P-3321

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Ref: MMPL/KOL-NMET/2023-17

Date: 30/09/2023

To,
The Commissioner,
Directorate of Mines & Geology
Government of Odisha

Sub: Submission of Detailed Project Report for G4 stage investigations on identified areas of Odisha state

Respected Sir,

Maheswari Mining Pvt. Ltd, has been accredited as a Private Notified Exploration Agency under Ministry of Mines vide certificate no. NABET/AEA/004.

We are hereby submitting our Detailed Project Report of Darukona Graphite Block to the State DGM & NMET.

It is requested to you kindly consider these detailed proposal .The details of the blocks along with the attachments enclosed are as follows:

PROPOSED BLOCK	COMMODITY	DISTRICT	TOPOSHEET NO
Darukona Block	Graphite	Raygada	65M/11

Looking forward to have a positive response from your end.

Yours Faithfully

MAHESHWARI MINING PVT. LTD. Kolkata

Anusrita Thakur
Senior-Geologist

For & On Behalf of Maheshwari Mining Pvt. Ltd.
Date: 30.09.2023

Proposal for Darukona Block, Rayagada District, Odisha State for Reconnaissance Survey (G4 Stage)under NMET.

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

By

Maheswari Mining Pvt. Ltd.

Place: Kolkata
Date: 30.09.2023

Summary of the Block for Reconnaissance Survey (G4 Stage)
GENERAL INFORMATION ABOUT THE BLOCK

	Features	Details
	Block ID	Darukona Graphite Block
	Exploration Agency	Maheswari Mining Pvt. Ltd.
	Commodity	Graphite
	Mineral Belt	Eastern Ghats Mobile Belt, Rayagada District, Odisha
	Completion period with entire time schedule to complete the project	12 months
	Objectives	
	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 Maheshwari Mining Private Ltd.
	Name/Number of Geoscientists	In field: Three Geoscientists (Two Geologists and one Geophysicist) and one Surveyor. At Headquarters: 2 Geoscientists.
	Expected field days (Geology) Geological Party Days	Expected field days: In field: 240 party days for a party of 2 Geologists; 30 days for 1 Geophysicist; 30 days for 1 Surveyor. At Headquarters: 2 Geologists (120 mandays each)
1.	**Location**	
	Latitude	19° 25' 00.00"N to 19° 30' 00.00"N
	Longitude	83°30' 00.00"N to 83°37' 30.00"E
	Villages	Darukona
	Tehsil/Taluk	Bissamcuttack
	District	Rayagada
	State	Odisha
2.	**Area (hectares / square kilometres)**	
	Block Area	11900 Ha or 119 sq km
	Forest Area	
	Government Land Area	
	Private Land Area	
3.	**Accessibility**	
	Nearest Rail Head	Chatikona which is on East Coast Railway 29 km from Kanapulisi.
	Road	The distance from the district headquarters Rayagada is about 62 kms.
	Airport	Visakhapatnam is the nearest Airport is at 272 km.
4.	**Hydrography**	
	Local surface drainage pattern (channels)	Surface pattern is subdendritic
	Rivers/Streams	The drainage system of the area is controlled by Burhabandha Nala, Kumbhikada Nala and Saharha Nala flowing from the SE to NW, S to N and SE to NW respectively along with their first order and second order nalas control the drainage system of the area which finally feed to the river Vanshadhara in downstream.
5.	**Climate**	
	Mean Annual Rainfall	1280mm

	Temperatures (December)(Minimum) Temperatures (June)(Maximum)	December:7^{0}C to 8^{0}C May: 46^{0}C
6.	**Topography**	
	Toposheet Number	65M/11
	Morphology of the Area	The area represent highly undulated topography characterized by lofty hills like Munda Pahar and Kumbhia Pahar in the central part of the area and flanked by valleys in the eastern and western part. The valley regions are dotted with NNW- SSE isolated hillocks around Panasagurha, Burhuni, Naringipanga.
7	**Availability of baseline geosciences data**	
	Geological Map (1:50K/25K)	1:50K map is available.
	Geochemical Map	Not Available
	Geophysical Map (Aeromagnetic, ground geophysical, Regional as well as local scale GP maps)	Not Available
8.	**Justification for taking up Reconnaissance Survey/ Regional Exploration**	Graphite bodies of economic importance occur in the Eastern Ghats migmatite complex of Odisha, India, which consists of sillimanite-rich gneiss (khondalite), calc-silicate granulite, basic (pyroxene) granulite and acidic gneiss palaeosomes and a variety of quartzo feldspathic neosomes and pegmatite veins. There is more graphite in migmatised khondalite and calc-silicate granulite than in their unmigmatised counterparts and it is common at pegmatite-country rock margins. Lodes of graphite are structurally controlled by fold hinge zones, necks of boudins and along the dominant foliation in rocks that show the effects of polyphase deformation. Faults, fractures and joints also act as structural controls. The richest lodes are located where there is the coincidence of several lithological and structural features. The graphite occurs in graphite-rich schists and gneisses, as veins and as disseminated flakes along grain boundaries and in microfractures and cleavages. It is present in all rock types except pegmatites emplaced after the D_4 deformational phase, and is localised in structures developed during the D_1, D_2, D_3 and D_4 phases. Most of the bodies of graphite are lenticular and show pinch and swell characters. The present area hosts pelitic and psammopelitic meta sediments often migmatised to varibale degree with the characteristic mineral assemblages like graphite and sillimanite. The area is in close proximity to the famous Tumudibandh Graphite Belt controlled by the Tumudibandh shear zone. During reconnaissance traverse, in-situ exposures of graphite bearing khondalites and calc-granulite have been noticed around village Darukona, Hajaridanga, Dukumu

		of variable dimensions and grade in which graphite occurs as disseminations and minor vein lets. Analysis of few grab samples collected indicates FC content varying from 3.29 to 12.30. State Directorate had also located few pockets without any detailed assessment. In order to assess the geospatial disposition and to study the grade and resource potential of the graphite incidences the present exploration will be taken at G4 stage for further up scaling to higher level of MEMC rule.

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

1. Block Summary

In view of the auction policy of the Government of India and demand of more explored blocks Govt. of India amended the MM (D&R), 1957 in 2021 allowing Private Agencies to be a stake holders in explorations of major minerals in a time bound manner in which the funds will be provided by the NMET instituted by Govt. of India (Notification, NPEA, 2021).

India is a major global producer of flake graphite. The country has been ranked amongst the top five graphite producers by the USGS. Graphite occurrences are reported from different states including Jammu and Kashmir, Arunachal Pradesh, Gujarat, Jharkhand, Maharashtra, Karnataka, Kerala, Tamil Nadu, Odisha, Chattisgarh and Rajasthan. However, the deposits of economic importance are located in Andhra Pradesh, Chattisgarh and Arunachal Pradesh, which are yet to be exploited. As far as mining and processing of graphite is concerned, Jharkhand, Odisha and Tamil Nadu are the only states where operations are being conducted. The worldwide as well as in the country, demand for graphite is increasing with the development of non-carbon energy applications such as batteries used in electric vehicles, electric devices and energy storage devices that use graphite. To fulfil demand and to keep a balance between demand and production, it is essential to develop the resources of graphite in country.

In view of the auction policy of the Government and demand of graphite in the domestic industries, emphasis for assessment of graphite is warranted. In order to carve out an auctionable block, Government of Odisha accorded "in principle approval" for the agency vide L.No. 7664 Dt.- 05.06.2023 to undertake geological prospecting at G4 level to identify potential graphite bearing areas in T.S.No. 65M/11 where the agency M/s Maheswari Mining Private Ltd. performed some ground work with the background geology available and identified potential graphite prospects which can be taken up for detailed assessment from reconnaissance to exploration at different levels so as to support the State Govt. for putting potential blocks for auction with our effort to contribute for mineral development of the State.

