern blocks.

Occurrences of Float Ore

On the basis of Geological mapping the surface out crops of float ore zones have been demarcated in the ML area. In the South block the float ore zone has been mapped in the east and west of S3 band at a level of 1020 mRL to 960 mRL. In the North Block the float ore zone has been demarcated to the East

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and west of N3 band. The iron ore float zone has been found to be occurring at 900-830 mRL. The float ore zones have been shown in Geological plan i.e. **Drg. No. MEC/11/16/Q7EB/03 (Plate No. 03)**.

Structure:

The hill ranges in the study area trend in NNW-SSE direction, which is similar to the regional tectonic trend. The area has under gone two phases of deformation [F1 and F2]. The axial trace of F1 have NNW-SSE trend which defines the geomorphology of the area and is refolded by open type F2 folds trending ENE-WSW. The primary structure of banded iron ore formation is bedding and pene-contemporaneous faults. The repetitions of iron ore bands, which cause the thickening of ore at places, are due to diastrophic folds.

The study area, in particular, forms part of the eastern limb of the synform (F1) with axial plane trending NNW-SSE direction. The strike is of NNW-SSE with dips of about 50 ° to 80 ° Easterly. This major synform is referred as Sandur-Donimalai syncline. This syncline shows structural closure to the south near Devagiri, i.e. further south of the study area. Repetition of mineralized BHC shows the folded nature and is also faulted. Faulting has cut across central and western band.

There are evidences of faulting in the central and southern part of the lease area, and as a result of the faulting the BHC bands are evidently displaced. The fault plane in the central part trends in ESE-WNW direction, with a relative strike slip displacement of about 240m. The fault plane in the central portion is marked F1-F1.

The fault in the southern part trends NE-SW direction, and has a relative strike slip displacement of about 90 meter. This fault plane is marked F2-F2.

Metamorphism:

The rocks of this area have undergone a low grade green schist facies of metamorphism.

d) Name of Prospecting /Exploration Agency:

i. Geological Survey of India has carried out the exploration work in Devadari Block.

Address:

Head of the Department,
Airborne Mineral Survey & Exploration Wing,
GSI Complex, Vasudha Bhavan,
Kumaraswamy Layout,
Bangalore-560078 Karnataka
Tel: (080)26662881, 26662564, 26662594
Fax 080-26662595

Email: hod.amse@gsi.gov.in

ii. MECON Limited has carried out detailed Geological mapping, surface sampling and analysis for Iron (Fe) and Manganese (Mn) content for Devadari Block. The location of the surface sampling are demarcated in the Geological Plan (Plate No. 03).

Address:

MECON Limited (A Govt. of India Enterprise),

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Doranda, Ranchi – 834002, Jharkhand.
Tel: 5061 – 2483645, 2483441
FAX: 0651 - 2482189, 2482214
e-mail: mining@meconlimited.co.in

e) Details of prospecting/exploration already carried out:

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

In North block, 112 nos. of trench samples have been collected by GSI by putting eight numbers of trenches (Plate-3-10) amounting 258.50 cu.m. across the western (N3) and central band (N2) of the study area. In western band, 52 nos. of trench samples were collected by putting three trenches (TR-1, 7 and 8) amounting to 136 cu.m. and in central band, 60 nos. of trench samples were collected by putting five trenches (TR- 2, 3, 4, 5 and 6) amounting to 122.50 cu.m. for analysis.

The analytical results for Fe (t) is corroborates with core sample analysis and enclosed as *Annexure-10.*

Bulk Density Determination Studies

The bulk density of iron ore has been considered 3 t/m^3 by GSI for the purpose of reserve estimation.

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

Drilling

On the basis of bedrock and trench sample values a total of 678.45m drilling has been achieved in the study area falling on the western and central BHC band (Plates11-19 of GSI Report attached as *Annexure-9*). The detailed litholog, summarized litholog and analytical results of the core samples are given in Annexure-III, IV and V respectively in GSI Report attached as *Annexure-9.* Summary of the drilling activity undertaken in this block is given below Table.

Table -05: Summary of the Drilling Activity

Sl. No.	BH No.	From	To	Depth	Date of Comm.	Date of Closer	R.L. of Collar	Remarks
		(in meters)						
1	NB-1	0.00	73.15	73.15	03.06.06	30.08.06	907.80	Abandoned at 42.50m
2	NB-1A	0.00	42.50	42.50	16.09.06	15.11.06	926.10	Abandoned at 38.10m
3	NB-1B	0.00	38.10	38.10	24.11.06	01.03.07	925.60	
4	NB-1C	0.00	80.10	80.10	24.03.08	28.06.08	925.00	
5	NB-2	0.00	60.00	60.00	19.07.07	23.08.07	888.70	
6	NB-2A	0.00	57.30	57.30	03.05.07	05.07.07	877.10	
7	NB-3	0.00	77.70	77.70	03.09.07	05.11.07	863.00	
8	NB-4	0.00	67.50	67.50	31.12.07	13.02.08	881.60	
9	NB-5	0.00	73.30	73.30	18.08.08	01.11.08	899.90	
10	NB-6	0.00	55.00	55.00	23.06.0	30.07.0	887.60	
11	NB-7	0.00	53.80	53.80	19.07.0	29.08.0	903.90	

iii) Details of samples analysis indicating type of sample (surface/sub-

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surface from pits/ trenches/ borehole etc.) Complete chemical analysis for entire strata for all radicals may be undertaken for selected samples from a NABL accredited Laboratory or Government laboratory or equivalent. Entire mineralized area may be analyzed metet wise with 10% of check samples. (At least for 10% of total samples may be analyzed in accordance to BIS and reports from NABL accredited/other government laboratory).

The analytical result of 11 no. of boreholes and 112 nos. of trench samples carried out in Northern block by GSI is attached as annexure in GSI report.

The recent field sampling activities involved collection of 105 no. of random bedrock samples. Sampling details are as follows:

The 105 samples were numbered as DK-1 to DK-105. (Donimalai- Kudremukh). The samples DK-3 and DK-4 were collected between boundary pillars K-13 and K-14, and are falling just outside the lease area by 20 meters. Many of the high Fe value are on the BHC bands. Some isolated samples have given value due to folding. DK-78, 79, 80, 82 have given high Fe values. These values falling on S3a band and on the strike direction, at a distance of 300 m north, these soft laminated ore (SLO) crops out on the road cutting indicates a blind zone. Due to folding (digitization) and faulting these 4 isolated in situ BHC sample have given high values of Fe.

Methodology:

The samples were analyzed as per test protocol IHM 01 /W1 01 for total Iron as Fe%, and for Al2O3% as per test protocol IHM 01 /W1 03 and for Mn% IHM 01 /W1 05. The standard test protocol IS:1493 (part1)-1981(reaffirmed 2011) was followed for analysis of Silica. The chemical analysis was done at NABL accredited laboratory of SGS India Pvt. Ltd., Hospet, Karnataka. The details are attached at annexure-10.

Percentage of SiO_2, Al_2O_3 and Mn

Samples were also analyzed for SiO_2, Al_2O_3 and Mn for better evaluation of grade of the ore. The litho units in the mine lease area belong to Donimalai Formation, which are devoid of known occurrence of manganese (as the Mn ore occurrence is known to occur in Deogiri Formation, which is stratigraphically older formation to that of Donimalai formation). Manganese occurrence reported by GSI in the valley portion is within Donimalai Formation. Due to structural control (folding, faulting and flexuring), considerable amount of manganese is reported. Five samples were selected from the old working just south of BMM mines and another six from further south of old working in order to understand occurrence of Manganese. The samples were analysed for Mn and found to have the presence of Mn.

iv) **Expenditure incurred in various prospecting operations.**

With the consent of GSI the exploration report has been obtained by KIOCL. The relevant communication regarding this is enclosed as *Annexure – 9A*.

f) **The surface plan of the lease area may be prepared on a scale of 1: 1000 or 1: 2000 with contour interval of maximum of 10 m depending upon the topography and size of the area duly marked by grid lines showing all features indicated under Rule 31 of MCDR 2017.**

The surface plan of Devadari Iron Ore Mine in the scale of 1: 4000 is enclosed as **Drg. No. MEC/11/16/Q7EB/05 (Plate No. 05).**

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g) **For preparation of geological plan, surface plan prepared on a scale of 1: 1000 or 1: 2000 scale specified under para 1.0 (f) of Part A of the format may be taken as the base plan. The details of exploration already carried out along with supporting data for existence of mineral, locations proposed exploration, various litho-units along with structural features, mineralized/ore zone with grade variation if any may be marked on the geological plan along with other features indicated under Rule 31 of MCDR 2017.**

The geological plan on the scale of 1:4000 is prepared based on the exploration report prepared by GSI and geological mapping carried out by MECON and the same is enclosed as **Drg. No. MEC/11/16/Q7EB/03 (Plate No. 03).**

h) **Geological sections may be prepared on natural scale of geological plan at suitable interval across the lease area from boundary to boundary.**

The geological sections prepared by GSI are enclosed in the GSI Report. The geological sections have been re-constructed on the basis of grade of iron ore and the same has been utilized for computerized orebody modeling and reserve estimation. The geological sections thus prepared are shown in the **Drg. No. MEC/11/16/Q7EB/04 (Plate No. 04)**.

i) **Broadly indicate the future programme of exploration with due justification (duly marking on Geological plan year wise location in different colors) taking into consideration the future tentative excavation programme planned in next five years.**

All proposed boreholes are coring types. A total of 141 boreholes with an average depth from 30m to 120m with a total drilling meterage of 8,060 m (6,490 m core drilling and 1,570 m RC drilling) are proposed during the plan period (1st and 2nd) of exploration at 100m x 100m grid interval programmed to prove the presence of mineral reserves in lease hold area under G1 level category.

The details of the proposed boreholes are as follows:

Table -06

Year	BH ID	Coring/ Non Coring	Easting	Northing	Elevation (m)	Proposed Depth (m)	Angle (due west)
1st Year	PBH01	Coring	671700	1661500	792	30	90
	PBH02	Coring	671658.7	1661400	740	50	75
	PBH03	Coring	1661400	1661500	765	70	75
	PBH04	Coring	671577.4	1661400	755	50	75
	PBH05	Coring	671100	1661800	895	30	90
	PBH06	Coring	671200	1661800	912	40	75
	PBH07	Coring	671300	1661800	925	80	75
	PBH08	Coring	671400	1661800	945	30	90
	PBH09	Coring	671800	1661900	975	30	90
	PBH10	Coring	671700	1661900	940	70	75
	PBH11	Coring	671600	1661900	923	50	75
	PBH12	Coring	671500	1661900	940	120	75
	PBH13	Coring	671400	1661900	961	100	75
	PBH14	Coring	671300	1661900	947	100	75

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PBH15	Coring	671200	1662000	925	80	75
PBH16	Coring	671100	1662000	904	30	90
PBH17	Coring	671000	1662000	881	30	90
PBH18	Coring	671100	1662000	915	70	75
PBH19	Coring	671200	1662000	947	60	75
PBH20	Coring	671300	1662000	970	80	75
PBH21	Coring	671400	1662000	995	100	75
PBH22	Coring	671500	1662000	970	50	75
PBH23	Coring	671600	1662000	954	60	75
PBH24	Coring	671700	1662000	975	90	75
PBH25	Coring	671800	1662000	967	100	75
PBH26	Coring	671900	1662000	963	110	75
PBH27	Coring	672000	1662000	985	120	75
PBH28	Coring	672100	1662000	967	60	75
PBH29	Coring	672000	1662100	975	50	75
PBH30	Coring	671900	1662100	1000	100	75
PBH31	Coring	671800	1662100	1005	70	75
PBH32	Coring	671700	1662100	1000	40	75
PBH33	Coring	671600	1662100	994	90	75
PBH34	Coring	671500	1662100	1000	60	75
PBH35	Coring	671400	1662100	1005	40	75
PBH36	Coring	671300	1662100	995	100	75
PBH37	Coring	671200	1662100	960	60	75
PBH38	Coring	671048.8	1662100	905	60	75
PBH39	Coring	671300	1662200	1016	50	75
PBH40	Coring	671400	1662200	1010	60	75
PBH41	Coring	671500	1662200	1005	90	75
PBH42	Coring	671600	1662200	1005	100	75
PBH43	Coring	671700	1662200	1003	110	60
PBH44	Coring	671800	1662200	1002	120	60
PBH45	Coring	671900	1662200	985	60	60
PBH46	Coring	671900	1662300	948	80	60
PBH47	Coring	671800	1662300	993	60	60
PBH48	Coring	671700	1662300	1008	100	60
PBH49	Coring	671600	1662300	1010	80	60
PBH50	Coring	672000	1662400	862	120	60
PBH51	Coring	671900	1662400	910	100	60
PBH52	Coring	671800	1662400	955	80	60
PBH53	Coring	671700	1662400	1007	50	60
PBH54	Coring	672000	1662500	818	75	75
PBH55	Coring	671900	1662500	860	100	75
PBH56	Coring	671800	1662500	925	80	75
PBH57	Coring	671675.4	1662500	1005	55	60
PBH58	Coring	671900	1662600	855	50	75

