Summary of the block for Reconnaissance Survey (G-4 stage) for Iron ore in AREWADA – HITAPADI BLOCK (70 sq. km.), District: Gadchiroli, Maharashtra, Topo sheet No-65A/11.	
GENERAL INFORMATION ABOUT THE BLOCK	
Features	**Details**
Block ID	**AREWADA – HITAPADI BLOCK**
Exploration Agency	Gemco Kati Exploration Pvt. Ltd., Chandrapur
Commodity	**IRON ORE (Magnetite)**
Mineral Belt	The area belongs to the Bastar craton in Central Indian Peninsular shield, bounded by Satpura Mobile Belt in the Northwest, Eastern Ghat Mobile Belt (EGMB) in the East; Godavari graben in the South and the Deccan Trap in the West. The Bastar Craton covers parts of Southern Orissa, South eastern Madhya Pradesh, and Eastern and Southeastern Maharashtra.
Time Schedule to complete the Project	Time Line for Exploration work is 8 months.
Objectives	There are five G4 resource bearing blocks have been concluded and the final reports have also been submitted to NMET during February'2024. The Present Exploration Programme (G-4) in the adjacent areas of previously explored blocks by Gemco Kati was presented before 53rd TCC on 24th May'2023, based on available data in Public Domain on regional and local level exploration being carried out previously by various agencies in the surrounding areas, with the following objectives via-a vis proposed field components. 1) To carry out Geological Mapping on 1:25,000 scale of the block area (70 Sq. Km) to assess various litho units using field equipment's, recording of linear and planar structural features like shear zones, fracture zones and lineaments, looking for iron ore mineralization and to assess the strike continuity of possible Iron Ore deposit. 2) Preparation of PGRS map of the block area on 1:25,000 scale. 3) Magnetic survey for 10,000 LKm ie 250 Stations at an interval of 40 m. 4) To identify wall rock alteration zones, if any by study of Satellite Aster data. 5) To carry out systematic grab/channel sampling of bed rocks.

	6) To carry out systematic soil sampling/overburden material of areas overlying targeted host rocks and stream sediments of first and second order streams. 7) Anomalous mineralized zone is to be identified, if any using hand held portable XRFs, before undertaking detailed chemical analysis. 8) Petrological/Minerological studies of possible host rock and their chemical analysis. (For trace elements including Gold) 9) Pitting of selected zones and sampling based on suitability. 10) To assess G4 category (334) Iron Ore resources in the Block area, as per UNFC norms and Minerals (Evidence of Mineral Contents) Rules 2015.

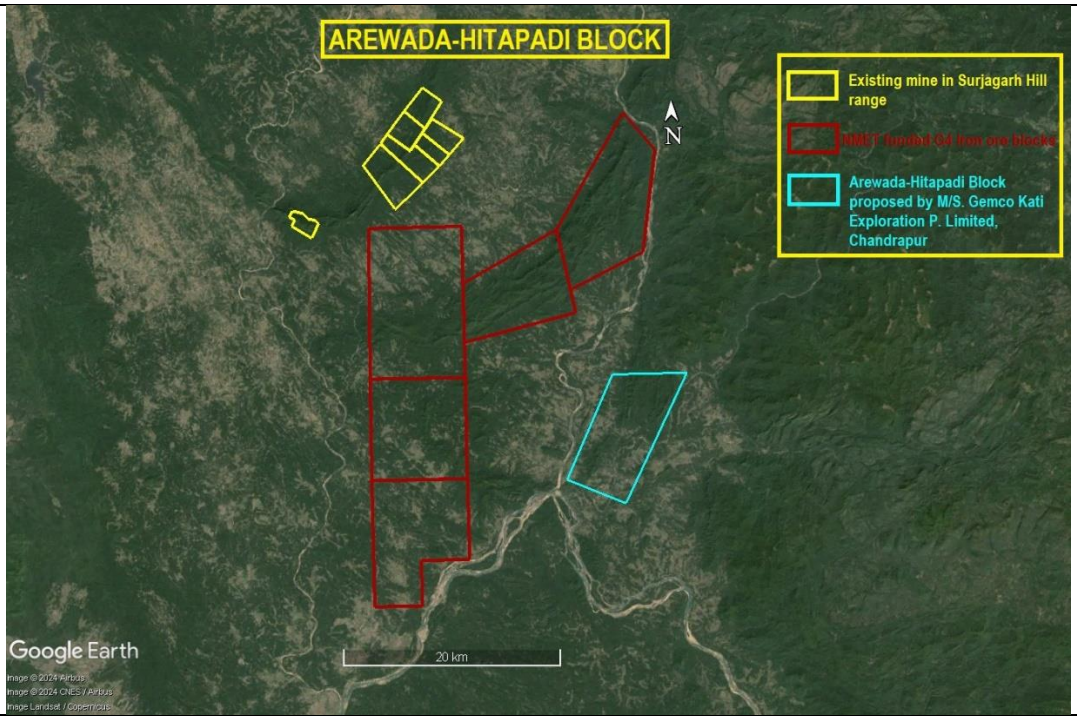
<table>
<tr><td>Whether the work is to be carried out by the proposed agency or through outsourcing and details thereof.
Components to be outsourced and name of the outsourced agency.</td><td>Work will be carried out by the proposed agency ie. Gemcokati Exploration Pvt. Ltd

Not applicable</td></tr>
<tr><td>Name /Number of Geoscientists</td><td>Two Geologists (2G), Two Geophysicists (2GP) & Surveyor (01).</td></tr>
<tr><td>Expected Field Days</td><td>Geologist- 120 days: Geophysicist-60 days: Surveyor – 30 days.</td></tr>
<tr><td colspan="2">1-Location</td></tr>
<tr><td>Co-ordinates of the proposed block</td><td>
<table>
<tr><th></th><th colspan="3">Latitude</th><th colspan="3">Longitude</th></tr>
<tr><td>(A)</td><td>80^0</td><td>37’</td><td>45”</td><td>19^0</td><td>30’</td><td>00”</td></tr>
<tr><td>(B)</td><td>80^0</td><td>41’</td><td>40”</td><td>19^0</td><td>30’</td><td>00”</td></tr>
<tr><td>(C)</td><td>80^0</td><td>38’</td><td>19”</td><td>19^0</td><td>23’</td><td>36”</td></tr>
<tr><td>(D)</td><td>80^0</td><td>35’</td><td>15”</td><td>19^0</td><td>24’</td><td>50”</td></tr>
</table>
</td></tr>
<tr><td>Villages</td><td>Hidur, Arewada, Hitapadi, Pileksa, Bhamragarh and Dhandrai.</td></tr>
<tr><td>Tehsil/Taluk</td><td>Etapalli</td></tr>
<tr><td>District</td><td>Gadchiroli</td></tr>
<tr><td>State</td><td>Maharashtra</td></tr>
<tr><td colspan="2">2-Area (hectares/square km.)</td></tr>
<tr><td>Block Area</td><td>70 Sq. Km.</td></tr>
<tr><td>Forest Area</td><td>The area is covered by mixed dense forest.</td></tr>
<tr><td>Government Land Area</td><td>-</td></tr>
<tr><td colspan="2">3-Accessibility</td></tr>
<tr><td>Nearest Rail Head</td><td>Mul is the nearest Railway stations operated by Central and South-Central Railways connecting Nagpur and Chandrapur cities.</td></tr>
<tr><td>Road</td><td>The study area well connected with Nagpur/Chandrapur Towns by State Highway No.70B and accessible throughout the year via the District Headquarters Gadchiroli, which is about 100 km NNW of Ettapalli and connected by District Main Road, Bhamragarh a prominent tribal village in the area which is 20 km south of Jinjgaon. Bhamragarh is the Tehsils Hqrs. and of 215 Kms away from Chandrapur and 289 km from Nagpur.</td></tr>
<tr><td>Airport</td><td>Nagpur Airport: 290 km from Block area</td></tr>
<tr><td colspan="2">4-Hydrography (Local Surface Drainage Pattern- Channels)</td></tr>
<tr><td>Rivers and Streams</td><td>The first/second order streams of the area display dendritic pattern and are controlled by both lithology and structure of the rocks. The Nibra Nadi joins the Laheri Nadi in the eastern part and meeting Kotri/Paralkote River in the SW corner of the of the block area.</td></tr>
</table>

