

Proposal for Lamer-Panga Graphite Block A (G3
Area – 13.99 SQ.KM), Kalahandi District, Odisha
State for Preliminary Exploration (G3 Stage)
under NMET

(Base metals/Ferrous/Non-Ferrous/Industrial/Strategic &
Critical/Precious metals etc.)

By
Odisha Mineral Exploration Corporation
Limited(OMECL)
Bhubaneswar, Odisha

Place:
BhubaneswarDate:
30th July 2022

Summary of the Block for Preliminary Exploration (G3 Stage)

GENERAL INFORMATION ABOUT THE BLOCK

	Features	Details
	Block ID	Lamer-Panga Graphite Block A (G3 Area)
	Current Exploration Agency	Odisha Mineral Exploration Corporation Limited (OMECL), Bhubaneswar, Odisha
	Previous Exploration Agency	Geological Survey of India (GSI)
	Geological Report (Previous stage Geological Report)	Geological Report on the Graphite investigation in parts of Bolangir, Kalahandi and Phulbani districts, Orissa (Field Seasonm1983-84 BY GSI) 1. Geological mapping (1:12500 scale) and grab sampling, has been carried out by GSI in 1983-84. 2. Geophysical Survey (Magnetic) has been carried out in the block in 2019-20 by GSI under National Geophysical Mapping (NGPM).
	Commodity	Graphite
	Mineral Belt	Eastern Ghats Mobile Belt (EGMB)
	Completion Period with entire Time schedule to complete the project	The total duration of the project shall be completed in 16 months from the date of commencement of the project.
	Objectives	Based on the evaluation of available geological data, the present Proposal for exploration in G3 has been expressed to fulfill the following objectives. 1. Large scale Geological map at 1:4000 scale. 2. Topographical Contouring at 1:4000 scale. 3. To take up exploratory drilling at 200 X200m as per G3 level of exploration to intersect graphite mineralization. 4. To carry out Geophysical Surveys Self Potential (S.P) at 100m grid interval and 10m station interval to delineate potential zones. 5. To estimate resources of Graphite mineral as per UNFC norms and Minerals (Evidence of Mineral Contents) Rules-2015 & Amendment MEMC Rule-2021 at G3 level.
	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	1. The Geological Mapping, core logging and report writing will be carried out by OMECL. 2. Topographical Survey, Geophysical survey, drilling, and Laboratory studies will be outsourced through tender process by the proposed agency.
	Name/Number of Geoscientists	OMECL Geologists
	Expected Field Days (Geology, Geophysics, Survey)	Geologist Party Day :180 days

1.	Location			
	Latitude / Longitude	LAMER-PANGA GRAPHITE BLOCK A (G3 AREA) CORNER POINTS		
		PILLAR ID	LATITUDE	LONGITUDE
		1	20°05'53.652" N	83°25'49.818" E
		2	20°06'6.635" N	83°25'50.146" E
		3	20°06'5.830" N	83°30'11.023" E
		4	20°04'30.905" N	83°30'11.158" E
		5	20°04'31.520" N	83°27'42.045" E
		6	20°05'51.638" N	83°27'42.450" E
	Villages	Lamer, Dudalu, Tarkabahali, Sadalguchchha, Patangpadar		
	Tehsil/Taluk	Madanpur-Rampur & Narla		
	District	Kalahandi		
	State	Odisha		
2.	Area (hectares/square kilometers)			
	Block Area	13.99 sq. km		
	Forest Area	Land details of the block to be collected		
	Government Land Area	-do-		
	Private Land Area	-do-		
3.	Accessibility			
	Nearest Rail Head	Narla (17 Kms)		
	Road	The Graphite block is 17 km away from NH-6A. The main access road to the block connects NH-6A at Narla and passes through Pipalpada to join at Lamer village inside the block. Lamer village within the block can be approached through Belagaon from Sergarh at NH-6A by a metal top road.		
	Airport	Utkela Airport, Kesinga (51km), VSS Airport Jharsuguda (257 km).		
4.	Hydrography			
	Local Surface Drainage Pattern (Channels)	The block consists of hilly terrain and shows dendritic drainage pattern. There is no perennial nallah passing within the block area.		
	Rivers/Streams	Chauldhua nallah flows at 8 km away from the block at the Eastern side. Sandul river flows outside the block in the NW side at 13 km.		
5.	Climate			
	Mean Annual Rainfall	Average annual rainfall is 1378.20mm (Source: District rainfall data)		
	Temperatures (December) (Minimum) Temperatures (June)(Maximum)	Minimum temperatures 04°C (December) Maximum temperatures up to 45°C (May) (Source: District rainfall data)		
6.	Topography			
	Toposheet Number	F44X8 (64P/8) & F44X12 (64P/12) The Block area has been shown on the SOI Toposheets (Plate I)		
	Morphology of the Area	Most of the area shows hilly terrain with a rugged topography.		
7.	Availability of baseline geosciences data			

	Geological Map (1:50K/25K)	1:12,500 Scale Geological Map (Geological Survey of India)
	Geochemical Map	Not Available
	Geophysical Map (Aeromagnetic, ground geophysical, Regional as well as local scale)	Geophysical Survey (Magnetic) carried out by GSI under National Geophysical Mapping (NGPM) in 2019-20
8.	Justification for taking up G3 / G2 Mineral Exploration	1. Geological Survey of India had carried out Geological mapping in 1:12500 scale and find out four mineralized zones within the block. 2. Graphite samples have been collected from the mineralized zones within the block during the Geological Mapping by GSI and primary field visit by OMECL which shows FC ranging from 5.80 % to 11.67 %. 3. Based on the evaluation of geological data obtained from Lamer-Panga Graphite block (G4 area) explored by GSI during 1983-84, the present exploration program at G3 level has been prepared. 4. The Geophysical Survey combined with Geological mapping, drilling and sampling will be helpful in assessing the disposition of the mineralized zones and assessment of graphite resource in the block. 5. The exploration in G3 will be helpful in estimation of graphite resources (333) and will facilitate for further level of exploration to make the block actionable.

Detailed description on the following titles to be made in the proposal.

1. Block Summary

1.1. Physiography

In general, the study area forms a hilly undulated terrain. The area has got dendritic pattern of drainage. There is no perennial nallah passing within the block area.

