PROPOSAL FOR PRELIMINARY EXPLORATION OF MALANGTOLI IRON ORE DEPOSIT IN E-SUB BLOCK OF BONAI-KENDUJHAR-IRON ORE BELT IN THE DISTRICT-SUNDARGARH & KENDUJHAR, ODISHA

SYNOPSIS

1. Mineral	Iron
2. Location	The area of investigation falls in parts of Survey of India Toposheet Nos 73 G/5, being one of the most important iron and manganese mining centers of Odisha. It is well connected with other parts of the State as well as with the neighboring State of Jharkhand. National Highway No.215 connecting Panikoili on National Highway No.5 with Rourkela via Kendujhar, Joda, Barbil and Koira passes through the area. The other important mining centers in the vicinity are Kalta, Tensa and Barsuan. The nearest rail head Barbil is 30km away, on Tatanagar-Barbil section of the South-Eastern Railway.
3. Total Area	14.70 Sq. km.
4. Exploration Agency	MECL
5. Background	The Banded Iron formation (B.I.F) and associated Volcano-Sedimentary sequence of Iron ore group of Bonai-Kendujhar belt, North Odisha, received attention of geoscientists and mining agencies as early as 1930's. Geological Survey of India has been carrying Iron ore exploration work in this belt since 1960's. In addition, several Iron ore bodies also occur within the synclinal valley, which are mostly associated with the upper shale formation of Koira Group of rocks. The exploration for Iron ore in Malangtoli Deposit, Sundargarh District, Odisha, has been carried out by Geological Survey of India, Eastern Region, State Unit: Odisha, Bhubaneswar. The Principal Secretary, Ministry of Mines, Government of Odisha, has allotted the twelve sub-blocks of Malangtoli Iron Ore Deposit of Odisha state to MECL for taking up of exploration for Iron Ore. MECL requested DGM,Odisha to provide the basic data for preparation of proposal & accordingly MECL prepared proposal for preliminary exploration(G-3) level and put up for evaluation of TCC of NMET & approval of EC. In case the results of G-3 level are encouraging then MECL will take up the G-2 level exploration after approval from TCC & EC of NMET to facilitate Government of Odisha for auctioning of block in view of MMDR Amendment Act 2015. E-Sub- Block for preliminary exploration for Iron is one of the 12 blocks for which exploration proposal (G-3) is prepared and put up for approval of Technical cum Cost Committee of NMET (TCC), for G-3 level exploration for iron ore.
6.Regional Geology	The present study area is a part of the Bonai-Kendujhar belt of Sundargarhdistrict. The little metamorphosed Precambrian volcano sedimentary rocksexposed in this belt between the SinghbhumGranite in theeast and BonaiGraniteinthe west are classified as 'Iron Ore Group' (Sarkar&Saha, 1963) or 'KoiraGroup'(Murty and Acharya, 1975). These rocks aredisposed in form of a low northerlyplunging 'Horse-shoe' shaped Synclinorium(Jones, 1934). The base of the Koira Group is marked by a pronounced unconformity over the SinghbhumGranite in the eastern side and has a sheared inter-fingering contact relationship with Bonai Granite on the western side. The Basal Formation comprises of gritty sandstone, which ranges from ortho-quartzite on one hand to pebbly sandstone and conglomerate on the other. This arenaceous unit is followed by mafic volcanics which is found all along the outer periphery of the Horse-Shoe Synclinorium.

The volcanic formation comprises predominantly of Lower Volcanic Flows dominantly of mafic composition and an upper tuffaceous zone. The lava is pillowed at the bottom part and amygdaloidal at the top indicating its sub-aqueous and subsequent sub-aerial character. The lava grades into purple colour tuffaceous shale conformably towards the upper part and described as 'Lower Shale Formation' (Murty and Acharya, op. cit.). By the appearance of jasper and banded jasper interbanded with the greenish and black shale towards the top, the lower shale graded into the 'Banded Iron Formation'.

The litho-stratigraphic succession of this area, as worked out by earlier workers, based on regional field studies is shown below.

Table Showing Litho-stratigraphic succession of the area

Jones (1934)		Saha(1994) Modified after Sarkar & Saha (1977)		Murthy & Acharya (1975)	
	Upper shales, epidiorite and ash bed B.H.Q. with iron ore bodies Shales with occasional sandstones Purple sandstone with basal conglomerate ----------Unconformity---------- Older Dharwars	IRON ORE GROUP	Singhbhum Granite Upper Shale with volcanics BHJ with iron ore, ferruginous quartzite Lower shale and acid, intermediate tuffs, local dolerite	KOIRA GROUP	Mixed facies formation Upper Shale Formation Banded Iron Formation Volcanic Formation

The stratigraphy of the area modified after Murty and Acharya (op. cit) is given below:	
Kolhan Group	
KOIRA GROUP	Upper Shale Formation
	Banded Iron Formation
	Volcanic Formation
	Basal Sandstone – Quartzite
Singhbhum and Bonai Granites and metamorphosed sediments	

The 'Banded Iron Formation' is represented by BHJ/ BHQ, inter-bedded with black or green shale and banded ferruginous chert. Due to high resistance to erosion these litho-units form high ridges conspicuously mark the outline of the 'Horse-Shoe' Synclinorium" and depict the major structural pattern of the belt.

7. Objective

The present exploration programme has been formulated to fulfill the following objectives:-

i) To prove the existence / occurrence of iron ore in strike and dip continuity in the block by drilling bore holes at 400m X 400m grid interval.
ii) To find out the quality and grade of iron ore.
iii) To estimate resources of iron ore at G-3 level of UNFC.
iv) To carry out preliminary exploration as per Minerals (Evidence of Mineral Contents) Rules- 2015, Mineral Auction Rule 2015 and MMDR Amendment Act-2015.

8. Time Schedule

12 Months

9.Cost Estimate

Rs. 199.209 lakhs

10. Justification	i) In view of MMDR Amendment Act and Mineral Auction Rule 2015, DMG Odisha requested MECL to take up the preliminary exploration in this block. DMG, Odisha has requested MECL to take up exploration work under NMET funding. ii) The mineralized zones intersected in GSI boreholes drilled in adjacent L-Block are continuous both in strike and dip direction. Hence the continuity of the zones requires further proving in this area. iii) The present exploration will establish the resources and grade of the Iron ore in G-3 level. Based on the results of this programme decision will be taken for taking up G-2 level exploration in the block and will eventually lead to enable the State Government of Odisha for auctioning of the block.

PROPOSAL FOR PRELIMINARY EXPLORATION OF MALANGTOLI IRON ORE DEPOSIT IN E-SUB BLOCK OF BONAI-KENDUJHAR-IRON ORE BELT IN THE DISTRICT-SUNDARGARH & KENDUJHAR, ODISHA

1.0.0 Introduction

1.1.1 The Banded Iron formation (B.I.F) and associated Volcano-Sedimentary sequence of Iron ore group of Bonai-Kendujhar belt, North Odisha, received attention of geoscientists and mining agencies as early as 1930's. Geological Survey of India has been carrying Iron ore exploration work in this belt since 1960's. In addition, several Iron ore bodies also occur within the synclinal valley, which are mostly associated with the upper shale formation of Koira Group of rocks. The exploration for Iron ore in Malangtoli Deposit, Sundargarh District, Odisha, has been carried out by Geological Survey of India, Eastern Region, State Unit: Odisha, Bhubaneswar.

1.1.2 The Principal Secretary, Ministry of Mines, Government of Odisha, has allotted the twelve sub-blocks of Malangtoli Iron Ore Deposit of Odisha state to MECL for taking up of exploration for Iron Ore. MECL requested DGM,Odisha to provide the basic data for preparation of proposal & accordingly MECL prepared proposal for preliminary exploration(G-3) level and put up for evaluation of TCC of NMET & approval of E.C. In case the results of G-3 level are encouraging then MECL will take up the G-2 level exploration after approval from TCC & EC of NMET to facilitate Government of Odisha for auctioning of block in view of MMDR Amendment Act 2015.

1.1.3 E-Sub- Block for preliminary exploration for Iron is one of the 12 blocks for which exploration proposal (G-3) is prepared and put up for approval of Technical cum Cost Committee of NMET (TCC), for G-3 level exploration for iron ore.

1.2.0 Location & Accessibility

The area of investigation is 3-4km SW of Pipokri and falls in parts of Survey of India Toposheet Nos 73 G/5, being one of the most important iron and manganese mining centers of Odisha. It is well connected with other parts of the State as well as with the neighboring State of Jharkhand. National Highway No.215 connecting Panikoili on National Highway No.5 with Rourkela via Kendujhar, Joda, Barbil and Koira passes through the area. The other important mining centers in the vicinity are Kalta, Tensa and Barsuan. The nearest rail head Barbil is 30km on Tatanagar-Barbil section of the South-Eastern Railway. The block location is shown as Plate No-I. The block co-ordinate of E-sub-block, Malangtoli Iron Ore Deposit is given in Table No.1.2

Table No.1.2

BLOCK COORDINATE OF MALANGTOLI IRON ORE DEPOSIT E- SUB- BLOCK

DISTRICT- SUNDARGARH, ODISHA

POINT NAME	EASTING	NORTHING	LONGITUDE	LATITUDE
E - 1	327723.313	2415324.156	85° 19' 59.161"	21° 50' 0.406"
E - 2	323404.894	2415349.364	85° 17' 28.780"	21° 49' 59.687"
E - 3	323472.755	2419237.447	85° 17' 29.640"	21° 52' 6.115"
E - 4	324226.539	2419311.833	85° 17' 55.865"	21° 52' 8.805"
E - 5	324170.310	2420016.288	85° 17' 53.635"	21° 52' 31.687"
E - 6	323975.195	2419979.908	85° 17' 46.853"	21° 52' 30.434"
E - 7	323386.488	2420743.893	85° 17' 26.052"	21° 52' 55.059"
E - 8	322935.934	2420690.253	85° 17' 10.379"	21° 52' 53.152"
E - 9	322917.917	2420802.111	85° 17' 9.708"	21° 52' 56.782"
E - 10	325957.682	2420786.679	85° 18' 55.597"	21° 52' 57.373"
E - 11	325989.452	2420691.439	85° 18' 56.740"	21° 52' 54.288"
E - 12	326010.076	2420524.745	85° 18' 57.522"	21° 52' 48.876"
E - 13	326057.696	2420445.388	85° 18' 59.211"	21° 52' 46.313"
E - 14	326311.695	2419821.493	85° 19' 8.296"	21° 52' 26.120"
E - 15	326137.088	2419719.899	85° 19' 2.253"	21° 52' 22.755"
E - 16	325925.670	2420149.980	85° 18' 54.725"	21° 52' 36.662"
E - 17	325773.278	2420097.576	85° 18' 49.437"	21° 52' 34.904"
E - 18	325859.001	2419900.732	85° 18' 52.498"	21° 52' 28.535"
E - 19	325774.855	2419238.737	85° 18' 49.820"	21° 52' 6.983"
E - 20	324666.786	2419305.400	85° 18' 11.201"	21° 52' 8.754"
E - 21	324404.860	2417952.058	85° 18' 2.599"	21° 51' 24.662"
E - 22	324789.827	2417959.991	85° 18' 16.003"	21° 51' 25.058"
E - 23	324234.188	2416523.304	85° 17' 57.205"	21° 50' 38.151"
E - 24	326714.671	2416618.574	85° 19' 23.548"	21° 50' 42.133"
E - 25	326820.495	2417584.293	85° 19' 26.867"	21° 51' 13.567"
E - 26	326509.606	2418741.846	85° 19' 15.600"	21° 51' 51.090"
E - 27	327005.720	2419132.120	85° 19' 32.731"	21° 52' 3.954"
E - 28	327058.617	2419866.341	85° 19' 34.295"	21° 52' 27.843"
E - 29	327779.618	2420521.174	85° 19' 59.161"	21° 52' 49.387"
E - 30	327786.241	2419853.115	85° 19' 59.644"	21° 52' 27.670"
E - 31	327283.518	2419912.647	85° 19' 42.111"	21° 52' 29.428"
E - 32	327220.019	2419055.382	85° 19' 40.224"	21° 52' 1.535"
E - 33	327775.642	2418999.829	85° 19' 59.597"	21° 51' 59.925"

