Proposal for Amhawa Iron Ore Block, Sidhi District, Madhya Pradesh State for G3 Stage Mineral Exploration under NMET.

Commodity: Iron Ore

By:

Maheshwari Mining Private Limited

Place: Kolkata
Date: **12-12-2024**

Summary of the Block for G3 stage exploration

	Features	Details
	BlockID	Amhawa Iron Ore G3 Exploration block
	CurrentExplorationAgency	Maheshwari Mining Private Limited
	PreviousExplorationAgency	GSI, Central Region, State Unit MP
	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
	MineralBelt	Mahakoshal Belt
	Completion Period with entire Time schedule to complete the project	365 Days/ 12 Months
	Objectives	Objectives of the **Preliminary Exploration (G3)**over an area of 2.3 sq km are as follows: 1. Geological mapping on 1:4000 scale and demarcating iron bearing BIF band/bands with the structural features i.e. strike, dip, folds, etc., for medium to high grade iron ore within the Agori Formation of Mahakoshal Supergroup of rocks. 2. Based on **the outcome of the geological mapping**, for bedded, for other (iron ore) deposit the spacing may be 400m or closer for regular and 200m or closer for irregular habit,18 nos. of boreholes with a total 1680 m depth of core drilling are being proposed over the strike of mineralized area of 2.3 sq km to intersect the mineralized zone. The first level of boreholes planned are 12 in numbers with vertical depth of 30 m and total depth of 80-90 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

<table>
<tr><td></td><td></td><td>estimation of tonnage, grade and mineral content in G3 level as per Minerals (Evidence of Mineral Contents) Rules, 2015.</td></tr>
<tr><td></td><td>Whether the work will be carried out by the proposed agency or through outsourcing and details there of.
Components to be outsourced and name
of the outsource agency</td><td>The work will be carried out by proposed agency.</td></tr>
<tr><td></td><td>Name/Number of Geoscientists</td><td>In field: Two Geologists.
At Headquarters: Two Geologists.</td></tr>
<tr><td></td><td>Expected Field days (Geology, Geophysics Surveyor)</td><td>Item execution duration 12 Months (365 days) and actual field days of field geologist 180 days and 60 days for headquarters.</td></tr>
<tr><td>1.</td><td>Location</td><td></td></tr>
<tr><td></td><td></td><td>
<table>
<tr><th>Boundary Pts</th><th>Latitude</th><th>Longitude</th></tr>
<tr><td>A1</td><td>24.3417318</td><td>81.9137828</td></tr>
<tr><td>A2</td><td>24.3519995</td><td>81.9348752</td></tr>
<tr><td>A3</td><td>24.3610243</td><td>81.9591229</td></tr>
<tr><td>A4</td><td>24.3575482</td><td>81.9601219</td></tr>
<tr><td>A5</td><td>24.3479063</td><td>81.9365385</td></tr>
<tr><td>A6</td><td>24.3374145</td><td>81.9165660</td></tr>
</table>
</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>Villages</td><td>Amhawa, Satnara Kothar</td></tr>
<tr><td></td><td>Tehsil/Taluk</td><td>Gopadbanas Tehsil</td></tr>
<tr><td></td><td>District</td><td>Sidhi</td></tr>
<tr><td></td><td>State</td><td>Madhya Pradesh</td></tr>
<tr><td>2.</td><td>Area(hectares/squarekilometres)</td><td></td></tr>
<tr><td></td><td>BlockArea</td><td>2.3 sq km</td></tr>
</table>

	ForestArea	
	GovernmentLandArea	
	PrivateLandArea	
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 near the proposed area are those connecting Sidhi-Beohari, Sidhi-Marhwas, Sidhi - Majrohar and Sapehi-Amarpur. The proposed area is not connected by any railway line.
	Airport	Bamrauli Airport (Prayagraj), Rewa Airport.
4.	**Hydrography**	
	Local Surface Drainage Pattern (Channels)	The important nala in the area is Dhonnai nala. The sub parallel drainage system is the main characteristic feature in the area.
	Rivers/Streams	The area is drained by Gopad River and its tributaries. The Gopad River flows from southwest to northeast 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)(Maximum)	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.
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 MSL in northernmost part of the area and minimum elevation is 267 metres above MSL in easternmost part of the area.