Physiography and Drainage:

The area represents highly rugged terrain with undulated topography characterized by lofty hill ranges intervened by intermundane valleys. A prominent NS valley dissects the block in central part.

The hill ranges seems to be structurally controlled and aligned in NNW- SSE part to NS in the central and western part, beside this few conical hills with steep scarp are also observed in central and southern part. Chatikona RF and Burhuni RF and Kumbhia pahar form the prominent hill ranges. The highest elevation is 957m above MSL in Kumbhia Pahar while 335m is the lowest elevation in the valley around Bissamcuttack.

The drainage system of the area is controlled by Burhibandha Nala and Bamana Nala flowing from the N to S and E to W respectively along with their first order and second order nalas and control the drainage system of the area which finally feed to the river Vanshadhara in lower reaches.

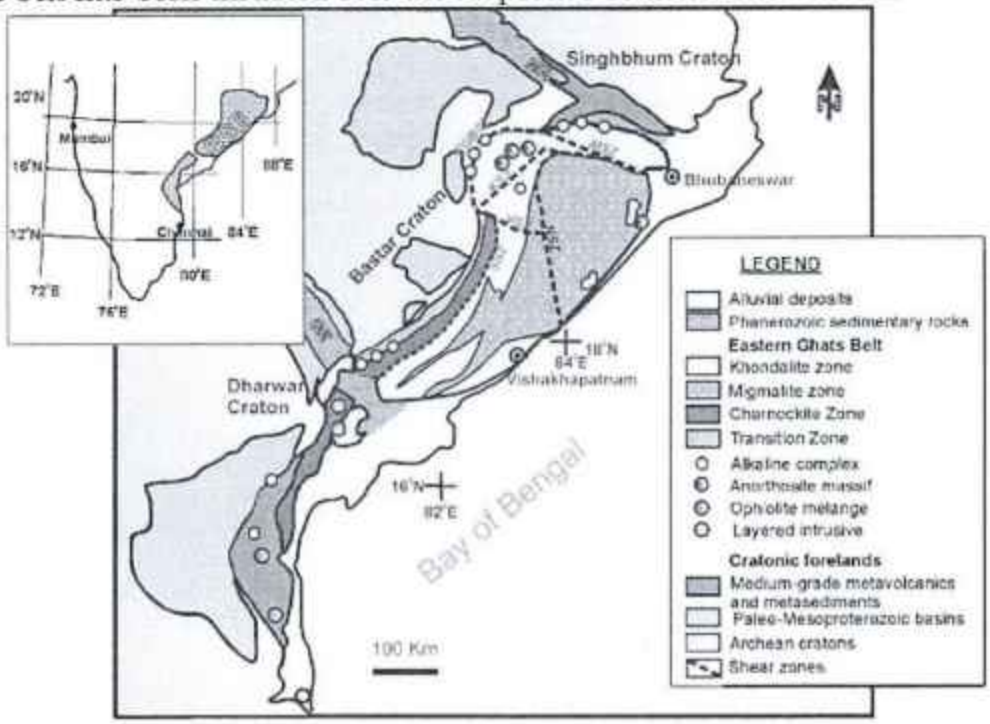
Climate:

The area experiences sub-tropical climate with heavy monsoon downpours, extreme cold during winter and hot summer months. The temperature exceeds in summer up to 46^0 and falls to $7^0$to 8^0 during winter. The average annual rainfall in the area is approximately 1280 mm.

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

Regional Geology of the area:

The area of exploration forms a part of Eastern Ghats Mobile Belt which skirts the eastern fringe of Dharwar and Bastar Cratons and the southern fringe of Singhbhum Craton. This belt has been sliced off along eastern continental margin of India. In western and northern part, this belt has been thrusted over the respective Cratons. The Eastern



Ghats Mobile Belt is also cut across by Gondwana grabens of the Mahanadi and the Godavari. It consists of a typical litho assemblages of charnockites, supracrustals of khondalite group (dominated by garnet-sillimanite gneiss with sub-ordinate quartzite, marble and calc-silicate), migmatised gneisses (leptynite and orthogneiss) and granitoids. All have been metamorphosed in upper amphibolite to granulite facies. Younger intrusions of anorthosites, alkaline rocks and granites are also conspicuous in this belt (Ramakrishnan et.al. 1998). Retrograde metamorphism has been reported in this belt (Sen et. al. 1995). In general, the Eastern Ghats Mobile Belt is tightly folded into isoclinal and recline folds, the axial plane of which plunges south-easterly due to strong forces of compression directed from south-east (Chetty et. al. 1998). Nanda (1995) divided the Eastern Ghats Mobile Belt into four longitudinal litho zones depending on the predominance of litho types. These are western Charnockite Zone (WCZ), Western Khondalite Zone (WKZ), Central Migmatite Zone (CMZ) and Eastern Khondalite Zone (EKZ). The present area of exploration lies in the Western Khondalite Zone.

Mahalik (1998) has divided Odisha into three geological sectors. Present area of exploration lies in the south Odisha sector. Rocks of the region have been affected by two typical tectonic trends; the NE-SW trend, commonly known as the Eastern Ghats trend (oldest) and NW-SE trend, known as Nagavalli- Vansadhara trend. The NW-SE trend has been off-set by two major faults, the Eastern Ghats Boundary Fault and Tel River Shear. The NW-SE trend between Koraput and Bhawanipatna gets deflected to north-south orientation and continues up to Gandhamardan hill where it again deflected to NE-SW trend forming an arcuate belt. Faults and shear zones of south Odisha sector have genetically related either to the Eastern Ghats trend (NE-SW) or Nagavalli-Vansadhara trend (NW-SE).

The broad stratigraphic framework of Eastern Ghats Super Group postulated by Ramakrishnan et al (1998) is as follows.

800-900 Ma	Alkaline rocks, granitoids
	-------Eastern Ghats Orogeny-------
1000-1100 Ma	Development of Eastern Ghats 'Front' of upgraded cratonic rocks
	Incipient and massive charnockite and garnet-hornblende-biotite gneisses and garnetiferous gneiss with biotite and sillimanite
1300-1400 Ma	Emplacements of alkaline rocks (feldspathoidal gneisses) and anorthosites
Khondalite Group (WKZ,CMZ&EKZ)	Garnet-sillimanite-graphite gneisses
	Cordierite-sapphirine-spinel rocks
	Calc-silicate rocks and rare marbles
	Quartzite rich in garnet (and some sillimanite)
	(The whole suite interleaved with charnockites)
1600-1800 Ma	Evolution of Purana basins
2600-2800Ma	Charnockites with enclaves of basic granulites, high grade (WCZ) schists including BIF, and layered basic complexes, representing original cratonic basement (?) in 'migmatitic' amphibolite facies
3000 Ma	Vestigial events (?)