The climate of the Kalahandi district is of extreme type. It is dry except during monsoon. The maximum temperature of the district is 45° + Celsius, whereas the minimum temperature recorded is 04° Celsius. The district experiences the average annual rainfall as 1378.20mm. The monsoon starts late in June and generally lasts up to September.

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

1.2.1. Regional Geology

The area comprises Eastern Ghats Super Group of rocks represented by khondalite and charnockite groups of rocks with their associated pegmatites and quartz veins.

The khondalite group of rocks consists of quartzites, garnetiferous-quartzites, garnet-feldspar-biotite-sillimanite $\pm$ graphite gneiss / schist, calc granulite and migmatites. Khondalites and calc-granulites are predominant in Bolangir district but in Phulbani / Kalahandi district the group is mainly represented by garnetiferous quartzites, quartzites, quartz-garnet-feldspar-sillimanite $\pm$ graphite schists and gneisses.

Pyroxene granulite (Basic charnockite) represents charnockite group rocks. Porphyroblastic granite gneiss streaky gneisses have been met in parts of Bolangir district only. The area covered by the granite gneiss is comparatively more in Bolangir sector than both Kalahandi and Phulbani sectors. They comprise both medium grained/streaky gneiss and porphyroblastic granite gneiss. Tentatively stratigraphy of the area is as follows:

Stratigraphic succession of the Area (after GSI)

Recent Intrusives	Laterite Soil and Alluvium	
	Pegmatite and Quartz vein.	
	Porphyroblastic granite gneiss. Medium grained granite gneiss	
Eastern Ghats Super Group	Charnockite Group	Pyroxene Granulite
	Khondalite Group	Calc granulite
		Quartz-garnet feldspar-biotite-sillimanite $\pm$ graphite gneiss/schist.
		Garnetiferous quartzites, Quartzites.

1.2.2. Geology of the block

The Lamer Graphite Block A has been considered for geological exploration in G3 level. The block demarcated has an area of 13.99 Sq. Km and located in Madanpur-Rampur Tehsil of Kalahandi district which falls in toposheet no. F44X8 (64P/8) & F44X12 (64P/12).

The area has been explored by GSI during 1983-84 and prepared the geological map of the area in 1:12500 scale under project investigation for Graphite in Balangir, Phulbani and Kakahandi district. The litho units present within this block are granite gneiss, pyroxene granulite (Basic charnockite), khondalite and quartzite. The general trend of foliation of khondalite, granite gneiss and quartzite is N45°E-S45°W dipping 45° to 65° southernly. During the course of mapping, GSI have located one prominent zone of graphite mineralization i.e. Terlo-Mansara zone. Within the Terlo-Mansara zone GSI have delineated four graphite mineralization patches in the NW direction of Lamer village which comes within this proposed block. Here the graphite is associated with the meta sedimentaries as quartz-graphite schist bands of limited extensions.

During the primary field visit by the geologist of OMECL to the block, graphite mineralization is also located at the SW side of the Lamer village. The samples have been collected from this zone and analysed which shows FC 11.67%.

Description of various rock formations in the Area:

The rock types exposed in the area are khondalite, granite gneiss and quartzite 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 lithounits is given below.

Soil/Alluvium: Soil is found mainly in valley area over the khondalite and granite gneiss.

Granite Gneiss: This is medium to coarse grained rock occupying in low-lying areas with migmatite, consisting mainly of quartz, orthoclase, plagioclase, feldspar, biotite, garnet and opaque minerals. The whole sequence has been metamorphosed to granulite facies. The alkali-feldspar gneiss is fine to coarse grained and contains porphyro-blastic texture. Graphite mineralisation is noticed as dissemination along the foliation plane.

Pyroxene granulite (Basic charnockite): Mainly Pyroxene granulite (Basic charnockite) insitu rocks are limited in this area and occurs mainly as boulders forming slope wash talus.

Khondalite: (quartz- feldspar- garnet- sillimanite + graphite schist/gneiss): 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. The schistose variety being softer and more prone to weathering occupies the valley regions, whereas the gneissose type forms higher relief. The schistose variety invariably contains richer disseminations of graphite. The graphite occurs as quartz-graphite schist bands within the khondalite.

Quartzite: The quartzite is medium to coarse-grained, white to buff coloured, granular to faintly schistose in nature and is invariably garnetiferous.

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

During the course of mapping some occurrences of graphite have been noticed within the Lamer Graphite block by GSI where Fixed Carbon (FC) content varies from 5.8% to 10%.

Details of Reserve calculation of some of the Graphite deposits with in the Lamer-Panga Block A explored by GSI									
Sl. No.	Location of the deposits	Strike length in m. (a)	Dip	Assumed depth in m. (b)	Thickness in m (c)	Volume in cum a X b X c	Specific gravity/ Bulk density (g)	Reserve of graphitic materials in tonnes (a X b X c) X g	Average fixed carbon content in percentage
1.	0.8 Km north west of Lamer	20	-	10	3	600	2	1200	5.8
2.	0.77 Km north west of Lamer	15	-	10	1	150	2	300	10 (VE)
3.	0.60 Km West of Lamer Dudalu foot track	60	-	10	3	1800	2	3600	10 (VE)

With this background, the area can be put into G3 level of exploration for assessment of graphite within the block with the help of geological mapping, geophysical survey, drilling and sampling.

1.4. Scope for proposed exploration:

The proposed geological exploration in G3 level comprises components like Geological Mapping (1:4,000 scale), Topographic survey (1: 4000), Sampling (Core & grab), Geophysical Survey i.e. Self-Potential (SP), drilling (2040 m), chemical analysis, laboratory studies and report preparation.

1.5. Observation and Recommendations of previous work:

The anomalous zone should be delineated by geophysical survey. The anomalous mineral potential zones are to be explored by detailed drilling to assess the economic potentiality of graphite in the block. The area was proposed for Preliminary Exploration (G3 stage of exploration) for graphite as per UNFC.

