Revised Proposal for Exploration of Manganese Ore, Tentuliguda Block, Koraput District, Odisha State, for Reconnaissance Survey, G-4 Stage

(After recommendation of TCC, NMET)

(Basemetals/ **Ferrous**/ Non-Ferrous/ Industrial/

Strategic & Critical/ Precious metals etc.)

By

Directorate of Geology, Department of Steel & Mines

Government of Odisha

Place: Bhubaneswar

Date: 10.04.2019

Summary of the Block for Reconnaissance Survey (G4 Stage)

GENERAL INFORMATION ABOUT THE BLOCK

	Features	**Details**
	Block ID	Tentuliguda Block
	Exploration Agency	Directorate of Geology, Odisha
	Commodity	Manganese Ore
	Mineral Belt	Eastern Ghats Super Group
	Completion Period with entire Time schedule to complete the project	10 Months (Time schedule bar chart attached)
	Objectives	Estimation of manganese ore resources (334) in the block as per UNFC norms and MEMC Rules, 2015
	Whether the work will be carried out by the proposed agency or through outsourcing and details thereof.	Work will be carried out by the proposed agency, i.e. Directorate of Geology, Odisha
	Name/ Number of Geoscientists	2 Geologists
	Expected Field days (Geology) Geological Party Days	8 months 10 months
1.	**Location**	
	Latitude	19^0 00’ 00” N to 19^0 05’ 00” N
	Longitude	82^0 25’ 00” E to 82^0 32’ 30” E
	Villages	Tentuliguda, Maliguda and Dadriguda
	Tehsil/Taluk	Kotapad Tehsil
	District	Koraput
	State	Odisha
2.	**Area (hectares/ square kilometers)**	
	Block Area	121 sq.km
	Forest Area	To be estimated
	Government Land Area	To be estimated
	Private Land Area	To be estimated
3.	**Accessibility**	
	Nearest Rail Head	Kusumi Railway Station
	Road	From Jeypore town via Bariguma
	Airport	Vishakapatnam/ Bhubaneswar
4.	**Hydrography**	
	Local Surface Drainage Pattern (Channels)	Sub-dendritic drainage. Numerous seasonal streams. General slope is towards the west.
	Rivers/ Streams	Numerous ephemeral streams which drain into the Ambabeli N and its tributaries.
5.	**Climate**	
	Mean Annual Rainfall	150 cm

	Temperatures (December)(Minimum) Temperatures (June)(Maximum)	8°C (Minimum) December 45°C (Maximum) June
6.	**Topography**	
	Toposheet Number	E44E8 (65I/8) and E44E12 (65I/12)
	Morphology of the Area	Gentle Topography with isolated hills and mounds in the western part and high hills in the south eastern part represented by the Chikima Parbat Range.
7.	**Availability of baseline geosciences data**	
	Geological Map (1:50k/ 25k)	Available 50K
	Geological Map (Aeromagnetic, ground geophysical, Regional as well as local scale GP maps)	Regional Map Available
8.	**Justification for taking up Reconnaissance Survey/ Regional Exploration**	Manganese ores in the Eastern Ghats occur as distinctly conformable bands in the khondalite suit of rocks of Eastern Ghats complex. The dominant manganese ore minerals include cryptomelane, psilomelane, pyrolusite and wad. Quartz, chalcedony, orthoclase, garnet and kaolinite are the associated gangue minerals. Presence of high iron, high phosphorous, low to medium silica and dominance of CaO over MgO, K2O over Na2O, Ni over Co, Zn over Pb and Cu over Pb are the characteristics of this manganese deposit. Phosphorous occurs as discrete apatite inclusions within the quartz and orthoclase; and also adsorbed in the secondary manganese and iron minerals. Field characters, mineralogy and geochemistry of manganese ores suggest their formation as chemical precipitates, and the source of which appears to be continental erosion. Manganese formation along with the country rocks have been metamorphosed under granulite facies conditions, affected by granitisation and subsequently undergone supergene enrichment to give rise to the present deposit. These ores will be amenable to removal of silica but will not respond well to removal of iron and phosphorous by physical beneficiation. The proposed area hosts the contact zone of the Eastern Ghat Mobile Belt and the Indravati Group of Rocks of Proterozoic age.

Detailed description:

1. **Block Summary**

Physiography: Most of the area is represented by gentle topography with isolated hills and mounds in the western part and high hills in the south eastern part represented by the Chikima Parbat Range. The highest point within the study area is at 914m above Mean Sea Level in the hill peak north-west of Chikima while the lowest part is around 500m MSL in the western part of the study area. General slope is towards the west.

Drainage is mostly sub-dendritic type. Numerous streams originate within the study area which drain into the Ambabeli N which flows westward.

Background Geology (Regional Geology, Geology of the Block).