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PBH59	Coring	671800	1662600	915	100	75
PBH60	Coring	671700	1662600	973	90	75
PBH61	Coring	671614	1662601	1005	65	75
PBH62	Coring	671800	1662700	877	40	75
PBH63	Coring	671699.9	1662701	935	65	75
PBH64	Coring	671574.2	1662700	973	65	75
PBH65	Coring	671700.4	1662800	885	65	75
PBH66	Coring	670863.9	1663232	918	60	75
PBH67	Coring	670792.3	1663299	920	60	75
PBH68	Coring	670793.4	1663500	909	50	75
PBH69	Coring	670700	1663600	880	40	75
PBH70	Coring	670700	1663900	890	60	60
PBH71	Coring	1664000	1664099	890	70	75
PBH72	Coring	670300	1664100	850	30	90
PBH73	Coring	670200	1664400	890	75	75
PBH74	Coring	670117.3	1664600	892	75	60
PBH75	Coring	670025.2	1664600	890	75	60
PBH76	Coring	669999.9	1664800	840	75	75
PBH77	Coring	669900.1	1664800	822	70	75
Sub Total					**5430**	
RC-1	Non Coring (RC)	671200	1663000	850	50	90
RC-2	Non Coring (RC)	671200	1663200	780	40	90
RC-3	Non Coring (RC)	671200	1663400	861	40	90
RC-4	Non Coring (RC)	671200	1663600	712	20	90
RC-5	Non Coring (RC)	671000	1663050	940	50	90
RC-6	Non Coring (RC)	671000	1663200	910	50	90
RC-7	Non Coring (RC)	671000	1663400	826	40	90
RC-8	Non Coring (RC)	671000	1663600	830	40	90
RC-9	Non Coring (RC)	671000	1663800	785	40	90
RC-10	Non Coring (RC)	670800	1664000	794	50	90
RC-11	Non Coring (RC)	670600	1664200	826	50	90
RC-12	Non Coring (RC)	670400	1664400	840	50	90
RC-13	Non Coring (RC)	670200	1664600	859	50	90
RC-14	Non Coring (RC)	670200	1664800	760	40	90
RC-15	Non Coring (RC)	670000	1665000	826	50	90
RC-16	Non Coring (RC)	670000	1665200	812	50	90
RC-17	Non Coring (RC)	670000	1665400	707	30	90
RC-18	Non Coring (RC)	670000	1665600	770	40	90
RC-19	Non Coring (RC)	669800	1665400	760	20	90
RC-20	Non Coring (RC)	669800	1665200	800	30	90
RC-21	Non Coring (RC)	669800	1665000	745	30	90
RC-22	Non Coring (RC)	669800	1664800	795	30	90
RC-23	Non Coring (RC)	669800	1664600	835	40	90
RC-24	Non Coring (RC)	669800	1664400	765	30	90

(S.R. Virsen, Mining Engineer)
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	RC-25	Non Coring (RC)	669800	1664200	789	30	90
	RC-26	Non Coring (RC)	669600	1664480	683	20	90
	RC-27	Non Coring (RC)	669600	1664600	720	30	90
	RC-28	Non Coring (RC)	669600	1664800	679	20	90
	RC-29	Non Coring (RC)	669600	1665000	705	20	90
	RC-30	Non Coring (RC)	670000	1664200	769	30	90
	RC-31	Non Coring (RC)	670000	1664400	772	40	90
	RC-32	Non Coring (RC)	670600	1663400	829	40	90
	RC-33	Non Coring (RC)	670600	1663200	799	30	90
	RC-34	Non Coring (RC)	670400	1663200	727	30	90
	RC-35	Non Coring (RC)	670800	1663050	885	50	90
	RC-36	Non Coring (RC)	670600	1662800	761	30	90
	RC-37	Non Coring (RC)	670600	1662400	796	40	90
	RC-38	Non Coring (RC)	670800	1662200	852	50	90
	RC-39	Non Coring (RC)	670800	1662000	745	30	90
	RC-40	Non Coring (RC)	670600	1661800	692	20	90
	RC-41	Non Coring (RC)	671800	1662800	827	20	90
	RC-42	Non Coring (RC)	670200	1664000	745	20	90
	RC-43	Non Coring (RC)	670400	1663800	762	20	90
	RC-44	Non Coring (RC)	670400	1663600	701	20	90
	RC-45	Non Coring (RC)	670400	1663400	732	20	90
	Sub Total					**1570**	
	Total 1st Year					**7000**	
2nd Year	PBH78	Coring	669963.9	1664700	875	55	75
	PBH79	Coring	670052.5	1664700	850	50	60
	PBH80	Coring	670000.2	1664500	888	30	90
	PBH81	Coring	670081.8	1664500	893	75	75
	PBH82	Coring	670181.3	1664499	894	75	75
	PBH83	Coring	670278.6	1664400	895	75	75
	PBH84	Coring	670129.4	1664300	875	30	90
	PBH85	Coring	670220	1664300	890	70	75
	PBH86	Coring	670355.3	1664300	903	50	75
	PBH87	Coring	670400	1664200	903	50	75
	PBH88	Coring	670500	1664200	885	65	75
	PBH89	Coring	670500	1664000	880	75	60
	PBH90	Coring	670629.3	1664002	890	75	60
	PBH91	Coring	670597.5	1663800	875	40	60
	PBH92	Coring	670679.1	1663701	880	40	75
	PBH93	Coring	1663600	1663700	905	50	75
	PBH94	Coring	670800	1663600	907	50	75
	PBH95	Coring	670950.8	1663498	855	50	75
	PBH96	Coring	670850.1	1663300	915	55	75
	Total 2nd Year					**1060**	
	Total Drilling					**8060**	

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In addition to the above, trial pits of dimension 4m (Length) × 4m (Width) × 2m (Depth) have been proposed in the float ore zone for depth confirmation of float ore in the hill slopes. The Trial pits have been shown in the Geological plan (**Plate No. 03**).

Table -07

Trial Pit No.	Easting	Northing	Dimension (L×W×D)
TP1	669932.9586	1664760.0928	4m×4m×2m
TP2	669948.0198	1664441.5471	4m×4m×2m
TP3	670384.4730	1664150.9037	4m×4m×2m
TP4	671487.9678	1662256.3871	4m×4m×2m
TP5	671638.8584	1662051.4816	4m×4m×2m
TP6	671322.2292	1662003.8474	4m×4m×2m

Categorization of Reserve:

G2 Category:

A northern part of the lease area has been explored by 11 no.s of coring boreholes and 8 no.s of trenches by GSI. The grade of the ore in coring boreholes has been systematically analysed at 1 meter interval and the grade of the ore has been ascertained. So, the depth of the ore encountered in these boreholes has been considered as proved category. Thus, the reserve arrived has been categorized under G2 category.

G4 Category:

The areas covered under geological mapping at 1:2000 scales and random surface sampling and analysis for Fe content has been covered under G4 category. These areas include additional mineralised BHC bands of northern and mineralised BHC bands of southern side.

j) **Reserves and Resources as per UNFC with respect to the threshold value notified by IBM may be furnished in a tabular form as given below: (Area explored under different level of exploration may be marked on the geological plan and UNFC code for area considered for different categories of reserve/resources estimation may also be marked on geological cross sections). Submit a feasibility/pre-feasibility study report along with financial analysis for economic viability of the deposit as specified under the UNFC field guidelines may be incorporated.**

On the basis of 11 nos. of drill holes and 8 nos. of trenches amounting to 258.50 cu.m. detailed sampling and analysis, GSI has estimated 8.20 Mt of iron ore reserve at 45% Fe cut-off for the northern part of lease hold area.

The details of reserve estimated by GSI are as follows:

Table -08

Mineralised Band	Reserve with grade (tones /percentage)		
	45 % cut-off	50 % cut-off	55 % cut-off
WESTERN			
1C	29,44,080 / 57.36	24,36,480 / 59.36	17,25,840 / 62.36
2A	5,07,276 / 57.05	4,24,116 / 58.58	3,03,534 / 61.09
3	3,16,463 / 58.09	3,03,413 / 58.46	2,25,113 / 60.53
4	70,470 / 46.41	-	-

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5	6,82,440 / 51.95	5,27,340 / 53.63	3,41,928 / 59.50
6	11,03,678 / 65.56	11,03,678 / 65.56	10,62,901 / 66.16
Total	**56,24,407 / 56.07**	**47,95,027 / 59.12**	**36,58,508 / 61.93**
CENTRAL			
2	7,36,313 / 62.05	6,51,[illegible] / 63.65	6,12,256 / 64.12
7	7,06,359 / 55.66	5,89,584 / 59.05	3,94,049 / 58.88
1	6,51,420 / 57.90	6,09,543 / 60.23	5,67,829 / 60.88
1A	4,87,014 / 59.08	4,87,014 / 59.08	4,55,994 / 59.61
TOTAL	**25,81,106 / 58.67**	**23,37,272 / 59.98**	**20,59,126 / 60.87**
Band wise			
Western	**56,24,407 / 56.07**	**47,95,027 / 59.12**	**36,58,508 / 61.93**
Central	**25,81,106 / 58.67**	**23,37,272 / 59.98**	**20,59,126 / 60.87**
Total	**82,05,513 / 57.37**	**71,32,299 / 59.55**	**57,17,634 / 61.40**

Reconnaissance Category

The recent field study through topographical contour survey, detailed geological mapping at 1:2000 scales and random surface sampling including analysis for Fe content reveals the possibility of additional resource potential for the leasehold area. Some additional mineralised BHC bands in northern part and mineralised BHC bands of southern side were identified during detailed geological mapping. The details of reserve for the additional mineralised bands estimated are as follows:

North Block:

Additional resource in reconnaissance category (334) from N2 mineralised BHC band for a strike length of 1000metres (1600m-400m), Width 20m, Depth 30m,and specific gravity 3 is 18,00,000tonnes.

South Block: (around BMM mines)

1. Band S1: 500m*35m*40m*3= 21,00,000 tones. (2.1 million tons)
2. Band S2:1000m*50m*70m*3=1,05,00,000tonnes (10.5 million tons)
3. Band S3:300m*145m*70 m*3=91,35,000tonnes. (9.135 million tons)
4. Band S4:300m*40m*50m*3=18,00,000 tones. (1.8 million tons)
5. Band S5 Hard non mineralised band.

The total additional resource in reconnaissance category (334) estimated from south block is 2,35,35,000 tones.

The total additional resource of North and South block under reconnaissance category (334) is estimated to be 253,35,000 tonnes (25.335 mt).

Reassessment of Resources through Ore Body Modeling

The reserve/resource assessment was carried out in the Mine Planning software package "GEOVIA SURPAC". The following were utilized as basic input data for the preparation of geological model:

Parameters considered for estimation of Mineral Resources

(a) The threshold value considered as per the IBM guidelines is 45% Fe.

(b) The entire data has been being transferred to form a geological database in an ore body modeling software namely 'SURPAC'.

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(c) The basic data has been derived from the exploration report of GSI (*Annexure-9*)

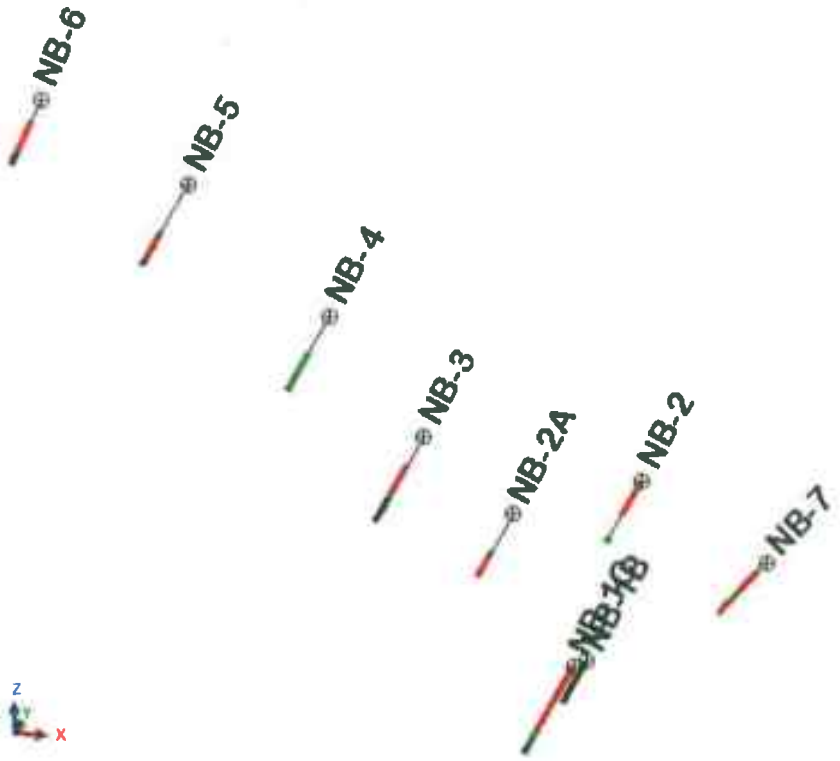
a. Preparation of Database

Four basic files namely collar, survey, assay and litho files are required in Comma Separated Value (CSV) format for further processing by SURPAC Software. On the basis of cut-off database preparation is given below. The borehole database has been prepared considering the following boreholes:

Table -09

BHID	Northing	Easting	Collar RL (m)	Total Depth Depth (m)
NB-1C	1663367.74	670777.8	925	80.1
NB-1B	1663373.95	670786.71	927	38.1
NB-2	1663799.085	670735.4221	888.7	56.5
NB-2A	1663743.264	670645.3894	877.1	57.3
NB-3	1663903.88	670537.98	863	77.7
NB-4	1664072.12	670426.25	881.6	67.5
NB-5	1664255.43	670272.61	899.9	73.3
NB-6	1664417.23	670119.12	887.6	55
NB-7	1663632.74	670871.47	903.9	53.8

A total of 346 borehole samples have been considered as assay analysis and litholog analysis for interpretation of ore geometry.



