PROPOSAL FOR PRELIMINARY EXPLORATION (G-3) IN THAKURDIH AREA-1 BLOCK (4.1 Sq.km area) FOR **COPPER AND ASSOCIATED MINERALS,** SINGHBHUM COPPER BELT, DISTRICT: EAST SINGHBHUM, STATE- JHARKHAND.

Copper and Associated Minerals

By

Mineral Exploration & Consultancy Limited (A Government of India Enterprise) **A Mini Ratna Company** Seminary Hills, Nagpur – 440006, Maharashtra

Place: Nagpur

Date: 18th March, 2024

Summary for G-3 Stage Exploration for Copper and Associated Minerals in Thakurdih Area-1 Block, Singhbum Copper Belt, East Singbhum District, Jharkhand

Features	Details
Block ID:	Thakurdih Area-1 Block
Exploration Agency	Mineral Exploration And Consultancy Limted (MECL)
Previous Exploration	GSI and MECL.
Agency	
Commodity	Copper(Cu) and Associated Minerals
Mineral Belt:	Singhbhum Copper Belt
Budget &Time Schedule to complete the project	Rs. 371.06 Lakhs ; 12 months
Objectives:	 Objectives of the present level (G3) exploration are as follows: To carry out Detailed geological mapping on 1:4000 scale supported with surface samples (Bedrock/channel) from the area. To carry out Topographical survey at 2m contour interval in the entire block area. To confirm the strike and depth persistence of copper mineralisation at 200m spacing interval over 2200m cumulative strike length and to intersect ore zone at 1st level i.e. 60m vertical depth (20mRL) and three boreholes at 2nd level i.e. 120m vertical depth (-40mRL) from surface. To estimate copper ore resources at G3 level as per UNFC norms and Minerals (Evidence of Mineral Contents) Rules 2015.
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 work will be carried out by MECL.
Name/ Number of	Geologist: 01 Nos. at HQ (60 days)
Geoscientists:	
Expected Field days	Geologist: 01 Nos. at Field (150 days)
(Geology, Surveyor)	Surveyor: 30 days
1. Location:	•
Location	The proposed block area covered 4.10 sq.km comprising North, Northwest and West of Baharagora town East Singhbhum district in Jharkhand. Near the junction of NH-49 (Kharagpur to Bilaspur) and

Block boundary coordinate	NH-18 (Dhanbad-Balasore), Baharagora is a small town in East Singhbhum district and situated on the south-east corner of Jharkhand, India. It is 60 km from Kharagpur, 90 km from Jamshedpur, 50 km from Ghatshila, 50 km from Baripada and 200 km from Kolkata. Chakulia and Dhalbhumgarh are the nearest railway stations. The nearest airport is Netaji Subhas Chandra Bose International Airport, Kolkata which is 200 km. away from the study area. Thakurdia Area-1 (4.10 sq.km) corner cardinal cardinal points Corner WGS -84 (DMS)					
	Cardinal points	LATITUDE	LONGITUDE			
	1	22° 19' 23.1904" N	86° 40' 34.8022" E			
	2	22° 19' 23.4125" N	86° 41' 56.3542" E			
	3	22° 18' 10.7567" N	86° 41' 56.5099" E			
	4	22° 18' 10.6238" N	86° 41' 20.5106" E			
	5	22° 19' 04.1304" N	86° 40′ 34.6370″ E			
Villages:	In and around villages of Thakurdih, Maheshpur, Bhandudihi					
Tehsil/ Taluk:	Baharagora					
District :	East Singhbhum					
State:	Jharkhand					
2. Area (hectares/						
square kilometres)	4.10					
Block Area:	4.10 sq.km					
Forest Area:	-					
Government Land Area Private Land Area	-					
3. Accessibility	-					
Nearest Rail Head :	The nearest railhea	ad is Chakulia and Dha	albhumgarh, which are	at a		
Nearest Nan Head.			ly in the Howrah-Mur			
	line of the South-E	_	if in the Howitan was	nour		
Road:		•	ragpur in West Benga	ıl to		
	,	,	Old NH 33) running f			
	-		Odisha made a junctio			
	Baharagora Town.					
Airport :	Netaji Subhas Cha km towards East	ndra Bose Internationa	l Airport, Kolkata is at	200		
4. Hydrography						
	The major part of the Baharagora area is covered by alluvium and soil upto 20m thickness. The area is constituted of rolling plains with occasional low ridges and is about 80 to 100 m above mean sea level. The major river nearby the area is Subarnarekha River in the West of the block.					
Rivers/ Streams	Part of tributaries/v	water shed area of Rive	r Subarnarekha			
5. Climate	TOTAL CONTRACTOR OF THE PARTY O	1	. 0. 111 ~ .			
Mean Annual Rainfall :	_	ual rainfall in the Ea 0-1300 mm, mainly du	ast Singhbhum Distric	et is		

Temperatures	(May-June) (Maximum) 40° C (Minimum) 27° C						
	(November- December) (Maximum) 26 ^o C (Minimum) 16 ^o C						
6. Topography							
Toposheet Number	73J/11						
	The major part of the area is covered by alluvium and soil. The						
	general altitude of the area is 80 to 100 m above mean sea level.						
	The general slope of the ground is South-West, all the drainage						
	system following West and South-West trend merging in Subarnarekha River.						
7	Availability of baseline geoscience data						
Geological Map	i. Surface Geological Map of Baharagora Copper Prospect						
Geological Wap	is on scale 1:6000 (Field season: 1975-76 & 1977-78)						
	ii. Surface geological map of Thakurdih-Charakmara bloc						
	on 1:5000 scale is available						
Geochemical Map and	Surface plan showing data of Geochemical and Geophysical						
Geophysical Map	Traverses on scale: 1: 6000 (Field season:1970-71,71-72)						
8. Historical work	The block area area is part of MECLøs previously explored						
	Thakurdih-Charakmara Block and forms the part of Baharagora						
	copper prospect and is locted southeastern extremity of Singbhum						
	copper belt of Jharkhand. Previous workers carried out exploration						
	activities in and around the block in the past. The list of available						
	reports of the area as listed below.						
	reports of the area as fisted below.						
	1. Report on the Exploration in the Mundadevta-						
	Darkhuli Block, Baharagora Copper Prospect,						
	Singhbhum District, Bihar by P Majumder, Geologist						
	(Sr), AMSE Wing, GSI, September, 1974.						
	2. Exploration for Copper in the South Jharia-						
	Charakmara Blocks and Mundadevta Sub-Block						
	Extension, Baharagora Copper Pospect, Singhbhum						
	District, Bihar, FSP: 1975-76 & 1977-78, By P						
	Majumder, Geologist (Sr.)., AMSE Wing, GSI,						
	February, 1984.						
	3. Geological Report on General Exploration (G2) for						
	Copper Mineralisation, Mundadevta-Darkhuli South						
	Jharia Block, Singbhum Copper Belt, East Singbum						
	District, Jharkhand (MECL, October, 2022)						
	4. Geological Report On Preliminary Exploration (G3)						
	For Copper Ore In Thakurdih-Charakmara, Singbhum						
	Copper Belt, East Singbhum District, Jharkhand						
	State, December, 2023.						
	State, December, 2023.						

9 Justification for taking up G3 stage mineral exploration.

- ➤ Thakurdih Area-1 is part of previously explored Thakurdih-Charakmara G3 Block and forms part of Baharagora copper prospect s located at the extreme southeastern end of Singbhum copper belt of Jharkhand.
- ➤ During the F.S. 1975-76 & 1977-78 , GSI carried out Geochemical survey followed by geophysical survey in and around the area. Soil samples at closer intervals (10-15m) were collected and analyzed for copper, nickel, cobalt and molybdenum which resulted with 46 anomalies with weak, moderate, and strong categories. In general, geochemical anomalies coincide with the old workings, values are upto 10000ppm for Cu.
- Subsequently, the area was covered by IP- Resistivity traverses at interval of 150/300 m with dipole length of 150m. In some sections, detailing with shorter dipole separation (30m) had been done which resulted with 15 no of high chargeable IP and Magnetic anomaly zones with values 200nT to maximum value 1200 nT. Geophysical anomalies indicated weak IP anomalies in Charakmara area and strong IP anomalies in Area-1, Area-2 and Area-3 of the block area. Geophysical anomalies (IP) corroborated well with geochemical anomalies and old workings in the area.
- ➤ During the year 2022-23, MECL carried out G3 stage exploration in Thakurdih-Charkamara block over 10 sq.km area in four sub blocks namely, Charakmara, Area-1, 2 &3. Thakurdi Area-1 (4.10 sq.km) is one of the sub-block has been covered by ground geophysical survey (I.P., Resistivity, Magnetic) at 100/50 m profile at 20m interval planned to delineate potential mineralized zones in Area-1. Geological survey has brought out some prominent anomalies in Area-1. High chargeability and low resistivity zones were delineated and are well corroborated with old workings, previous geophysical and geochemical anomalies of GSI.
- ➤ In Area-1, integrated geophysical anomalies intersected copper mineralized zones in all 3 nos. scout boreholes (MTCB-09, 10 & 11) drilled in Area-1. Total four mineralized zones at 0.20% cut-off value delineated. Lode-1B in MTCB-09 (0.26% Cu over 3.22m thickness) and Lode-1AA in MTCB-10 (0.46% Cu over 5.20m thickness are significant and likely to persist along strike and depth. Area-1 hold potential for further exploration. Total 128689 tonnes (0.13 million tonnes) of copper ore resource with average grade of 0.39% Cu over an average thickness of 3.23m estimated and placed under Reconnaissance category

- (334) of resource as per UNFC code.
- ➤ It was recommended that õIntegrated geophysical anomalies intersected significant mineralized zones of considerable thickness and grade at depth in the test boreholes drilled in Area-1. Hence, in order to ascertain the potentiality of the prospect, seamless G3/G2 stage exploration is recommended to confirm the strike and depth persistence of ore zone in Area-1 of Thakurdih-Charakmara block.ö
- 8.1.4 Moreover, all the three Test boreholes drilled in Area-1 are scout boreholes in nature and copper ore resoures of Area-1 placed under õReconnsaissance Category (334 of UNFC). Hence resources need to be upgraded to õInferred Resource category (333 of UNFC) by carrying out systematic drilling at G3 stage
- ➤ Hence, G3 stage exploratory drilling at 200m spacing is required to fill up the gaps and to establish the strike and depth continuity of ore zones over 2200m cumulative strike length in the block area.
- ➤ The present exploration at G3 stage would be helpful to figure out the exact potentiality of the prospect and to estimate the resource in to 333 category of UNFC.