1.3.0 Physiography & Drainage

The E-block of Malangtoli area is a highly rugged terrain with elongated hills having general extension along NNE-SSW direction. The area is an undulating country on a plateau which rises about 400.00m to 500.00m above the surrounding plains, and has an average elevation of nearly 920.00m above mean sea level. Some of the ridges further south of the mapped area have arcuate shape with their convexity pointing towards NNE. The main drainage of the area is Baitarni River which flows in a northward direction east of the Pipokri-Sirkagutu plateau and forms the eastern boundary of the Malangtoli area. The most important tributary of the Baitarni River is the Mohalda Nala which flows in a northeastern direction at the southeastern foot of the Pipokri-Sirkagutu plateau. A number of perennial streams radiate from the plateau, the notable among these Jalpa, Nalpani, Kasijoda, Sirkagutu, Khandahar and Malangtoli Nalas. All these streams ultimately flow into Baitarni River with only exception of Malangtoli nala which flows northwards into Kundra River.

1.4.0 Climate, flora and fauna:

The area experiences a humid-tropical climate. The period between December and March is very cold when the mercury drops down to sub-zero, bringing in occasional layers of frost during winter. It is very hot during summer with temperature rising to nearly 50°C during peak period. During rainy season, heavy rains bring in flash floods. Over precipitation during monsoon has resulted in development of tropical forest comprising densely packed tall trees and the thick green cover. The forests are inhabited by elephants, wild boar, bear, monkeys and occasional tiger and leopard.

2.0.0 Previous Work

2.1.1 H.C.Jones (Hayden-1920; Pascoe-1921, 1923, 1924, 1925, 1927; Fermor-1923; and Jones-1922 and 1934) and M.S.Krishnan (Pascoe-1927, 1928; and Jones-1934) carried out traverses in parts of the area under report, while covering the entire Singhbhum-Keonjhar-Bonai iron ore region between 1919 and 1927, for delineating the geological set up and rapid assessment of the potentialities of the various iron ore deposits in the region. They estimated a reserve of about 2970 m.t. for the entire area. Out of this, about 200 m.t. was their estimates for the ore deposits now included in the Malangtoli block. The area covering parts of the Malangtoli block was geologically mapped on 1:63,360 scale by B.C.Gupta during the field season 1938-39. A preliminary survey of the various deposits of iron ore in the Malangtoli block was carried out by P.C. Mathur and P.V.S. Kurup (Mathur & Kurup-1962) and a reserve of about 470.00 m.t. of ore with average Fe of 60%. The present preliminaryinvestigation was planned on the basis of the data available from the above mentioned earlier work.

2.1.2 **Work Carried out By GSI**

GSI carried out exploration work in the adjoining 'L'block during FS 1963-64 to1967-68 which includes geological mapping 3.4 Sq.Km. of the ore bearing and adjoining areas; 3551.29m of drilling in 95 bore holes; about 52.0m of excavation in 5 deep pits. These data of GSI has been considered for preparation of present exploration proposal presuming the continuity of occurrence of iron ore in the area as established by GSI..

3.0.0 Regional Geological setup:

3.1.1 The present study area is a part of the Bonai-Kendujhar belt of Sundargarh district. The little metamorphosed Precambrian Volcano-Sedimentary rocks exposed in this belt between the Singhbhum Granite in the east and Bonai Granite in the west are classified as 'Iron Ore Group' (Sarkar & Saha, 1963) or 'Koira Group' (Murty and Acharya, 1975). These rocks are disposed in the form of a low northerly plunging 'Horse-Shoe' shaped Synclinorium (Jones, 1934), which is shown in Plate No.II(After GSI)

The litho-stratigraphic succession of this area, as worked out by earlier workers, based on regional field studies is shown below:

Table Showing Litho-stratigraphic succession of the area

Jones (1934)		Saha(1994) Modified after Sarkar & Saha (1977)		Murthy & Acharya (1975)	
	Upper shales, epidiorite and ash bed B.H.Q. with iron ore bodies Shales with occasional sandstones Purple sandstone with basal conglomerate ----------Unconformity---------- Older Dharwars	IRON ORE GROUP	Singhbhum Granite Upper Shale with volcanics BHJ with iron ore, ferruginous quartzite Lower shale and acid, intermediate tuffs, local dolerite	KOIRA GROUP	Mixed facies formation Upper Shale Formation Banded Iron Formation Volcanic Formation

The stratigraphy of the area modified after Murty and Acharya (op. cit) is given below:	
Kolhan Group	
KOIRA GROUP	Upper Shale Formation
	Banded Iron Formation
	Volcanic Formation
	Basal Sandstone – Quartzite
Singhbhum and Bonai Granites and metamorphosed sediments	

3.1.2 The base of the Koira Group is marked by a pronounced unconformity over the Singhbhum Granite in the eastern side and has a sheared inter-fingering contact relationship with Bonai Granite on the western side. The Basal Formation comprises of gritty sandstone, which ranges from ortho-quartzite on one hand to pebbly sandstone and conglomerate on the other. This arenaceous unit is followed by mafic volcanics which is found all along the outer periphery of the Horse-Shoe Synclinorium. The volcanic formation comprises predominantly of Lower volcanic flows dominantly of mafic composition and an upper tuffaceous zone. The lava is pillowed at the bottom part and amygdaloidal at the top indicating its sub-aqueous and subsequent sub-aerial character. The lava grades into purple colour tuffaceous shale conformably towards the upper part and described as 'Lower Shale Formation' (Murty and Acharya, op. cit.). By the appearance of jasper and banded jasper interbanded with the greenish and black shale towards the top, the lower shale graded into the 'Banded Iron Formation'.

The 'Banded Iron Formation' is represented by BHJ / BHQ, inter-bedded with black or green shale and banded ferruginous chert. Due to high resistance of erosion, these litho-units form high ridges conspicuously mark the outline of the 'Horse-Shoe' Synclinorium and depict the major structural pattern of the belt.

The 'Banded Iron Formation' is overlain by the 'Upper Shale Formation' comprising of thick sequence of tuffaceous purple, white and buff coloured shale, black shale, banded ferruginous shale with inter-bedded chert and BHJ / BHQ bands which spread over the entire core of the Synclinorium. The 'Upper Shale Formation' can be divided into two horizons / zones (Patel, et.al, 2005) namely, lower manganiferrous shale horizon/ zone and upper ferruginous shale horizon/ zone. These two horizons / zones exhibit

conformable relationship and are characterised by their typical litho-assemblages. The manganiferrous horizon / zone comprising predominantly of manganiferrous grayish green shale, carbonaceous black shale with inter-beds of chert locally grading to dolomite hosts almost all the major manganese ore deposits of the area, whereas, ferruginous shale horizon/ zone comprising of banded ferruginous shale with inter-beds of BHJ / BHQ and BFC gives rise to isolated iron ore deposits within the core of the synclinorium, the Regional Geological Map of the Bonai-Kendujhar Iron Ore belt is shown in Plate No.III(After GSI).

A younger sequence of conglomerate and sandstone, exposed on the northern and north eastern part of the belt are unconformably overlying the Koira Group of rocks, is arenaceous rock sequence which have been described as Kolhan Series (Dunn, 1940) or Kolhan Group (Murty and Acharya, 1975). It is differentiated from the basal sandstones and conglomerate by the presence of jasper pebbles, iron ore pebbles and fragments of BHJ.

The iron ore bodies associated with the 'Upper Shale Formation', occur at much lower topographic elevations (450-650 m) within the core of the synclinorium compared to the major iron ore deposits belonging to the 'Banded Iron Formation' and occurring at the ridge tops (750-950 m).

Structure:

In general the Iron Ore Super Group of rocks in the Bonai-Kendujhar belt are disposed in form of an *"Omega"* and referred to as "Horse Shoe Synclinorium" (Jones, 1934). This belt is 60 km long and 25 km wide extending from south of Malangtoli in Kendujhar district up to Chakradharpur in West Singhbhum district (Jharkhand). The structural fabrics in the above, little metamorphosed Volcano-Sedimentary litho-sequence indicate at least two phases of deformation and folding. The earlier phase is the most prominent and resulted in formation of two synclines intervened by an anticline trending NNE-SSW with a low north-north easterly plunge. The western limb is slightly overturned to the east and dip westerly (65^0-75^0) whereas, the eastern limb is a normal one with moderate to low (30^0-45^0) westerly dip. This phase of folding is affected by a later NW-SE to WNW-ESE trending fold resulting in broad warps and formation of structural domes and basins in the area. The western syncline known as Koira syncline, due to steep dip and overturned nature of its limb forms a deeper basin with thick sequence of younger shales in the core region. On the other hand, the eastern syncline known as Bamebari syncline is a shallower basin and exposes younger litho members within the core region as outliers. The Upper shale unit within the Koira syncline is mostly continuous whereas, in Bamebari syncline it occurs as isolated patches.

Local Geology:

The area under investigation lies within the Upper Shale Formation of the Koira Group. The Upper Shale Formation as described by Murthy & Acharya (1975) can be subdivided in to two units namely lower manganiferrous shale horizon and upper ferruginous shale horizon.

Local stratigraphic succession as worked out in the areas under investigation (i.e.in Malangtoli Iron Ore) is as follows

Upper Shale Formation	**Ferruginous Shale Unit:** Shales of different colouration like pink, yellow, variegated with narrow inter beds of BHJ/BHQ and derived Iron ore.
	Manganiferrous Shale Unit: Manganiferous shale with associated manganese ore followed up by massive chert (brecciated at places).
Banded Iron Formation	Coarsely banded jaspellite followed up by finely banded jaspellite.

