Proposal for Khairmal Block (Area – 83.34 Sq. Km), Balangir District, Odisha G4 stage

Commodity : Graphite
Exploration agency

Odisha Mining Corporation Limited
Gopabandhu Marg, Unit 4, Keshari Nagar, Bhubaneswar, Odisha 751001

Submitted to
67th meeting of NMET Technical-cum-cost Committee

Place : Bhubaneshwar
Date : 17-07-2024

Summary of the Khairmal Graphite block (G4 Stage)

GENERAL INFORMATION ABOUT THE BLOCK

1.	Features	Details
	Block ID	Khairmal Graphite block
	Exploration Agency	Odisha Mining Corporation Limited
	Commodity	Graphite
	Mineral Belt	Sargipalli Graphite belt
	Completion Period with entire Time schedule to complete the project	15 Months
	Objectives	• Identification of basic litho-units and structural fabric of the area through geological mapping • To conduct geophysical survey to ascertain the trend of graphite mineralization within the contact regions of Calc silicates and Khondalites/Granite Gneisses • Study of behavior of existing graphite vein and its lateral and depth continuity though scout drilling and sampling. • To understand the mode of occurrence and genesis of graphite in the study area.
	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	The current exploration work will be carried out by OMC Limited.
	Name/ Number of Geoscientists	Geologist : 01 HQ (60 days) Geologist : 02 Field (120 days)
	Expected Field days Geological Party Days	120 days
2.	**Location**	
	Latitude	20° 29' 01.10" N to 20° 33' 42.45" N
	Longitude	82° 58' 10.84" E to 83° 01' 24.14" E
	Villages	Ainlapalli, Rarbahal, Mandal, Khairmala, Pandrijor and Juptapalli

	Tehsil/ Taluk	Belpara
	District	Balangir
	State	Odisha
3.	**Area (hectares/ square kilometres)**	
	Block Area	83.34 Sq. Km
	Forest Area	Not available
	Government Land Area	Not available
	Private Land Area	Not available
4.	**Accessibility**	
	Nearest Rail Head	Nearest Rail Head: Kantabanji (2.5 Km. South West)
	Road	State Highway No. 42 passes through southern part of the area.
	Airport	Bhubaneshwar Airport is around 385.0 Km from the area aerially.
5.	**Hydrography**	
	Local Surface Drainage Pattern (Channels)	Simple trellis drainage pattern
	Rivers/ Streams	Lant River flowing eastwards to join Tel River.
6.	**Climate**	
	Mean Annual Rainfall	126 cm/annum
	Temperatures (December) (Minimum)	23.52^{O} C
	Temperatures (June) (Maximum)	50^{O} C
7.	**Topography**	
	Toposheet Number	Part of Toposheet No. 64 P/2, 64 L/14, and 64 L/15
	Morphology of the Area	The area represents monotonous flat topography with extensive alluvial soil cover with occasional outcrop of weathered Khondalites. The general slope of the area is towards centre of the block. Average altitude of the area is around 260 mRL AMSL.
8.	**Availability of baseline geoscience data**	
	Geological Map (1:50K/ 25K)	Geological Map (based on works of GSI) derived from Bhukosh website on scale 1:50,000
	Geochemical Map	**Not Available**
	Geophysical Map (Aeromagnetic, ground geophysical, Regional as well as local scale GP maps)	Aeromagnetic survey data available (Sourced from Directorate of Geology, Odisha. eromagnetic Survey was carried out in the year 1993-1997)

9.	**Justification for taking up Reconnaissance Survey / Regional Exploration**	The thirty critical minerals for India have been identified on the basis of their high supply risk, economic importance, or both, are: Antimony, Beryllium, Bismuth, Cobalt, Copper, Gallium, Germanium, Graphite, Hafnium, Indium, Lithium, Molybdenum, Niobium, Nickel, PGE (Platinum Group Elements), Phosphorus, Potash, Rare Earth Elements (REE), Rhenium, Silicon, Strontium, Tantalum, Tellurium, Tin, Titanium, Tungsten, Vanadium, Zirconium, Selenium, and Cadmium. In view of this, the Odisha Mining Corporation has intensified its efforts to discover and exploit new resources of graphite along with rejuvenating the existing OGP areas of graphite occurrences in eastern Odisha. Further, the area has not been much studied by GSI and DoMG, wherein only one GSI legacy report (UE-10642) covers the area. During a preliminary visit to this block, a sole working lease in Ainlapalli village was found to be producing graphite from a vein type deposit. Since the area is soil covered and the deposit is extensive in nature, detailed geophysical surveys along with drilling is required to quantify the deposit. Sample taken from the graphite vein as well as drift samples from Lant river have FC values of 10.90 % to 32.31 %.

1. Block Summary

Physiography

The physiography is dominantly structurally controlled and falls south of the arcuate Gandhamardhan range forming a water divide. The different hill ranges in the area have NE-SW to ENE-WSW trends in the northern part which swerves to the general N-S direction in the southern part. The Gandhamardhan range is table land having the highest elevation of about 1000m above MSL. To the SW lies the Chandil range known as the Patpani range in the southern extension. The drainage of the area is mostly controlled by joints. In the northern part, the Sukhajhor (also known as katanginala) flows north-easterly and joins the Suktel River. In N-E of the study area, the Lant River forms the major drainage and flows to the N-E to join ultimately Tel River, further SE. In the Southernmost part of the area, the Arjuna Nala flows SE and joins the Udanti River.

Figure 1 : Map showing location of the proposed block

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

The study area in eastern India is located within the Sargipalli graphite belt. The area represents parts of the Eastern Ghat Supergroup comprising strongly metamorphosed rocks Viz, khondalites (and their migmatitic derivatives) calc-granulite and garnetiferous quartzite associated with granite gneisses, pegmatites, and quartz veins. The Eastern Ghat Mobile Belt (EGMB) extends from Brahmani River in Odisha to Ongone in Andra Pradesh over a stretch of 900 km with a width Varying from 30 to 300 km, the maximum width of Odisha. Graphite occurs either sporadically or locally concentrated in the rock units.

Table 1 : Stratigraphic succession in the study area (Derived from GSI)

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, garneti- ferous 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 observed in the study area		

Geological setup of Khairmal block

The local geological setup in and around the study area is dominated by Khondalites, Leptynites, Granitic Gneisses and Calc silicates. However, due to extensive soil cover, the outcrops are scanty. From the sporadic outcrops available, Khondalites and leptynites are the pre-dominant lithology in the area, punctuated by Granitic Gneisses with enclaves of calc-silicate rocks. The banks of Lant river in the area show highly sheared and weathered Khondalites abutting the highly disturbed calc-silicate suite of rocks. Detailed description of the lithology is provided as below.

1. Khondalites

The Khondalites are visibly represented by quartz-.garnet-sillimanite-graphite gneiss and often grading into Granitic Gneisses that may host garnets. The contacts are not clearly demarcated. The Khondalites generally forms low mounds and subdued topography in the area as against of the NE-SW ridges in the west of region. The outcrops present themselves as grayish to reddish brown in Colour, medium grained and foliated. The constituting minerals are quartz, garnet, sillimanite, granite with some biotite and feldspar.