Boreholes plotted in 3-D graphics window of SURPAC

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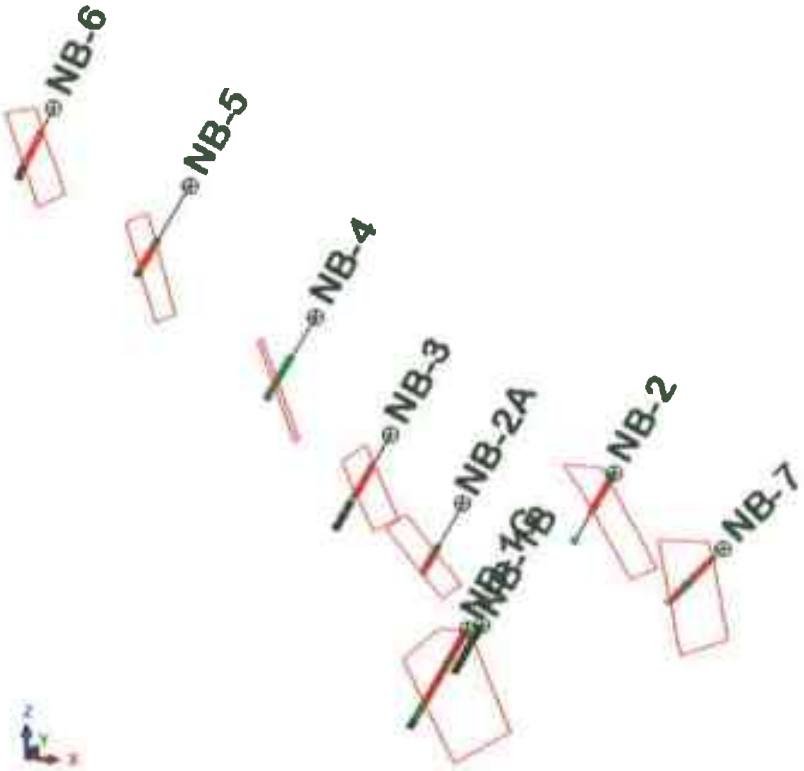
(Qualified Person)

b. Delineation of Ore Geometry and Construction of Ore Body

Preparation of Transverse Sections

Boreholes were displayed in SURPAC graphics window along with litho, Fe%, SiO_2% & Al_2O_3%. 7 nos. of transverse sections were extracted from 1663350N to 1664423N in the strike direction. Threshold value of 45% Fe has been considered while constructing the ore sections. The grade type-wise envelopes were delineated at each section considering the continuity of mineralisation, lithology, structure and other geological features. Length of influence for extrapolation of the section has been considered on the basis of thickness of ore in neighboring boreholes.



Ore body delineated in transverse sections in graphics window of SURPAC

Preparation of Digital Terrain Model (DTM) of Surface Topography

The digitized contour of updated surface plan with Z values have been transformed into digital terrain model (DTM) utilising the principle of triangulation and wire framing of points with X, Y and Z co-ordinates. Digital terrain model is the most effective way of representing a surface in three dimensional computerised forms. It is an important tool to calculate volume between two or more surfaces. The digital terrain model of surface topography with drill holes of Devadari Iron Ore Mines is shown in the figure below:-

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(Qualified Person)

Digital Terrain Model (DTM) of Surface Topography

3-D Solid Modeling of Ore Body

The grade-wise ore zones of the respective transverse cross sections have been connected/ joined to form grade-wise solid ore body models. Ore type-wise 3-D solid model of Devadari iron ore deposit is presented in the figure below:-

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(Qualified Person)

Grade-wise three dimensional solid model

c. Block Modeling

The entire deposit is divided into no. of judiciously chosen sub-blocks for proper estimation of grade and quantity, keeping in view of the structural discontinuity of the deposit, extent etc. The estimated blocks in the block model has been used for optimum pit generation, mine planning and production scheduling.

- Selection of Block Size

  Considering the accuracy desired, borehole spacing and mining constraints, a unit block of 10 m x 10 m x 5 m and subsequently sub blocking of unit block of 2.5m x 2.5m x 1.25 m has been selected for block wise grade estimation.

- Development of Block Model

  In order to cover the entire extent of Devadari iron ore deposit in three dimensions, a dummy block model with unit block sizes as indicated above have been generated. An un-constrained dummy block model is shown in the figure below:-

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Block Model constrained by 3-D ore body

- Addition of Attributes

  Attributes are the properties of individual block such as Fe, SiO_2, Al_2O_3, specific gravity, litho code etc. These attributes were added in the dummy block model using suitable technique.

- Application of Constraints

  Constraints are the logical combination of spatial operators and objects such as DTM of surface contour, solid model of ore zone, block etc. with which the block model can be enveloped/ intersected with respect to inside/ outside and above/ below their spatial position. The block model developed for Devadari iron ore deposit has been constrained with the surface DTM with updated pit positions, mining lease boundary, statutory safety barriers, individual quarry boundaries as well as ore type-wise 3-D solid models as developed and discussed in the preceding paragraphs. In

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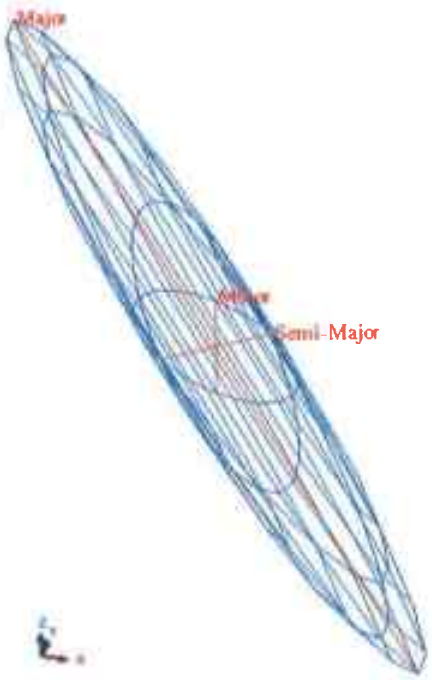
this way, the blocks have been developed within ore zone boundary and surface topography for the purpose of grade interpolation and reserves estimation.

- Block Model Estimation

Block model estimation parameters such as anisotropic ratio, search distances etc. were derived from the results of variogram analysis. Devadari iron ore deposit is uniform in mineralisation. It is not erratic in behaviour. Hence, the globally accepted technique of Inverse Square Distance (ISD) method has been used for ore reserve estimation. The parameters for reserve estimation have been derived from the statistical and geo-statistical analysis done previously. A search ellipsoid as indicated below has been used to select samples for assigning grade to the blocks. The axial parameters and its search orientation were derived from the results of geo-statistical analysis.

Ellipsoid Visualiser



The Specific gravity of 3.0 has been considered as tonnage factor for computation of ore reserves. The same specific gravity has been considered by GSI for resource estimation purpose.

On the basis of UNFC guidelines the iron ore resources can be categorized on the basis of different levels of exploration as under:

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Table 10

Level of Exploration	Resources in million tons	Grade (Fe%)
G1-Detailed exploration	NIL	NIL
G2-Generalexploration	7.47	58.04%
G3-Prospecting	NIL	NIL
G4 – Reconnaissance	25.33	+45%

The area under exploration under UNFC category

Justification of UNFC Classification

Indicated Mineral Resources (332)

The area has been explored by GSI by means of detailed mapping (1:2000), chip sampling, trenching and drilling at a borehole interval of 200m. A total of 1 sq km of detailed mapping, 81 nos. of chip/bedrock samples, 270 cu m of trencing with 131 nos. of trench samples and 678.45 m of drilling with 417 no. of core sampling were carried out by GSI. On the basis of the level of exploration the area explored can be categorized into G2 category.

The resources estimated through orebody modeling have been taken into consideration the borehole and exploration data as basic inputs. Hence the resources established through orebody modeling has been categorized under Indicated Mineral Resources (332) category.

a. Probable Mineral Reserves (122)

A Pre-Feasibility study has been carried out considering the mineable reserve of the deposit. The Pre-Feasibility Report (PFR) has been enclosed as *Annexure-12*. The salient financial indices of the Pre-FR is as under:

Table -11

Salient financial indices

Sl.No	Index	Unit	Value
1.	Cumulative Profit After Tax (PAT) over 10 years of operation	Rs. Crores	482.3
2.	Average Profit After Tax (PAT) per year over 10 years of operation	Rs. Crores	48.2
3.	Cumulative cash surplus over 10 years of operation	Rs. Crores	500.5
4.	Break even capacity		
	Conventional	%	53.2
	Cash	%	35.5
5.	Internal rate of return (post tax)	%	14.7
6.	NPV @10% discount rate (post tax)	Rs. Crores	149.8
7.	Debt service coverage ratio		1.6
8.	Payback period	Years	7.6

Considering the PFR, the mineable reserves (>55% Fe) falling under G2 category have been categorized as Probable Mineral Reserves (122).

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b. Pre-Feasibility Mineral Resources (222)

The part of mineral blocked in statutory barriers & ultimate pit slopes falling under G2 category has been considered as Pre-Feasibility Mineral Resources (222).

The details of the reserves/ resources established at 45% Fe cut off for Devadari iron ore block is given in table below:

Table -12

Resource type	Total tonnage at cut-off (+45% Fe), Million tons
Indicated Mineral Resources (332)	7.47/ 58.04% Fe

Pre-Feasibility Study was then carried out as enclosed in Annexure – 13 and the reserves/ resources classified thereafter for the G2 area comprising the total iron ore block is furnished below:

Table -13

RESERVES		REMAINING RESOURCES				
Category	Quantity (Mineable) (in Mt)	Potentially Economic (Non-mineable)	Quantity (in Mt)	Constraints wise quantities (in Mt)		Remaining Measured Resources
Probable Reserves (122)	7.34/ 58.04% Fe	Pre-Feasibility Mineral Resources (222)	0.13/ 58.04% Fe	0.13/ 58.04% Fe	Below economic o/c Ultimate pit limit	Nil

Resources of Iron Ore Floats

In addition to the above, the reserve of float ore occurring in the mining lease spread over northern, central and southern blocks have been calculated as follows:
Areal extent of float ore = 60,262 sq. m.
Average depth of float ore zone = 1 m
Tonnage of float ore = 60,262 x 3 = 1,80,786 tonnes.

Resources of Manganese Ore

Additional 4 nos. of samples were collected for Manganese and the sample no. DK 106 to 109 has given Mn % in the range of 25.25 to 45.18 with an average of 34.96% of Mn. The Strike length of manganese band of 80 m, with a lateral influence of 5m and depth of 1m with a specific gravity of 3.5. The tentative resource is of 1400 tons.

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(Qualified Person)

k) Furnish detailed calculation of reserves/resources section wise (When the mine is fully mechanized and deposit is of complex nature with variation of size, shape of mineralized zones, grade due to intrusion within ore zone etc., an attempt may be made to estimate reserves/resources by slice plan method). In case of deposits where underground mining is proposed, reserve/resources may be estimated by level plan method, as applicable, as per the proposed mining parameters.