7	**Availability of baseline geosciences data**	
	GeologicalMap(1:50K/25K)	**Available**
	GeochemicalMap	**Available**
	GeophysicalMap (Aerogeophysical, Ground geophysical, Regional as well as local scale GP maps)	**Not Available**
8.	**Justification for taking up G3 mineral exploration**	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 brecciation of BIFs in between leading to formation of ironoxide rich zones that yield iron values up to 70% of Fe_2O_3 indicates potentiality of the area. Based on investigation it can be concluded that: 1. BIF comprises several lithologies viz. banded haematite quartzite, banded haematite chert, banded haematite 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 exposures. At places either by deformation or by auto brecciation or by regional scale faulting, the bands are 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 haematite and quartzite or chert) have width of haematitic 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 seven BRS samples are encountered with values ranging from 43.31% to 72.18 % of Fe2O3.**

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 above 473 m forms the ridge and the lowest elevation is 400 m, 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 volcanics. 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 BundelkhandCraton 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, tuffaceousphyllite 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 interbeddedcalc-chlorite schist with occasional metabasalt lenses and conglomerate.
			Chotanagpur-DudhiGranitoids 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>
<tr><td colspan="3">Table: Litho -stratigraphyofthemappedarea</td></tr>
<tr><td colspan="3">Laterite</td></tr>
<tr><td colspan="2" rowspan="2">JUNGELGROUP</td><td>Purpleshale/phyllite</td></tr>
<tr><td>quartzitewith pebblyhorizon</td></tr>
<tr><td colspan="3">-------Unconformablefaultedcontact----------</td></tr>
<tr><td colspan="2">INTRUSIVES</td><td>Quartzveins/dolerite/Gabbro/lamprophyre</td></tr>
<tr><td rowspan="4">MAHAKOSHAL GROUP</td><td rowspan="4">AGORI FORMATION</td><td>Dolomite</td></tr>
<tr><td>BIF/BHQ/BHJ</td></tr>
<tr><td>Phyllite bearing andalusite-biotite porphyroblast</td></tr>
<tr><td>Schist
(Chlorite schist/chlorite-biotite schist/talc-chlorite schist)</td></tr>
<tr><td colspan="3">Basement not mapped</td></tr>
</table>

Mahakoshal Group of rocks is represented by varied lithologies of Palaeoproterozoic 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 lying areas are mostly covered by schistose rocks. 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 Chaupalkothar 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 S_1 is defined by mostly chlorite and S_2 by biotite. S_1 is most pervasive in nature whereas S_2 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 Amhawa.

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, Amhawa, 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 haematite quartzite/banded haematite 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 sinuous, 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 haematite 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, Amhawa, Baheraha areas of Sidhi district.

Banded grunerite-magnetite/banded grunerite-haematite quartzite (BGHQ): Small section of quarry is present at road section near Satnaraveen, where thinly 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 VindhyanSupergroup. 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 haematite quartzite/chert and banded haematite jasper are the main lithological assemblage in the area that comprises the ore zone to target. Haematite is the primary ore mineral with remnants of magnetite and specularite and martite in the thin section can be observed. Limonite and goethite are also present in area.

In previous work,the overall grade of iron varies from low to medium grade. Out of 80 BRS samples from LSM area 22 samples have values (Fe_2O_3%) ranging from 20-40%. Fe_2O_3 values in 26 samples ranges from 41% – 60% and that of 22 samples shows values from 61% - 80% of Fe_2O_3.Values of Fe total in 50 BRS samples (Fe total=0.7x (Fe_2O_3%+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 Fe total 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 Fe_2O_3%.

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 Fe_2O_3 indicates potentiality of the area. Analytical results obtained from the areas of Large scale mapping and Detailed mapping indicate the area like **Amhawa** 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 5.0 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.