Proposal for Preliminary Exploration (G3) for Copper and Associated Minerals in Thakurdih Area-1 Block, Singhbhum Copper Belt, District: East Singhbhum, Jharkhand.

1. 0 INTRODUCTION

- 1.1.1 Copper with its unique physical, mechanical and electrical properties, has played a vital role in the industrial growth of a nation. In India, around 75% of demand is met through imports. The increasing demand of Copper metal in the country can be eased with the exploration of new copper deposits of economic importance. In view of the above, exploration for copper ore has been accorded high priority in the XIIth Plan document.
- 1.1.2 During the last three decades, no large base metal deposit has been discovered in India. However, the possibility of working of small mineral bodies in proximity to each other, through technological advances and increased operational efficiency, cannot be ruled out. Therefore, it is utmost imperative to locate and explore such small sized deposits in clusters.
- 1.1.3 Thakurdih Area-1 Block area is part of previously MECL explored Thakurdih-Charakmara G3 block and forms the part of Baharagora Copper prospect is located near the southeastern extremity of the Singhbhum Copper Belt of Jharkhand. The existence of old workings (shallow pits) for copper in Thakurdih-Charkamara area was reported by previous workers (Stoehr 1870 & Dunn 1937). The area was covered by airborne multi-instrument geophysical surveys in 1963. Ground evaluation of the electromagnetic and magnetic signatures coupled with the available geological knowledge indicated the presence of potential mineralized zones in the Baharagora area. Integrated geological, geochemical and ground geophysical surveys and exploratory drilling in the area by GSI (FS 1975-76 & 1977-78) indicated a number of small blocks i.e. Mundadevta-Darkhuli & South Jharia and Charakmara area. Mundadevta-Darkhuli & South Jharia block was recently explored by MECL (2021-22) at G2 stage for Copper and a net geological instu resource of 1.75 million tonnes of 0.96% Cu at 0.50% Cu cut-off and 0.64 million tonnes of 1.46% Cu at 1.00 Cu cut-off was estimated up to 245m vertical depth.
- 1.1.4 Few old workings trending in NW-SE direction located in Area-1 near Thakurdih village. Previous work of GSI indicated strong Geochemical anomalies for Copper and strong I.P. geophysical anaomalies in Area-1, 2 and 3 of the block area and corroborated well with old workings and geochemical anomalies.
- 1.1.5 Thakurdih-Charakmara block was recently explored by MECL during 2022-23 at G-3 stage is just adjoining and extension to the Mundadevta-Darkhuli & South Jharia

- G2 Block. The Thakurdih-Charakmara block covers an area of 10.0 sq.km and comprises four sub-blocks namely Charakmara, Area-1, 2 & 3 in close proximity to each other. Exploratory drilling work at 100m spacing interval carried out in Charakmara area to intersect the mineralized zones at 60m and 120m vertical depth. Integrated geophysical survey carried out in Area-1, 2 and 3 and based on geophysical anaomaly test drilling was carried out in Area-1 and 3 of Thakurdih-Charakmara block.
- 1.1.6 In Area-1, integrated geophysical anomaly intersected four zones of mineralisation at depth. Lode 1B (MTCB-09 analysing 0.26% Cu over 3.22m thickness) and Lode-1AA (MTCB-10 with 0.46%Cu over 5.20m thickness) intersected in Area-1 are significant and likely to persist along strike and depth. Area-1 hold potential for further exploration. Total 128689 tonnes (0.13 million tonnes) with average grade of 0.39% Cu over an average thickness of 3.23m estimated at 0.2% Cu cut off in Area-1.
- 1.1.6 It was recommended that Integrated geophysical anomalies intersected significant mineralized zones of considerable thickness and grade at depth in the test boreholes drilled in Area-1. Hence, in order to ascertain the potentiality of the prospect, Seamless G3/G2 stage exploration was recommended to confirm the strike and depth persistence of ore zone in Area-1 of Thakurdih-Charakmara block. As the test borehole are scout boreholes in nature further detailed exploration is required to ascertain the exact potentiality of the prospect.
- 1.1.7 Hence, based on the recommendations and potentiality of the prospect, Thakurdih Area-1 is selected to take up G3 stage exploration work by carrying out exploratory drilling at 200 m spacing interval to fill up the gap area and to establish the strike and depth persistence of mineralized zones in the area. Accordingly present exploration proposal at G3 stage has been formulated.

2.0 LOCATION AND ACCESSIBILITY

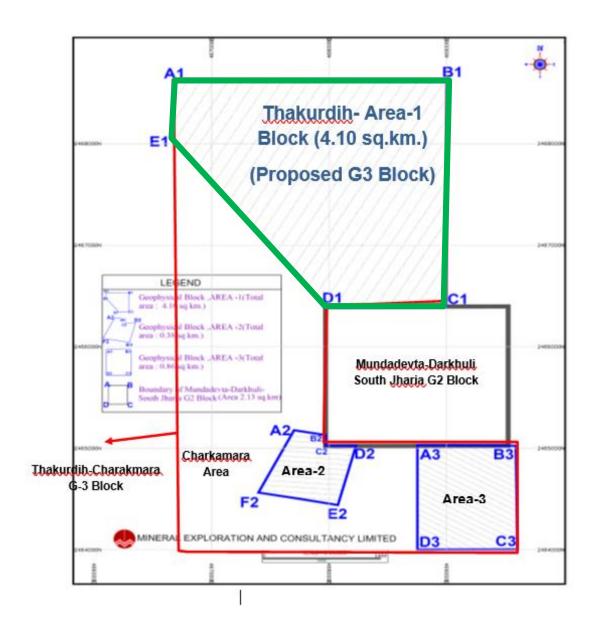
- 2.1 The study area is situated in and around Thakurdih, Bandudihi and Maheshpur Villages located about 4km Northwest of Baharagora town and tehsil headquarter in East Singhbhum District, Jharkhand.
- The Thakurdih Area-1 block area covered under Survey of India Toposheet No. 73J/11, covering an area of 4.10 sq and lies between 22° 18ø10.6238ö N to 22° 19ø 23.4125öN latitudes and 86° 40ø34.6370öE to 86° 41ø56.5099öE longitudes. The block location is shown in **Plate-I** and **Text Figure-1**. The locational co-ordinates (Geographic & UTM) of the cardinal points of the Thakurdih Area-1 Block,

Singhbhum Copper Belt, East Singhbhum District, Jharkhand are in given in **Table 1.1**. The locational co-ordinates (Geographic & UTM) of the cardinal points of the Thakurdih Area-1 Block, Singhbhum Copper Belt, East Singhbhum District, Jharkhand are in given in **Table 1.1**.

Table-1.1 Co-ordinates of the corner points of the block boundary of Thakurdih-Area-1 Block, Singhbhum Copper Belt, East Singhbhum District, Jharkhand

Corner	WGS -8	UTM (Zone 45N)		
Cardinal points	LATITUDE	LONGITUDE	Easting	Northing
1	22° 19' 23.1904" N	86° 40' 34.8022" E	466667	2468627
2	22° 19' 23.4125" N	86° 41' 56.3542" E	469000	2468629
3	22° 18' 10.7567" N	86° 41' 56.5099" E	469000	2466395
4	22° 18' 10.6238" N	86° 41' 20.5106" E	467970	2466393
5	22° 19' 04.1304" N	86° 40' 34.6370" E	466661	2468041

2.3 The block area can be approached by metal road from Baharagora. Baharagora is a small town near the junction of NH-49 (Kharagpur to Bilaspur) and NH-18 (Dhanbad-Balasore), in East Singhbhum district and situated on the south-east corner of Jharkhand, India. Baharagora is a small town near the junction of NH-49 (Kharagpur to Bilaspur) and NH-18 (Dhanbad-Balasore), in East Singhbhum district and situated on the south-east corner of Jharkhand, India. It is 60 km from Kharagpur, 90 km from Jamshedpur, 50 km from Ghatshila, 50 km from Baripada and 200 km from Kolkata. The nearest railhead is Chakulia and Dhalbhumgarh, which are at a distance of 25 km and 31 km respectively in the Howrah-Mumbai line of the South-Eastern Railway. The nearest airport is Netaji Subhas Chandra Bose International Airport, Kolkata which is 200 km towards East from the area.