The section wise reserves established for the Devadari Block is as under:

Table -14

Block	Cross-section along BH	UNFC category 122			UNFC Category 222		
		Cross-sectional Area, Sq. M	Volume, cu. M	Tonnage, Tonnes	Cross-sectional Area, Sq. M	Volume, cu. M	Tonnage, Tonnes
Devadari	NB6	1481.0	296198.4	888595.3	70.4	14084.8	42254.5
	NB5	1136.1	238584.4	715753.1	6.6	1386.4	4159.1
	NB4	239.2	50227.0	150681.0	1.3	264.9	794.8
	NB3	1123.5	220206.0	660618.0	0.0	0.0	0.0
	NB2/2A	2884.2	548005.9	1644017.7	1.3	249.1	747.3
	NB7	2692.4	538470.0	1615410.0	0.0	0.0	0.0
	NB1B/1C	3905.9	749942.1	2249826.3	159.6	30645.9	91937.6
	Total	**13462.3**	**2641633.8**	**7924901.4**	**239.2**	**46631.1**	**139893.3**
	Reserves		***(122)***	***7345995***		***(222)***	***129674***

**The average length of influence considered for sectional method of reserve estimation is 199.7m and recovery is taken as 92.6951% considering the comparison of volume between 3-D orebody modelling and sectional method of ore delineation*

The detailed calculation of the level wise resources established at 45% Fe is furnished in the table below

Level wise Resources established for 45% to 55% Fe Table -15

Fe% Range	mRL	Tonnes	Fe%
45.0 -> 55.0	798.0 -> 804.0	2222	53.746
45.0 -> 55.0	804.0 -> 810.0	22856	53.933
45.0 -> 55.0	810.0 -> 816.0	64645	54.145
45.0 -> 55.0	816.0 -> 822.0	102703	54.194
45.0 -> 55.0	822.0 -> 828.0	125320	54.115
45.0 -> 55.0	828.0 -> 834.0	159295	53.909
45.0 -> 55.0	834.0 -> 840.0	193200	53.694
45.0 -> 55.0	840.0 -> 846.0	197011	53.412
45.0 -> 55.0	846.0 -> 852.0	188616	52.91
45.0 -> 55.0	852.0 -> 858.0	193219	52.534
45.0 -> 55.0	858.0 -> 864.0	205195	52.404
45.0 -> 55.0	864.0 -> 870.0	205045	52.363
45.0 -> 55.0	870.0 -> 876.0	195666	52.38
45.0 -> 55.0	876.0 -> 882.0	170948	52.501
45.0 -> 55.0	882.0 -> 888.0	148073	52.842
45.0 -> 55.0	888.0 -> 894.0	111858	53.045
45.0 -> 55.0	894.0 -> 900.0	76486	53.269

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Fe% Range	mRL	Tonnes	Fe%
45.0 -> 55.0	900.0 -> 906.0	46013	53.338
45.0 -> 55.0	906.0 -> 912.0	28153	53.409
45.0 -> 55.0	912.0 -> 918.0	9933	53.444
45.0 -> 55.0	918.0 -> 924.0	2664	54.008
Sub Total	**45.0 -> 55.0**	**2446523**	**53.076**

Level wise Resources established for Fe range above 55%

Table -16

Fe% Range	mRL	Tonnes	Fe%
55.0 -> 100.0	786.0 -> 792.0	295	58.019
55.0 -> 100.0	792.0 -> 798.0	30567	58.5
55.0 -> 100.0	798.0 -> 804.0	82116	58.412
55.0 -> 100.0	804.0 -> 810.0	111225	58.409
55.0 -> 100.0	810.0 -> 816.0	142153	58.782
55.0 -> 100.0	816.0 -> 822.0	204366	59.984
55.0 -> 100.0	822.0 -> 828.0	256880	60.806
55.0 -> 100.0	828.0 -> 834.0	308245	60.662
55.0 -> 100.0	834.0 -> 840.0	362325	60.328
55.0 -> 100.0	840.0 -> 846.0	399427	60.432
55.0 -> 100.0	846.0 -> 852.0	429773	60.455
55.0 -> 100.0	852.0 -> 858.0	405792	60.874
55.0 -> 100.0	858.0 -> 864.0	358922	61.316
55.0 -> 100.0	864.0 -> 870.0	309117	61.592
55.0 -> 100.0	870.0 -> 876.0	286191	61.414
55.0 -> 100.0	876.0 -> 882.0	283008	60.866
55.0 -> 100.0	882.0 -> 888.0	268547	60.12
55.0 -> 100.0	888.0 -> 894.0	227222	59.09
55.0 -> 100.0	894.0 -> 900.0	193603	58.926
55.0 -> 100.0	900.0 -> 906.0	175148	59.533
55.0 -> 100.0	906.0 -> 912.0	102548	61.234
55.0 -> 100.0	912.0 -> 918.0	57984	63.307
55.0 -> 100.0	918.0 -> 924.0	31688	63.764
55.0 -> 100.0	924.0 -> 930.0	2006	64.255
Sub Total	**55.0 -> 100.0**	**5029148**	**60.461**
Grand Total	**45% - 100%**	**7475672**	**58.04**

The level wise mineable reserves as established has been shown in the table below

Level wise mineable reserves established for Fe range above 55%

Table -17

Fe%	mRL	Tonnes	Fe
55.0 -> 100.0	792.0 -> 798.0	26681	58.61
55.0 -> 100.0	798.0 -> 804.0	73359	58.573
55.0 -> 100.0	804.0 -> 810.0	109866	58.424

(S.R. Virsen, Mining Engineer)
(Qualified Person)

(S. Hareesh Babu, Mining Engineer)
(Qualified Person)

Fe%	mRL	Tonnes	Fe
55.0 -> 100.0	810.0 -> 816.0	136795	58.921
55.0 -> 100.0	816.0 -> 822.0	176522	59.972
55.0 -> 100.0	822.0 -> 828.0	218916	60.565
55.0 -> 100.0	828.0 -> 834.0	280744	60.521
55.0 -> 100.0	834.0 -> 840.0	350461	60.273
55.0 -> 100.0	840.0 -> 846.0	399155	60.434
55.0 -> 100.0	846.0 -> 852.0	429370	60.457
55.0 -> 100.0	852.0 -> 858.0	405764	60.874
55.0 -> 100.0	858.0 -> 864.0	358922	61.316
55.0 -> 100.0	864.0 -> 870.0	309117	61.592
55.0 -> 100.0	870.0 -> 876.0	286191	61.414
55.0 -> 100.0	876.0 -> 882.0	283008	60.866
55.0 -> 100.0	882.0 -> 888.0	268547	60.12
55.0 -> 100.0	888.0 -> 894.0	227222	59.09
55.0 -> 100.0	894.0 -> 900.0	193603	58.926
55.0 -> 100.0	900.0 -> 906.0	175148	59.533
55.0 -> 100.0	906.0 -> 912.0	102548	61.234
55.0 -> 100.0	912.0 -> 918.0	57984	63.307
55.0 -> 100.0	918.0 -> 924.0	31688	63.764
55.0 -> 100.0	924.0 -> 930.0	2006	64.255
Grand Total		**4903617**	**60.45**

I) Mineral reserves/Resources:

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

On the basis of UNFC guidelines the resources can be categorized on the basis of different levels of exploration as under:

Table -18

Level of Exploration	Resources in million tons	Grade
G1-Detailed exploration	NIL	NIL
G2-Generalexploration	7.47	58.04
G3-Prospecting	NIL	NIL
G4 – Reconnaissance	25.33	+45%

The details of the reserves/ resources established at 45% Fe cut off for Devadari iron ore block is given in table below:

Table -19

Resource type	Total tonnage at cut-off (+45% Fe), Million tons
Indicated Mineral Resources (332)	7.47/ 58.04% Fe

Pre-Feasibility Study was then carried out as enclosed in *Annexure – 13* and the reserves/ resources classified thereafter for the G2 area comprising the total iron ore block is furnished below.

Table -20

RESERVES		REMAINING RESOURCES				
Category	Quantity (Mineable) (in Mt)	Potentially Economic (Non-mineable)	Quantity (in Mt)	Constraints wise quantities (in Mt)		Remaining Measured Resources
Probable Reserves (122)	7.34/ 58.04% Fe	Pre-Feasibility Mineral Resources (222)	0.13/ 58.04% Fe	0.13/ 58.04% Fe	Below economic o/c Ultimate pit limit	Nil

UNFC Classification of Iron ore Reserves & Resources

Table -21A

Sl. No	Reserve Category	(UNFC Code)	Qty. in Million Tonnes	Avg. Grade (Fe %)
A. Total Mineral Reserves				
1	Proved Mineral Reserves	(111)	NIL	NA
2	Probable Mineral Reserves	(122)	7.34	58.04%
B. Total Remaining Resources				
3	Feasibility Mineral Resource	(211)	NIL	NA
	Pre-Feasibility Mineral Resource	(222)	0.13	58.04%
4	Remaining measured resource	(331)	NIL	NA
5	Indicated Resource	(332)	NIL	NA
6	Inferred Resource	(333)	NIL	NA
7	Reconnaissance Resource	(334)	25.33	+45%

UNFC Classification of Manganese ore Reserves

Table -21B

Sl. No	Reserve Category	(UNFC Code)	Qty. in Tonnes	Avg. Grade Grade (Mn %)
1	Probable Mineral Reserves	(122)	1400	34.96%

(S.R. Virsen, Mining Engineer)
(Qualified Person)

(S. Hareesh Babu, Mining Engineer)
(Qualified Person)

2.0 MINING

A. OPEN CAST MINING:

a) Briefly describe the existing as well as proposed method for excavation with all design parameters indicating on plans /sections.

Devadari Iron Ore Mine is a Greenfield project and the lease will be executed after approval of this submitted mining plan and grant of environment clearance and forest clearance etc.

There exists an old manganese quarry in south-western part of lease area before allocating the lease area to KIOCL. Further, eight (08) old trenches in the central and northern part of lease area were made during the exploration activities by Geological Survey of India.

The mine will be developed by mechanized opencast method of working. The height & width of benches will be 6 m x 11 m respectively both on the hang wall & foot wall side. The haul roads will be laid on the foot wall side. The haul roads shall be of 20 m width and at a maximum gradient of 1: 16. The bank slope angle of the benches will be 75^0. The configuration of the proposed pit is given in the following table:-

Table -22

Pit configuration	Details
Bench height, m	6 m
Bench width, m	11 m
Bank slope angle	75^0
Overall slope angle	Below 36^0

Permission for deep-hole drilling & blasting with deployment of HEMM will be taken from the regional office of DGMS prior to commencement of the mining workings. All necessary information will be given to the statutory bodies under MMDR Act & Mines Act prior to the commencement of the mining activities.

It is proposed to deploy Hydraulic Excavators of 3.5-4.5 cu.m capacity in conjunction with 35 tonnes dumpers. 4 ½" diameter drills will be deployed for primary drilling. No secondary drilling & blasting has been envisaged. Secondary breaking of rock will be done by rock breakers. The blasted ore will be mucked by the excavator and transported by dumper to a ROM stock pile close to the proposed crushing plant. The crushing plant with downstream facilities will be established by the end of third year, after carrying out detailed exploratory drilling during the 1st and 2nd year of the plan period.

The proposed manganese pit is envisaged adjacent to old manganese pits with the following parameters:

Table -23

Pit configuration	Details
Bench height, m	2.5 m
Bench width, m	5 m
Bank slope angle	65^0
Overall slope angle	Below 45^0

After loosening the rock by blasting, the manganese ore will be transported to stack yard for further breaking and manual sorting.

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

(S.R. Virsen, Mining Engineer)
(Qualified Person)

(S. Hareesh Babu, Mining Engineer)
(Qualified Person)

I. In-situ Tentative Excavation

The year-wise in-situ tentative excavation for the proposed plan period for the iron pit is given below.

Table -24

Year	Pit No.	Total Tentative Excavation	Top Soil	OB/SB/ IB	ROM		Mineral Reject	ROM: Waste
					Ore	Sub grade		
		M. cu. m	cu. m	M. cu. m	M. cu. m	M. cu. m	M. cu. m	cu. m : cu. m
1st yr.	nil	nil	nil	nil	nil	nil	nil	nil
2nd yr.	Iron Pit	0.672864	26,406	0.560994	0.092078	0.019792	nil	0.199
3rd yr.	Iron Pit	1.508416	63,290	1.323634	0.100488	0.084294	nil	0.140
4th yr.	Iron Pit	1.899085	22,395	1.556718	0.210969	0.131398	0.128325	0.220
5th yr.	Iron Pit	3.593178	4,012	2.910318	0.406352	0.276508	0.147755	0.235
Total		**7.673543**	**1,16,102**	**6.351664**	**0.809887**	**0.511992**	**0.27608**	**0.208**

The year-wise in-situ tentative excavation for the proposed plan period for the Manganese Pit is given below.

Table -25

Year	Pit No.	Total Tentative Excavation	Top Soil	OB/SB/ IB	ROM		Mineral Reject	ROM: Waste
					Ore	Sub grade		
		M. cu. m	cu. m	M. cu. m	M. cu. m	M. cu. m	M. cu. m	cu. m : cu. m
1st yr.	nil	nil	nil	nil	nil	nil	nil	nil
2nd yr.	nil	nil	nil	nil	nil	nil	nil	nil
3rd yr.	nil	nil	nil	nil	nil	nil	nil	nil
4th yr.	nil	nil	nil	nil	nil	nil	nil	nil
5th yr.	Mn Pit	0.001	Nil	0.00085	0.00012	0.000023	nil	0.168
Total		**0.001**	**Nil**	**0.00085**	**0.00012**	**0.000023**	**nil**	**0.168**

The year-wise development & production quantity of iron ore in tonnes for the proposed plan period is given in the following table.

Table -26

Year	Pit No.	R.O.M. Production qty., Million tonnes	Development qty. Million Cu.m. (OB/IB)	Stripping Ratio (Cu.m/t)
1st yr.	Nil	Nil	Nil	-
2nd yr.	Iron ore Pit	0.33561	0.560994	1.671565
3rd yr.	Iron ore Pit	0.554346	1.323634	2.38774
4th Year	Iron ore Pit	1.027101	1.556718	1.515643
5th Year	Iron ore Pit	2.04858	2.910318	1.420651
Total		**3.965637**	**6.351664**	**1.601676**

The year-wise development & production quantity of manganese in tonnes for the proposed plan period is given in the following table.