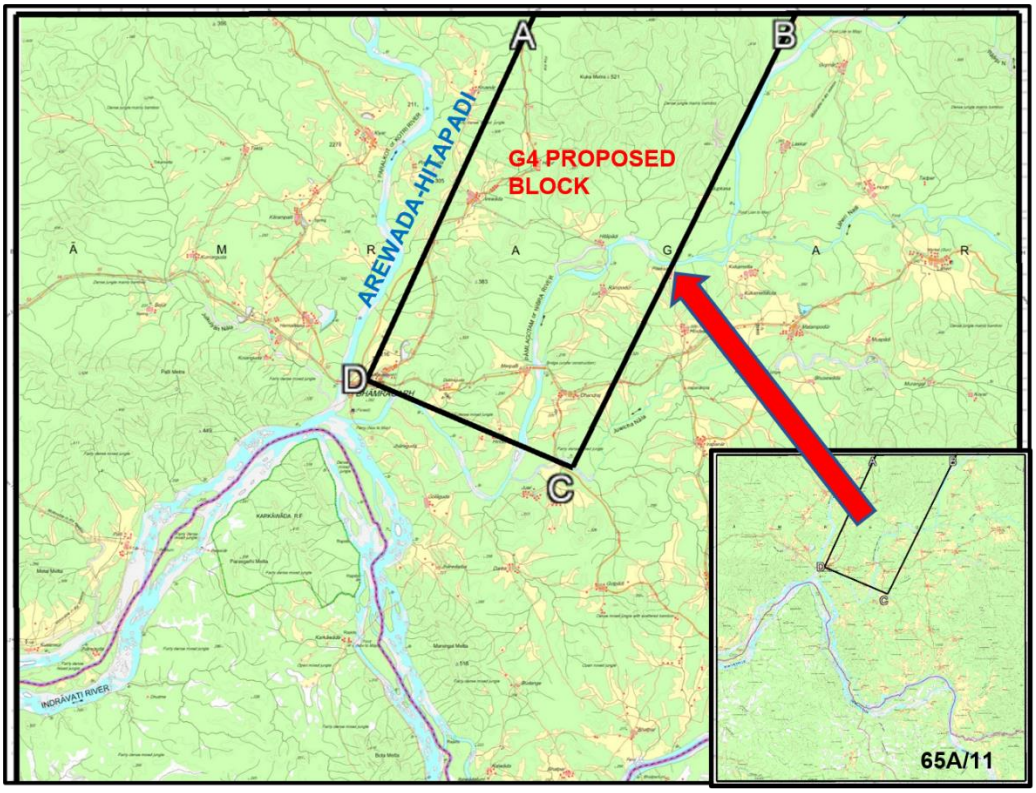
5-Climate	
	The area is having dry and partly humid climate. The southwest monsoon commences from June and continuous till September. The winter starts from late October/early November and continue to February.
Mean Annual Rainfall	The area experiences an annual average rainfall of about 140 cm during monsoon between June to October. A thick soil cover aided by a good rainfall has given rise to moderately thick vegetation forming deciduous type of forests.
Temperature	The highest and lowest temperatures of the area vary between 45°C and 15°C.May is the hottest month of the season, whereas December is the coldest month.
December (Minimum)	10^0C
May (Maximum)	40^0 - 45^o C [Average varies from 10°C to 30°C]
6-Topography	
Topo sheet No	**65A/11**
Morphology of the area	The area is represented by linear NE-SW hill ridges. Densely forested terrain with intermittent valleys in between. The northern part of the Block is represented by high hilly terrains. Western part is pediplain. The relief difference is much higher, the highest and lowest points being 521m in Kuka Meta towards North and 220 m in the south near Dhandraj.
7- Availability of Baseline Geoscience Data	
Geological Map (1:50K/1:25K)	1:50, 000 Scale Geological Map is available and was downloaded from GSI Portal (Bhukosh).
Geochemical Data	Area is not covered yet by National Geochemical Mapping (NGCM).
Geophysical (Aeromagnetic, ground geophysical, Regional and local GP maps)	Area is not covered yet by National Geophysical Mapping (NGPM) and National Aero-Geophysical Mapping (NAGMP).
8-Justification for taking up Reconnaissance Survey/Regional Exploration	
	1) The proposed area falls under Western Bastar Craton which hosts numerous Iron Ore occurrences along three distinct parallel arcuate ridges starting from Surjagad Hill range in the north (65A/06) to Damkod Wadvi Hill Range (65A/06 & 65A/10) in the middle and Bhamragad Hill Range (65A/11) in the southern most part. **2)** Mineralization of Iron is occurring around the area associated with Banded Iron Formation (BIF) and ferruginous Phyllites. 3) Iron ore Mines at Surjagad is operational right now, is the only exploration activity prevailing in the close vicinity of the block area.

	4) However, 5 (G4) blocks have been explored recently in the adjacent areas on Damkodwadvi Hill range and further south with NMET funding by Gemco Kati Exploration (P) Ltd. after a span of 40 years by any Govt./Private agencies. 5) National Programs i.e. National Geochemical Mapping **(NGCM)** and National Geophysical Mapping **(NGPM)** coupled with **STM & NAGMP** work have not yet been initiated in this part of Maharashtra. 6) Major part of Gadchiroli District is designated "Obvious Geological Potential" Area **(OGP)** and remain unexplored. 7) The area seems to be potential and need to be explored and proper GR to be brought out with resources of Iron ore under UNFC G4 stage to facilitate State Govt for initiating auctioning process. 8) GEMCOKATI has identified BIF and Phyllites at several places, along with enclaves of BMQ within the block area, collected 4 samples and analysed them for **Iron ore** from **M/s Tata Steel, Joda and Shiva Lab. Bangaluru**. Samples are showing values from 27.84% (Magnetite) to 49.59% Fe(T). 9) Based on the above facts and mineralization evidences of Iron, the present Reconnaissance Survey program at G-4 level has been proposed through Geological mapping, Geophysical mapping and surface sampling. 10) This G4 work will be helpful in estimation of reconnaissance resources of Iron. Geochemical sampling of BRS/CS/ will be helpful in assessing the disposition and grade of mineralization. 11) The Reconnaissance Survey (G4) will eventually help in planning of detailed exploration program (in case upgraded to G-3 level) which in turn will facilitate the state Government **for auctioning of block**

Block area shown on google map. (Topo sheet- 65A/11) Arewada - Hitapadi Block.



Location of the proposed block demarcated on Survey of India (SOI) Toposheet(s) 65A/11



Detailed proposal for Reconnaissance Survey (G4) for Iron Ore in Arewada-Hitapadi Block (70 sq.km), District: Gadchiroli, Maharashtra, Topo sheet no-65A/11.

1.0.0. Block Summary

1.1.0Preamble:

1.1.1 Iron is the second most abundant element after Aluminum, constituting 5.6 per cent of the Earth's crust. The vast majority of it is found in form of oxides, besides its occurrences are also known in form of silicates, and less commonly as carbonate and supplied minerals. Iron ore is the raw material used to make pig iron utilized ultimately in the manufacture of steel. Realizing its vast utility in modern day world, it is unanimously considered to be "more integral to the global economy than any other commodity, except perhaps oil". The ore is usually in form of oxide either hematite or magnetite, varies in colour from dark grey, bright yellow, deep purple, to rusty red.