The area under exploration forms a part of Eastern Ghats Super Group of rocks of Archaean age comprising politic and psammopelitic schists and gneisses viz: khondalite suite of gneisses, charnockite, quartzo-feldspathic gneiss and pegmatite overlain by recent soil and alluvium. The litho units form more or less banded assemblages with permeations of neosomes, pegmatites and vein quartz. The litho units exhibits foliations varying from N40° -60° W-S40° -60° E dipping at 50° to 75°southwesterly. Pegmatite occurs as intrusives within the migmatised khondalite. Based on the field studies and earlier works of various eminent geoscientists (Ramakrishna etal, 1998), the regional stratigraphy surrounding this region can be enumerated as follows:

Recent to sub recent	Soil/Alluvium
	Laterite
Intrusive	Pegmatite/vein quartz
	Porphyroblastic granite gneiss
	Garnetiferous granite gneiss
	Charnockite
	Pyroxene Granulite
Archaean	Khondalite suite : Quartzite, Migmatised
	Khondalite, calc granulites (± Graphite)

Local Geology and Stratigraphy:

Geological traverses over the area revealed that area is occupied by para and ortho metamorphites of EGMB forming high rising hillocks and mounds with intervening valleys which mostly soil covered with scanty exposures of khondalite and its variants, pyroxene granulites, quartzo-feldspathic gneiss, charnockite, granite gneisses and pegmatites forming more or less banded assemblage with variable degree of alteration.

The rock formation exposed in the investigation area belong to the Eastern Ghats Super Group comprising mostly quartz-feldspar- garnet- sillimanite graphite schist gneiss (Khondalite), Quartzite, granite gneiss, migmatite, pegmatite and quartz veins, Khondalite and granite gneiss represent the predominant member among the above litho units and alternate in the entire terrain with an approximate NNW- SSE trending hills and ridge with the development of migmatite at their margins. The migmatised zones are variously folded and impregnated by quartz-feldspar veins. These migmatised zones are sporadically enriched with graphite mineralization. One such graphite mineralized zone of approximately 3.8 km. length has been traced between Hajaridanga in the north and Lelibarhi the south. Low grade disseminated type of graphite occurs intermittently within the mineralized zone at the contact of migmatised khondalite and/ calc granulite granite gneiss. Besides, in the NE part of the area few sporadic graphite occurrences are seen around Dukumu.

The foliation in the khondalite and granite gneiss is the most pervasive structural element. Besides, lineation, slickenside surface, cleavage and local folds are the associated structural features marked in the area.

The metasediments have foliation trend varying between NNE- SSE to NW-SE which persists almost over the entire terrain excepting a few local variations. The foliation in the metasediments dips towards west with varying angles from sub vertical to near vertical. Two sets of joints i.e strike joints and another NE-SE joint are very prominent in this terrain. The hills and nalas of this area seem to be joint controlled.

Based on their mutual field relation relationships, the following stratigraphic succession is suggested in order of their increasing antiquity.

Recent to sub recent	Soil/Alluvium
Intrusive	Pegmatite/VQ
	Quartzo-feldspathic gneiss (±graphite)
Archaean	Charnockite (migmatised)
	Khondalite suite of rocks (migmatised/kaolinised/±graphite)

Khondalite:

Khondalite is the oldest rock unit occurring in the area which are migmatised and altered to variable extent. It is exposed in the Nala cuttings & wall sections only and also in the scarp section of hills. It forms a banded assemblage with quartzites, quartzo-feldspathic gneiss, granite gneiss& often silicified. Because of close proximity to perennial streams, the lithounits have undergone higher degree of alterationand at places kaolinised. It is reddish brown to buff in colour, medium grained, inequigranular consisting essentially of quartz, plagioclase, sillimanite &/or graphite, garnet and opaque minerals which are scattered throughout the rock mass. Quartz and orthoclase are abundant; plagioclase, sillimanite are common and garnet isnoticed as an accessory. Secondary growth is noticed in most of the quartz grains. Under microscope

plagioclases are highly saussuritised. Iron solution leached out from the garnet imparts a reddish look to the rock mass. Flakes of graphite occur as dissemination within the khondalite. The trend of foliation in khondalite varies from NNE-SSW to N40°-60°W to S40°-S60°Edipping 55° to 70°westerly &southwesterly. Intense weathering and alteration of the constituent minerals rendered the litho units moderately fissile at places with kaolinisation of the plagioclage porphyroblasts. Hard and fresh khondalites are rare.

Charnockite:

Charnockites are exposed in bouldery form and xenoliths within granite gneisses in the slopes and often migmatised with granite gneiss in southwestern part of the area on the Nala banks. Megascopically, it is hard, massive, mesocratic and medium grained rock showing a distinct gneissic trend and exfoliation weathering features. Crude gneissosity is developed due to dimensional orientation of quartz and feldspar along a definite direction. Granulated prisms of hypersthene and flakes of biotite constitute the melanocratic bands whereas felsic bands are represented by quartz and feldspar. Mineralogically, it is composed of plagioclase, orthoclase, hypersthenes and quartz as major and biotite are found as accessory mineral. Equidimensional quartz and feldspar form a mosaic texture. Exfoliation weathering is also noticed.

Granite gneisses:

Granitic suite of gneisses and their migmatised equivalents are another predominant litho units in the area which occur in the mid contours and foothill regions of hill ranges and valleys with xenoliths of pelites and pyroxene granulites & charnockite. Both mesocratic and leucocratic medium to coarse grained granite gneisses have been observed in the area. In the valley portions porphyroblastic granite gneisses are also noticed.The trend of foliation in granite gneisses varies from NNE-SSW to N40°°W to S40°-Edipping 55° to 70°westerly. Granite suite of rocks have significantly migmatised the para-metamorphites giving rise to migmatites where graphite mineralizations are noticed.

Quartzo-feldspathic gneiss:

Quartzo-feldspathic gneiss is the second most predominant unit exposed in the valleys that occur in close association with granitic gneisses. It occurs as sheet rocks and highly weathered and altered enclosing enclaves of mesocratic gneisses in bouldery form on the surface and closely associated with migmatised khondalite exhibiting crude foliation andexfoliationweathering and is encountered in the nala cuttings. It is a medium to coarse grained highly altered and weathered rock showing a distinct gneissic trend. Both quartz and feldspar show dimensional orientation along the folial plane. Garnets are highly altered with leaching out of iron solution. Secondary over-growth in most of the quartz grains indicates a sedimentary parentage. It is essentially composed of quartz, orthoclase, plagioclase and graphite and garnets are found as accessory minerals. Opaque are scattered throughout the rock mass. Graphite flakes occur as disseminations along the foliation of quartzo-feldspathic gneiss.

Pegmatite:

Small veinlets ofpegmatite/pegmatoids are exposed on the valleys both in northern and southern part of the area. These are mainly composed of megacrysts of quartz and feldspar where micaconstitutes a very less percentage showing concordant relationship with the country rock. The permeations are mostly foliation guided.

Soil and alluvium:

