Proposal for Preliminary Exploration (G3 Stage) of Iron Ore, Bamuri Block, Sidhi District, Madhya Pradesh under NMET

Commodity: Iron Ore

By:

Maheshwari Mining Private Limited

Place: Kolkata
Date: 15/10/2024

Summary of the Block for G3 stage exploration

	Features	Details
	Block ID	BAMURI
	Current Exploration Agency	Maheshwari Mining Private Limited
	Previous Exploration Agency	GSI , Central Region
	G4 stage Geological Report (Previous stage Geological Report)	Final report on large scale mapping for search of low grade iron ore in Mahakoshal belt in Gandhigram, Baheraha, Parkhuri and Chauphal areas of Sidhi district of Madhya Pradesh (Stage: G4)
	Commodity	Iron Ore
	Mineral Belt	Mahakoshal Belt
	Completion Period with entire Time schedule to complete the project	
	Objectives	Objectives of the Preliminary Exploration (G3) over an area of 2.5 Sq. Km are as follows: 1. Geological mapping on 1:4000 scale and demarcating Iron bearing BIF band with the structural features i.e. strike, dip, lineation/foliation, etc. , for medium to high grade iron ore deposits within the Agori Formation of Mahakoshal Supergroup of rocks. 2. Based on **the outcome of the geological mapping**, for bedded stratiform regular deposit a with 800 m and closer spacing , 12 nos. of boreholes of 1200 mtrs, depth of core drilling are being proposed over the strike of mineralized area of 2.5 sq. km to intersect the mineralized zone. The first level of boreholes planned are 6 in numbers with vertical depth of 30 m and total depth of 75-80 m, the second level of boreholes planned are 6 in numbers , with vertical depth of 60 m and a total depth of 120-130 m. 3. Chemical Analysis of core samples and surface samples. 4. Determination of dimension of Iron ore body and estimation of tonnage, grade and mineral content in G3 level as per UNFC guidelines & Minerals (Evidence of Mineral Contents) Amendment Rules.
	Whether the work will be carried out by the proposed agency or throughoutsourcing and details thereof. Components to be outsourced and name of the outsource agency	The work will be carried out by proposed agency.
	Name/ Number of Geoscientists	In field: Two Geologists. At Headquarters: Two Geologists.
	Expected Field days (Geology, Geophysics, Surveyor)	Item execution duration 12 Months (365 days) and actual field days of field geologist 180 days and 60 days for HQ.
	Location	

		Point ID	Latitudes	Longitudes
		B1	24.34252898	81.94515999
		B2	24.35787867	81.97267725
		B3	24.3610911	81.98199332
		B4	24.35704188	81.98399183
		B5	24.35208391	81.9726703
		B6	24.34378632	81.95985867
		B7	24.33863544	81.94871404
	Villages	Bamuri, Amhawa, Satnara Kothar		
	Tehsil/ Taluk	Gopadbanas Tehsil		
	District	Sidhi		
	State	Madhya Pradesh		
2.	**Area (hectares/ square kilometres)**			
	Block Area	2.5 sq km		
	Forest Area			
	Government Land Area			
	Private Land Area			
3.	**Accessibility**			
	Nearest Rail Head	Marwasgram, Sidhi District.		
	Road	The study area is part of Sidhi district of Madhya Pradesh. Sidhi can be approached from Rewa, a Divisional headquarters, on National Highway (NH-7) by the road leading to Singrauli which is about 90 km away from it. The other fair weather roads which pass through the area are those connecting Sidhi-Beohari, Sidhi-Marhwas, Sidhi -Majrohar and Sapehi-Amarpur. The area is not connected by any railway line.		
	Airport	Bamrauli Airport (Prayagraj)		
4.	**Hydrography**			
	Local Surface Drainage Pattern (Channels)	The important nala in the area is Dhonnai nala. The sub parallel drainage system is characteristic of the area.		
	Rivers/ Streams	The area is drained by Gopad River and its tributaries. The Gopad River flows in SW-NE direction		
5.	**Climate**			
	Mean Annual Rainfall	Maximum rainfall is witnessed during the period from June end to September. Average rainfall is about 1500 mm.		
	Temperatures (December) (Minimum) Temperatures (June) (Maximu	The area is known for severe cold during December and January and hot summer during May and June. The climate in general is of extreme type. Maximum temperature rises to more than 44° C and the lowest temperature drops down to about 5° C.		

	m)	
6	**Topography**	
	Toposheet Number	63H/15
	Morphology of the Area	The area consists of a series of roughly parallel to subparallel, ENE-WSW trending ridges and intervening valleys. The maximum elevation is 490 metres above M.S.L. in northernmost part of the area and minimum elevation is 267 metres above M.S.L. in easternmost part of the area.
7	**Availability of baseline geoscience data**	
	Geological Map (1:50K/ 25K)	**Available**
	Geochemical Map	**Not Available**
	Geophysical Map (Aerogeophysical, Ground geophysical, Regional as well aslocal scale GP maps)	**Not Available**
8	**Justification for taking up G3 mineral exploration**	1. Gupta and Maurya, 2018, carried out large scale mapping (G4 Stage) for search of low grade Iron ore in Mahakoshal Belt in Gandhigram, Beheraha, Pakhuri and Chaupal areas of Sidhi district, Madhya Pradesh in parts of Toposheet no 63H/15. Large scale mapping of 100 sq km on 1:12,500 scale and detailed mapping of 02 sq km on 1:4000 scale was carried out with total collection of 220 BRS and 100 PTS for search of low-grade iron ore in the areas in parts of toposheet no. 63H/15 during field season 2017-18. BIF bands mapped in the area are found to be persistent and running for kilometers in length without any discontinuity. Linear ridges with micro faults, folds of megascopic and microscopic nature and brecciating of BIFs in between leading to formation of iron rich zones that yield iron values up to 70% of Fe2O3 indicates potentiality of the area. Based on investigation it can be concluded that: 1. BIF comprises several different lithologies viz. banded hematite quartzite, banded hematite chert, banded hematite jasper, brecciated iron quartzite, specularite quartzite and micro platy hematite, since all are not mappable on this scale therefore a common name given to all that is BIF/BHQ. 2. BIF bands in studied area are prominent and have extensive exposure. At places either by deformation or by auto brecciation or by regional scale faulting, the bands have brecciated and developed massive and oxidised zones that have led to rich iron zones which gave iron values ranging from 40 to 60 % (based on analytical results obtained till date). 3. Banded Iron Formations (that has alternate bands of hematite and quartzite or chert) have width of hematitic bands varying from a few millimetres to centimetres. 4. The area is promising for Iron ores. The ore can be classified as low to medium grade iron ore.

		In the proposed area for G3 investigation a total of eight BRS samples were analysed with values ranging from 43.31% to 72.18 % of Fe_2O_3.