Figure 2 (Left) Highly sheared outcrop of Khondalites (Right) Close up of the Khondalite outcrops, the garnets have been disintegrated due to intense shearing along with the development of olive green laths of Sillimanite

2. Calc Silicates

The calc-silicates (Including Calc-granulites and Calc-schists) occur as linear bands whose lateral extension cannot be determined due to the soil cover. The available outcrops of calc-silicates are found intricately folded. The calc-silicate rocks are much more exposed in the Ganjaudhar, Turekela area. In the Ganjaudhar area, which falls west to the study area, contact between Khondalites and Calc silicates is observed to be transitional as outcrops of the Khondalites start showing typical ribbed texture along with development of calcareous mineral assemblage. This could be interpreted as transition from deep marine carbonate facies to fresh water alluvium facies.

North of Belpara town, Calc-silicate rocks are being quarried for aggregates. The Calc-silicates in these quarries are dominated by Calc-granulites accompanied by minor bands of dolomitic limestones that are now metamorphosed into enclaves of para-amphibolites, Hornblendites and cluster of acicular Actinolite crystals. Further, evidence of emplacement of anorthosites are found within the Calc silicates with minor amounts of Biotite. The Anorthosites are fine grained and

compact. The outcrops show large grains of Anorthite (or oligoclase?) in the hand specimen.

Figure 3 Outcrop of Calc silicates in Lant River along with an exposure of sheared Khondalite in the background.

Mineral potentiality based on geology, geophysics, ground geochemistry etc.

Odisha state has a great potential for exploitation of graphite deposits. The graphite deposits of Odisha have been mined since pre-independence days. However, graphite deposits are widely spread across different districts and have debatable genesis. The uncertainty in its genesis along with inconsistent thickness of ore bodies and lateral continuity makes it challenging to explore and economically exploit such deposits.

The block forms a part of Sargipalli Graphite belt that conforms to the "Western Zone" (Acharya and Dash, 1984). The structural fabric of the area consists of NNE-SSW/NE-SW trending ridges in the western portion of the study area. However, in the Khairmal block, the topography is subdued and soil covered.

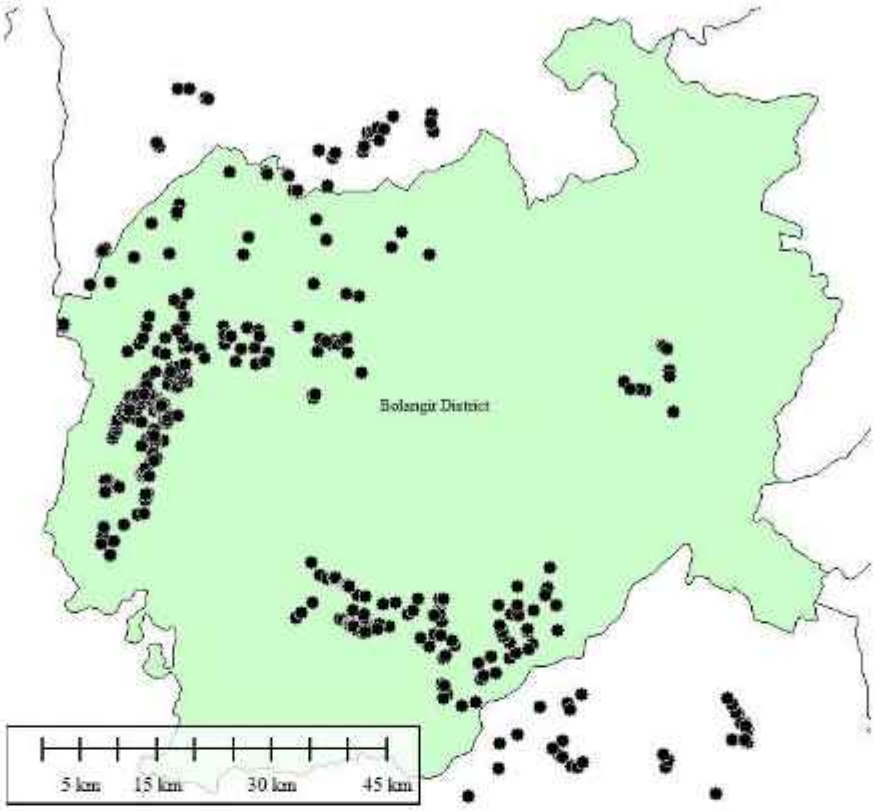

Figure 4 Distribution of graphite occurrences in the Balangir district (derived from GSI legacy reports)

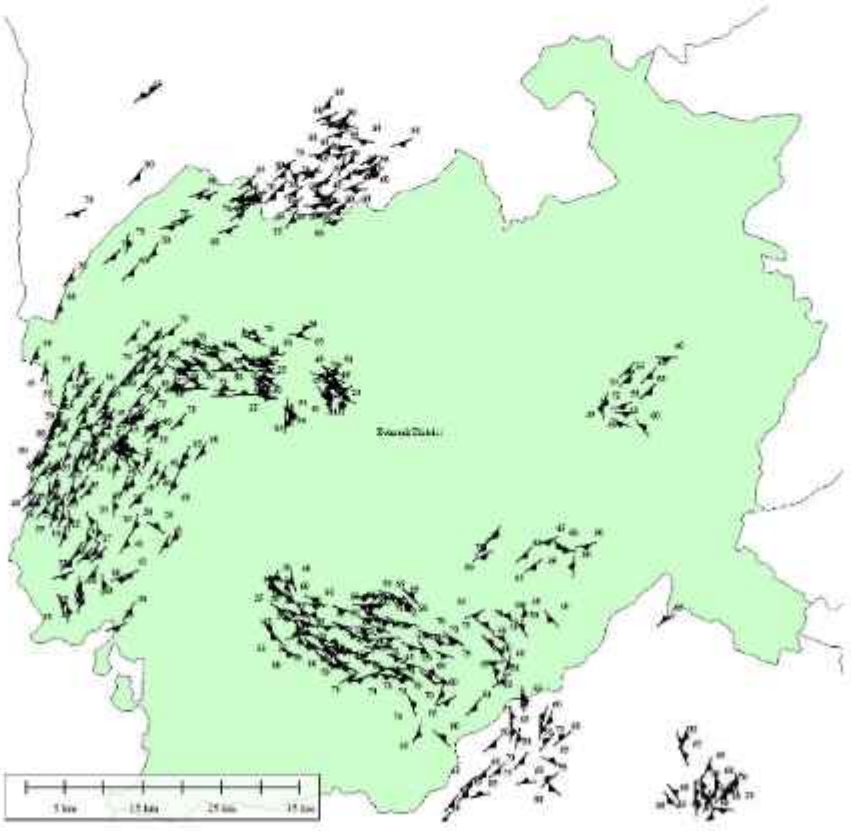

Figure 5 Map showing the trend of the foliation plane along the graphite bearing zones in Bolangir

As already mentioned, GSI and DoMG (Odisha) have limited published reports in Khairmal block. However, due to the presence of an active mining lease and its continuity, the area is being deemed as having potential.