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 Fe_2O_3 indicates potentiality of the area. Analytical results obtained from the areas of large scale mapping and detailed mapping indicate the area like **Amhawa** are potential areas and can be taken to account for further exploration and investigation for iron commodity. The area mapped in detail has given results that fall in medium to high grade iron and frequency of samples falling in high grade compared to medium grade. The strike length of that area is about 5.0 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 Amhawa to know the behavior 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. PreviousWork

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.

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 this1:12,500 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 % Fe (based on analytical results obtained).

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

Boundary Pts	Latitude	Longitude
A1	24.3417318	81.9137828
A2	24.3519995	81.9348752
A3	24.3610243	81.9591229
A4	24.3575482	81.9601219
A5	24.3479063	81.9365385
A6	24.3374145	81.9165660

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 block, in Sidhi District, geological mapping on 1:4000 scale, BRS, PTS, core drilling, core sampling, chemical studies, Geophysical studies petrological and mineralogical studies are proposed in the block. The

exploration will be carried out as per Minerals (Evidence of Mineral contents) Rules-2015 and 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 (2.3 sq km) and all the surface features will be marked by using total station on the 1:4000 scale plans. The block boundary will be surveyed by DGPS in WGS-84 Datum and demarcation of the boundary pillars to enable the auctionable block. 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 (2.3 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 6 trenches being proposed at an interval of 400m strike spacing. The dimension of trench is proposed to be 1m (width) x 1m (depth) × 20m (length), with 20 cu m each, giving a total of 120 cu m of volume. The total samples obtained will be 50% of the volume giving cu m equals to 120 numbers. The locations of the trenches will be on the boreholes profile as possible or nearest from the profile of the borehole or between the intersection points of the two consecutive boreholes, but the location of trenches will be where it is not exposed.

And on the exposure of the iron ore channel sampling will be carried out, channel is proposed in stellar pattern with an interval of 250m strike spacing. A total of 10 channels are proposed with length 10 m approx. each, with total quantity of sample 100 numbers.

4.5. Core Drilling

Based on **the outcome of the geological mapping**, for bedded, for other (Iron ore) deposit the spacing may be 400m or closer for regular and 200m or closer for irregular habit,18 nos. of boreholes of 1680 mtrs of core drilling are being proposed over the strike of 5km, over mineralized area of 2.3 sq km to intersect the mineralized zone. The first level of boreholes planned are 12 numbers with vertical depth of 30 m and at a depth of 80-90 m, the second level of boreholes planned are 6 numbers, with vertical depth of 60 m and at a depth of 120-130 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 80- 90 m depth. The second level boreholes are intersecting the ore body at 60 m vertical depth and giving a total 120-130m 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 type of Iron ore would be recorded.

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

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 fourparts (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,Al_2O_3%, 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

Quantum of work for Amhawa Iron ore G3 Block			
SlNo.	**Item ofwork**	**Unit**	**Quantity**
A	**DetailedGeologicalMapping**		
1	on1:4000Scale	Sq km	2.3
B	**SurveyWork 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	24
2	TopographicSurveyandsurfacecontouring 1:4000 scale	Sq km	2.3

C	**Drilling**		
1	Core drilling	m	1680
2	Borehole Pillaring(12"x12"x30")	Nos.	18
D	**ChemicalAnalysis**		
i)	***Primary Samples***(Surface Samples (BRS & Channel + Trench)+ Core Samples +CheckSamples) Chemical analysis by XRF radicals (Fe%, Fe_2O_3%, Al2O3%,SiO2%,P%,S%,Insolubles&LOI) + other oxides and traces	Nos.	450 Core Samples, BRS 50, PTS 60, Channel 100, ICPMS 20 **680 Total**
E	**PhysicalAnalysis**		
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 Rule 2015 and the amended version 2021)**	Nos.	5

Annexure 7A

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

Total area: 2.3 sq km, Period of Completion: 12 months BH: 18nos., 1680m , Review: After 4 months