Detailed description

1. **Block Summary**

Physiography

The area is known for severe cold during December and January and hot summer during May and June. The climate in general is of extreme type. Maximum temperature rises to more than 44˚C and the lowest temperature drops down to about 5˚ C. Maximum rainfall is witnessed during the period from June end to September. Average rainfall is about 1500 mm. The area under exploration is a highly rugged terrain with elongated hills trending in ENE-WSW direction, low mounds and narrow valleys, rocky and flat surfaces. The highest elevation is 473 m RL forms the ridge and the lowest elevation is 400 m RL, which forms irregular pattern of hills and the valley in this block.

Background Geology (Regional Geology & Geology of the Block)

Geologically, the study area falls under eastern part of Mahakoshal belt. The dominant rock types of Mahakoshal belt are quartzite, carbonate, chert, BIF, graywacke-argillite and mafic volcanic. Nair et al. (1995) proposed a threefold stratigraphic division for the entire Mahakoshal belt. The three Formations recognised by them in the order of younging are Chitrangi Formation, Agori Formation and Parsoi Formation. The Chitrangi is dominated by ultramafic flows and plugs and occupy the lower most part of the supracrustal sequence. The Agori Formation is dominated by chemogenic sediments such as carbonates, chert and BIF with thin mafic flows. Parsoi Formation is clastic dominated and is represented by a thick sequence of argillites and greywacke.

Structural studies showed that the supracrustal rocks were subjected to three phases of deformation with an overall ENE-WSW disposition controlled by original linearity of the basin that is accentuated by the two main deformational episodes. The first two episodes were more pronounced (Roy and Bandyopadhyay, 1990a).

Initially the Mahakoshal Belt was considered pericratonic shallow level marine basin along the southern margin of the Bundelkhand Craton in which sedimentary successions were deposited (Roy and Devarajan, 2000). Afterward basin had experienced explosive nature of volcano-thermal event in the rift environment as suggested by the abundance of pyroclastic flows. The mafic volcanism was generated by high degree melting of shallow level mantle (Chaudhuri and Basu, 1990; Kumar, 1993; Nair et al., 1995). Finally, rocks of the Mahakoshal Belt were intruded by ultramafic-mafics, alkaline rocks and granitoid plutons during a time span of 2.045 Ga to 1.75 Ga (Sarkar, et al., 1988; Roy and Deverajan, 2000). Intrusive granitoid plutons have played significant role in the crustal evolution of Mahakoshal Belt. These granitoid plutons are emplaced either as diapiric or non-diapiric forms.

Table -1 Lithostratigraphy of the Mahakoshal Group as proposed by Nair et al., (1995) and earlier workers					
Mathur and Narain (1981)		Choubey and Gupta, (1980)		Nair et al. (1995)	
Parsoi Formation	Slate, phyllite and shale with inter bedded greywacke	Upper Turbidite Group	Red and purple sandstone, Argillite and shale Conglomerate, greywacke, sandstone	Intrusives	Dunite, gabbro, dolerite, quartz porphyry, quartz veins, alkaline rocks, carbonatites, barite, lamprophyre, trachyte, Barambaba granite and equivalents
Faulted Contact		Middle Chemogenic Group	Banded Iron Formation, Limestone, dolomite, marble, chert	Parsoi Formation	Tuffaceous and carbonaceous phyllites, feldspathic quartzite, conglomerate, tuffaceous phyllite with metabasalt intercalations.
Agori Group	Calc-chlorite schist, Ferruginous shale, Upper Jasperoid beds, Karji Shale Lower Jasperoid beds Bhitri Shale Banded Hematite Quartzite Ferruginous quartzite Hornstone, limestone and shale	Lower Greenstone Group	Metavolcanic rocks with pillow structure, phyllite, ash beds and tuff Orthoquartzite, phyllite and occasionally limestone (Basal shelf facies)	Agori Formation	Banded hematite/magnetite quartzite and jasperoid with associated tuffs and ash beds. Impure marble, dolomite and interbedded calc-chlorite schist with occasional metabasalt lenses and conglomerate.
			Chotanagpur-Dudhi Granitoids Basement Complex	Chitrangi Formation	Basic and ultrabasic plugs and dykes including peridotites and serpentinite, agglomerates, metabasalt and peridotitic pillow lava

Geology of the Block

Table: Litho - stratigraphy of the mapped area		
		Laterite
JUNGEL GROUP		Purple shale/phyllite
		quartzite with pebbly horizon
------- Unconformable faulted contact ----------		
INTRUSIVES		Quartz veins /dolerite/Gabbro/lamprophyre
MAHAKOSHAL GROUP	**AGORI FORMATION**	Dolomite
		BIF/BHQ/BHJ
		Phyllite bearing andalusite- biotite porphyroblast
		Schist (Chlorite schist/chlorite -biotite schist/talc- chlorite schist)
Basement not mapped		

Mahakoshal Group of rocks is represented by varied lithologies of Palaeo proterozoic and is about 1800 ma to 2700 ma old. The litho assemblage of the Mahakoshal Belt is represented by quartzite-

carbonate-chert-BIF-greywacke-argillite mafic volcanics. Nair et al., (1995) provided the stratigraphy of the belt, which is modified by Roy and Devarajan, 2000. The study area exposes rocks of Agori Formation of Mahakoshal Group. Lithologically, it includes BIF/BHQ, phyllite, dolomite and basic schist. In south it is marked by granite – gneiss and in north by Vindhyan or Jungel. The main rock types of the Mahakoshal belt in general are predominant clastics over carbonates in the eastern part of the belt. The rocks of Agori formation along with intrusive and Jungel Group have been studied while carrying out Large Scale Mapping on 1:12500 scale.

Agori Formation: This Formation named by Devarajan and Srivastava (1996) is represented by the lithological association dominated by dolomite, BIF/BHQ/BHJ, phyllite with andalusite and biotite and chlorite schist/ talc-chlorite schist/chlorite-biotite schist. The formation is best exposed in central part of toposheet 63H/15. All the rocks have general trend of E.N.E - W.S.W. The dips are steeply (60°-80°) towards SE direction.

Schist: The low laying areas are mostly covered by schistose rock. These include chlorite schist, hornblende schist, talc- chlorite schist, talc-tremolite schist, talc-biotite schist, chlorite-biotite schist. Good exposures are seen around North of Parkhuri, Gajraha, Morcha, Satnara, Baharia, around Chaupal kothar and Gandhigram. It is varying in color from light green to light brown, fine grained rock with well-developed schistosity and at places coarse grained with acicular mineral such as observed near Gajraha. The rock shows two generation of schistosity in which S1 is defined by mostly chlorite and S2 by biotite. S1 is most pervasive in nature whereas S2 is discrete spaced crenulation cleavage. The general trend of the schistosity is ENE-WSW with moderate dips towards SSE. The light green coloured, medium-grained rock composed mainly of chlorite, talc and tremolite with well-developed schistosity characterised by crenulation cleavage and has soapy touch, observed in Nebuha and Kathas village. Talc-mica schist is also observed near Bamuri.