The deposit in the Ainlapalli-Rarbahal graphite mine is vein type deposit trending curvilinearly towards NNW-SSE having a pitch of around 15^{O} towards NNW. The deposit was found during excavation of a pond. The following observations can be made.

- The vein type deposit has a persistent character and follows the local structural trend of the contact between the calc-silicate suite of rocks and Khondalites.
- The Belpara Quarries for quarrying granitic gneisses along with Calc-granulite enclaves are in near vicinity and the Ainlapalli-Rarbahal Graphite mine is near Khondalite and Calc silicate contact. The contact is unconformable and potentially a weak zone for percolation of carbon bearing fluids that can sequester with Calcareous rocks to facilitate precipitation of Graphite.
- The section of the pit shows highly weathered Calc-silicate rocks along with profuse igneous intrusives such as pegmatites
- Sample derived from this vein provided the following values

Parameters	**Free carbon**	Volatile matter	Moisture	Ash
Values (%)	**10.90**	5.61	1.180	83.48

Figure 6 Flaky graphite within weathered pegmatite on the bank of Laul river.

Figure 7 Surface view of Ainlapalli-Rarbahal Graphite mine

Figure 8 Within the pit photographs of the Ainlapalli-Rarbahal Graphite mine

As observed, the major domain of the foliation/schistosity planes are NE-SW in the Western portion of the Bolangir. This portion of the Bolangir area has profuse outcrops of Khondalites and migmatites with intrusions of granite gneisses. The trend of the foliation plane in the north then turn NW-SW and N-S in the eastern portion, thus mimicking a fold. The WNW-ESE lineations conform to the Mahanadi trend and often manifest on the surface as fault breccia.

Geophysical data available over the area

Aeromagnetic data available of the area combined with foliation planes show distinct NE-SW trending magnetic pattern in the western portion of the study area. The trend is conformable with Khondalite outcrops that form synformal structure. The 'hinge' portion of this structure is deformed by cataclastic deformation brought upon by a fault or shear zone as observed by development of fault breccia near Amabanji. Two distinct ENE-WSW trending linear structures conforming to the Mahanadi trend are also observed that are thought to be deep seated dykes or faults, however their manifestations on the surface are to be confirmed based on further field work.

Some discrete packages trending NNW – SSE of low magnetic areas are observed near the study area, field observations indicate low magnetic bodies such as acidic dykes or calc granulites (as near Belpara quarries)

Scope for proposed exploration.

1. **Geological Mapping**

   It is proposed to conduct geological mapping at 1 : 12,500 scale to identify soil type, lithology and structural fabric that would be important in identifying the controls of mineralization of graphite in the study area. Further infilling at 1 : 2000 can be considered in mineralized areas.

2. **Pitting/Trenching**

   Since the area is covered by soil cover, continuation of lateritic clay material which accompanies the graphite vein can be tested by deep pitting or trenching as per site conditions.

3. **Ground geophysical Survey**

   As noted by earliest GSI workers, the self-potential methods and Induced Polarization methods of ground geophysical survey are the best tools to delineate graphite deposits. The trend of the graphite veins and their extension can be delineated based on the survey.

4. Exploratory drilling and core sampling

The identified key target areas identified through geophysical survey, pitting including the extension of existing vein are to be drilled and core-sampled to get the samples for determination of Free carbon, Moisture, Volatile matter and Ash content.

Observation and Recommendations of previous work.

Interim report on regional assessment of graphite Resources in Sargipalli graphite belt covering parts of Balangir district, Orissa. (Progress report for the field Season 1985-86.) Geological Survey of India. (Report no. UE 10642)

Photogeological study was carried out on 1:60,000 aerial photographs in Patnagarh, Sargipalli and Sapamund areas (Toposheet No. 64 P/2, 64 P/1 & 64 L/13) that helped in mainly interpreting the regional structure of the area. The known graphite occurrences when plotted on the photo interpreted map are found to be confined only within khondalite migmatite and, are also localized along foliation planes and fold hinges suggesting thereby both lithological and structural controls on the graphite mineralisation.

Five mineralised zones with trend along NNE-SSW/NE-SW have been delineated. They appear to occur rhythmically maintaining regularity in space i.e. the distance between the individual graphite bearing zones is similar.

Out of 21 test drill holes drilled at the centre of the S.P. anomalies at Pakhanmunda, Bakbahal, Larki, Mahanilaha and Dudukamal area, graphite ranging in cumulative thickness from 0.40 to 8.17m has been intersected in 16 boreholes indicating 76% of success of the S.P. survey in Picking up concealed graphite bodies in favorable geological set up. Since, this represents only the shallowest portion of the causative bodies, it is recommended to delineate the individual graphite bodies precisely in three dimensions by exploratory drilling and pitting/trenching for assessment of reserve.

2. Previous Work

Previous Exploration in adjoining area

Report No	Report Title/Authors	Year	Work undertaken
UE 5772	A Report On The Detailed Investigation On Graphite By Drilling In Sambalpur And Bolangir-Patna Districts, Orissa. Prateek Bose	FS 1966 - 1967	Exploratory drilling over geophysical anomalies.
UE 6364	Progress Report On Graphite Investigation In Sargipalli Belt, Bolangir District, Orissa S.D.Mohanty and B Sarangi	FS 1976-1977	Geological mapping
UE 7268	Progress Report On Investigation For Graphite In Sargipali And Titlagarh Graphite Belt Bolangir District, Orissa S. C. Kanungo & S. D. Mohanty	FS 1975-1976	Geological mapping at 1 : 63,360, Pitting and trenching near Malisira
UE 7310	Report On Geophysical Investigations For Graphite In Turekela Block, Bolangir Dist., Orissa N. Kar, A. P. Das & O. N. Tarafder	FS 1980-1981	Geophysical survey
UE 7421	Report On The Investigation For Graphite Occurrences In Sargipali Graphite Belt, Bolangir District, Orissa S. D. Mohanty	FS 1977-1978	Geological mapping of graphite bearing areas and possible reserve estimation of some of the quarries
UE 7767	Report on the Investigation For Graphite in parts of Sambalpur, Bolangir and kalahandi District, Orissa. S.D. Mohanty and B.Sarangi	FS 1979-1980	Geological mapping
UE 8094	Report On The Investigation For Graphite In Bolangir, Sambalpur And Kalahandi Districts, Orissa S.D. Mohanty & O.P. Joshi	FS 1978-1979	Geological mapping of graphite bearing areas at 1 : 63,360 and 1 : 15,840 and test pitting
UE 8985	Report on Regional Geophysical Surveys for Graphite in Turekela Block,Bolangir District. H.Das and O.N.Tarafder	FS 1983-1984	Geophysical survey

