PROPOSAL OF RECONNAISSANCE SURVEY (G-4 STAGE) FOR COPPER, LEAD, ZINC & GOLD IN BAGWARI, SUKWARI BLOCK (44.75 SQ.KM AREA) DISTRICT- SIDHI, MADHYAPRADESH

COMMODITY: COPPER, LEAD, ZINC & GOLD

BY

MINERAL EXPLORATION CORPORATION LIMITED

DR. BABASAHAB AMBEDKAR BHAWAN

SEMINARY HILLS

PLACE: NAGPUR

DATE: 25.03.2021

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

	Features	**Details**
	Block ID	Bagwari, Sukwari Area
	Exploration Agency	Mineral Exploration Corporation Limited (MECL)
	Commodity	Copper (Cu), Lead (Pb), Zinc (Zn), Gold (Au)
	Mineral Belt	Mineralisation of copper and barytes occuring in the area is associated with shear zones within 'Sidhi series'. It can be further linked to the intrusive granite in the talc-chlorite schist, hornblende-chlorite schist, quartz-sericite schist, amphibolites etc.
	Completion period with entire Time schedule to complete the project	Eighteen Months
	Objectives	During field season of 1965-66 and 1966-68,Copper mineralisation as encrustations of malachite and azurite associated with barytes and specks of chalcopyrite in amphibolites was noted in the shear zones passing through the villages of Sukwari (24°21′:81°51′; 63H/15), Bagwari (24°20′:81°47′; 63H/15) and others. While Zinc contents are 1000, 150 and 300 ppm respectively with minimum values giving below 50 ppm For Copper, the anomalous zones coincide mainly with the barytes occurrences with values upto 700 ppm in Sukwari (24°21′:81°51′; 63H/15), and 800 ppm in Bagwari (24°20′:81°47′; 63H/15) villages. The basic schistose rocks recorded copper contents as much as 1000 ppm in the village of Bagwari 24°20′:81°47′; 63H/15). Further prospecting for the base metals like copper, lead and zinc in the area can be continued especially in parts of high index values of the metal contents, by deep pitting and blasting together with detailed capping of the structures. A few geophysical traverses in the anomalous zones will be of utmost advantage to confirm the base-metal enrichment. Based on the evaluation of previous work, the present exploration program has been formulated to fulfil the following objectives. i) To carry out remote sensing study, geological & structural mapping on 1:12,500 scale for

		demarcation of Copper, Lead, Zinc with the structural features to identify the surface manifestations and lateral disposition of the mineralized zones. ii) To collect surface (Bedrock/soil/stream sediment) samples & analyze for Copper, Lead, Zinc & Gold for further course of Exploration program. iii) In case, surface samples give positive results, 5 Nos. scout boreholes shall be drilled which in turn will decide the future course of Exploration program at G-3/G-2 category of UNFC. iv) To estimate reconnaissance Copper, Lead, Zinc, Gold etc, resources along with accessory elements as per UNFC norms and Minerals (Evidence of Mineral Content) Rules-2015 at G-4 level.
	Whether the work will be carried out by the proposed agency or through outsourcing and details thereof. Components to be outsourced and name of the outsource agency	Work will be carried out by the proposed agency.
	Number of Geoscientists	Nos. of Geoscientists: 2 (Field + HQ)
	Expected Field days(Geology, Surveyor)	Geologist Party days: (180+60) Days
		Survey Party days : 15 Days
		Sampling Party Days: 110 Days

1.	**Location**	
	Latitude	A-24° 22' 30" B-24° 22' 30" C-24° 20' 01" D-24° 20' 01"
	Longitude	A-81°46'44" B-81°52'27" C-81°52'27" D-81°46'44"
	Villages	Sukwai, Bagwari. Khirkori, Parkhuri, Khushihawa, Chhirauhi, Chhidahawa, Banjari, Panwar, Mauharian, Tendua, Pathera, Baharia
	Tehsil/Taluk	Gopad-Banas
	District	Sidhi
	State	Madhya Pradesh

2.	**Area (hectares/ square kilometres)**	
	Block Area	44.75 sq.km
	Forest Area	Part of Pabaia Reserve Forest falls in the Block area
	Government Land Area (Bilanam)	Data not available
	Charagaha	Data not available
	Private Land Area	Part of the area is private cultivated land
3.	**Accessibility**	
	Nearest Rail Head	Beohari (55 Km), Satna (101 Km)
	Road	16km SSW of Sidhi
	Airport	Varanasi (190 km)
4.	**Hydrography**	
	Local Surface Drainage Pattern (Channels)	The dendritic drainage (South Central part of the Block) channels flow towards North converting in Tendum Nala. Drainage (in the North-Eastern part of the Block) channels flow towards North in the form of Deonar Nala.
	Rivers/ Streams	Tendum Nala, Deonar Nala.
5.	**Climate**	
	Mean Annual Rainfall	Average annual rainfall is 1132 mm
	Temperatures (December) (Minimum) Temperatures (June) (Maximum)	Minimum temperatures $08^{O}C$ (Dec-Feb), Maximum temperatures up to $45^{O}C$ (April-June)
6.	**Topography**	
	ToposheetNumber	63 H/15
	Morphology of the Area	Most of the area in the block is peneplain flat land except the southern part with general elevation varies from 280m AMSL to 340m AMSL. The southern part is mostly covered by forest land (Reserved Forest) and hills having elevations ranging upo 445m AMSL.
7.	**Availability of baseline geoscience data**	
	Geological Map (1:50K/25K)	District Resource Map of Sidhi (1:2,50,000 scale)
	Geochemical Map	-
	Geophysical Map (Aeromagnetic, ground geophysical, Regional as well as local scale GP maps)	
8.	**Justification for taking up Reconnaissance Survey/ Regional Exploration**	i) During the F.S. 1966-67, Geochemical sampling were carried out by GSI to explore for copper, lead and zinc in Sukwari and Bagwari area in Sidhi district of Madhya Pradesh. Copper mineralization was reported as encrustations of malachite and azurite associated with barytes

		and specks of chalcopyrite in amphibolites was noted in the shear zones passing through the villages of Sukwari (24°21':81°51'; 63H/15), Bagwari (24°20':81°47'; 63H/15) and others Considering the prominent anomalies in the shear zone it was recommended that further prospecting for the base metals like copper, lead and zinc in the area can be continued especially in parts of high index values of the metal contents, by deep pitting and blasting together with detailed capping of the structures. The maximum values obtained for Copper, Lead and Zinc contents are 1000, 150 and 300 ppm respectively with minimum values giving below 50 ppm For Copper, the anomalous zones coincide mainly with the barytes occurrences with values upto 700 ppm in Sukwari (24°21':81°51'; 63H/15), and 800 ppm in Bagwari (24°20':81°47'; 63H/15) villages. The basic schistose rocks recorded copper contents as much as 1000 ppm in the village of Bagwari 24°20':81°47'; 63H/15). A few geophysical traverses in the anomalous zones will be of utmost advantage to confirm the base-metal enrichment. ii) Based on the evaluation of previous work, the present Reconnaissance Survey exploration program at G-4 level has been prepared. The Remote sensing combined with geological mapping, surface sampling and pitting/trenching will be helpful in assessing the disposition of the mineralized zones, structural features like shears and faults if any. iii) The Exploration will be helpful in estimation of reconnaissance resources of copper, lead and zinc and other accessory minerals in block area. iv) The Reconnaissance Survey (G4) will eventually help in planning of detailed exploration program (incase upgraded to G-3/G-2 level) which in turn will facilitate the state Government for action of block.