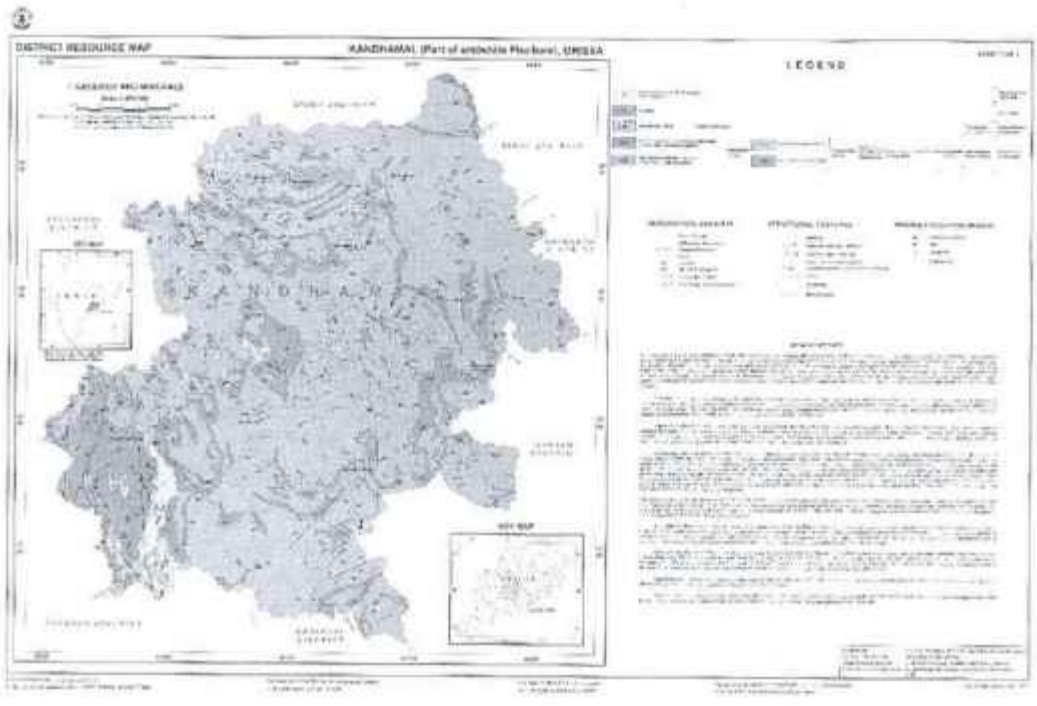
The valley parts of the area is covered with soil and alluvium with average thickness of 4m. Residual soil is formed by weathering of the in-situ country rocks. The alluvium is encountered in the narrow tracts which support the vegetation and agriculture of area. The soil is grayish in look and plastic. Both vertisols, transported soil and alluvium occupy the valleys and flood plains of ephemeral and perennial nalas.

Structure:

Both diastrophic and non-diastrophic structures are found within the litho assemblages. The diastrophic structures include foliation, shears, folds and faults and non-diastrophic structure include joint and impersistent mineral lineation. As revealed from the surface data, graphite mineralization is litho structurally controlled as it is confined to the foliation plane of quartzo-feldspathic gneiss and migmatised khondalite. The area is affected by granitic activity as a result of which meta-sediments are sheared. Drags and kinks are well marked in the migmatised khondalite. Secondary structural features are noticed in the litho units that include kinks and joints.

Study of satellite imagery revealed that the area lies in close proximity to the west of Tumudibandh Shear Zone (N-S running) and a N-S sympathetic shear passes through the area of proposal.

Tumudibandha shear zone map after Nash et.al. 1993



Similarly asymmetric minor shears of Tel shear (ENE-WSW) also cross cuts the Tumudibandha shear in WNW-ESW direction where the intersection of lineament offered suitable avenues for emplacement of granitic melt resulting in remobilization of graphite along the structural weak planes i.e. foliation in this case.

Foliation:
Foliations are well developed in khondalite, granite gneisses and quartzo-feldspathic gneiss. The general trend of the foliation of lithounits varies from NNW-SSE to N40°W-S40° E dipping 50°- 70°southwesterly.

Joints:
Two set of joints are well developed in khondalite and quartzo-feldspathic gneiss. One set of joint trends in N45° W-S45° E dipping 74° northwesterly and other set is parallel to the folial plane.

Metamorphism

Megascopic Petrographically studies of the lithounits revealed the following mineral assemblage signifies the metamorphic episodes the area has witnessed:

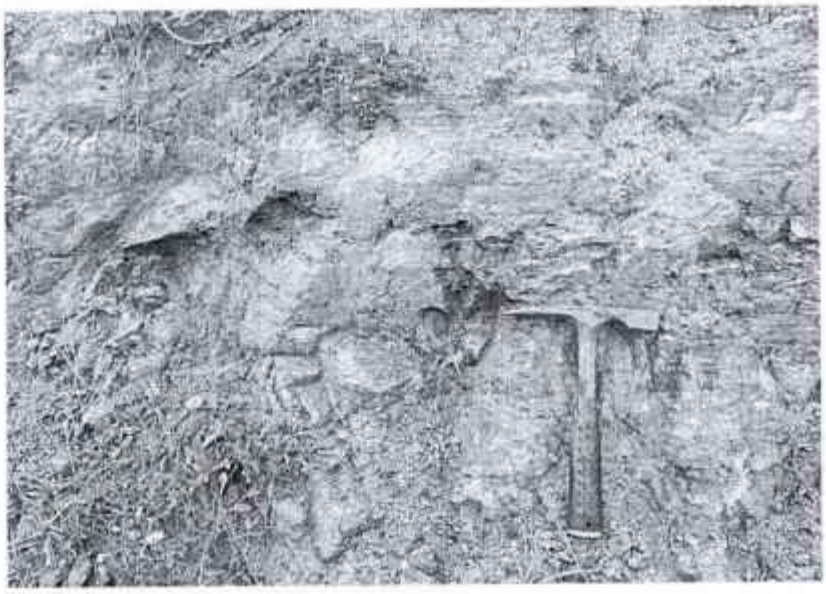
a. Quartz+ Orthoclase+Plagioclase+Sillimanite+Garnet+ graphite
b. Quartz +Plagioclase+ Orthoclase + Hypersthene+Biotite
c. Quartz+ Orthoclase+ Plagioclase+Garnet+Zircon

The above mineralogical assemblages& their mutual textural characteristicsare suggestive of high temperature– high pressure phenomena characteristic of granulite facies of regional metamorphism. Occurrence of biotite in the fracture planes of garnet and saussuritisation of feldspar are indicative of retrogression.

Mineralization Details:

The reconnaissance traverses under taken in the area and background information collected from the agenda volume of SGPB it is inferred that the area is a potential graphite prospects in which nine occurrences of graphite have been reported and well within the influence of Tumudibandha shear zones in its western part. It is expected that out of 119 Sq Km area 10-15 sq.km. area (Cumulatively) would be potential for geophysical survey. Migmatised khondalite & quartzo feldspathic gneiss occur concomitantly& graphite mineralisation is restricted only to the contact zones (more pronounced in the hanging wall side of quartzo - feldspathic gneiss & less often in the foot wall. Graphite chiefly occur as dessiminations and veinlets along foliation of host rocks in conformity to the migmatised foliations and at places in the sympathetic lineaments.It is inferred that numerous sporadic pockets of graphite mineralised zone persists within the area.

During reconnaissance traverse within the proposed block few occurrence of graphite mineralization have been noticed and grab samples have been collected for chemical assay. It is noticed that graphite disseminations are foliation controlled within the migmatised Khondalites and Granite-gneiss.



Graphite schist near Dukumu

Graphitised khondalite near Darukona

Migmatised khondalite with Graphite near Hajaridanga

Graphite mineralization is litho-structurally controlled & mineralisation has been facilitated by granitic gneisses which seems to act like a scavenger and graphite is a remobilized product follows emplacement of quartzo feldspathic gneiss & migmatisation. As a whole mineralisation within the area, has been proved to be restricted within valleys and lower contours. Graphite being a constituent mineral of migmatised khondalite occurs as disseminations within the host rock as flakes and fibers. Size of graphite tiny flakes & fibers varies from 1 to 5 mm are randomly distributed exhibiting a preferred orientation in conformity to the foliation and defines schistose plane.

However, mineralogical studies indicate that graphite occurs as disseminated flakes and fibers along the folial plane of migmatisedkhondalite and quartzo feldspathic gneiss and is of erratic nature. The deleterious elements present are quartz, plagioclase, orthoclase, biotite and opaques. Quartz grains showing secondary overgrowths occur as oval to lensoidal grains with sutured outline. Orthoclases are mostly perthitic and altered significantly to kaolin while plagioclases occur as platy crystals suffering from saussuritisation. The mineralisation is believed to be remobilized product of carbon during contact regional metamorphism facilitated during emplacement of quartzo-felspathic gneiss. Disseminated graphite bearing rocks occur as narrow tongues or ribbons and more often as lensoidal bodies. The chemical assay data of few grab samples collected by the agency from different localities analyses following assay for FC content which signifies its potentiality.