2. Previous work:

2.1. Previous Exploration in adjoining area (Regional area):

The proposed block is previously explored by Geological Survey of India (GSI) for regional assessment of graphite resources during 1983-84 field season covering an area of 302 sq.km

in parts of Bolangir, Kalahandi and Phulbani districts of Orissa. The area is mostly covered by soil/slope wash debris with sporadic outcrops of khondalite and Charnockite suite of rocks, granite gneisses and their related quartz and pegmatite veins. Low to medium grade graphite bodies with carbon content ranging from 5 to 30% have been located in Kandhenjhula-Darrhamunda, Sargimunda-Banipali, Dhurgiamunda, Dhourakhaman- Rengali and Mahanilaha-Dudukamal zones in Bolangir and Belgaon-Barabandha- Mansara area of Kalahandi district. The strike of these graphite bodies varies from 15 to 640 m with width ranging from 1.2 to 6.4 m. A reserve of 1,49,527 tonnes of graphite schist containing 5-15% F.C. has been estimated down to a depth of 10m below the ground.

2.2.Previous Exploration in the proposed block area:

In Kalahandi district, graphite mineralisation is noted mainly in Terlo-Mansara zone (In parts of toposheet No. 64P/8 & 64 P/12).

The proposed graphite block area has been previously mapped by GSI in 1:12500 scale and comes under Terlo-Mansara zone. About 0.8 km NW of Lamer village graphite schist containing 20 to 25% F.C. (VE) is exposed on the flank of a small hill covering the eastern slope. The width of the body ranges from 3 to 5 m over a strike length of 20m. Boulders of graphite schist with 5 to 15% F.C. (VE) is strewn over a N70E-S70W trending zone NW of Lamer.

So, it is worthwhile to explore the area with G3 level to delineate the disposition of ore body and assessment of graphite resource by way of geological mapping (1:4000), drilling(200X200m) and sampling for facilitating the generation of actionable block.

The geological map is placed in Plate-III.

3. Block Description

The Block area falls in Survey of India Toposheet No. F44X8 (64P/8) & F44X12 (64P/12) and covers an area of 13.99 Sq.Km in and around Lamer, Dudalu, Tarkabahali & Sadalguchchha villages of Madanpur-Rampur Tehsil and Patangpadar Village of Narla Tehsil. The block is coming under Madanpur-Rampur Tehsil of Kalahandi District, State Odisha. The location of the block in toposheet is given in Plate-I. The Co- ordinates of all the corner points of the block area are given in the following table.

Co-ordinates of the Corner/Pillar points of the block

LAMER-PANGA GRAPHITE BLOCK A (G3 AREA) CORNER POINTS		
PILLAR ID	LATITUDE	LONGITUDE
1	20°05'53.652" N	83°25'49.818" E
2	20°06'6.635" N	83°25'50.146" E
3	20°06'5.830" N	83°30'11.023" E
4	20°04'30.905" N	83°30'11.158" E
5	20°04'31.520" N	83°27'42.045" E
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4. Planned Methodology

In accordance with the objective set for the block, the exploration programme is proposed. The exploration shall be carried out as per Minerals Evidence of Mineral Content (MEMC) Rule-2015 & Amendment MEMC Rule-2021. Accordingly, the following scheme of exploration is formulated to achieve the objectives.

4.1. Geological Mapping

Geological Mapping will be done over the entire of 13.99 sq.km in 1:4000 scale. During the geological mapping different lithounits will be delineated along with their contact and structural features. Surface manifestations of the ore bodies available along with their surface disposition will be marked on the map.

4.2. Surface Sampling

During course of geological mapping the grab samples shall be collected from the outcrops. A total 50 nos. of grab Samples from different location which will be analyzed for graphite mineralization (FC, Ash, Moisture and VM).

4.3. Geophysical Survey

The area of the block is 13.99 sq.km. Mainly it is covered with hilly terrain with some plain land. Majority of the area is covered with forest and some cultivated land. In view of presence of vegetation and soil cover the ground Geophysical Survey is required to know the anomalous zone of graphite and its depth persistency. On interpretation of data of geological mapping, geochemical sampling, geophysical survey, Thirty four (34 nos.) boreholes will be drilled to assess the sub surface disposition of ore body. In this context, surface geophysical survey i.e. Self- Potential (SP) survey will be carried out over the area.

- (i) Ground Self Potential (SP): Total coverage of about 25 line kilometers with 100m grid interval and 10m station interval to delineate potential zones.

4.4. Drilling and Core Logging

Twenty five (25 nos.) vertical boreholes shall be drilled over the mineralised zone in a grid pattern of 200mX 200m and nine (9 nos.) boreholes along the strike and dip direction to prove the mineralization if any. All total 34 boreholes shall be drilled with a drilling meterage of 2040m, taking the average depth of borehole as 60m. The borehole cores will be logged systematically. Viz. details of the litho units, colour, structural feature, texture, grain size, mineralization, core recovery and graphite ore zones would be recorded. The map showing the borehole proposal is attached as Plate IV.

4.5. Core Sampling

The drill cores will be sliced into two equal halves for sampling and one part will be preserved in the core box. The other part will be pulverized to -200 mesh size and the resultant pulp will be subjected to coning and quartering to obtain the required sample. One part of 100 gm sample will be sent to chemical laboratory for analysis. second counterpart to be preserved as duplicate sample, third counterpart will be used for preparing composite sample and the fourth counterpart would be kept as sample to be used for any other specific purpose in future.

The graphite mineralized part of drill core will be sampled as Primary sample. The length of each sample will be kept 1.00m within the ore zone depending upon the thickness of

graphite and its physical character. The drill cores 3m immediately on footwall and 3m immediately 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. The primary core samples will be analyzed for Fixed Carbon, Ash, Moisture and Volatile Matter (Proximate Analysis for 4 radicals).

- a) Around 550 nos. of primary core samples (500 nos. Primary & 50 nos. Check samples) shall be generated from the mineralized zones intersected in the boreholes of the block and will be analyzed for graphite mineralization (FC, Ash, Moisture and VM).
- b) Around 10% samples will be sent to NABL Chemical laboratory for analysis of graphite mineralization (FC, Ash, Moisture and VM) as external check samples.
- c) Composite samples would be prepared from the mineralized zones of primary drill core samples of each borehole. A total of 34 nos. of composite samples for graphite would be generated, one from each borehole and be analyzed for graphite mineralization (FC, Ash, Moisture and VM) and total Sulphur.