PROPOSAL OF RECONNAISSANCE SURVEY (G-4 STAGE) FOR COPPER, LEAD, ZINC & GOLD IN BAGWARI AND SUKWARI AREA IN 44.65 SQ.KM, DISTRICT- SIDHI, MADHYA PRADESH

1.0.0 INTRODUCTION

1.1.0 Preamble

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 could be eased with the exploration of new copper deposits of economic importance.

1.1.2 During, preceding decades. No large scale metal deposit has been discovered in India. However, the possibility of working of small mineral bodies in proximity to each other, though technological advances and increased operational efficiency cannot be ruled out. Therefore, it is necessary and imperative to locate and explore such small copper deposits in cluster.

1.2.0 Background

1.2.1 Exploration for strategic, critical, precious, rare earths and PGE are given top priority by Govt. of India, after amendment of MMDR act 2015. Keeping in view, the present proposal is being put up for Reconnaissance Survey. Consequent upon positive outcome, the exploration programme shall follow G3/G2, which may facilitate state government for auctioning of the block.

1.3.0 Location and Accessibility

1.3.1 The block is located in Gopad-Banas Tehsil , Sidhi District, Madhya Pradesh. The nearby railway station is Beohari (55 Km), Satna (101 Km). The nearest airport Banaras, is 190 Km away from the block in NE direction. The area falls in Survey of India Toposheet No. 63H/15.

1.4.0 Physiography & Drainage

1.4.1 In general, the study area forms a flat land (peneplain) except some isolated low rising hillocks and mostly northeast-southwest striking ridges in the sothern part of the block. The altitude of the study area varies between 280m (west) and 445 m (south).

1.4.2 The drainage pattern in the area is of dendritic type. The dendritic drainage (South Central part of the Block) channels flow towards North converting in Tendum Nala. Drainage (in the North-Eastern part of the Block) channels flow towards North in the form of Deonar Nala.

1.5.0 Climate

1.5.1 The average rainfall is 1132 mm. The area comes within the semi arid zone with temperature ranging from 08^{o}C (Dec-Feb) to 45^{o}C (Apr-Jun).

1.6.0 Regional Geology

1.6.1 The geological formations of the area consist mainly of Archaeans represented by the older Metamorphics-Granite Gneisses and Schists etc. These older schists have been intruded by basic and ultrabasic rocks metamorphosed into metadolerites and amphibolites and it is also intruded by granite. Archaens are overlain by Mahakoshal Group of Palaeo-Proterozoic aged rocks comprising of Meta Arkose, Phyllites, Quartzites, Metabasics, Tuffs, BHJ and BHQ. These Palaeo-Proterozoic rocks are overlain by Meso-Proterozoic aged rocks of Semri Series of Vindhyan Super Group and it includes Deoland Sandstone, Arangi/Kanwari Shale, Kajrahat Limestone, Deonar Porcellanite, Koldaha Shale and Salkhan/Chorhat Limestone.

1.7.0 Regional Structure

1.7.1 The area between the two minor lineaments trending ENE-WSW within Mahakoshal Group is the zone of interest for the search of various minerals in the area. Two sets of Minor fault (NE-SW and NW-SE) are also found to be present the area. Regional

stratigraphic succession of the litho-units after District Resource map of GSI is illustrated in the Table I.A. Regional geological map with the proposed Block is given in PLATE-II.

Table I.A
Regional Stratigraphic sequence of Litho units (After District Resource map of GSI)

Age	Super Group/Group	Litho-units
MESO PROTEROZOIC	Semri Group/ Vindhyan Super Group	Salkhan/Chorhat Limestone
		Koldaha Shale
		Deonar Porcellanite
		Kajrahat Limestone
		Arangi/Kanwari Shale
		Deoland Sansdstone
PALAEO-PROTEROZOIC	Mahakoshal Group	BHQ/BHJ
		Metabasics and Tuffs
		Cherty Quartzite
		Phyllite
		Meta Arkose
ARCHAEAN		Granite Gneisses, Amphibolites and Schists

1.8.0 Geology of the Block

1.8.1 The area mostly exposes lithounits belonging to Archaen aged Granite Gneisses and Schists represented by the older Metamorphics-talc-chlorite-schist, quartz-sericite-schist etc, Mafics and Ultramafics and Granites. These older schists have been intruded by basic and ultrabasic rocks metamorphosed into metadolerites and amphibolites and it is also intruded by granite. The granite is intrusive into the basic schists and is exposed more extensively in the Sukwari (24°21':81°51'; 63H/15) than in the Bagwari (24°20':81°47'; 63H/15) area. Exposures of banded-haematite-quartzite of the Sidhi Series, were found to overlie the older metamorphics in the Sukwari (24°21':81°51': 63H/15) area in the vicinity of the mineralised localities.

The granitic rock is composed mainly of quartz, orthoclase, albite, muscovite biotite and hornblende. The area has undergone shearing which is evident from the slickenside surfaces reported on the basic rocks as well as the quartz veins near the contacts of the granitic area. Apart from the rocks discussed above, Phyllites, Cherty Quartzites, BHJ/BHQ of Mahakoshal Group and Lower Sandsotne, Lower Shales of Semri Group are found in the block area. The tentative srtratigraphic sequence of litho units exposed in the Block area (After G.V. Rao and P.K. Ramam - 1965) and after District Resource map of GSI is given in Table I.B.

Table I.B
Stratigraphic sequence of the Bagwari, Sukwari G4 Block area
(After GSI)

Group	Litho-units
Semri Group	Arangi/Kanwari Shale
	Deoland Sansdstone
Mahakoshal Group	BHQ/BHJ
	Cherty Quartzite
	Phyllite
Faulted Contacts	
Older Metamoerphics (Archaeans)	Granite and quartz veins
	Mafic and ultramafic rocks
	Quartz-sericite-schist
	Amphibolites, Basic schists-hornblende-chlorite-schist-talc-chlorite-schist, hornblende-schist with lenses of hornblende, magnetite, epidote, quartzite and epidosite

1.9.0 Mineral Potentiality based on geology and ground geochemistry etc.

1.9.1 Mineralisation of copper and barytes occuring in the area is associated with shearing movements as represented by slicken sides. It can be further linked to the intrusive granite in the talc-chlorite schist, hornblende-chlorite schist, quartz-sericite schist, amphibolites etc. The mechanism of intrusion might have played a part in the creation of open cavities and voids in the fissile country rocks as well as shallow fractures within the granite. The sporadic nature of barytes occurrence together with its shallow depth and clear cut boundaries with the host rocks, suggests that the barytes veins

might have originated due to fracture and cavity fillings. The association of chalcopyrite and barytes with malachite and azurite, quartz and siderite indicates an intermediate temperature condition of deposition. The pink barytes with associated haematite near the village Bagwari (24° 20': 81°47'; 63H/15) indicates the higher temperature condition of the mineralising solutions.

1.9.2 The chalcopyrite exposed in a pit at a depth of 1m from the surface was slopping to the west. Shallow limonite cappings were seen near the mineralised areas. The pitting operations carried out here during the last field season to know the behaviour of the mineralisation brought to light that this mineralisation is very sporadic in nature with exposures of granite within 1m from the surface.