1.1.2 Iron has been known to mankind since antiquity. Iron is ubiquitous in the lithosphere as either a major constituent or in trace amounts. By far the most important use of iron is in the making of steel, which is essentially an alloy of iron with carbon and other elements depending on end use. India is one of the earliest manufactures and users of iron and steel in the world. Literature survey reveals many documentary evidences such as making of various surgical instruments in the 3rd & 4th century B.C. Till 18th century iron and steel making in India was at par with that of Europe in the form of village crafts. The scene was totally changed with the invention of the Bessemer process in 1856 and the Basic Open-Hearth Process in 1878. These developments led to significant increase in the world steel production from 0.5 Mt in 1870 to 28 Mt in 1900.

1.1.3 Iron ore in India is found in form of either hematite and/or magnetite. About 79% haematitic ore deposits are found predominantly in the Eastern Sector (Chhattisgarh, Jharkhand and Odisha) while about 93% magnetite ore deposits occur in Southern Sector (Karnataka, Goa, Andhra Pradesh, Kerala & Tamil Nadu). Karnataka alone contributes nearly 72% of magnetite deposit in India. Of these, hematite is considered to be superior because of its higher grade. Indian deposits of hematite belong to the Precambrian Iron Ore Super group of rock. The ore zone occurring as capping is restricted to bands/interbeds of banded iron formation lithounit (BIF in short) comprises massive, laminated, friable and powdery ore types from top to bottom.

1.1.4 Maharashtra:

Iron ore deposits are found associated with the Iron ore Group rocks of Archaean age. It comprises older schist and unclassified crystalline overlain by metamorphosed sedimentary rocks such as quartzite, banded ferruginous quartzite, schist and phyllites. These metasedimentary rock formations are intruded by dolerite, granite, gneisses etc. The iron ores are derived from banded ferruginous quartzite (BHQ) by leaching of silica. The economically viable deposits in Maharashtra occur in Chandrapur, Gadchiroli, Bhandara in the Eastern part and Sindhudurg district (Shiroda, Reddi mines area) on the seacoast in the western part of the State. Minor occurrences are reported from Nagpur, Nanded, Satara and Yavatmal districts of Maharashtra. They are mostly concentrated in the Vidarbha region on the Eastern part of the State where ore bodies occur as lenses in banded hematite quartzite. The ore minerals are mainly hematite and minor magnetite.

1.2.0 Physiography

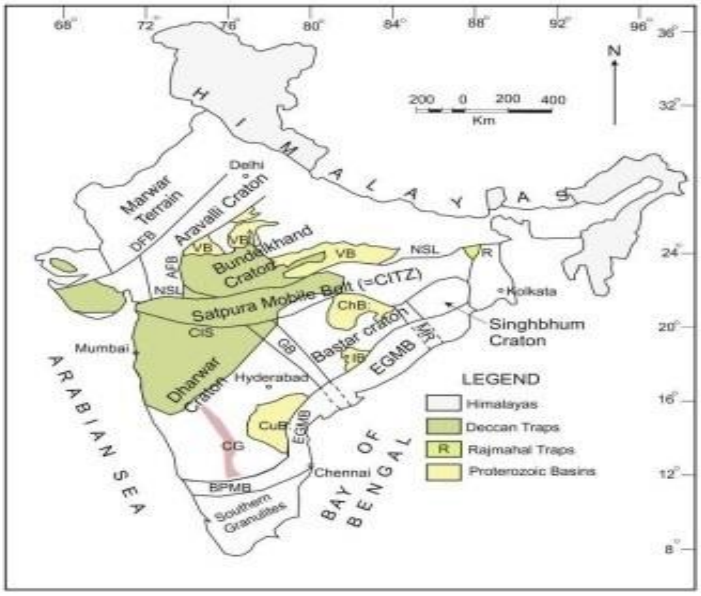
The area is represented by linear NE-SW hill ridges. Densely forested terrain with intermittent valleys in between. The northern part of the Block is represented by high hilly terrains. Western part is pediplain. The relief difference is much higher, the highest and lowest points being 521m in Kuka Meta towards North and 220 m in the south near Dhandrai.

1.3.0 Background of Previous work:

The areas in and around adjoining Topo sheets were mapped by GSI viz. R. Raman, (1969-70) in Toposheet No. 65A/01, (Phadtare and Rajarajan-1965-66), Phadtare (1966-67) in sheet No. 65A/02. Hemmady (1967-68) in Toposheet No. 65A/03, Rajarajan, K. (1964-65) in Toposheet No. 64D/07, 64D/11, The Geological mapping of this Surjagarh and surrounding areas was carried out by GSI by T. Krishnama Charlu and K. Kumaran (1978-79), S. K. Pattnaik & S. K. Sengupta (1977-78), R. V. Iyer (1969-70). S. A. Ahsan (1976-77) in Toposheet No-65A/11, Jain & Pattanaik (1978-79) in Toposheet No-(65A/06,07 & 11), Kameswar Rao (1979-80) in Toposheet No-65A/11 and Aftab Ahsan and Zaheer (1980-81) in Toposheet No-65A/11.

During 1963-1970, the DGM Maharashtra had carried out Exploration work across the curvilinear Surjagad Hill range and inferred resources of Iron ore was estimated. However, the reference of this work viz. Geological report, information about Borehole location, depth, chemical analysis etc. are not available in public domain.

1.3.1 [Regional Geology] Description of stratigraphic units:



Generalized tectonic map of Indian subcontinent: Precambrian Cratons, MobileBelts and Lineaments. AFB = Aravalli Fold Belt, DFB = Delhi Fold Belt, EGMB = Eastern Ghats Mobile Belt, SMB = Satpura Mobile Belt, NSL = Narmada-Son Lineament, CIS = Central Indian Suture and BPMP = Bhavani–Palghat Mobile Belt. Proterozoic Rifts and Basins include IB = Indravati Basin, ChB = Chhattisgarh Basin, GB = Godavari Basin; MR = Mahandi Rift; CuB = Cuddapah Basin, VB = Vindhyan Basin. CG = Closepet Granite (after from Rao and Reddy, 2002 and Meert et al., 2010).

Around Bhamragarh exposes three Distinct Groups of rocks belonging to Bengpal, Bailadila and Narainpur Groups which are probably the north westward extension of the above said Groups occurring in Bastar District of Chhattishgarh. The two older Groups was named as Arewada and Bhamragarh by local names. The Arewada Group is represented by intermediate to high grade metasediments **like magnetite quartzite**, quartzite with or without fuchsite, andalusite-mica schist, hornblende schist and gneiss, granite gneiss, migmatites and granite. The younger intrusives are metadolerite dykes, pyroxenite and vein quartz.

The Arewada Group of rocks are overlain by the younger Bhamragarh Group of rocks with basal conglomerates separating the younger from the older Group, which is seen near **Arewada village** on Arewada-Gupkasa road. The Bhamragah Group is represented by typical “Green Stone” suite of rocks of low grade metamorphics and which includes basal conglomerates, chlorite schist with interbanded cherty quartzite, **ferruginous phyllite interbedded with banded hematite quartzite** and massive mafic/ultramafic group of rocks interbedded with Bhamragarh Group metasediments.

The youngest Group, Narainpur are unmetamorphosed sediments deposited over a basal conglomerate with arkosic and gritty sandstone interbedded with shales and clay pockets are resting over Bhamragarh Group of rocks on western side and on eastern side it is making a faulted contact with Arewada Group. This Group of rocks crops out only to the **NW of Gupkasa village** and to the **WSW of .449m hill.**

The Arewada Group of rocks are highly folded and metamorphosed with extensive development of migmatites. The Metasedimentary enclaves within the migmatites and granites show very close resemblance with the metasediments of Bengpal of Bastar District and moreover the Arewada Group is the north westward extension of the Bengpals of Bastar area.

