

**PROPOSAL FOR RECONNAISSANCE SURVEY (G-4)
FOR MANGANESE ORE IN
TALJURI-GUNCHADIHI BLOCK
(83 SQ. KM AREA)
DISTRICT- BALANGIR, ODISHA**

COMMODITY: MANGANESE

**BY
MINERAL EXPLORATION CORPORATION LIMITED
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SEMINARY HILLS**

PLACE: NAGPUR

DATE: 17th November 2022

Summary of the Block for Reconnaissance Survey (G-4)

Features	Details
Block ID	Taljuri-Gunchadihi Block
Exploration Agency	Mineral Exploration and Consultancy Limited (MECL)
Commodity	Manganese
Mineral Belt	Eastern Ghats Mobile Belt, Balangir District, Odisha
Budget & Time schedule to complete the project	283.61 lakhs & 18 months
Objectives	The present exploration programme (G-4) has been formulated on the basis of previous regional data available in surrounding area of the block and the data collected by MECL team during the field visit to fulfil the following objectives: i) To carry out geological mapping on 1:12,500 scale and demarcate the rock types of manganese bearing formations with the structural features i.e. strike, dip, lineations / foliations etc. ii) To demarcate concealed manganese ore bodies by carrying out surface geophysical survey (I.P. Cum Resistivity, S.P. and Magnetic) after completion of geological mapping. iii) To carry out trenching/pitting to expose manganese bodies under soil & lateritic cover. iv) To drill scout boreholes to prove the existence and establish persistence of manganese ore bodies over a promising strike length. v) To estimate reconnaissance (334) resource of manganese ore in the block as per UNFC norms & Minerals (Evidence of Mineral Contents) Rules- 2021.
Whether the work will be carried out by the proposed agency or through outsourcing and details thereof. Components to be outsourced and name of the outsource agency	Work will be carried out by the proposed agency.
Name/Number of Geoscientists	
Expected Field days (Geology, Geophysics, Surveyor)	Geologist Party days: Field -180 days & HQ-60 days
	Geophysicist Party Days: Field -120 days & HQ-30 days
	Survey Party days: 120 days (for geophysics)
	Sampling Party days: 60 days

1.	Location	The block proposed for exploration lies in the parts of Survey of India Toposheet No 64 P/05 and is bounded by latitude 20° 50' 36.82" to 20° 55' 24.37" and longitude 83° 14' 59.57" to 83° 21' 50.56" (Plate No I). The area is connected by fair weather road from the State High-Way No.-1 (Balangir-Patanagarh Road). The fair weather road crosses Suktel River through a ford north of Khuntapalli village and is open to traffic from January to June. During the peak of Monsoon, Taljuri-Gunchadihi block can be approached from Balangir via Chandanbhati by an all weather pucca road. The intermittent villages are connected by fair weather jeepable unmetalled roads. The nearest railhead is Balangir.																							
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	Villages	Taljuri, Sartimunda, Phiringimal, Sankripani, Gharhagharhima, Turcha, Gourenmunda, Burochhapar, Chhindrapali, Gudiyajur, Salhepali, Saidungripali, Jamjuri, Jhankarpali, Gunchadihi, Thelkuchppar, Phalsamal, Ratakhandi, Barhajhula, Dandapani, Rengali, Bharatbahal, Champasar, Mudalsar, Jamjuri, Laherjuri, Brahmanipali, Chuwaliudar, Baghamunda, Chandanjuri, Dumerjharan, Pandripani, etc.																							
	Tehsil/Taluk	Balangir-Patnagarh-Loisinga																							
	District	Balangir																							
	State	Odisha																							
2.	Area (hectares/ square kilometres)																								
	Block Area	83 sq.km																							
	Forest Area	Forest and Non-Forest area.																							
	Government Land Area (Bilanam)	Data not available																							
	Charagaha	Data not available																							
	Private Land Area	Data not available																							
3.	Accessibility																								
	Nearest Rail Head	Balangir (280 km from Raipur and 310 Km from Bhubaneswar),																							
	Road	The intermittent villages in the area are connected by fair weather jeepable metalled / unmetalled roads. The nearest railhead is																							

		Balangir.
	Airport	Raipur (225 km)
4.	Hydrography	
	Local Surface Drainage Pattern (Channels)	The general slope of the area is towards north and northeast. The drainage in the block is collected by northerly flowing Berha Jor and Kulari Jor nalas ultimately draining into Ong River. The area has got dendritic pattern of drainage. The Mohadaseni, Pandripani and Garhagharh reserve forest falls under the block area.
	Rivers/ Streams	Berha Jor Nala, Kulari Jor Nala and Ong River
5.	Climate	
	Mean Annual Rainfall	Average annual rainfall is 100 cm
	Temperature:	Minimum temperatures: 10°C (Dec-Feb), Maximum temperatures: up to 46°C (March-June)
6.	Topography	
	Toposheet Number	64P/05
	Morphology of the Area	The area covers flat as well as hilly terrain with agriculture and forest land. The height of the area varies from 200 to 550 above MSL with an average of is 325m above MSL.
7.	Availability of baseline geoscience data	
	Geological Map (1:50K/25K)	Regional Geological map from Bhukosh, Geological Survey of India available (1:50,000 scale)
	Geochemical Map	Not available.
	Geophysical Map (Aeromagnetic, ground geophysical, Regional as well as local scale GP maps)	Available.
8.	Justification for taking up Reconnaissance Survey/ Regional Exploration	1. The Govt. of India enacted the MMDR Amendment Act-2015 duly introducing the system of auction for allocation of Mineral Concessions. Manganese has been categorized in the Fourth Schedule which needs prospecting and exploration by the State Govt. before auctioning of blocks. 2. Considering the potentiality of the area for manganese based on the available historic exploration data of blocks explored by GSI & MECL in the surrounding area, MECL proposed G-4 stage exploration work for manganese in Taljuri-Gunchadihi Block in Balangir District of Odisha through NMET funding. The Taljuri-Gunchadihi Block may be the prospective manganese blocks identified for auction.

3. The proposed study area falls in the north and north-west of Babja, Thakurpali & Uchhabpali, Dandapani, Rengali, Tabalbanji, Antapali, Kumiapali, Biarpali, Dungaripali and Khagsabahal Cluster of Manganese blocks, north-east of Tamiya Manganese block and east of ongoing Larambha-Kanaital & Pudapadar-Bharatbahal Manganese and Graphite Block.

4. There are 12 manganese blocks explored by MECL are in vicinity of the block. The details of the blocks are given below:

SL No.	Block Name	Area (Sq. Km)	At 18% Mn Cut-off		At 10% Mn Cut-off	
			Resource (MT)	Grade Mn %	Resource (MT)	Grade (Mn %)
1	Tamiya (G-2)	0.81	0.633	23.04	1.314	18.19
2	Tamiya (G-4)**	3.12	-	-	-	-
3	Rengali (G-2)	1.83	0.328	21.37	2.193	14.45
4	Rengali (G-4)	2.45	0.011	18.8	0.045	13.5
5	Babja (G-2)	0.20	0.356	23.6	1.157	19.49
6	Biarpalli (G-2)	1.32	1.937	22.45	3.358	18.63
7	Biarpalli (G-4)*	2.06	-	-	0.047	11.14
8	Dunguripalli (G-3)	8.05	0.264	22.5	0.555	17.77
9	Kumiapali (G-4)*	8.92	-	-	0.235	14.07
10	Antapali (G-4)*	2.30	-	-	0.109	12.97
11	Rengali Graphite (G-4)**	9.41	-	-	-	-
12	Larambha-Kanaital & Pudapadar-Bharatbahal	135	Block under exploration			
Total		175.47	3.529	22.56	9.013	17.35

* Resource has not been estimated at 18% Mn cut-off.

** Resource has not been estimated.

Considering the resource and grade of all these blocks, the cluster mining approach can be used in the area.

5. There are 1.330 mt graphite resource with an average grade of 4.71% FC at 2% FC cut-off has been estimated in Tamiya (G-2), Rengali (G-2), Babja (G-2) and Biarpalli (G-2) blocks which are south and south-east of Taljuri-Gunchadihi Block. The details of the block wise resources are given below.

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		exploration programme which in turn will lead to estimation of inferred/indicated (333/332) category resources and will facilitate the State Govt. Odisha for auctioning of blocks.
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PROPOSAL FOR RECONNAISSANCE SURVEY (G-4) FOR MANGANESE ORE IN TALJURI-GUNCHADIHI BLOCK, DISTRICT-BALANGIR, ODISHA

1.0.0 INTRODUCTION

1.1.0 Preamble:

- 1.1.1 Manganese is one of the most common elements in the Earth's crust and is widely distributed across the planet's surface. It is very hard, brittle, gray-white transition metal that is found in variety of minerals, but never as free element in nature; is it often found in minerals in combination with iron. Manganese ore is the basic source to provide manganese as indispensable input in making of iron and all types of steels. So far there is no technology which can substitute manganese in steel making. Manganese combines the twin benefits of relatively low price with outstanding technical usage.
- 1.1.2 In order to sustain the current level of production of Mn ores and to meet the future demands, the exploration of Manganese ore is the need of the hour.
- 1.1.3 In India the Manganese Ore deposits mainly occurs as metamorphosed bedded sedimentary deposits associated with Gondite Series (Archaean) of Madhya Pradesh (Balaghat, Chhindwara & Jhabua districts), Maharashtra (Bhandara & Nagpur districts), Gujarat (Panchmahal district), Odisha (Sundargarh district) and Kodurite Series (Archaean) of Odisha (Ganjam & Koraput districts) and Andhra Pradesh (Srikakulam & Vishakhapatnam districts).
- 1.1.4 The total reserves/resources of manganese ore in the country as on 1.04.2015 have been placed at 495.87 million tonnes as per NMI database, based on UNFC system (Mineral Year Book-2019). Out of these, 93.47 million tonnes are categorised as reserves and the balance 402.40 million tonnes are in the remaining resource category. Grade-wise, Ferromanganese grade accounts for 7%, Medium grade 11%, BF grade 28% and the remaining 54% are of Mixed, Low, Others, Unclassified, and Not-known grades including 0.17 million tonnes of battery/chemical grade. The overall grade of the manganese ore reserve in the country is in the range of 30-35% Mn (IBM Mineral Year Book 2019).
- 1.1.5 The total state-wise distribution of the manganese resources in the country indicates that Odisha tops with 44% share followed by Karnataka 22%, Madhya Pradesh 12%, Maharashtra & Goa 7% each, Andhra Pradesh 4% and Jharkhand 2% each. Rajasthan, Gujarat, Telangana and West Bengal together shared the remaining about 2% resources.