3.2.0 Description of rock types

Banded Iron Formation (BHJ & BHQ):

These rocks serve as important marker horizon. Major iron ore bodies are closely associated with these litho units. It encompasses BHJ, BHQ and ferruginous quartzite of the area. Megascopically BHJ comprises alternate bands (laminations less than 5mm thick) of haematite and dark brown to red jasper. Magnetite is rare and usually associated with hematite in minor proportion. BHQ is found to occur towards the upper part of BHJ profile or as thin layers within BHJ. Both BHJ and BHQ are sheared at various places and are traversed by fine silica and haematite veins.

They are discontinuously exposed along strike for a maximum length of 100m in a single outcrop. The BHJ bands in the valley area are affected by shearing showing unevenness of the jasper bands. The shear zones are filled with fragments of BHJ, BHQ and laminated ore. Megascopically, the individual jasper bands / laminations are seen to be much thicker as compared to that of the iron oxide rich bands / laminations within the BHJ. The Jasper contains small discrete aggregates of quartz, opaque grains and ferruginous materials. The quartz occurs as anhedral to subhedral grains and haematite forms anhedral grains and masses.

Manganiferrous Shale :

This is the overlying unit of BHJ/BHQ having gradational contact. The shale unit is often enriched in manganese minerals and hence called manganiferrous shale. The bedding is marked by colour banding and constitutes clay minerals, sericite and needle sized amphiboles. The opaque shows a preferred orientation parallel to bedding plane.

Ferruginous Shale:
It occupies the central valley and represented by a finely laminated rock having varied shades of colour ranging from white, maroon, dark gray, brownish and purple to green etc. The coloration of the shale largely depends on the mineral composition (Murthy & Acharya, 1975). It is mostly composed of clayey micaceous minerals, with lenses of chert. The upper shale contains several unmappable units such as carbonaceous shale, banded shale, sandy claystone, shales and mudstones etc. Most of the area containing this unit is lateritised extensively.

Iron ore:
The thinly laminated, hematite ore bodies exposed in the valley area are very often lateritised near the surface. However, insitu bouldery outcrops of hard and soft laminated, massive and brecciated ores are found at the identified blocks where exploration have to be carried out. 'Canga' zones occur near to the iron ore bodies within the hard lateritised duricrust and contain mostly iron ore floats. Detrital Iron ores deposited in the saddle region adjacent to the main iron ore bodies occur at several places in the area.

Laterites:
Most part of the area is covered by laterite of various types. The laterites have been developed mostly over the shale unit of the area and depending upon the composition of the shale, different types of laterites have been developed. The shale rich in alumina has given rise to bauxitic laterite and those rich in manganese or iron have developed manganiferrous and ferruginous laterites respectively. Ferruginous laterite occupies most of the high lands in the vicinity and is wide-spread. Aluminous laterite/ bauxite occur in form of small patches and narrow bands, spread over the area. The yellowish black laterite covering major part of the area has been the host for pockets of manganese concentration.

Alluvial soil:
The low lying areas, river banks etc are filled up with alluvial soil.

3.6.0 Mineralisation Details

Mode of Occurrence and Controls of Ore Localisation:
Iron ore in the Malangtoli Iron Ore Deposit, E-Sub-Block area occurs as continuous bodies associated with variegated shale and ferruginous shale. The ore bodies are capped by ferruginous laterite on surface. Though the ore types show outcrops of hard ore, lateritic ore and float ore on the surface but soft laminated and powdery ore constitutes the bulk thickness of the ore zone as evidenced from pit sections and drill cores.

Nature of Ore and Mineralogy:

The ore is mostly powdery to soft laminated varieties with partings of ferruginous shale. Thin layers of Hard Laminated ore are present on the surface, followed by powdery and soft laminated at depth, which are inseparable. The mineralization of iron ore is mainly bedded type associated with ferruginous shale of Upper Shale Formation of Iron Ore Super Group.

4.0.0 Objective of the proposed exploration programme

4.1.0 The present exploration programme has been formulated to fulfill the following objectives:-

i) To prove the existence / occurrence of iron ore in strike and dip continuity in the block by drilling bore holes at 400m X 400m grid interval.
ii) To find out the quality and grade of iron ore.
iii) To estimate resources of iron ore at G-3 level of UNFC.
iv) To carry out preliminary exploration as per Minerals (Evidence of Mineral Contents) Rules- 2015, Mineral Auction Rule 2015 and MMDR Amendment Act-2015.

5.0.0 Proposed Scheme of Exploration

5.1.0 In accordance with the objectives set for preliminary exploration in Malangtoli, E-Sub-Block, the drilling programme is proposed to fill the data gap of earlier exploration of GSI at 200m strike interval. The exploration shall be carried out as per Mineral (Evidence & Mineral Contents) Rule -2015 and Mineral Auction Rule-2015.

Therefore, the following scheme of exploration was formulated in order to achieve the objectives. The details of different activities to be carried out are presented in subsequent paragraphs.

5.2.0 Topographic Surveying

The deposit area would be tied up with the triangulation network of GSI & earlier MECL work. The reduced levels and co-ordinates of boreholes would be determined, keeping GSI co-ordinates and benchmarks intact. The contouring would be done at 5 m interval on 1:10,000 scale to prepare a detailed topographic map of the deposit. The block boundary will be surveyed by DGPS & total station in WGS -84 Datum for demarcation of Block Boundary points and ancillary area to facilitate the State Governments for Auctioning of Blocks.

5.3.0 Geological Mapping

The area of the block is 14.70 sq.km calculated by auto cad software which is almost equal to the area supplied by DGM, Govt. of Odisha.

The earlier geological map of the area prepared by GSI will be updated with the present exploration data by few rapid geological traverses and also with reference to the new

subsurface data which will be generated through this exploration program and would be used as a base map for the purpose of exploration work.

5. 4.0 Exploratory Drilling:

The drilling work is proposed at rectangular grid pattern of 400mX400m in grid has been maintained to bring the deposit to G-3 Level which will help the State Govt. of Odisha to facilitate auctioning.

However, the average depth of the bore holes has been considered 60m on the basis of drilling information gathered from adjoining L Sub-Block of GSI and the information gathered by MECL from the nearby area of the block during field visit. The bore hole will be closed in BHJ/BHQ/ lower shale judiciously and taken care by field geologist during the course of exploration.

The bore hole location plan at 400mX400m grid is shown as plate No.IV. Total 98 nos. of coring bore holes will be drilled on above proposed grid to establish the deposit in G-3 level which involves 5880 meter drilling in the block.

Table No. 5.1		
Details of Proposed Boreholes		
SL. NO	PROPOSED CORING BOREHOLE No.	PROPOSED DEPTH TO BE DRILLED (m)
1	PBH 1	60.00
2	PBH 2	60.00
3	PBH 3	60.00
4	PBH 4	60.00
5	PBH 5	60.00
6	PBH 6	60.00
7	PBH 7	60.00
8	PBH 8	60.00
9	PBH 9	60.00
10	PBH 10	60.00
11	PBH 11	60.00
12	PBH 12	60.00
13	PBH 13	60.00
14	PBH 14	60.00
15	PBH 15	60.00
16	PBH 16	60.00
17	PBH 17	60.00
18	PBH 18	60.00
19	PBH 19	60.00
20	PBH 20	60.00

21	PBH 21	60.00
22	PBH 22	60.00
23	PBH 23	60.00
24	PBH 24	60.00
25	PBH 25	60.00
26	PBH 26	60.00
27	PBH 27	60.00
28	PBH 28	60.00
29	PBH 29	60.00
30	PBH 30	60.00
31	PBH 31	60.00
32	PBH 32	60.00
33	PBH 33	60.00
34	PBH 34	60.00
35	PBH 35	60.00
36	PBH 36	60.00
37	PBH 37	60.00
38	PBH 38	60.00
39	PBH 39	60.00
40	PBH 40	60.00
41	PBH 41	60.00
42	PBH 42	60.00
43	PBH 43	60.00
44	PBH 44	60.00
45	PBH 45	60.00
46	PBH 46	60.00
47	PBH 47	60.00
48	PBH 48	60.00
49	PBH 49	60.00
50	PBH 50	60.00
51	PBH 51	60.00
52	PBH 52	60.00
53	PBH 53	60.00
54	PBH 54	60.00
55	PBH 55	60.00
56	PBH 56	60.00
57	PBH 57	60.00
58	PBH 58	60.00
59	PBH 59	60.00
60	PBH 60	60.00
61	PBH 61	60.00

62	PBH 62	60.00
63	PBH 63	60.00
64	PBH 64	60.00
65	PBH 65	60.00
66	PBH 66	60.00
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75	PBH 75	60.00
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78	PBH 78	60.00
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82	PBH 82	60.00
83	PBH 83	60.00
84	PBH 84	60.00
85	PBH 85	60.00
86	PBH 86	60.00
87	PBH 87	60.00
88	PBH 88	60.00
89	PBH 89	60.00
90	PBH 90	60.00
91	PBH 91	60.00
92	PBH 92	60.00
93	PBH 93	60.00
94	PBH 94	60.00
95	PBH 95	60.00
96	PBH 96	60.00
97	PBH 97	60.00
98	PBH 98	60.00
	Grand Total	**5880.00**

NOTE: The highlighted proposed no in above scheme should be taken up in order of priority for drilling.

5.5.0 Core Logging

The borehole cores would be logged systematically. Details of the lithounit viz. colour, structural feature, texture, mineralisation, besides the recovery and rock quality designation (RQD) would be recorded. The details of nature of ore as Massive, Laminated, Lateritic, Limonitic ore and Fine/Blue Dust ore will be recorded in detail.

5.6.0 Sampling:

The drill core will be splitted into two equal halves and one part would be preserved in the core box. The other half will be powdered to - 100 # size and the same would be divided into four parts by coning and quartering. One part of 100gm sample will be sent to chemical laboratory for analysis, second part to be preserved in the camp as duplicate sample, third part to be utilized for preparing composite sample for individual ore band and the fourth part would kept as either check sample or sample to be used for any other specific purpose. The length of each sample will be kept 0.50 m-1.0m depending upon the width of particular type of iron ore and its physical character (like lumpy, powdery, friable, massive etc.). The primary core samples will be analysed for various radicals such as Fe, SiO_2, and Al_2O_3.

The mineralized zone including the cores of immediate footwall and hanging wall rocks (5 m length each) would be sampled at 1.0 m interval, as far as possible, depending upon the intensity of mineralization, change in lithology and core recovery etc. It is envisaged that:

a) Around 935 **nos.** of primary samples including check samples would be generated from the mineralized zone intersection, so obtained from the drill holes of Malangtoli Iron Ore in E-Sub-Block. All the primary and check samples would be analysed for 3 radicals i.e. Fe%, SiO_2% & Al_2O_3% (Core Samp. + Check Samp.)

b) Around 5% of Primary samples (40 **nos.**) will be sent to NABL accredited external labs for analysis of 3 radicals i.e. Fe%, SiO_2% & Al_2O_3% as External Check Samples.

c) Composite samples would be prepared from mineralized zones of primary drill core samples from each borehole. It has been envisaged that **100 nos.** of composite sample would be generated and will be analysed for 7 radicals i.e. Fe, SiO_2, Al_2O_3, P, Mn, S & V_2O_5.