1.3.2 A tentative geological sequence is given below

	Recent to Sub-recent	Laterite, soil and alluvium residual Iron ore capping over Bhamragarh Iron ore formations. Narainpur Group (Middle Proterozoic) Vesicular andesite upper conglomerates.
(Middle Proterozoic)	Narainpur Group	Sandstone, Arkose and grits. Clay pockets interbanded with shales Sandstone, grits and arkose. Basal Conglomerates angular.
---------- Unconformity ----------		
	Intrusive	Vein quartz
Lower Proterozoic	Bhamragarh Group Bailadila Group	Mafic/ultramafic group of rocks at places Intercalated with argillites and vesicular Type mafic bodies. Chlorite schist/Talc-tremolite schist Iron Formations (Banded hematite quartzite, ferruginous phyllite and cherts) Serictie Quartz schist with interbedded Quartzites. Conglomerates and gritty quartzites.
---------- Unconformity ----------		
ARCHAEAN	Intrusive Arewada Group Bengpal Group (older metamorphic)	Vein quartz and pegmatite Metadolerite dykes/sills, Pyroxenite. Granite gneiss-Migmatites-granites Magnetite quartzite, quartzite (with or without fuchsite), andalusite bearing mica schist, feldspathised mica-quartz-schist and hornblende schist Hypersthene bearing granite (Charnockite) Grey granite (with or without garnet) Hypersthene bearing granulites Garnetiferous sillimanite. K-feldspar-graphite gneiss and migmatites.

1.3.3 Local Geology:

[A] Arewada Group: Bengpal Group (older metamorphic)

1) Hornblende Schist and Gneiss:

Best exposed in Laheri nala near Hodri village and also in Pamlagotam river section near Gupkasa village. They form small knolls and hills near Parasnar village. These rocks are usually associated with quartz-mica schist, granite gneiss and migmatite. At places gradation of these units into banded migmatites are very common particularly in Indravati River section near Damrancha. In Indravati and Bandia River sections, they are garnetiferous near Damrancha village. The rock is coarse grained, well foliated with gneissosity marked by the alternating arrangement of quartzo-feldspathic material and amphiboles with little pyroxenes. Garnet is occasionally present.

2) Quartz-Mica-Schist (With or without feldspathisation):

This lithounit is widely distributed throughout the area in Arewada Group. In Laheri nala, it is associated with hornblende schist and granite gneiss to the south west of Hodri village and its association with granite gneiss is seen in the nala near Pitekasa village. Here, this unit is highly feldspathised with the addition of pink colour feldspar. To the south of Irapanar village in a nala section, it is associated with the granite and migmatite. The same type of association is also seen in Indravati River section near Gondwana and Bhatpara villages. In

Indravati River section to the west of Jhareguda village the unconformable relation of these rocks with Bhamragarh Group of rocks is noticed.

3) Andalusite bearing Mica Schist:

This litho-unit is exposed to the west of Juwi village in .299m knoll. Here it is associated with actinolite-tremolite schist and pyroxenite. It is muscovite quartz schist with knots of andalusite. The andalusite grains are usually in prismatic form with a size variation from 2 cm to 5 cm. Schistosity is well developed in this unit due to the preferred orientation of micas and quartz.

4) Quartzite (with or without Fuchsite):

The quartzite is conformable with quartz-mica-schist, granite gneiss, magnetite quartzite and hornblende schist/gneiss. They are usually interbanded with quartz-mica-schist and magnetite quartzite. Micaceous quartzites are forming high hills and knolls. The hills to the west of Gopnar and Laskar i.e. .414m and .449m hills are muscovite or fuchsite bearing one. They come in contact with the Bhamragarh as well as Narainpur Group of rock forming faulted unconformity. Near to Yerapalli, Hindewada and Juwi village, this unit crops out as small knolls where they are commonly associated with quartzmica schist and banded magnetite quartzite. The rock is grey to white in colour, hard and compact with occasional well preserved colour banding.

5) Magnetite Quartzite (with or without banding):

Banded magnetite quartzite is seen near to Gotpadi and Bhatpara villages. It is commonly associated with quartzites, quartz-mica schist and hornblende schist/gneiss. The width of this unit varies from a few metres to more than 25m. The rock is coarse grained with concentrations of magnetite and quartz. Here, this unit has alternate magnetite and quartz banding. At places, the rock contains garnet also. Some of the sample were analysed for FeO content which varies from 27% to 44%.

6) Granite Gneiss-Migmatite-Granite:

The granite gneiss, migmatite and granite occupy a major part of the Area. Migmatite associated with hornblende schist/gneiss are very well exposed in Pamlagotam River section near to Gupkasa village. Here in up steam side migmatite grades into pyroxene bearing gneiss and granite. Granite associated with migmatite is seen in Paralkot River section near Krisnar. Near Bhusewada village granite is making contact with the phyllites of Bhamragarh Group. In Indravati River section near Bhatpara and Gondwana villages" gradation of granite gneiss to migmatite to granite is very well seen. Here this gradation appears towards the core of the folds and granites occupy the core of the folds. Megascopically, the granite gneiss is a fine to medium grained rock, well foliated with alternate bands of light and dark coloured minerals. The rock is grayish white to brownish grey in colour. The light coloured bands comprise mostly quartz and feldspar with muscovite, whereas the dark comprise mostly biotite and amphibole. The granodiorite variety granite is well exposed near Bhusewada village. Nowhere granite is seen as intrusives as they are controlled by the folds and concordant to the other litho-units. Relict folds of megascopic scale are common in granite. The granitisation must have taken place at two stages syn to the two phases of deformations (i.e.F2 & F3).

7) Intrusive:

a) Meta dolerite Dykes/Sills:

This is the most common intrusive occurring as isolated and scattered outcrops. The usual trend of this intrusive is NNW-SSE to NW-SE. They usually occur as discordant bodies in the country rock. Their width varies from 5m to 20m but very large size bodies are also very commonly present particularly near Krisnar village. Here the Meta dolerite dykes are having the width of 50m and above. Some of the dykes are disseminations of metallic sulfides which are usually pyrite and pyrrhotite (?). Branching of these bodies is also observed. The dykes occurring near Krisnar and Hidur village are abruptly ending against the Bhamragarh Group of rocks indicating that they are older to metasediments of Bhamragarh Group. So they have been included as intrusives in the Arewada Group. The rock is hard, compact, and fine to medium grained At Places chilled margins are also noted near to the contact with the country rock. Occasionally, incipient development of schistosity parallel to that of the country rock is noticed.

b) Pyroxenite:

This rock is exposed as detached outcrops; good exposures are seen to the north west of Asa and also to the north east of Chintarevu in Indravati River section. The width of exposures/outcrops varies from 2m to 15m whereas the length varies from 10m to 1.5 km. The rock is coarse grained and deep green in colour.

c) Actinolite-Tremolite Schist:

This unit is best exposed in Indravati River section to the west of Jhareguda, in .299m knoll to the east of Juwi, in nala flowing to the south of Iranpanar and near to the Irapanar village.