UE 9862	Report On The Investigation For Graphite In Parts Of Bolangir And Kalahandi Districts, Orissa S. D. Mohanty	FS 1981-1982	Geological mapping, inventory and channel sampling
UE 9883	Report on Regional Geophysical Surveys for Graphite in Turekela Block, Bolangir District. H.Das and O.N.Tarafder	FS 1983-1984	Geophysical survey
UE 9099	Report On Geophysical Investigation For Graphite Mineralisation In Turekela Block Of Titlagarh Subdivision, Bolangir District, Orissa H. Das & O. N. Tarafder	FS 1982-1983	Geophysical survey
UE 9999	Report on Large scale Geological Mapping for Graphite Occurrences in Parts of Koraput District, Orissa A.K.Lal & K.P.Singh	FS 1982-83	Geological mapping
UE 10171	Report On The Investigation For Graphite In Turekela And Bakbera Areas Of Bolangir And Kalahandi Districts. Orissa S. D. Mohanty, P.Chakrabarti & V.Ankanna,	FS 1982-83	Geological mapping
UE 10305	Report On The Investigation For Graphite In Salepali And Turekela Areas, Bolangir (Balangir) District, Orissa. S. D. Mohanty, S. C. Rath and S. C. Kanungo	FS 1984-1985	Geological mapping
UE 10375	Report On The Graphite Investigation In Parts Of Bolangir, Kalahandi And Phulbani Districts Of Orissa S. C. Kanungo, S. D. Mohanty, K. N. Nanda and V. Ankanna	FS 1983-84	Geological mapping
UE 10438	Report On Geophysical Investigation For Regional Assessment Of Graphite In The West Of Talbhata & Pandikimal Areas, Bolangir District, Orissa H.Das, S. Chakaraborty and O.N.Tarafder	FS 1985-1986	Geophysical survey

UE 10642	Interim Report On Regional Assessment Of Graphite Resources In Sargipali Graphite Belt Covering Parts Of Balangir District, Orissa S. C. Kanungo, R. M. Khuntia, S. D. Mohanty & S. C. Rath	FS 1985-86	Photogeological study
UE 11150	Photogeological Studies On The Assessment Of Graphite Resources In Titlagarh - Sargipali Belts In Parts Of Balangir And Sambalpur Districts, Orissa. U. N. Satapathy	FS 1987-1988	Photogeological study
UE 11254	Report On The Geophysical Investigation For Regional Assessment Of Graphite Resources In Parts Of Titlagarh Area, Bolangir District, Orissa G. Kameshwara Rao, R.N. Kapoor and Dr H.K. Kundu	FS 1988-1989	Geophysical survey

Previous Exploration in the proposed block area:

GSI has conducted photo-geological mapping in the area.

Regional geological map adapted from GSI (1:50,000 scale)

Available and attached as annexure

3. Block description

Corner	Northing	Easting	Effective area of the block
1	20°29'01.10320"	82°56'13.37916"	**83.34 Sq. Km** (after deducting the lease area of **0.1496 Sq. km**)
2	20°36'53.59263"	83°01'24.14346"	
3	20°35'44.98173"	83°03'21.66494"	
4	20°34'52.04414"	83°03'24.17529"	
5	20°33'42.45014"	83°03'11.10581"	
6	20°27'52.55501"	82°58'10.84970"	

4. Planned Methodology

a. Work allocation

The on-site team shall consist of one senior geologist along with a team of 04 field geologists and field assistants. Based on the initial field observations regarding the fabric of the area, the work will be further allotted primarily by scouting the available outcrops over the soil covered area and indications of graphite mineralization.

b. Geological mapping and field work

Geological mapping at a scale of 1:12500 has been proposed for an area of 83.34 Sq. km with further infilling at 1:2000 in the mineralized area has also been considered. This will include tracing of the existing graphite vein system in the strike of the contact. From the available outcrops, rock chip sampling will be conducted. While all the samples bearing visible graphite will be subjected to analysis for FC, Ash, Moisture and Volatile matter, some samples will be subjected to whole rock analysis and petrological analysis to get further insight into the local geology.

Key samples will be examined for major oxide, petrological analysis and proximate analysis for FC content.

c. Geophysical survey

Since graphite mineralization is already visible in the existing lease, it is very imperative that its continuity below the soil cover be established firmly. The self-potential method (SP) has been found to be instrumental in bringing out anomalies of graphite in the Bolangir region. However, the results of the SP survey must be rigorously verified by excavation or by drilling.

A total of 30.0 Line kilometers is envisaged to cover the areal extension satisfactorily. The spacing between the traverses is kept being 100.0/50.0 meters to anticipate any change in trend of the vein.

d. Trenching

Since the graphite bearing vein is concealed under a mantle of soil, trenching would be needed to verify the results of SP survey that is being conducted to test the extension of the existing graphite vein in the area.

A cumulative of 200.0 Cu.M of excavation is proposed for this area.

e. Exploratory drilling/Scouting holes

The graphite vein manifests itself like an asymmetrical and acylinderical fold, with its hinge portion plunging N/NE with an angle of 15-20 degrees along the contact of Granite Gneisses and calc-silicate rocks. Therefore after thorough mapping of the extents of the vein along these contacts, scout boreholes can be drilled to find the continuity and thickness of the graphite vein.

10 boreholes of 100 meters each have been planned for scout drilling. Therefore, the total meterage comes to be 1000 meters.

5. Nature, Quantum and Target

Sr. no	Item	Description	Qty	Unit
1	Geological mapping and collection of surface samples.	1 : 12500	83.34	Sq. km
2	Procurement of satellite imagery	From NRSA	1	Scene/Tile
3	Fixing collar RL for the boreholes + Benchmark	By DGPS	11	Observation points
4	Trenching		200	Cu.M
5	S.P Survey/E.M Survey		30	Line Km.
6	Drilling	Medium rock 10 BH – 100 m each	1000	Metres
7	Bore hole plugging and construction of concrete pillars		10	Nos
8	Promixate analysis (Including Rock chip samples, Trench samples and Borehole samples)		500	Nos
9	Petrography, digital microphotograph and Thin section preparation		25	Nos

6. Time schedule of the project

Phase	Activity	2024												2025											
		Month 1		Month 2		Month 3		Month 4		Month 5		Month 6		Month 7		Month 8		Month 9		Month 10		Month 11		Month 12	
		July		August		September		October		November		December		January		February		March		April		May		June	
		2 weeks	2 weeks	2 weeks	2 weeks	2 weeks	2 weeks	2 weeks	2 weeks	2 weeks	2 weeks	2 weeks	2 weeks	2 weeks	2 weeks	2 weeks	2 weeks	2 weeks	2 weeks	2 weeks	2 weeks	2 weeks	2 weeks	2 weeks	2 weeks
Phase 1	Geological mapping and surveying	Monsoon																							
	Chemical analysis																								
	Geophysical survey																								
	Trenching excavation																								
Phase 2	Drilling of 10 boreholes																								
	Chemical analysis of core samples																								
	Interpretation of results																								
Phase 3	Preparation of GR																								
	NMET Presentation																								
		2024												2025											