Phyllite: Phyllite is one of the most dominant fine-grained foliated rock in study area that is exposed in low lying areas since it is soft and can be weathered easily. Phyllite is found in association with BIF and with other lithologies of Agori Formation. It is exposed in the areas near Kathas, Nibuha, Katauli, Lohra, Chaupal, Satnara, Gandhigram, Bamuri, south-west of Itaunhi and Parkhuri. Phyllite is associated with chlorite schist, near Gandhigram and Chaupal and it becomes difficult to differentiate it from schist rock in the field. Phyllites are of various compositions viz. carbonaceous, ferruginous and tuffaceous phyllites. Phyllites show colour banding, a depositional feature produced due to the variation in mineralogical composition with typical “phyllitic sheen” everywhere that has helped to differentiate it from the chlorite schists.

Banded hematite quartzite/banded hematite jasper/BIF: BHQ/BMQ/BIF forms the most prominent lithology in the study area and is found throughout the Agori Formation. It runs kilometres in length and is long and sinous, being harder rock it is forming the top of ridge and subdued topography is dominated by soft rocks like phyllite and schist. BIF is mostly represented by BHQ, which shows primary structure or got deformed and forms brecciated hematite quartzite. At places instead of these two, lithologies secondary enriched iron formations were observed that show high percentage of iron. BIF is well exposed in Chauphal, Gandhigram, Parkhuri, Itauhi, Satnaraveen, Amahwa, Lohra, Morcha, Nebuha, Kathas, Bamuri, Baheraha areas of Sidhi district.

Banded grunerite-magnetite/banded grunerite-hematite quartzite (BGHQ): Small section of quarry is present at road section near Satnaraveen, where thinnely banded iron quartzite was mapped with thin layers of radiating minerals alternating with iron as well silica layers. This layer of radiating minerals in hand specimen could not be identified as the rock is hard and associated with thin bands of phyllite and intrusive on both sides and giving indication of some event as associated with coarse grained dark intrusive.

Dolomite: Dolomite occurs as very small patches or lenticular band of about 50 m in length with its characteristics elephant skin weathering. It is exposed near Gandhigram village, at the top of ridge associated with BIF. Dolomite is found interbanded with BIF/chert and has preserved several

generations of deformation in the form of folds and faults. Tension gashes were also observed that gives an indication of shear senses in opposite to that of other shear sense indicators.

Intrusive: Cross cutting relations of intrusive in different lithologies indicate that area possess intrusives that change the properties of rock and chemically alter it to some extent. Dark colour, in vein form oriented in direction opposite to dominant lithologies, fine to medium grained comprising mainly plagioclase feldspar, pyroxenes, olivine and phenocryst of biotite is characterstic of intrusive.

Lamprophyre: It occurs as intrusives within both Mahakoshal Group and granite gneiss. The shape of the body is not determined because of limited exposures and is not mappable; however, at places it occurs as linear body. Important exposures are in nala section near Sidhi.

Gabbro: It is fine to medium grained mostly composed of laths of plagioclase feldspar and pyroxenes. At places it shows doleritic nature near Gajraha with fine grained ophitic texture. Occasionally, it shows presence of sulphide mineralization as disseminated or scattered. This is observed in Badaraha and is not mappable on this scale.

Quartz veins: These are of very small dimensions but very common in Mahakoshals, the prominent trends are ENE-WSW, NW-SE and N-S, corresponding to the different phases of deformation. North of Gandhigram, number of massive quartz veins within mafic unit are observed.

Jungel Group: The rocks of Jungel Group occur within the narrow faulted basin within Mahakoshal Group. Lithologically, succession starts with polymictic conglomerate followed by gritty sandstone and siltstone, purple coloured shale/phyllite and sandstone. North of Kanjihabo, the contact between Mahakoshal and Vindhyans is well exposed and it is sheared represented by polymictic deformed conglomerate. Conglomerate comprises clast of BHJ, quartzite, jasper, vein quartz and mafic rock embedded within the arenaceous matrix.

Laterite: This forms irregular patches with a roughly horizontal base resting on the rocks of Mahakoshal Group as well as Vindhyan Supergroup. Some part of the study area is covered with laterite. It forms many irregularly shaped patches.

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

The ore zone of the block is predominantly rich with BHQ/BHC and BHJ. Banded hematite quartzite/chert and banded hematite jasper are the main lithological assemblage in the area that comprises the ore zone to target. Hematite is the primary ore mineral with remnants of magnetite and speularite and martite in the thin section can be observed. Limonite and goethite are also present in area.

In previous works,the overall grade of iron varies from low to medium grade. Out of 80 BRS samples from LSM area 22 samples have values (Fe2O3%) ranging from 20-40%. Fe2O3 values in 26 samples ranges from 41% – 60% and that of 22 samples shows values from 61% - 80% of Fe2O3.Values of Fetotal in 50 BRS samples (Fetotal=0.7x (Fe2O3%+Fe%)) out of 80 BRS samples range from 21% – 40 % and that of 23 samples range from 41% - 60%. Chemical analysis of DM samples indicate that major fraction of samples i.e. 85nos. out of 120nos. falls in range from 30% - 50% of Fetotal indicating area to be classified in medium to high grade of iron. Banded form is prominent and bands are persistent. At places due to deformational events, bands have been brecciated and have developed massive and highly enriched iron pockets that show values more than 70% of Fe2O3%.

Scope for proposed exploration

During previous exploration, GSI reported BIF bands mapped in the area are found to be persistent and running for kilometers in length without any discontinuity. Linear ridges with microfaults, folds of megascopic and microscopic nature and brreciation of BIFs in between leading to formation of iron

rich zones that yield iron values up to 70% of Fe2O3 indicates potentiality of the area. Analytical results obtained from the areas of Large scale mapping and Detailed mapping indicate the area like **Bamuri** are potential areas and can be taken to in account for further exploration and investigation for iron commodity as mentioned in G4 exploration reports. North of Chauphal and Nibuha may be taken for consideration in coming future with advanced techniques for iron exploration. The area mapped in detailed has given results that fall in medium to high grade iron and frequency of samples falling in high grade is more as compare to medium grade. **The strike length of that area is about 4.0 Km and width varies from 0.5km to 0.6km. width may increase both side in consideration of mining feasibility.**
In view of above, there is scope for preliminary exploration (G3 level of exploration) in the block to prove the sub-surficial existence of Iron ore & potentiality of the block.

The geologists of MMPL completed the sampling from the proposed block boundary for iron ore, there were 9 samples analyzed for Fe total for which the results obtained are as follows 63.74, 20.81, 34.36, 51.10, 59.50, 59.50, 56.80, 45.45, 44.71.