			Rates as per NMET		Estimated Cost of the		
			SoC 2020-21		Proposal		
S. No.	Item of Work *	Unit *	SoC- Item No. *	Rates as per SoC * (a)	Qty. (b)	Total Amount (Rs) (a*b)	Remarks
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 2.3 sq km
ii	b. Labours Charges; Base rate	day	5.7	522	360	187920	Amount will be reimbursed as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher.
	c. Charges for Geologist per day (HQ)	day	1.2. a	9,000	60	540000	
	Sub Total- A					**2707920**	
B	**Survey work**						
a	DGPS Survey for BH fixation & RL determination	Per Point of observation of observa	1.6.2	19,200	24	460800	

		tion					
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					**772,440**	
C	**Geophysical Survey**						
a	Magnetic method	Per Station	3.2a	1,800	72	129600	6 line km
	Sub-Total C					**129,600**	
D	**Trenching/Pitting**						
	a) Trenchs	per cu.m	2.1.2	3,300	60	198000	6 trench
	Sub Total D					**198000**	
E	**DRILLING (after review)- In -house**						
1	Drilling up to 1200 m (very Hard rock)	m	2.2.1.4a	12,650	1680	21252000	
2	Land / Crop Compansation (in case the BH falls in agricultural Land)	per BH	5.6	20,000	18	360000	As per actuals
3	Construction of concrete Pillar (12"x12"x30")	per borehole	2.2.7a	2,000	18	36000	

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	2.2.10a	22,020	5	110100	As per actuals
9	Drill Core Preservation	per m	5.3	1,590	570	906300	120 m one BH, 18 BH * 25
10a	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 E					**23803656**	
F	**LABORATORY STUDIES**						
1	**Chemical Analysis**						
i)	**Geochemical Sampling-Surface samples (Bedrock/Channel /Soil/Stream sediment)**						BRS 50, Channel 100
	a. Analysis of major oxides and trace samples by XRF	Nos	4.1.15a	4,200	150	630000	
	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	15	63000	

	b. Analysis for precious metals by fire assay technique		4.1.5a	2,380	2	4760	
iii)	**Trench & Check Samples from Trench**					0	
	a. Analysis of major oxides samples by XRF	Nos	4.1.15a	4,200	60	252000	
	Trench samples					0	
iv)	**Trench Check samples (10% External)**					0	
	a. Analysis of major oxides samples by XRF	Nos	4.1.15a	4,200	6	25200	
v)	**BH Core samples**					0	
	a. Analysis of major oxides samples by XRF	Nos	4.1.15a	4,200	570	2394000	
	b. Analysis for precious metals by fire assay technique		4.1.5a	2,380	20	47600	
vi)	**BH Core samples (10%External)**					0	
	a. Analysis of major oxides samples by XRF	Nos	4.1.15a	4,200	57	239400	
	b. Analysis for precious metals by fire assay technique		4.1.5a	2,380	2	4760	
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 F					**3781785**	
G	**Total A to F**					**31,393,401**	
H	Geological Report Preparation	**5 Hard copies with a soft copy**	5.2	ii		1573670.05	Reimbursement will be made after submission of the final Geological Report in Hard Copies (5 Nos) and the soft copy to NMET.
I	**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		627868.02	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**					**33,624,939**	
K	**Provision for GST (18% of J)**					**6052489.033**	GST will be reimburse as per actual and as per notified prescribed rate
L	**Total Estimated Cost with GST**					**39,677,428**	
				Rs. In Lakhs		**396.77**	
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.**						

Annexure 7B													
Time Schedule/ Action Plan for Reconnaissance Survey (G4) for Amhawa Iron Ore , Sidhi District, Madhya Pradesh													
	Months												
Item of work	1	2	3	4	5	REVIEW	6	7	8	9	10	11	12
Camp Setup													
Detailed Mapping (1:4000													
Bed Rock Sampling													
Geochemical Survey													
Pitting and sampling													
Chemical analysis of surface samples													
Scout Drilling / systematic drilling													
Core sampling and its preparation													
Chemical analysis of Core Samples													
Processing of Analytical data													
Preparation of geologcial report													

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

ListofPlates

Plate 1: Block boundary over large scale mapping on the scale of 1:12,500 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 Fe2O3 % 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 Amhawa iron ore area (After Gupta and Maurya 2018).