Sl. No.	Sample No.	Location of the graphite Body	FC	Ash	Moisture	LOI at 95°C
1	DUG-1	19° 29' 18.58"-83° 35' 55.03" Village Dukumu	2.34	91.43	2.64	8.57
2	DKG-2	19° 26' 50.27"-83° 34' 10.06 Village Darukona	6.17	90.53	1.05	9.47
3	HAZDG-3	19° 27' 5.93"-83° 34' 5.32 Village Hajaridanga	6.78	88.26	1.90	11.74

1.3 Mineral potentiality:

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

This zone includes the well-known Tumudibandh graphite deposit and the ones located in the Kandhamal, Rayagada and Gajapati districts. The strike of the litho-units varies from northeasterly to northerly. This zone is separated from the western zone by faults. Khondalite, calc-silicate granulite and associated quartzofelspathic intrusions are of widespread occurrences. Charnockites are more abundant in this zone compared to western zone. The important graphite mines include those at Madaguda, Lakhajorna, Raisil, Ambaguda and Bandhamundi. State department has also successfully established significant graphite deposits around Naringapanga, Khalpadar and Jagadalpur with similar litho structural setup and two blocks have been successfully auctioned as ML by the state.

1.3 Scope for proposed exploration.

A. Geological Mapping

The target area of 119 sq km in toposheet no 65M/11 will be scanned through geological mapping in 1:12500 scale through geological traverses with help of GPS and brunton to locate the graphite bearing horizons and validation of the available geological and litho structural data. The contacts of different formations, identification of different rock formation, structural features, etc., will be recorded in detail. The contacts of different formations, identification of different rock formation, structural features, etc. will be recorded in detail.

Geophysical Survey

The potential graphite bearing mineralized zones identified through large scale geological mapping will be taken up for geophysical survey. Geophysical techniques to be adopted are magnetic survey, self-potential survey. As per available information and the cursory field works done by the agency, it is revealed that graphite bearing pockets, lenses and disseminations occur in the area which are of variable dimension and litho-structurally controlled. In absence of detailed geometrical data of the mineralized zone it is proposed to take up SP survey at 50m X 40m grid interval and the potential SP anomalous zone will be

Pitting/ Trenching

Pitting and trenching will be done to expose the mineralized zone and to study the behavior of the ore body. It is proposed to take up pitting over the graphite mineralized zones at 50m interval along the strike and dip with each dimension 2m X 2m X 2m. Subsequently the pits will be converted to trenches (10m X 1m X 1m) whereever necessary to delineate the spatial disposition of the host rock and mineralized zone. As such about 30 pits and 10 trenches are expected to be driven during course of prospecting in apprehension of locating about 8-10 pockets or bands in the area based on surface mapping and geophysical survey to expose the ore body.

Scout drilling/ Systematic drilling

Based on the outcome of geological mapping & geophysical survey and trail excavation along with analytical results of surface, grab samples and delineation of graphite ore bodies few scout angle bore holes are proposed to be given to prove their strike continuity with 30m vertical depth of intersection. So initially about 10 bore holes (1 BH per prospect approximately) are suggested to be given at 45° angle to study the subsurface geometry and grade. Thus in the 1st phase of G4 level exploration a tentative meter of 1000m of drilling is envisaged at G4 level of prospecting.

Sampling (Grab and Chip)

During the course of mapping, grab samples will be collected from the surface exposures & pit wall/floor sections to examine the grade of ore. 100 BRS samples will be collected from the surface exposures & pit wall/floor sections to examine the grade of ore, petrographic and mineralogical characterizations. The representative samples shall be prepared in field in triplicate. One part shall be forwarded to NABL accredited laboratory for analysis. About 30pit samples, 100 trench samples, 100 bed rock samples and 200 borehole core samples will be generated during the course of exploration for primary analysis. The borehole cores would be logged systematically.
The mineralized part of drill core will be sampled as primary sample. The individual sample will be split into two equal halves and one part will be preserved in the core box for future reference and will be stored in core library, after completion of the project. The whole samples shall be split through coning and quartering in field. One part will be sent to the NABL accredited Laboratory for analysis, second part will be preserved in the camp as duplicate sample, 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. The length of each sample will be kept 1m within the ore zone depending upon the width of particular type of graphite ore and its physical character.

All primary, internal check and external check samples will be analyzed for 5 radicals i.e. (Al_2O_3, SiO_2, Ash, FC and LOI). Mineralized zones will be delineated at cut-off grade FC: 2% based on the chemical results of primary samples.

B. PreviousWork

Previous Exploration in adjoining area (Regional area);

- J. K. Nanda U. C. Pati, Geologists (Sr.) AUGUST, 1988 of GSI had reported occurrence of pelitic and psammopelitic meta sedimenaries with or without graphite in the area along with charnockite and granite suite of rocks.

- Officers of Directorate of Geology,Odisha first reported the graphite occurrences around Sollagudi, Narigapanga, Khallupadar, Mudra, Bongna, Berliand Sabinala villages of Rayagada District in 1982-83. Preliminary investigation was carried out and found Graphite occurrences occur under a thick soil cover. Analysis shows F.C. content varying up to 49%. It was observed that Graphite occurs within migmatised khondalite and are of stratiform type. The ore bodies exhibit concordant relationships with the host rocks indicating structural control of mineralization.
- In 1983-84 DG (O) carried out mapping in nearby areas of Narigapanga block and found 7 occurrences of Graphite. Out of the see the graphite deposit near Bandhamandiisoflowgrade with F.C. content varying from 4.56 to 21.38%. The depositis now under mining.

- Later on, during 2015-16 officers of DG (O) carried out investigation at G-4 level around Panchubai village Rayagada Dsitrict and located10 graphite bodies. Out of 10 graphite bodies, Narigapanga graphite was later explored at G2 level and auctioned by Govt.
- In 2016-17, officers of DG (O) carried out G 2 level Exploration in Naringpanga of Rayagada district. The Block assessed for resource and grade of graphite and has been successfully auctioned.
- DoMG Odisha has recently completed a G2 level exploration in Jagdalpur block (Toposheet no.- 65M/11) and auctioned successfully.
- State Department DoMG Odisha has recently completed a G2 level exploration in Khalpadar block (Toposheet no.- 65M/11) and established a mineralized zone of about 1km length and 300m width having optimum vertical depth of mineralization up to 132m and drilling was done by the agency outsourced by the state department.

C. Block description

Block Corner points Cardinal Points	Latitude	Longitude
A	19°30°	83° 30°
B	19°30°	83° 37°30"
C	19° 25°	83° 37°30"
D	19°25°	83° 30°

D. Planned Methodology

In accordance to the objectives set for reconnaissance Exploration (G-4) around Darukona, Rayagada District, Odisha, large scale geological mapping, geophysical survey and drilling programe associated with other geological sampling and analytical work is proposed in the block. The exploration shall be carried out as per Mineral (Evidence of Mineral Contents) Rule-2015 & 2021.

E. Nature Quantum and Target

The quantum of work proposed by Maheshwari Mining Private Limited in Darukona Block (G-4 Level of Exploration) is given in Table below.