1.10.0 Observation and Recommendations of previous work

1.10.1 During the F.S. 1966-67, Geochemical sampling were carried out by GSI to explore for copper, lead and zinc in Sukwari and Bagwari area in Sidhi district of Madhya Pradesh. Copper mineralisation as encrustations of malachite and azurite associated with barytes and specks of chalcopyrite in amphibolites was noted in the shear zones passing through the villages of Sukwari (24°21':81°51'; 63H/15), Bagwari (24°20':81°47'; 63H/15) and others. The mineralisation affected talc-chlorite schist, hornblende-chlorite schist, amphibolite etc. associated with the shear zone areas. Geochemical soil samples were collected along a grid pattern at intervals of 100m and 50m from the shear zones and barytes occurrences respectively. These were analysed for Copper, Lead and Zinc contents. The maximum values obtained for Copper, Lead and Zinc contents are 1000, 150 and 300 ppm respectively with minimum values giving below 50 ppm For Copper, the anomalous zones coincide mainly with the barytes occurrences with values upto 700 ppm in Sukwari (24°21':81°51'; 63H/15), and 800 ppm in Bagwari (24°20':81°47'; 63H/15) villages. The basic schistose rocks recorded copper contents as much as 1000 ppm in the village of Bagwari 24°20':81°47'; 63H/15).

1.10.2 Further prospecting for the base metals like copper, lead and zinc in the area can be continued especially in parts of high index values of the metal contents, by deep pitting and blasting together with detailed capping of the structures. A few geophysical traverses in the anomalous zones will be of utmost advantage to confirm the base-metal enrichment.

2.0.0 Previous Work

2.1.0 The earliest account of the area was given by Mallet (1869) who carried out traverse survey, while mapping in adjacent Vindhyans. Subsequent work in the area and neighboring tracts carried out by Oldham, (1901, p.1-178) Dutta and Vredenburg. Kedar Narain (1956 p. 5-10) mapped the area around Sidhi in 1952-53 and parts of the area to the east and SE of Sidhi in 1954-55. He has referred the metasedimentary rocks in the area first as Bijawars in his earlier report and as "Sidhi Series" in his later report. He has correlated the Sidhi Series with the Iron Ore Series of the Singhbhum District in Bihar and the Lora (?) stage of Jabalpur Series. J. Narayan Murthy and T.S. Radhakrishna (1961, p.1-5) carried out preliminary examination in the neighboring Satnara-Byriah Section during 1959-60. T.S. Radhakrishna and M.N. Biswanath (1962, p.5) investigated in detail in Satnara- Byriah area during 1961-62 with particular reference to the copper deposits. G.V. Rao and P.K. Ramam (1965, p. 3,7-10) have carried out systematic mapping in the Archaeans and Lower Vindhyans in parts of the Gopad-Banas Tehsil, Sidhi district during the field season 1964-65 and have accepted in general the idea of the "Sidhi Series" of Kedar Narain. Occurrences of chalcopyrite in association with pyrite, azurite, and malachite have been reported by them from the vicinities of Gara (24°27’: 81°55’; 63H/15). They have collected 190 geochemical samples from an area of 450m x 275m of that locality and concluded that the mineralisation is of sporadic nature. They have also reported the occurrence of malachite encrustations from the vicinities of Gurjara (24°22’:81°53’; 63H/15) Byriah (24°20’:81°52’; 62H/15). Malachite encrustations, associated with azurite and covellite have been reported from the cultivated fields of Sonbersa (24°24’:81°48’; 63H/15) and west of Bagwari (24°20’:81°47’; 63H/15).

2.2.0 During the F.S. 1965-66, under the supervision of S. N. Bhattacharjee, GSI has carried out the study of Barytes occurrence of Sukwari and Bagwari area in Sidhi district of Madhya Pradesh. Together with baryte, preliminary investigation has also been carried out for copper mineralisation in Sukwari area by pitting and trenching. Based on the malachite and azurite staining on baryte and limonitization on the surface seven sites were selected for deep pitting. Out of these seven sites, only pit no. 1 showed some specks of chalcopyrite within a shallow depth of one metre from the surface. Chalcopyrite has been found segregated in a very hard basic amphibolitic rock. The mineralisation is in the western direction and deep pitting through it has been possible only upto a depth of about 2.1m. It has been suggested that further lateral extension of mineralisation at depth can be proved by extensive excavation or by drilling only. Besides this pit, boulders of malachite and azurite have been found together with baryte in pit nos. 2, 3. A lateritic iron ore resembling morum occasionally used for road building has also been found in these pits. From other pits satisfactory results could not be achieved for locating any copper mineralisation.

2.3.0 During the F.S. 1966-67, under the supervision of S. N. Bhattacharjee, GSI has carried out Geochemical sampling to explore for copper, lead and zinc in Sukwari and Bagwari area in Sidhi district of Madhya Pradesh.

2.4.0 The soil cover in the areas is of residual type. Geochemical soil samples were collected from the shear zone areas to find out the anomalous zones. Soil sampling was carried out on a grid pattern of 100m and 50m intervals in the shear zones and barytes areas respectively. The sample lines were aligned 67°-227° and 157°-337°. The villages traversed include Sukwari (24°21’:81°51’; 63H/15), Bagwari (24°20’:81°47’; 63H/15), Khirkhori (24°21’:81°48’; 63H/15), Tendua (24°23’:81°47’; 63H/15) and Panwar (24°23’:81°47'; 63H/15). From the village of Panwar (24°23’: 81°47’; 63H/15) eleven samples were collected from a linear zone

marked by shearing.As the width of the shear zone is more than <100m a spacing of 100m for the collection of samples was found to be quite ideal.

2.5.0 A total of 499 samples were collected from the areas, and these were sent for analysis to know the copper, lead and zinc contents.

2.6.0 Geological mapping on a scale 1:10,000 was carried out in the mineralised area, based on sample points. Chemical data showing the copper, lead and, zinc contents in the samples were plotted on the grid points in order to get the 'Iso-grads'. The values thus plotted ranges from <50 to 1000 ppm. The plottings brought to light a few anomalous zones around high index values arranged parallel to the mineralised belt of the shear zone (Plates III-A & III-B). For copper, the anomalous points coincide mainly with the barytes occurrences. Concentrations upto 700 ppm of copper were recorded in the barytes occurrences (Plate III-A). The maximum copper concentrations were met with in the high grounds of the Bagwari (24°20':81°47'; 63H/15) village. The basic schistose rocks recorded copper contents as much as 1000 ppm Besides, 800, 600, 300 and 200 ppm concentrations were also noted in the spots. The Bagwari occurrences are similar to the Sukwari occurrences. In the western and N.W. parts of the Bagwari (24°20':81°47'; 63H/15) village the copper contents touched the 800 ppm mark in the barytes zone. Besides, copper showing as much as 100 ppm are also scattered in the localities.

2.7.0 Lead with values upto 150 ppm was recorded adjoining the barytes occurrences of Sukwari (24°21':81°51'; 63H/15) village. Scattered spots showing 100 ppm were found in the Bagwari (24°20':81°47'; 63H/15) village.

2.8.0 Values for Zinc ranging upto 300 ppm were also recorded in the villages of Sukwari (24°21':81°51'; 63H/15) and in Bagwari (24°20':81°48'; 63H/15) These were upto 150 ppm Plate III-B).

3.0.0 Block description

3.1.0 The proposed G-4 block for copper, Lead and Zinc falls in Survey of India Toposheet No. 63H/15 and covers an area of 44.75 sq. km in and around villages Sukwari, Bagwari. Khirkori, Parkhuri, Khushihawa, Chhirauhi, Chhidahawa, Banjari, Panwar, Mauharian, Tendua, Pathera, Baharia of Sidhi District, State Madhya Pradesh. The block location is given in **PLATE-I.** The Co-ordinates of the corner points of the block area both geodetic and UTM are given in **Table No.-III.A**.