Phase	Activity	2025													
		Month 13		Month 14		Month 15									
		July		August		September									
		2 weeks	2 weeks	2 weeks	2 weeks	2 weeks	2 weeks								
Phase 1	Geological mapping and surveying														
	Chemical analysis														
	Geophysical survey														
	Trenching excavation														
Phase 2	Drilling of 10 boreholes														
	Chemical analysis of core samples														
	Interpretation of results														
Phase 3	Preparation of GR														
	NMET Presentation														

Project period : 15 months

7. Tentative budget of the project

SoC item no.	Component	Quantity	Unit	Unit rate	Total
Geological Mapping					
1.1	Charges of procurement of imageries	**1**	Tile	At actual	At actual
1.2	Large scale geological mapping @ 1:12,500				
	Field	180	Man-day	11,000.00	19,80,000.0
	Head office	60	Man-day	9,000.00	5,40,000.0
1.52	Charges of one sampler per day	30	Man-day	5,100.00	1,53,000.0
				Total	**25,20,000.0**
Survey Work					
1.6.2	Fixation of collar RL of boreholes and creation of permanent bench mark	11	Points of observation	19,200.00	2,11,200.0
	Creation of Benchmarks - 01 nos				
	Fixation of Boreholes - 10 Nos				
				Total	**2,11,200.0**
Drilling and Trenching					
2.1.1	Excavation of trenches upto 2.0 metres depth	200	Cu.M	3,300	6,60,000.0
2.2.1.4a	Drilling in medium hard rock	1000	Meter	10,100.00	1,01,00,000.0
2.2.7a	Construction of concrete pillars	10	Nos	2,000.00	20,000.0
				Total	**1,07,80,000.0**
Tendering process cost					
2.3	Tendering process cost (2% or %5 Lacs whichever is lower)	1	LS	5,00,000	5,00,000
				Total	**5,00,000.0**
Geophysical Survey					
3.3a	Self potential (8-20 line Km)	30	Line Km.	29,600	8,88,000.00
				Total	**8,88,000.00**

Laboratory analysis					
4.1.14	Analysis of one rock/soil sample for determination of apackage of 34 elements by ICP-AES/ICP MS	20	Per sample	7,731.00	1,54,620.00
4.1.15	Major oxides	30	Per sample	4,200.00	1,26,000.00
4.1.16	Proximate analysis of Graphite (FC, VM, Ash, Moistu	500	Per sample	3,000.00	15,00,000.0
				Total	**17,80,620.0**
Petrological studies					
4.3.1	Preparation of standard thin section of the rocks	10	Per sample	2,353.00	23,530.0
4.3.4	Completed petrographic/ore microscopic study/mineragraphic report of the rock samples	5	Per sample	4,232.00	21,160.0
4.3.7	Digital photomicrograph of the thin sections	10	Per sample	2,380.00	23,800.0
				Total	**68,490.0**
Miscellaneous charges					
5.2	Geological report preparation	1	Lot		7,50,000.0
5.7	Unskilled Labours (04 Nos x 120 days)	480	Man-days	433.00	2,07,840.0
	Total				**9,57,840.0**
	Total project expenditure				**1,77,06,150.0**
	In crores				**1.77**

List of Plates

List of Annexures

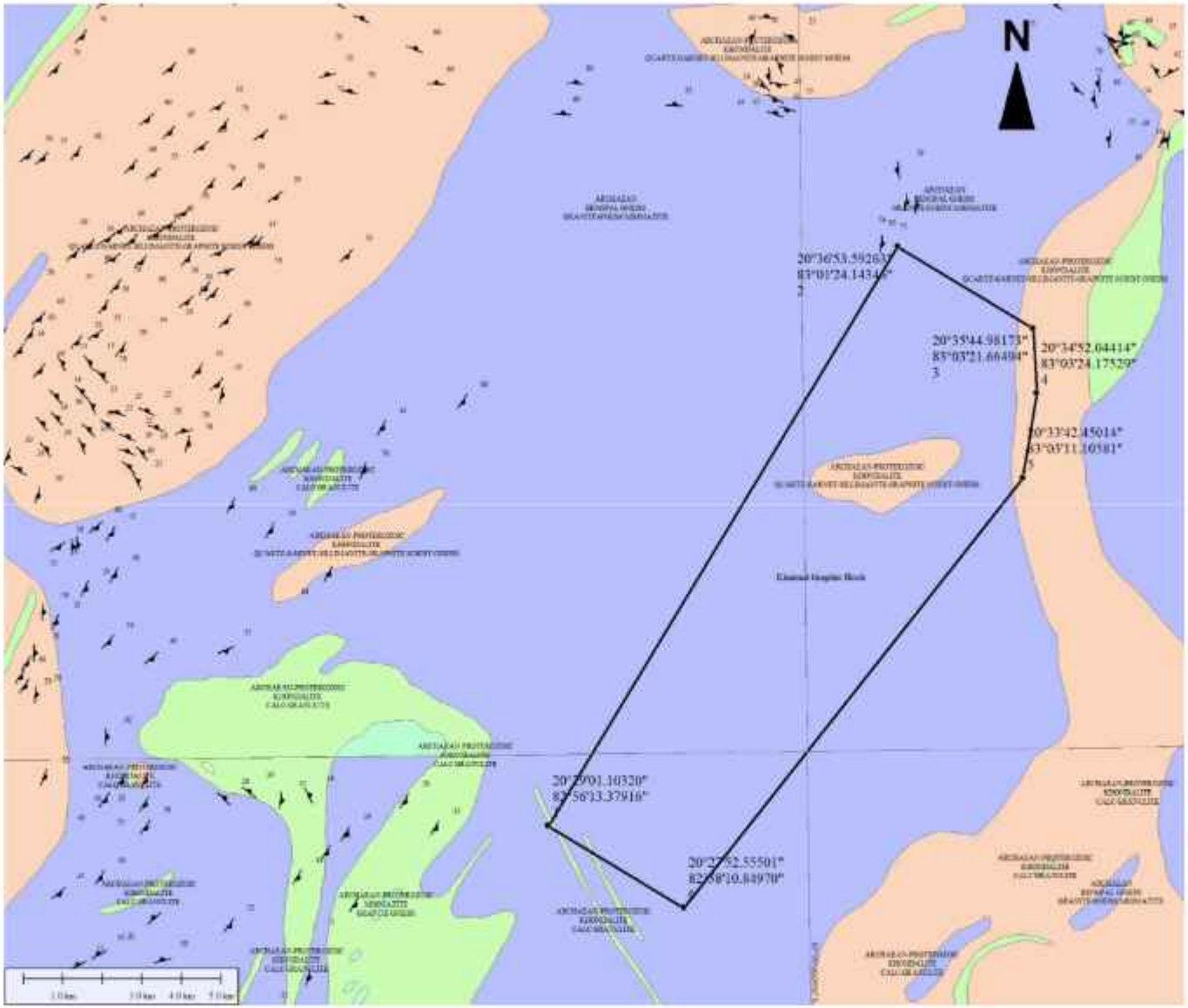

Plate 1 : Geological map at 1 : 50,000 (derived from GSI)