5.7.0 Petrological Studies: Thin and polished section studies on drill cores as well as out-crop samples would be studied for detailed petrographic and mineragraphic characteristics. These samples would be drawn from ore zones and host rocks. A provision of 15 specimens for petrographic and 15 specimens for mineragraphic studies has been kept for the purpose.

5.8.0 Bulk Density Determination: In addition to specific gravity determination, 15 nos. of bulk density determination study will be carried out.

5.9.0 Quantum of work

The quantum of work proposed by MECL in E- Sub- Block is given in Table 5.2.

Table: 5.2
Proposed Quantum of work in E- Sub Block

SL NO	Item of work	Unit (m)	TOTAL
1	Survey (1:10000) a) B.H. fixation (Hilly Terrain)	Nos.	10
	b) R.L. & coordinate determination	Nos.	10
	c) Traverse	Line km	20
	d) Contouring (5m Contour Interval)	Sq. Km	16.60
	e) DGPS Survey (Demarcation of Block Boundary points)	Sq. Km	16.60
2	Drilling (coring) *Borehole depth may vary from 60 m to 130m upto Contact of Lower Shale/BHJ/BHQ	M	1000 m (10 Bhs.) at 400mx400m grid
3	Pitting (for Bulk density sample collection) (1m x 1m x1m) (30 Nos)	Cu.m	15
4	Geological work a) Geological Core Logging	M	1000 m (10 Bhs.)
	b) Sampling (Primary+ Check) for 3 radicals Fe%, SiO_2% & Al_2O_3%,	Nos.	935
	c) Composite sample for 7 radicals (Fe%, SiO_2%, Al_2O_3%, P%, Mn%, S% & V_2O_5%)	Nos.	100
5	Chemical Analysis a) Primary (850) +Internal Check samples (85) for 3 radicals (Fe%, SiO_2% & Al_2O_3%.	Nos.	935
	b) Composite sample 7 radicals (Fe%, SiO_2%, Al_2O_3%, P%, Mn%, S% & V_2O_5%)	Nos.	100
	c) External Check Samples for 3 radicals (Fe%, SiO_2% & Al_2O_3%)	Nos.	40
6	Petrological Studies	Nos.	15
7	Mineragraphic Studies	Nos.	15
8	Bulk Density Determination	Nos.	15
9	**Report Preparation**[As per Mineral (Evidence of Mineral Contents) Rule-2015]/ UNFC	Nos.	1

Time schedule and Cost estimates

6.1.0 Time schedule:

The proposed exploration programme is planned in such a way that all the activities like, tendering process, drilling, survey and associated geological work and laboratory work will be completed within 10 months' time. Report writing will take another 4 months' time including overlapping of two months of Laboratory studies. Thus the total duration of the project for completion of the above exploration will be 12 months from the date of commencement of the project.

The bar chart showing activities wise time schedule is placed at Table-6.1.

6.2.0 Cost estimates:

Cost has been estimated based on actual and provisional escalation as per RBI indices as on 31-03-17 and same has been for the subsequent years. The total estimated cost is **Rs. 199.209 Lakhs**. The details of cost estimates are given in Table 6.2 and summary is given below:

Summary of Cost Estimates

Sl. No.	Item	Total Estimated Cost (Rs.)
1	Drilling	12329835/-
2	Geology	2117670/-
3	Laboratory Studies	1707960/-
4	Preservation of Core	549600/-
	Sub Total (1+2+3+4)	16705065/-
5	Exploration Report (1% of 1+2+3+4)	167051/-
6	Peer Review	10000/-
	Sub Total	16882116/-
7	GST@18%	3038781/-
	Total	**19920896/-**
		Say- Rs. 199.209 Lakhs

7.0.0 Justification

i) In view of MMDR Amendment Act and Mineral Auction Rule 2015, DMG Odisha requested MECL to take up the preliminary exploration in this block. DMG, Odisha has requested MECL to take up exploration work under NMET funding.

ii) The mineralized zones intersected in GSI boreholes drilled in adjacent L-Block are continuous both in strike and dip direction. Hence the continuity of the zones requires further proving in this area.

iii) The present exploration will establish the resources and grade of the Iron ore in G-3 level. Based on the results of this programme decision will be taken for taking up G-2 level exploration in the block and will eventually lead to enable the State Government of Odisha for auctioning of the block.

Table-6.2 Cost Estimate for Iron Ore Exploration Malangtoli E Sub - Block District- Sundargarh, Odisha								
SL. N0.	Item of Work	Unit	Base Rate	Escalated rates (2018-19)			Grand Total	
				Esc. Rate	Qty.	Amount	Qty.	Amount
			1.4.90					(Rs)
A	DRILLING							
1	Surface Drilling (4 rigs) *	m	9000	9000	1000	9000000	1000	9000000
2	Pitting (1m x 1m x 1m)	Cu.m.	395	1673	15	25095	15	25095
2	Transportation	Km	8.8	31	3000	93000	3000	93000
3	Accomodation (One time/ Drill)		185925	663715	4	2654860	4	2654860
4	Camp Winding	- do-	68606	244910	0	0	0	0
5	Road Making (Hilly Terrain)	Km	7800	27844	20	556880	20	556880
	Sub Total A					12329835		12329835
B	GEOLOGICAL WORK							
1	Survey Party days (1 party)	day	1180	5840	90	525600	90	525600
2	Geologist Party days (1 party)	day	1541	7802	120	936240	120	936240
3	Bulk Sampling Party days (1 party)	day	2566	13434	30	403020	30	403020
4	Core Sampling Party days (1 party)	day	525	2809	90	252810	90	252810
5	SUB TOTAL B					2117670		2117670
C	LABORATORY STUDIES							
1	Chemical Analysis							
	i) Primary & Check samples							
	a. For 3 radicals Fe, SiO_2 & Al_2O_3 [core samp + Internal Check Samp	Nos	262(110 +76x2)	1374	935	1284690	935	1284690
	b) External Check Samples from NABL Labs for 3 radical (Fe, SiO2 & Al2O3)	Nos	262(110 +76x2)	1374	40	54960	40	54960
	ii) Composite Samples							
	a) Composite Samples for 7 radicals (Fe%, SiO2%, Al2O3%, P%, Mn%, S% & V2O5%)	Nos	268	2982	100	298200	100	298200
2	Physical Analysis							
i)	Preparation of thin section	Nos	100	538	15	8070	15	8070
ii)	Petrographic Studies	Nos	228	1436	15	21540	15	21540
iii)	Preparation of polished section	Nos	100	538	15	8070	15	8070
iv)	Mineragraphic Studies	Nos	364	2023	15	30345	15	30345
v)	Density Determination	Nos	24	139	15	2085	15	2085
	Sub-Total C					1707960		1707960
D	Preservation of Core							
i)	GI Core boxes	Nos.		2000	250	500000	250	500000
ii)	Transportation of Core Boxes	Km	8.8	31.0	1600	49600	1600	49600
	Sub-Total D					549600		549600
	Total A+B+C+D							16705065
E	EXPLORATION REPORT - 1% of (A+B+C+D)				1			167051
F	PEER REVIEW OF DGR (Lump Sum)	Nos		10000	1	10000	1	10000
	Grand Total : A to F							16882116
G	GST @ 18%							3038781
H	GRAND TOTAL							19920896
Notes:								Say 199.209 Lakhs
1	Revised Rates of Promotional Work done by MECL on behalf of Govt. of India Vide letter No. 37(I) /2006-M.I. dated-02/07/2014 and based on actual escalation as per RBI indices as on 31-03-2017 and the same has been considered for subsequent year.							
2	*Outsourcing rate has been considered in drilling. Moreover handling Charges will be applicable and will be desided later by NMET committee.							

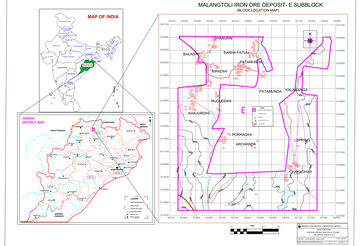
Mineral Exploration and evaluation 18%(SAC Code: 998343)

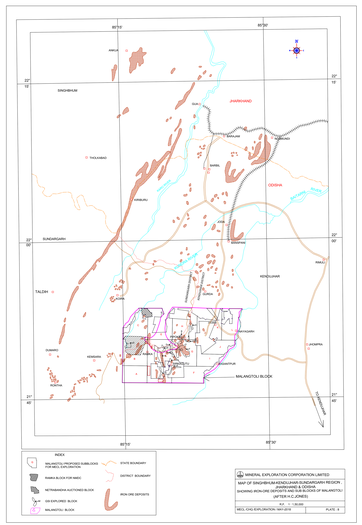
Table 6.1: TIME SCHEDULE /ACTION PLAN , G3 LEVEL OF IRON ORE EXPLORATION IN MALANTOLI E- SUB BLOCK ODISHA.

Sl. No.	Activities	Unit	MONTHS												Total
			1	2	3	4	5	6	7	8	9	10	11	12	
1	Tendering Period	Month													5 month
2	Core Drilling (4 rigs)	m.													1000 m (in 10 BHs)
3	Bulk Sampling Party days	Day													30
4	Survey Party days (1 Party)	day													90
5	Geologist Party days (1 Parties)	day													120
6	Sampling Party days, Core Sampling (1 parties)	day													90
7	Laboratory Studies	Nos.													1120
8	Report Writing	Month													4 months

MALANGTOLI IRON ORE DEPOSIT- E SUBBLOCK

(BLOCK LOCATION MAP)


MAP OF INDIA
ODISHA
ODISHA DISTRICT MAP
KORAPUT
NABARANGPUR
KALAHANDI
BOUDH
SONEPUR
BALANGIR
NUAPADA
GANJAM
GAJAPATI
KANDHAMAL
BARGARH
SAMBALPUR
JHARSUGUDA
SUNDERGARH
DEOGARH
SUNDARGARH
ANGUL
DHENKANAL
KEONJHAR
MAYURBHANJ
BALASORE
BHADRAK
JAJPUR
CUTTACK
KENDRAPARA
JAGATSINGHPUR
PURI
KHURDA
NAYAGARH
MALANGTOLI IRON ORE DEPOSIT- E SUBBLOCK
BARPA PATALI
TENGOLI
PATAMUNDA
YOJNAPADA
RUKUDIHI
ANAJURDHI
TI PORNADHI
ARCHANDIR
UPPER
LOWER
E
LEGEND
Forest
Non Forest
Mining Lease
Proposed Mining Lease
Mining Lease Boundary
Proposed Mining Lease Boundary
Forest Boundary
Village Boundary
Road
Nala
Contour
Mine Pit
Mine Dump
Proposed Mine Pit
Proposed Mine Dump
Proposed Mine Dump Area
Proposed Mine Pit Area
Proposed Mine Dump Area
Proposed Mine Pit Area
Proposed Mine Dump Area
Proposed Mine Pit Area



INDEX

- MALANGTOLI PROPOSED SUBBLOCKS FOR MECL EXPLORATION
- RAMKA BLOCK FOR IMEC
- NETRANANDIA AUCTIONED BLOCK
- GSI EXPLORED BLOCK
- MALANGTOLI BLOCK
- STATE BOUNDARY
- DISTRICT BOUNDARY
- IRON ORE DEPOSITS