ListofPlates

Plate 1: Block boundary over large scale mapping on the scale of 1:12,500 at G4 stage in parts of toposheet no. 63 H/15.

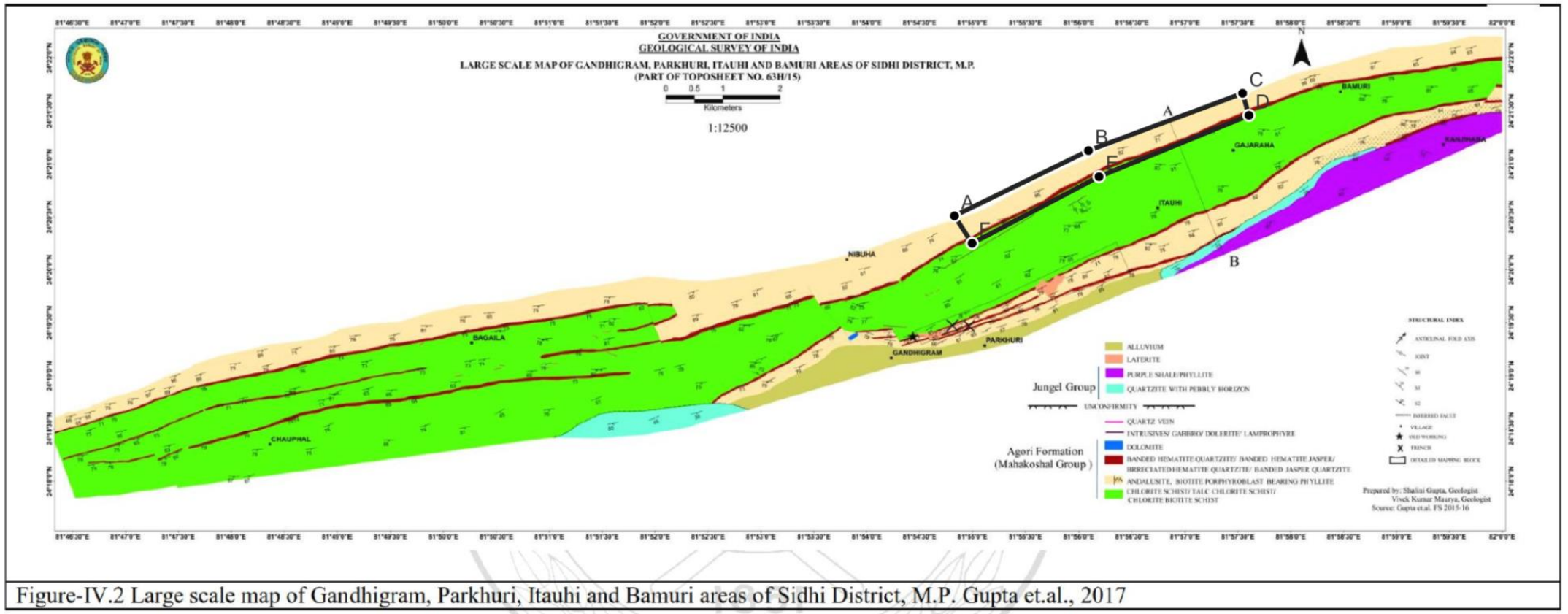
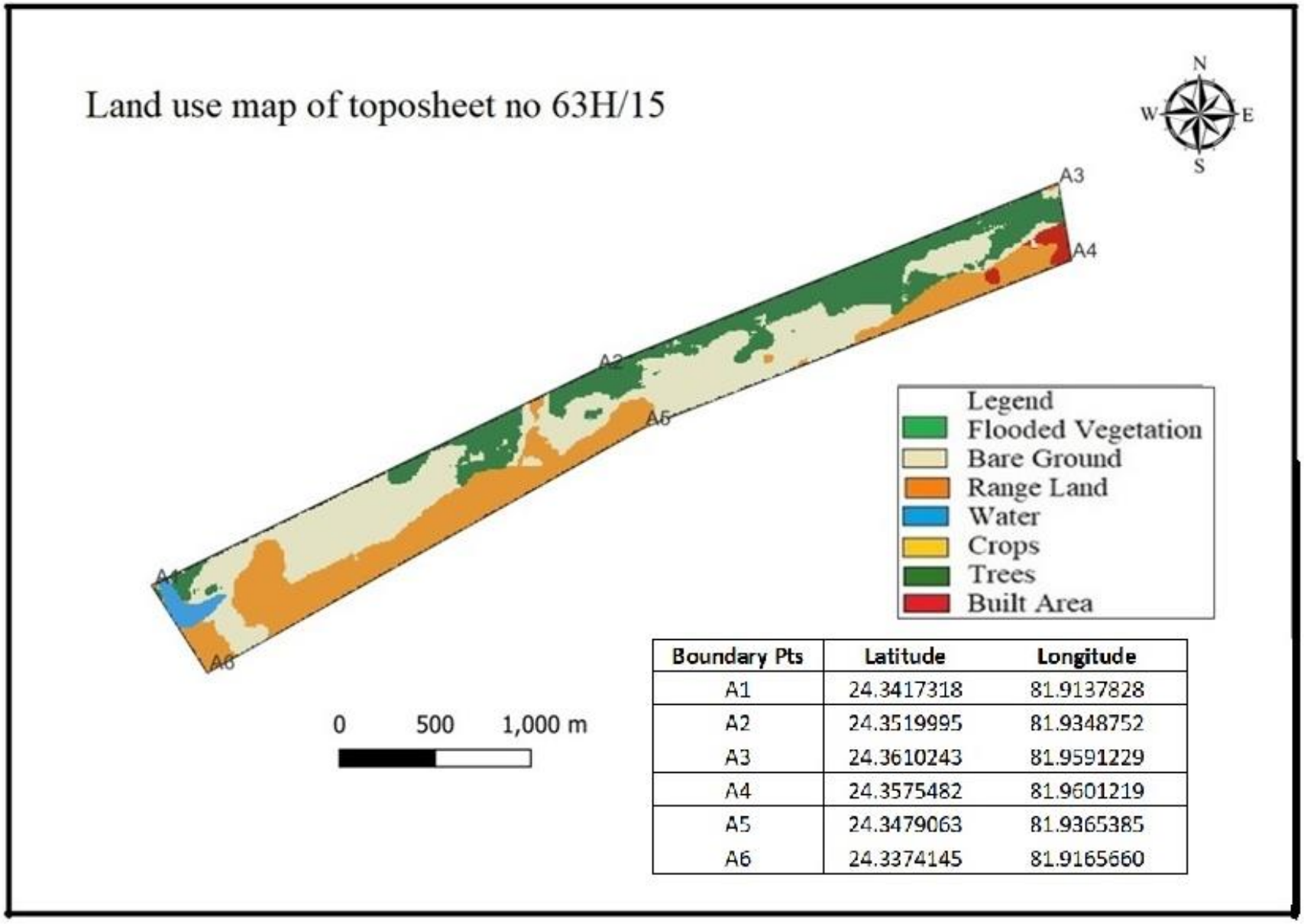