Table-III.A

Co-ordinates of the Corner points of the Block

Block Corner points	WGS 84 (DD MM SS)		UTM Zone-44 (m)	
	Latitude	Longitude	Easting (m)	Northing (m)
A	24° 22' 30"	81°46'44"	578991.99	2695966.87
B	24° 22' 30"	81°52'27"	588655.17	2696024.41
C	24° 20' 01"	81°52'27"	588684.01	2691441.51
D	24° 20' 01"	81°46'44"	579017.68	2691384.05

4.0.0 Planned Methodology

The proposed programme for Reconnaissance survey at G-4 stage of exploration in the block comprises of Remote sensing study, Geological mapping (1:12,500 scale), Surface Geochemical sampling (Bedrock/Channel, Soil, Stream sediment), Pitting/Trenching, drilling of 5 Nos of scout boreholes involving about 500m drilling 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:

4.1.0 Remote Sensing Study

4.1.1. Remote sensing study shall be carried out in the entire 44.75 sq km area to identify the lineaments, lithological contacts, other structural features and the mineral

potential zones through mineral targeting process. A detailed report will be provided in the end of the study which will be helpful for the current and future exploration work

4.2.0 Geological Mapping

4.2.1. Geological mapping will be done in the entire 44.75 sq km area on 1:12,500 scale. Rock types, their contact, structural features will be mapped. Surface manifestations of the ore bodies available along with their surface disposition will be marked on map.

4.3.0 Geochemical Sampling

4.3.1. **Surface sampling (Bed Rock/Channel//Soil/ Stream Sediment Sample):** During the course of Geological mapping, the Bed rock / Channel / Soil / Stream sediment samples shall be collected so as to over the entire area. The samples shall be collected depending upon the forest cover and accessibility of the area. A total 300 Nos of Bed rock / Channel / Soil / Stream sediment samples (300 nos for assay of 34 elements by ICPMS), 60 Nos for of Au & Ag by fire-assay will be collected. Total 45 Nos Check samples (5% internal + 10% External) will be analyzed for assay of 34 elements by ICPMS and 10 Nos for Au & Ag analysis by fire-assay method.

4.4.0 Surveying

4.4.1. Geological traverses, geological features and location of surface samples will be marked with hand held GPS. During exploratory drilling of scout borehole, fixation and determination of reduced level and co-ordinates of the boreholes only will be undertaken by DGPS/ Total station. The anomalous zone demarcated on the basis of Geological mapping and Geo-chemical sampling where drilling will be carried out can be surveyed on topographic plan in 1:50000 and contour map will be prepared at 2m contour interval.

4.5.0 Exploratory Mining (Trenching/Pitting)

4.5.1. Shallow trenching/pitting (Excavation) shall be carried out in the potential zones identified based on the results of geological mapping and geochemical sampling. A provision of shallow trenching/pitting of 200 cubic meter has been kept. Pitting shall be done for correlation of mineralized zones on surface up to a depth of 1-2 m after removal of soil/weathered column in the area. Locations of pits/trenches on ground will be decided by field geologist based on field observations. A provision of 230 Nos of primary & check (5% internal+10% External) trench/pit samples is kept for analysis for assay of 34 elements by ICPMS, 46 Nos for Au & Ag by Fire assay analysis. The trench /pit walls will be mapped on 1:200 scale. Thus a total of 200 cu m of shallow trenching/pitting work along with associated geological & laboratory studies have to be carried out.

4.6.0 Core Drilling:

4.6.1. Based on Geological mapping with Remote sensing studies, Geochemical studies and Shallow trenching/pitting (Excavation), the extension of the mineralized zones (ore bodies) will be marked. To find out the potentiality of mineralized zones in strike & dip, 5 Nos scout boreholes involving 500m of drilling will be carried out for upper level of intersection of mineralized zones.

4.7.0 Drill Core Logging:

4.7.1. The drill core will be logged for rock types, structural features, textures, intersection of ore zones, types of mineralization and occurrence of various ore minerals. The logging for determination of Rock quality determination (RQD) will also be undertaken.

4.8.0 Drill Core Sampling:

4.8.1. During geological logging of drill core, mineralized zone will be marked on basis of concentration and lithology. Total 115 Nos of primary and check (5% Internal Check+10%

External Check) samples will be analysed for Cu, Pb & Zn, Co & Mo assay and 23 Nos will be analysed for assay of Au & Ag.

4.8.2. Total 15 Nos of composite samples will be analysed for Cu, Pb & Zn, Co & Mo assay and 15 Nos of composite samples will be analysed for assay of Au & Ag.

4.9.0 Petrological & Mineralogical Studies:

4.9.1. During the course of Geological mapping and core logging 30 samples from various litho units from surface, Pit/Trenh/Channels and lithounits intersected in boreholes will be studied for petrography and 20 samples from mineralized zones will be studied for the ore mineral assemblages and their distribution, alteration, enrichment etc in polished sections.

4.10.0 Specific Gravity Determination:

4.10.1. Study of the specific gravity determination of 10 samples from the mineralized zones intersected in the boreholes will be undertaken in MECL, Petrology Lab.

4.11.0 Nature Quantum and Target

4.11.1. Details of the particular, Quantum and the targets are tabulated in **Table No.-IV.A.**

Table No-IV.A

Envisaged Quantum of proposed work in Bagwari-Sukwari Block

Sl. No.	Item of Work	Unit	Target
1	**REMOTE SENSING & REPORT (1 BLOCK)**	Nos	1
2	**Geological Mapping** (on 1:12,500 Scale)	Sq km	44.75 sq.km
3	**Survey**		
	Bore Hole Fixation* (Scout Boreholes)	Nos	5 Nos
	RL & Coordinate Determination*	Nos	5 N0s
4	**Geochemical Sampling** (Taken up in Anomalous areas) a) Bed rock /channel/Soil/Stream Sediment sampling	Nos.	300 Nos
5	**Exploratory Mining**	**m**	**200 Cu m**
	Excavation (Trenching/Pitting)	Cu. m.	200 Cu m
7	**Drilling (coring)***	**m**	**500m (5 BHs)**
8	**Geological work***		
	a) Geological Core Logging, Sample Preparation etc.	m	500m (5 BHs.)
9	**Laboratory Studies**		

Sl. No.	Item of Work	Unit	Target
	i) Surface Samples (Bed rock/Channel/Soil/ Samples) a) Primary,5% Internal & 10% External check by ICP-MS b) Primary & Check Samples Au & Ag by Fire assay	**Nos**	345 Nos 69 Nos
	ii) Pit/Trench Samples a) Primary,5% Internal & 10% External check by ICP-MS b) Primary & Check Samples Au & Ag by Fire assay	**Nos**	230 Nos 46 Nos
	iii) Drill Core Samples* a) Primary,5% Internal & 10% External check For 5 Radicals (Cu, Pb, Zn, Co & Mo) b) Primary & Check Samples Au & Ag by Fire assay		115 Nos 23 Nos
	iv) Composite Samples*		
	a) For 5 Radicals (Cu, Pb, Zn, Co & Mo)	Nos	15 Nos
	b) Au & Ag by Fire assay	Nos	15 Nos.
10	**Petrological Samples (Surface & BH Core Samples)**		
	a) Preparation of Thin Section b) Study of Thin Section	Nos Nos	30 Nos 30 Nos
11	**Mineragraphic Studies (Surface & BH Core Samples)**		
	a) Preparation of Polished Section b) Study of Polished Section	Nos Nos	20 Nos 20 Nos
12	**Specific gravity Determination***	Nos.	10 Nos
13	**Report Preparation (Digital format)**	Nos.	01 Nos
*** The 2nd Level of work to be decided after review of Geological Mapping & Geochemical Sampling**			