(S.R. Virsen, Mining Engineer)
(Qualified Person)

(S. Hareesh Babu, Mining Engineer)
(Qualified Person)

Table -27

Year	Pit No.	Manganese Ore Production qty. Million tonnes	Development qty. Million Cu.m. (OB/IB)
1st yr.	Nil	Nil	Nil
2nd yr.	Nil	Nil	Nil
3rd yr.	Nil	Nil	Nil
4th Year	Nil	Nil	Nil
5th Year	Manganese Pit	0.000500	0.00085
Total		**0.000500**	**0.00085**

The sub grade generated during the plan period will be stacked separately at the designated place.

The details of proposed development to be carried out of different quarries during the review period are furnished below:

Table -28

Year	Pit	Section Line	Area in ha	No. of Benches	Level in MSL	Location Co-ordinates
1st yr.	Nil	-	-	-	-	-
2nd yr.	Iron ore Pit	section line along NB-1B & 1C; NB-7	10.563	04	924, 918,912, 906, 903	1663140N - 1664355N; 670245E - 670900E
3rd yr.	Iron ore Pit	section line along NB-1B & 1C; NB-7; NB-6, 5 and 4	35.88	06	900, 894, 888, 882, 876, 871	1663140N - 1664580N; 669970E – 670940E
4th Year	Iron ore Pit	NB-7; NB-6, 5 and 4	35.88	05	870, 864, 858, 852, 850	1663140N - 1664580N; 669970E – 670950
5th Year	Iron ore Pit	NB-6, 5, 4 and NB-2 & 2A	35.88	05	846, 840, 834, 828,822	1663140N - 1664580N; 669970E – 670950

II. Dump re-handling (for the purpose of recovery of mineral):

Not applicable.

c) Enclose individual year wise development plans and sections showing pit layouts, dumps, stacks of mineral reject, if any, etc. in case of 'A' category mines. Composite development plans showing pit layouts, dumps, stacks of mineral reject, if any, etc. and year wise sections in case of 'B' category mines.

Apart from the regular mining operations, the lease area is planned to accommodate a mineral processing complex comprising office buildings, rest shelter, crushing & screening plant and beneficiation plant.

The areas where the proposed dumps, processing complex, stack yards etc. are envisaged will be proved for its barrenness prior to commencement of construction work and subsequent dumping operations.

Considering this criterion, the first year is planned for detailed exploration and developmental activities of the total lease area. And no excavation has been planned during the initial three years of the plan period.

In the first quarter of the 2nd year, the mine development will start from the hillock situated at the central part of the lease and gradually advances towards north. The mine development & production plan during 2nd to 5th year of the plan period showing the pit layouts and sections, dumps etc. are given in **Drg. No. MEC/11/16/Q7EB/06 (Plate No. 06)** (05 sheets).

d) Describe briefly giving salient features of the proposed method of working

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(Qualified Person)

indicating Category of mine.

The mine will be developed by fully-mechanized opencast method of working in 3 shifts operations. Iron ore and over burden will be removed by conventional shovel – dumper combination after loosening the hard rock mass by blasting. Excavators of 2.5 - 3.5 m^3 capacity will be utilized for excavation and loading. 35 tonne capacity dumpers will be used for the transportation of the ore.

The height & width of benches in ore/ OB will be 6 m x 11 m respectively both on the hang wall & foot wall side. The bank slope angle of the benches will be 75^0. The configuration of the proposed pit is given in the following table:-

Table -29

Pit configuration	Details
Bench height, m	6 m
Bench width, m	11 m
Bank slope angle	75^0
Overall slope angle	Below 36^0

Permission for deep-hole drilling & blasting with deployment of HEMM will be taken from the regional office of DGMS prior to commencement of the mining workings. All necessary information will be given to the statutory bodies under MMDR Act & Mines Act prior to the commencement of the mining activities.

Drilling will be done by 115 mm diameter drills and blasted to loosen the in-situ rock. The waste will be dumped in the non-mineralised as well as mined out areas. The ore will be loaded by loaders of 2.5 - 3.5 cu.m over 35t rear discharge trucks for its onward dispatch.

However, the manganese pit situated at the southern part of the lease will be developed with the help of shovel dumper combination with limited blasting. The loosened rock will be transported to stack yard for manual sorting. The production of the manganese pit will start from the fifth year.

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.**

As explained above, the mining operations will commence from the 2nd year as the initial 1st year is envisaged for detailed exploration and developmental activities of the total lease area. The development of mining operations in this mining plan period is envisaged in two pits i.e., iron ore pit at the northern block and manganese pit located at the southern corner of the mining lease. The Manganese pit will be mined in the fifth year. The mining operations in the manganese pit advance from north to south following the terrain.

The excavated ore will be loaded to rear discharge trucks for its onward dispatch. And the sub-grade ore will be stacked separately in sub-grade yard and this will be used by blending with high grade iron ore. Whereas, the waste removed will also be stacked in the waste dump having retaining wall with garland drain constructed at its periphery.

The surface plan of the mine is shown as **Drg. No. MEC/11/16/Q7EB/05 (Plate No. 05)**. Considering the constraints like safety zone and the undulating terrain; the mining operations and dumping the waste, stacking sub-grade etc. are to be

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planned in an optimized manner so that the non-mineralised area is continuously available for proper usage. The demarcated areas where the proposed dumps, processing complex, stack yards etc. are envisaged will be proved for its barrenness prior to commencement of construction work and subsequent dumping operations.

As shown in the **Drg. No. MEC/11/16/Q7EB/06** (**Plate No. 06**), the iron ore and sub-grade from iron ore pit located at the central part of the mining lease will be excavated and the ore will be fed to dump hopper of crushing plant or stacked at Primary Ore Stock Pile during the fourth year. The Mineral Processing Complex of 2 MTPA will be completed by the end of third year accommodating the mine to produce to 1.8 MTPA in fourth year and 2 MTPA in the fifth year.

The OB generated excavating this iron ore pit will be dumped at Dump-1. Haulage roads are envisaged for dumping OB, approach roads to magazine, ore stock pile as well as for sub-grade stock pile, disposing tailings.

As mentioned above, the mine will produce 1 MTPA in fourth year and 2 MTPA in the fifth year onwards and the ore will be transported to Mineral Processing Complex for further up-gradation.

The sub-grade generated during the plan period will be stacked at the proposed sub-grade stack yard situated at the north of Mineral Processing complex.

The proposed waste dumps i.e. Dump-1 for iron pit and Dump-2 for manganese pit shall be formed by retreating method of dumping in order to facilitate its early reclamation.

The location & configuration of the proposed OB/ IB dumps to accommodate the waste generated are given below:-

Table -30

Dump Name	Temporary Location & place where the OB/ IB will be disposed	Dimensions (L x B x H in m)
Dump-1 (2nd Year)	1663470N - 1664800N; 669490E - 670412E	1300 x 144 x 10 – 1st terrace 1100 x 123 x 10 – 2nd terrace 900 x 115 x 10 – 3rd terrace 795 x 90 x 10 – 4th terrace
Dump-1 (3rd Year)	1663470N - 1664800N; 669490E - 670473E	2160 x 136 x 10 – 5th terrace 1980 x 118 x 10 – 6th terrace 1214 x 85 x 10 – 7th terrace
Dump-1 (4th Year)	1663470N - 1664800N; 669490E - 670532E	1830 x 105 x 10 – 8th terrace 1546 x 80 x 10 – 9th terrace 1286 x 65 x 10 – 10th terrace
Dump-1 (5th Year)	1663470N - 1664800N; 669490E - 670595E	1574 x 120 x 10 – 11th terrace 1360 x 95 x 10 – 12th terrace 1240 x 76 x 10 – 13th terrace 950 x 65 x 10 – 14th terrace
Dump-2 (5th Year)	1661765N - 1661864N & 670554E - 670657E	105 x 90 x 2 – 1st terrace

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

Considering the present available reserves and resources the excavation

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(Qualified Person)

activities at the conceptual stage are envisaged as stretched from the central part of lease to the northern extent as well as the entire southern part of the lease area. The slopes on both sides of the lease are predominantly free of mineral and are planned for various activities viz.-ore processing complex, green belt/ afforestation, storage facilities for sub-grade, waste and mineral rejects.

After the mine reaches the conceptual stage, backfilling is envisaged in a sequential manner such that the terrain attains its original profile. All over-burden dumps and tailing stack yards are planned for afforestation with indigenous species. Additional greenbelt with plantation of indigenous species is planned along the eastern boundary of the mine lease. The infrastructure facilities will be dismantled and the area will be used for local public purpose.

The parameters of the conceptual pit are furnished in the following table:

Table -31

Pit/ Block	Pit area in ha	Pit Dimension			Ultimate Pit Slope
		Length	Width	Max. Depth	
Iron Ore Pit in North Block	35.878	1670	288	786	< 40 deg.

The conceptual land use is given below:-

Table -32

Sl. No.	Head	Area put on use at start of plan period (ha)	Additional area requirement during Plan period (ha)	Total area (ha)	Total area at Conceptual Period (ha)
1	Area under mining	0.8399	35.9199	36.7598	285.23148
2	Storage for top soil	0	1.8750	1.8750	0
3	Waste dump site	0	42.1194	42.1194	91.49110
4	Mineral Storage	0	6.6548	6.6548	0
5	Infrastructure – workshop, administrative building etc.	0	2.0277	2.0277	0
6	Roads	0.8861	6.8063	7.6924	0
7	Railways	0	0	0	0
8	Tailing pond	0	9.7736	9.7736	33.63410
9	Effluent Treatment Plant	0	0	0	0
10	Mineral Separation Plant	0	11.5887	11.5887	11.5887
11	Township area	0	0	0	0
12	Green Belt	0	0	0	37.42295
Sub- Total		**1.72598**	**116.7654**	**118.4912**	**459.36833**
13	**Safety Zone**	**0**	**11.03167**	**11.03167**	**11.03167**
Total		**1.72598**	**127.79707**	**129.5229**	**470.40**

B. UNDERGROUND MINING

Not applicable

C. EXTENT OF MECHANISATION

(S.R. Virsen, Mining Engineer)
(Qualified Person)

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(Qualified Person)

The mining operations will be carried out by fully-mechanized opencast method of working in 3 shifts operations. The ore and over burden will be excavated and transported by conventional shovel – dumper combination after loosening the hard rock mass by blasting. The proposed drill machines to be deployed for blasting operations based on detailed calculations is given below:-

Drill machines:

Table -33

Drill diameter, mm	150
Height of bench, m	6
sub grade drilling @10%	0.6
Length of hole, m	6.6
burden, m	3.5
spacing, m	4
Volume of ore to be broken/ hole, m^3	92.4
Volume of maximum excavation, m^3	3,593,178
50% of excavation to be drilled	1,796,589
No. of holes to be drilled	19,444
Meterage of drilling to be required, m	128,327.78
Speed of drill, m/hr	15
No. of working days	300
Efficiency	80%
no. of shifts	3
meterage of drilling per year	64,800
No. of drills required	1.9804
Total Drill Machines Considered	**2 + 1 (stand by) = 3**

Excavators of 3.5 - 4.5 m^3 capacity will be utilized for excavation and loading and 35 tonne capacity dumpers will be used for the transportation of the ore and overburden.

The loosened overburden will be transported to Dump through dumpers.

The proposed HEMM fleet to be deployed for transporting the ROM to dump hopper/primary stock pile and overburden to the Dump-1 based on detailed calculations is given below:-

Excavating Machines:

Table -34

Excavator calculation	
Bucket capacity	4.5
Time per swing (cycle time), sec	35
Fill factor	0.9
Swell factor	0.7

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(Qualified Person)

(S. Hareesh Babu, Mining Engineer)
(Qualified Person)

Production efficiency	0.9
Output/shovel/hour	262.44
Output/shovel/day	4723.92
Volume of maximum excavation, m^3	35,53,178
Volume of maximum excavation/day, m^3	11,977.26
No. of excavators required	2.5354
Total Excavators Considered	**= 3+1 (standby) = 4**

Hauling Machines:

Table -35

Transportation	
Truck capacity, t	35
Bucket capacity of shovel, m^3	4.5
Fill factor	0.9
Swell factor	0.7
tonnage factor, t/m^3	3
tonnage per pass of shovel	8.505
No. of passes of shovel	4.115226337
No. of passes considered	5
Dumper Cycle Time	
Distance, m	1
Time per swing (cycle time) of shovel, sec	35
Loading time, sec	175
hauling time, sec	240
unloading time, sec	90
returning time, sec	180
spotting time, sec	60
dumper cycle time, sec	745
no. of dumpers	3.170212766
no. of dumpers per excavator	4
total dumpers	**20**
Total Dumpers Considered	**= 20+5 (standby) =25**

Table -36

Blasting		
	ore	**waste**
Total excavation, tonnes	2,048,580	58,20,636
% of the rock requires blasting	50%	50%
total excavation requiring blasting	1,024,290	2,910,318
Drill diameter, mm	150	150
burden, m	2.5	3.5

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(Qualified Person)

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(Qualified Person)

spacing, m	3	4
Height of bench, m	6	6
Sub grade drilling @10%	0.6	0.6
Length of hole, m	6.6	6.6
Volume to be broken/ hole, m^3	49.5	92.4
stemming	3	3
charge length	3.6	3.6
explosive density, gm/cc	1.1	1.1
loading density, kg/m	6	6
total explosive charge/hole	21.6	21.6
density, tonnes/m^3	3	2
yield/hole, tonne	148.5	184.8
total holes/year	6734	15748.474
total no. of holes blasted per day	56	131.23
amount of explosive blasted per day, kg	1212	2834.72
quantity of material blasted per day, tonnes	6410	18655.88
powder factor , ton/kg	**5.3**	**6.6**
drilling pattern	staggered	
initiation system	electric detonator/ DF/ nonel	
firing pattern	wide v-cut	

The summary of all the auxiliary fleet required is given below:-

Table -37

S.No.	Nos.	Size / capacity	Make	Purpose
1	6 no.	1.5-2.5 cu.m	Front end loader	For loading of blasted ore and waste to dumpers
2	6 nos.	150 hp	Dozer	For maintaining the working faces, drill faces, dumping areas etc.
3	2 nos.	9kL	Water tanker	For suppression of dust over the haul roads
4	2 no.	9 kL	Diesel browser	For filling of diesel into track mounted equipment.
5	2 no.	-	Maintenance Van	For maintenance of the track mounted equipment at working faces itself.
6	2 no.	-	Pick up van	
7	1 no.	30 t	Mobile crane	For maintenance of the HEMM viz. lifting up of the dump body, engines etc., whenever required during maintenance.
8	1 no.		Tyre handler	For replacement of dumper tyres

S.No.	Nos.	Size / capacity	Make	Purpose
9	1 no.	4 t	Rock breaker	For secondary breaking of large boulders at mines faces / blasted muck.