- 1.1.6 The Govt. of India enacted the MMDR Amendment Act, 2015 duly introducing the system of auction for allocation of Mineral Concessions. Manganese has been categorized in the Fourth Schedule which needs prospecting and exploration by the State Govt. before auctioning of blocks
- 1.1.7 MECL looked up for the area for investigation of manganese around already explored Manganese blocks in Balangir district and prepared a proposal for reconnaissance survey (G-4) for manganese. MECL team carried out field field work nearby Taljuri, Gunchadihi, Thelkuchhapar, Barhajhula and Dandapani villages and collected 7 bedrock samples from manganese ore zones in the area. The sample has been analysed for Mn and associated elements/oxides. Considering the potential values of the samples, MECL prepared proposal for manganese in Taljuri-Gunchadihi Block, district - Balangir, Odisha and submitted to NMET for taking up for discussion in the upcoming TCC.

1.2.0 Background:

- 1.2.1 The proposed study area falls in the north and north-west of Babja, Thakurpali & Uchhabpali, Dandapani, Rengali, Tabalbanji, Antapali, Kumiapali, Biarpali, Dungaripali and Khagsabahal Cluster of Manganese blocks, north-east of Tamiya Manganese block and east of Larambha-Kanaital & Pudapadar-Bharatbahal Manganese and Graphite Block. These blocks are potential for manganese ore and/or graphite.
- 1.2.2 To find the new occurrences of manganese, during the course of exploration of Larambha-Kanaital & Pudapadar-Bharatbahal Block, MECL team carried out field work nearby Taljuri, Gunchadihi, Thelkuchhapar, Barhajhula and Dandapani villages. They have collected 7 bedrock samples from manganese ore zones in the area and analysed for Mn ICP-OES. All the samples having Mn% > 10% with range from 16.21% to 37.17% Mn with an average grade of 27.17% Mn.
- 1.2.3 Considering the previous study, field visit by MECL team and vicinity of adjoining manganese bearing area, a proposal to carry out the exploration for manganese in Taljuri-Gunchadihi block has been prepared and submitted to 46th meeting of Technical cum Cost Committee (TCC) of National Mineral Exploration Trust (NMET) held on 27th and 28th October 2022. The committee has informed that the part of the area falls under the block proposed by GSI for F.S.P. 2023-24. The committee suggested to solve the overlapping issue and resubmit the block after modification of the block boundary in consultation with GSI. Subsequently, the officials of MECL has discussed with GSI State Unit, Odisha and prepared a proposal excluding the overlapping area.

1.3.0 Location & Accessibility of the Area

The block proposed for exploration lies in the parts of Survey of India Toposheet No 64 P/05 and is bounded by latitude 20° 50' 36.82" to 20° 55' 24.37" and longitude 83° 14' 59.57" to 83° 21' 50.56" (Plate No I).

The coordinate of cardinal points of block boundary are as follows:

Cardinal Point	Co-ordinates (WGS-84)	
	Latitude	Longitude
A	20° 55' 24.3681" N	83° 15' 00.3876" E
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The area is connected by fair weather road from the State High-Way No.-1 (Balangir-Patanagarh Road). The fair weather road crosses Suktel River through a ford north of Khuntapalli village and is open to traffic from January to June. During the peak of Monsoon, Taljuri-Gunchadihi block can be approached from Balangir via Chandanbhati by an all weather pucca road. The intermittent villages are connected by fair weather jeepable unmetalled roads. The nearest railhead is Balangir.

1.4.0 Physiography, Drainage and Vegetation

- 1.4.1 The area covers flat as well as hilly terrain with agriculture and forest land. The height of the area varies from 200 to 550 above MSL with an average of is 325m above MSL. The general slope of the area is towards north and northeast. The drainage in the block is collected by northerly flowing Berha Jor and Kulari Jor nalas ultimately draining into Ong River. The area has got dendritic pattern of drainage. The Mohadaseni, Pandripani and Garhagharh reserve forest falls under the block area. The drainage is sub-parallel to sub-dendritic controlled by ridges and lineaments. Thick alluvium accumulated due to the Ong and Suktel River has helped extreme cultivation in the area.
- 1.4.2 The area has a sub-tropical climate with torrential rainfall between June and September. The temperature ranges between 10⁰ C in winter and 46⁰ C in summer season and the average annual rainfall is around 100 cm. This part of Odisha is very hot in summer with occasional extreme hotness in comparison to other parts of the state.
- 1.4.3 The areas under exploration are sparse to densely vegetated. The floral assemblage includes Sal (*Shorea robusta*), Shishu (*Dalbergia latifolia*), Neem (*Nekua indica*),

Tamarind (*Tamarindus indica*), Jackfruit (*Artocarpus intergrifolia*), Kendu (*Diaspyros melanxylon*), Mango, Amla, Harida, Bahada, Boula, Simili, Berries and Bel etc. Wild animals are scarcely observed in this area. The faunal assemblages include bears, rabbits, snakes, wild boars, jackals, peacocks, wild hens and host of birds.

1.5.0 Previous Work

- 1.5.1 B.C. Roy (1940) first reported the manganese ore deposits in Balangir district. He observed that: (i) the manganese ore deposits occupy summits and plains (ii) the manganese ore bodies have definite strike and dip (iii) the manganese ore comprises mainly of pyrolusite and psilomelane as ore minerals with chert, limonite and wad, (iv) the ore bands are associated with calc-granulites and garnetiferous gneisses.
- 1.5.2 Later on, Jhingran (1947) investigated and Krishnaswamy (1950) estimated the ore reserve to the tune of 650 thousand tonnes up to 1.5 m depth. Later on, host of workers from Geological Survey of India have carried out field work from 1962-65 and onwards. Finally, investigation aided by drilling was taken up in 1994-95. The average grade of ores from Balangir district range from 19-39% Mn, 10-28% Fe, 4-46% SiO₂ and 0.12-0.48% P.
- 1.5.3 A.G. Jhingran (1947) envisaged that the Dunguripalli manganese ore deposit (T. S. No. 64 P/5) was of considerable magnitude. Shri S. Krishnaswamy (1950) observed numerous occurrences of Mn ore mainly as lenses and pockets in calc-silicates, being parallel to regional foliation trend and assessed a reserve of 6,60,000 tonnes up to a depth of 15 m in T.S. P/1 & 5. M.W. Tak (1964-65), P. Bose (1965-66) and D. Mitra (1964-65) had mapped on 1:63,360 scale in Toposheet No. 64 P/5 & 9, 64 P/5, and 64 P/1 & 5 respectively.
- 1.5.4 M.W. Tak carried out mapping in the northern part of the present area and found that Mn mineralisation is associated with calc-gneiss, diopside granulite and highly weathered khondalite. P. Bose (1967) observed numerous lensoidal and pocket type deposits within khondalite and partly in calc-silicate rocks. D. Mitra observed the occurrences of Mn ore within khondalite suite of rocks. He envisaged that the presence of quartz-garnet-rhodonite association in deposits indicate probably a gonditic rock and closeness of calc-silicate within ore deposits suggest a calc-magnesian association common in sedimentary environment.
- 1.5.5 Patel, N.K. et al. (1983) of D.M.G., Orissa carried out systematic mapping of 60 sq. km on 1: 25,000 scale in Babja-Dumerijharam area and 2.5 sq. km detailed mapping on 1: 2000 scale in Bijapatti east of Belpali-Bhaludungri area. He computed the total probable

reserve of all grades to be 95,677 tonnes up to a depth of 3m. They observed that Mn ores occurs at the contact of khondalite and calc-granulites in the form of discontinuous bands and pockets of irregular dimensions. Twelve numbers of Mn ore occurrences were reported in the area such as: near southeast of Banipali, NW of Dandapani, NW of Dumerijharam, NE of Gerdi and SE of Thakurpalli. Besides, disintegrated manganese float ores were reported near Barkani, Babja and Uchhabpalli. They had done 410 cu. m of trenching and pitting and 249 nos. of channel and grab sampling.