[B] Bhamragarh Group: Bailadila Group

The Bhamragarh Group of rocks occurs only in Toposheet 65A/11. The Arewada Group of rocks is unconformably overlain by the Bhamragarh Group of rocks. They occur as linear hill ranges trending N-S in west of Hidur and east of Bhusewada villages. The NW-SE trend is observed to the south west of Bhamragarh to the west of Nelgunda and to the west of Budange in Marangal Metta. The NE-SW trend is seen to the east of Bhamragarh village. This group is faulted against the different members of Arewada Group. Near to Arewada village the basal conglomerates of Bhamragarh group is exposed otherwise this litho-unit is missing in other parts of the area. This may be due to the faulting along the boundary of the two groups. The Bhamaragarh Group consists of low grade metamorphites, possibly of “greenstone” suite of rocks. The individual litho-units area described below:

1) Conglomerate sand Gritty Quartzites:

Basal conglomerate with Gritty quartzite are best exposed near to the Arewada village on Arewada-Hitapadi road where they are cropping out as knoll. The other exposure of this unit is seen on the left bank of the Indravati River near to Parasnar village in CG. The rock is quite compact with well sorted pebbles of quartz mainly and sulfides bearing black cherts are also seen with in this unit. At places graded bedding is also seen where the pebble sizes vary from a cm to 10 cm. The matrix of this unit is mainly siliceous and consists of quartz as main

constituent. Argillitic matrix is also seen within this unit. Stretching of quartz pebbles along with schistosity plane is also noted.

2) Sericite quartz schist with Interbedded Quartzite:

This litho-unit is very well exposed in Indravati River section to the south west of Bhmragarh village. It comes in contact on lower side with interbedded quartzite with chlorite schist and on upper side chlorite schist is coming in contact with this. The rock consists of quartz, secrete with occasional flakes of muscovite and grains of garnet. The schistosity is well developed due to the arrangement of sericite and muscovite flakes and long axis orientation of quartz grains. The quartzite is seen as interbands within the sericite quartz schist.

3) Chlorite Schist:

This is the most common litho-unit occurring within Bhamragarh Group of rocks. This unit is seen on both sides of Iron formations. It is dark greenish in colour with well developed schistosity. Crenulation cleavages are also well preserved within this unit. At places this unit is having spotted appearance could be of volcanogenic. Bands of highly deformed quartzite are also seen in this unit where the quartzite bands are detached and exhibit appearance of inter-formational conglomerates. Earlier workers mapped this unit as conglomerates. At places this unit grades into compact basic rock, indicating a possible intrusive nature.

4) Iron Formation:

Iron formation included banded hematite quartzite, chert and ferruginous Phyllite. At places chlorite schist also comes under this formation. The banded hematite quartzite is the main litho-unit which is traceable throughout the Bhamragarh Group. This unit usually occurs within the ferruginous phyllites and at places it is very well developed within the chlorite schist exposed in the Indravati River section. The width of this unit varies from place to place and the variation varies from a metre to 50m. This is a hard, compact and brownish red to grey in colour with well developed colour bands due to compositional variations. The thickness of individual compositional bands ranges from few mm to 10 cm. Minor folds of both generations F1 and F2 are well preserved in this formation. The ferruginous phyllite is closely associated with B.H.Qs. The rock is aphanitic and reddish brown in colour. The foliation in this unit is very well developed. At places it has the intercalations of cherts.

5) Ultramafic/Talc-Tremolite Schist:

Concordant bands of ultramafic intercalated with talc-tremolite schist are seen above Iron Formation in Bhamragarh Group. Ultramafic at places grading into mafic rock which is very well seen in Indravati River section near Marangal Metta. This unit is vesicular with secondary cherty quartz filling indicating volcanogenic origin. The rock is fine to medium grained where it is mafic. The ultramafic are medium to coarse grained with development of incipient foliation. Some epidote veins cut across the crudely developed schistosity.

6) Intrusives:

a) Vein quartz:

Vein quartz is seen in two directions only i.e. in NE-SW and NW-SE directions. The quartz veins are brecciated and it is barren of any mineralisation. Apart from these veins quartz covering small knolls is seen near to Hodri village. These quartz veins do not have any economical signification.

b) Pegmatite:

Dykes of pegmatite have pink feldspar and quartz cutting across the granitic and migmatite terrains. They are of small size varying from a few cm to 3m in width. They do not have zoning and almost devoid of mica. Very rarely biotite and muscovite books are seen in this rock. An epidote vein usually is seen along with this rock

[C] Narainpur Group:

Small patches of this group of rocks are cropping out on a hilly terrain. It is located to the west of .449m hill located to the west of Laskar village. Here this group rocks are making faulted contact with fuchsite quartzite which belongs to Arewada Group in. the caster side. In rest of the part this group makes unconformable contact over Bhamragarh Group of rocks. The lower part of this group is only exposed in this area and the rest of the part is missing may be due to faulting.

1) Basal conglomerate, Sandstone, Grits and Arkose, Clay pockets Interbanded with Shale:

The Narainpur Group sedimentation starts with basal conglomerate which is resting over Bhamragarh Group of rocks. The conglomerate horizon is sheared and dipping ESE moderately. The conglomerates are poorly sorted and well rounded. They are buff white in colour with siliceous matrix. The conglomerate size varies from 2 cm to 10 cm. They are mostly made up quartz and also fragments of BHQ, metabasic and chert. The conglomerates gradually grade into grits and arkose. Graded bedding is very common in sandstone. The sandstone is grading into buff white coloured shales which is having the pockets of clay. The clay zone is seen in between two sandstone units. More than two clay pockets are seen in the area mapped. The clay zone which is covering the slope of a knoll has about a width of 20m and above. The clays are having white, red, yellow and orange colours. The strike length of this zone is traced for more than 100m. Current bedding in the form of small lamellae is seen in this zone. Sandstone and pebble are also occurring as thin bands within clay pocket. The upper part of this zone is grading into sandstone and which is followed by upper conglomerate unit. This unit is making unconformable contact (angular unconformity) with the Iron Formation of Bhamragarh Group.

2) Vesicular andesite:

Outcrop of vesicular andesite is found exposed sporadically in Pamalgatam River. The rock is fine grained and grayish green in colour. Amygdule of quartz is commonly found. The rock has no effect of metamorphism.

[D] Recent to Sub-Recent:

1) Residual Iron Ore:

Residual iron ore cappings are seen over the Iron formation of the Bhamragarh Group near Hidur Village. The important ore mineral is hematite. Hematite rich ore is occurring as pockets within residual iron ore capping. The rest of the unit is siliceous with secondary precipitation of silica in the form of cherts and jasper. Ahsan (1976-77) analysed the total iron content of this body which ranges from19% to 63.63% out of which most the samples ranged from 30% to 40% total iron content.

2) Laterite, soil and Alluvium:

Laterite is usually seen covering over the granitic terrain. Iron oxide in the form of Kanker cemented with ferruginous material is usually seen the nalas draining the iron formation of Bhamragarh Group. Soil over the iron formation is rich in iron content which gives reddish brown colour to the soil. Fine and quartz rich sand are seen on the banks of Indravati River, whereas in other rivers the river bed is covered with boulders and pebbles. Fertile soil is covering both the banks of the rivers which are being used for cultivation.

1.3.4 Mineral potentiality based on Geology

Iron Ore deposit:

Banded iron formation of the Bhamragarh group represents the main iron ore bearing horizon of this area. Other less important horizon is the magnetite quartzite of Arewara group. These are low grade iron ores. The grab sample analysis ranges generally from 28% to 50% Fe and one sample has given 63% Fe content.

1.3.5 Mineral potentiality based on Geophysics and ground Geochemistry

Area within Gadchiroli and adjoining Districts in this part, were not been covered either by National Geochemical Mapping [NGCM], National Geophysical Mapping [NGPM] and National Aero Geophysical Mapping Programme [NAGMP]. Hence, there are no data available yet on Geochemistry and Geophysics.

1.3.6- Scope of proposed exploration

Previous work:

S.A.Ahsan (1976-77) in Toposheet No-65A/11, Jain & Pattanaik (1978-79) in Toposheet No-(65A/06,07 & 11), Kameswar Rao (1979-80) in Toposheet No-65A/11 and Aftab Ahsan and Zaheer (1980-81) in Toposheet No-65A/11.Recently under NMET funding the M/s.Gemco Kati Exploration Private Limited has concluded five Iron ore blocks (G4) viz.