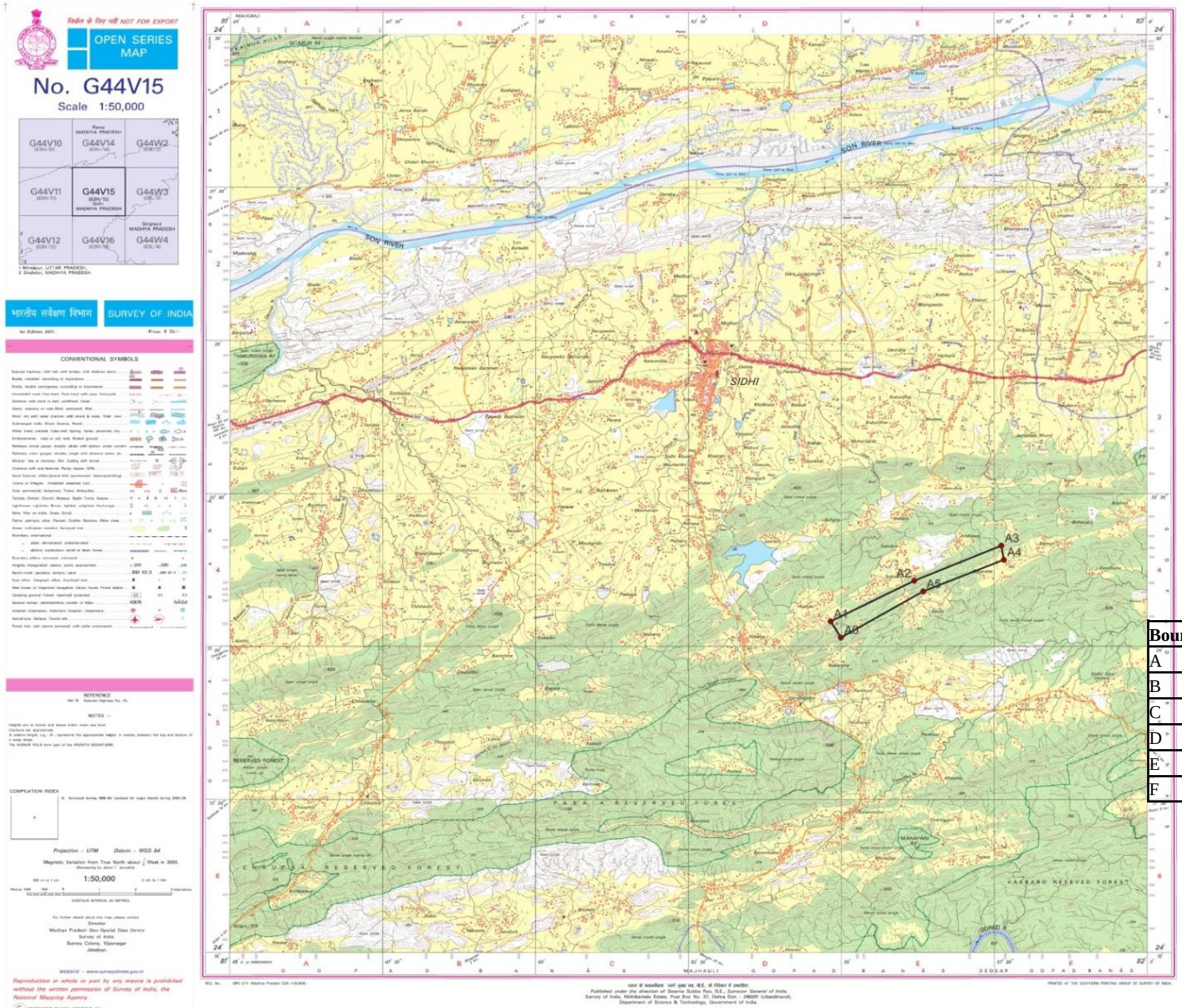
Figure-IV.2 Large scale map of Gandhigram, Parkhuri, Itauhi and Bamuri areas of Sidhi District, M.P. Gupta et.al., 2017