- 1.5.6 Jena, S.K. et al. (1993-94) carried out large scale mapping on 1:25,000 scale in Gadashankar-Dandapani area of Balangir district between latitude $20^{\circ} 44'$ to $20^{\circ} 55'N$ and longitude $83^{\circ} 15'$ to $83^{\circ} 21'E$ and delineated four major ore zones.
- 1.5.7 Patel, M.C. (1996) initiated preliminary exploration work by drilling in 1994-95 F.S. Mishra U.S. and Hussain, A. (1997) carried out E-1stage (G-3 of UNFC, Ref: letter No 2692/K-1(Vol-II)/TC/ODS/2017 dated 07/11/2017 of GSI) exploration work over four blocks, viz., Biarpalli, Khagsabahal. Tabalbanji and Dunguripalli (north) blocks aided by detailed mapping and drilling in Toposheet No. 64 P/5 & 6.
- 1.5.8 Behera, S.N. (1996-97) carried out large scale mapping of an area of 115 sq.km on 1:25,000 scale in Babja ($20^{\circ}50'00''-83^{\circ}20'36''E$) - Thelkuchhapar ($20^{\circ}50'15''N-83^{\circ}46'00''E$), Dandapani, Tamiya and adjoining areas under P-II stage investigation to study manganese occurrences viz-a-viz their nature & grade and to identify potential blocks for detailed exploration.
- 1.5.9 During 2018 to 2022, MECL carried out exploration for manganese in 12 blocks around the Taljuri-Gunchadihi block. They have established 3.529mt manganese ore resources with an average grade of 22.56% Mn at 18% Mn cut-off and 9.013mt manganese ore resources with an average grade of 17.35% Mn at 10% Mn cut-off in 11 blocks. MECL also established 1.330mt graphite resources with an average grade of 4.71% FC (Fixed Carbon) at 2% FC cut-off in 4 blocks.
- 1.5.10 The Larambha-Kanaital & Pudapadar-Bharatbahal Block, which is west of Taljuri-Gunchadihi Block, is under exploration by MECL. There are 93 samples have been collected in the block, out of which analytical results of 38 samples have been received. A total of 26 samples out of 38 having Mn% > 10% which range from 10.09% to 38.13% Mn with an average grade of 24.63% Mn. Besides, 10 samples has been analysed for graphite mineralisation, out of which 4 samples having more than 2% FC, ranging between 2.60 to 6.56% FC with an average grade of 4.74% FC.
- 1.5.11 During the course of exploration of Larambha-Kanaital & Pudapadar-Bharatbahal Block, MECL team carried out field work nearby Taljuri, Gunchadihi, Thelkuchhapar,

Barhajhula and Dandapani villages. They have collected 7 bedrock samples from manganese ore zones in the area and analysed for Mn ICP-OES. All the samples having Mn% > 10% with range from 16.21% to 37.17% Mn with an average grade of 27.17% Mn.

1.6.0 Regional Geology

1.6.1 The exploration area lies in the northern part of the Eastern Ghats Super Group of rocks belonging to the meta-sedimentary sequence of Precambrian khondalite. The sequence of para-metamorphic is made up of pelitic, psammitic and calcareous formations, which are represented by khondalite, quartzite and calc-silicate rocks. These have been intruded by granites. All the hill ranges in this area are composed of either khondalite or garnetiferous quartzite or both. Calc-silicate bands adjoining to the ore horizons form denudational hillocks or mounds and are 1 to 2m thick. Granite gneiss occupies the valleys. The whole sequence has been metamorphosed to granulite facies. Structurally the area exhibits a complex picture.

1.6.2 On the basis of contact relationship, presence of xenoliths/caught up patches of one particular unit within the other & structural and stratigraphical relationship, the tentative stratigraphic succession of the area (After GSI) may be given as follows:

Age	Formation	Lithology
Quaternary	-	Alluvium, soil and latsol
Tertiary	-	Laterite
Precambrian (Eastern Ghat Supergroup)	-	Aplite, Pegmatite and Quartz veins
	Granitoids	Equigranular, non-garnetiferous granite gneiss, garnetiferous granite gneiss and granulite, leptinitic gneiss Migmatite
	Charnockite Suite	Hypersthene bearing gneisses and granulites (mostly acid to intermediate charnockitic type)
	Khondalite Suite	Pyroxene granulite, quartzite, Khondalite with manganiferous horizons Calc-silicate rocks with manganese ore
Base Not Seen		

1.6.3 Description of various rock formations in the Area

The rock types exposed in the area are calc-silicate, quartzite (Mn bearing), granite gneiss, amphibolite and quartz and pegmatite vein. From the disposition of individual members of khondalite it is difficult to ascertain the stratigraphy, as the units have been

subjected to different cycles of sedimentation as well as deformation. Description of different litho units is given below.

Calc-silicate rocks: The calc-silicate rocks occur as bands and lenses within khondalite and also with Mn-ore bearing silicate-carbonate rock in the form of denudational hillocks and mounds and are intricately folded and exhibit rib and furrow weathering structure and crude layering. Their trend generally confirms the regional foliation direction and the contact of these rocks with khondalite and granite is sharp. The calc-silicate bands are 100m to 1km in length and 20 to 50 m in width. The calc-silicate rock is usually a dark grey to greenish, fine to medium grained, hard and massive to foliated. It contains green diopside, hornblende, plagioclase (andesine), garnet (grossularite), scapolite, sphene and quartz. Accessories include zircon, calcite, apatite and epidote.

Khondalite (quartz- feldspar- garnet- sillimanite + graphite schist/gneiss): It occurs typically in bouldery outcrops (highly weathered) on narrow, steep hill ranges and low lying mounds and in valley interbanded with quartzite and calc-silicate rocks. This is coarse grained, brownish yellow to reddish grey coloured, foliated and highly weathered rock. Due to varying degree of weathering its colour changes to pinkish/purplish at places, when highly kaolinised, it becomes very light. It is highly sheared and mylonitised at places. The rock is manganiferous and secondary manganese minerals occur along the foliation, fracture and joints planes. The rock is intimately associated with quartzite and both grade into each other along as well as across the foliation. They are highly migmatized and the quartzofeldspathic neosome bands that have traversed the rock along the regional foliation plane of the rocks.

Quartzite: The quartzite is medium to coarse grained, white to buff coloured, granular to faintly schistose in nature and are invariably garnetiferous. Pegmatite and quartz veins traverse the rock along foliation planes. Quartzite grades laterally to khondalite. It is predominantly made up of large xenoblastic grains of quartz with pale pink garnet and clusters of sillimanite. Quartzite is highly brecciated in a number of places such as in Dandapani block. Brecciated quartzite, in general contains ore bodies. Manganese mineralisation is noticed within brecciated and feldspathised quartzite at places. Manganiferous quartzite is exposed in Dandapani and Dunguripalli (south) blocks.

Granulite: It is coarse grained black massive rock and occurs as small lenticular inclusions parallel to foliation within granite gneiss and at places occur in boulder form along small ridges in association with khondalite and quartzite. It is mainly a plagioclase (andesine-labradorite)-pyroxene rock with subordinate amount of amphibole, biotite, garnet, perthite and quartz and accessories include sphene, ilmenite, zircon and apatite.

Migmatite: Migmatite occupy the low lying areas in the east of Bijapati and around Dunguripalli. It exhibits gneissose structure and the palaeosome includes hypersthene, diopside and biotite and the neosome comprises of K-feldspar and plagioclase.

Granite Gneiss: This is medium to coarse grained rock occupying low-lying areas with migmatite, consisting mainly of quartz, plagioclase, K-feldspar, biotite, garnet, epidote and few opaques. The whole sequence has been metamorphosed to granulite facies. The alkali-feldspar gneiss is fine to coarse grained and contains porphyroblasts of microcline and perthite within quartz-feldspar-garnet aggregates.

Pegmatite and quartz veins: Pegmatite and quartz veins traverse the rocks at a number of places close to manganese mineralisation in all the rock types both along and across the foliation. At places pegmatite contains few crystals of beryl which are of less significance.

Laterite: Laterite is developed mainly over khondalite and granite gneiss and is very common in areas close to manganese mineralised zones as in Dunguripalli (south) Block. Extensive development of laterite over laterite has been developed in northeast of Rengali.

1.6.4 Regional Structure

The entire area covered by large scale/detailed mapping exhibits a complex structural fabric as the whole sequence has been subjected to multiple cycles of deformation. As a result, the existing structural elements are completely altered rendering it difficult to decipher the complete structural geometry. However, the secondary planar structural elements like, foliation and gneissosity and joints are well preserved in the rock types of the area. The different structural features as observed are described below:

Primary structures: The primary structures have been mostly obliterated due to granulite facies metamorphism. However, relict bedding is observed along the contact between khondalite, quartzite and calc-silicates. Interbanding of different litho units within the Khondalite Group is seen clearly in many outcrops.

Secondary structures: The secondary planar structures such as foliation, gneissosity, schistosity, joint and cleavages are well preserved in rocks. S1 is defined by compositional banding, preferred orientation of prismatic, acicular and flaky minerals in the rock.

- i) **Foliations:** Foliation (S1) is most pervasive and trends in NNW-SSE to NE-SW direction with moderate to steep easterly to south-easterly dip. Planar arrangement of minerals like garnet, biotite, sillimanite, graphite, quartz and feldspar mark the foliation plane in khondalite, quartzite, calc-silicate rocks and granite.

ii) Joints: Altogether, two sets of joints are observed in the surrounding area. These are E-W dipping 70° to 80° to south and N 65° E-S 65° W dipping 60° - 80° to southeast.

iii) Lineations: Two types of lineations are noted in the area:

(a) slickenside lineation: This is observed in manganiferous quartzite and calc-silicate rocks.

(b) Mineral lineation: The mineral lineation is defined by minerals like sillimanite, biotite and garnet.

iv) Folding: The area exhibits at least three generations of folding. The first generation of folds (F1) is tight isoclinal, intrafolial, upright and reclined in nature. The F1 folds are developed conspicuously in calc-silicate rocks and to a lesser extent in quartzite. The axial planes of F1 folds have a general trend in NNW-SSE direction. The second generation of folds (F2) is moderate to steeply plunging, open and broad type on NE-SW axis and third generation fold (F3) is characterised by upright, open to broad warps with E-W trend.