Text Figure-1: Location of Thakurdih-Area-1 Block

3.0 REGIONAL GEOLOGY AND STRUCTURE

3.1 The Precambrian Geology of the Singhbhum Craton was first built up by Dunn (1929,1937), Dunn and Dey (1942) and they divided the craton into four major structural units, which are I) Singhbhum geo-anticline comprising highly metamorphosed rocks of Iron Ore Series, II) Dalma lava geo-syncline in the north, running parallel to the geo-anticline, III) a shear-zone, known as Singhbhum Shear Zone, and IV) a second geo-anticline to the north of the Dalma Lava Geo-syncline with an intervening thrust zone. According to them Singhbhum shear zone extends from Duarpuram, North-East of Chakradharpur, in an approximately East-West direction, turns South-East near Jamshedpur and continues through Jaduguda-Rakhamines, Surda-Mosaboni-Badia mines and eventually ends up at Granites near

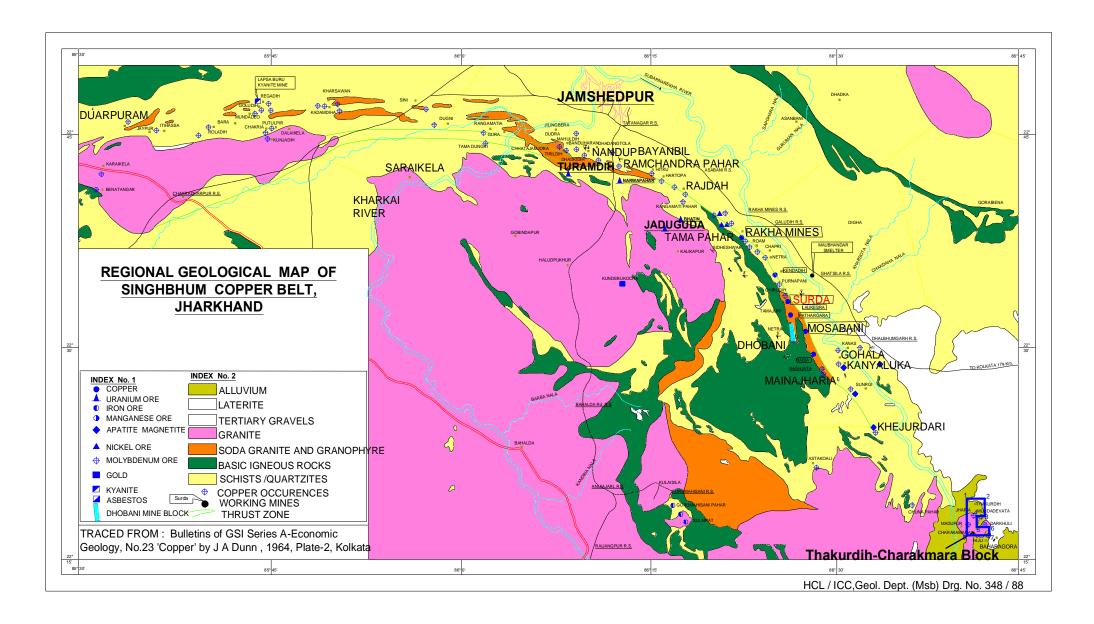
- Baharagora. However later studies revealed that the shear zone extends upto Mayurbhanj districts of Odissa where its trace can be found through some N-S trending shears.
- 3.2 Recent studies by Sarkar and Saha (1959, 1962, 1966) and subsequently Sarkar, Saha ana Miller (1969) revised the stratigraphic sequence in Singhbhum and adjoining areas (Table-I). According to these authors, the Singhbhum cratonic area had undergone three orogenic cycles- The Older Metamorphic Orogeny (3035m.y.), the Iron Ore Orogeny (2000 m.y.) and the Singhbhum Orogeny (905-934 m.y).
- 3.3 The Stratigraphic succession of the Singhbhum and adjoining areas, After Sarkar, Saha& Miller (1969) are given in following Table-7.1 and the regional geological map is given as Plate-II and Text Figure-3.

Table-	1: Geological Su		recambrian rock Sarkar, Saha& M	s of Singhbhum and a liller (1969).	djoining areas. (After
	of copper Belt-T hbhum, N. May N. Keonjh	Thrust Zone in urbhanj and	North of Copp	er Belt Thrust Zone ungbhum	Sundargarh District
			l humorogenic cycl	e (C. 850 m.y.)	
NEWER DOLERITES	Biotite Granit Sing M Granophyt anorthosite Ultramafic int	te-gneiss of SE hbhum and N layurbhanj res Gabbro- (1470m.y.), rrusions (within	Soda-gran Chakrad Kuila		
ER DC		ghbhum granite) (C. 1500-1600 m.y.)	Dal	ma Lavas	
NEW	Jagannathpur Lavas (1600- 1700 m.y.)	Dhanjori formations	Dhalbhum formation, Chaibasa formation	Singhbhumgroup? (2000-1700 m.y.)	Dhalbhum formation (I.O.S. of Krishnan Gr. Gangpur)
		End of Iron	Ore Orogenic cy	cle (c. 2700 m.y.)	
	Singhbhum Gra				
	Upper shales will Banded hematit	ith sandstone and s e Jasper	volcanics		
Iron Ore Group	Lower shales Basic lavas Sandstone and	conglomerate			
	•	ityityity Orogenic Cycle (
	Granitic activity	1			
	Basic intrusives				
		phic Group, Calc-G nde Schist, Quartz	•		

Thakurdih Area-1 block is located in the southeastern extremity of Singhbhum Shear Zone and forms part of Thakurih-Charkamara Block of Baharagora Copper prospect. The Baharagora area is the SE extension of the main Singhbhum Shear Zone. The portion in between is covered with thick alluvium for about 13km. Baharagora copper prospect consititues several sub blocks namely, Mudadevta-Darkhuli & South Jharia, Thakurdih-Charakmara. The present exploration block forms part of Baharagora copper prospect and is just adjoining and extension block to the previously explored Mundadevta-Darkhuli & South Jharia G2 block (2021-22) by MECL. The main rock types are quartzites, quartz schist, mica schist and phyllites which are intruded by basic rocks and granites. The strike varies from N-S, NE-SW to NWóSE and dip 70°-80° due E, SE and NE. Copper mineralisation associated with Ni and Mo occurs in chlorite-biotite-quartz schist associated with shears.

4.0 REGIONAL STRUCTURE & MINERALISATION

- 4.1 The Singhbhum Shear Zone is the most important single structural element and has been traced for more than 200km, from West to the southeast, with widths varying from a few hundred meters to several kilometers, dipping about 40° northward. Mineralisation localized along the shear zone.
- 4.2 According to previous workers, the Singhbhum Shear Zone or the Copper Belt Thrust extending east from N. Singhbhum through Seraikela, turns south-east near Jamshedpur and continues through Baharagora towards Mayurbhanj in Orissa. Baharagora is thus located almost at south-eastern end of the Copper Belt Thrust. Evidences of shearing and breciation are common and preserved in the mica schists, quartzite, quart schist and quartz granulite.
- 4.3 In the Baharagora area, the shear zone is rather ill-defined, narrow and limited in extent and becomes almost obscure in the granite country. The foliation planes in schists away from the granite have been found to be shear-plates formed by transposition of earlier S-planes in the zone of shearing. The dominant linear structures are parallel to the direction of tectonic transport with the sense of movement broadly up-dip in all places.
- Apatite-Magntite, Sulphide and Uranium mineralisation irrespective of any good relationship of time and space in between. The main sulphide minerals are Chalcopyrite, Pyrite and Pyrrhotite. Other minerals occur in minor to very minor proportions. Sulphide mineralisation is not restricted to any particular lithology. Copper is the metal mainly found with the traces of other metals such as Mo, Ni, Co, Au also reported. A number of workable deposits are there situated in the South-Eastern section of this structural unit, numerous other sulphide occurrences also found in the rest of the belt.



5.0 GEOLOGY OF THE BLOCK

5.1 Thakurdih Charakmara block is situated near the extreme southeastern tip of Singhbhum Copper Belt. The block area exposes mainly Granite/ Granite Gneiss of Archaean (Singhbhum Granite Complex), Newer Dolerite of Archaean-Proterozoic, Quartzite of Palaeoproterozoic, Schistose rocks of Palaeoproterozoic, Gravels of Tertiary and Sand Silt Clay Calcareous concretions of Pleistocene óHolocene. Exposure of rocks e.g. Granite intruded by newer dolerite dykes outcrops near Charakmara village. Quartzite/Quartz schist varying to quartz granulite forms low ridges above schistose rocks in Area-1 of the Block area. In general, most of the block area is concealed under soil cover and is under cultivation except few scanty isolated outcrops in the block area. The local geological succession of the Block area is given in **Table No. 7.2**.

Table No. 7.2: The Local Stratigraphic Succession of the Block area

Age	Litho-units
Pleistocene - Holocene	Soil, Sand ó Silt- Clay ó Calcareous Concretions
Tertiary	Gravel Beds
	Schistose rocks, Mica Schist with Hornblende schist
Palaeoproterozoic	Quartzite
Archaean -Proterozoic	Newer Dolerite
Archaean	Granite / Granite gneiss

The main lithounits intersected in the boreholes drilled by MECL are Amphibolite, schists (biotite chlorite schist / biotite schist / Biotite Quartz Schist / Chlorite Biotite Schist / Chlorite Schist / Garnetiferous Chlorite Schist, Quartz Biotite Chlorite Schist), Dolerite, Granite, Granite Gneiss and Quartzite rock.

6.0 STRUCTURE & METAMORPHISM

- Thakurdih block is located almost at the south-eastern end of the copper belt thrust/ Singhbhum shear Zone and forms the part of baharaghora Copper prospect. In Baharagora area shear zone is ill defined, narrow and gradually disguised into the granite. The dominant linear structures are parallel to the direction of tectonic transport. The planar structures present in the area are stratification plane (S1), axial plane foliation (S2) crenulation cleavage (S3), slickensides and joints.
- 6.2 The main linear structures found are puckers, mineral lineation, Bedding-Cleavage intersection, streaking and grooving. No major faults except small drag faults due to stretching in quartzite/ quartz schist are noticed at places.

- Quartzite & Quartz schist in the Baharagora area are thrown into S-shaped, plunging synforms and antiforms, with plunge varying from 35°to 50° towards northeast. In the Mundadevta-Darkhuli block, the synformal flexure is asymmetric with eastern limb dipping more steeply (80-85°) than the western limb (60-65°). The plunge of the fold axis is about 40° towards N40°E. No major folds mapped in the Thakurdih-Charakmara block area except small scale folds including chevrons and mullions at places. In general litho units strike N20°E-S20°W diping 60° to 70° due SE in Charakmara area and N60°W-S60°E dipping 70° to 80° NE in Area-1 of of the Thakurdih-Charakmara block.
- 6.4 Metamorphism in this area indicated by minerals as Biotite, Garnet, Staurolite and kyanite points towards middle amphibolite facies of metamorphism (Fyfe & Turner 1966). Occurrence of these index minerals during regional metamorphism constitutes a progressive series which is followed by retrogressive metamorphism during later shearing movements resulting developments of Biotite, muscovite and chlorite indicating Middle Greenschist facies.