Recommendations of G4 Stage Mineral Exploration
BIF bands mapped in the area are found to be persistent and running for kilometers in length without any discontinuity. Linear ridges with microfaults, folds of megascopic and microscopic nature and brecciation of BIFs in between leading to formation of iron rich zones that yield iron values up to 70% of Fe2O3 indicates potentiality of the area. Analytical results obtained from the areas of large scale mapping and detailed mapping indicate the area like **Bamuri** are potential areas and can be taken to in account for further exploration and investigation for iron commodity. The area mapped in detailed has given results that fall in medium to high grade iron and frequency of samples falling in high grade is more as compare to medium grade. The strike length of that area is about 4.0 Km and width varies from 0.5km to 0.6km. Therefore a G3 level project can be formulated to know the vertical extension and grade of iron and first level of boreholes can be proposed along the channels and grading can be calculated horizontal as well as vertical to know the resource of iron in that area. Further detailed mapping can be proposed in the areas of Bamuri to know the behaviour of bands on large scale, strike length of bands and grade of iron in that area

Objectives

a. The objective of this project is to estimate the resource of iron in the area and demarcation of iron ore bearing bands.
b. Borehole planning on the basis of previous data and present work; chemical analysis of trenching and pitting in the potential areas to delineate the lithological thickness of iron ore bearing ridges and to determine the associate stratigraphic sequences in the area.

2. Previous Work

Attach Complete Previous Geological Report (G4 Stage); G4

(Attached as Annexure: I)

Previous Exploration in adjoining area (Regional area): All the sample (bed rock/trench/ groove/soil), borehole location should be plotted on the geological map and analytical data should be discussed briefly

1. The surrounding area has been covered by Maurya and Gupta, 2017-18 at G4 stage of exploration.
2. The adjacent area is covered for G3 stage of exploration by Gupta and Maurya, 2020.

Previous Exploration details in the proposed block area All the sample (bed rock/trench/ groove/soil), borehole location should be plotted on the geological map and analytical data should be discussed briefly
(G4 only)

Large scale mapping of 100 sq km on 1:12,500 scale was carried out with total collection of 220 BRS and 100 PTS for search of low grade iron ore in the areas in parts of toposheet no. 63H/15 during field season 2017-18. However from the proposed area, seven samples have been collected ranging from 33% to 76% Fe2O3. Based on investigation it can be concluded that:

1. BIF comprises several different lithologies viz. banded hematite quartzite, banded hematite chert, banded hematite jasper, brecciated iron quartzite, specularite quartzite and microplaty hematite, since all are not mappable on this scale therefore a common name given to all that is BIF/BHQ.

2. BIF bands in studied area are prominent and have extensive exposure. At places either by deformation or by autobreciation or by regional scale faulting, the bands have brecciated and developed massive and oxidised zones that have led to rich iron zones which gave iron values ranging from 40 to 60 % (based on analytical results obtained till date).

3. Banded Iron Formations (that has alternate bands of hematite and quartzite or chert) have width of hematitic bands varying from a few millimetres to centimetres.

4. The area is promising for Iron ores. The ore can be classified as medium to high grade iron ore.

3. Block description

Point ID	Latitudes	Longitudes
B1	24.34252898	81.94515999
B2	24.35787867	81.97267725
B3	24.3610911	81.98199332
B4	24.35704188	81.98399183
B5	24.35208391	81.9726703
B6	24.34378632	81.95985867
B7	24.33863544	81.94871404

4. Planned Methodology: As per the MEMC rule will be followed

4.1. In accordance to the objectives set for preliminary exploration (G3 level of exploration) in Amhawa North block, in Sidhi District, geological mapping in 1:4000 scale, core drilling, core sampling, chemical studies, petrological and mineralogical studies are proposed in the block. The exploration will be carried out as per Minerals (Evidence of Mineral contents) Amendment Rules-2021. Accordingly, the details of different activities to be carried out are presented in subsequent paragraphs.

4.2. Topographic Surveying

Topography survey will be carried in the area (2.5 Sq. Km) and all the surface features will be marked in the 1:4000 scale plans. The block boundary will be surveyed by DGPS / total station in WGS-84 Datum and demarcation of the boundary pillars to enable the block auctionable. The reduced level and coordinate of the boreholes would be surveyed by DGPS/ total station.

4.3. Geological Mapping

Geological mapping on 1:4000 scale in the area (2.5 Sq. Km) will be carried out by taking geological traverses. The contacts of different formations, surficial lithology, structural features, etc. will be noted in detail. The geological map on 1:4000 scale will be generated based on the details gathered during the field visit.

4.4. Trenches and Channel

There are a total 10 trenches being proposed at an interval of 500 m. The dimension of trench is proposed to be 1m (Width)X 1m (depth) × 20m (Length), giving a total of 20 cu m of volume. The total samples obtained will be 50% of the volume giving meterage equals to 100 cu m. The locations of the trenches will be one near the borehole location and other between the intersection points of the two consecutive boreholes, but the location of trenches will be where it is not exposed.

Channel sampling is proposed in stellar pattern with an interval of 250m spacing. A total of 10 channels are proposed with quantity of 200m.

4.5. Core Drilling

Based on **the outcome of the geological mapping**, after review for bedded stratiform regular deposit

a with 800 m and closer spacing, 12 nos. of boreholes of 1200 mtrs, depth of core drilling are being proposed over the area 2.5 sq. km to intersect the mineralized zone. The first level of boreholes planned are 6 in numbers with vertical depth of 30 m and total depth of 75-80 m, the second level of boreholes planned are 6 in numbers , with vertical depth of 60 m and a total depth of 125-130 m.

Borehole plan-

The geological interpretation of the ore body observed is the width of iron ore band is approximately 50 m with strike NNE-SSW, dip amount 60-70º towards SE. The boreholes proposed are across the strike shows Azimuth N30ºW, Borehole angle 45º. First level of borehole is intersecting the band at 30 m vertical depth and giving a total 85- 90 m depth. The second level boreholes are intersecting the ore body at 60 m vertical depth and giving a total 110-120m depth as depicted in Plate 5.

4.6. Core Logging

The drill cores would be logged systematically viz. details of lithounits, colour, structural feature, texture, mineralization, beside the recovery, rock quality designation and Iron ore type would be recorded.

4.7. Core Sampling 25-30 sample for each borehole because band width is 50-60m based on largescale map

a.) The drill core will be split into two equal halves and one part would be preserved in the core box. The other half will be powdered to -200 mesh size and the same would be divided into four parts (250gm each) through coning and quartering. One part of 250 gm sample will be sent to chemical laboratory for analysis, second part to be preserved in the camp as duplicate sample, third part to be utilized for preparing composite sample for individual ore band and the fourth part would keep as either check sample or sample to be used for any other specific purpose.