Components	G4-stage
Aerial reconnaissance	Nil
Geological Survey	1:12,500 scale for 119 sq km area. Identification of lithology, structure, surface mineralization, borehole core studies and old history of mining, if any.
Geophysical Survey	Regional ground geophysical survey:5Lkm, (i)Gravity survey, (ii)Magnetic survey (iii) SP Survey
Geochemical Survey	Bedrock samples:100nos Pit samples:30nos Trench samples:100nos
Pitting/Trenching	30nos.Pits (1mX1mX1m):30cu m 10nos.Trench (10mX1mX1m):100cum
Scout drilling/ Systematic drilling	Ten boreholes with a total of 1000m of drilling target.
Grab and chip sampling for petrographic and Mineragraphic studies	(10PS+10PCS) representative samples from all bed rocks to carryout petrographic studies(PS) and petro-chemistry(PCS).
Core sample	200borehole core samples from graphite bearing zones. Sample length1m.
Analyses of samples	BRS + Pit samples + Trench samples + Core samples=100+30+100+200=430nos
Synthesis of all available data	Integration of regional geophysical, geological, and geochemical data. Synthesis of all available data and Report writing

Estimated cost of different work components of Graphite investigation of Darukona area (G4 Stage)

Total area: 119 sq km, Period of Completion: 12months

Sl. Nos.	Item of work	Unit	Rates as per NMET SoC 2020-21		Estimated Cost of the Proposal	
			SoC-Item-Sl No	Quantity	Rates as per SoC	Total
1	**Geological Mapping (on 1:12,500) (79 sq km)**					
	(a) Charges for Geologist in field (without laborer)	per day per Geologist	1.2. b	240	11,000	2640000
	(b) Charges for Geologist at Headquarters	per day per Geologist	1.2. a	60	9,000	540000
	(c) Wages for 2 labourers for geologist	per day	5.7	420	345	144900
2	**Land/Crop compensation**	per borehole	5.6	10	2000	20000
3	**Geochemical sampling (Bedrock sampling)**	100nos				
4	**Geophysical survey (Gravity survey, Magnetic survey and SP survey) (5 L.km)**	5 L.km				
	(a) Charges for 1 Geophysicist in field (without laborer)	per day	3.18b	60	11000	660000
	(b) Charges for 1 Geophysicist at Headquarters	per day	3.18a	45	9000	405000
	(c) Wages for 4 laborers in field with geophysicist	per day	5.7	240	345	82800
	(d) Charge for Gravity survey	per station	3.1a.i	350	3800	1330000
	(e) Charge for Magnetic survey	per station	3.2a.i	350	1800	630000
	(f) Charge for SP survey	per L.km	3.3a	5	29600	148000
5	**Survey work**					
	(a) Surveyor Charges (without laborer)	per day	1.6.1a	45	8300	373500
	(b) Labour(4nos) charges for survey work	per day	5.7	180	345	62100
6	**Technological Survey**					
	(a) Pitting	per cu m	2.1.2	30	3800	114000

	(a) Trenching	per cu m	2.1.1	100	3330	333000
	(b) Drilling	per m in soft rock	2.2.1.4a	1000	11500	11500000
	(c) Borehole pillaring (construction of concrete pillar) 12 inches x12 inches x 30 inches	per borehole	2.2.7a	10	2000	20000
	(d) Transportation of Drill Rig and truck(to and from Headquarter s or Previous drill site)	per km	2.2.8	900	36	32400
	(e) Drilling camp setting cost	per drill	2.2.9a	1	250000	250000
	(f) Drilling camp winding cost	per drill	2.2.9a	1	250000	250000
	(g) Monthly accommodation charges for drilling camp	per month	2.2.9	3	50000	150000
	(h) Approach road making to drill site	per km	2.2.10	5	22020	110100
7	**Laboratory Studies**					
	(a) Proximate analysis for graphite	per sample	4.1.16	430	3000	1290000
	(b) Analysis for associated trace element (Vanadium)	per sample	4.1.15b	430	421	181030
	(c) Analysis for associated REE	per sample	4.1.13	10	5380	53800
	(d) Petrochemical studies (PCS)	per sample	4.1.15a	10	4200	42000
8	**Petrographic studies**					
	(a) Preparation of thin sections	per sample	4.3.1	10	2353	23530
	(b) Study of thin sections	per sample	4.3.4	10	4232	42320
9	**Bulk Density/specific gravity Determination**	per sample	4.8.1	5	1605	8025
10	**Drill core preservation**	per m	5.3	450	1590	715500
11	**Geological Report preparation (5 hard copies with a soft copy)**	cost per 5 hard copies along with soft copy	5.2		As the exploration cost is exceeding 50 lakhs but less than 150 lakhs.	750000
12	**Peer Review**	lumpsump	as per EC decision	1	10000	10000

13	**Preparation of exploration proposal (5 hard copies with a soft copy)**	one number (5 hard copies) along with soft copies	5.1	1	2% of approved project cost or 3.8 lakh, whichever is lower	380000
	Grand Total of estimated cost:					**₹ 2,32,92,005.00**
	Grand Total including 18%GST					**₹ 2,74,84,565.90**
Grand Total= Two Crore Seventy four Lakhs Eighty-four Thousand Five Hundred Sixty-Five only						

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List of Plates

Plate 1: Index map on 1:50,000.

Plate2: Location map

Plate3: Geological map on 1:50,000.

Proposed Timeline for different work components of Graphite investigation in Darukona Block, Rayagada District, Odisha State													
	Months												
Item of work	**1**	**2**	**3**	**4**	**5**	**6**		**7**	**8**	**9**	**10**	**11**	**12**
Large Scale Mapping (1:12,500)													
Bed rock sampling													
Geophysical survey by Geophysicist													
Laying of Geophysical survey lines & location of Boreholes by surveyors													
Trenching & Sampling													
Chemical analysis of surface samples													
Drilling													
Core Sampling & its preparation													
Chemical analysis of core samples													
Processing of Analytical data													
Preparation of Geological report													

REVIEW

DIRECTORATE OF MINES AND GEOLOGY
STEEL AND MINES DEPARTMENT, GOVT. OF ODISHA,
BHUBANESWAR
Heads of Department Building, Unit-V, Pin-751001
Tel No.: 0674-2391537, Fax No.: 0674-2391684
Email ID: dirmines_odisha@rediffmail.com

No. R1-176 **/DoMG., Dt.** 07-08-2023

From,

Dr. Sukanta Mishra
Joint Director (C.A)
Directorate of Mines and Geology
Odisha, Bhubaneswar

To,

Maheshwari Mining Private Ltd.
PO-Kaliapani, Kaliapani Main Road
C/O- IMFA Ltd, Mahagiri Mines (Chromite)
Kaliapani, Jajpur, Odisha-755047

Sub: Issue of analysis report of Graphite sample.

Ref: Your letter dtd.28.07.2023.

Sir,

I am enclosing herewith the analysis report of 07 (Seven) nos. of Graphite Sample submitted to this Laboratory vide your letter dtd. under reference above for favour of your information and necessary action.

Yours faithfully,

7-8-23

JOINT DIRECTOR (C.A)

DIRECTORATE OF MINES AND GEOLOGY
STEEL AND MINES DEPARTMENT, GOVT. OF ODISHA,
BHUBANESWAR
Heads of Department Building, Unit-V, Pin-751001
Tel No.: 0674-2391537, Fax No.: 0674-2391684
Email ID: dirmines_odisha@rediffmail.com

ANALYSIS REPORT

Name of the Sample: Graphite Sample.

Received from : Maheshwari Mining Private Ltd.