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



Boundary Pts	Latitude	Longitude
A1	24.3417318	81.9137828
A2	24.3519995	81.9348752
A3	24.3610243	81.9591229
A4	24.3575482	81.9601219
A5	24.3479063	81.9365385
A6	24.3374145	81.9165660

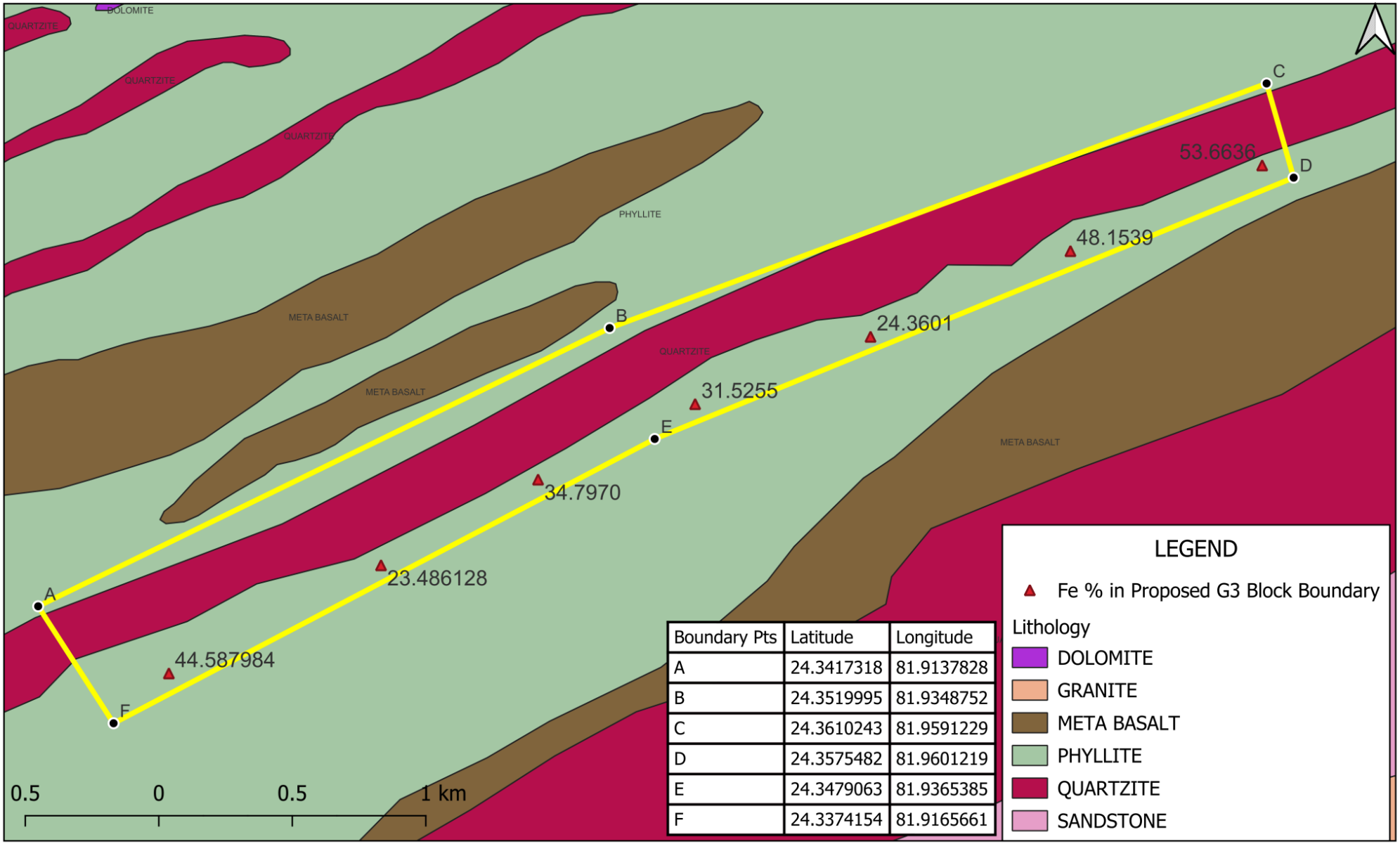
Plate 3: Block Boundary over toposheet no. 63H/15



Boundary Pts	Latitude	Longitude
A	24.3417318	81.9137828
B	24.3519995	81.9348752
C	24.3610243	81.9591229
D	24.3575482	81.9601219
E	24.3479063	81.9365385
F	24.3374154	81.9165661

Plate 4: Block boundary over geological map showing distribution of Fe2O3 % in BRS over proposed Block boundary area.

Lithological map of parts of toposheet number 63H/15 in Gopadbanas Tehsil, Sheopur, MP Showing Fe% values of samples collected by Gupta and Maurya 2018, GSI



Boundary Pts	Latitude	Longitude
A	24.3417318	81.9137828
B	24.3519995	81.9348752
C	24.3610243	81.9591229
D	24.3575482	81.9601219
E	24.3479063	81.9365385
F	24.3374154	81.9165661

Plate 5: Borehole planning in the proposed block aresa.