1) Alenga-Nendwadi Block
2) Tadgaon-Wateli Block
3) Marampalli-Jinjgaon Block
4) Gilanguda-Padur Block &
5) Murwada-Tumarikodi Block,in the adjacent areas within vicinity on Llyod Mines at Surjagarh & Damkodwadvi Hill range.

2.0.0 Block description:

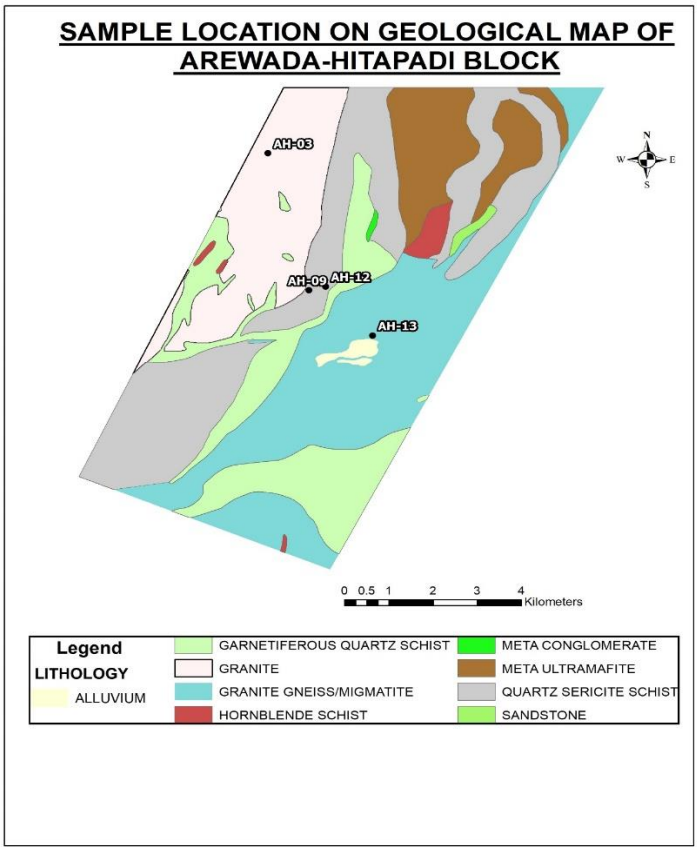
The study area is well connected with Nagpur/Chandrapur towns by state highway No.70B and accessible throughout the year via the district headquarters **Gadchiroli**, which is about 100 km NNW of **Etapalli** and connected by District Main Road, **Bhamragarh** a prominent tribal village in the area which is 20 km south of **Jinjgaon. Ettapalli** is Tehsils Hqrs. and of 215 Kms away from Chandrapur and 289 km from **Nagpur**. **Etapalli** and **Ahiri** are also well connected through Gondia-Chandrapur narrow gauge Railway line.

Table: - 1 Block Description

Boundary corners	LONGITUDE			LATITUDE		
(A)	80^0	37’	45”	19^0	30’	00”
(B)	80^0	41’	40”	19^0	30’	00”
(C)	80^0	38’	19”	19^0	23’	36”
(D)	80^0	35’	15”	19^0	24’	50”

3.0.0 Field visit by GEMCOKATI

Gemco Kati has conducted field visit in the proposed block. During geological traverses, Gemcokati has identified the host rocks viz. BIF and Phyllites at several places. 2 no. of Samples are collected and analyzed through Tata Steel, Joda & Shiva Lab Bangaluru. The analytical results are shown in following Table ranging from 27.84% - 49.59% Fe(T).



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CHEMICAL ANALYSIS

Sl. No.	Sample ID	Latitude	Longitude	Fe	SiO2	Al2O3	S	P	MnO	P2O5	TiO2	MgO	CaO	Na2O	K2O	Fe2O3	SO3	BaO	V2O5	LOI
1	AH-3	19° 29' 7.584"N	80° 37' 33.672"E	31.05	52.80	1.06	0.05	0.05	<0.05	0.10	0.19	<0.05	0.09	<0.05	<0.05	44.39	0.13	0.12	<0.05	0.98
2	AH-9	19° 27' 18.4'' N	80° 38' 3.58'' E	27.84	59.44	0.60	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	39.80	<0.05	0.15	<0.05	<0.1

Chemical Analysis Report- Tata Steel Ltd Mines Division -Joda

Sr.No.	LATTITUDE	LONGITUDE	SAMPLE NO.	Fe%	SiO2%	Al2O3%	P%	Mn%	TiO2%	K2O%	MgO	Cao	S
1	19°27'21.37"	80°38'15.86"	AH-12	49.59	22.56	1.99	0.052	0.336	0.047	0.032	0.094	0.078	0.009

SHIVA LAB BANAGALURU - SAMPLE ANALYSIS FOR BASE METAL (In ppm)

Sr. No.	LATTITUDE	LONGITUDE	SAMPLE NO.	Ag	Al	As	Ba	Bi	Ca	Cd	Co	Cr	Cu	Fe	Ga	K	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sn	Sr	Te	Ti	Tl	V	W	Zn	Zr
1	19°26'42.29"	80°38'50.29"	Arewada-hitapadi AH-13	2	38645	8	342	<10	5704	35	34	206	222	324856	35	1669	3663	2823	<10	1977	76	1115	1507	373	31	<10	39	51	3139	<10	257	48	163	53

Planned Methodology

The exploration program is proposed in accordance to the objective set for reconnaissance survey (G-4) as per Minerals (Evidence of Mineral Contents) Rule-2015.

3.1.0 Geological Mapping

Geological mapping of 70 sq. Km area of the block would be carried out on 1:25,000 scale. Various litho units, their contact relationship, textural characters and structural features will be mapped. Surface manifestations of the mineralization available along with their surface disposition will be marked on map.

3.2.0 Geochemical Sampling

3.3.1 Bed Rock and Soil Sampling:

During the course of geological mapping the bed rock samples shall be collected from the host outcrops exhibiting indications of mineralization like supplied enrichment, shearing, brecciation, oxidation, silicification, ferruginisation and alteration.

A total 70 nos. bed rock samples [+ check samples 10%= 7 :: 77 nos] from targeted location would be collected by either chip, groove or channel sampling method for Whole rock analysis of major oxides by XRF technique, Trace element studies for 10 Nos BRS [+check 10% =2 nos :: 12 nos] .

3.4.0 Petrological & Mineragraphic Studies

During the course of Geological mapping 10 nos. of samples from outcrop of various litho units will be studied for petrography and petrochemistry associated with 5 nos of samples for mineragraphic study

3.5.0 XRD & Spectroscopy Studies

Five (5) samples shall be subjected for XRD studies for mineral phase analysis.