The proposed area of exploration lies in the northwestern part of the Eastern Ghat Super Group of rocks belonging to the metasedimentary sequence of Precambrian khondalite. The sequence of parametamorphic rocks is made up of pelitic, psammitic and calacareous 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-slicate bands adjoining the ore horizons form denudational hillocks and are 1 to 2m thick. Granite gneiss occupies the valleys. The whole sequence has been metamorphosed to granulite facies. The area has undergone several phases of structural deformation which reflect in the several sets of joints, folds and faults in the host rocks. The tentative stratigraphic succession of the area is given below.

Recent to sub-recent	Soil and Alluvium
	Laterite
Proterozoics Indravati Group	Quartzite/ Shale/Stromatolites
EGMB	Pegmatite and quartz veins
	Granite, granite gneiss, granulite, leptynite, migmatite
	Charnockite suite of rocks
	Khondalite suite of rocks
	Calc silicate rocks with manganese mineralisation

Mineral potentiality based on geology, ground geochemistry etc.

The proposed block represents the contact between the Eastern Ghats Super Group of rocks and the Indravati Group of rocks of Proterozoic Age. Occurrence of Manganese ore within the Eastern Ghats Group of rocks has been established around Nishikhal, Leliguma areas in Koraput district and Muniguda-Ambadola belt of Rayagada district.

During spot visit to the area, floats of Manganese Ore were noticed in the foothill area around Tentuliguda in the contact zone. It is likely that in-situ Manganese Ore body may be encountered in the block.

Scope for proposed exploration:

Geological mapping in 12,500 scale followed by trial excavation and sampling to delineate the manganese ore occurrences within the proposed area.

Observation and Recommendations of previous work.

Occurrence of Manganese ore within the Eastern Ghats Group of rocks has been established around Nishikhal, Leliguma areas in Koraput district and Muniguda-Ambadola belt of Rayagada district. Hence, the proposed study area with similar geological set up may expose occurrences of manganese ore.

Contact zone of Proterozoics and Eastern Ghats Super Group has been reported in the area which needs to be examined from mineralisation point of view.

2. Previous Work

Previous Exploration in adjoining area (Regional area):

The area to the west of the proposed area has been covered by gravel sampling for Diamond Indicator Minerals (DIM) study in the contact zones of Archaean and Proterozoic formations. Also stromatolitic limestone occurrences have been studied around Kosagumuda of Nabarangpur district.

Previous Exploration in the proposed block area:

Part of the proposed block area has been covered by by gravel sampling for Diamond Indicator Minerals (DIM) study in the contact zones of Archaean and Proterozoic formations & reported sporadic boulders of manganese ore in the valleys.

3. Block description

Block Corner Points Cardinal Points	Latitude	Longitude
A	19^0 05’ 00” N	82^0 25’ 00” E
B	19^0 05’ 00” N	82^0 32’ 30” E
C	19^0 00’ 00” N	82^0 32’ 30” E
D	19^0 00’ 00” N	82^0 25’ 00” E

4. Planned Methodology

i. Geological mapping (LSM) in 1:12,500 scale and delineating the rock types bearing the manganese mineralization

ii. Trial excavation in shape of pits and trenches to unearth the manganese bearing formations underneath the soil and lateritic cover

iii. Samples to be collected from pits and trenches and channels.

iv. Estimation of manganese ore resources (334) in the block as per UNFC norms and MEMC Rules, 2015

5. Nature Quantum and Target

Components	G4 Stage
Aerial reconnaissance	Remote sensing study
Geological Survey	i) Geological mapping (LSM) on 1: 12,500 scale over 121 sq.km to delineate the lithology, structure & surface mineralization within the study area.
Pitting/ Trenching	i) 5 Trenches (1m x 2m x 20m) ii) 10 Pits (1m x 1m x 1m) for bulk density determination Meter-wise samples will be collected.
Grab and Chip sampling	A few samples from bed rock (few representative samples from all the exposed rocks in the area for first-hand information and more samples from rocks which host the mineralization).
Channel sampling	10cmx 5cm channels from pit, trench & exposed ore body.
Petrographic and mineragraphic studies	Principal rock types, mineral assemblage, identification of minerals of interest
Synthesis of all available data	i) Integration of regional geophysical, geological data. ii) Synthesis of all available data and Report writing