The length of each sample will be kept 0.50 m-1.0m depending upon the width of particular types of ore and its physical character. The primary core samples will be analyzed for five radicals i.e., Total Fe%, Fe2O3, Al2O3%, SiO_2%, P2O5%, & SiO2% and other oxides and traces including LOI by XRF methods.

c) 20 nos. of samples would be analyzed by ICPMS to ascertain the presence of any uncommon minerals.

d) 20 nos. of samples would be analyzed for gold analysis by Fire Assay since gold is reported in BIF.

4.8. Petrographic & Mineralographic Studies

Thin and polished section studies of the out-crop samples and the core samples will be studied for detailed petrographic and mineralographic characteristics. These samples will be drawn from ore zones and associated rocks. A provision of 10 nos. specimens for petrographic and 10 nos. specimens for mineralographic studies has been kept for the proposed area.

4.9. Bulk Density Determination

In addition, bulk density determination of 5 nos. of samples will be carried out for the proposed block.

5. **Nature Quantum and Target**

   G4 stage GR should be submitted for G3 stage proposal

6. **Nature and Quantum of work proposed**

Quantum of work for Bamuri Iron ore G3 Block			
Sl No.	**Item of work**	**Unit**	**Quantity**
A	**Detailed Geological Mapping**		
1	on 1:4000 Scale	Sq. Km	2.5
B	**Survey Work by surveyor days**		
1	Demarcation of proposed boundary, Fixation of Borehole and determination of co-ordinates & Reduced Level (RL)of the boreholes by DGPS	Per point of observation	19
2	Topographic Survey and surface contouring 1:4000 scale	Sq. Km	2.5

C	**Drilling**		
1	Core drilling	m	1200
2	Borehole Pillaring (12"x12"x30")	Nos.	12
D	**Chemical Analysis**		
i)	***Primary Samples*** (Surface Samples (BRS & Channel + Trench) + Core Samples +Check Samples) Chemical analysis by XRF radicals (Fe%, Fe_2O_3%, Al_2O_3%,SiO_2%, P%, S%, Insolubles & LOI) + other oxides and traces	Nos.	655
E	**Physical Analysis**		
1	Preparation of standard thin section of rock	Nos.	10
2	Complete Petrographic Studies	Nos.	10
3	Preparation of polished thin section of rock.	Nos.	5
F	**Analysis of rock sample for determination of Au by Fire Assay**	Nos.	20
G	**Bulk Density Determination**	Nos.	5
H	**Report Preparation (as per MEMC Amendment Rule2021/UNFC)**	Nos.	1

Nature and quantum of work Proposed.

Annexure 7A

Estimated cost for Preliminary exploration Survey (G3) for Iron ore and associated mineralization in and around Bamuri area, Sidhi District, Madhya Pradesh

Total area: 2.5 sq km, Period of Completion: 12 months BH: 12nos., 1200m , review: after 4 months

S. No.	Item of Work *	Unit *	Rates as per NMET SoC 2020-21		Estimated Cost of the Proposal		Remarks
			SoC- Item No. *	Rates as per SoC * (a)	Qty. (b)	Total Amount (Rs) (a*b)	
A	**Geological Mapping Other Geological Work & Surveying**						
	Geological mapping, (1:4,000 scale) & Trenching , drilling work						
i	a. Charges for Geologist per day (Field) for geological mapping & trenching work, drilling work	day	1.2. b	11,000	180	1980000	1:4,000 scale mapping of 2.5 sq km Amount will be reimbursed as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher.
ii	b. Labours Charges; Base rate	day	5.7	522	360	187920	
	c. Charges for Geologist per day (HQ)	day	1.2. a	9,000	40	360000	
	Sub Total- A					**2527920**	
B	**Survey work**						
a	DGPS Survey for BH fixation & RL determination	Per Point of observation of observation	1.6.2	19,200	19	364800	

b	Charges of one qualified surveyor with Total Station for carrying out topographical survey in different RF and surface contouring at different interval, fixation of borehole and determination of co- ordinates & Reduced Level (RL) of the boreholes with total station etc.		1.6.1a	8,300	30	249000	For Topographical survey
c	Labours Charges for survey work;	day	5.7	522	120	62640	4 labours per day
	Sub-Total B					**427,440**	
C	**Trenching/Pitting**						
	a) Trenchs	per cu.m	2.1.2	3,300	100	330000	
	Sub Total C					**330000**	
D	**DRILLING (after review)- In -house**						
1	Drilling up to 1200 m (very Hard rock)	m	2.2.1.4a	12,650	1200	15180000	
2	Land / Crop Compansation (in case the BH falls in agricultural Land)	per BH	5.6	20,000	12	240000	As per actuals
3	Construction of concrete Pillar (12"x12"x30")	per borehole	2.2.7a	2,000	12	24000	
4	Transportation of Drill Rig & Truck associated per drill (2 rig)	Km	2.2.8	36	2,600	93600	Raniganj to Sidhi to and fro (650 Km)
5	Monthly Accomodation Charges for drilling Camp (up to 2 Rigs)	month	2.2.9	50,000	2	100000	
6	Drilling Camp Setting Cost	Nos	2.2.9a	250000	1	250000	
7	Drilling Camp Winding up Cost	Nos	2.2.9a	250000	1	250000	
8	Road Making (Flat Terrain)	Km	2.2.10 a	22,020	5	110100	As per actuals
9	Drill Core Preservation	per m	5.3	1,590	240	381600	
10 a	Charges for one Sampler per day (1 Party)	one sampler per day	1.5.2	5,100	62	316200	

10b	Labours (4 Nos)	day	5.7	522	248	129456	Amount will be reimbursed as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher.
	Sub Total D					**17074956**	
E	**LABORATORY STUDIES**						
1	**Chemical Analysis**						
i)	**Geochemical Sampling-Surface samples (Bedrock/Channel /Soil/Stream sediment)** a. Analysis of major oxides and trace samples by XRF	Nos	4.1.15a	4,200	200	840000	
	b. Analysis for Au by fire assay technique		4.1.15a	2,380	20	47600	
ii)	**Surface Check samples (10% External)**					0	
	a. Analysis of major oxides samples by XRF	Nos	4.1.15a	4,200	20	84000	
	b. Analysis for precious metals by fire assay technique		4.1.5a	2,380	1	2380	
iii)	**Trench & Check Samples from Trench**					0	
	a. Analysis of major oxides samples by XRF	Nos	4.1.15a	4,200	100	420000	
	Trench samples					0	
iv)	**Trench Check samples (10% External)**					0	
	a. Analysis of major oxides samples by XRF	Nos	4.1.15a	4,200	10	42000	
v)	**BH Core samples**					0	
	a. Analysis of major oxides samples by XRF	Nos	4.1.15a	4,200	240	1008000	
	b. Analysis for precious metals by		4.1.5a	2,380	20	47600	