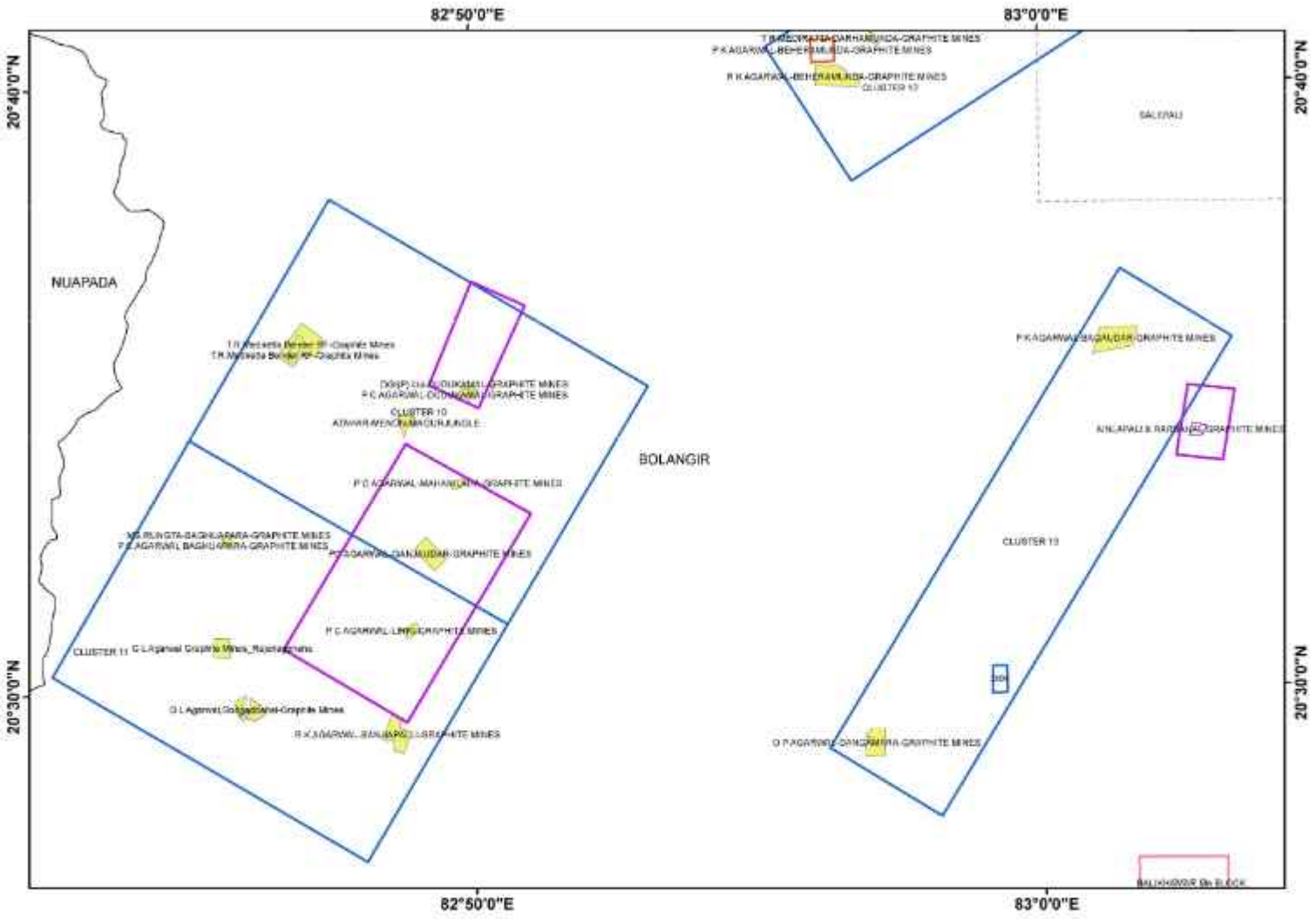

Plate 2 : Map sourced from DoMG Odisha showing location of expired/taken over graphite leases in vicinity of the block