Sl. No.	Sample No.	Lab. No.	LOI % at (950^0)C	Ash %	M %	F.C %
1	DUG - 1	524-C/23	8.57	91.43	2.64	2.34
2	DKG - 2	525-C/23	9.47	90.53	1.05	6.17
3	HAZDG - 3	526-C/23	11.74	88.26	1.90	6.78
4	BRPG - 4	527-C/23	12.64	87.36	1.22	10.33
5	RAMG - 5	528-C/23	29.86	70.14	5.10	15.23
6	DURG - 6	529-C/23	13.71	86.29	1.26	10.97
7	KPG - 7	530-C/23	9.79	90.21	1.89	4.24

N.B. (1) The above mineral samples are not drawn by the Government Laboratory.

(2) Samples will be destroyed after 15 days from the date of issue of analysis report to the party.

1.9.23

JOINT DIRECTOR (C.A)

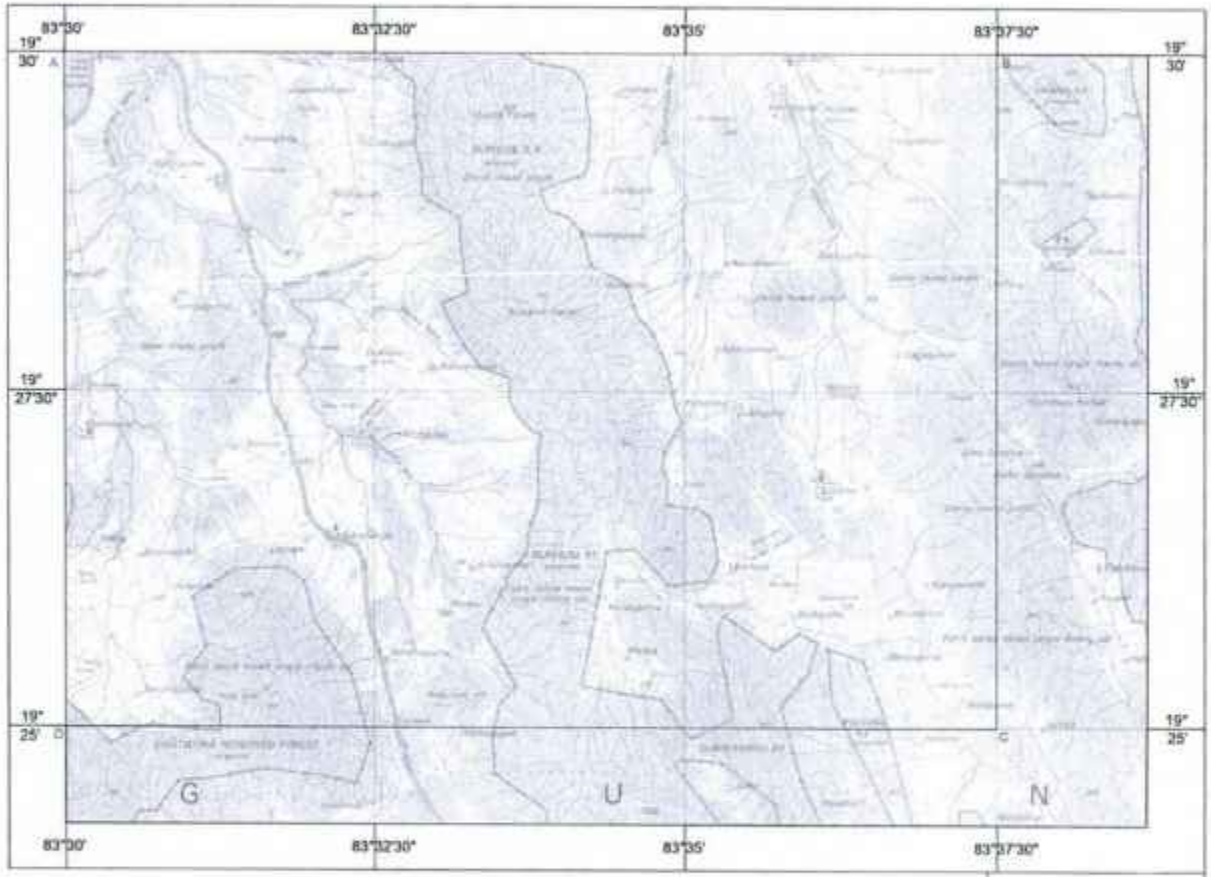
Joint Director (C.A)
Directorate of Mines and Geology
Odisha, Bhubaneswar

PLATE - I

INDEX MAP OF THE PROPOSED EXPLORATION FOR GRAPHITE AROUND DARUKONA, RAYAGADA DISTRICT

Toposheet no.- E44F11

Scale -1:50,000



Block Area- 119sq km

LEGEND

CORNER POINT

BLOCK BOUNDARY

CORNER POINTS	LONGITUDE	LATITUDE
A	83°30'00.00"	19°30'00.00"
B	83°37'30.00"	19°30'00.00"
C	83°37'30.00"	19°25'00.00"
D	83°30'00.00"	19°25'00.00"