4.0.0 Quantum of Work

The following Table shows the Nature & Quantum of Work to be carried out During Reconnaissance Survey

Sl.	Parameters	Quantification
1	Mapping (LSM) on 1:25,000 scale)	70 Sq Km
2	PGRS study	70 Sq Km
3	Geophysical survey (Magnetic) 10-line km @ 40m interval	250 points
4	Primary BRS for major oxides by XRF	70 nos
5	Check BRS for major oxides by XRF @ 10%	7 nos
6	Primary Trace element analysis	10 nos
7	Check Trace element analysis	2 nos
8	Petrochemical analysis	10 nos
9	Gold analysis by Fire assay	5 nos
10	PS	10 nos
11	XRD	5 nos
12	OM	5 nos

Table: - 2 Quantum of proposed work in Arewada - Hitapadi Block

Sl.	Item of Work	Unit	Target	Sl No	Cost/Rs	Amount
1	**Geological Mapping (on 1:12,500 Scale)**	Sq km	70			
	a) Charges for one Geologist per day in Field	Days	140	1.2b	11,000	1540000
	b) Field labourer 2x140=280	Days	280	5.7	522	146160
	TOTAL -1 A					**1686160**
B	**Ground Geophysical Survey**					
1	Magnetic Survey (30 Lkm)/ 250 Stations	8-10 Line Km	250	3.21	1,800	4,50,000
3	Geophysicist party days (Field)	per day	45	1.2b	11000	495000
4	c. Labours Charges	day	90	5.7	522	46980
5	Geophysicist party days (HQ)	per day				
	TOTAL-1B					**9,91,980**
C	**Survey work**					
a	DGPS Survey for BH fixation & RL determination	Per Point of observation	1.6.2	19,200	-	0
b	Charges of Surveyor (1 party) for Geophysical survey layout work & Block boundary demarcation	one surveyor per day	1.6.1a	8,300	45	373500
c	Labours Charges for survey work;	day	5.7	522	180	93960
	TOTAL-1C					**467460**
	TOTAL (1A TO 1C)					**31,45,600**
	As this is a programme of Naxalite area					**39,32,000.00**
1	c) Charges for one Geologist per day at HQ	Days	60	1.2a	9,000	**540000**
2	**Geochemical Sampling/ Laboratory Studies**					
	Whole Rock Analysis					
	i)For SiO_2, Al_2O_3, Fe_2O_3, TiO_2, MnO, CaO, Na_2O, K_2O, H_2O, MgO, P_2O_5, CO_2, & S.	Nos.	77	4.1.15a	4,200	323400

	ii)Gold analysis by Fire Assay	Nos	5	4.1.5a	2,380	11900
	iii)Trace element analysis 16 radicals @Rs421/radicals	Nos	10	4.1.15b	6,736	67,360
	PCS for whole rock elements	per sample	10	4.1.15a	4,200	42,000
	TOTAL-2					**444660**
3	**Physical Studies**					
	a) XRD	Nos.	5	4.5.1	4,000	**20,000**
4	**Petrological Samples**					
	Preparation and Study of Thin Sections	Nos	10	4.3.1	2,353	**23530**
5	Petrographic report of rock samples	Nos	10	4.3.4	4,232	**42320**
6	Mineragraphic Studies					
	Preparation and study of Polished Section	Nos	10	4.3.2	1,549	15,490
	Minerographic report of rock samples	Nos	10	4.3.4	4,232	42320
						57,810
	TOTAL 1 TO 6					**50,60,320**
7	a) Preparation of exploration proposal	Nos.	1	5.1	2%	**1,01,206**
7	b)Report Preparation (5 Hard copies with a soft copy)	Nos.	1	5.2	250000 + 4,000	2,54,000
8	Peer Review	Nos.	1		30000	30,000
						3,85,206
9	**TOTAL (1 TO 8)**					**54,45,526**
10	**GST**	18% of Total cost				**980194.752**
11	**Grand total**					**64,25,721**

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Annexure 7A

Estimate Cost for reconnaissance Survey (G-4) for Iron in Arewada-Hitapdi Bock, Chandrapur, District: Maharashtra, Area 70 sq. km, Schedule timeline- 8 months [Review: After 5 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)	
1A	**Geological Mapping Other Geological Work & Surveying**						
	Geological mapping, (1:12,500 scale) & Trenching , drilling work	Sq. km			**70**		
i	a. Charges for Geologist per day (Field) for geological mapping & trenching work, drilling work	day	1.2b	11000	140	1540000	
ii	b. Labours Charges; Base rate	day	5.7	522	280	146160	Amount will be reimbursed as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher.
	Sub Total- 1A					**16,86,160**	
1B	**Ground Geophysical Survey**						
1	Magnetic Survey (30 Lkm)	8-10 Line Km	3.21	250	1,800	4,50,000	
3	Geophysicist party days (Field)	per day	1.2b	45	11000	4,95,000	
4	c. Labours Charges	day	5.7	90	522	46,980	

5	Geophysicist party days (HQ)	per day					
	Sub Total- 1B					**9,91,980**	
1C	**Survey work**						
a	DGPS Survey for BH fixation & RL determination	Per Point of observation	1.6.2	19,200	-	0	
b	Charges of Surveyor (1 party) for Geophysical survey layout work & Block boundary demarcation	one surveyor per day	1.6.1a	8,300	45	373500	
c	Labours Charges for survey work;	day	5.7	522	180	93960	
	TOTAL-1C					**467460**	
	Total (1A to 1C)					**31,45,600**	
	As this is a programme is a naxalite area					**39,32,000.00**	
	c. Charges for Geologist per day (HQ)	day	2a	9000	60	**540000**	
2	**LABORATORY STUDIES**						
a	**Chemical Analysis**						
i)	**Geochemical Sampling-Surface samples (Bedrock/Channel /Soil/Stream sediment)**						
	a. Au by Fire Assay	Nos	4.1.5a	2380	5	11,900	
	b. For Ag, Ni, Co, Cr, Cu, Pb, Zn, V, Ti by AAS Method	Nos				-	

	c. Trace element Analysis	Nos	4.1.15b	6736	10	67,360	
ii)	**Surface Check samples (10% External)**						
	a. Au by Fire Assay	Nos					
	b. For Ag, Ni, Co, Cr, Cu, Pb, Zn, V, Ti by AAS Method	Nos					
	c. For PGE	Nos					
iii)	**Trench & Check Samples from Trench**						
	Trench samples						
	a. Au by Fire Assay	Nos					
	b. For Ag, Ni, Co, Cr, Cu, Pb, Zn, V, Ti by AAS Method	Nos					
	c. For PGE	Nos					
iv)	**Trench Check samples (10% External)**						
	a. Au by Fire Assay	Nos					
	b. For Ag, Ni, Co, Cr, Cu, Pb, Zn, V, Ti by AAS Method	Nos					
	c. For PGE	Nos					
v)	**BH Core samples**						
	a. Au by Fire Assay	Nos					
	b. For Ag, Ni, Co, Cr, Cu, Pb, Zn, V, Ti by ICPMS-34 elements	Nos					
	c. For PGE	Nos					
vi)	**BH Core samples (10%External)**						
	a. Au by Fire Assay	Nos					
	b. For Ag, Ni, Co, Cr, Cu, Pb, Zn, V, Ti by AAS Method	Nos					
	c. For PGE	Nos					

vii)	**Major Oxide Analysis**						
	a) Estimation of major oxides by XRF/whole rock analysis for primary samples (CaO, MgO, SiO2, Al2O3, LOI, Na2O, Fe2O3, MnO, K2O, TiO2, SO3, P2O5, Cr203, ZnO, V2O5)	per sample	4.1.15a	4200	70	2,94,000	70 BRS
	Estimation of major oxides by XRF/whole rock analysis for check samples	per sample	4.1.15a	4200	7	29,400	7 check sample of BRS
	PCS for whole rock analysis	per sample	4.1.15a	4200	10	42,000	
3	**Physical & Petrological Studies**					-	
i	Preparation of thin section	Nos	4.3.1	2353	10	23,530	
ii	Study of thin section	Nos				-	
iii	Preparation of polish section	Nos	4.3.2	1549	10	15,490	
iv	Minerographic report of rock sample	Nos	4.3.4	4232	10	42,320	
v	Digital Photographs	Nos	4.3.7	280	-	-	
vi	Whole Rock Analysis	Nos				-	
vii	Sp. Gravity	Nos				-	
	SEM Studies	per hour				-	
viii	XRD Studies	Nos.	4.5.1	4,000	5	20,000	
						10,86,000	
4	**Total 1 to 3**					**50,18,000**	

5	**Geological Report Preparation**	**5 Hard copies with a soft copy**	**5.2**	**5.2 (i/ii/iii/iv)**		**2,54,000**	Reimbursement will be made after submission of the final Geological Report in Hard Copies (5 Nos) and the soft copy to NMET.
6	**Peer review Charges**		**As per EC decisio n**			**30,000**	
7	**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		**1,00,360**	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.
8	**Total Estimated Cost without GST**					**54,02,360**	
9	**Provision for GST (18% of J)**					**9,72,425**	GST will be reimburse as per actual and as per notified prescribed rate
10	**Total Estimated Cost with GST**					**63,74,785**	
				or Say Rs. In Lakhs		**63.75**	
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.
*	SoC Item No, Unit and Rate for each item of work must be as mentioned in the SoC.