7.0 MINERALISATION

- 7.1 In Charakmara area, there is a line of discontinuous pits for a distance of about 500m in a NE-SW direction in metabasites, basic schists and biotite quartz schist within the granitic country rocks. Similary few old working trending NW-SE direction located in Thakurdih area (Area-1). Rock exposures are scanty in the area and the surface expression of the mineralized zone is limited and ill defined. Geochemical sampling and I.P. Resistivity survey, however, provide some anomalies but most of the information on the geology and the sulphide mineralization has been obtained from the drill holes
- 7.2 Sulphide mineralisation is in the form of fissure vien type associated with closely spaced shear zones, mostly parallel to sub-parallel to the foliation. Four main modes of occurrence of copper-nickel ore in and around the area is dessiminations confined to Biotite quartz rock, stringers and veinlets along the foliation and fractures of schist, massive sulphide veins in brecciated vein quartz and minor streaks and replacement patches. In general, sulphide mineralisation occurs in the area as dissemination, stringers, veins, minor streaks and replacement patches associated with closely spaced shears.
- 7.3 Mineralisation in this area is not confined to any particular stratigraphic horizon nor to any particular litho-unit. However, some litho-units are preferred relative to other. Mineralistion is spatially associated with metabasites or their derivates such as Chlorite-biotite schist, quartz-biotite schist and biotite-quarztites.

- 7.4 Mineralisation in this area is broadly controlled by litho-structure i.e. various openings as a result of multi stage deformation. Ore bodies are located along the shear tension surfaces and are more or less parallel to the foliations of the host rock. Different openings thus gave rise to in-filling types of mineralisation such as stringers, veins and veinlets, Breccia filling etc.
- 7.5 Chalcopyrite is the main ore mineral followed by pyrite (+ marcasite), pyrrhotite and magnetite. Nickel sulphides occur in small proportions.
- 7.6 In Area-1, three zones of mineralisation numbered 1A, 1B, 1AA and local starting from footwall side and a Local minor zone have been intersected in the boreholes drilled by MECL. The copper mineralisation is erratic in nature and individual lodes are low grade thin/lean bands in nature. The widths and grades of the lodes depends on the cut-off grade, thickness and strength of the partings.





Photograph No.15: Core Photograph of MTCB-09 showing sulphide mineralisasiton in Biotite-schist (Depth: 76.10m -76.19m)



Pmg – 7: Photomicrograph showing fine inclusions of sphalerite within chalcopyrite patches as seen under reflected light.

Specimen No.: MTCB09/M6 Magnification: 200X



Pmg – 8: Photomicrograph showing very fine lamellar exsolutions of pentlandite within pyrrhotiteas seen under reflected light.

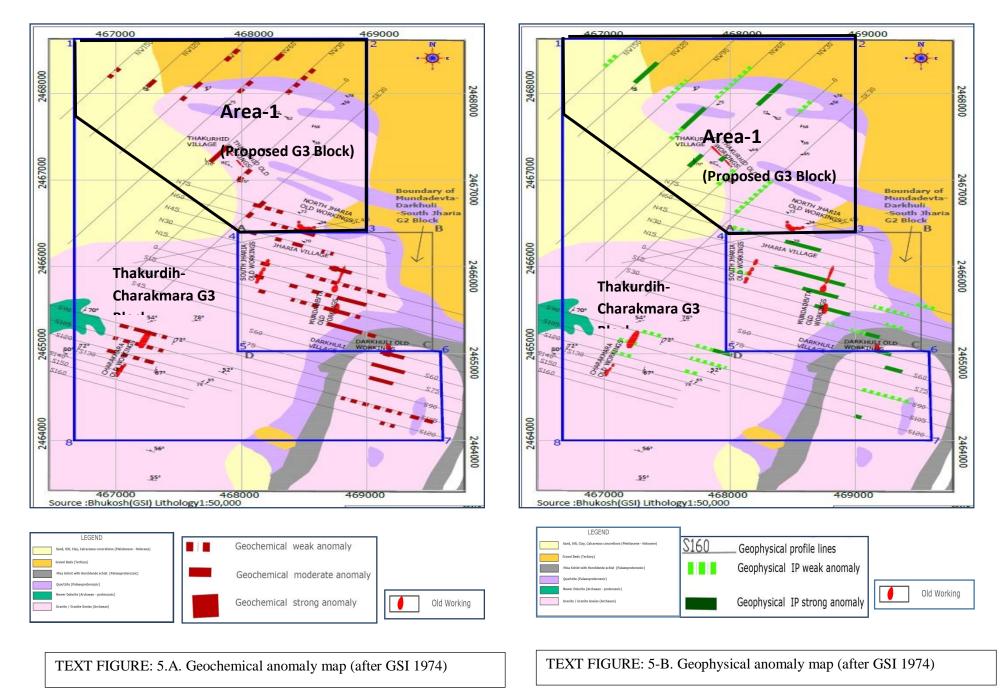
Specimen No.: MTCB10/M7 Magnification: 200X

8.0 PREVIOUS WORK

- 8.1 The Baharagora Copper Prospect is located near the southeastern extremity of the Singhbhum Shear Zone. The present exploration block forms the part of Baharagora Copper prospect. The existence of old workings (shallow pits) for copper in the Baharagora area area was reported as early as 1870 by Stoehr. A description of these workings was given by Dunn (1937). The area was covered by airborne multi-instrument geophysical surveys in 1963.
- 8.2 The Airborne Mineral Surveys and Exploration wing of GSI carried airborne Geophysical survey under õOperation Hardrockö in 1967-68. Airborne Geophysical data supplemented with Ground Geophysical Reconnaissance indicated a probable zone of Mineralisation in the Baharagora Area. Ground evaluation of the electromagnetic and magnetic signatures coupled with the available geological knowledge indicated the presence of potential mineralised zones. This led to the intensification of efforts in the form of integrated geological, geochemical and ground geophysical surveys and exploratory diamond drilling to locate ore bodies and to assess the potentiality of the deposit. Results of all these efforts have indicated that the Baharagora copper deposit consists of a number of small blocks/mineralised grounds Mundadevta Darkhuli, South Jharia and Charakmara Blocks are apparently more promising.
- 8.3 GSI explored Mundadevta-Darkhuli Block in detail and a geological resource of 1.22m tonnes of 1.23% Cu and 0.70m tonnes of 0.87% Cu and 0.21% Ni was estimated in the area. (Majumder, 1971). Based on the outcome of previous work of GSI, MECL explored Mudadevta-Darkhuli & South Jharia Block for Copper and associated minerals over an area of 2.13 sq.km. at G2 stage in 2021-22. Total 5112m in 23 nos Boreholes were drilled in the area. Copper ore resources estimated at 0.50% Cu and 1.0% Cu cut-off separately with 2.0m minimum stoping width (M.S.W.) as true width and 3.0m maximum parting. Total 1.74 milllion tonnes of net geological in-situ resources with an average grade of 0.96% Cu over 3.58m thickness at 0.50% Cu cut-off and 0.64 million tonnes of net geological in-situ resource with an average grade of 1.46% Cu over 3.53m thickness at 1.00% Cu cut-off up to a vertical depth of 245m from ground surface. The Thakurdih-Charakmara block is just adjoining and extension to the Mundadevta-Darkhuli & South Jharaia G2 Block. (Plate No. III).
- During the F.S. 1975-76 & 1977-78, GSI carried out Geochemical survey followed by geophysical survey carried in the Block area. Soil samples at closer intervals (10-15m) were collected from the anomalous zones and analyzed for copper, nickel, cobalt and molybdenum which resulted with 46 anomalies with weak, moderate, and

strong categories.In general, geochemical anomalies coincide with the old workings, values are upto 10000ppm for Cu. Subsequently, the area was covered by IP-Resistivity traverses at interval of 150/300 m with dipole length of 150m. In some sections, detailing with shorter dipole separation (30m) had been done which resulted with 15 no of high chargeable IP and Magnetic anomaly zones with values 200nT to maximum value 1200 nT. Geophysical anomalies indicated weak IP anomalies in Charakmara area and strong IP anomalies in Area-1, Area-2 and Area-3 of the block area. Geophysical anomalies (IP) corroborated well with geochemical anomalies and old workings in the area. (Text Figure 5-a & 5-B)

In Charakmara village there is a line of discontinuous pits for a distance of about 500m in a NE-SW direction in metabasites, basic schists and biotite quartz schist within the granitic country rocks. Similarly, NW-SE trending old workings located in Thakurdih (Area-1) area. GSI drilled 2 test boreholes namely BC-1 and BC-2 in Charakmara area involved 300.45m drilling spaced 100m apart. A zone of mineralisation in BC-1 intersected over a width of 1.35m with 0.59% Cu & 0.11% Ni and in BC-02 over a width of 2.05m with 2.74% Cu. Further drilling was recommended by the previous workers and further it was opined that there is a reasonable chance of finding some tonnage from this block.



19

- 8.7 G3 Stage Exploration in Thakurdih-Charkamara Block (10 sq.km) by MECL:
 During the year 2022-23, MECL carried out G3 stage exploration in Thakurdih-Charkamara block. The work comprises of exploratory drilling at 100m spacing interval in line with previously drilled GSI boreholes (BC-01 & 02) in Charakmara area to confirm the strike and depth persistence of ore zones at 60m and 120m vertical depth at G3 stage. Simultaneously, Integrated Ground geophysical survey (I.P., Resistivity, Magnetic) at 100/50 m profile at 20m interval planned to delineate potential mineralized zones in Area-1, 2 and 3 in Thakurdih Charakmara block area. (Text Fig. No 5-C).
- 8.8 Integrated geophysical survey (I.P. Resistivity and Magnetic) carried out in the area (60 Lkm) has brought out some prominent anomalies in Area-1 & 3. High chargeability and low resistivity zones were delineated and are well corroborated with old workings, previous geophysical and geochemical anomalies of GSI. (Text Fig.)