5.0.0 Manpower Deployment

5.1.0 Manpower deployment List will be provided later.

6.0.0 Break-up of Expenditure

6.1.0 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. **222.39 Lakh**. The summary of tentative cost estimates for Reconnaissance Survey (G-4 Level) is given in **Table No.-VI.A** and details of tentative cost estimates is given in **Table No.–VI.B**. Tentative Time schedule/action plan for proposed Reconnaissance Survey (G-4) is given in **Table No. VI-C.**

Table No-VI.A

Summary of Tentative Cost Estimates for Reconnaissance Survey (G-4 Level)

Exploration

Sl. No.	Item	Total Estimated Cost (Rs.)
1	Remote Sensing, Geological Mapping (LSM), Other Geological Work	32,87,600
3	Trenching & Pitting	6,66,000
4	Drilling & associated works	74,63,820
5	Laboratory Studies	58,34,205
6	Geologist at HQ	5,40,000
	Sub Total (1 to 6)	**1,77,91,625**
7	Exploration Report Preparation	7,50,000
	Proposal Preparation	3,80,000
8	Peer review cherges	10,000
	Sub Total (1 to 7)	**1,89,31,625**
9	GST 18%	34,07,693
	Total:	**2,23,39,318**
	Say Rs. In Lakh	**223.39**

Table No-VI.B

Details of Tentative Cost Estimates for Reconnaissance Survey (G-4 Level)

Estimated cost for Reconnaissance Survey (G-4) for Copper (Cu), Lead (Pb), Zinc (Zn) and Gold (Au) in Sukwari-Bagwari Area, Sidhi District, Madhya Pradesh.

Total Area - 44.75sq km; Nos. of Borehole - 5 ; Borehole depth range - 100m avg ; Completion Time - 16 Months

Sl. No.	Item of Work	Unit	Rates as per NMET SoC 2020-21		Estimated Cost of the Proposal		Remarks
			SoC- Item-S. No.	Rates as per SoC	Qty.	Total Amount (Rs)	
1.0	**Geological, Sampling & Survey Days**						
1.1	Satellite imagery/Aerial photo interpretation studies					-	
	a) Charges for procurement of satellite imageries	Nos	1.1.a	0	0	-	If required; will be reimbursed as per actual
	b) Geologist man days (1 No) for interpretation (HQ)	days	1.1.b	9,000	45	4,05,000	
1.2	Large scale (LSM) Geological mapping/ Trenching/ Drilling					-	
	a) Geologist man days (1 No) for Geological Mapping/Trenching/Drilling (Field)	days	1.2	11,000	180	19,80,000	
	b) Labour Mapping/Trenching/Drilling (Field) (2 workers per geologist)	per worker	5.7	427	360	1,53,720	Amount will be reimburse as per the notified rates by the Central Labour Commissioner (Rs. 427/- per day) or respective State Govt. whichever is higher
	c) Sampling man days -1 Sampler (Geochemical /Trenching/Drilling) Labour charge not included	day	1.5.2	5,100	110	5,61,000	
	d) 4 labours/ party (Rs 427/day/labour) (As per rates of Central Labour Commissioner)	day	5.7	427	440	1,87,880	Amount will be reimburse as per the notified rates by the Central Labour Commissioner (Rs. 427/- per day) or respective State Govt. whichever is higher
	Sub-Total A					**32,87,600**	
2.0	**Mineral Investigation**						
2.1	Trenching/Pitting$						
	a) Excavation of trenches & pits	per cu m	2.1.1	3,330	200	6,66,000	
	Sub-Total B					**6,66,000**	
3.0	**Drilling**					-	
3.1	a) Drilling up to 300m Rigs) (Medium Hard Rock)	per m	2.2.1.4 a	11,500	500	57,50,000	
3.2	Borehole deviation survey	per m	2.2.6	330	500	1,65,000	
3.3	Borehole pillaring					-	
	a) construction of concrete pillar (12"x12"x30")	per borehole	2.2.7.a	2,000	5	10,000	
3.4	Transportation of drill rigs & truck associated per drill (To & Fro from HQ)	per km	2.2.8	36	1200	43,200	
3.5	Monthly accommodation charges for drilling camp	monthly	2.2.9	50,000	5	2,50,000	
3.6	a) Drilling camp setting (2 rigs)	per drill	2.2.9a	2,50,000	1	2,50,000	
3.7	b) Drilling camp winding (2 rigs)	per drill	2.2.9b	2,50,000	1	2,50,000	

Sl. No.	Item of Work	Unit	Rates as per NMET SoC 2020-21		Estimated Cost of the Proposal		Remarks
			SoC- Item-S. No.	Rates as per SoC	Qty.	Total Amount (Rs)	
3.8	Approach road making in rugged- hilly terrain (Partly rugged-hilly terrain)	per km	2.2.10b	32,200	5	1,61,000	
3.9	Drill core preservation	per m	5.3	1590	150	2,38,500	
3.10	Land/crop compensation	per borehole		20000	5	1,00,000	
3.11	Demarcation Fixation of borehole and determination of co-ordinates & Reduced Level (RL) of the boreholes by DGPS	Per point of observation	1.6.2	19,200	5	96,000	the area surrounding mineralized zones (ore bodies)/potential area will be contoured
3.12	a) Surveyor man days (1 Nos) (the area surrounding drill points/mineralized zones (ore bodies)/potential area will be contoured)	days	1.6.1.a	8,300	15	1,24,500	
3.13	b) 4 labours/ party (Rs 427/day/labour) (As per rates of Central Labour Commissioner)	per worker	5.7	427	60	25,620	
	Sub-Total C					**74,63,820**	
4.0	**Laboratory Studies**						
4.1	Chemical Analysis						
	i) Surface sampling (Bed Rock Samples/Soil/Stream Sediment)						
	a) 34 element Package analysis by ICP-MS for surface samples	per sample	4.1.14	7,731	300	23,19,300	
	b) For Au & Ag by Fire Assay	per sample	4.1.5a	4,760	60	2,85,600	
	ii) Check Samples (Bed Rock/Soil/Stream Sediment Samples) - 5% Internal & 10% External					-	
	a) 34 element Package analysis by ICP-MS for surface samples	per sample	4.1.14	7,731	45	3,47,895	
	b) For Au & Ag by Fire Assay	per sample	4.1.5a	4,760	9	42,840	
4.2	**Pit & Trench, Primary Samples**					-	
	a) 34 element Package analysis by ICP-MS for surface samples	per sample	4.1.14	7,731	200	15,46,200	
	b) For Au & Ag by Fire Assay	per sample	4.1.5a	4,760	40	1,90,400	
	ii) Check Samples - 5% Internal & 10% External					-	
	a) 34 element Package analysis by ICP-MS for surface samples	per sample	4.1.14	7,731	30	2,31,930	
	b) For Au & Ag by Fire Assay	per sample	4.1.5a	4,760	6	28,560	
4.3	**ii) BH Core Sampling, Primary & Check samples (5% internal +10% External)**					-	
	a) For Cu, Pb, Zn, Co, Mo	per sample	4.1.7b	2,506	100	2,50,600	
	b) For Au & Ag by Fire Assay	per sample	4.1.5a	4,760	20	95,200	
	ii) Check Samples - 5% Internal & 10% External					-	
	a) For Cu, Pb, Zn, Co, Mo	per sample	4.1.7b	2,506	15	37,590	
	b) For Au & Ag by Fire Assay	per sample	4.1.5a	4,760	3	14,280	