Table: - 5 Tentative Time schedule/action plan for proposed Reconnaissance Survey (G-4) for Iron Ore.

			2024							
		Oct	Nov	Dec	Jan	Feb	Review	Mar	April	May
	Activities	1	2	3	4	5		6	7	8
1	Geological mapping and sampling									
2	Sample preparation									
3	Analytical work									
4	Peer Review									
5	Report Preparation									
6	Submission of Report									

	Table: - 6 Reference: Authors
1	Ahsan, 1976-1970 : Geology of parts of Sironcha Tehsil, Gadchiroli District in parts of Toposheet No-65A/11.
2	Ahsan & Zaheer, 1980-1981 : Report on Geological Mapping of parts of Aheri and Etapalli Tehsils of Gadchiroli District in parts of Toposheet No-65A/8 & 65A/11.
3	Agarwal, J.P. 1963 Report on investigation of iron ore deposits of Surjagarh area, Chanda District.
4	Chande V. D & Zaheer B. (1976-77) :- A note on the investigation of ultramafic rocks for basemetals, south and west of kurema area (64 A/1) tahsil garhchiroli, district: chandrapur,.
5	Marawar (1966):- Report on the prospecting of Iron ore Deposits of Surjagarh and adjoining areas in Sironcha Tahsil Chanda District.
6	Marwar, et.al. (1967):- Report on the prospecting of Iron ore Deposits of Surajagarh and Adjoining areas in Sironcha Tahsil of Chanda District
7	Nag, P. 1961 Progress Report for the Field Season 1960-61. Unpublished Report of the G.S.I.
8	Patil, A.R. 1966 Progress Report for the Field Season 1965-66. Unpublished Report of the G.S.I.
9	Raman.R (1969-70) Geology of a part of Garhchiroli and Sironcha Tahsil, Chandrapur District, Maharashtra
10	Sharma, R.K. and Satyanarayana, G.C. (1964-65) Systematic geological mapping and search for Iron ore in parts of Durg and Bastar districts M.P.Unpub. Prog. Rep. GSI.

Fig. 1- Block boundary on google map.

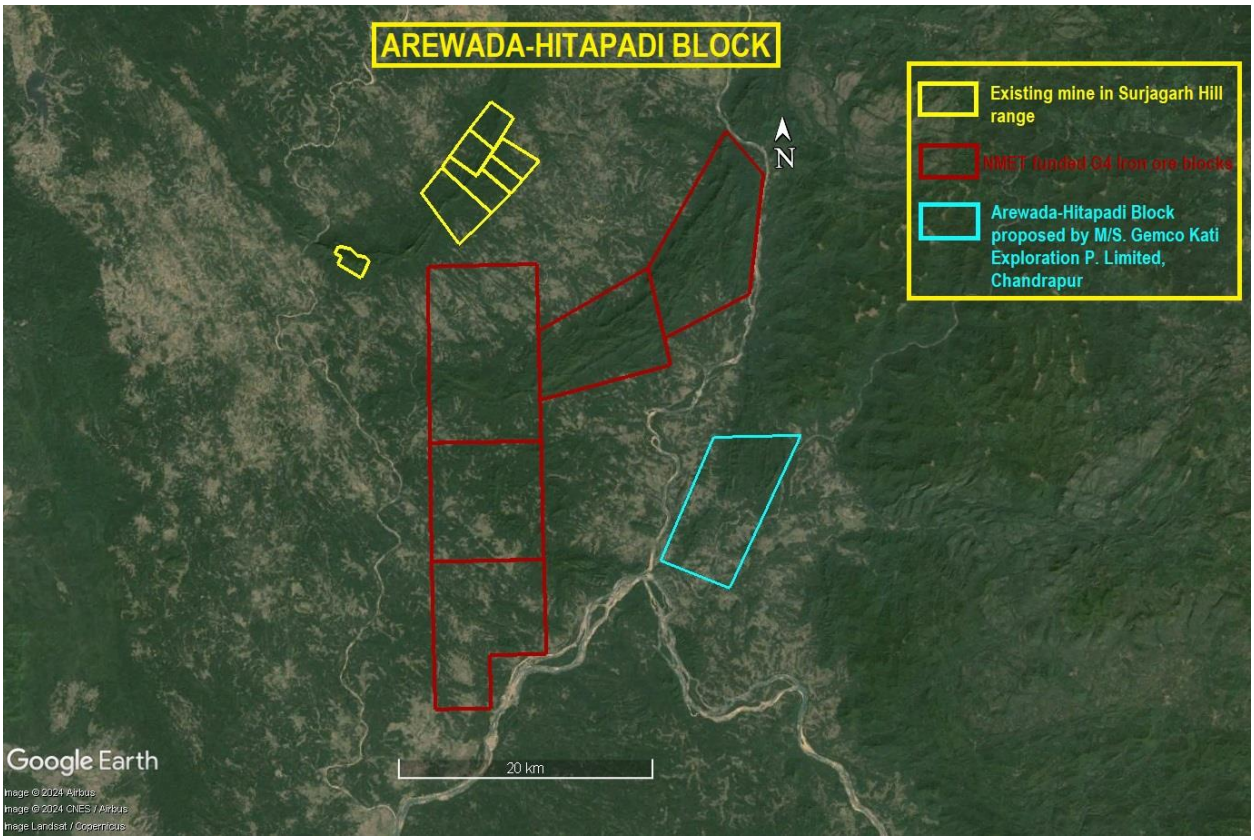

Fig. 2- Block Boundary on Toposheet.

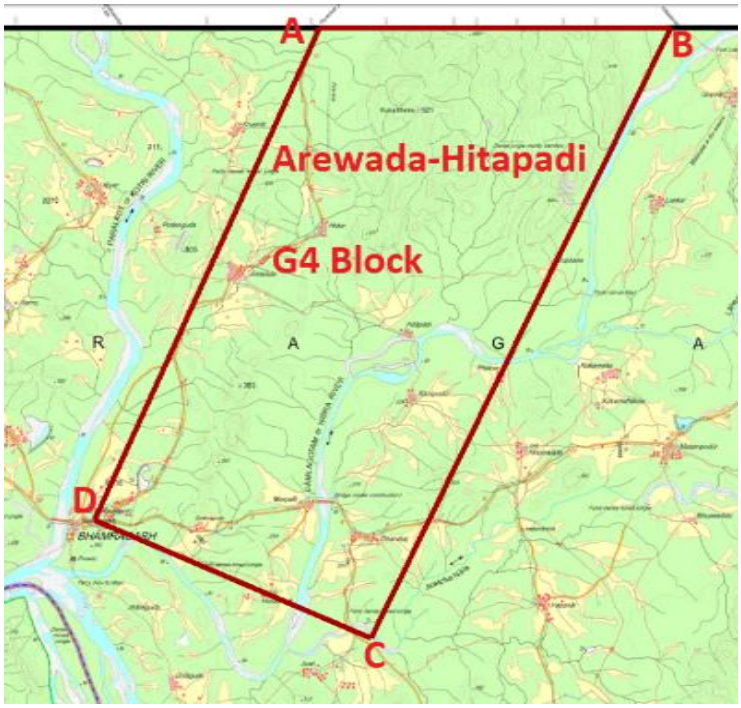

Fig. 3- Block Boundary on Geological Map.