	fire assay technique						
vi)	**BH Core samples (10%External)**					0	
	a. Analysis of major oxides samples by XRF	Nos	4.1.15 a	4,200	24	100800	
	b. Analysis for precious metals by fire assay technique		4.1.5a	2,380	20	47600	
2	**Physical & Petrological Studies**					0	
i	Preparation of thin section	Nos	4.3.1	2,353	10	23530	
ii	Study of thin section	Nos	4.3.4	4,232	10	42320	
iii	Preparation of polish section	Nos	4.3.2	1549	5	7745	
iv	study of polished section	Nos	4.3.4	4,232	5	21160	
v	Digital Photographs	Nos	4.3.7	280	10	2800	
vii	Bulk density analysis	Nos	4.8.1	1,605	3	4815	
	SEM Studies	per hour					
viii	EPMA studies	per hour					
	Total E					**2713445**	
F	**Total A to E**					**23,073,761**	
G	Geological Report Preparation	**5 Hard copies with a soft copy**	5.2	ii		11576878.05	Reimbursement will be made after submission of the final Geological Report in Hard Copies (5 Nos) and the soft copy to NMET.
H	**Peer review Charges**		**As per EC decision**	30,000	**1**	**30,000**	
I	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 less		461475.22	EA will be reimbursed after submission of 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.
J	**Total Estimated Cost without GST**					**24,722,924**	
K	**Provision for GST (18% of J)**					**4450126.369**	GST will be reimburse as per actual and as per notified prescribed rate
L	**Total Estimated Cost with GST**					**29,173,051**	
				Rs. In Lakhs		**291.17**	
Note:							
1	**Strict adherence to the Ministry of Finance's and GFR guidelines is mandatory. Every transaction must adhere to GFR rule 21.**						