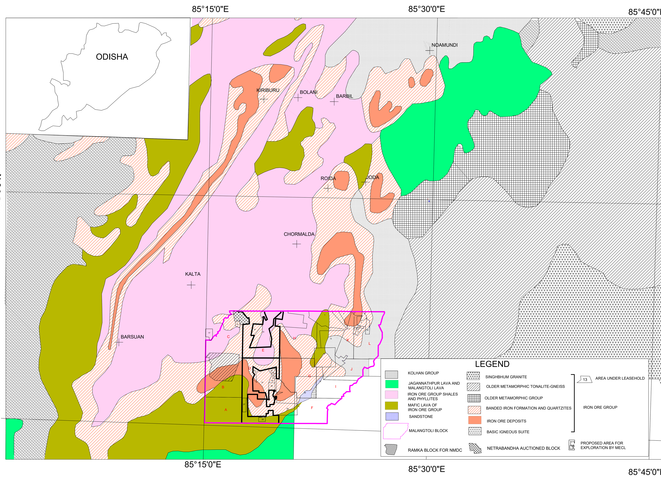
MECL MINERAL EXPLORATION CORPORATION LIMITED

MAP OF SINGHBHUM-KENDUJHAR-SUNDARGARH REGION, (JHARKHAND & ODISHA) SHOWING IRON ORE DEPOSITS & LOCATION OF MALANGTOLI (AFTER A.C.JONES)

R.F. = 1:50,000

MECL CHG EXPLORATION YEAR:2016	PLATE : 3

REGIONAL GEOLOGICAL MAP OF SINGHBHUM-KENDUJHAR IRON ORE BELT WITH MALANGTOLI BLOCK



RF 1: 1,00,000

PLATE NO. : III

INDEX
PBH-00
PROPOSED BOREHOLE
MAGNETITE
IRON ORE
SHALE
MAGNETITE-HAEMATITE-JASPER
TUFF
MAIN CHAINLINK SUITE
DRAINAGE
DISTRICT BOUNDARY
ROAD
CONTOUR (m)
VILLAGE
BLOCK BOUNDARY
MINERAL EXPLORATION CORPORATION LIMITED
PROPOSED BOREHOLE LOCATION PLAN
FOR IRON ORE EXPLORATION (SLS STAGE)
WALIBIROTOLI SUB BLOCK 2
DISTRICT : NUAPADA
SCALE : 1:5000
DATE : 02/09/14
MESL ENG.EXPLORATION TAFF.LTD
PLATE NO : 4
R

F. No. 6/2/2015-NMET
Ministry of Mines
National Mineral Exploration Trust

New Delhi, 16th August, 2018

OFFICE MEMORANDUM

Subject: Approval of mineral exploration projects in 5 blocks to be executed by MECL.

On the recommendation of Technical-cum-Cost Committee (TCC) of NMET, the Executive Committee in its 9th meeting, held on 8th August, 2018 approved mineral exploration projects in 5 blocks to be executed by MECL at an estimated cost of **Rs. 1741.22 Lakh**. The details of the Blocks are given in **Annexure I.**

2. The G-4 level exploration for manganese in Rengali & Tamiya Blocks shall be carried out in the extension area (excluding the area) where GSI has worked for G-3 level exploration.

3. The mineral exploration projects in these 5 blocks will be funded by NMET as per the costing recommended by the TCC and approved by the Executive Committee. MECL shall undertake exploration in these blocks as per Tripartite Agreement between Ministry of Mines (NMET), MECL and the respective State Governments and complete the same as per the approved cost estimates and time schedule, enclosed as **II** to **VIII**.

4. The Implementing Agencies shall submit progress on monthly basis to NMET. The TCC, NMET shall review the progress of projects and provide update to the Executive Committee.

16/8/2018
(Pradeep Singh)
Director, NMET

To
The Chairman-cum-Managing Director,
Mineral Exploration Corporation Limited,
Dr. Babasahib Ambedkar Bhawan,
Seminary Hills, Nagpur- 440 006.

Copy for information & necessary action to:
Sh. D. Mohan Raj, ADG, NM-II& Chairman, NMET TCC, Geological Survey of India, Seminary Hills, Nagpur- 440 006.

Annexure I

List of mineral blocks approved in 9th Executive Committee on 08.08.2018, to be executed by MECL

Sl. No.	*Block Name*	*Commodity*	*Stage*	*Duration*	*Estimated Cost (Rs. in Lakh* **Including GST*)***
1	Rengali Block, District: Bolangir, Odisha	Manganese	G-4	12-14 months	284.10
2			G-2	13-15 months	340.93
3	Tamiya Block, District: Bolangir, Odisha	Manganese	G-4	11-13 months	246.43
4			G-2	12-14 months	248.78
5	Sub Block-D of Malangtoli Block, Districts: Sundargarh & Kendujhar, Odisha	Iron Ore	G-3	12-14 months	210.89
6	Sub Block-E of Malangtoli Block, Districts: Sundargarh & Kendujhar, Odisha	Iron Ore	G-3	12-14 months	199.21
7	Sub Block-G of Malangtoli Block, Districts: Sundargarh & Kendujhar, Odisha	Iron Ore	G-3	12-14 months	210.88
				Total	**1741.22**

Annexure - II/1

Table-7.2 Cost Estimate for Manganese Ore Mineralisation in Rengali Block (G4),

SL. N0.	Item of Work	Unit	Base Rate	Escalated rates (2018-19)			Escalated rates (2019-20)			Grand Total	
				Esc. Rate	Qty.	Amount	Esc. Rate	Qty.	Amount	Qty.	Amount
			1.4.90	(Rs)		(Rs)					(Rs)
A	**DRILLING**										
1	Surface Drilling (2 rig)	m	2035	8177	600	4906200	8177		0	600	4906200
2	Transportation	Km	8.8	31.0	2600	80600	31.0		0	2600	80600
3	Accomodation (One time/ Drill)		185925	663715	2	1327430	663715		0	2	1327430
4	Camp Setting / Winding	- do-	68606	244910	2	489820	244910		0	2	489820
5	Road Making (Flat Terrain)***	Km	5200	18563	5	92815	18563		0	5	92815
	Sub Total A					**6896865**			**0**		**6896865**
B	**GEOPHYSICAL WORK**										
1	Magnetic Survey	**Nos**	107	467	4384	2047328	449		0	4384	2047328
2	Gravity Survey	**Nos**	445	1842	4384	8075328	1974		0	4384	8075328
3	Resistivity Survey	**Line Km**	3473	14734	86.38	1272722.92	14734		0	86.38	1272722.92
	Subtotal B					**11395378.92**			**0**		**11395379**
C	**GEOLOGICAL WORK**										
1	Survey Party days (1 party)	day	1180	5840	60	350400	5840		0	60	350400
2	Geologist Party days (1 party)	day	1541	7802	90	702180	7802		0	90	702180
3	Bulk Sampling Party days (1 party)	day	2566	13439	90	1209510	13439		0	90	1209510
4	Core Sampling Party days (1 party)	day	525	2809	60	168540	2809		0	60	168540
	Sub-Total C					**2430630**			**0**		**2430630**
D	**Pitting & Trenching**										
	a) Pitting 5 Nos (1m x 1m x 1m) & Trenching (1m x 2mx 800 m) 7 Nos	Cu.m	395	1673	405	677565	1673		0	405	677565
	Sub Total D					**677565**					**677565**
E	**LABORATORY STUDIES**										
1	**Chemical Analysis**										
	i) Primary & Check samples										
	a. Primary Samples For 6 radical (Mn, SiO_2, P_2O_5, Fe_2O_3, MnO_2 and Insolubles)	Nos	490 (110 +76x5)	2580	600	1548000	2580		0	600	1548000
	b) Check Samples for 6 radical (Mn, SiO_2, $P2O_5$, Fe_2O_3, MnO_2 and Insolubles)	Nos	490 (110 +76x5)	2580	60	154800	2580		0	60	154800
	d) External Check Samples from NABL Labs for 6 radical (Mn, SiO_2, P_2O_5, Fe_2O_3, MnO_2 and Insolubles)	Nos	490 (110 +76x5)	2580	30	77400	2580		0	30	77400
	ii) Composite Samples										
	a) Composite Samples for 6 Radicals (Mn, SiO_2, P_2O_5, Fe_2O_3, MnO_2 and Insolubles).	Nos	490 (110 +76x5)	2580	60	154800	2580		0	60	154800
2	**Physical Analysis**										
i)	a) X-RD Studies on composite	Nos	1137	5605	10	56050	5605		0	10	56050
ii)	b) ICP-MS studies (14 Trace elements- Cd,Sn,W,Sb,Ce,Nb,Ba,La ,Bi,Co, Ni, Sr, Mo, V**	Nos		4620	10	46200	4620		0	10	46200
iii)	Preparation of thin section	Nos	100	538	10	5380	538		0	10	5380
iv)	Petrographic Studies	Nos	228	1436	10	14360	1436		0	10	14360
v)	Preparation of polished section	Nos	100	538	10	5380	538		0	10	5380
vi)	Mineragraphic Studies	Nos	364	2023	10	20230	2023		0	10	20230
vii)	Specific Gravity determination	Nos	32	188.5	20	3770	188		0	20	3770
viii)	Bulk Density	Nos	24	139	5	695				5	695
	Sub-Total E					**2087065**			**0**		**2087065**
F	**Preservation of Core**										
i)	**GI Core boxes**			**2000**	**150**	**300000**	**2000**		**0**	**150**	**300000**
ii)	**Transportation of Core Boxes**	Km	8.8	31.0	1300	40300	31.0		**0**	**1300**	**40300**
	Sub-Total F					340300					**340300**
	Total A+B+C +D+E+F					**23827804**			**0**		**23827804**
G	**EXPLORATION REPORT 1% of A+B+C +D+E**									**1**	**238278**
H	**PEER Review**						**10000**	**1**	**10000**	**1**	**10000**
	Total A+B+C +D+E+F+G										**24076082**
I	**GST @ 18%**										**4333695**
	Grand Total :										**28409777**
										Say 284.097 Lakhs	

Note:

1. **Goel Committee rates for Manganese ore are not available, hence Gold rates are taken on actual escalation as per RBI Indices as on 1.3.2017 and same**
2. **** Rate has taken from Schedule of Charges of differen activities of GSI as on 2014-15 and 40% escalation on the same has been concidered for FY 2018-19.**
3. *****Payment will be as per length of road made.**
4. **Statutory payments relating to forest clearance will be paid extra**
5. **In case of outsourcing handling charges will be paid as applicable for NMET blocks.**

Annexure- II/2

TABLE- 6.1 TIME SCHEDULE / ACTION PLAN FOR EXPLORATION PROPOSAL FOR MANGANESE ORE IN RENGALI BLOCK, (G-4 Level) DISTRICT - BALANGIR, ODISHA