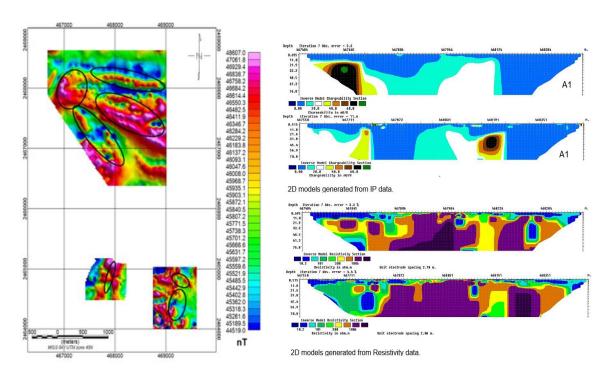


Figure: 2.3.1.1 Total Magnetic Intensity (TMI) Map.

TEXT FIGURE: 5-C: Geophysical anomaly, Thakurdih-Charakamara Block (MECL 2022-23)

- Total 1497.50m in 12 Boreholes drilled in Thakurdih Charkamara Block. Out of total 12 nos boreholes drilled, 8 nos. boreholes drilled in Charakmara area to confirm the strike and depth persistence of copper bearing ore zones in two levels. Based on the outcome of Geophysical survey, total 3 nos. test boreholes (MTCB-9, 10 &11) drilled in Area-1 and one test borehole (MTCB-12) drilled in Area-3 to test the geophysical anomaly at about 60m vertical depth.
- 8.10 Based on the analytical results of borehole core samples, four copper bearing ore zones (Lode-1A, 1B and 1AA, Local) have been delineated on the basis of 0.2% Cu cut-off grade (for correlation purpose only) details provided in **Table no. 8.1**. For estimation of resource lodes have been identified on the basis of assay chemical analysis i.e. Cu% at 0.2% Cu cut-off grade considering the minimum stoping width of 2.00m as true thickness and maximum parting of 3.00m details provided in **Table no. 8.2**.

Table-8.1: Borehole wise Ore Zone at 0.2% Cu cutoff (For correlation purpose only) Thakurdih-Charakmara Block, District-East Singhbhum, Jharkhand (By MECL & GSI)

Section	Borehole	Depth of Intersection(m)		Thickness	True	Grade Cu	Lode	Area	Agency
No.	No.	From	To	(m)	Thickness	(%)	No.	Name	8 .
L15E	MTCB-09	75.78	79.00	3.22	2.47	0.26	1B	Area-1	MECL
L15E	MTCB-09	82.50	83.00	0.50	0.38	0.27	1A	Area-1	MECL
L25E	MTCB-10	75.00	80.20	5.20	3.98	0.46	1AA	Area-1	MECL
L18E	MTCB-11	84.90	85.50	0.60	0.46	0.24	Local	Area-1	MECL

Table-8.2: Borehole wise Ore Zone at 0.2% Cu cutoff with 2.00m MSW and 3.00m Maximum parting Thakurdih-Charakmara Block, District-East Singhbhum, Jharkhand (By MECL)

Section	Davahala	Dept	th (m)	Thiskness	True	Grade	Lodo	Area Name		
Section No.	Borehole No.	From	To	Thickness (m)		Lhickness	Thickness (m)	Cu (%)	Lode No.	
L15E	MTCB-09	75.78	79.00	3.22	2.47	0.26	1B	Area-1		
L25E	MTCB-10	75.00	80.2	5.20	3.98	0.46	1AA	Area-1		

- 8.10 In Area-1, integrated geophysical anomalies intersected copper mineralized zones. All 3 nos. scout boreholes (MTCB-09, 10 & 11) drilled in Area-1 intersected mineralized zones at 0.20% cut-off value. Copper bearing zones namely 1A, 1B, 1AA and one Local minor zone intersected in the drilled boreholes. As per the cut-off grade criteria parameters for resource estimation two considerable mineralized zones intersected in two boreholes i.e. Lode-1B in MTCB-09 (0.26% Cu over 3.22m thickness) and Lode-1AA in MTCB-10 (0.46%Cu over 5.20m thickness are significant and likely to persist along strike and depth. Area-1 hold potential for further exploration.
- 8.11 The summarized resources of Thakurdih-Charakmara block at 0.2% Cu cut-off area are given below Table No.8.1.

Table No.20.1:
Summary of Estimated Resources (333 & 334) by cross section method At 0.2 Cu cut-off grade.

Area Name	UNFC Resource category	Gross Total Resource (Tonnes)	Net Resource (Tonnes)	Average Grade (Cu %)	Average Thickness (m)	Lode No.	Total Metal content (Tonnes)
Charakmara	(333)	45017	40516	0.27	2.96	1	109
Area-1	(334)	142987	128689	0.39	3.23	1B, 1AA	502
Total		188004	169205	0.36	3.10	-	611

8.12 Out of total estimated 169205 Net geological resource in Thakurdih-Charkamara block, Area-1 holding total **128689** tonnes (**0.13 million tonnes**) with **average grade of 0.39% Cu** over an average thickness of 3.23m.

9.0 OBSERVATIONS & RECOMMENDATIONS OF PREVIOUS WORK

9.1 G3 stage exploration of MECL (2022-23) carried out in Thakurdih Charkamara block recommended that "Integrated geophysical anomalies intersected significant mineralized zones of considerable thickness and grade at depth in the test boreholes drilled in Area-1. Hence, in order to ascertain the potentiality of the prospect, seamless G3/G2 stage exploration is recommended to confirm the strike and depth persistence of ore zone in Area-1 of Thakurdih-Charakmara block."

10.0 MINERAL POTENTIALITY

- 10.1 The block area hold potential in terms of geology, geochemistry and geophysics as reported by the previous workers of GSI and MECL in and around the block area.
- In Area-1, integrated geophysical anomaly intersected three zones of mineralisation at depth numbered 1A, 1B, 1AA and one Local minor zone in the drilled boreholes. Lode 1B (MTCB-09 analysing 0.26% Cu over 3.22m thickness) and Lode-1AA (MTCB-10 with 0.46%Cu over 5.20m thickness) intersected in Area-1 are significant and likely to persist along strike and depth. Area-1 hold potential for further exploration.
- 10.3 In Area-1, total 128689 tonnes (0.13 million tonnes) of copper ore resource with average grade of 0.39% Cu over an average thickness of 3.23m estimated and placed under Reconnaissance category (334) of resource as per UNFC code.
- 10.4 Integrated geophysical anomalies intersected significant mineralized zones of considerable thickness and grade at depth in the test boreholes drilled in Area-1. Hence, in order to ascertain the potentiality of the prospect, seamless G3/G2 stage exploration is recommended to confirm the strike and depth persistence of ore zone in Area-1 of Thakurdih-Charakmara block.
- Moreover, all the three test boreholes drilled in Area-1 are scout boreholes in nature and copper ore resource of Area-1 placed under

 Reconnaissance Caterogy (334 of UNFC). Hence, resources need to be upgraded to õ Inferred Resource category (333 of UNFC) by carrying out systematic drilling at G3 stage.
- Hence, G3 stage exploratory drilling at 200m spacing is required to fill up the gaps and to establish the strike and depth continuity of ore zones over 2200m cumulative strike length in the block area. The present exploration at G3 stage would be helpful to upgrade the resource in to 333 category of UNFC.
- 10.7 Accordingly, the present Exploration program at G=3 stage has been formulated to target the potential zone by systematic drilling program.

11.0 PRESENT WORK

Objectives of the present level (G3) exploration are as follows:

- I. To carry out Detailed geological mapping on 1:4000 scale supported with surface samples (Bedrock/channel) from the area.
- II. To carry out Topographical survey at 2m contour interval in the entire block area.
- III. To confirm the strike and depth persistence of copper mineralisation at 200m spacing interval over 2200m cumulative strike length and to intersect ore zone

- at 1st level i.e. 60m vertical depth (20mRL) and three boreholes at 2nd level i.e. 120m vertical depth (-40mRL) from surface.
- IV. To estimate copper ore resources at G3 level as per UNFC norms and Minerals (Evidence of Mineral Contents) Rules 2015.

12.0 PLANNED METHODOLOGY

12.1 The proposed programme for Preliminary Exploration at G-3 stage of exploration in the block comprises of Geological mapping on (1:4,000 scale), Topographical Survey and exploratory drilling along with associated survey, chemical analysis, physical analysis and Report preparation. The Exploration shall be carried out as per Minerals (Evidence of Mineral Content) Rule-2015. Accordingly, the following scheme of exploration is formulated in order to achieve the objectives. The details of different activities to be carried out are presented in subsequent paragraphs:

12.2 Survey

The Block boundary will be surveyed by DGPS in WGS-84 datum for demarcation of block boundary/corner points. Triangulation network will be laid down in the proposed block for the entire area of 4.10 sq.km. (410 Ha). Topographical Surveying will be carried out in in the entire block area at 2 m contour interval and existing physical and manmade features in the area shall be surveyed. During exploratory drilling all Boreholes will be fixed on the ground whose RLøs and co-ordinates will be determined by DGPS.

12.2 Geological Mapping: Detailed Geological Mapping supported with collection of surface samples (Bedrock/channel) will be carried out in the block area on 1:4000 scale to demarcate the litho-units alongwith structural features for planning of G-3 level work. All the geological features will be recorded and litho-contacts will be plotted for finalization of Geological map. This map will be used as base map for future work. During the course of geological mapping total 30 samples shall be collected for analysis of Cu, Pb, Zn, Ni, Co, Mo, Ag & W by AAS method & 30 nos. samples for Au by fire assay method. External check samples (10% of primary samples) shall be analysed for Cu, Pb, Zn, Ni, Co, Mo, Ag & W and Au at external NABL accredited laboratory to check for analytical bias if any.