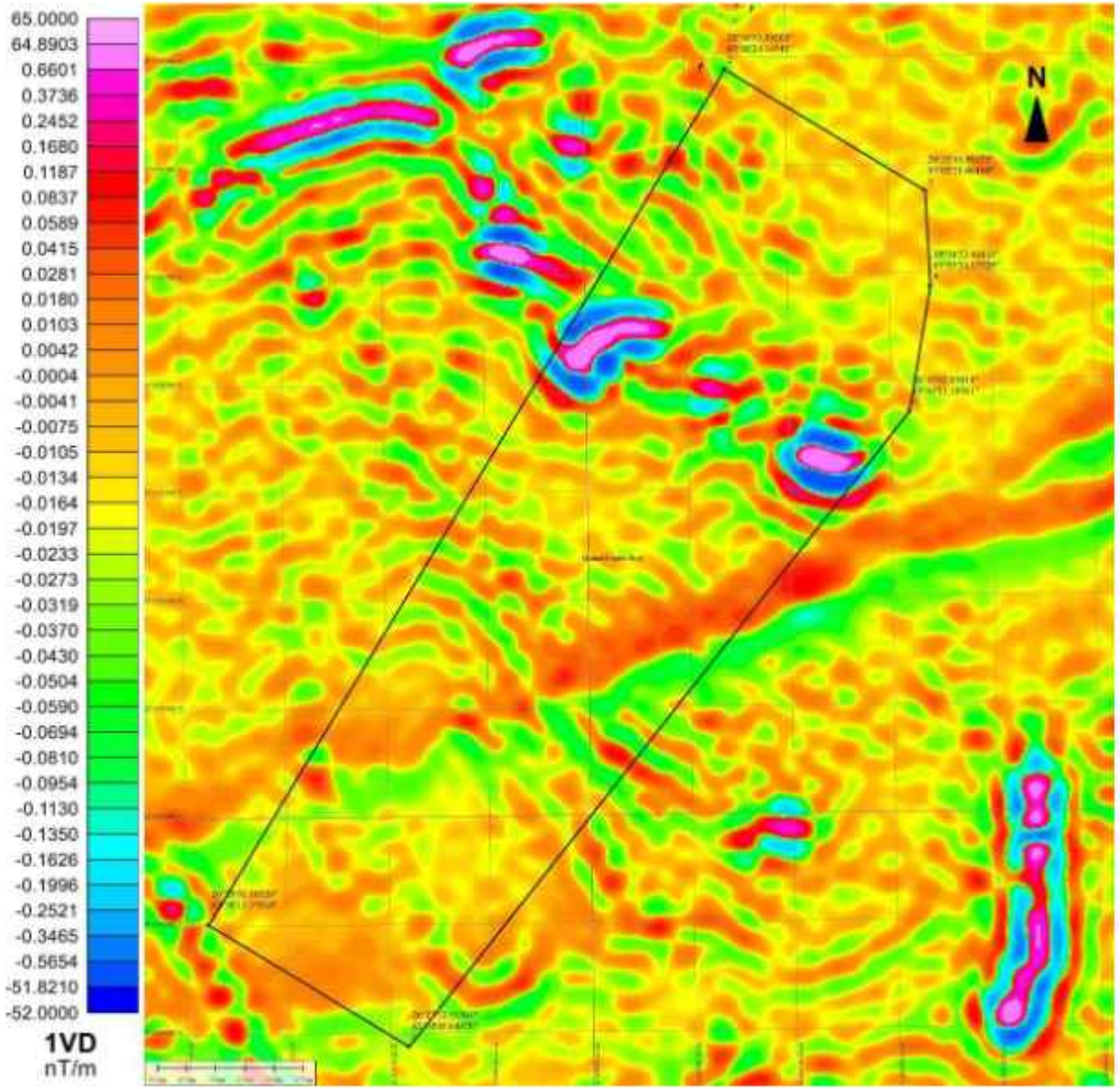

Plate 3 : Aeromagnetic data over the block showing prominent magnetic features

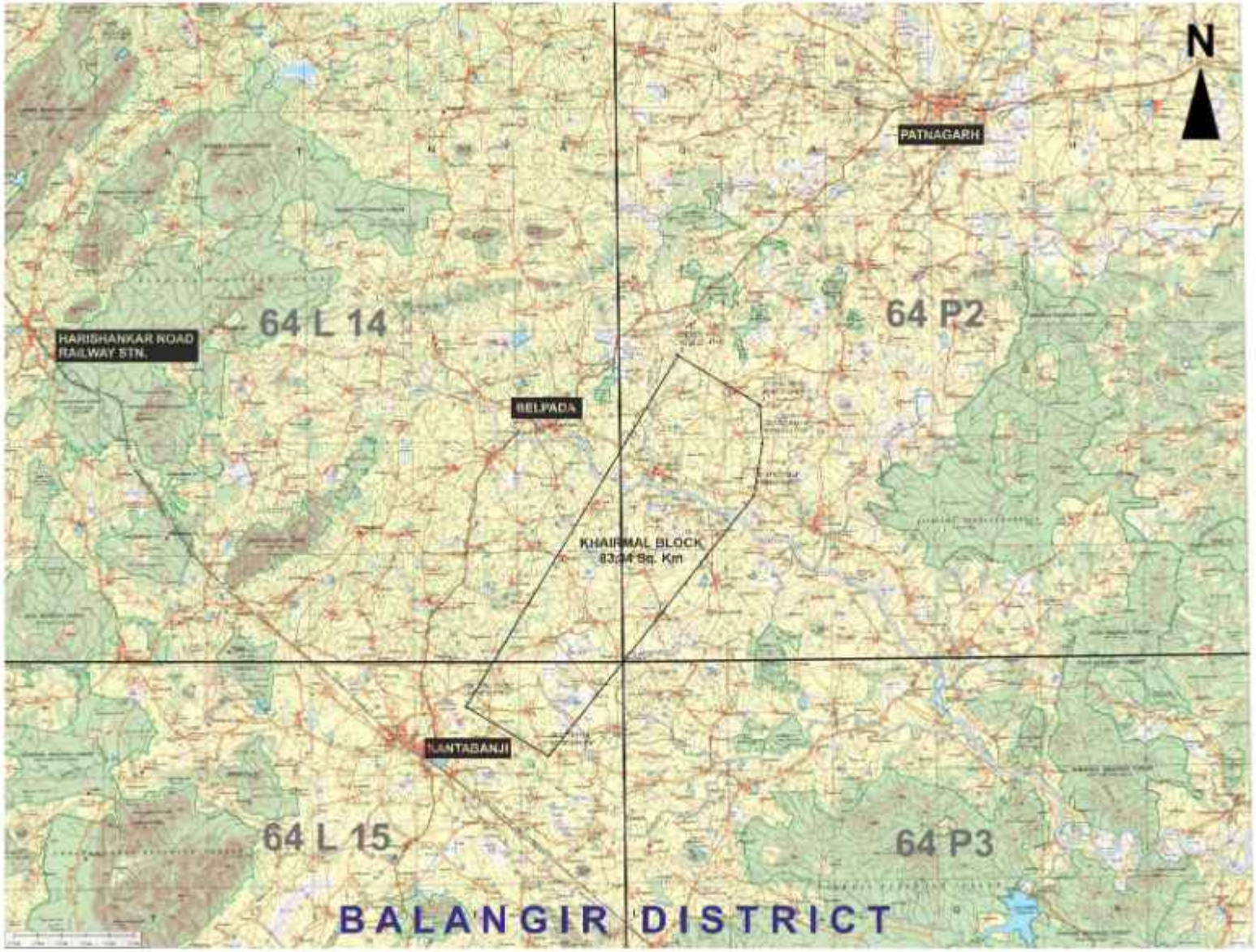

Plate no. 4 : Location of the block superimposed on Survey of India toposheet no. 64 P/2

Annexure 1 : Minutes of meeting from initial TEC meeting (state level)

1ST e-mail

DIRECTORATE OF MINES & GEOLOGY
STEEL AND MINES DEPARTMENT, GOVT. OF ODISHA, BHUBANESWAR
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Tel No.: 0674-2391537, Fax No.: 0674-2391684
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5321
08.12.23

No. GXVII(h) -8/22 14568 **/DoMG., Dt.** 06-12-2023

From

Sri Rajat kumar Kar,
Additional Director (Geology),

To

The Director/Sr.Geologist,GSI,Bhubaneswar
The Director (Project & Planning)/
G.M(Expolration)/DGM (Geology)OMC Ltd.
The Project Director/Project Manager/
Sr.Professional Geolgst/Jr.Professional Geolgst,STC
The Project Co-ordinator, IDPeX

Sub: Proceedings of the Technical Evaluation meeting held on 07.11.2023 for discussion on further level of Explorations on Graphite Blocks recommended by STC

Sir,

In reference to the captioned subject, I am directed to send herewith the proceedings of the Technical Evaluation meeting held on 07.11.2023 under the Chairmanship of the Director of Mines & Geology, Odisha for information and necessary action.

Encl: As above

Yours faithfully,

5/12/23

ADDITIONAL DIRECTOR (GEOLOGY)

Sr. Mgr (G&I), TM,
Pl. inform STC.

11/12/23

Proceedings of the Technical Evaluation meeting held on 07.11.2023 under the Chairmanship of the Director of Mines & Geology, Odisha for discussion on Graphite blocks recommended by Strategic Technical Consultant (STC) for further level of exploration

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A Technical Evaluation meeting was held on 07.11.2023 at 4.00 PM in the Conference Hall of the Directorate of Mines & Geology, Odisha under the Chairmanship of the Director of Mines & Geology, Odisha with the agenda to discuss the graphite blocks identified by STC and finalise the blocks for a further level of exploration as a part of MRM. The list of participants present in the meeting is in ***Annexure -I***.

The Director of Mines & Geology, in his welcome address appraised the objective of the Committee Meeting & asked the Director (Project & Planning), OMC to summarise the findings of the STC where three Graphite Blocks have been identified after integration of the legacy data of different exploring agencies.