Foliated and Folded Calc-Silicate Rock

v) Faults and Shear: Faulting and shearing are evidenced by brecciation, silicification, vug filling, slickensides and mylonitisation in quartzite and khondalite. Quartzite and khondalites are intensely silicified and brecciated resembling chert breccia in the vicinity of manganese ore bands in a number of places such as west of Bijapali village in Dunguripalli south block. Shifting and missing of ore bands are due to local fault and pinching and swelling nature of ore bodies in the area.

1.6.5 Metamorphism

High grade metamorphism under granulite facies conditions characterise the Eastern Ghats Super Group of rocks. The mineral assemblages of khondalite (quartz-feldspar-garnet-sillimanite+graphite), granulite (plagioclase-hypersthene-diopside) and calc-silicate (diopside-plagioclase-calcite-quartz-scapolite) indicate pyroxene granulite sub-facies under granulite facies of Eskola.

1.6.6 Mineralization (Surface manifestation)

On the surface the Mn ore mineralization presents a rugged bouldery outlook. In general, oxide minerals show granoblastic to granulitic fabric. Gravity filling, stalactitic, botryoidal, box work and colloform structures are commonly observed within the ore. The ore is in general steel grey to dull grey in colour and is soft or powdery in nature. Pyrolusite, psilomelane and cryptomelane are seen replacing each other. Silica in rhodonite is seen replaced by the manganese oxides.

Manganese ore bodies occur as bands, lenses, pockets, veins, tabular bodies and disseminations within the khondalite group of rocks. The ore is more enriched at the central part. The lensoidal/discontinuous ore bodies are arranged in an en-echelon pattern. These are lateritic and have been weathered to a considerable depth along with the enclosing rocks.

The ore bodies are conformably interstratified with and enclosed in different stratigraphic levels with calc-granulite at its contact with khondalite. Detailed mapping and available subsurface data suggest that the ore is concentrated along the fold axes of minor and mesoscopic folds. Intense brecciation, shearing, fracture form the important loci for mineralisation and the granitic intrusion have influenced the depth persistence of the ore. The lensoidal discontinuous ores owe their origin to the flowage or drag folds. Hence it may be concluded that manganese ores are both lithologically and structurally controlled.

1.7.0 Scope of Proposed Exploration

- 1.7.1 The proposed Reconnaissance Survey (G-4 stage) program comprises Geological mapping (1:12,500 scale), Trenching, Geophysical Survey, Drilling of scout boreholes involving about 500m with associated survey, chemical analysis & physical analysis and geological report preparation.

1.8.0 Observation and Recommendations of previous work

- 1.8.1 The area has not been explored previously by any agency. However, during the course of exploration of Larambha-Kanaital & Pudapadar-Bharatbahal Block, MECL team carried out field work nearby Taljuri, Gunchadihi, Thelkuchhapar, Barhajhula and Dandapani villages. They collected 7 bedrock samples from manganese ore zones in the area and analysed for Mn ICP-OES. All the samples having Mn% > 10% with range from 16.21% to 37.17% Mn with an average grade of 27.17% Mn.

2.0.0 Previous Work / Background information

- 2.0.1 The background information and previous works have been described in para 1.2.0 and 1.5.0 respectively. On the basis of previous data available, field visit by MECL team and vicinity of adjoining manganese bearing area, the G-4 level of exploration for manganese has been proposed in the block.

3.0.0 Block description

The proposed block details are given in para 1.3.0.

4.0.0 Objective of the proposed Reconnaissance Survey (G4):

- 4.0.1 The present exploration programme (G4) has been formulated on the basis of previous regional data available and the data collected by MECL team during the field visit to fulfil the following objectives:

4.1.0 Objective of the proposed Reconnaissance Survey (G4):

- i) To carry out geological mapping on 1:12,500 scale and demarcate the rock types of manganese bearing formations with the structural features i.e. strike, dip, lineations / foliations etc.
- ii) To demarcate concealed manganese ore bodies by carrying out surface geophysical survey (I.P. Cum Resistivity, S.P. and Magnetic) after completion of geological mapping.
- iii) To carry out trenching/pitting to expose manganese ore bodies under soil & lateritic cover.
- iv) To drill scout boreholes to prove the existence and establish persistence of manganese ore bodies over a promising strike length.

- v) To estimate reconnaissance (334) resource of manganese ore in the block as per UNFC norms & Minerals (Evidence of Mineral Contents) Rules- 2015.

5.0.0 Planned Methodology

- 5.1.0 In accordance to the objective set for reconnaissance survey (G-4) of the block, the exploration programme is proposed. The Exploration shall be carried out as per Minerals (Evidence of Mineral Contents) Rule-2015. Accordingly, the following scheme of exploration is formulated in order to achieve the objectives. The details of different activities to be carried out are presented in subsequent paragraphs.

5.2.0 Geological Mapping

- 5.2.1 Large scale geological mapping on 1:12,500 scale will be carried out in the entire block by taking geological traverses. The contacts of different formations, identification of different lithological units, structural features, etc., will be carried out in detail. The geophysical survey data could help in updating of map. The geological map on 1:12,500 scale will be generated based on the detail geological mapping of the block and interpretation of exploration data.

5.3.0 Geochemical Sampling

5.3.1 Surface sampling (Bed Rock /Channel):

During the course of Geochemical Sampling the bed rock / channel samples shall be collected from the outcrops along with soil and stream sediment samples. A total of 100 no of primary, 5 no of internal check and 10 no of external check channel samples will be analyzed for manganese mineralization i.e. Mn, SiO₂, P₂O₅, Fe₂O₃, MnO₂ and Acid Insolubles. Similarly, 50 no of primary, 3 no of internal check and 5 no of external check channel samples will be analyzed for graphite mineralization i.e. Fixed Carbon (FC), Ash (A), Moisture (M) and Volatile Matter (VM).

5.4.0 Geophysical Survey

- 5.4.1 The proposed area consists of a sequence of para-metamorphics made up of pelitic, psammitic and calcareous formation, which were represented by khondalite, quartzite and calc-Silicate rocks. The rock types in the area are khondalite, granite gneiss, granulite, quartzite, calc-silicate, quartz vein. Manganese mineralisation is restricted to Khondalite Suite and its migmatized equivalents.

5.4.2 Physical properties of Manganese ore and expected host rocks are given in table below.

Ore/ rock	Chemical composition	Mn content	Density (g/cc)	Magnetic Susceptibility. 0-CGS
Pyrolusite	MnO ₂	63%	4.70-5.00	Paramagnetic
Psilomelane	MnOMn ₂ OH ₂ O		3.70-4.70	
Braunite	Mn ₂ O ₃ Mn ₆ O ₂	64.3%	4.75-4.82	
Rhodonite	MnSiO ₃	41.8%	3.40-3.6	Paramagnetic
Rhodochrosite	MnCO ₃	47.8%	3.40-3.60	100
Jacobsite	MnFe ₂ O ₄		4.95	200-300
Quartz	SiO ₂		2.6-2.8	.00063
Mica	K(Mg,Fe) ₃ AlSi ₃ O ₁₀ (F,OH) ₂ / KAl ₂ (F,OH) ₂		2.15	

5.4.3 On the basis of above properties, Integrated Geophysical Surveys i.e., I.P. Cum Resistivity, S.P. and Magnetic have been planned to carry out in the potential area marked by geological mapping. A total of 50.00 L.km of Self Potential (S.P) and Magnetic Surveys will be covered in the block. The Approximate time period to conduct the survey will be around 5 months.

5.5.0 Trenching:

5.5.1 During the exploration, trenching work will be carried out by cutting trenches of 1m width and 2 m depth directly on the fresh outcrop/rock exposures across the Mn ore bearing formation involving 150 cubic meter excavation.

5.6.0 Channel Sampling:

5.6.1 During the exploration, trenching work will be carried out by cutting trenches of 1m width and 2 m depth directly on the fresh outcrop/rock exposures across the Mn ore/graphite body involving 300 cubic meter excavation. The channel of 5cm x 2cm dimension will be cut on the floor of the trenches to collect the channel samples. The length of each channel sample will be kept as 1.00m uniformly in the same type of lithology, whereas, the length of the sample may be adjusted with variation/change in lithology. The representative powdered samples of (-) 200 # size will be obtained by stage wise grinding of the chips collected from the channels and by reducing the weight of sample by repeated coning and quartering. A final finished sample of 500 gram (-200 mesh) will thus be prepared. One part around 100gm sample will be sent to chemical laboratory for analysis, second part will be preserved in the camp as duplicate sample, the third part will be utilized for preparing composite sample for individual ore band and the fourth part will be kept as either check sample or sample to be used for any other specific purpose. Thus total 200 no of primary channel samples will be generated. 5% of primary channel samples (10 no samples) will be analyzed as internal check samples. Around 10% of primary samples (20 no samples) will be analyzed as external

check samples from any NABL accredited External Laboratory. A total of 75 no of primary, 4 no of internal check and 8 no of external check channel samples will be analyzed for manganese mineralization i.e. Mn, SiO₂, P₂O₅ Fe₂O₃, MnO₂ and Acid Insolubles. Similarly, 40 no of primary, 2 no of internal check and 4 no of external check channel samples will be analyzed for graphite mineralization i.e. Fixed Carbon (FC), Ash (A), Moisture (M) and Volatile Matter (VM).

5.7.0 Exploratory Drilling:

- 5.7.1 Based on the outcome of geological mapping, analytical results of surface channel samples and delineation of graphite and manganese ore zones, approximately 500.00 m of drilling in 8 scout boreholes will be carried out for intersection of mineralised zones in the block.