			1	2	3	4	5	6	7	8	9	10	11	12	
1	Camp Setting	Month	↔												1 month
2	Surface Drilling (2 rigs)	m.							↔	↔					600 m (in 5 BHs)
3	Geophysical Work	Months		↔	↔	↔	↔	↔							5 month
4	Geophysical Report preparation	Months							↔	↔					2 month
5	Pitting Trenching (5 Pit & 7 Trenches)	Cu.m							↔	↔					1005.00
6	Survey Party days (1 Party)	Party days							↔	↔					60 Days
7	Geologist Party days (1Party)	Party days							↔	↔	↔				90 Days
8	Bulk Sampling Party days, (1 party)	Party days							↔	↔	↔				90 Days
9	Sampling Party days, Core Sampling (1 party)	Party days							↔	↔					60 Days
10	Laboratory Studies	Nos.								↔	↔	↔			815 Nos.
11	Camp Winding	Months	Continue to G2												
12	Report Writing with Peer Review	Months									↔	↔	↔	↔	4 months

Annexure - III/1

Table-7.2 Cost Estimate for Manganese Ore Mineralisation in Rengali Block (G 2),

SL. N0.	Item of Work	Unit	Base Rate	Escalated rates (2018-19)			Escalated rates (2019-20)			Grand Total	
				Esc. Rate	Qty.	Amount	Esc. Rate	Qty.	Amount	Qty.	Amount
			1.4.90	(Rs)		(Rs)					(Rs)
A	DRILLING										
1	Surface Drilling (2 rig)	m	2035	8177	2350	19215950	8177		0	2350	19215950
2	Transportation	Km	8.8	31.0	0	0	31.0		0	0	0
3	Accomodation (One time/ Drill)		185925	663715	0	0	663715		0	0	0
4	Camp Setting / Winding	- do-	68606	244910	2	489820	244910		0	2	489820
5	Road Making (Flat Terrain)***	Km	5200	18563	5	92815	18563		0	5	92815
	Sub Total A					**19798585**			**0**		**19798585**
B	**GEOLOGICAL WORK**										
1	Survey Party days (1 party)	day	1180	5840	150	876000	5840		0	150	**876000**
2	Geologist Party days (1 party)	day	1541	7802	270	2106540	7802		0	270	**2106540**
3	Bulk Sampling Party days (1 party)	day	2566	13439	30	403170	13439		0	30	**403170**
4	Core Sampling Party days (1 party)	day	525	2809	240	674160	2809		0	240	**674160**
	Sub-Total B					**4059870**			**0**		**4059870**
C	**Pitting & Trenching**										
	a) Pitting 5 Nos (1m x 1m x 1m) & Trenching (1m x 2mx 800 m) 7 Nos	Cu.m	395	1673	5	8365	1673		0	5	**8365**
	Sub Total C					**8365**					**8365**
D	**LABORATORY STUDIES**										
1	**Chemical Analysis**										
	i) Primary & Check samples										
	a. Primary Samples For 6 radical (Mn, SiO_2, P_2O_5, Fe_2O_3, MnO_2 and Insolubles)	Nos	490 (110 +76x5)	2580	900	2322000	2580		0	900	2322000
	b) Check Samples for 6 radical (Mn, SiO_2, $P2O_5$, Fe_2O_3, MnO_2 and Insolubles)	Nos	490 (110 +76x5)	2580	90	232200	2580		0	90	232200
	d) External Check Samples from NABL Labs for 6 radical (Mn, SiO_2, P_2O_5, Fe_2O_3, MnO_2 and Insolubles).	Nos	490 (110 +76x5)	2580	45	116100	2580		0	45	116100
	ii) Composite Samples										
	a) Composite Samples for 6 Radicals (Mn, SiO_2, P_2O_5, Fe_2O_3, MnO_2 and Insolubles).	Nos	490 (110 +76x5)	2580	200	516000	2580		0	200	516000
2	**Physical Analysis**										
i)	a) X-RD Studies on composite	Nos	1137	5605	20	112100	5605		0	20	112100
ii)	b) ICP-MS studies (14 Trace elements- Cd,Sn,W,Sb,Ce,Nb,Ba,La,Bi,Co, Ni, Sr, Mo, V**	Nos		4620	10	46200	4620		0	10	46200
iii)	Preparation of thin section	Nos	100	538	30	16140	538		0	30	16140
iv)	Petrographic Studies	Nos	228	1436	30	43080	1436		0	30	43080
v)	Preparation of polished section	Nos	100	538	30	16140	538		0	30	16140
vi)	Mineragraphic Studies	Nos	364	2023	30	60690	2023		0	30	60690
vii)	Specific Gravity determination	Nos	32	188.5	40	7540	188		0	40	7540
viii)	Bulk Density	Nos	24	139	5	695				5	695
	Sub-Total D					**3488885**			**0**		**3488885**
E	**Preservation of Core**										
i)	**GI Core boxes**			**2000**	**600**	**1200000**	**2000**		**0**	**600**	**1200000**
ii)	**Transportation of Core Boxes**	Km	8.8	31.0	1300	40300	31.0		**0**	**1300**	**40300**
	Sub-Total E					1240300					**1240300**
	Total A+B+C +D+E					**28596005**			**0**		**28596005**
F	**EXPLORATION REPORT 1% of A+B+C +D+E**									**1**	**285960**
G	**PEER Review**						**10000**	**1**	**10000**	**1**	**10000**
	Total A+B+C +D+E+F+G+H										**28891965**
I	**GST @ 18%**										**5200554**
	Grand Total :										**34092519**
										Say 340.925 Lakhs	

Note:

1. Goel Committee rates for Manganese ore are not available, hence Gold rates are taken on actual escalation as per RBI Indices as on
2. ** Rate has taken from Schedule of Charges of differen activities of GSI as on 2014-15 and 40% escalation on the same has been
3. ***Payment will be as per length of road made.
4. Statutory payments relating to forest clearance will be paid extra
5. In case of outsourcing handling charges will be paid as applicable for NMET blocks.

Annexure - III/2

TABLE- 6.1 TIME SCHEDULE / ACTION PLAN FOR EXPLORATION PROPOSAL FOR MANGANESE ORE IN RENGALI BLOCK, (G-2 Level) DISTRICT - BALANGIR, ODISHA

			1	2	3	4	5	6	7	8	9	10	11	12	13	
1	Camp Setting	Month														
2	Surface Drilling (2 rigs)	m.	←	—	—	—	—	—	—	→						2350m (in 37 BHs)
3	Pitting (5 Pit)	Cu.m	↔													5.00
4	Survey Party days (1 Party)	Party days	←	—	—	—	→									150 Days
5	Geologist Party days (1 Party)	Party days	←	—	—	—	—	—	—	—	→					270 Days
6	Bulk Sampling Party days, (1 Party)	Party days	↔													30 Days
7	Sampling Party days, Core Sampling (1 Party)	Party days		←	—	—	—	—	—	—	→					240 Days
8	Laboratory Studies	Nos.		←	—	—	—	—	—	—	—	→				1400 Nos.
9	Camp Winding	Months									↔					1 month
10	Report Writing with Peer Review	Months										←	—	—	→	4 months

Annexure-IV/1

Table-7.1 Cost Estimate for Manganese Ore Mineralisation in Tamiya Block (G4),

SL. N0.	Item of Work	Unit	Base Rate	Escalated rates (2018-19)			Escalated rates (2019-20)			Grand Total	
				Esc. Rate	Qty.	Amount	Esc. Rate	Qty.	Amount	Qty.	Amount
			1.4.90	(Rs)		(Rs)					(Rs)
A	DRILLING										
1	Surface Drilling (2 rig)	m	2035	8177	310	2534870	8177		0	310	**2534870**
2	Transportation	Km	8.8	31.0	2600	80600	31.0		0	2600	**80600**
3	Accomodation (One time/ Drill)		185925	663715	2	1327430	663715		0	2	**1327430**
4	Camp Setting / Winding	- do-	68606	244910	2	489820	244910		0	2	**489820**
5	Road Making (Flat Terrain)***	Km	5200	18563	5	92815	18563		0	5	**92815**
	Sub Total A					**4525535**			**0**		**4525535**
B	GEOPHYSICAL WORK										
1	Magnetic Survey	**Nos**	107	467	3296	1539232	449		0	3296	**1539232**
2	Gravity Survey	**Nos**	445	1842	3296	6071232	1974		0	3296	**6071232**
3	Resistivity Survey	**Line Km**	3473	14734	79.9	1177246.6	14734		0	79.9	**1177246.6**
	Subtotal B					**8787710.6**			**0**		**8787711**
C	GEOLOGICAL WORK										
1	Survey Party days (1 party)	day	1180	5840	30	175200	5840		0	30	**175200**
2	Geologist Party days (1 party)	day	1541	7802	90	702180	7802		0	90	**702180**
3	Bulk Sampling Party days (1 party)	day	2566	13439	90	1209510	13439		0	90	**1209510**
4	Core Sampling Party days (1 party)	day	525	2809	30	84270	2809		0	30	**84270**
	Sub-Total C					**2171160**			**0**		**2171160**
D	**Pitting & Trenching**										
	a) Pitting 5 Nos (1m x 1m x 1m) & Trenching (1m x 2mx 800 m) 7 Nos	Cu.m	395	1673	605	1012165	1673		0	605	**1012165**
	Sub Total D					**1012165**					**1012165**
E	LABORATORY STUDIES										
1	**Chemical Analysis**										
	i) Primary & Check samples										
	a. Primary Samples For 6 radical (Mn, SiO_2, P_2O_5, Fe_2O_3, MnO_2 and Insolubles)	Nos	490 (110 +76x5)	2580	1200	3096000	2580		0	1200	3096000
	b) Check Samples for 6 radical (Mn, SiO_2, $P2O_5$, Fe_2O_3, MnO_2 and Insolubles)	Nos	490 (110 +76x5)	2580	120	309600	2580		0	120	309600
	d) External Check Samples from NABL Labs for 6 radical (Mn, SiO_2, P_2O_5, Fe_2O_3, MnO_2 and Insolubles)	Nos	490 (110 +76x5)	2580	60	154800	2580		0	60	154800
	ii) Composite Samples										
	a) Composite Samples for 6 Radicals (Mn, SiO_2, P_2O_5, Fe_2O_3, MnO_2 and Insolubles).	Nos	490 (110 +76x5)	2580	100	258000	2580		0	100	258000
2	**Physical Analysis**										
i)	a) X-RD Studies on composite	Nos	1137	5605	10	56050	5605		0	10	56050
ii)	b) ICP-MS studies (14 Trace elements-Cd,Sn,W,Sb,Ce,Nb,Ba,La,Bi,Co, Ni, Sr, Mo, V**	Nos		4620	10	46200	4620		0	10	46200
iii)	Preparation of thin section	Nos	100	538	10	5380	538		0	10	5380
iv)	Petrographic Studies	Nos	228	1436	10	14360	1436		0	10	14360
v)	Preparation of polished section	Nos	100	538	10	5380	538		0	10	5380
vi)	Mineragraphic Studies	Nos	364	2023	10	20230	2023		0	10	20230
vii)	Specific Gravity determination	Nos	32	188.5	20	3770	188		0	20	3770
viii)	Bulk Density	Nos	24	139	5	695				5	695
	Sub-Total E					**3970465**			**0**		**3970465**
F	**Preservation of Core**										
i)	**GI Core boxes**			**2000**	**80**	**160000**	**2000**		**0**	**80**	**160000**
ii)	**Transportation of Core Boxes**	Km	8.8	31.0	1300	40300	31.0		**0**	**1300**	**40300**
	Sub-Total F					200300					**200300**
	Total A+B+C +D+E+F					**20667336**			**0**		**20667336**
G	**EXPLORATION REPORT 1% of A+B+C +D+E+F**									**1**	**206673**
H	**PEER Review**						**10000**	**1**	**10000**	**1**	**10000**
	Total A+B+C +D+E+F+G+H										**20884009**
I	**GST @ 18%**										**3759122**
	Grand Total :										**24643131**
									Say 246.431 Lakhs		