Sl. No.	Item of Work	Unit	Rates as per NMET SoC 2020-21		Estimated Cost of the Proposal		Remarks
			SoC- Item-S. No.	Rates as per SoC	Qty.	Total Amount (Rs)	
	iii) Composite Samples - 5% Internal & 10% External					-	
	a) For Cu, Pb, Zn, Co, Mo	per sample	4.1.7b	2,506	15	37,590	
	b) For Au & Ag by Fire Assay	per sample	4.1.5a	4,760	15	71,400	
4.4	**Petrological / Mineralographic studies**					-	
	a) Preparation of thin section	per sample	4.3.1	2,353	30	70,590	
	b) Study of thin section for petrography	per sample	4.3.4	4,232	30	1,26,960	
	c) Preparation of polished section	per sample	4.3.2	1,549	20	30,980	
	d) Study of polished section for mineragraphy	per sample	4.3.4	4,232	20	84,640	
	e) Digital photomicrograph of thin polished section	per sample	4.3.7	280	20	5,600	
	f) Specific Gravity Determination (BH)	per sample		1,605	10	16050	
	Sub-Total D					**58,34,205**	
5.0	**Geologist man days (1 No.) for geological map & Report (HQ)**	**days**	1.2	**9,000**	**60**	**5,40,000**	
6.0	**Total (1.0 to 5.0)**					**1,77,91,625**	
7.0	**Geological Report Preparation**	Nos	5.2	A Minimum of Rs. 7.5 lakhs or 3% of the work whichever is more	1	**7,50,000**	For the projects having cost up to exceeding Rs. 150 Lakhs but less than 300 Lakhs: A Minimum of Rs. 7.5 lakhs or 3% of the work whichever is more and Rs. 3000/- per each additional copy.
8.0	**Preparation of Exploration Proposal**	**Nos**	**5.1**	**380000**	**1**	**3,80,000**	EA has to submit the Hard Copies and the soft copy of the final proposal along with Maps and Plan as suggested by the TCC-NMET in its meeting while clearing the proposal.
9.0	**Report Peer Review Charges**	**lumpsum**	**As per EC decision**	**10000**	**1**	**10,000**	
10.0	**Total Estimated Cost without GST (7+8+9)**					**1,89,31,625**	
11.0	**Provision for GST (18%)**					**34,07,693**	GST will be reimburse as per actual and as per notified prescribed rate
12.0	**Total Estimated Cost with GST**					**2,23,39,318**	
					Say, in Lakhs	**223.39**	
Note:							
	Note - ***1. If any part of the project is outsourced, the amount will be reimbursed as per the Paragraph 3 of NMET SoC and Item no. 6 of NMET SoC. In case of execution of the project by NEA on its own, a Certificate regarding non outsourcing of any component/project is required.*** ***2. Rates are calculated as per NMET SOC issued on 31st March 2020 without escalation. Although billing for subsequent financial years will be done as per the actual escalations as per RBI Indices.***						

Table VI-C

Table -VI C: Tentative Time schedule / Action plan of Reconnaissance Survey (G-4) for Copper (Cu), Lead (Pb), Zinc (Zn) and Gold (Au) in Sukwari-Bagwari Area, Sidhi District, Madhya Pradesh.																	
S.No.	Activities	MONTHS															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Camp setting								Review								
2	Remote Sensing																
3	Report writing for RS																
4	Geological mapping & Sampling																
5	Sample preparation (1 Party days)																
6	Analytical work																
7	Exploratory mining for trenching																
8	Sample preparation (Trench samples)																
9	Analytical work																
10	Drilling 500m																
11	Sample preparation for Drill core samples																
12	Survey work for area surrounding mineralized zones																
13	Camp winding																
14	Analytical work dril core samples																
15	Geological report																
16	Peer Review																
* Commencement of project will be reckoned from the day the exploration acreage is available along with all statutory clearances																	
*Time loss on account of monsoon/agricultural activity/forest clearance/ local law & order problems will be addition to above time line.																	

7.0.0 References:

1. Mallet, F.R. (1869) Mem. Geol. Surv. Ind. Vol. 7.

2. Oldham, R.D. (1901) Mem. Geol. Surv. Ind. Vol. 31, pt. 1.

3. Kedar Narain (1956) Systematic mapping in Sidhi District, 1956.

4. Narayanmurthy, J and Radhakrishna, T.S. (1961) A note on the preliminary investigations of the occurrences of argentiferous rocks in the mineralised zone between Satnara and Byriah, Sidhi District, 1961, Unpublished.

5. Radhakrishna, T.S. and Biswanath, M.N. (1962) Investigation of the mineralised zone between Satnara and Byriah, Gopad - Banas Tahsil, Sidhi District, Madhya Pradesh, 1962 Unpublished.

6. Rao, G.V. and Ramam, P.K. (1965) Report on geology and structure of parts of Gopad - Banas Tehsil, Sidhi District, Madhya Pradesh, 1965, Unpublished.

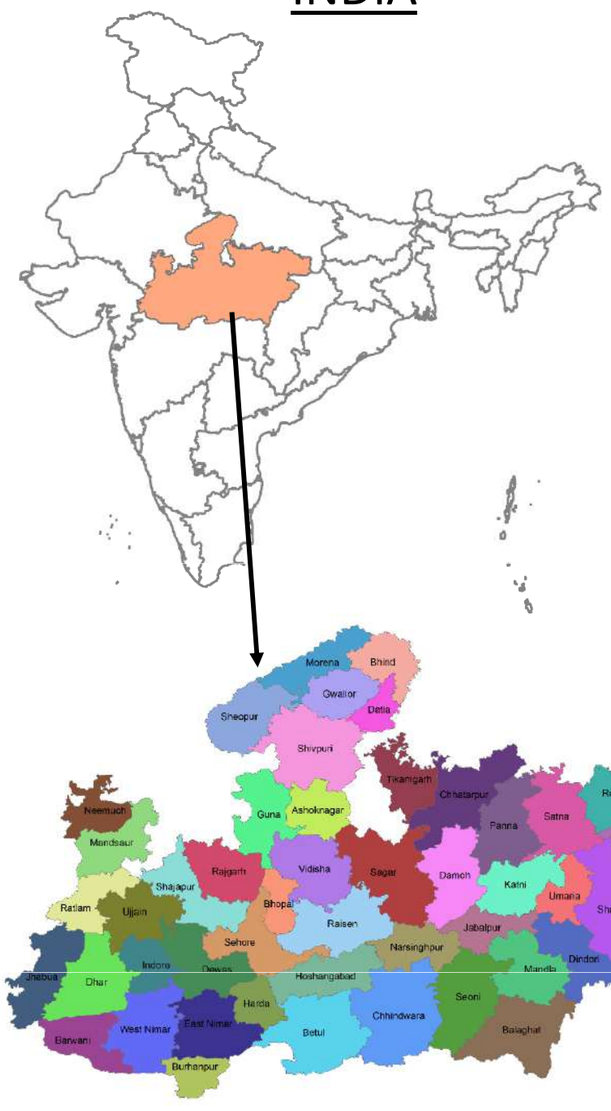
7. Bhattacharjee, S.N. (1966) A report on the barytes occurrences in the Sukwari and Bagwari areas, Sidhi District, Madhya Pradesh, Toposheet No. 63H/15,