5.8.0 Core Logging

- 5.8.1 The borehole cores would be logged systematically. Viz. details of the litho units, colour, structural feature, texture, mineralization, besides the recovery, rock quality designation (RQD) and manganese ore type would be recorded.

5.9.0 Core Sampling

- 5.9.1 The mineralized (graphite & manganese) part of drill core will be sampled as Primary sample. The length of each sample will be kept 1.00 m within the ore zone depending upon the thickness of particular type of manganese ore & graphite and its physical character. The primary core samples for manganese mineralisation will be analysed for 6 radicals' i.e. Mn, SiO₂, P₂O₅ Fe₂O₃, MnO₂ and Acid insolubles. The primary core samples for graphite mineralisation will be analysed for Fixed Carbon (FC), Ash, Moisture and Volatile Matter (VM) (Proximate Analysis for 4 parameters). The cores of rocks 3 m immediate on footwall and 3 m immediate on hanging wall of mineralized zones 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.

- a) Around 138 no of core samples (120 no Primary & 18 no Check samples) shall be generated from the mineralized zones to be intersected in the boreholes of Taljuri-Gunchadihi Block. A total of 120 no of primary core samples for manganese mineralization (Mn, SiO₂, P₂O₅ Fe₂O₃, MnO₂ and Acid Insolubles) and 60 no of primary core samples will be analyzed for graphite mineralization (FC, Ash, Moisture and VM).
- b) Around 5% (6 no samples for Manganese and 3 no for Graphite) samples will be analyzed in Chemical Laboratory of MECL as Internal check samples and 10% of Primary samples (12 no samples for Manganese and 6 no for Graphite) will be sent to NABL External Labs for analysis of manganese mineralization (Mn, SiO₂, P₂O₅ Fe₂O₃,

MnO₂ and Acid Insolubles) and/or for graphite mineralization graphite mineralization (FC, Ash, Moisture and VM) as external check samples.

5.10.0 Whole Rock Analysis:

5.10.1 Whole Rock analysis for SiO₂, Al₂O₃, Fe₂O₃, TiO₂, MnO, CaO, Na₂O, K₂O+H₂O, MgO, P₂O₅, CO₂, & S radicals will be carried out on 15 Nos samples to check the rock types, their variation in chemical composition.

5.11.0 Petrological and Mineragraphic Studies

5.11.1 Thin and polished section studies on drill cores samples would be done for ascertaining the 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 in the block.

5.12.0 Quantum of work:

5.12.1 The quantum of work proposed by MECL in Talhuri-Gunchadihi Block (G-4 Stage of Exploration) is given in Table 5.1.

Table: 5.1 Proposed Quantum of Exploratory Work in Talhuri-Gunchadihi Block, District-Balangir, Odisha.

Sl. No.	Item of Work	Unit	Proposed Quantum of work
1	Geological Mapping (on 1:12,500 Scale)	Sq. Km.	83.00
2	Geophysical Work		
	i) I.P. Cum Resistivity, S.P. and Magnetic Survey	Line Km	50.00
3	Trenching (1m x 2m x75m)	Cu. m	150
4	Core Drilling (8 Scout Boreholes)	m.	500.00
5	Sample Preparation & Chemical Analysis		
A.	Primary samples for Manganese (Bedrock/Channel Samples)		
	i) Primary samples for 6 radicals i.e. Mn, SiO ₂ , P ₂ O ₅ , Fe ₂ O ₃ , MnO ₂ and Acid Insolubles	Nos.	100
	ii) Internal Check samples (5% of Primary samples) for 6 radicals	Nos.	5
	iii) External Check sample (10% of Primary samples) for 6 radicals	Nos.	10
B.	Primary samples for Graphite (Bedrock/Channel Samples)		
	i) Proximate Analysis of Primary samples for Graphite for 4 parameters i.e. Fixed Carbon (FC), Ash (A), Moisture (M) and Volatile Matter (VM)	Nos.	50
	ii) Internal Check samples (5% of Primary samples) for Graphite for 4 parameters	Nos.	3

Sl. No.	Item of Work	Unit	Proposed Quantum of work
	iii) External Check sample (10 % of Primary samples) for Graphite for 4 parameters	Nos.	5
C.	Primary samples for Manganese (Trennch/Channel Samples)		
	i) Primary samples for 6 radicals i.e. Mn, SiO ₂ , P ₂ O ₅ , Fe ₂ O ₃ , MnO ₂ and Insolubles	Nos.	75
	ii) Internal Check samples (5% of Primary samples) for 6 radicals	Nos.	4
	iii) External Check sample (10% of Primary samples) for 6 radicals	Nos.	8
D.	Primary samples for Graphite (Trennch/Channel Samples)		
	i) Proximate Analysis of Primary samples for Graphite for 4 parameters i.e. Fixed Carbon (FC), Ash (A), Moisture (M) and Volatile Matter (VM)	Nos.	40
	ii) Internal Check samples (5% of Primary samples) for Graphite for 4 parameters	Nos.	2
	iii) External Check sample (10 % of Primary samples) for Graphite for 4 parameters	Nos.	4
E.	Primary samples for Manganese (Core)		
	i) Primary samples for 6 radicals i.e. Mn, SiO ₂ , P ₂ O ₅ , Fe ₂ O ₃ , MnO ₂ and Insolubles	Nos.	120
	ii) Internal Check samples (5% of Primary samples) for 6 radicals	Nos.	6
	iii) External Check sample (10% of Primary samples) for 6 radicals	Nos.	12
F.	Primary samples for Graphite (Core)		
	i) Proximate Analysis of Primary samples for Graphite for 4 parameters i.e. Fixed Carbon (FC), Ash (A), Moisture (M) and Volatile Matter (VM)	Nos.	60
	ii) Internal Check samples (5% of Primary samples) for Graphite for 4 parameters	Nos.	3
	iii) External Check sample (10 % of Primary samples) for Graphite for 4 parameters	Nos.	6
6	Whole Rock Analysis		
	For SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ , TiO ₂ , MnO, CaO, Na ₂ O, K ₂ O+H ₂ O, MgO, P ₂ O ₅ , CO ₂ , & S.	Nos	15
7	Petrographic Studies	Nos	15
8	Mineragraphic Studies	Nos	15
9	Report Preparation (Digital format)	Nos.	1

6.0.0 Manpower Deployment

6.0.1 Manpower deployment List may be provided later.

7.0.0 Break-up of Expenditure

- 7.1.0 The proposed exploration programme is planned for reconnaissance survey (G-4). The work activities like camp setting, survey and associated geological work, geophysical studies, drilling & laboratory work will be completed within 15 months' time. Report writing (including peer review) will take another 4 months' time with overlapping of one month's laboratory studies. Thus the total duration of the project shall be 18 months from the date of commencement of the project. The bar chart showing activities wise time schedule is placed at Table-7.1.
- 7.2.0 Tentative cost has been estimated based on Schedule of Charges (SoC) of projects funded by National Mineral Exploration Trust (NMET) w.e.f. 01/04/2020 and the total estimated cost is **Rs. 283.61 Lakh**. The summary of tentative cost estimates for Reconnaissance Survey is given in **Table No.-VA** and details of tentative cost estimates are given in **Table No.-VA**. Tentative Time schedule/action plan for proposed Reconnaissance Survey (G-4) for manganese is given in **Table No. VB**.

Table No-VA

Summary of Tentative Cost Estimates for Reconnaissance Survey (G-4 Level) Exploration

Sl. No.	Item	Total
1	Geological Work	29,51,240
2	Pitting & Trenching	4,95,000
3	Geophysical Work	1,00,39,225
4	Drilling	74,64,630
5	Laboratory Studies	18,68,355
	Sub total	2,28,18,450
6	Report	7,50,000
7	Peer Review	10,000
8	Proposal Preparation	4,56,369.00
	Total	2,40,34,819
9	GST (18%)	43,26,267.42
Total cost including 18% GST		28361086.42
SAY, in Lakhs		283.61

8. 0.0 Justification:

- 8.0.1 The Govt. of India enacted the MMDR Amendment Act-2015 duly introducing the system of auction for allocation of Mineral Concessions. Manganese has been categorized in the Fourth Schedule which needs prospecting and exploration by the State Govt. before auctioning of blocks.

8.0.2 Considering the potentiality of the area for manganese based on the available historic exploration data of blocks explored by GSI & MECL in the surrounding area, MECL proposed G-4 stage exploration work for manganese in Taljuri-Gunchadihi Block in Balangir District of Odisha through NMET funding. The Taljuri-Gunchadihi Block may be the prospective manganese blocks identified for auction.

8.0.3 The proposed study area falls in the north and north-west of Babja, Thakurpali & Uchhabpali, Dandapani, Rengali, Tabalbanji, Antapali, Kumiapali, Biarpali, Dunguripali and Khagsabahal Cluster of Manganese blocks, north-east of Tamiya Manganese block and east of Larambha-Kanaital & Pudapadar-Bharatbahal Manganese and Graphite Block.

8.0.4 There are 12 manganese blocks explored by MECL are in vicinity of the block. The details of the blocks are given below:

SL No.	Block Name	Area (Sq. Km)	At 18% Mn Cut-off		At 10% Mn Cut-off	
			Resource (MT)	Grade Mn %	Resource (MT)	Grade (Mn %)
1	Tamiya (G-2)	0.81	0.633	23.04	1.314	18.19
2	Tamiya (G-4)**	3.12	-	-	-	-
3	Rengali (G-2)	1.83	0.328	21.37	2.193	14.45
4	Rengali (G-4)	2.45	0.011	18.8	0.045	13.5
5	Babja (G-2)	0.20	0.356	23.6	1.157	19.49
6	Biarpalli (G-2)	1.32	1.937	22.45	3.358	18.63
7	Biarpalli (G-4)*	2.06	-	-	0.047	11.14
8	Dunguripalli (G-3)	8.05	0.264	22.5	0.555	17.77
9	Kumiapali (G-4)*	8.92	-	-	0.235	14.07
10	Antapali (G-4)*	2.30	-	-	0.109	12.97
11	Rengali Graphite (G-4)**	9.41	-	-	-	-
12	Larambha-Kanaital & Pudapadar-Bharatbahal	135	Block under exploration			
Total		175.47	3.529	22.56	9.013	17.35

* Resource has not been estimated at 18% Mn cut-off.