D. Blasting

a) Broad blasting parameters like charge per hole, blasting pattern, charge per delay, maximum number of holes blasted in a round, manner and sequence of firing, etc.

The broad blast design parameters envisaged are given below:-

Table -38

Blasting		
	ore	**waste**
Total excavation, tonnes	2,048,580	58,20,636
% of the rock requires blasting	50%	50%
total excavation requiring blasting	1,024,290	2,910,318
Drill diameter, mm	150	150
burden, m	2.5	3.5
spacing, m	3	4
Height of bench, m	6	6
Sub grade drilling @10%	0.6	0.6
Length of hole, m	6.6	6.6
Volume to be broken/ hole, m^3	49.5	92.4
stemming	3	3
charge length	3.6	3.6
explosive density, gm/cc	1.1	1.1
loading density, kg/m	6	6
total explosive charge/hole	21.6	21.6
density, tonnes/m^3	3	2
yield/hole, tonne	148.5	184.8
total holes/year	6734	15748.474
total no. of holes blasted per day	56	131.23
amount of explosive blasted per day, kg	1212	2834.72
quantity of material blasted per day, tonnes	6410	18655.88
powder factor , ton/kg	**5.3**	**6.6**
drilling pattern	staggered	
initiation system	electric detonator/ DF/ nonel	
firing pattern	wide v-cut	

Rock breaker will be used so that no secondary blasting is required. It is proposed to carry out controlled blasting in the pits to keep the ground vibration level within permissible limit.

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(Qualified Person)

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A magazine 10t capacity is envisaged within the mining lease hold area at the western corner of the lease. The same is shown in the **Drg. No. MEC/11/16/Q7EB/10 (Plate No. 10)**.

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3.0 MINE DRAINAGE

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

Water table in the area varies from 15-20 m below the general surface level.

b) Indicate maximum and minimum depth of Workings.

The deposit is initially planned to be developed over the hill slopes & in the form of benches and therefore is not likely to intersect the water table.

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

No water table will be touched during the mining operations and accordingly the quality of underground water will not be deteriorated.

d) Describe regional and local drainage pattern. Also indicate annual rain fall, catchments area, and likely quantity of rain water to flow through the lease area, arrangement for arresting solid wash off etc.

Because of the hilly topography, there are numerous seasonal drainage channels but no perennial streams are present in the vicinity. The seasonal drainage channels coming out of the lease area drains down of the mine lease. The drainage pattern of the area is clearly reflected in the surface plan **Drg. No. MEC/11/16/ Q7EB/05 (Plate No. 05)** and Environment Plan **Drg. No. MEC/11/16/ Q7EB/07 (Plate No. 07)**.

This region receives approximately 750 mm of rainfall in general, but occasionally has seen more than 1000 mm of rainfall. The predominant rainy season in this area is between July and October. Rain also occurs occasionally in the months of November and January due to northeast monsoon. The maximum temperature is around 42^0 C in summer while minimum temperature is around 15^0 C in winter, which occasionally goes to as low as 6^0 C.

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

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

Most of the top soil is either eroded or degraded because of the steep terrain conditions. The top soil generated during the mining operations will be used for avenue plantation as well as at the envisaged Mineral Processing Complex.

The overburden/ waste generated during the excavation of iron ore will be dumped at the western side of the lease area demarcated as Waste Dump-1. Similarly, the waste generated by the Manganese pit will be dumped at Waste Dump-2 demarcated at the south western corner of the lease area.

The iron ore will be processed for up-gradation of the Fe content. The tailings generated by this beneficiation will be dewatered and the tailing cakes will be dumped at a specific location at North West corner of the lease near boundary pillar no. 30.

The year-wise quantity of wastes proposed to be generated during the proposed plan period is given below.

Table -39

Year	Top Soil (cu. m)		Waste (M. cu. m)		Mineral Rejects (M. cu. m)	
	Reuse/ Spreading	Storage	Backfilling	Storage	Storage	Beneficiation
1st yr.	nil	nil	nil	Nil	nil	nil
2nd yr.	Nil	26,406	nil	0.560994	Nil	nil
3rd yr.	nil	63,290	nil	1.323634	nil	nil
4th yr.	nil	22,395	nil	1.556718	0.128325	nil
5th yr.	nil	4,012	nil	2.910318	0.147755	nil
TOTAL	Nil	**1,16,102**	Nil	**6.351664**	**0.27608**	Nil

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.

As the entire mining lease area is virgin land and considering the exploration status, the generated wastes in the initial period of mining operations are envisaged to be stacked as temporary dumps.

The area where the proposed dumps will be located will be proved for its barrenness prior to commencement of dumping operations. However, once the quarries attain ultimate level, the same will be backfilled with the waste generated from the other quarries. Prior to commencement of dumping all statutory clearances will be made. Retaining wall & garland drains along with settling pits will be constructed to protect the surrounding environment from wash-offs etc.

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.

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(Qualified Person)

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(Qualified Person)

All the dumps shall be formed by retreating method of dumping in order to facilitate its early reclamation. Some quantity of overburden waste is envisaged for laying of mine roads for optimum utilization.

Year-wise dumping details are given in the following table:

Table -40

Year	Dump Name	Area (ha)	No. of stages with height	Level in MSL	Location Coordinates	Slope angle
2nd Year	Dump-1	6.2797	04 stages each of 10 m height	675, 685, 695 & 705	1663470N - 1664800N; 669490E - 670412E	< 25 deg.
3rd Year	Dump-1	20.2025	03 stages each of 10 m height	715, 725, 735	1663470N - 1664800N; 669490E - 670473E	
4th Year	Dump-1	10.025	03 stages each of 10 m height	745, 755, 765	1663470N - 1664800N; 669490E - 670532E	
5th Year	Dump-1	6.353	05 stages each of 10 m height	775, 785, 795, 805, 815	1663470N - 1664800N; 669490E - 670595E	

Depending upon the drainage pattern of the area where the dump is located, retaining walls, garland drains with settling tanks will be provided in the dumps. The same are shown in the Reclamation Plan in **Drg. No. MEC/11/16/Q7EB/08**. The garland drains will be dug around 1 m beneath the adjoining contour level at the lower peripheral areas of the dump. The width of the drains shall be around 1.5 m. The settling tanks will be located at the outlet of the garland drains. It will of around 3m length with three compartments of around 1m width to arrest the suspended solids followed with the chamber to arrest any oil particles. The last chamber shall contain the clean water which will be ultimately discharged. A total 3500 m long retaining wall and garland drains are proposed as protective measures. The retaining walls will be of 1m height and 1m width at the top and around 1.2m at the base. The material of construction shall be RCC.

The ultrafine tailing cakes generated by the beneficiation process are disposed separately at a designated place. The tailings are free of any hard chemicals and hence there is no danger of ground water contamination. Water sprinklers at regular intervals are proposed to arrest any dust generation. The ends of tailing yards where no further dumping take place will be covered with grass turf so that no dust will be generated.

Considering the steep terrain of the slopes of the mine lease area and the shortage of free space available for dumping the overburden and wastes, additional precautionary measures are proposed for the stability of the overburden waste dump slopes. In addition to the retaining wall and garland drains proposed at the foot hills of waste dump, some intermediate retaining walls along the contours of the proposed waste dump terrain are envisaged to arrest the slope failures.

Year	Dump Name	Length of Retaining Wall (m)	Length of Garland Drain (m)	Length of Check Dam (m)
2nd Year	Dump-1	2067	2067	5
3rd year	Dump-1	1362	320	-
4th year	Dump-1	2032	-	-
5th year	Dump-1	1987	-	-
5th year	Dump-2	140	140	5

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5.0 USE OF MINERAL AND MINERAL REJECT

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

The entire ore production including lumps and fines produced from Devadari lease is envisaged to be consumed in KIOCL's existing Blast Furnace/ Pellet Plant at Mangalore and Pellet plant envisaged by KIOCL in Bellary - Hospet sector in future. The expected lump & fines ratio is 80:20.

Quality parameters of lumps and fines as specified by the KIOCL plants are as follows.

Table -41

S. No.	Parameters	Lump Ore	Fines Ore	Iron ore concentrate
i	Fe	65.0 % (min)	63.5% (min)	63.5%(min)
ii	SiO_2	2.0 % (max)	2.0 % (max)	2.0 % (max)
iii	Al_2O_3	2.0 % (max)	2.0 % (max)	2.0 % (max)
iv	Total Gangue (Al_2O_3 + SiO_2)	4.0 % (max)	4.0 % (max)	4.0 % (max)
v	Size	+10 - 40 mm (Over & under size : Max. 5% Each)	Size: - 10mm (with oversize 5% maximum and undersize 20% maximum)	(-)325 mesh

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

The entire ore produced will be used in KIOCL's existing Blast Furnace/ Pellet plant at Mangalore and Pellet plant envisaged by KIOCL in Bellary- Hospet sector in future. However, the ore excavated will be crushed, screened and beneficiated to produce concentrate filter cake and CLO, which will be transported to KIOCL's plants at Mangalore through Rail.

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

The entire ore produced will be consumed by KIOCL's existing Blast Furnace and Pellet plant at Mangalore and Pellet plant envisaged by KIOCL in Bellary-Hospet sector in future..

d) Indicate precise physical and chemical specification stipulated by buyers

The entire ore production including lumps and fines produced from Devadari lease hold area will be consumed by KIOCL's existing Blast Furnace / Pellet Plant at Mangalore and Pellet plant envisaged by KIOCL in Bellary - Hospet sector in future.

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

The fine iron ore so obtained, after crushing and screening will be beneficiated in the beneficiation plant. The filter cake so obtained will be transported to KIOCL's existing Blast Furnace / Pellet Plant at Mangalore and Pellet plant envisaged by KIOCL in Bellary - Hospet sector in future..

f) The useable mineral recovered from ROM may not be directly used in any industry and may need intermediate process to suit the user industry in

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terms of physical and chemical compositions.

Multilevel crushing, screening, grinding, gravity and magnetic separation, thickening will be carried out to produce CLO of 0.4 MTPA and Filtered concentrate of 1.2 MTPA from a ROM feed of 2 MTPA. The iron ore concentrate and CLO will be transported to meet the demand of KIOCL's existing Pellet plant and Blast Furnace.

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6.0 PROCESSING OF ROM AND MINERAL REJECT

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.

Crushing & Screening Plant

The Crushing and Beneficiation Plant is designed to process iron ore lumps of -1000 mm size of grade Fe-57.34% to produce concentrate iron ore grade (63.5%Fe). The blasted ROM will be transported by 35 t capacity dumpers to a 350 tph capacity Primary jaw crusher and secondary cone crushers. The product (-100 mm size fraction) of jaw crusher will be fed to a scalping screen wherein -100mm and +100mm will be separated. The scalping screen oversize material is crushed in the secondary cone crusher and the crushed ore is then fed through common collecting DH (Downhill) conveyor for further feeding to the tertiary cone crusher housed in the Screening Plant together with screen undersize material for further size reduction.

The scalping screen undersize material (-100 mm size) and the crushed product of Secondary crusher is fed to Tertiary Crusher. The crushed ore from tertiary cone crusher is then fed to double deck screen to separate three products. The oversize +40 mm is fed to Quaternary crusher for further size reduction, -20 mm size material shall be conveyed to 500 ton capacity Storage silo and -40 mm + 20 mm calibrated lump ore (CLO) shall be conveyed to CLO storage yard.