2	**In case of delay/non- performance, the appropriate action will be taken by competent authority against delinquent agency as per prevailing govt. of India rules/guidelines on procurement.**						
3	**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 execusion of the project by NEA on its own, a Certifiate regarding non outsourcing of any component/project is required.**						
4	**Necessary efforts should be made to minimize any adverse impact on the environment during exploration activities.**						
5	**Any item of work not mentioned above shall be added as per SoC.**						

References:

1. FINAL REPORT ON LARGE SCALE MAPPING FOR SEARCH OF LOW GRADE IRON ORE IN MAHAKOSHAL BELT IN GANDHIGRAM, BAHERAHA, PARKHURI AND CHAUPHAL AREAS OF SIDHI DISTRICT OF MADHYA PRADESH (STAGE: G4) TOPOSHEET NUMBER 63H/15

List of Plates

Plate 1: Block boundary over large scale mapping on the scale of 1:25,000 at G4 stage in parts of toposheet no. 63 H/15.

Plate 2: Land use map of toposheet no 63H/15 showing the proposed block boundary.

Plate 3: Block Boundary over toposheet no. 63H/15

Plate 4: Block boundary over lithological map showing distribution of Fe_2O_3 % in BRS as obtained from G4 stage of work after Gupta and Maurya 2018, over proposed Block boundary area.

Plate 5: Proposed borehole locations and borehole plan in the G3 Bamuri iron ore area (After Gupta and Maurya 2018).

Plate 1: Block boundary over large scale mapping on the scale of 1:25,000 at G4 stage in parts of toposheet no. 63 H/15.

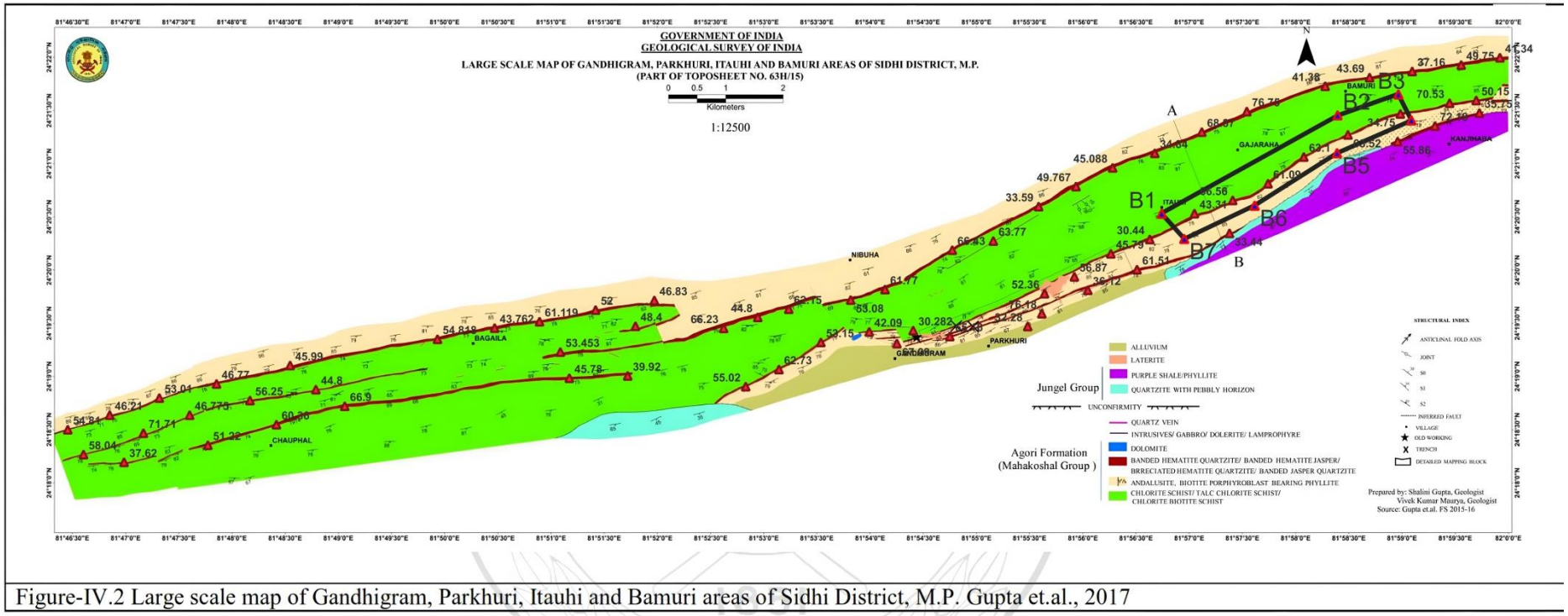
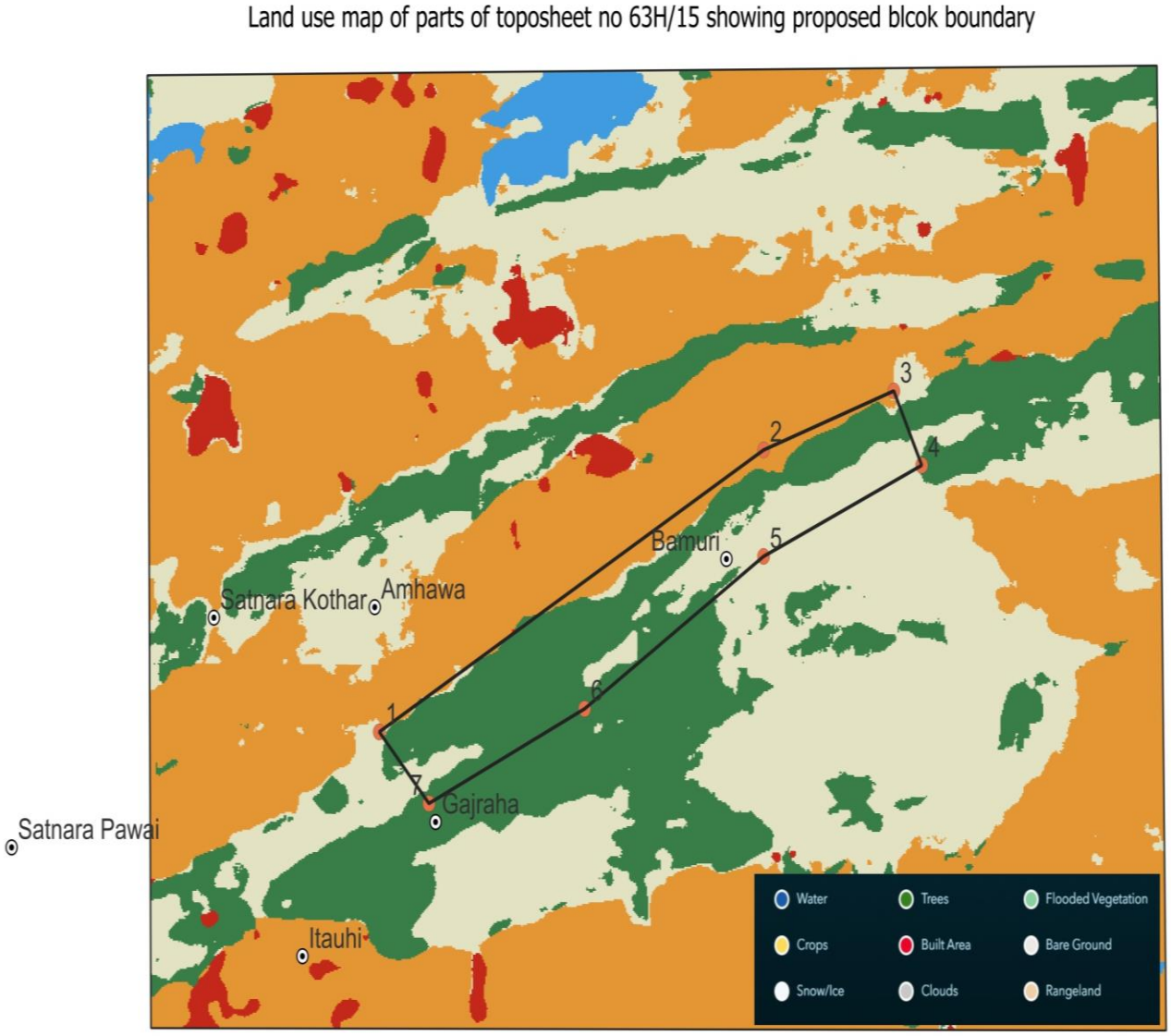