** Resource has not been estimated.

Considering the resource and grade of all these blocks, the cluster mining approach can be used in the area.

8.0.5 There are 1.330 mt graphite resource with an average grade of 4.71% FC at 2% FC cut-off has been estimated in Tamiya (G-2), Rengali (G-2), Babja (G-2) and Biarpalli (G-2) blocks which are south and south-east of Taljuri-Gunchadihi Block. The details of the block wise resources are given below.

S. No	Block	Resource (MT)	FC %
1	Tamiya (G-2) Block	0.610	5.56
2	Rengali (G-2) Block	0.308	4.41
3	Babja (G-2) Block	0.111	3.61
4	Biarpalli (G-2) Block	0.302	3.71
	TOTAL	1.330	4.71

8.0.6 The Larambha-Kanaital & Pudapadar-Bharatbahal Block, which is west of Taljuri-Gunchadihi Block, is under exploration by MECL. There are 93 samples have been collected in the block, out of which analytical results of 38 samples have been received. A total of 26 samples out of 38 having Mn% > 10% which range from 10.09% to 38.13% Mn with an average grade of 24.63% Mn. Besides, 10 samples has been analysed for graphite mineralisation, out of which 4 samples having more than 2% FC, ranging between 2.60 to 6.56% FC with an average grade of 4.74% FC.

8.0.7 The Thakurpali & Uchhabpali and Dandapani blocks, which are south-east of Taljuri-Gunchadihi Block, is under G-2 level exploration by GSI.

8.0.8 During the course of exploration of Larambha-Kanaital & Pudapadar-Bharatbahal Block, MECL team carried out field work nearby Taljuri, Gunchadihi, Thelkuchhapar, Barhajhula and Dandapani villages. They collected 7 bedrock samples from manganese ore zones in the area and analysed for Mn ICP-OES. All the samples having Mn% > 10% with range from 16.21% to 37.17% Mn with an average grade of 27.17% Mn.

These areas falls to the south of the present exploration block.

8.0.9 Since most of the block area is covered with soil, geophysical survey (Self potential, (I.P. Cum Resistivity, S.P. and Magnetic) in the block will facilitate to demarcate the geophysical anomaly/mineralized zones of manganese, which will help in the formulation of G-3/G-2 level exploration programme.

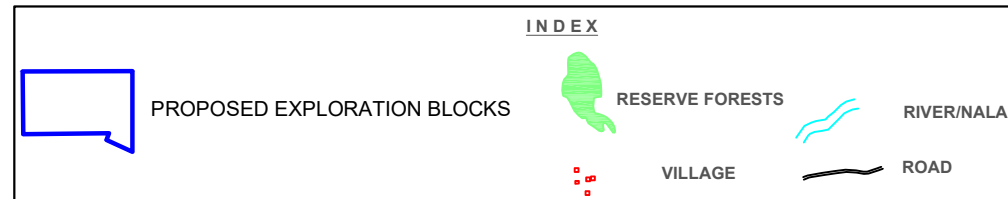
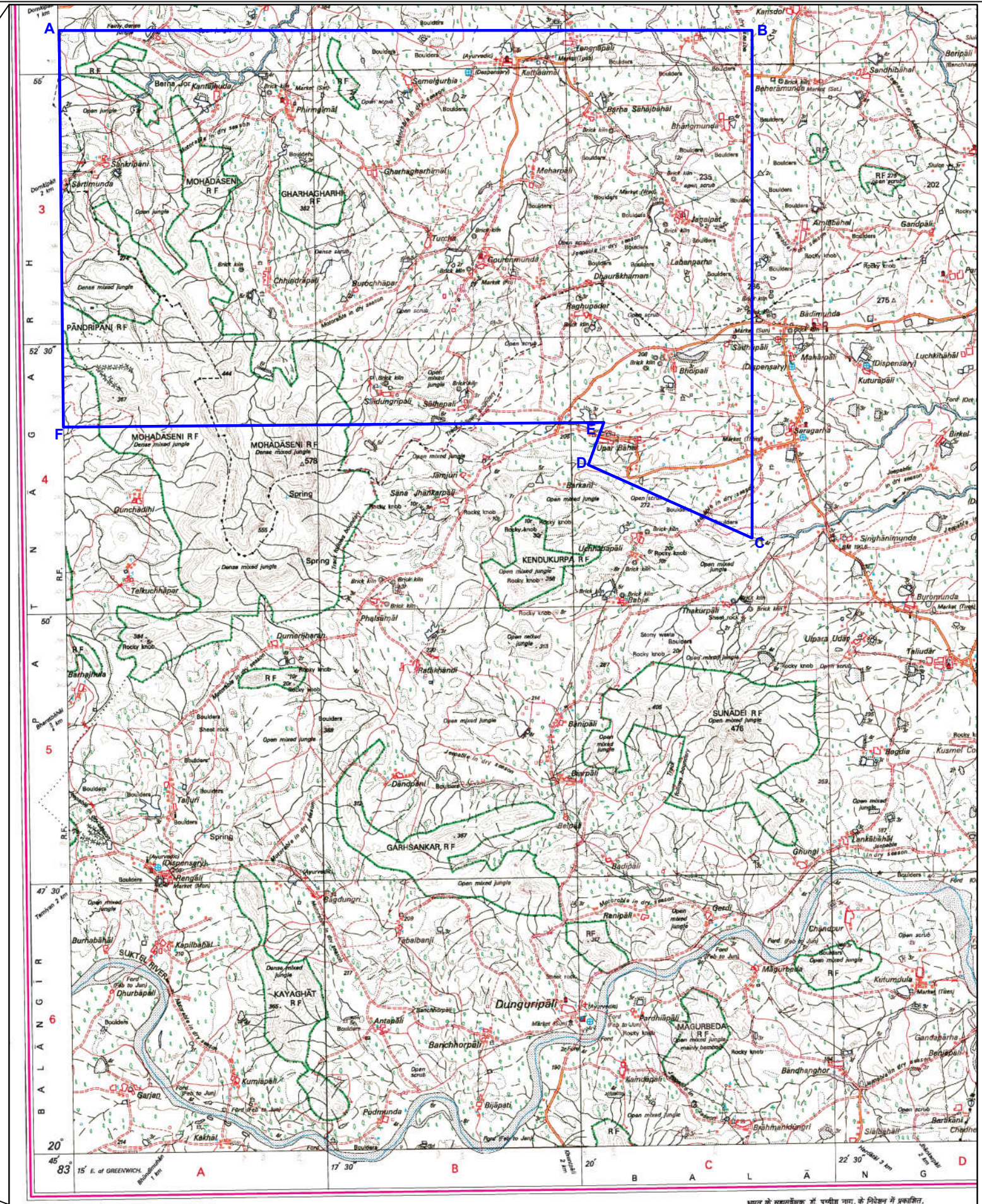
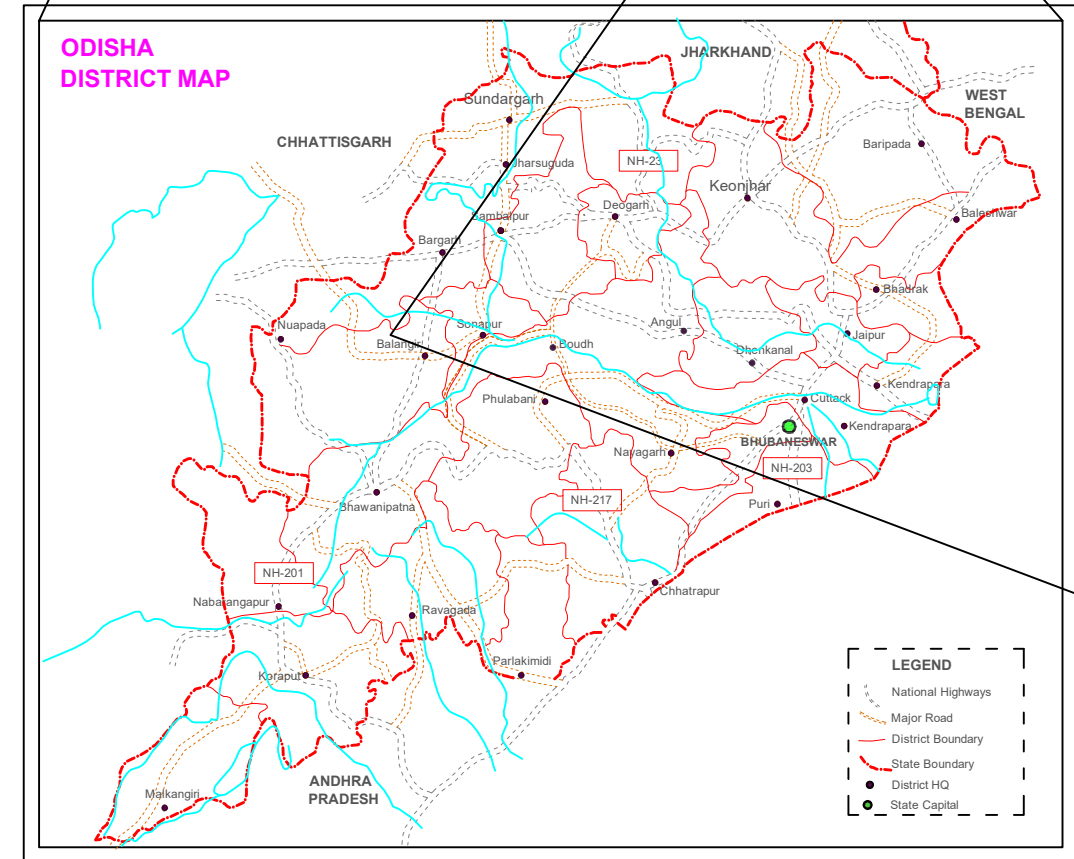
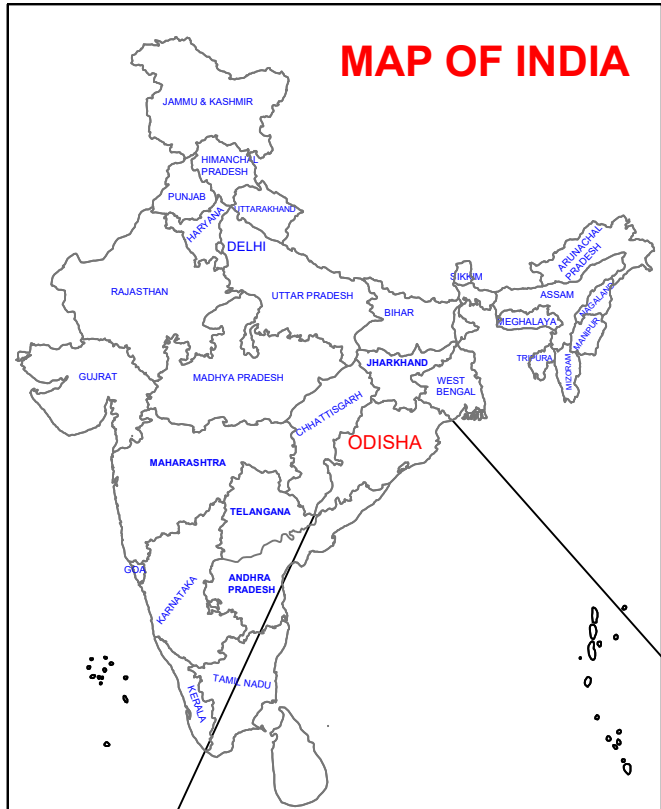
8.0.10 The exploration will be helpful in estimation of Reconnaissance (334) Resources and will help in planning G3/G2 level of exploration programme which in turn will lead to estimation of inferred/indicated (333/332) category resources and will facilitate the State Govt. Odisha for auctioning of blocks.