12.3 Drilling:

In line with previously drilled three test boreholes at 1st level intersections in Thakurdih- Area-1 block by MECL during 2022-23, the present drilling plan at G-3 stage has been designed to cover total 2200m cumulative strike length and to intersect the ore body at 1st level at 200m interval. Three boreholes planned for 2nd level

intersections where MECL drilled 1st level boreholes in previous exploration to check the persistence of ore zones at 120m vertical depth. Total 15 nos. boreholes with 1760m of drilling have been planned. Out of these 12 boreholes planned targeting to intersect 1st level intersection of 60m vertical depth and remaining The present exploration at G3 stage would be helpful to upgrade the resource in to 333 category of UNFC. The details of proposed boreholes in Thakurdih Area-1 are given in below **Table 12.1**

Table No.12.1:

Details of proposed boreholes in Thakurdih Area-1 Block (G3 Stage)

SR.	SECTION					LEVEL OF
NO.	NO.	BH NO.	DEPTH	AZIMUTH	INCLINATION	EXPLORATION
1	L27E	PBH-1	100.0	210°	50°	FIRST
2	L25E	PBH-2	180.0	210°	50°	SECOND
3	L23E	PBH-3	100.0	210°	50°	FIRST
4	L21E	PBH-4	100.0	210°	50°	FIRST
5	L19E	PBH-5	100.0	210°	50°	FIRST
6	L18E	PBH-6	180.0	210°	50°	SECOND
7	L17E	PBH-7	100.0	210°	50°	FIRST
8	L15E	PBH-8	100.0	210°	50°	FIRST
9	L13E	PBH-9	100.0	210°	50°	FIRST
10	L11E	PBH-10	100.0	210°	50°	FIRST
11	L9E	PBH-11	100.0	210°	50°	FIRST
12	L19E	PBH-12	120.0	210°	50°	FIRST
13	L17E	PBH-13	100.0	210°	50°	FIRST
14	L15E	PBH-14	180.0	210°	50°	SECOND
15	L13E	PBH-15	100.0	210°	50°	FIRST
	TOTAL (m)		1760.0			·

12.4 **Borehole Core Logging**

Detailed drill core logging will be done with consideration of lithological details, structural features, e.g. joints, veins foliations, mineralization pattern, visual estimation of copper content and other associated minerals in percentage etc. for entire length of all the holes and determination of Rock Quality Designations (RQD) for entire length of core in each borehole.

12.5 Borehole sampling (Primary analysis)

The borehole cores will be spitted into two equal halves by using core splitter. One half will be powdered to -200 mesh size and the other half will be kept for future studies. The powdered material will be mixed thoroughly and about 100 gram of

samples will be taken for chemical analysis by successive coning and quartering as primary samples and rest of the material (-200 mesh size) will be kept as duplicate for future reference. This will generate about 300 nos. of samples, which will be sent to MECL Lab. for analysis for Cu, Pb, Zn, Ni, Co, Mo, Ag & W elements by AAS method. Total 100 nos. core samples shall be subjected to Au analysis by fire assay method.

A total nos. of 50 borehole core sample shall be analysed for 34 elements by ICP-MS method to check elemental concentrations in the zones intersected in the boreholes.

12.5 Borehole sampling (Check Analysis)

Total 30 Nos. External Check samples (10% of primary samples) shall be analysed for Cu, Pb, Zn, Ni, Co, Mo, Ag & W and 10 Nos. for Au values at at external NABL accredited laboratory to check for any analytical bias

12.6 Petrography and Mineragraphy Studies

Total 10 nos. of samples for Petrographic study by thin section 10 no of samples for Mineragraphic studies through polished section are proposed to be carried out at MECL Lab. Petrological and Mineragraphic study report includes 10 Nos. of digital photomicrographs of thin and polished sections.

13.0 Quantum of Proposed Work

Table- 13.1 Nature and Quantum of proposed G3 exploratory programme

Sl.No	Description and Nature of Work	Unit	Target
A	GEOLOGICAL & SURVEY WORK		
1	Detailed Geological Mapping (1:4000 scale)	Sq. km	4.10
2	Topographical Survey (2m contour interval)	Sq. km	4.10
a	Bore Hole Fixation and determination of co-ordinates & Reduced Level of the boreholes & Boundary points by DGPS survey	Per Point of observation	20
В	DRILLING		
1	Drilling up to 300m (Hard Rock)	m	1760
2	Borehole deviation Survey by Multishot Camera	m	1760
3	Borehole Geophysical logging	m	1760
C	LABORATORY STUDIES		
1	Chemical Analysis		
i)	Surface Samples (Bedrock/Channel) Primary samples		
	a. for Cu, Pb, Zn, Ni, Co, Mo, Ag & W	Nos	30
	b. for Au by Fire Assay	Nos	30
iii)	Check samples External (10%)		

Sl.No	Description and Nature of Work	Unit	Target
	a. for Cu, Pb, Zn, Ni, Co, Mo, Ag & W	Nos	3
	b. for Au by Fire Assay	Nos	3
i)	Borehole Primary samples		
	a. for Cu, Pb, Zn, Ni, Co, Mo, Ag & W	Nos	300
	b. for Au by Fire Assay	Nos	100
	c) 34 Elements by ICP-MS	Nos	50
iii)	Check samples External (10%)		
	a. for Cu, Ni, Co, Mo& W	Nos	30
	b) For Au (Gold) by Fire Assay	Nos	10
iii)	Composite Samples		
	a) For 5 Radicals (Cu, Ni, Co, Mo and W)	Nos	10
	b) For Au (Gold) by Fire Assay	Nos	10
D	Petrological samples (Surface & BH Core Samples)		
i	Preparation of thin section	Nos	10
ii	Study of Thin Section	Nos	10
E	Mineragraphic Studies (Surface & BH Core Samples)		
a	Preparation of polished section	Nos	10
b	Study of Polished Section	Nos	10
С	Digital Photographs	Nos	10
F	Geological Report preparation (Digital and Hard Copy Format)	Nos	1

14.0 MANPOWER DEPLOYMENT

Manpower deployment List will be provided later.

15.0 BREAK-UP OF EXPENDITURE

Tentative Cost has been estimated based on Schedule of Charges (SoC) of projects funded by National Mineral Exploration Trust (NMET) w.e.f. 01/04/2020. The total estimated cost is Rs. 371.06 Lakh. The summary of tentative cost estimates for Preliminary Exploration (G-3 stage) is given in Table No.-15.1 and details of tentative cost estimates is given in Table No.-15.2. Tentative Time schedule/action plan for proposed Preliminary Exploration (G-3 Level) is given in Table No. 15.3.

Table- 15.1 Summary of Cost Estimates- Thakurdih Area-1 Block

Sl. No.	Item	Total
1	Geological & Survey work	31,84,380.00
2	Drilling	2,48,37,480.00
3	Laboratory Studies	21,43,893.00
	Sub total	3,01,65,753.00
4	Geological Report	7,50,000.00
5	Peer Review	30,000.00
6	Proposal Prepration	5,00,000.00
	Total Cost (without GST)	3,14,45,753.00
7	GST (18%)	56,60,235.54
Т	otal cost including 18% GST	3,71,05,988.54
	SAY, in Lakhs	371.06