Figure-IV.2 Large scale map of Gandhigram, Parkhuri, Itauhi and Bamuri areas of Sidhi District, M.P. Gupta et.al., 2017

Point ID	Latitudes	Longitudes
B1	24.34252898	81.94515999
B2	24.35787867	81.97267725
B3	24.3610911	81.98199332
B4	24.35704188	81.98399183
B5	24.35208391	81.9726703
B6	24.34378632	81.95985867
B7	24.33863544	81.94871404

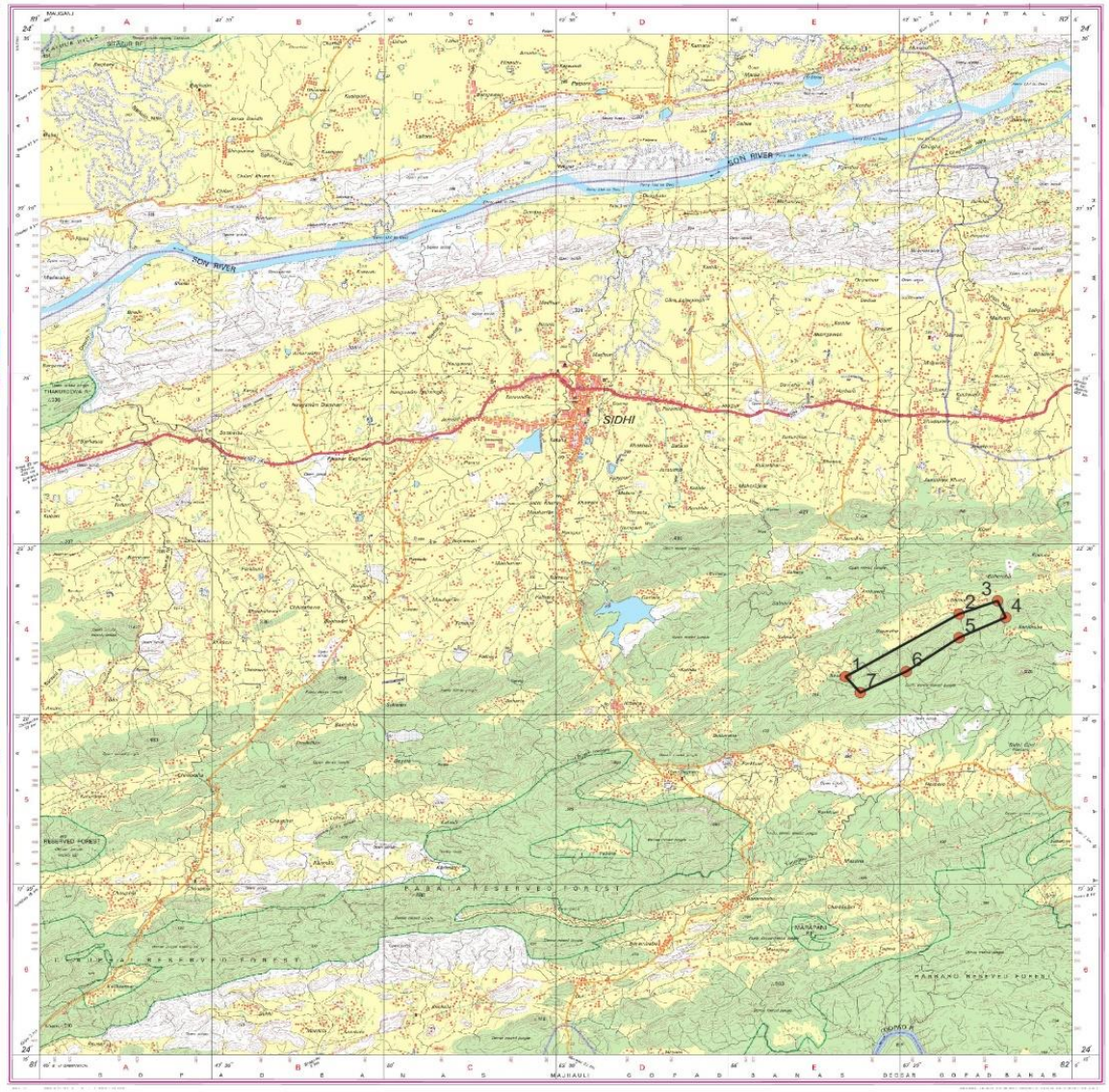
Legend

- Proposed block boundary
- Bamuri boundary points
- BRS sample location of G4 work (After Guptaand Maurya 2018)



Point ID	Latitudes	Longitudes
B1	24.34252898	81.94515999
B2	24.35787867	81.97267725
B3	24.3610911	81.98199332
B4	24.35704188	81.98399183
B5	24.35208391	81.9726703
B6	24.34378632	81.95985867

Plate 2: Land use map of toposheet no 63H/15 showing the proposed block boundary.



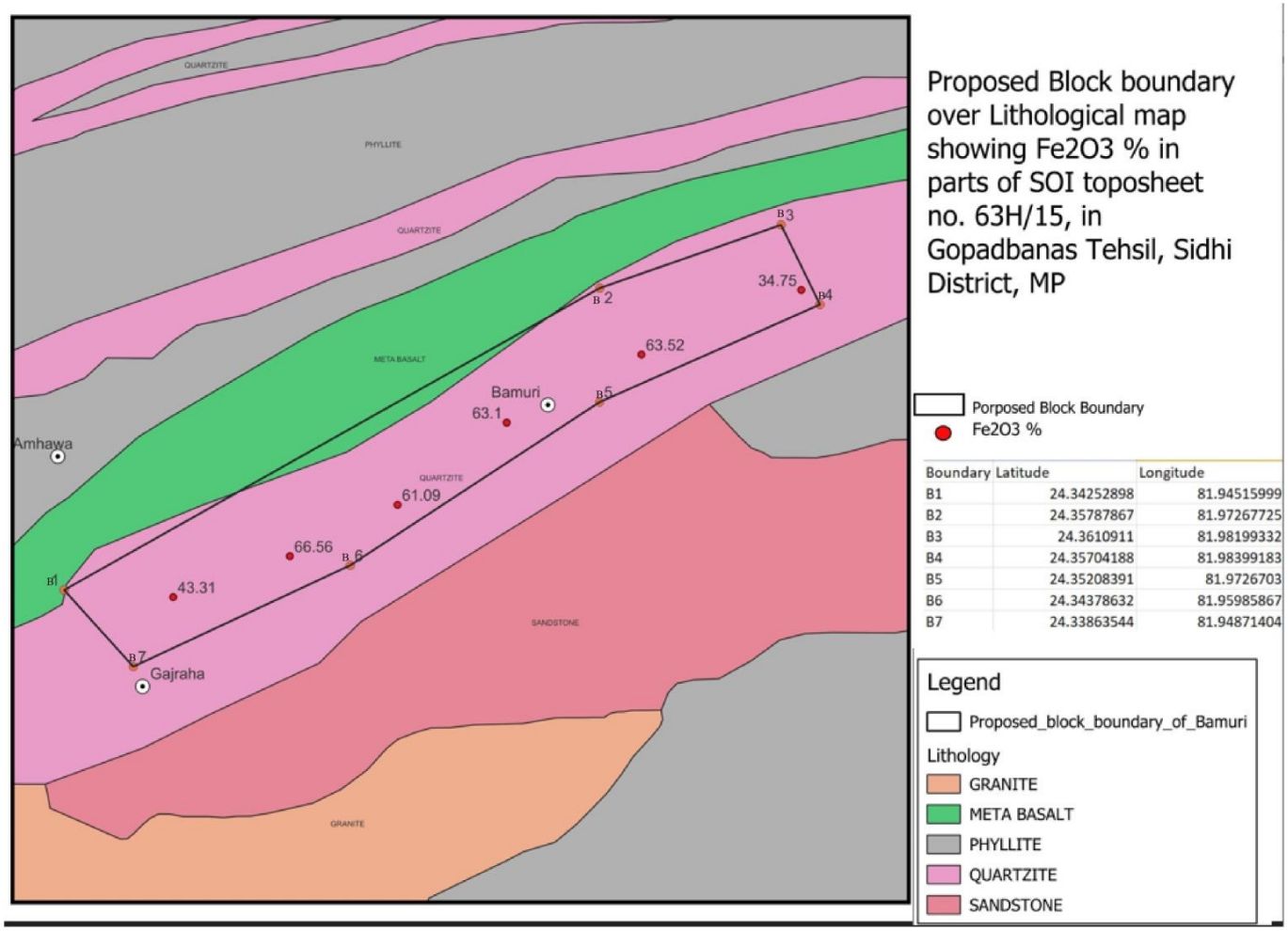
Proposed Block boundary over SOI toposheet no. 63H/15, in Gopadbanas Tehsil, Sidhi District, MP

Porposed Block Boundary

Boundary	Latitude	Longitude
B1	24.34252898	81.94515999
B2	24.35787867	81.97267725
B3	24.3610911	81.98199332
B4	24.35704188	81.98399183
B5	24.35208391	81.9726703
B6	24.34378632	81.95985867
B7	24.33863544	81.94871404

Plate 3: Block Boundary over toposheet no. 63H/15

Plate 4: Block boundary over lithological map showing distribution of Fe2O3 % in BRS as obtained from G4 stage of work after Gupta and Maurya 2018, over proposed Block boundary area.



Proposed Block boundary over Lithological map showing Fe2O3 % in parts of SOI toposheet no. 63H/15, in Gopadbanas Tehsil, Sidhi District, MP

Porposed Block Boundary
Fe2O3 %

Boundary	Latitude	Longitude
B1	24.34252898	81.94515999
B2	24.35787867	81.97267725
B3	24.3610911	81.98199332
B4	24.35704188	81.98399183
B5	24.35208391	81.9726703
B6	24.34378632	81.95985867
B7	24.33863544	81.94871404

Legend
Proposed_block_boundary_of_Bamuri
Lithology
GRANITE
META BASALT
PHYLLITE
QUARTZITE
SANDSTONE

Plate 5: Proposed borehole locations and borehole plan in the G3 Bamuri iron ore area (After Gupta and Maurya 2018).