4.6. Analysis for Rare Earth Elements (REE)

A total 10 nos. of samples shall be analyzed for Rare Earth Elements (REE).

4.7. ICP-MS studies (34 trace elements)

A total 10 nos. of samples shall be analyzed for trace elements (34 nos.) by ICPMS method spectroscopic studies.

4.8. XRD Studies

A total 20 nos. of sample shall be subjected for XRD studies.

4.9. Petrological & Mineragraphic Studies

Thin section studies on surface and drill cores samples would be done for ascertaining the petrographic & mineragraphic characteristics. A provision of 40 specimens (20 specimens are for petrographic studies & 20 specimens are for mineragraphic studies) has been kept.

4.10. Specific Gravity Determination

To derive the tonnage factors, 5 nos. of sample are proposed to be subjected for specific gravity determination. The samples are to be drawn from ore zones/ mineralized zones.

4.11. Bulk Density Determination

A total 5 nos. of graphite sample shall be analyzed for bulk density for estimation of resource.

5. Nature Quantum and Target

The quantum of work proposed by OMECL in Lamer-Panga Graphite block A (G3 Area) is given in table below:

**Envisaged Quantum of proposed work in Lamer-Panga
Block A (G3 Area)**

SI No.	Item of Work	Unit	Quantum of Work
A	GEOLOGICAL WORK		
1	Geological Mapping (1:5000 Scale)	Sq. Km.	13.99
2	Topographic Survey	Sq. Km.	13.99
B	SURVEY (1:5000)		
1	Demarcation of lease boundary, Fixation of Borehole and determination of coordinates & Reduced Level (RL) of the boreholes by DGPS	point observation	40
C	DRILLING		
1	Surface Drilling	m	2040
2	Core logging	m	2040
3	Construction of concrete pillar(12"x12"x30")	Bore hole/Pillar	40
5	Camp setting	drill	1
6	Camp winding	drill	1
7	Approach road making	km	20
8	Drill core preservation	m	2040
D	GROUND GEOPHYSICAL SURVEY		
1	Self-potential / Charged Potential	Line Km	25
E	LABORATORY STUDIES		
1	Chemical Analysis		
	i) Primary samples and Check samples for Graphite (Core Samples)		
	a) Primary samples for Proximate Analysis (Ash, Moisture, V.M. and F.C.)	Nos	550
	b) Check sample Proximate Analysis (Ash, Moisture, V.M. and F.C.)	Nos	55
	c) REE	Nos	10
	ii) Composite Samples for Graphite (Core Samples)		
	a) Proximate Analysis (Ash, Moisture, V.M. and F.C.)	Nos	34
	b) Total Sulphur (S)	Nos	10
2	Physical Analysis		
i)	X-RD Studies	Nos	20

ii)	ICP -MS studies (34 trace elements)	Nos	10
iii)	Preparation of thin section	Nos	20
iv)	Petrographic studies	Nos	20
v)	Preparation of polished section	Nos	20
vi)	Mineralographic studies	Nos	20
vii)	Specific gravity	Nos	5
viii)	Bulk density	Nos	5
F	TENDER PREPARATION, PUBLISHING AND FINALISATION	Nos.	1
G	GEOLOGICAL REPORT PREPARATION	Nos.	1
H	PEER REVIEW	Nos.	1
I	PREPARATION OF EXPLORATION PROPOSAL	Nos.	1

6. Manpower deployment

Manpower deployment List will be provided later.

7. Break-up of expenditure

Cost has been estimated based on actual schedule of charges mandated in the circular OM No. 61/1/2018-NMET dated 31st March 2020 for promotional projects of MOM.

The total estimated cost is Rs. **450.08319 Lakhs**. The cost estimates for geological exploration (G3 Level) are given in Table below.

ESTIMATED COST FOR G3 LEVEL OF EXPLORATION FOR GRAPHITE IN LAMER - PANGA BLOCK A, DISTRICT - KALAHANDI, ODISHA (PROPOSED G3 AREA: 13.99 SQ. KM, NOS. OF BOREHOLE - 34 NOS., BOREHOLE DEPTH RANGE - 60 M, SCHEDULE TIMELINE - 16 MONTHS)							
Sl. No.	Item of Work	Unit	Rate as per NMET SoC 2020-21		Estimated cost of proposal		Remarks
			SoC item Sl. No.	Rate as per SoC (in Rs)	Quantum of Work	Total Amount (Rs.)	
A	GEOLOGICAL WORK						
1	Charges for One Geologist - Field	per day	1.3	11,000	150	16,50,000	
2	Charges for One Geologist - HQ	per day	1.3	9,000	30	2,70,000	
3	Labour Charges for Geological mapping (2 Nos.) Base rate- 443/-	per day	5.7	443	300	1,32,900	(Amount will be reimbursed as per notified rates by central labour Commission rates or respective State Govt. Whichever is higher)
4	Charges for one Sampler	per day	1.5.2	5,100	120	6,12,000	
5	Labour Charges for sampling work (4 Nos.) Base rate- 443/-	per day	5.7	443	480	2,12,640	(Amount will be reimbursed as per notified rates by central labour Commission rates or respective State Govt. Whichever is higher)
Sub Total-A						28,77,540	

B	SURVEY (1:5000)						
1	Demarcation of lease boundary, Fixation of Borehole and determination of coordinates & Reduced Level (RL) of the boreholes by DGPS	Per point observation	1.6.2	19,200	40	7,68,000	
2	Charges for 1 Surveyor (1 Party)	one surveyor per day	1.6.1a	8,300	60	4,98,000	
3	Labour charges for Survey (4 Nos.) Base rate- 443/-	per day	5.7	443	240	1,06,320	(Amount will be reimbursed as per notified rates by central labour Commission rates or respective State Govt. Whichever is higher)
Sub Total-B						13,72,320	
C	DRILLING						
1	Surface Drilling	per m	2.2.1.4	11,500	2040	2,34,60,000	
2	Land/Crop compensation	Per Bore hole	5.6	20,000	34	6,80,000	As per actuals as certified by local authorities subject to a maximum of 20,000 per borehole
3	Construction of concrete pillar(12"x12"x30")	Per Bore hole/Pillar	2.2.7a	2,000	40	80,000	
4	Monthly Accommodation charges for drilling camp (up to 2 rigs)	Per Months	2.2.9	50,000	3	1,50,000	
5	Camp setting	Per drill	2.2.9a	2,50,000	1	2,50,000	
6	Camp winding	Per drill	2.2.9b	2,50,000	1	2,50,000	
7	Approach road making	Per km	2.2.10b	32,200	20	6,44,000	
8	Drill core preservation	Per m	5.3	1,590	2040	32,43,600	
Sub Total-C						2,87,57,600	
D	GROUND GEOPHYSICAL						