S. No.	Item of Work	Unit	Rates as per SoC-Item -SI No.	Rates as per SoC	Estima Qty.	ated Cost of the Proposal Amount (Rs)	Remarks
Α	GEOLOGICAL & SURVEY WORK					, unount (NS)	
i	Detailed geological mapping (1:4000 scale)	sq.km.			4.10 sq.km		
i ii	Charges for one Geologist- Field Charges for one Geologist per- HQ	day day	1.2 1.2	11,000 9,000	150 60	16,50,000 5,40,000	
iii	2 labours/ party (Rs 504/day/labour) (As per rates of Central Labour Commissioner)	day	5.7	504	300		Amount will be reimburse as per the notified rates the Central Labour Commissioner or respective State Govt. whichever is higher
iv	Sampling Party Days -1 Sampler Labour charge not included	day	1.5.2	5,100	75	3,82,500	, , , , , , , , , , , , , , , , , , ,
V	4 labours/ party (Rs 504/day/labour)	day	5.7	504	300	1,51,200	Amount will be reimburse as per the notified rates the Central Labour Commissioner or respective State Govt. whichever is higher
vi	Survey Party Days for topographical contour survey, block boundary and borehole points fixation	day	1.6. 1a	8,300	30	2,49,000	
vii	4 labours for surveyor	day	5.7	504	120 ıb Total- A	60,480 31,84,380	Amount will be reimburse as per the notified rates the Central Labour Commissioner or respective State Govt. whichever is higher
В	DRILLING						
i ii	Drilling upto 300m (Hard Rock) (1 rigs) Borehole deviation Survey	m m	2.2.1.4a 2.2.6	11,500 330	1,760 1,760	2,02,40,000 5,80,800	
iii	Borehole Geophysical logging	5 Bhs of 350m each	3.12	622.25	1,760	10,95,160	Base reate Rs. 10, 88, 941/1750=622.25m
iv	Land / Crop Compansation	per BH	5.6	20,000	15	, ,	
	Construction of concrete Pillar (12"x12"x30") Transportation of Drill Rig & Truck associated per	per borehole	2.2.7a	2,000	15	,	
vi vii	drill (2 rigs)-Two way Monthly Accomodation Charges for drilling Camp	Km month	2.2.8	36 50,000	4,000	2,00,000	
viii	Drilling Camp Setting Cost	Nos	2.2.9a	2,50,000	2	5,00,000	
ix x	Drilling Camp Winding up Cost Approach Road Making (Flat Terrain) Bore Hole Fixation and determination of co-	Nos Km	2.2.9b 2.2.10a	2,50,000 22,020	6		
хi	ordinates & Reduced Level of the boreholes and block boundary by DGPS Borehole core preservation-One complete	Nos	1.6.2	19,200	20	3,84,000	
хіі	borehole plus mineralised cores of all the remaining BHs	m	5.3	1,590	460	7,31,400	
С	LABORATORY STUDIES			Sı	ıb Total- B	2,48,37,480	
1	Chemical analysis Geochemical surface samples (Primary)						
Α	(Bedrock/channel) a) Primary samples for Cu, Pb, Zn, Ni, Co, Mo, Ag & W		4.1.7a & b	3,511	30	1,05,330	AAS method
	b) Primary samples for Au by fire Assay	Nos	4.1.5a	2,380	30	71,400	
	Surface Check samples (10% External check)						
	c) For Cu, Pb, Zn, Ni, Co, Mo, Ag & W		4.1.7a & b	3,511	3	*	AAS method
В	c) For Au (Fire assay) BH core samples	Nos	4.1.5a	2,380	3	7,140	
	a) Primary samples for Cu, Pb, Zn, Ni, Co, Mo, Aq & W	Nos	4.1.7a & b	3,511	300	10,53,300	AAS method
	b) For Au (by fire assay)	Nos	4.1.5a	2,380	100	2,38,000	
	c) ICP-MS (34 elements) (for BH Samples)	Nos	4.1.14	7,731	50	3,86,550	
	BH Core Check samples (10% External						
	a) External Check sample (10% of Primary	Nos	4.1.7a & b	3,511	30	1.05.330	AAS method
	samples) for Cu, Pb, Zn, Ni, Co, Te, Mo and Se b) External Check sample (10% of Primary						And Heliou
	samples) for Au (fire assay)	Nos	4.1.5a	2,380	10	23,800	
L -	Petrological & Mineragraphic studies	NI	404	0.050	10	00.500	
iv v	Preparation of thin section Complete petrographic study report	Nos Nos	4.3.1 4.3.4	2,353 4,232	10 10	42,320	
vi vii	Preparation of polished section Complete mineragraphic study report	Nos Nos	4.3.2 4.3.4	1,549 4,232	10 10		
viii	Digital Photographs Specific Gravity Determination	Nos Nos	4.3.7	280 1,605	10	2,800	
х	opecine Gravity Determination	INOS	4.0.1		ıb Total- C	16,050 21,43,893	
D					otal A to C	3,01,65,753	
F	Geological Report Preparation		5.2	For Projects having cost less than Rs. 300 lakhs-A minimum of Rs.7,50,000 or 3% of the value of work whichever is more For the projects having cost exceeding Rs. 150 lakhs and less than Rs. 300 lakhs - A minimum of Rs. 7.5 lakhs or 3% of the value of work whichever is more		7,50,000	Reimbursement will be made after submission of final Geological Report in Hard Copies (5 Nos) at the soft copy to NMET.
G	Peer review Charges		As per EC decision			30,000	
н	Preparation of Exploration Proposal (5 Hard copies with a soft copy)	5 Hard copies with a soft copy	5.1	2% of the Cost or Rs. 5.0 Lakhs whichever is lower		5,00,000	EA has to submit the Hard Copies and the soft of the final proposal along with Maps and Plan as suggested by the TCC-NMET in its meeting while clearing the proposal.
I	Total Estimated Cost without GST	3,14,45,753	CST will be reimbured as per actual and as per				
J	Provision for GST (18%) Total Estimated Cost with GST					56,60,236	notified prescribed rate
K						3,71,05,988.54	1

11.0 TIME SCHEDULE

11.1 The proposed exploration programme at G3 stage in Thakurdih Area-1 Block envisages surveying, geological mapping, exploratory drilling, deviation survey, borehole geophysical logging, sample preparation and laboratory studies and geological report preparation which will be completed within 12 months by deploying 2 drill rigs. Therefore, a total of 12 months is planned for completion of the entire programme.

(Time schedule 12 months: Review after 6 months)															
S. No.		Qty.	1	2	3	4	5	6		7	8	9	10	11	1
1	Camp Setting	months													
2	Geological Mapping & Sample work	months													
3	Survey work	months													
4	Drilling & associated works (2 rig)	months							_						
5	Borehole deviation survey & Borehole geophysical logging	months							eview						
6	Geologist party days (Field)	months							œ						
7	Sampling party days,	months													
8	Camp winding	months													
9	Laboratory Studies	months													
10	Geologist party days at HQ	months													
11	Report Writing with Peer Review	months													

2 Time loss on account of monsoon/agricultural activity/forest clearence/local law & order problem/ lockdown etc will be additional

12.0 **JUSTIFICATION**

- Thakurdih Area-1 is part of previously explored Thakurdih-Charakmara G3 Block and forms part of Baharagora copper prospect s located at the extreme southeastern end of Singbhum copper belt of Jharkhand.
- 12.2 During the F.S. 1975-76 & 1977-78, GSI carried out Geochemical survey followed by geophysical survey in and around the area. Soil samples at closer intervals (10-15m) were collected and analyzed for copper, nickel, cobalt and molybdenum which resulted with 46 anomalies with weak, moderate, and strong categories. In general, geochemical anomalies coincide with the old workings, values are upto 10000ppm for Cu.
- 12.3 Subsequently, the area was covered by IP- Resistivity traverses at interval of 150/300 m with dipole length of 150m. In some sections, detailing with shorter dipole separation (30m) had been done which resulted with 15 no of high chargeable IP and Magnetic anomaly zones with values 200nT to maximum value 1200 nT. Geophysical

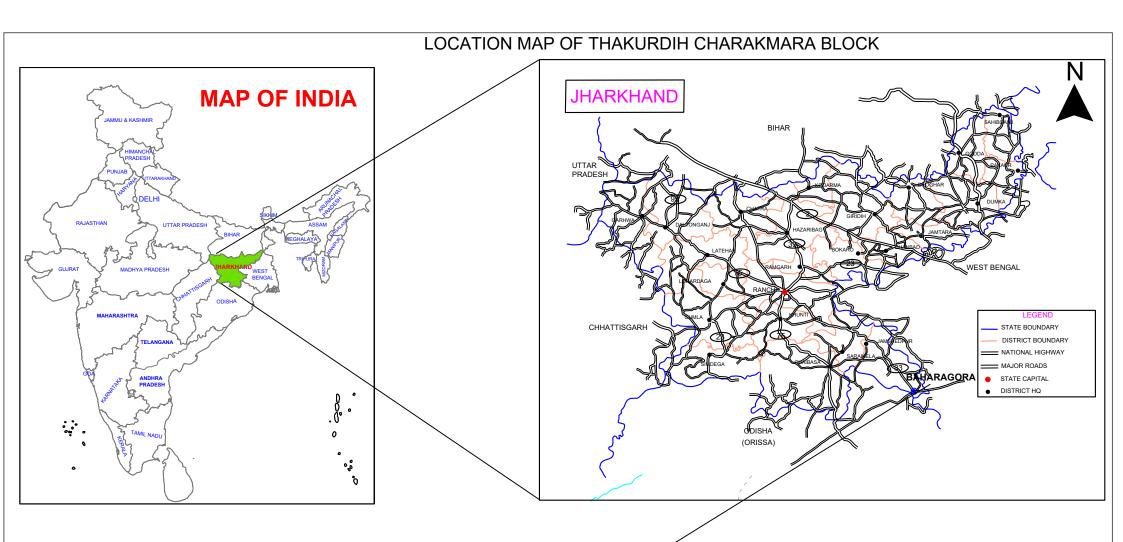
- anomalies indicated weak IP anomalies in Charakmara area and strong IP anomalies in Area-1, Area-2 and Area-3 of the block area. Geophysical anomalies (IP) corroborated well with geochemical anomalies and old workings in the area.
- 12.4 During the year 2022-23, MECL carried out G3 stage exploration in Thakurdih-Charkamara block over 10 sq.km area in four sub blocks namely, Charakmara, Area-1, 2 &3. Thakurdi Area-1 (4.10 sq.km) is one of the sub-block has been covered by ground geophysical survey (I.P., Resistivity, Magnetic) at 100/50 m profile at 20m interval planned to delineate potential mineralized zones in Area-1. Geological survey has brought out some prominent anomalies in Area-1. High chargeability and low resistivity zones were delineated and are well corroborated with old workings, previous geophysical and geochemical anomalies of GSI.
- 12.5 In Area-1, integrated geophysical anomalies intersected copper mineralized zones in all 3 nos. scout boreholes (MTCB-09, 10 & 11) drilled in Area-1. Total four mineralized zones at 0.20% cut-off value delineated. Lode-1B in MTCB-09 (0.26% Cu over 3.22m thickness) and Lode-1AA in MTCB-10 (0.46%Cu over 5.20m thickness are significant and likely to persist along strike and depth. Area-1 hold potential for further exploration. Total 128689 tonnes (0.13 million tonnes) of copper ore resource with average grade of 0.39% Cu over an average thickness of 3.23m estimated and placed under Reconnaissance category (334) of resource as per UNFC code.
- 12.6 It was recommended that õIntegrated geophysical anomalies intersected significant mineralized zones of considerable thickness and grade at depth in the test boreholes drilled in Area-1. Hence, in order to ascertain the potentiality of the prospect, seamless G3/G2 stage exploration is recommended to confirm the strike and depth persistence of ore zone in Area-1 of Thakurdih-Charakmara block.ö
- 12.7 Moreover, all the three Test boreholes drilled in Area-1 are scout boreholes in nature and copper ore resources of Area-1 placed under õReconnsaissance Category (334 of UNFC). Hence resources need to be upgraded to õInferred Resource category (333 of UNFC) by carrying out systematic drilling at G3 stage
- 12.8 Hence, G3 stage exploratory drilling at 200m spacing is required to fill up the gaps and to establish the strike and depth continuity of ore zones over 2200m cumulative strike length in the block area.
- 12.9 The present exploration at G3 stage would be helpful to figure out the exact potentiality of the prospect and to estimate the resource in to 333 category of UNFC.