9.0.0 References:

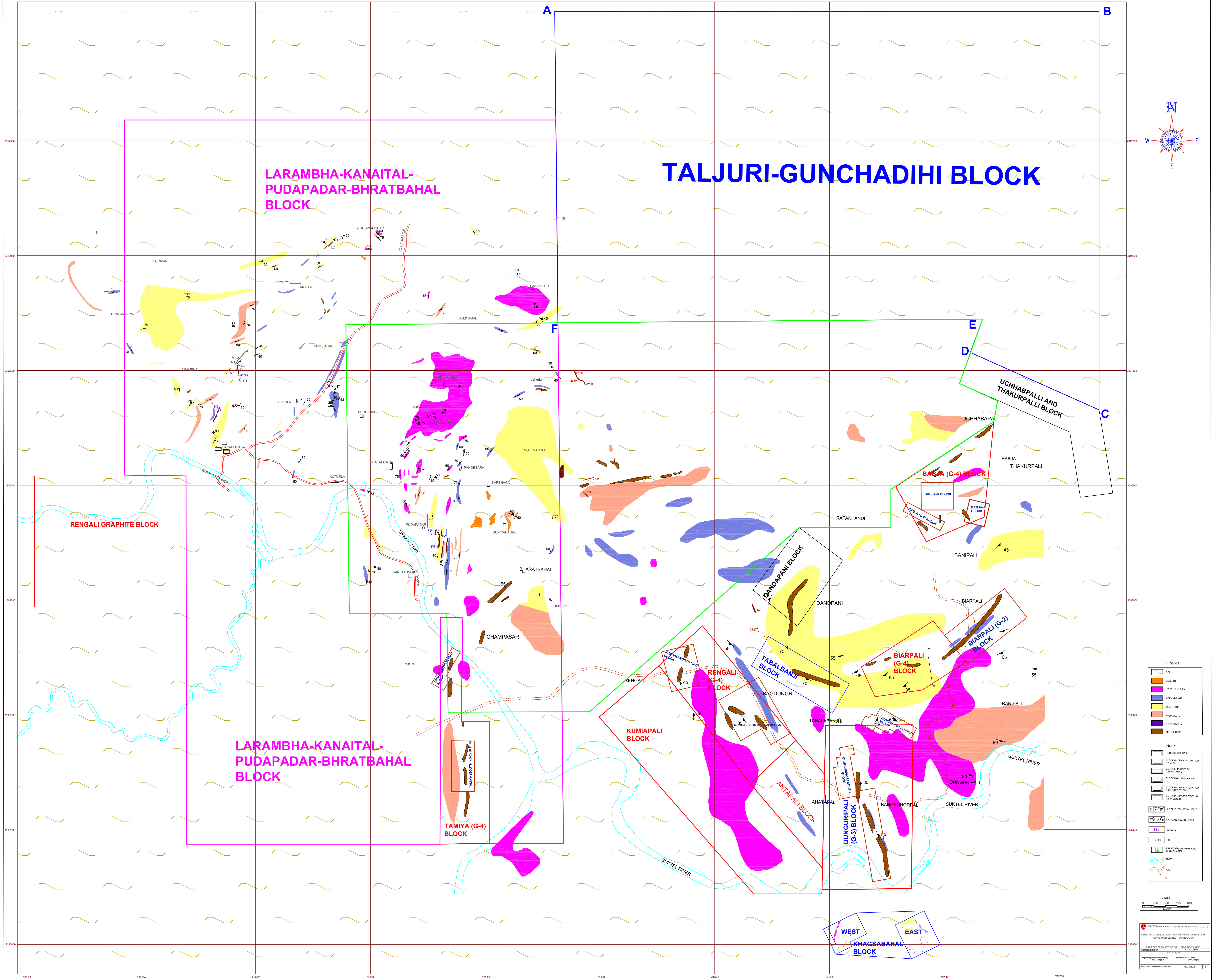
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List of Plates:

1. Plate-I: Block Location Map of Taljuri-Gunchadihi Block in Toposheet no. 64P/05, Balangir District, Odisha State.
2. Plate-II: Regional Geological Map of the area (Scale 1: 25,000).
3. Plate-III: Geological Map of the block area from Bhukosh, GSI (Scale 1: 50,000).