	SURVEY						
1	Self-potential / Charged Potential	Line Km	3.3a	29,600	25	7,40,000	
Sub Total-D						7,40,000	
E	LABORATORY STUDIES						
1	Chemical Analysis						
	i) Primary samples and Check samples for Graphite (Core Samples)						
	a) Primary samples for Proximate Analysis (Ash, Moisture, V.M. and F.C.)	Nos	4.1.16	3,000	550	16,50,000	core sample (500m) + 50 grab sample
	b) Check sample Proximate Analysis (Ash, Moisture, V.M. and F.C.)	Nos	4.1.16	3,000	55	1,65,000	
	c) REE	Nos	4.1.13	5,380	10	53,800	
	ii) Composite Samples for Graphite (Core Samples)						
	a) Proximate Analysis (Ash, Moisture, V.M. and F.C.)	Nos	4.1.16	3,000	34	1,02,000	
	b) Total Sulphur (S)	Nos	4.2.14	1,900	10	19,000	
2	Physical Analysis						
i)	X-RD Studies	Nos	4.5.1	4,000	20	80,000	10 core samples + 10 grab samples
ii)	ICP -MS studies (34 trace elements)	Nos	4.1.14	7,731	10	77,310	
iii)	Preparation of thin section	Nos	4.3.1	2,353	20	47,060	
iv)	Petrographic studies	Nos	4.3.4	4,232	20	84,640	
v)	Preparation of polished section	Nos	4.3.2	1,549	20	30,980	
vi)	Mineralographic studies	Nos	4.3.4	4,232	20	84,640	
vii)	Specific gravity	Nos	4.8.1	1,605	5	8,025	

vii)	Bulk density	Nos	4.10	3,540	5	17,700	
Sub Total-E						24,20,155	
Total A+B+C+D+E						3,61,67,615	
F	Tender preparation, publishing & finalization	one time	2.3			5,00,000	2% of the approved project cost or 5 lakh whichever is lower will be paid one time to exploration agency.
G	GEOLOGICAL REPORT PREPARATION	One Number (5 Hard copies) along with soft copy	5.2			10,85,028	Project cost exceeding 300 Lakh: A minimum of Rs 9 lakh of 3% of the work whichever is more and Rs 3000/- per each additional copy
H	PEER REVIEW		As per EC decision			10,000	
I	PREPARATION OF EXPLORATION PROPOSAL	One Number (5 Hard copies) along with soft copy	5.1			3,80,000	2% of approved project cost or 3.8 lakh whichever is lower
Total F+G+H+I						19,75,028	
Total A+B+C+D+E+F+G+H+I						3,81,42,643	
GST 18%						68,65,676	
Grand Total (A+B+C+D+E+F +G+H+I+18% GST)						4,50,08,319	

8. Time Schedule/Action plan

TIME SCHEDULE FOR G3 STAGE EXPLORATION PROPOSAL FOR GRAPHITE ORE IN LAMER-PANGA BLOCK A, KALAHANDI DISTRICT, ODISHA																					
SI No.	Item of Work	unit	1	2	3	4	5	6	7	8	9	Review	10	11	12	13	14	15	16	Quantity	
1	Camp Setting	Month																			1
2	Geological Mapping	Sq. Km																			13.99
3	Geological Party days	Party days																			150
4	Survey Party days	Party days																			60
5	Geophysical Survey (Self-potential)	Line Km																			25
6	Geophysical Report Preparation	Month																			1
7	Surface Drilling	m																			2040
8	Sampling Party days	Party days																			120
9	Laboratory Studies	Nos.																			779
10	Camp Winding	Months																			1
11	Report Writing with Peer Review	Months																			4
Note 1: Commencement of project may be reckoned from the day the exploration acreage is available along with all statutory clearance.																					
2: Time loss on account of monsoon/ agricultural activities/forest clearance/local law and order problem/lockdown etc. will be additional to above timeline.																					

9. References:

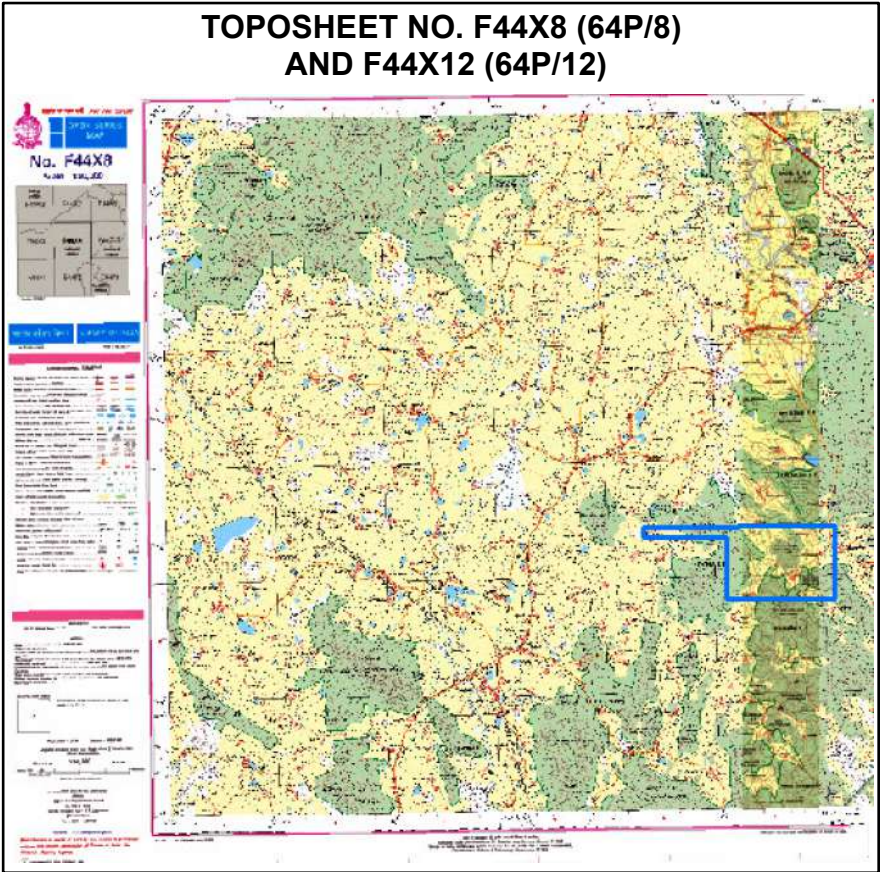
- Geological Investigation for Graphite In The Titlagarh Graphite Belt, Bolangir District, Orissa in 1972-73 By Shri S.C.Kanungo, Geologist, Geological Survey of India.
- Graphite Investigation in the Eastern Ghats in 1968-69 by Shri Animesh Bhattacharya, Geologist, Geological Survey of India.
- District Resource Map Kalahandi district, Odisha, Geological Survey of India
- Report on the Graphite investigation in parts of Bolangir, Kalahandi and Phulbani districts, Orissa (Field Seasonm1983-84 BY GSI)