Note:

1. **Goel Committee rates for Manganese ore are not available, hence Gold rates are taken on actual escalation as per RBI Indices as on 1.3.2017 and**
2. **** Rate has taken from Schedule of Charges of differen activities of GSI as on 2014-15 and 40% escalation on the same has been concidered for FY**

Annexure- IV/2

TABLE- 6.1 TIME SCHEDULE / ACTION PLAN FOR EXPLORATION PROPOSAL FOR MANGANESE ORE IN TAMIYA BLOCK, (G-4 Level) DISTRICT - BALANGIR, ODISHA

			1	2	3	4	5	6	7	8	9	10	11	
1	Camp Setting	Month	↔											1 month
2	Geophysical Work	Month		↔	↔	↔	↔							4 month
3	Geophysical Report	Month						↔	↔					2 month
2	Surface Drilling (2 rigs)	m.						↔						310m (in 5 BHs)
3	Pitting Trenching (5 Pit & 7 Trenches)	Cu.m						↔	↔	↔				1605.00
4	Survey Party days (1 Party)	Party days						↔						30 Days
5	Geologist Party days (1Party)	Party days						↔	↔	↔				90 Days
6	Bulk Sampling Party days, (1 party)	Party days						↔	↔	↔				90 Days
7	Sampling Party days, Core Sampling (1 party)	Party days							↔					30 Days
8	Laboratory Studies	Nos.							↔	↔	↔			2695 Nos.
9	Camp Winding	Months	Continue to G2											
10	Report Writing with Peer Review	Months								↔	↔	↔	↔	4 months

Annexure - V/1

Table-7.2 Cost Estimate for Manganese Ore Mineralisation in Tamiya Block (G2),

SL. N0.	Item of Work	Unit	Base Rate	Escalated rates (2018-19)			Escalated rates (2019-20)			Grand Total	
				Esc. Rate	Qty.	Amount	Esc. Rate	Qty.	Amount	Qty.	Amount
			1.4.90	(Rs)		(Rs)					(Rs)
A	**DRILLING**										
1	Surface Drilling (2 rig)	m	2035	8177	1590	13001430	8177		0	1590	**13001430**
2	Transportation	Km	8.8	31.0	0	0	31.0		0	0	**0**
3	Accomodation (One time/ Drill)		185925	663715	0	0	663715		0	0	**0**
4	Camp Setting / Winding	- do-	68606	244910	2	489820	244910		0	2	**489820**
5	Road Making (Flat Terrain)***	Km	5200	18563	5	92815	18563		0	5	**92815**
	Sub Total A					**13584065**			**0**		**13584065**
B	**GEOLOGICAL WORK**										
1	Survey Party days (1 party)	day	1180	5840	120	700800	5840		0	120	**700800**
2	Geologist Party days (1 party)	day	1541	7802	210	1638420	7802		0	210	**1638420**
3	Bulk Sampling Party days (1 party)	day	2566	13439	30	403170	13439		0	30	**403170**
4	Core Sampling Party days (1 party)	day	525	2809	180	505620	2809		0	180	**505620**
	Sub-Total B					**3248010**			**0**		**3248010**
C	**Pitting & Trenching**										
	a) Pitting 5 Nos (1m x 1m x 1m) & Trenching (1m x 2mx 800 m) 7 Nos	Cu.m	395	1673	5	8365	1673		0	5	**8365**
	Sub Total C					**8365**					**8365**
D	**LABORATORY STUDIES**										
1	**Chemical Analysis**										
	i) Primary & Check samples										
	a. Primary Samples For 6 radical (Mn, SiO_2, P_2O_5, Fe_2O_3, MnO_2 and Insolubles)	Nos	490 (110 +76x5)	2580	900	2322000	2580		0	900	2322000
	b) Check Samples for 6 radical (Mn, SiO_2, $P2O_5$, Fe_2O_3, MnO_2 and Insolubles)	Nos	490 (110 +76x5)	2580	90	232200	2580		0	90	232200
	d) External Check Samples from NABL Labs for 6 radical (Mn, SiO_2, P_2O_5, Fe_2O_3, MnO_2 and Insolubles)	Nos	490 (110 +76x5)	2580	45	116100	2580		0	45	116100
	ii) Composite Samples										
	a) Composite Samples for 6 Radicals (Mn, SiO_2, P_2O_5, Fe_2O_3, MnO_2 and Insolubles).	Nos	490 (110 +76x5)	2580	100	258000	2580		0	100	258000
2	**Physical Analysis**										
i)	a) X-RD Studies on composite	Nos	1137	5605	20	112100	5605		0	20	112100
ii)	b) ICP-MS studies (14 Trace elements- Cd,Sn,W,Sb,Ce,Nb,Ba,La,Bi,Co, Ni, Sr, Mo, V**	Nos		4620	10	46200	4620		0	10	46200
iii)	Preparation of thin section	Nos	100	538	20	10760	538		0	20	10760
iv)	Petrographic Studies	Nos	228	1436	20	28720	1436		0	20	28720
v)	Preparation of polished section	Nos	100	538	20	10760	538		0	20	10760
vi)	Mineragraphic Studies	Nos	364	2023	20	40460	2023		0	20	40460
vii)	Specific Gravity determination	Nos	32	188.5	30	5655	188		0	30	5655
viii)	Bulk Density	Nos	24	139	5	695				5	695
	Sub-Total D					**3183650**			**0**		**3183650**
E	**Preservation of Core**										
i)	GI Core boxes			**2000**	**400**	**800000**	**2000**		**0**	**400**	800000
ii)	Transportation of Core Boxes	Km	8.8	31.0	1300	40300	31.0		**0**	**1300**	40300
	Sub-Total E					840300					**840300**
	Total A+B+C +D+E					**20864390**			**0**		**20864390**
F	**EXPLORATION REPORT 1% of A+B+C +D+E**									**1**	**208644**
G	**PEER Review**						**10000**	**1**	**10000**	**1**	**10000**
	Total A+B+C +D+E+F+G+H										**21083034**
H	**GST @ 18%**										**3794946**
	Grand Total :										**24877980**
										Say 248.780 Lakhs	

Note:

1. **Goel Committee rates for Manganese ore are not available, hence Gold rates are taken on actual escalation as per RBI Indices as on 1.3.2017**
2. **** Rate has taken from Schedule of Charges of differen activities of GSI as on 2014-15 and 40% escalation on the same has been concidered for**
3. *****Payment will be as per length of road made.**
4. **Statutory payments relating to forest clearance will be paid extra**
5. **In case of outsourcing handling charges will be paid as applicable for NMET blocks.**

Annexure - V/2

TABLE- 6.2 TIME SCHEDULE / ACTION PLAN FOR EXPLORATION PROPOSAL FOR MANGANESE ORE IN TAMIYA BLOCK, (G-2 Level) DISTRICT - BALANGIR, ODISHA

			1	2	3	4	5	6	7	8	9	10	11	
1	Camp Setting	Month	Continue from G4											1 month
2	Surface Drilling (2 rigs)	m.												1590m (in 29 BHs)
3	Pitting (5 Pit)	Cu.m												5.00
4	Survey Party days (1 Party)	Party days												120 Days
5	Geologist Party days (1 Party)	Party days												210 Days
6	Bulk Sampling Party days, (1 Party)	Party days												30 Days
7	Sampling Party days, Core Sampling (1 Party)	Party days												180 Days
8	Laboratory Studies	Nos.												1240 Nos.
9	Camp Winding	Months												1 month
10	Report Writing with Peer Review	Months												4 months

Annexure - VI/1

Table-6.2 Cost Estimate for Iron Ore Exploration Malangtoli D Sub - Block District- Sundargarh, Odisha								
SL. N0.	Item of Work	Unit	Base Rate	Escalated rates (2018-19)			Grand Total	
				Esc. Rate	Qty.	Amount	Qty.	Amount
			1.4.90					(Rs)
A	**DRILLING**							
1	Surface Drilling (4 rigs) *	m	9000	9000	1000	9000000	1000	9000000
2	Pitting (1m x 1m x 1m)	Cu.m.	395	1673	15	25095	15	25095
2	Transportation	Km	8.8	31	3000	93000	3000	93000
3	Accomodation (One time/ Drill)		185925	663715	4	2654860	4	2654860
4	Camp Setting	- do-	68606	244910	4	979640	4	979640
5	Road Making (Hilly Terrain)**	Km	7800	27844	20	556880	20	556880
	Sub Total A					**13309475**		**13309475**
B	**GEOLOGICAL WORK**							
1	Survey Party days (1 party)	day	1180	5840	90	525600	90	525600
2	Geologist Party days (1 party)	day	1541	7802	120	936240	120	936240
3	Bulk Sampling Party days (1 party)	day	2566	13434	30	403020	30	403020
4	Core Sampling Party days (1 party)	day	525	2809	90	252810	90	252810
5	**SUB TOTAL B**					**2117670**		**2117670**
C	**LABORATORY STUDIES**							
1	**Chemical Analysis**							
	i) Primary & Check samples							
	a. For 3 radicals Fe, SiO_2 & Al_2O_3 [core samp + Internal Check Samp	Nos	262(110 +76x2)	1374	935	1284690	935	1284690
	b) External Check Samples from NABL Labs for 3 radical (Fe, SiO2 & Al2O3)	Nos	262(110 +76x2)	1374	40	54960	40	54960
	ii) Composite Samples							
	a) Composite Samples for 7 radicals (Fe%, SiO2%, Al2O3%, P%, Mn%, S% & V2O5%)	Nos	268	2982	100	298200	100	298200
2	**Physical Analysis**							
i)	Preparation of thin section	Nos	100	538	15	8070	15	8070
ii)	Petrographic Studies	Nos	228	1436	15	21540	15	21540
iii)	Preparation of polished section	Nos	100	538	15	8070	15	8070
iv)	Mineragraphic Studies	Nos	364	2023	15	30345	15	30345
v)	Density Determination	Nos	24	139	15	2085	15	2085
	Sub-Total C					**1707960**		**1707960**
D	**Preservation of Core**							
i)	GI Core boxes	Nos.		2000	250	500000	250	500000
ii)	Transportation of Core Boxes	Km	8.8	31.0	1600	49600	1600	49600
	Sub-Total D					**549600**		**549600**
	Total A+B+C+D							**17684705**
E	**EXPLORATION REPORT - 1% of (A+B+C+D)**				**1**			**176847**
F	**PEER REVIEW OF DGR (Lump Sum)**	Nos		10000	1	**10000**	1	10000
	Grand Total : A to F							**17871552**
G	**GST @ 18%**							**3216879**
H	**GRAND TOTAL**							**21088431**
Notes:								**Say 210.885 Lakhs**
1	Revised Rates of Promotional Work done by MECL on behalf of Govt. of India Vide letter No. 37(I) /2006-M.I. dated- 02/07/2014 and based on actual							
2	*Outsourcing rate has been considered in drilling as provided by DGM(Jharkhand). Handling Charges will be as paid applicable .							
3	**Payment will be as per length of road made.							
4	statutory payments relating to forest clearance will be paid extra.							