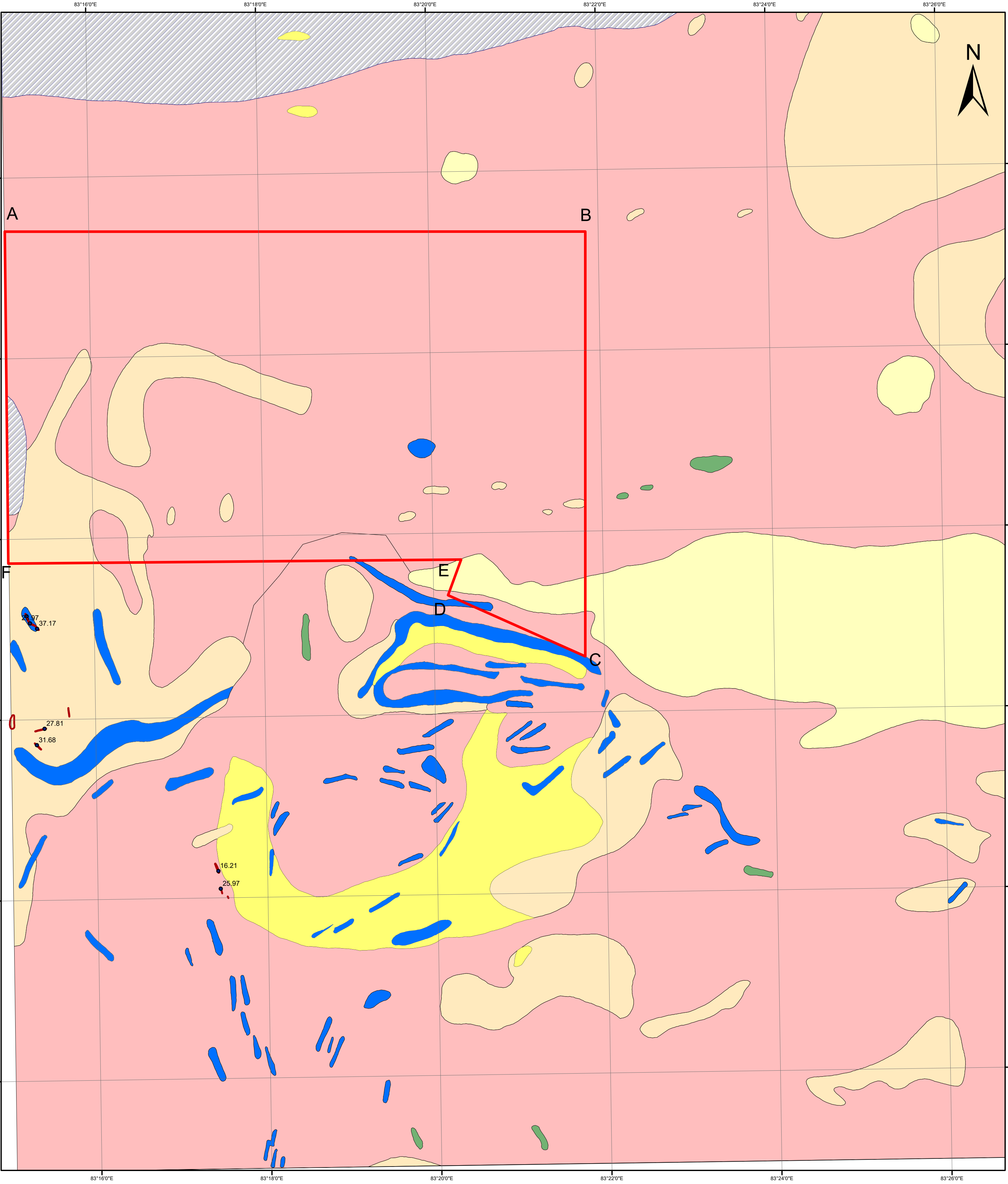


 MINERAL EXPLORATION AND CONSULTANCY LIMITED		
LOCATION MAP		
TALJURI-GUNCHADIHI BLOCK (PART OF TOPOSHEET NO. 64P/05)		
DISTRICT : BALANGIR	STATE : ODISHA	
Prepared by : Exploration Division, MECL, Nagpur.	Processed at : Non-Coal Geological Report Cell MECL, Nagpur.	
MECL / EXPLORATION / OCTOBER-2022	PLATE NO - I	1



GEOLOGICAL MAP OF TALJURI-GUNCHADIHI AREA

(Source: Bhukosh GSI)



Legend

- Block Boundary
- GRANITE GNEISS/MIGMATITE
- CALC GRANULITE
- ANORTHOSITE
- QUARTZ-GARNET-SILLIMANITE-GRAPHITE SCHIST/GNEISS
- QUARTZITE
- SHALE, SANDSTONE, CONGLOMERATE
- PYROXENE GRANULITE/ BASIC CHARNOCKITE
- Manganese Ore Body
- Sample Location with grade (Mn%)

0 0.5 1 2 3 4 Kilometers

Estimated cost for Reconnaissance survey (G4) for manganese ore and graphite in Taljuri-Gunchadihi Block, District: Balangir, Odisha. [Block area- 75 sq. km; Nos. of Borehole- 8; Borehole depth range- 60m; Schedule timeline- 18 months]							
S. No.	Item of Work	Unit	Rates as per NMET SoC 2020-21		Estimated Cost of the Proposal		Remarks
			SoC-Item -SI No.	Rates as per SoC	Qty.	Amount (Rs)	
A	GEOLOGICAL WORK (1:12,500 scale)						
i	Charges for one Geologist- Field	day	1.2	11,000	180	19,80,000	
ii	Charges for one Geologist per- HQ	day	1.2	9,000	60	5,40,000	
iii	2 labours/ party (Rs 437/day/labour) (As per rates of Central Labour Commissioner)	day	5.7	437	360	1,57,320	Amount will be reimburse as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher
iv	Core Sampling -1 Samplers Labour charge not included	day	1.5.2	5,100	40	2,04,000	
v	4 labours/ party (Rs 437/day/labour) (As per rates of Central Labour Commissioner)	day	5.7	437	160	69,920	Amount will be reimburse as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher
					Sub Total- A	29,51,240	
B	GEOPHYSICAL SURVEY						
i	I.P. Cum Resistivity, S.P. and Magnetic (8-10 km) (50 L. Km.)	L. km.	3.4b	14,48,693	5	72,43,465	will be decided after review
ii	Charges for one Geophysicist per day at field	day	3.18	11,000	120	13,20,000	
iii	Charges for one Geophysicist per day at HQ	day	3.18	9,000	30	2,70,000	
iv	Surveyor Work	days	1.6.1a	8,300	120	9,96,000	
v	4 labours/ party (Rs 437/day/labour) (As per rates of Central Labour Commissioner)	day	5.7	437	480	2,09,760	
					Sub Total- B	1,00,39,225	
C	PITTING AND TRENCHING						
i	Trenching (1m x 2mx 150 m)	Cu m	2.1.1	3300	150	4,95,000	
					Sub Total- C	4,95,000	
D	DRILLING						
i	Drilling upto 300m (Hard Rock) (1 rigs)	m	2.2.1.4a	11,500	500	57,50,000	
ii	Borehole deviation Survey	m	2.2.6	330	500	1,65,000	
iii	Land / Crop Compansation	per BH	5.6	20,000	8	1,60,000	Amount will be reimburse as per actuals or max. Rs. 20000 per BH with certification from local authorities
iv	Construction of concrete Pillar (12"x12"x30")	per borehole	2.2.7a	2,000	8	16,000	
v	Transportation of Drill Rig & Truck associated per drill	Km	2.2.8	36	1,400	50,400	Certification in this regard is required to be provided
vi	Monthly Accomodation Charges for drilling Camp (up to 2 Rigs)	month	2.2.9	50,000	6	3,00,000	
vii	Drilling Camp Setting Cost	Nos	2.2.9a	2,50,000	1	2,50,000	
viii	Drilling Camp Winding up Cost	Nos	2.2.9b	2,50,000	1	2,50,000	
ix	Approach Road Making (Flat Terrain)	Km	2.2.10a	22,020	4	88,080	Road Making will be considered as per the requirement and Road Making Charges will be reimbursed for max. 4 km.
x	Bore Hole Fixation and determination of co-ordinates & Reduced Level of the boreholes and corner points of block by DGPS	Nos	1.6.2	19,200	9	1,72,800	
xi	One complete borehole plus mineralised cores of all the remaining Bhs	m	5.3	1,590	165	2,62,350	This amount will be reimbursed after successful delivery of the cores to concerned libraries/authorities
					Sub Total- D	74,64,630	
E	LABORATORY STUDIES						
1	Chemical Analysis						
i	Primary & Check samples for Maganese						
	a. Primary Samples for 6 radical (Mn, SiO2, P2O5, Fe2O3, MnO2 and Insolubles)	Nos	4.1.7a + 7b	2,841	300	8,52,300	
	b-Internal (5%) Check samples for 6 radical (Mn, SiO2, P2O5, Fe2O3, MnO2 and Insolubles)	Nos	4.1.7a + 7b	2,841	15	42,615	
	c-External(10%) Check samples from NABL Lab for 6 radical (Mn, SiO2, P2O5, Fe2O3, MnO2 and Insolubles)	Nos	4.1.7a + 7b	2,841	30	85,230	
ii	Primary & Check samples for Graphite						
	a. Proximate Analysis for Graphite (Ash, Moisture, V.M. and F.C.) for Primary Samples	Nos	4.1.16	3,000	150	4,50,000	
	b Proximate Analysis for Graphite (Ash, Moisture, V.M. and F.C.) for Internal (5%) Check Samples	Nos	4.1.16	3,000	15	45,000	
	c Proximate Analysis for Graphite (Ash, Moisture, V.M. and F.C.) for External (10%) Check Samples NABL Lab	Nos	4.1.16	3,000	30	90,000	
2	Physical & Petrological Studies						
i	Preparation of thin section	Nos	4.3.1	2,353	15	35,295	
ii	Complete petrographic study report	Nos	4.3.4	4,232	15	63,480	
iii	Preparation of polished section	Nos	4.3.2	1,549	15	23,235	
iv	Complete mineragraphic study report	Nos	4.3.4	4,232	15	63,480	
v	Digital Photographs	Nos	4.3.7	280	15	4,200	
vi	Whole Rock Analysis (Major oxide and 8 additional trace elements)	Nos	4.1.15a & b	7,568	15	1,13,520	
					Sub Total- E	18,68,355	
F					Total A to E	2,28,18,450	
G	Geological Report Preparation		5.2	For the projects having cost exceeding Rs. 150 lakhs and less than Rs. 300 lakhs - A minimum of Rs. 7.5 lakhs or 3% of the value of work whichever is more		7,50,000	Reimbursement will be made after submission of the final Geological Report in Hard Copies (5 Nos) and the soft copy to NMET.
H	Peer review Charges		As per EC decision			10,000	
I	Preparation of Exploration Proposal (5 Hard copies with a soft copy)	5 Hard copies with a soft copy	5.1	2% of the Cost or Rs. 3.8 Lakhs whichever is lower		4,56,369.00	EA has to submit the Hard Copies and the soft copy of the final proposal along with Maps and Plan as suggested by the TCC-NMET in its meeting while clearing the proposal.
K	Total Estimated Cost without GST					2,40,34,819.00	
J	Provision for GST (18% of I)					43,26,267.42	GST will be reimburse as per actual and as per notified prescribed rate
K	Total Estimated Cost with GST					2,83,61,086.42	or Say Rs. 283.61 Lakh

Schedule timeline for Reconnaissance survey (G4) for manganese ore and graphite in Taluri-Gunchadihi block, District: Balangir, Odisha.																				Annexure-5b					
S. No.		Months/Days	1	2	3	4	5	6	Review	7	8	9	10	11	12	Review	13	14	15	16	17	18			
1	Camp Setting	months																							1 month
2	Geological Mapping	months																							4 months
3	Survey days	days																							30 Days
2	Geophysical Work	months																							5 months
5	Trenching	cu.m																							175 Cu m
6	Drilling (1 rig)	m																							500m
7	Geologist days	days																							180 Days
8	Sampling days, Core Sampling	days																							45 Days
9	Camp winding	months																							1 month
10	Laboratory Studies	months																							4 months
11	Geologist days, HO	days																							60 Days
12	Report Writing with Peer Review	months																							4 months