List of Plates:

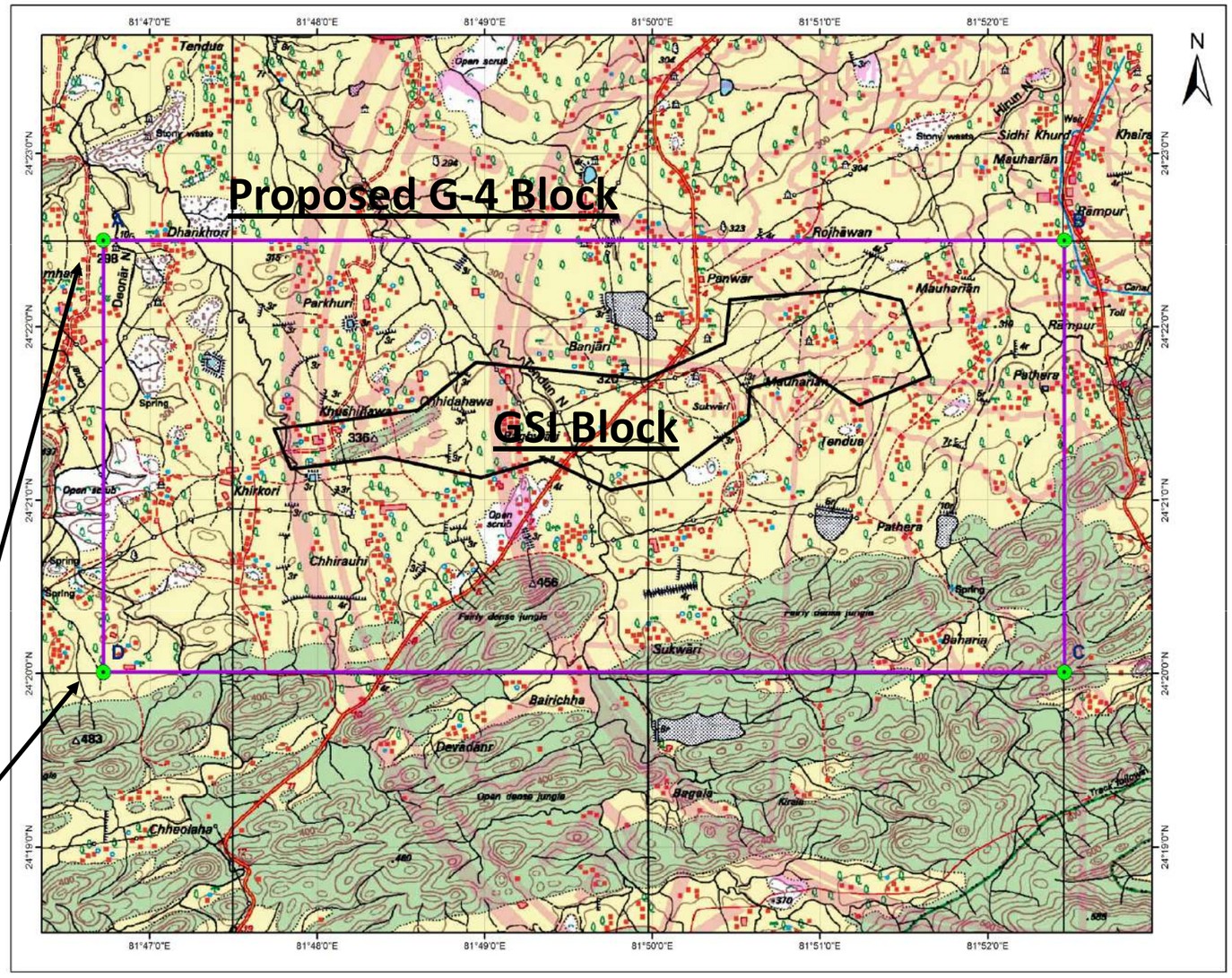
1. **Plate-I: Block Location Map of Bagwari Sukwari area, Sidhi, State Madhya Pradesh**
2. **Plate-II: Regional Geological Map with Proposed Bagwari Sukwari area block location (Part of GSI District Resource Map of Sidhi, Madhya Pradesh.**
3. **Plate III-A: Secondary Dispersion Pattern of Copper in Sukwari-Bagwari Area, Sidhi District, Madhya Pradesh. (1966-67, after GSI)**
4. **Plate III-B: Secondary Dispersion Pattern of Lead and Zinc in Sukwari-Bagwari Area, Sidhi District, Madhya Pradesh. (1966-67, after GSI)**