List of Plates

- Plate I: Toposheet map with proposed block boundary on 1:50000 scale.
Plate II: Google Earth map of the proposed block.
Plate III: Geological Map of the proposed block (Source: GSI).
Plate IV: Borehole plan over the proposed block in 1:20000.

MAP SHOWING PROPOSED LAMER-PANGA GRAPHITE BLOCK-A OVER AN AREA OF 13.99 Sq.Km. ON PART OF TOPOSHEET NO. F44X8 (64P/8) AND F44X12 (64P/12) FOR G3 EXPLORATION IN KALAHANDI DISTRICT, ODISHA

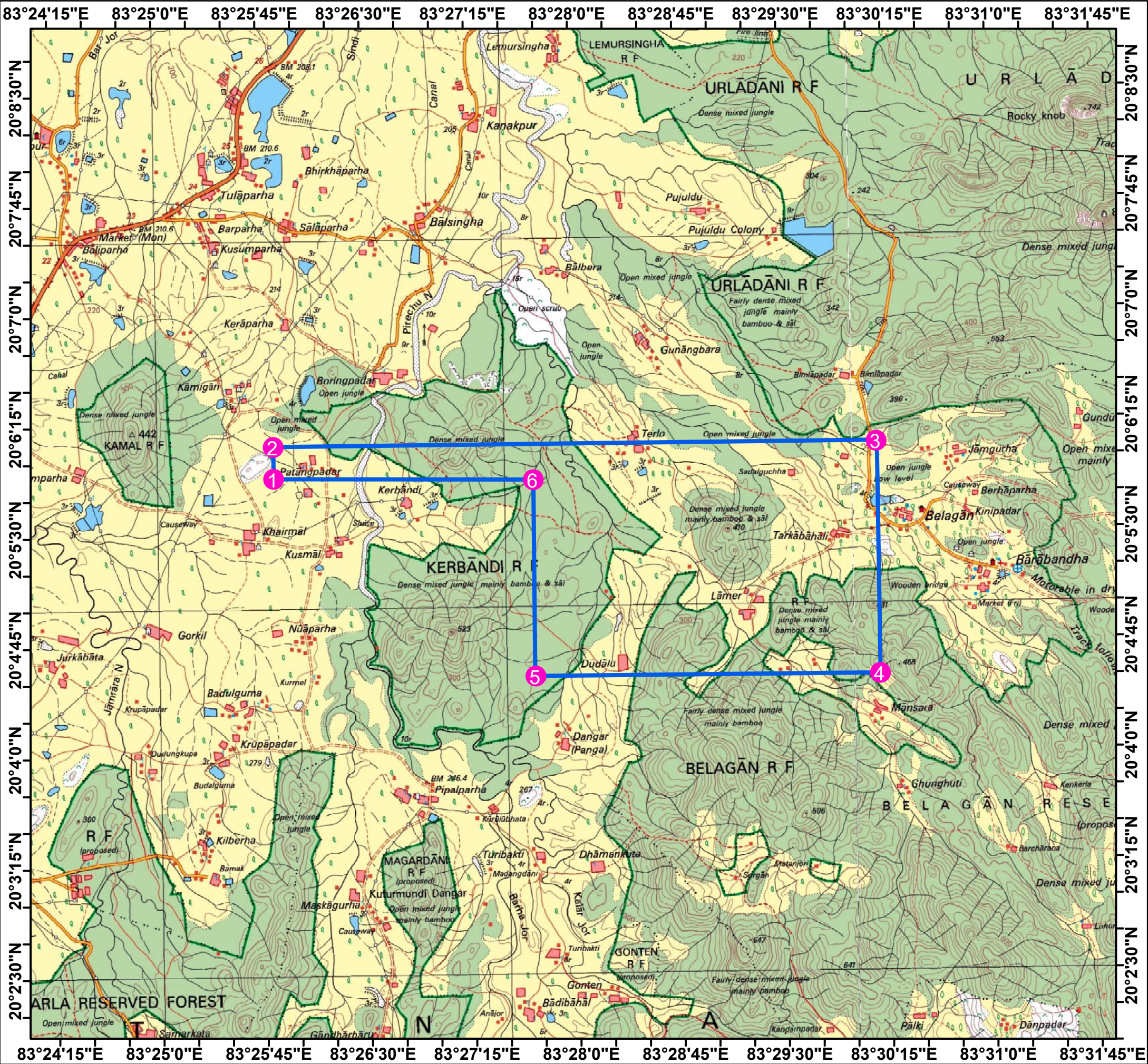
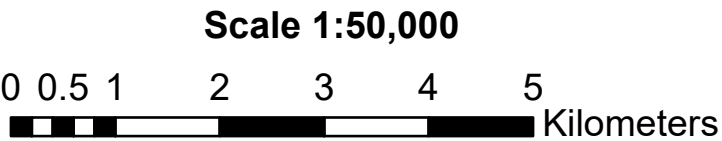
PLATE-I