Table-1: Proposed Quantum of Exploratory Work in Tentuliguda Block for G-4 level

Proposed Quantum of Work (G-4) in Tentuliguda Block, Koraput district, Odisha			
Sl No.	**Item of Work**	**Unit**	**Proposed Quantum of Work**
1	Geological Mapping (on 1: 12,500) (LSM)	Sq. km	121
2	Trenching and Pitting: iii) 5 Trenches (1m x 2m x 20m) iv) 10 Pits (1m x 1m x 1m) for bulk density determination	Cu.m	 200 10 Total=210
3	Sample Preparation and Laboratory Studies		
A.	Primary Samples (Channel +Pit +Trench Samples)		
	i) Chemical Analysis: Primary for 6 radicals i.e., Mn, SiO_2, P_2O_5, Fe_2O_3, MnO_2 and insolubles	Nos.	Trench-100 Pit-10 Chamnnel-25 Total-135
B.	Composite Samples (Channel +Pit +Trench Samples)		
	i) Composite samples will be analysed for 6 radicals i.e., Mn, SiO_2, P_2O_5, Fe_2O_3, MnO_2 and insolubles	Nos.	Trench-5 Chamnnel-5 Total-10
4	Petrographic studies	Nos.	10
6	Bulk Density Determination	Nos.	5
7	Report Preparation (Digital format)	Nos.	1

Time Schedule and Cost estimates

Time Schedule:

The proposed exploration programme is planned for G-4 Level. The work activities like camp establishment and associated geological work and laboratory work at G-4 level will be completed within 10 months time. Report Writing (including peer review) will take another 2 months time with overlapping of 1 month laboratory studies. Thus, the total duration of the project shall be 10 months from the date of commencement of the project.

The bar chart showing activities wise time schedule is placed at Table-3

Cost Estimates:

The project cost is estimated at **Rs. 22.27 Lakhs for G-4 level** of exploration. The details of item wise cost as on 31.03.2019 has been considered for estimation of geological and laboratory studies and is given in Table-4 and the summary is given below:

Table-2: Summary of Cost Estimates

Sl No.	Item	Total Estimated cost As on 31.03.2019
1	Camp establishment	6,74,800
2	Geological Activity	3,58,680
3	Pitting & Trenching	4,70,400
4	Laboratory Studies	3,61,000
	Sub Total	18,04,938
7	Supervisory cost(2% of Exploration Cost)	36,099
8	Report (2% of Exploration Cost)	36,099
9	Peer Review	10,000
10	**Sub Total**	18,87,136
11	GST @ 18% of Sl No.10	3,39,684
	Total	**22,26,820**

Table-3: Time Schedule/ Action Plan for Exploration Proposal for Manganese Ore in Tentuliguda Block (G-4) Level, Koraput District, Odisha

			1	2	3	4	5	6	7	8	9	10	
1	Camp Setting	Month	↔										1 month
2	Geological mapping	Month	←	—	—	—	→						5 months
3	Pitting & Trenching (10 pits & 5 Trenches)	Cu.m					←	—	→				210 Cu.m
4	Sampling Party days (Pit, Trench , Channel & Bulk)(1 party)	Party days							←	→			2 months
5	Laboratory studies	Nos.								←	—	→	170
6	Camp Winding	Days								↔			15 days
7	Report Writing with Peer Review	Months									←	→	2 months

*Including Monsoon period.

Table-4: Cost Estimate for Exploration of Manganese Ore around Tentuliguda Block (G-4 Stage), District- Koraput, Odisha				
Sl. No.	**Item of work**	**Unit**	**Quantity**	**Estimated cost as on 31.04.2019 (INR)**
A				
1	Transportation (Mobilisation & field work)	Km		400000
2	Accommodation/ Establishment		1	44000
3	Camp setting/Winding		2	24800
	Sub-Total-A			**674800**
B	**Geological Work**			
1	Geologist Party days(1 party)	Day	210	235200
2	Sampling Party days (Pit, Trench & Channel) (1 party)	Day	60	63538
	Sub-Total-B			**358680**
C	**Pitting & Trenching**			
	a) Pitting 10 Nos. (1m x 1m x1m) & Trenching (1m x 2m x 20m) 5 Nos.	Cu.m	210	470400
	Sub-Total-C			**470400**
D	**Laboratory Studies**			
1	**Chemical Analysis**			
	i) Primary samples			
	a) Primary samples for 6 radicals (Mn, SiO_2, P_2O_5, Fe_2O_3, MnO_2 and Insolubles)	Nos	135	310500
	ii) Composite samples			
	a) Composite samples for 6 radicals (Mn, SiO_2, P_2O_5, Fe_2O_3, MnO_2 and Insolubles.)	Nos.	10	23000
2	**Physical Analysis**			
i)	Preparation of Thin Section	Nos.	10	5000
ii)	Petrographic Studies	Nos.	10	5000
iii)	Preparation of polished section & studies	Nos.	10	10000
iv)	Bulk Density	Nos.	5	7500
	Sub-Total-D			**361000**
	Total:A+B+C+D			**1804938**
E	**Supervisory cost (2 % of A+B+C+D)**		1	**36099**
F	**EXPLORATION REPORT (2 % of A+B+C+D)**		1	**36099**
G	**Peer Review**		1	**10000**
	Total: A+B+C+D+E+F+G			**1887136**
	GST @ 18%			**339684**
	Grand Total:			**2226820**