The crushed ore from quaternary crusher is subjected to double deck screen to separate CLO and fines. The CLO is conveyed to CLO storage yard and then it is conveyed to railway siding through downhill conveyor. The fines shall be conveyed to storage silo and from there it is fed to beneficiation plant.

The process flow diagram for Crushing and Screening plant is enclosed in **Drg. No. MEC/11/16/Q7EB/12**.

Beneficiation Plant

The feed capacity of beneficiation plant is 2.0 MTPA. In Beneficiation plant, fines are further processed through feeder, screens, Grinding section, Gravity separation, Magnetic separation, Filtration, etc.

The details of process are as indicated below.

As required, material from the storage silo is then feed to Screen in Beneficiation Plant by vibrating feeder and conveyor combination.

The screen under size in slurry form is fed to hydro cyclone. The undersize of hydro cyclone is feed to spiral circuit and overflow to tailing thickener after further de-sliming in cyclone. The concentrate from spirals (Fe - 64.50%) is again feed to hydro cyclone to remove slimes.

The hydro cyclone underflow is feed to magnetic separation circuit. The concentrate from Magnetic separation circuit (Fe - 61.60%) is fed to Ball mill for further grinding and liberating the gangue particles. The Ball Mill discharge is fed to Hydro Cyclone. The Cyclone underflow is recirculated back to Ball Mill for regrinding. The Cyclone overflow (Fe - 63.50%) is taken to concentrate thickener for thickening. The thickened under flow is fed to Horizontal Belt Vacuum Filter.

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The Iron ore concentrate (Filter) (Fe - 63.50%) from the filters, having moisture around 10%, is fed to a Filter cake carrying reversible belt conveyor through Belt feeders.

The reversible belt conveyor can convey concentrates either to Rapid loading system (through Downhill conveyor and series of belt conveyors and junction houses) or to filter cake shed (through a series of belt conveyors and junction houses).

The concentrate storage shed shall be suitable for the storing approx. 15,000 T. As and when required, the stockpiled concentrate can be reclaimed through pay loaders and fed to Ground hoppers on belt conveyor and conveyed to Rapid loading system through Downhill conveyor and series of belt conveyors and junction houses.

The non-magnetic tailings from magnetic separation circuit (containing Fe-39.76%) are fed to tailing thickener. The tailings are thickened and the under flow is fed to Horizontal Belt Filter in filtration building and the tailings filter cake is disposed-off near tailing stockpile using belt conveyors (and required transfer houses) and tripper conveyor. The stocked tailings are further conveyed to tailings reservoir through trucks.

Feed and Product

Table -42

Sl.No	*Parameter*	*Feed Grade*	*Concentrate Grade*
1	Specific gravity	3.57	4.4
2	Size	-20mm	-100#
3	Fe	57.34%	63.50%
4	$Al_2O_3 + SiO_2$	7-8%	< 5%
5	Recovery	-	75%

Tailings

Specific gravity	:	3.39
Fe	:	39%
Size	:	-325#
$Al_2O_3 + SiO_2$	:	> 15%

In order to produce 1.20 MTPA of concentrate, the feed requirement for the Crushing & Beneficiation Plant will be 2 MTPA considering 75% recovery by weight.

The overflow water from both the thickeners is taken to recirculating tank. Water is pumped to various areas as per requirement through pipeline. A makeup water connection is provided from reservoir.

The process flow sheet for Beneficiation plant (**Drg. No. MEC/11/16/Q7EB/13**) is enclosed.

The process route for Beneficiating iron ore comprises of the following stages:

a) Primary and Secondary Crushing
b) Tertiary and Quaternary Crushing

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c) Screening
d) Grinding and classification
e) Gravity separation
f) Magnetic separation
g) Thickening
h) Filtration
i) Tailing disposal

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.

The process flow diagram for Crushing & Screening plant (**Drg. No. MEC/11/16/Q7EB/12**) and Beneficiation plant (**Drg. No. MEC/11/16/Q7EB/13**) are enclosed.

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

The non-magnetic tailings from magnetic separation circuit are fed to tailing thickener. The tailings are thickened and the under flow is fed to Horizontal Belt Filter in filtration building and the tailings filter cake is disposed-off near tailing stockpile using belt conveyors (and required transfer houses) and tripper conveyor. The stocked tailings are further conveyed to tailings reservoir through trucks.

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.

The filter tailings cake will be disposed-off in tailing reservoir @ 0.4 Mt/yr. The capacity of tailing reservoir envisaged is 3 Mt. The tailing cake is in solid form and does not contain any toxic elements.

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

No toxic chemicals will be used in the processing plant.

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

Not applicable

g) Indicate quantity (cu.m. 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.

The source of water for the project is Tungabhadra (TB) dam located 50 km (approx.) from the project site. An intake well and pump house is proposed to be constructed on up stream of TB dam. Raw water from the TB dam is pumped in various stages with intermediate pump houses along the route of the pipeline up to balancing reservoir at plant location. The balancing reservoir.

Process water will be made available at one point inside the Beneficiation Plant premises. A reservoir of 50,000 m^3 capacity will be earthen type with impervious lining within the plot area. Necessary pumping and distributing arrangements will be made for different consumers in the plant. The overflow from the tailings thickeners will be pumped back to reservoir in to the settling chamber. Fresh water (150 m3/hr) required to make up the losses is added to

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the reservoir.

Water from this reservoir is taken to all the fresh water consumer in the plant like process make up, flushing in the Beneficiation plant, filtration plant, dust suppression system, cooling requirement, firefighting requirement, etc. The water from the reservoir is supplied to the above consumers by pumping with common header and individual branches to all the consumers.

In the project area, all water mains, internal piping to wash water outlets, fire hydrants, drinking water distribution outlets are of MS piping. The below ground piping will be provided with suitable wrapping and coating as a measure of protection from corrosion.

The intake water requirement of the plant is estimated at 150 m^3/h.

Around 90 KL per day of water will be used for dust suppression of the haul roads, stock piles, plantation etc. The potable water requirement will be 25 cu.m. per day.

Bore wells will be dug at suitable locations within the lease area for general usage.

The details of water consumed at different units is given below: Table -43

Sl. No	Process/Fresh Water Input		Water Loss		Water Recovered	
	Units	m^3/hr	Units	m^3/hr	Units	m^3/hr
1	Screening	288	Concentrate	17.92	Overflow from Concentrate Thickener	454.80
2	Spirals	290	Tailings	36.76	Overflow from Tailing Thickener	1800.59
3	Magnetic separator	1952	Loss from Flush Water	40	Water recovered from flushing	225
4	Flush Water for plant	235	Loss from cooling tower	15.2	Cooling water Mill/ HGMS/Compressor	111.8
4	Dust Suppression	20	Drinking Water	10	Concentrate Filter	102.12
5	Gland Seals & Filter Cloth	36	Gland Seal & Filter Cloth	3.6	Tailing Filter	83.82
6	Drinking water	10	Dust Suppression	20	Gland Seal & Filter Cloth	32.4
7.	Cooling water Mill/HGMS/Compressor	122.11				
	Total	**2953.21**	**Total**	**143.48**	**Total**	2809.73

The water recovery (%) and water consumption per tonne of concentrate is as given below:

Table -44

Sl. No	Type	
1	Total water recovery of processing plant	95%
2	Water consumption per tonne of concentrate	0.65 m^3/tonne

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7.0 OTHER

a) Site Services

The site services play a vital role in management of mines. The following sites services will be provided within Devadari iron are mines to facilitate mining operation.

i) All statutory services like canteen, first aid center, drinking water station, Rest shelter sand Blasting sheds will be provided in close proximity of mines being developed.

ii) Electricity/ DG will be provided in camp, office, labour tenement and mines.

iii) Effective means of telecommunication.

iv) There will be an ambulance in the mines which in case of emergency can take the patient to the nearest hospital.

b) Employment Potential:

The details of the proposed employment in the mine are as follows:

Table -45

Position	Numbers
Sr. Executives	1
Executives	6
Highly Skilled	9
Skilled	5
Semi-Skilled	15
Unskilled	30
Semi-Skilled (Contract)	10
Unskilled (Contract)	20
Total	**96**

Details of statutory manpower requirement at the mine are given below.

Table -46

Sl. No.	Statutory Manpower	Nos.
1	Agent	1
2	Manager (Mines)	1
3	Assistant Managers	2
4	Engineer	2
5	Geologists	1
6	Surveyor	1
7	Foreman	3
8	Mining Mate	2
9	Electrical Supervisor	1
10	Shotfirer	2
Total		**16**

The details of the proposed employment in the Processing Complex are as follows:

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(Qualified Person)

Table -47

Position	Numbers
Sr. Executives	2
Executives	6
Highly Skilled	10
Skilled	10
Semi-Skilled	18
Unskilled	30
Semi-Skilled (Contract)	10
Unskilled (Contract)	10
Total	**95**

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(Qualified Person)

8.0 PROGRESSIVE MINE CLOSURE PLAN UNDER RULE 23 OF MCDR-2017

8.1 Environment Base Line Information:

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

The leasehold area is a virgin land and the occupancy of the land as on date is given below:-

Table -48

S. No.	Forest Land (ha)	Non Forest Land (ha)	Total Area (ha)
1	470.40	NIL	**470.40**

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

The terrain elevation ranges between 720 m and 1000 m MSL. Physiography of the area is characterized by the elongated ridges trending NNW-SSE, which are similar to the regional tectonic trend. The region has a tropical climate which lies on the border of semi-arid type of Ballari and Hospet, the climate is cooler than surroundings due to its elevation.

Quality of Air

The Meteorological data of the lease area is yet to be collected.

Flora

The tree species found within the core zone represent the common type of flora species along with small shrubs and bushes. Due to mining activities community structure of the vegetation will not change. However, density of plant species of the area will be reduced to certain extent.

With the provision of retention walls, garland drains and vegetation of dumped areas there shall be reduction in soil erosion. This in turn will improve the natural vegetation by improving the species density.

The project authorities hope to reclaim majority of mining lease area with better environmental quality indices Thus, the project shall ultimately contribute to the improvement of the environmental quality of the region.

Fauna

The area is poor in wildlife as there are few good forests in the region and that too is away from the lease area. Around the lease area, Hare, Jackals and foxes are seen adjacent to the rocky hills. Monkeys are represented by Langur and Bonnet. Wild Boar is found in scrub jungle. Of the reptiles, Rat snake, Cobra and Vipers are seen. Since, there are no large tracts of dense forests in the study area, diversity of wild animals is low.

Climatic Conditions

This region receives approximately 750 mm of rainfall in general, but occasionally has seen more than 1000 mm of rainfall. The predominant rainy season in this area is between July and October. Rain also occurs occasionally in the months of November and January due to northeast monsoon. The maximum temperature is around 42^{0}C in summer while minimum temperature is around 15^0 C in winter, which occasionally goes to as low as 6^0 C.

Human Settlements:

No human settlement is there in the leasehold area.

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(Qualified Person)

However, some villages are present in the buffer zone and their details are given in the following table:

Table -49

S. No.	Name of the Village	Aerial Distance from Mining Lease (km)	Population
1	Krishna Nagar	4.6	7027
2	Bhujanga Nagar	3.2	5535
3	Sandur Town	4.6	37431
4	Hulikunta	0.5	1650
5	Ranjitpur	1.4	1375
6	Narsingapur	1.2	2291
7	Vittal Nagar	3.5	1109
8	Devagiri	3.1	3606
9	Donimalai Township	0.6	6672

Public buildings, places of worship and monuments:

No public building, places of worship and monuments are present within the ML area or within its vicinity.

Indicate any sanctuary is located in the vicinity of leasehold:

No sanctuary is located in the vicinity of leasehold.

8.2 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.

An area of **118.4912 hectares** will be broken in the next five years due to commencement of mining operations in the virgin area. Soil sampling stations are proposed at Nandihalli and Narsingpur villages.

ii) Air quality

Detailed monitoring of the baseline data in this regard will be done during the process of preparation of EIA report for this ML at Donimalai Township, Narsingpur, Ranjitpur Nandihalli villages and at the location of proposed processing complex. To control the degradation of air quality due to mining operations, measures like Water sprinkling on haul roads, dense plantation along the safety zone, preventing overloading of tippers/ Dumpers, covered transportation of ore with tarpaulin, Provision of dust extractors with the drill machines/ wet drilling practices etc. are proposed.

iii) Water quality

The water quality is not likely to be degraded due to mining operations, as the UPL will not intersect the general ground water level. However, to prevent the contamination of surface water due to run-offs, retaining walls, garland drains with settleing tanks are proposed considering the drainage pattern. Surface water monitoring is proposed to be done at BMM reservoir and at Donimalai Township.

iv) Noise levels

The noise level is likely to increase due to mining operations and the noise monitoring stations are proposed at Donimalai Township, Narsingpur, Ranjitpur Nandihalli villages and at the location of proposed processing complex. The expected noise levels will be managed through proper maintenance of the plant & machineries & use of personal protective equipment.

All the proposed locations of monitoring stations are shown in **Plat No. 07**.