The Representatives of STC made a PPT presentation of the target graphite blocks of Balangir District as detailed below

Sl.No	Name of the Block	District	Area in sq km	Proposed Level of Exploration
1	Kharmal Graphite Block	Balangir	3.119	G3
2	Magurjungal Graphite Block	Balangir	5.909	G3
3	Turekela Graphite Block	Balangir	32.194	G3

After the deliberation, it is observed from the background information available with DoMG that

- Turekela & Mangurjungal Graphite Blocks are 300m apart and included within two Cluster blocks (Cluster 10 & 11) identified by DoMG for future exploration which encompasses twelve number of Taken over Leases as briefed below.
- Similarly, Kharmal Graphite Block which includes Anilapali & Rarbahal Graphite Mines of Sri Antaryami Mishra over an area of 14.959 Ha which is a working mines having validity upto 2027. The proposed block is flanked by another Cluster -13 in its western margin, where two Taken Over Leases and one 10 A (2) (b) cases are also included within the Cluster Block.

Details of the Cluster Blocks

Name of the Cluster	Lessee Name	Status of Lease	Area in sq km
Cluster-10	T.R.Mediretta Bender RF-Graphite Mines	Taken Over Leases	188.911
	Atahar-Menon-Magurjungle		
	P C Agarwal-Dudukamal-Graphite Mines		
	DGI(P)LTD-Dudukamal-Graphite Mines		
	R K Agarwal-Dudukamal-Graphite Mines		
	P C Agarwal-Mahanilaha-Graphite Mines		
	PC Agarwal-Ganjaudar-Graphite Mines		
Cluster-11	P C Agarwal-Lirki-Graphite Mines	Taken Over Leases	
	R K Agarwal-Banjiapalli-Graphite Mines		
	G L Agarwal,Godgadbahal-Graphite Mines		
	GL Agarwal Graphite Mines_Rajunagphena		

	Ms Rungta-Baghuapara-Graphite Mines		
Cluster-13	P K Agarwal-Bagaudar-Graphite Mines	Taken Over Leases	68.459
	O P Agarwal-Dangamara-Graphite Mines		
	Gidhmal_Mundapala Graphite_Prabhas ch Agarwal	10 A(2) (b)	

After threadbare discussion, the following decisions were taken by the Committee.

- The G3 level of exploration will be taken up by OMC in Magurjungal & Turekela Graphite Blocks for mineral targeting while, the Cluster -10 & 11 may be taken as a whole from which 151.03sq km area will be covered at G4 level by OMC through Geological & Geophysical prospecting to delineate the mineralised zone and potentiality of Taken over Leases.
- Kharmal Graphite Block will be explored at G3 level by OMC excluding the ML area. The Committee recommended to allot the adjoining Cluster 13 covering an area of 68.459 sq km to OMC for exploration at G4 level.
- The available information on Taken Over Leases, 10 A (2) (b) case & ML area with DoMG need to be incorporate in the exploration plan by OMC.
- Representatives from GSI opined to conduct Geophysical Exploration over the target blocks at G3 level/ G4 level and the regional geophysical study by Heliborn Survey taking the back ground geophysical data of GSI covered areas where number of graphite incidences had already been reported.

The meeting ended with a vote of thanks to the Chair and other participants.

DIRECTOR OF MINES & GEOLOGY

Annexure-I

List of Participants

Sl. No.	Name	Designation	Signature
1	Shri G. Rajesh	I.F.S, Director of Mines & Geology, Odisha	
2	Shri K.C.Das	Director, GSI, Bhubaneswar	
3	Shri Rajat Kumar Kar	Addl. Director, Directorate of Mines & Geology, Odisha	
4	Dr. P.C. Mishra	Joint Director, Directorate of Mines & Geology, Odisha	
5	Dr. Kshirod Ch Brahma	Director, Project & Planning, OMC	
6	Shri Biswajeet Lenka	Senior Geologist, GSI	
7	Shri B.C.Sahoo	General Manager (Exploration), OMC	
8	Shri Mihir Ku Malla	Deputy General Manager (Geology), OMC	
9	Dr. R. Mohanty	Project Director, STC	
10	Shri Asim Chatterjee	Program Manager, STC	
11	Shri Navneet Sharma	Sr. Professional Geologist, STC	
12	Mr. Nadim Mohd	Jr. Professional Geologist, STC	
13	Ms Ipsita	Project Coordinator, IDPeX	

Annexure 2 : Notification of the graphite blocks for exploration under Rule 67 – MCR in favour of OMC Ltd.

Government of Odisha

Department of Steel & Mines

*****

No 2033 /S&M, Bhubaneswar dated the 07/03/2024

SM-AE-ME-0012-2022

NOTIFICATION

Sub: Notification of two mineral blocks under Rule 67 of MC Rules'2016 in favour of Odisha Mining Corporation for carrying out exploration.

Whereas, the Director of Mines and Geology has identified 2 (two) graphite blocks of Bolangir district namely Kahirmal Block and Magurjungal-Turkela block to be notified under Rule 67 of Mineral (Other than Atomic & Hydro Carbons Energy Minerals) Concession Rules'2016 for Geological exploration to be carried out by Odisha Mining Corporation Ltd.

Now, therefore, after careful consideration, the State Government has been pleased to notify aforesaid two blocks of Bolangir district under Rule 67 of MC Rules'2016 to be under taken for Geological exploration up to G2 level of UNFC by OMC Ltd. The time period for exploration shall be 2 (two) years from the date of issue of this notification. The block details is given below.

Sl. No	Name of the block	Mineral	T.S. No	Area in Sq. Km.	Block Coordinates		
					Pillar ID	Longitude	Latitude
1	Khairmal Block	Graphite	F44X2	83.494	1	82°26'13.37916"	20°29'01.10320"
					2	83°01'24.14346"	20°36'53.59263"
					3	83°03'21.66494"	20°35'44.98173"
					4	83°03'24.17529"	20°34'52.04414"
					5	83°03'11.10581"	20°33'42.15014"
					6	82°58'10.84970"	20°27'52.55501"
					7	83°02'39.33615"	20°34'06.21480"
					8	83°02'39.31078"	20°34'06.33200"
					9	83°02'39.64683"	20°34'06.24240"
					10	83°02'40.14387"	20°34'06.56221"
					11	83°02'40.07758"	20°34'06.29237"
					12	83°02'48.82514"	20°34'07.05699"
					13	83°02'53.82463"	20°34'13.85407"
					14	83°02'53.58636"	20°34'16.48476"
					15	83°02'44.69651"	20°34'18.19050"
					16	83°02'38.86862"	20°34'19.30466"
					17	83°02'37.69898"	20°34'13.94459"
					18	83°02'35.93938"	20°34'05.97910"

					Pillar ID	Longitude	Latitude
2	Magurjungal-Turkela	Graphite	F44W2	188.959	1	82°42'34.421"	20°30'19.124"
					2	82°47'31.268"	20°38'10.109"
					3	82°53'5.394"	20°35'1.806"
					4	82°48'4.979"	20°27'12.915"

By order of the Governor

01/03/2024.

(D. K. Singh)

Additional Chief Secretary to Government

Steel and Mines Department

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