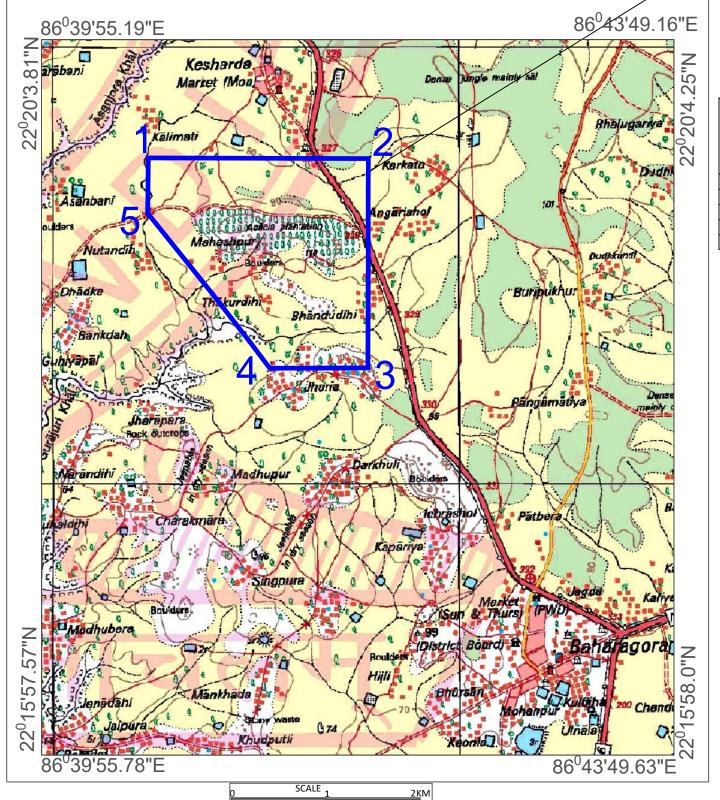
PLATES:

S.No	Description	Plate No.
1	Location map of Thajurdih Area-1 Block.	I
2	Regional Geological Map of Singhbhum Copper Belt,	II
	Jharkhand	
3	Geological Map of Thakurdih Area-1 Block with borehole	III
	locations	
4	Geological Cross Section along section line L9E-L9Eøto	IV
	L27E-L27Eø, Thakurdih-Area-1 Block.	
5	Longitudinal Vertical Section along section line A-Aø& B-Bø	V-A & V-B
	Thakurdih Area-1 Block	

References:

- 1 Report on the Exploration in the Mundadevta-Darkhuli Block, Baharagora Copper Prospect, Singhbhum District, Bihar by P Majumder, Geologist (Sr), AMSE Wing, GSI, September, 1974.
- 2 Exploration for Copper in the South Jharia-Charakmara Blocks and Mundadevta Sub-Block Extension, Baharagora Copper Pospect, Singhbhum District, Bihar, FSP: 1975-76 & 1977-78, By P Majumder, Geologist (Sr.)., AMSE Wing, GSI, February, 1984.
- 3 Geological Report on General Exploration (G2) for Copper Mineralisation, Mundadevta-Darkhuli South Jharia Block, Singbhum Copper Belt, East Singbum District, Jharkhand (MECL, October, 2022)
- 4 Geological Report On Preliminary Exploration (G3) For Copper Ore In Thakurdih-Charakmara, Singbhum Copper Belt, East Singbhum District, Jharkhand State, December, 2023.



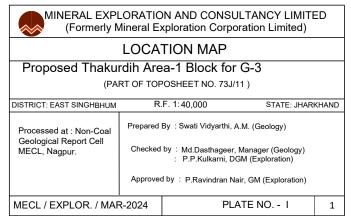


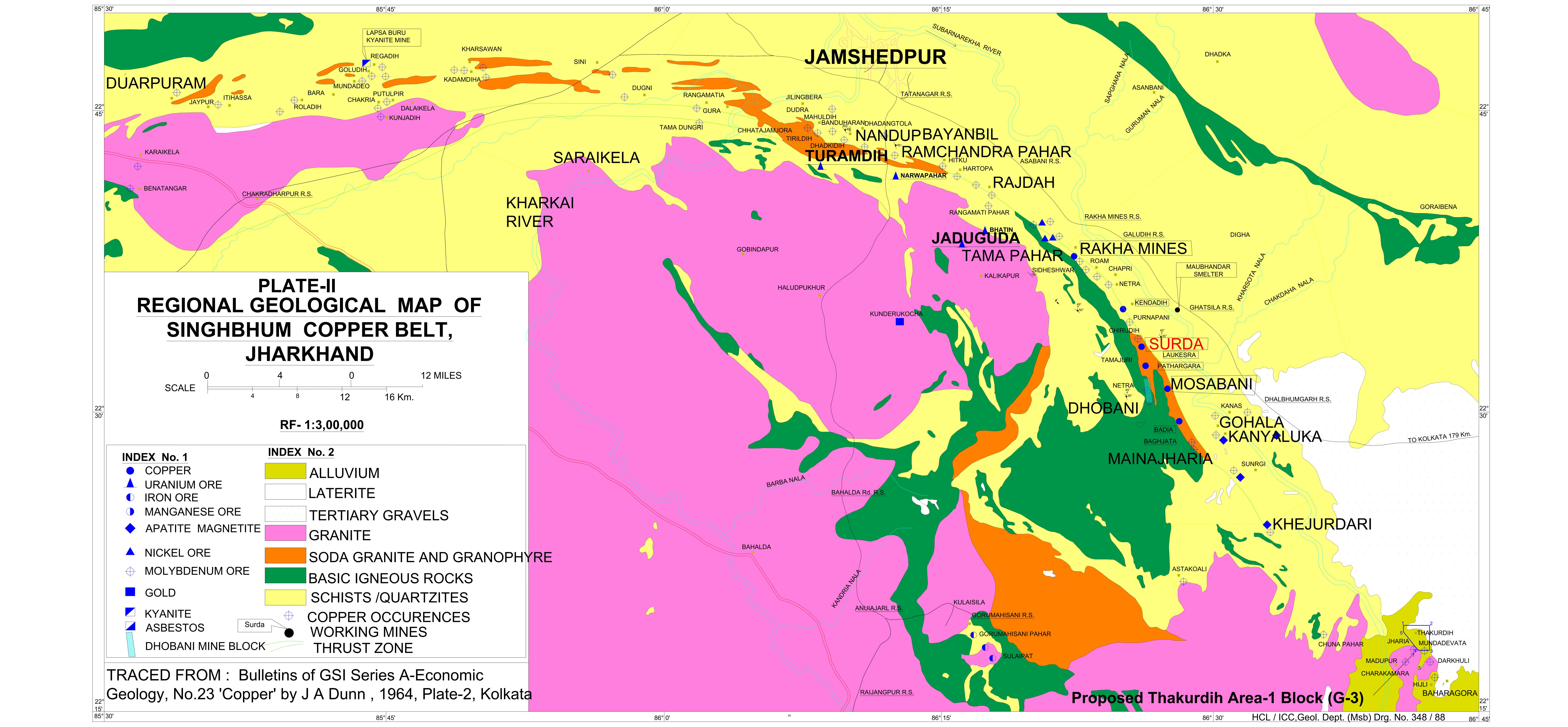
	WGS -8	UTM (Zone 45N)				
Corner Cardinal points	LATITUDE	LONGITUDE	Easting	Northing		
1	22° 19' 23.1904" N	86° 40' 34.8022" E	466667	2468627		
2	22° 19' 23.4125" N	86° 41' 56.3542" E	469000	2468629		
3	22° 18' 10.7567" N	86° 41' 56.5099" E	469000	2466395		
4	22° 18' 10.6238" N	86° 41' 20.5106" E	467970	2466393		
5	22° 19' 04.1304" N	86° 40' 34.6370" E	466661	2468041		

LEGEND



Proposed Block boundary of Thakurdih Area-1 Block for G-3 (Area- 4.10 sq.km)





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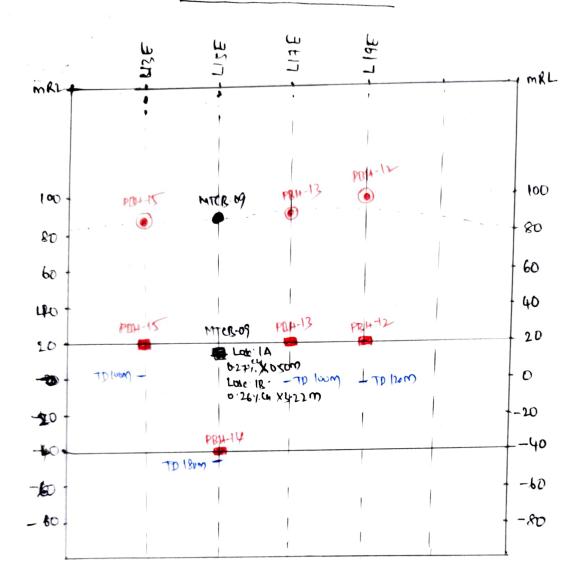
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GEOLOGICAL CROSS SECTION ALONG SECTION LINE L17E-L17E GEOLOGICAL CROSS SECTION ALONG SECTION LINE L18E-L18E' GEOLOGICAL CROSS SECTION ALONG SECTION LINE L19E-L19E' GEOLOGICAL CROSS SECTION ALONG SECTION LINE L21E-L21E' GEOLOGICAL CROSS SECTIONS ALONG L9E-L9E' TO L27E-L27E' PLATE No. IV

37

LONGITUDINAL VERTICAL SECTION ALONG SECTION B-B'

THAKUOIH AREA-1 BLOCK



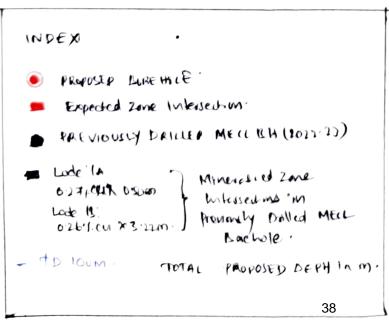


PLATE MO: V-B.