PART OF TOPOSHEET NO. 63 H/15

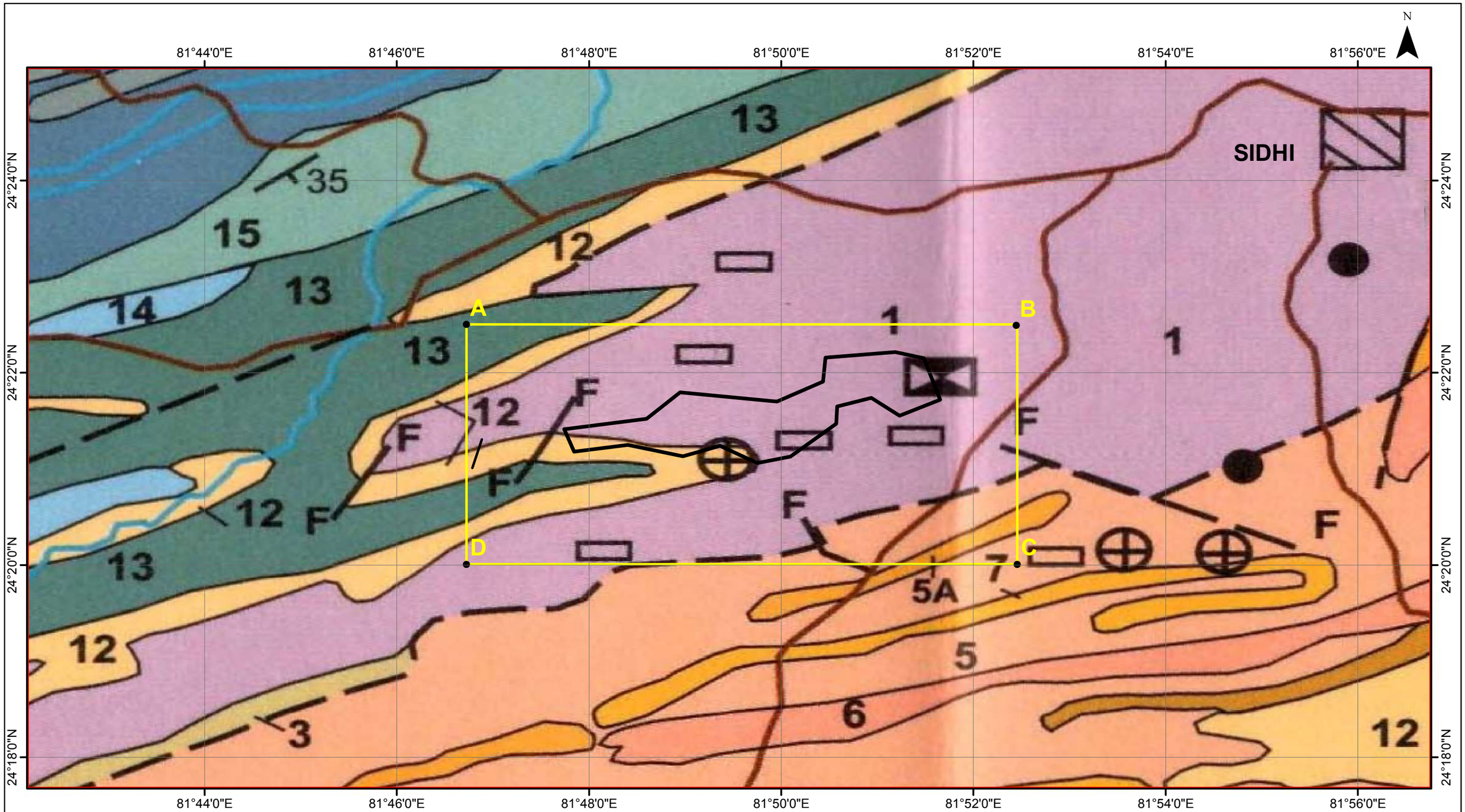
INDIA



MADHYA PRADESH



MINERAL EXPLORATION CORPORATION LIMITED	
LOCATION MAP of PROPOSED BLOCK	
G4 Exploration For Copper, Lead, Zinc & Gold in Bagwari, Sukwari Area (44.75 Sq. Km)	
DISTRICT- SIDHI	**STATE – MADHYA PRADESH**
Prepared By – Exploration Division, MECL, Nagpur	
MECL / CHQ / EXPLORATION / JUNE-2020	PLATE NO. - I | 1



INDEX

17	Salhkan/Chorhat sandstone, limestone	7	BHQ/BHJ
16	Koldaha shale	6	Metabasics and tuffs
15	Deonar porcellanite	5A	Cherty quartzite
14	Kajrahat limestone	5	Phyllite
13	Arangi/Kanwari shale	3	Meta arkose
12	Deoland sandstone	1	Granite gneisses and schists

Road
Settlement
Drainage/river, stream
Minor Lineament
Litho-contact
60 Attitude of bedding
F Fault
F High angle fault
Barytes
Iron ore
Soapstone
Copper

Proposed G4 Block

Corner points
Area coved by Geochem_GSI
Block

2.5 1.25 0 2.5 Km

MINERAL EXPLORATION CORPORATION LIMITED

REGIONAL GEOLOGY MAP

G4 Exploration For Copper,Lead,Zinc,Gold in Bagwari-Sukwari

Sale - 1:70,000

DISTRICT - SIDHI | STATE - MADHYA PRADESH

Prepared By: Exploration Division, MECL, Nagpur | Processed At : MECL, Nagpur

MECL / EXPLORATION / JUNE-2020 | PLATE - II | 2

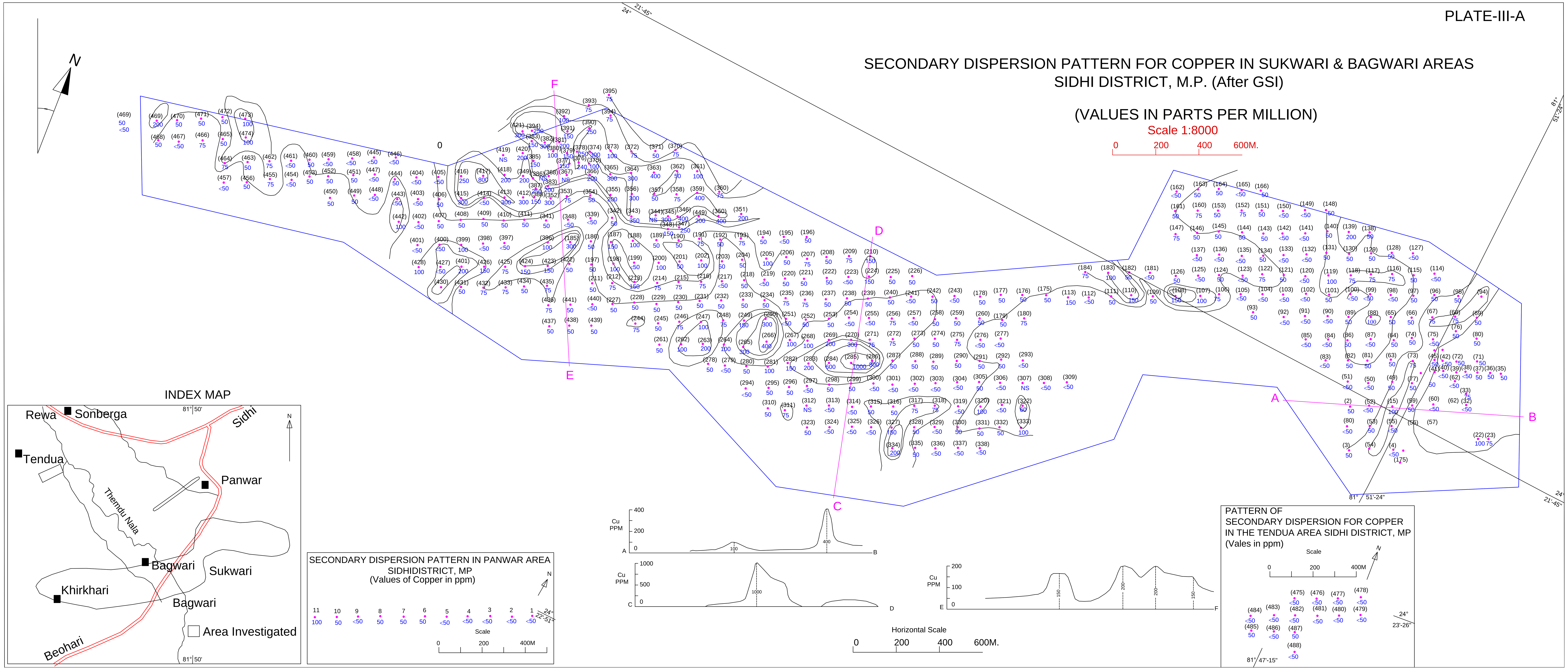


PLATE-III-A
SECONDARY DISPERSION PATTERN FOR COPPER IN SUKWARI & BAGWARI AREAS
SIDHI DISTRICT, M.P. (After GSI)
(VALUES IN PARTS PER MILLION)
Scale 1:8000
0 200 400 600M.
N
INDEX MAP
Rewa
Sonberga
Sidhi
Tendua
Panwar
Themdu Nala
Bagwari
Sukwari
Khirkhari
Beohari
Area Investigated
SECONDARY DISPERSION PATTERN IN PANWAR AREA
SIDHIDISTRICT, MP
(Values of Copper in ppm)
Scale
0 200 400M
Cu PPM
Horizontal Scale
0 200 400 600M.
PATTERN OF
SECONDARY DISPERSION FOR COPPER
IN THE TENDUA AREA SIDHI DISTRICT, MP
(Vales in ppm)
Scale
0 200 400M

PLATE-IIIB

SECONDARY DISPERSION PATTERN OF LEAD AND ZINC IN THE SUKWARI & BAGWARI AREAS
SIDHI DISTRICT, M.P.

(VALUES IN PARTS PER MILLION)