BLOCK CORNER POINTS COORDINATES (PLAN-B)				
Point	Latitude	Longitude	Lat_UTM	Long_UTM
1	20°5'53.652" N	83°25'49.818" E	2224205	754144
2	20°6'6.635" N	83°25'50.146" E	2224605	754148
3	20°6'5.83" N	83°30'11.023" E	2224692	761729
4	20°4'30.905" N	83°30'11.158" E	2221772	761777
5	20°4'31.52" N	83°27'42.045" E	2221728	757530
6	20°5'51.638" N	83°27'42.45" E	2224191	757418

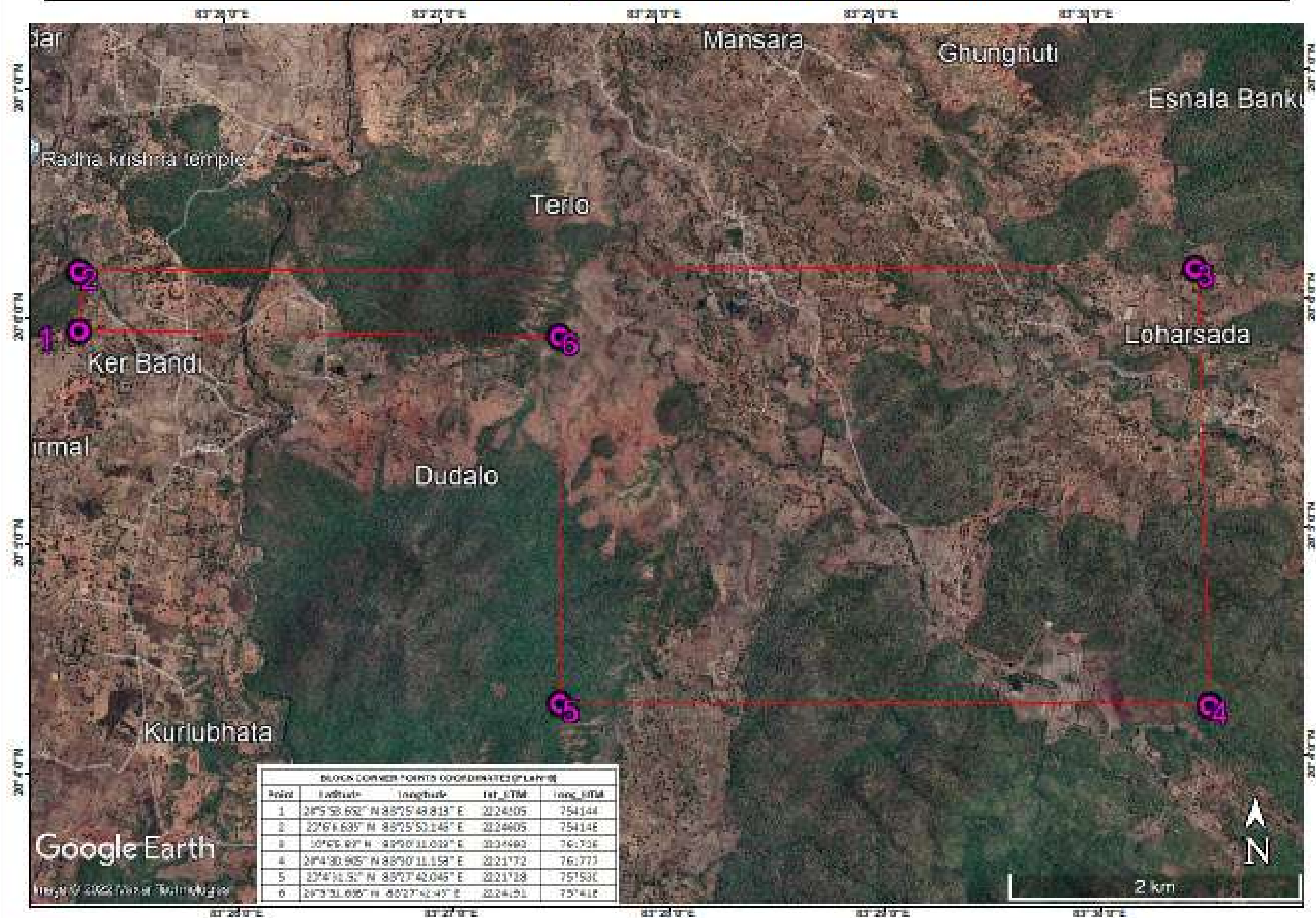
Legend

-  Proposed Lamer-Panga Graphite Block A (G3) Boundary
-  Block Corner Points



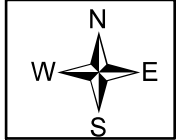
GOOGLE LOCATION MAP SHOWING PROPOSED LAMER-PANGA GRAPHITE BLOCK-A (G3) OVER AN AREA OF 13.99 Sq.Km. IN KALAHANDI DISTRICT, ODISHA

PLATE-II



MAP SHOWING LAMER-PANGA GRAPHITE BLOCK-A OVER AN AREA OF 13.99 Sq.Km.
IN KALAHANDI DISTRICT, ODISHA ON GEOLOGICAL MAP OF GEOLOGICAL SURVEY OF INDIA

PLATE-III



Lithology

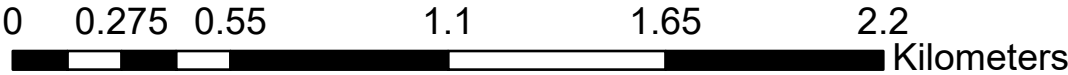
- Soil
- Garnetiferous Granite Gneiss
- Garneteferous Garnite gneiss of migmatite
- Pyroxene Granulite
- Calc-Granulite
- Quartz-Garnet-sillimanite±graphite gneiss
- Quartz-Graphite Schist
- Quartzite
- Talus of Quartzite

Legend

- Proposed Lamer-Panga Graphite Block A (G3) Boundary
- Block Corner Points
- Contour Line
- Graphite Sample Location
- Foliation
- Villages