0 1km 2km 10km

PLATE - II

LOCATION MAP OF THE PROPOSED AREA AROUND DARUKONA, RAYAGADA DISTRICT

Not in Scale

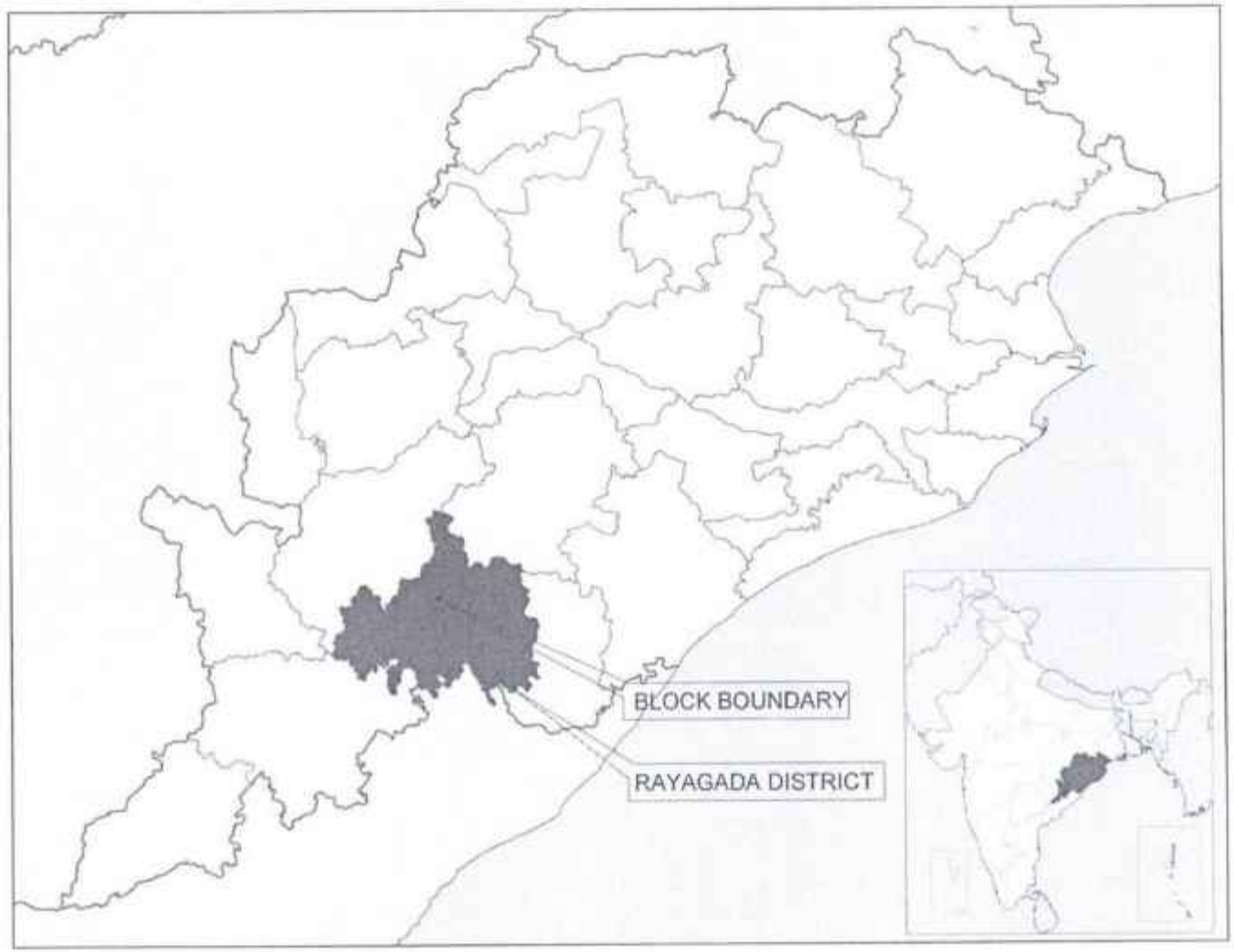
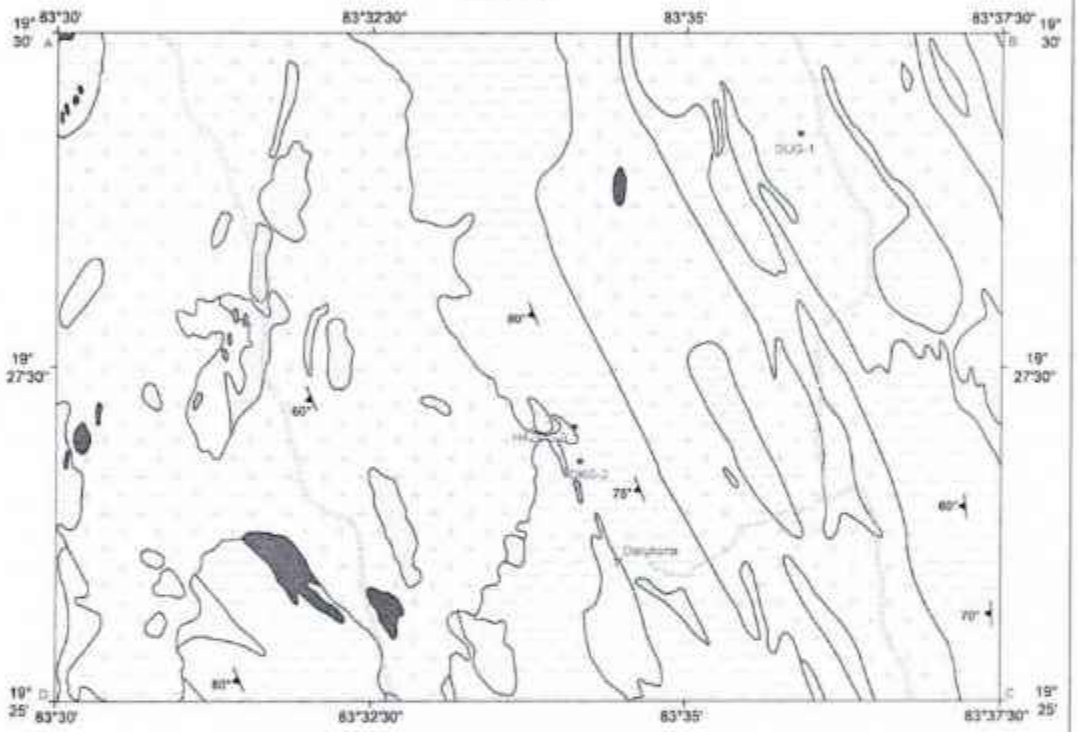


PLATE - III

GEOLOGICAL PLAN OF THE PROPOSED AREA AROUND DARUKONA, RAYAGADA DISTRICT (AFTER GSI)

Toposheet no.- E44F11

Scale -1:50,000



LEGEND

- BLOCK BOUNDARY
- ROAD
- GRAB SAMPLE LOCATION
- VILLAGE
- QUARTZ- GARNET- SILIMINITE GNEISS WITH OR WITHOUT GRAPHITE
- ACID CHARNOCKITE
- BASIC CHARNOCKITE
- GRANITE GNEISS
- CALC GRANULITE

CORNER POINTS	LONGITUDE	LATITUDE
A	83°30'00.00"	19°30'00.00"
B	83°37'30.00"	19°30'00.00"
C	83°37'30.00"	19°25'00.00"
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Maheshwari Mining Private Limited
Corporate Office : 21, C.L.M. Lane,
P.O.-Raniganj-713347, Dist.-Burdwan, W.B., India
Phone : 0341-2445446 / 5210, Fax : 0341-2446477
CIN No. : U14294WB1994PTC062326

To
The Director & HoD
National Mineral Exploration Trust (NMET)
Ministry of Mines
F-114, Shastri Bhavan
New Delhi-110001

It is certified that:

1. Project titled "PROPOSAL FOR DARUKONA BLOCK, RAYAGADA DISTRICT, ODISHA STATE FOR RECONNAISSANCE SURVEY (G4 STAGE) UNDER NMET." along with estimated cost Rs. 2,74,84,565.90 Crores is submitted for consideration of NMET funding.
2. The project proposal is prepared following the guidelines prescribed in Minerals (Evidence of Mineral Contents) Rules, 2015 in case of mineral exploration project proposals.
3. The proposal has been duly examined and concurred by associate finance in accordance with canons of financial propriety.
4. The same project proposal or project proposal with similar objectives has not been submitted to any other funding agency by this organisation and the project proposal bears no duplication with existing work/ ongoing project undertaken by this agency.

Yours faithfully,

Signature

MAHESHWARI MINING PVT. LTD. Kolkata

[Name & designation of Head of the Organisation]
[DG/Principal Secretary/Secretary (Geology & Mining)/CMD/CEO/MD]

Date.. 29.09.23
Place.. KOLKATA...

Estimated cost of different work components of Graphite investigation of Darukona area (G4 Stage)

Total area: 119 sq km, Period of Completion: 12months

Sl. Nos.	Item of work	Unit	Rates as per NMET SoC 2020-21		Estimated Cost of the Proposal	
			SoC-Item-Sl No	Quantity	Rates as per SoC	Total
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	(c) Wages for 2 labourers for geologist	per day	5.7	420	345	144900
2	**Land/Crop compensation**	per borehole	5.6	10	2000	20000
3	**Geochemical sampling (Bedrock sampling)**	100nos				
4	**Geophysical survey (Gravity survey, Magnetic survey and SP survey) (5 L.km)**	5 L.km				
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6	**Technological Survey**					
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	(a) Trenching	per cu m	2.1.1	100	3330	333000
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12	**Peer Review**	lumpsump	as per EC decision	1	10000	10000
13	**Preparation of exploration proposal (5 hard copies with a soft copy)**	one number (5 hard copies) along with soft copies	5.1	1	2% of approved project cost or 3.8 lakh, whichever is lower	380000
	Grand Total of estimated cost:					₹ 2,32,92,005.00
	Grand Total including 18%GST					₹ 2,74,84,565.90
	Grand Total= Two Crore Seventy Four Lakhs Eight four Thousand Five Hundred Sixty-Five only					