Mineral Exploration and evaluation 18%(SAC Code: 998343)

Annexure - VI/2

Table 6.1: TIME SCHEDULE /ACTION PLAN , G3 LEVEL OF IRON ORE EXPLORATION IN MALANTOLI D- SUB BLOCK ODISHA.

Sl. No.	Activities	Unit	MONTHS												Total
			1	2	3	4	5	6	7	8	9	10	11	12	
1	Tendering Period	Month	←	—	—	—	→								5 month
2	Camp Setting	Month						↔							1 month
3	Core Drilling (4 rigs)	m.							↔	—	→				1000 m (in 10 BHs)
4	Bulk Sampling Party days	Day								↔					30
5	Survey Party days (1 Party)	day							↔	—	→				90
6	Geologist Party days (1 Parties)	day							↔	—	—	→			120
7	Sampling Party days, Core Sampling (1 parties)	day								↔	—	→			90
8	Laboratory Studies	Nos.								↔	—	—	→		1120
9	Report Writing	Month									↔	—	—	→	4 months

Annexure-VII/1

Table-6.2 Cost Estimate for Iron Ore Exploration Malangtoli' E' Sub - Block District- Sundargarh, Odisha								
SL. N0.	Item of Work	Unit	Base Rate	Escalated rates (2018-19)			Grand Total	
				Esc. Rate	Qty.	Amount	Qty.	Amount
			1.4.90					(Rs)
A	DRILLING							
1	Surface Drilling (4 rigs) *	m	9000	9000	1000	9000000	1000	9000000
2	Pitting (1m x 1m x 1m)	Cu.m.	395	1673	15	25095	15	25095
2	Transportation	Km	8.8	31	3000	93000	3000	93000
3	Accomodation (One time/ Drill)		185925	663715	4	2654860	4	2654860
4	Camp Winding	- do-	68606	244910	0	0	0	0
5	Road Making (Hilly Terrain)**	Km	7800	27844	20	556880	20	556880
	Sub Total A					**12329835**		**12329835**
B	GEOLOGICAL WORK							
1	Survey Party days (1 party)	day	1180	5840	90	525600	90	525600
2	Geologist Party days (1 party)	day	1541	7802	120	936240	120	936240
3	Bulk Sampling Party days (1 party)	day	2566	13434	30	403020	30	403020
4	Core Sampling Party days (1 party)	day	525	2809	90	252810	90	252810
5	**SUB TOTAL B**					**2117670**		**2117670**
C	LABORATORY STUDIES							
1	**Chemical Analysis**							
	i) Primary & Check samples							
	a. For 3 radicals Fe, SiO_2 & Al_2O_3 [core samp + Internal Check Samp	Nos	262(110 +76x2)	1374	935	1284690	935	1284690
	b) External Check Samples from NABL Labs for 3 radical (Fe, SiO2 & Al2O3)	Nos	262(110 +76x2)	1374	40	54960	40	54960
	ii) Composite Samples							
	a) Composite Samples for 7 radicals (Fe%, SiO2%, Al2O3%, P%, Mn%, S% & V2O5%)	Nos	268	2982	100	298200	100	298200
2	**Physical Analysis**							
i)	Preparation of thin section	Nos	100	538	15	8070	15	8070
ii)	Petrographic Studies	Nos	228	1436	15	21540	15	21540
iii)	Preparation of polished section	Nos	100	538	15	8070	15	8070
iv)	Mineragraphic Studies	Nos	364	2023	15	30345	15	30345
v)	Density Determination	Nos	24	139	15	2085	15	2085
	Sub-Total C					**1707960**		**1707960**
D	**Preservation of Core**							
i)	GI Core boxes	Nos.		2000	250	500000	250	500000
ii)	Transportation of Core Boxes	Km	8.8	31.0	1600	49600	1600	49600
	Sub-Total D					**549600**		**549600**
	Total A+B+C+D							**16705065**
E	**EXPLORATION REPORT - 1% of (A+B+C+D)**				**1**			**167051**
F	**PEER REVIEW OF DGR (Lump Sum)**	Nos		10000	1	**10000**	1	10000
	Grand Total : A to F							**16882116**
G	**GST @ 18%**							**3038781**
H	**GRAND TOTAL**							**19920896**
Notes:								**Say 199.209 Lakhs**
1	Revised Rates of Promotional Work done by MECL on behalf of Govt. of India Vide letter No. 37(I) /2006-M.I. dated- 02/07/2014							
2	*Outsourcing rate has been considered in drilling as provided by DGM(Jharkhand). Handling Charges will be as applicable .							
3	**Payment will be as per length of road made.							
4	statutory payments related to forest clearance will be paid extra.							

Mineral Exploration and evaluation 18%(SAC Code: 998343)

Annexure - VII/2

Table 6.1: TIME SCHEDULE /ACTION PLAN , G3 LEVEL OF IRON ORE EXPLORATION IN MALANTOLI E- SUB BLOCK ODISHA.

Sl. No.	Activities	Unit	MONTHS												Total
			1	2	3	4	5	6	7	8	9	10	11	12	
1	Tendering Period	Month	←	—	—	—	→								5 month
2	Core Drilling (4 rigs)	m.						←	—	→					1000 m (in 10 BHs)
3	Bulk Sampling Party days	Day							← →						30
4	Survey Party days (1 Party)	day						←	—	→					90
5	Geologist Party days (1 Parties)	day						←	—	—	→				120
6	Sampling Party days, Core Sampling (1 parties)	day							←	—	→				90
7	Laboratory Studies	Nos.							←	—	—	→			1120
8	Report Writing	Month									←	—	—	→	4 months

Annexure -VIII/1

Table-6.2 Cost Estimate for Iron Ore Exploration Malangtoli G Sub - Block District- Sundargarh, Odisha								
SL. N0.	Item of Work	Unit	Base Rate	Escalated rates (2018-19)			Grand Total	
				Esc. Rate	Qty.	Amount	Qty.	Amount
			1.4.90					(Rs)
A	DRILLING							
1	Surface Drilling (4 rigs) *	m	9000	9000	1000	9000000	1000	9000000
2	Pitting (1m x 1m x 1m)	Cu.m.	395	1673	15	25095	15	25095
2	Transportation	Km	8.8	31	3000	93000	3000	93000
3	Accomodation (One time/ Drill)		185925	663715	4	2654860	4	2654860
4	Camp Winding	- do-	68606	244910	4	979640	4	979640
5	Road Making (Hilly Terrain)**	Km	7800	27844	20	556880	20	556880
	Sub Total A					**13309475**		**13309475**
B	GEOLOGICAL WORK							
1	Survey Party days (1 party)	day	1180	5840	90	525600	90	525600
2	Geologist Party days (1 party)	day	1541	7802	120	936240	120	936240
3	Bulk Sampling Party days (1 party)	day	2566	13434	30	403020	30	403020
4	Core Sampling Party days (1 party)	day	525	2809	90	252810	90	252810
5	**SUB TOTAL B**					**2117670**		**2117670**
C	LABORATORY STUDIES							
1	**Chemical Analysis**							
	i) Primary & Check samples							
	a. For 3 radicals Fe, SiO_2 & Al_2O_3 [core samp + Internal Check Samp	Nos	262(110 +76x2)	1374	935	1284690	935	1284690
	b) External Check Samples from NABL Labs for 3 radical (Fe, SiO2 & Al2O3)	Nos	262(110 +76x2)	1374	40	54960	40	54960
	ii) Composite Samples							
	a) Composite Samples for 7 radicals (Fe%, SiO2%, Al2O3%, P%, Mn%, S% & V2O5%)	Nos	268	2982	100	298200	100	298200
2	**Physical Analysis**							
i)	Preparation of thin section	Nos	100	538	15	8070	15	8070
ii)	Petrographic Studies	Nos	228	1436	15	21540	15	21540
iii)	Preparation of polished section	Nos	100	538	15	8070	15	8070
iv)	Mineragraphic Studies	Nos	364	2023	15	30345	15	30345
v)	Density Determination	Nos	24	139	15	2085	15	2085
	Sub-Total C					**1707960**		**1707960**
D	**Preservation of Core**							
i)	GI Core boxes	Nos.		2000	250	500000	250	500000
ii)	Transportation of Core Boxes	Km	8.8	31.0	1600	49600	1600	49600
	Sub-Total D					**549600**		**549600**
	Total A+B+C+D							**17684705**
E	**EXPLORATION REPORT - 1% of (A+B+C+D)**				**1**			**176847**
F	**PEER REVIEW OF DGR (Lump Sum)**	Nos		10000	1	**10000**	1	10000
	Grand Total : A to F							**17871552**
G	**GST @ 18%**							**3216879**
H	**GRAND TOTAL**							**21088431**
Notes:								**Say 210.884 Lakhs**
1	Revised Rates of Promotional Work done by MECL on behalf of Govt. of India Vide letter No. 37(I) /2006-M.I. dated- 02/07/2014 and							
2	*Outsourcing rate has been considered in drilling as provided by DGM(Jharkhand). Handling Charges will be as applicable .							
3	**Payment will be as per length of road made.							
4	statutory payments related to forest clearance will be paid extra.							

Mineral Exploration and evaluation 18%(SAC Code: 998343)

Annexure- VIII/2

Table 6.1: TIME SCHEDULE /ACTION PLAN , G3 LEVEL OF IRON ORE EXPLORATION IN MALANTOLI G- SUB BLOCK ODISHA.

Sl. No.	Activities	Unit	MONTHS												Total
			1	2	3	4	5	6	7	8	9	10	11	12	
1	Tendering Period	Month	←				→								5 month
2	Core Drilling (4 rigs)	m.						←		→					1000 m (in 10 BHs)
3	Bulk Sampling Party days	Day							← →						30
4	Survey Party days (1 Party)	day						←		→					90
5	Geologist Party days (1 Parties)	day						←			→				120
6	Sampling Party days, Core Sampling (1 parties)	day							←		→				90
7	Camp Winding	Month									← →				1 month
8	Laboratory Studies	Nos.							←			→			1120
9	Report Writing	Month									←			→	4 months