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Table -49A

Air Pollution		Water Pollution		Noise Pollution	
Source	**Measures**	**Source**	**Measures**	**Source**	**Measures**
Drilling	dust extractors	contamination of surface water due to run-offs	Constructing retaining walls, garland drains with settling tanks.	Loading, Crushing	Protective equipment to workers
Blasting	Controlled Blasting			Blasting	Controlled Blasting
Haulage	Water Sprinklers			Machinery	Proper Maintenance
Transportation	Covered transport				
Crushing	Dry Fog				

v) Vibration levels (due to blasting)

Some blast induced ground vibrations will be generated due to mining operations. These vibrations will be monitored with seismographs and based on the readings, blasting pattern will be designed to minimize the ground vibration levels.

vi) Water regime

The water regime is not likely to be degraded due to mining operations, as the UPL will not intersect the general ground water level.

vii) Acid mine drainage

Not applicable

viii) Surface subsidence

Not applicable

ix) Socio-economics

The mine as operated by a PSU will definitely have a positive contribution towards building up the socio-economic status of the area.

x) Historical monuments etc.

No historical monuments within the ML or with in its vicinity are present.

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 5 years period.

As the pit will not reach its UPL, reclamation of the mined out area is not proposed in this document. However, the ultrafine tailing cakes generated by the beneficiation process are disposed separately at a designated place. The tailings are free of any hard chemicals and hence there is no danger of ground water contamination. Water sprinklers at regular intervals are proposed to arrest any dust generation. The ends of tailing yards where no further dumping take place will be covered with grass turf so that no dust will be generated.

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".

As the pit will not reach its UPL, reclamation of the mined out area is not proposed in this document. The details of the protective measures envisaged for the proposed dumps are given below:-

Table -50

Waste Dump No.	Length of garland drain, m	Length of retaining wall, m
OB dumps	2527	7588
Mineral Stack Yards	1150	1150

Depending upon the drainage pattern of the area where the dump is located, retaining walls, garland drain with settling tanks will be provided in the dumps.

(S.R. Virsen, Mining Engineer)
(Qualified Person)

(S. Hareesh Babu, Mining Engineer)
(Qualified Person)

The same are shown in the Reclamation Plan Drawing No. **MEC/11/16/ Q7EB/08**. The garland drains will be dug around 1m beneath the adjoining contour level at the lower peripheral areas of the dump. The width of the drains shall be around 1.5 m. The settling tanks will be located at the outlet of the garland drains. It will of around 3m length with three compartments of around 1m width to arrest the suspended solids followed with the chamber to arrest any oil particles. The last chamber shall contain the clean water which will be ultimately discharged. The retaining walls will be of 1m height and 1m width at the top and around 1.2m at the base. The material of construction shall be RCC.

Year wise plantation details proposed are furnished below in table:

Table -51

Year	No. of saplings	Area (ha)	Survival Rate	Types of Species
2nd year	12,500	5	75%	Australian acacia, Banyan, Peepal, Teak etc.
3rd year	15,000	6	75%	
4th year	15,000	6	75%	
5th year	25,000	10	75%	

8.3.2 Topsoil Management: The topsoil available at the site and its utilization may be described.

A total volume of **1,16,102** cu.m. of top soil will be generated which will be used for avenue plantation as well as at the envisaged Mineral Processing Complex.

8.3.3 Tailings Dam Management: The steps to be taken for protection and stability of tailing dam, stabilization of tailing material and its utilization, periodic de-silting measures to prevent water pollution from tailings etc., arrangement for surplus water overflow along with detail design, structural stability studies, the embankment seepage loss into the receiving environment and ground water contaminant if any may be described.

Considerable quantities of fine solid (0.4 Mt/yr) will be generated in the form of slurry i.e. tailings from the beneficiation plant. The slurry generated in the beneficiation plant will be thickened in thickeners for water recovery from slurry. The thickening will be carried out in filtration plant, to produce a cake with a moisture content around 10%, which in turn will be dumped into the tailing disposal area. Tailing disposal area has been envisaged in this plan for disposal of the tails. An area equivalent to approximate 9 hectares of land has been demarcated as shown in Drawing No. **MEC/11/16/Q7EB/10** within the lease hold area. The tail disposal site shall be termed as tailing disposal areas and it will be of zero-discharge type. Depending upon the drainage pattern of the area where the tailing disposal yard is located, retaining walls, garland drain with settling tanks will be provided in the dumps. The same are shown in the Reclamation Plan Drawing No. **MEC/11/16/ Q7EB/08**.

The protective measures taken for protection and stability of the tailing dam are given below:

Year	Length of Retaining Wall (m)	Length of Garland Drain (m)	Length of Check Dam (m)
4th year	350	350	5
5th year	180	180	-

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

Not applicable

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(Qualified Person)

(S. Hareesh Babu, Mining Engineer)
(Qualified Person)

MINING PLAN INCLUDING PMCP FOR
DEVADARI IRON ORE MINE
(AREA – 470.40ha)
APPLICANT: KIOCL LIMITED

8.3.5 Surface subsidence mitigation measures through backfilling of mine voids or by any other means and its monitoring mechanism. The information on protective measures for reclamation and rehabilitation works year wise may be provided as per the following table.

Table -52

Items	Details	At end of 2nd yr	At end of 3rd yr	At end of 4th yr	At end of 5th yr
Dump management	Area afforested (ha)	NIL	NIL	6	10
	No of saplings planted	NIL	NIL	15,000	25,000
	Cumulative no. of plants	NIL	NIL	15,000	40,000
	Cost including watch and care during the year	NIL	NIL	NIL	NIL
Management of worked out benches	Area available for rehabilitation (ha)	NIL	NIL	NIL	NIL
	Afforestation done (ha)	NIL	NIL	NIL	NIL
	No. of saplings planted in the year	NIL	NIL	NIL	NIL
	Cumulative no. of plants	NIL	NIL	NIL	NIL
	Any other method of rehabilitation (specify)	NIL	NIL	NIL	NIL
	Cost including watch and care during the year	NIL	NIL	NIL	NIL
Reclamation and Rehabilitation by backfilling	Void available for Backfilling pit-wise/stope wise	NIL	NIL	NIL	NA
	Void filled by waste /tailings	NIL	NIL	NIL	NA
	Afforestation on the backfilled area	NIL	NIL	NIL	NA
	Rehabilitation by making water reservoir	NIL	NIL	NIL	NA
	Any other means (specify)	NIL	NIL	NIL	NA
Rehabilitation of waste land within lease	Area available (ha) (safety zone of mining lease)	5	6	NIL	NA
	Area rehabilitated (ha)	5	6	NIL	NA
	Method of rehabilitation	Plantation	Plantation	NIL	NA
	No. of saplings to be planted	12,500	15,000	NIL	NA
	Cost including watch and care	5,00,000	5,00,000	NIL	NA
Others (specify)	Construction of retaining wall for dumps, m	2067	1362	2032	2127
	Construction of garland drain with 1 No. of settling tank	2067	320	-	140
	Cost towards construction of above protective measures	20,00,000	8,00,000	10,00,000	10,00,000
	Cost towards monitoring of Environmental Parameters	5,00,000	2,00,000	2,00,000	2,00,000

(S.R. Virsen, Mining Engineer)
(Qualified Person)

(S. Hareesh Babu, Mining Engineer)
(Qualified Person)

8.4 Disaster Management and Risk Assessment: This may deal with action plan for high risk accidents like landslides, subsidence flood, inundation in underground mines, fire, seismic activities, tailing dam failure etc. and emergency plan proposed for quick evacuation, ameliorative measures to be taken etc. The capability of lessee to meet such eventualities and the assistance to be required from the local authority may also be described.

The objective of on-site disaster management plan for the mine is to be in a state of perpetual readiness through training and development to immediately control and arrest any emergency situation so as to avert a full-fledged disaster and the consequence of human and property damage and in the event of a disaster still occurring, to manage the same so that the risk of the damage to life and property is minimized. M/s KIOCL Ltd. will develop a procedure in vogue for emergency preparedness and responses.

Following key personnel will be responsible for co-ordination in case emergency is anticipated in any section of the mine. However, the names will be finalized once the lease is being executed & the mine comes under operation.

Table -53

Key personnel
Site Controller
Accident Controller / Communication Officer
Primary Controller
Liaison Officer

Key Personnel and their responsibilities

Site Controller:

- The site controller shall have an overall responsibility for controlling the incident / accident and directing the personnel. He will be in the rank of Agent (Mines)
- To prepare a full proof plan for control of accident like, landsides, subsidence flood and other natural calamities.
- To inform statutory bodies of the State and Central Government.
- To inform communication officer about the emergency, control centre and assembly point.
- To provide all assistance and call for fire squad, security officer and other services required for removing / control of danger.
- To ensure that all necessary personnel assemble at assembly point.
- Make arrangement for medical treatment to the personnel injured seriously.

Accident Controller:

- Mines manager shall act as accident controller/ communication officer.
- Mock rehearsal of management plan prepared for accident.
- To withdraw men / machine from the affected area with priority for safety of personnel, minimize damage to the machines, environment and loss of material.
- To make a report based on the facts and figure and submit to the site controller.

(S.R. Virsen, Mining Engineer)
(Qualified Person)

(S. Hareesh Babu, Mining Engineer)
(Qualified Person)

- To communicate to the site in charge and make arrangement for first aid and transportation of the injured personnel.

Primary Controller:

- To inform the Accident Controller from the nearest means of communication about the location and the nature of accident.
- To assist in clearing any obstruction in relief of accident.
- To carry out all instructions of accident controller.
- To provide first aid treatment and communicate to the shift in-charge.

Capability of Lessee:

Following facilities will be made available at the mine site, once the mine comes under operation:

- Public address system
- Telephone / Mobile handsets
- Messenger
- Firefighting equipment and accessories with trained manpower
- Hospital close to the mine.
- Training centre
- Ambulance van
- Jeeps

List of contact person of mines in case of emergency is given below:

Table -54

Name	Designation & Department	Address	Contact No.
Shri S.C. Basavaraju	AGM (Mining)	Devadari Iron Ore Mines, Sandur Taluk, Bllary Dist., PIN- 583118	9535372688
Sandur Police Station	Police Station	Sandur, Bellary - 583119	08395 260249
Taluk Hospital	Hospital	Sandur, Bellary - 583119	-
Fire Station	Fire Station	SH 40, Sandur, Karnataka 583119	08395 260249, 101

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

When the mine is temporarily discontinued due to any unforeseen circumstances the following care and maintenance shall be carried out:

Notice to be served to all the concerned authority.

- Temporary fencing shall cover the mining pit area.
- All access roads/openings to the pit / face shall be closed by parapet wall as per rule.
- Warning shall be displayed on the 'Notice Board' at appropriate places.

(S.R. Virsen, Mining Engineer)
(Qualified Person)

(S. Hareesh Babu, Mining Engineer)
(Qualified Person)

This Mining Plan is approved subject to the conditions / stipulations indicated in the Mining Plan approval letter No. [illegible] Date [illegible]

- Security personnel shall be posted at every danger point.
- No unauthorized person shall be allowed to enter into the mine without prior permission of the management.
- Mine benches shall be dressed and properly sloped for its stability.
- Steps to be taken for prevention of landslide/side fall.
- All men and machinery shall be withdrawn from the mine and shall be kept in a compound and safe place.
- All safety precautions shall be taken care of as per statutory rules.

Regional Controller of Mines
Indian Bureau of Mines, Bangalore - 560 022

8.6 Financial Assurance:

The financial assurance can be submitted in any encashable form preferably a Bank Guarantee from a Scheduled Bank as stated in Rule 27 (2) of Mineral Conservation and Development Rules, 2017 for five years period expiring at the end of validity of the document. The amount calculated for the purpose of Financial Assurance is based on the CCOM's Circular no. 4 dated 2006 as below.

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

Table -55

Sl. No.	Head	Area put on use at start of plan period (ha)	Additional area requirement during Plan period (ha)	Total area (ha)	Area considered as fully reclaimed & rehabilitated (ha)	Net area considered for calculation (ha)
1	Area under mining	0.8399 *	35.9199	36.7598	0	36.7598
2	Storage for top soil	0	1.8750	1.8750	0	1.8750
3	Waste dump site	0	42.1194	42.1194	0	42.1194
4	Mineral Storage	0	6.6548	6.6548	0	6.6548
5	Infrastructure – workshop, administrative building etc.	0	2.0277	2.0277	0	2.0277
6	Roads	0.8861	6.8063	7.6924	0	7.6924
7	Railways	0	0	0	0	0
8	Tailing pond	0	9.7736	9.7736	0	9.77355357
9	Effluent Treatment Plant	0	0	0	0	0
10	Mineral Separation Plant	0	11.5887	11.5887	0	11.5887
11	Township area	0	0	0	0	0
12	Others (Unused area)	468.6740	-	-	-	-
	Total	**470.4000**	**116.7654**	**118.4912**	**0**	**118.4912**

* old Mine working in South Block.

The total financial assurance upto the end of 5th year will be **Rs. 3,55,47,360/-** only @ **Rs. 3,00,000/ - per hectare.**

(S.R. Virsen, Mining Engineer)
(Qualified Person)

(S. Hareesh Babu, Mining Engineer)
(Qualified Person)