BLOCK CORNER POINTS COORDINATES (PLAN-B)				
Point	Latitude	Longitude	Lat_UTM	Long_UTM
1	20°5'53.652" N	83°25'49.818" E	2224205	754144
2	20°6'6.635" N	83°25'50.146" E	2224605	754148
3	20°6'5.83" N	83°30'11.023" E	2224692	761729
4	20°4'30.905" N	83°30'11.158" E	2221772	761777
5	20°4'31.52" N	83°27'42.045" E	2221728	757530
6	20°5'51.638" N	83°27'42.45" E	2224191	757418

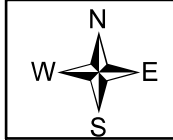
Scale: 1:20,000



83°26'0"E 83°27'0"E 83°28'0"E 83°29'0"E 83°30'0"E

GEOLOGICAL MAP SHOWING PROPOSED BOREHOLES IN LAMER-PANGA GRAPHITE BLOCK-A (G3)
OVER AN AREA OF 13.99 Sq.Km. IN KALAHANDI DISTRICT, ODISHA

PLATE-IV

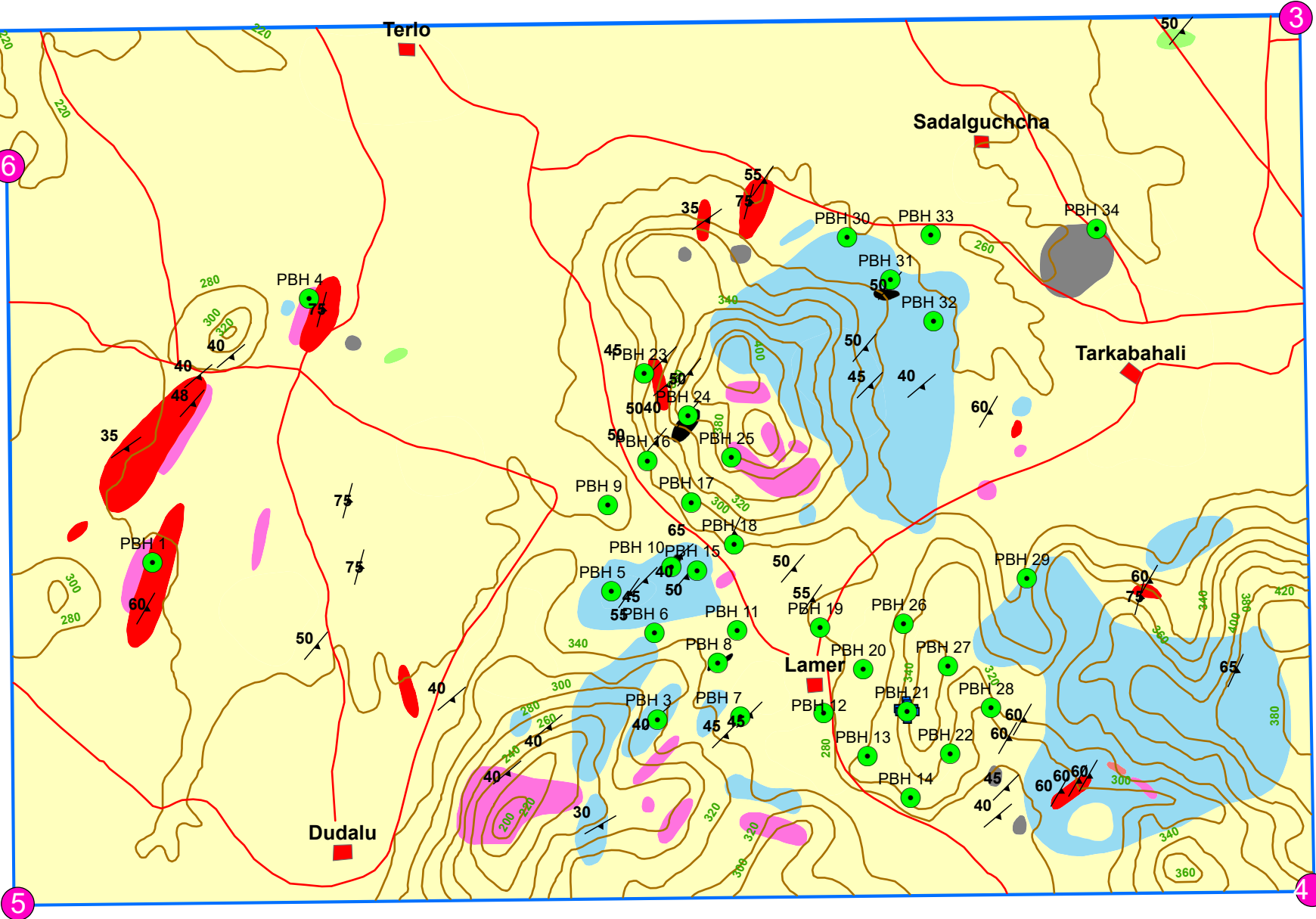


Lithology

- Soil
- Garnetiferous Granite Gneiss
- Garneteferous Garnite gneiss of migmatite
- Pyroxene Granulite
- Calc-Granulite
- Quartz-Garnet-sillimanite±graphite gneiss
- Quartz-Graphite Schist
- Quartzite
- Talus of Quartzite

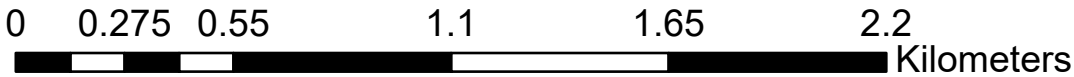
Legend

- Proposed Lamer-Panga Graphite Block A (G3) Boundary
- Block Corner Points
- Proposed Borehole Location (PBH)
- Contour Line
- Graphite Sample Location
- Foliation
- Villages



BLOCK CORNER POINTS COORDINATES (PLAN-B)				
Point	Latitude	Longitude	Lat_UTM	Long_UTM
1	20°5'53.652" N	83°25'49.818" E	2224205	754144
2	20°6'6.635" N	83°25'50.146" E	2224605	754148
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5	20°4'31.52" N	83°27'42.045" E	2221728	757530
6	20°5'51.638" N	83°27'42.45" E	2224191	757418

Scale: 1:20,000



83°26'0"E 83°27'0"E 83°28'0"E 83°29'0"E 83°30'0"E