

**DETAILED PROPOSAL FOR PRELIMINARY EXPLORATION (G-3 STAGE) FOR MANGANESE & ASSOCIATED
MINERALS IN DULHAPUR BLOCK, DIST: BALAGHAT, MADHYA PRADESH**

(3.00 Sq.Km Area)

COMMODITY: MANGANESE

**SUBMITTED TO
NATIONAL MINERAL EXPLORATION DEVELOPMENT TRUST (NMEDT)**

**BY
M/s APC DRILLING & CONSTRUCTION PRIVATE LIMITED
NAMAKKAL
E-mail: apcdrilling@gmail.com**

APRIL 2026

**Summary of the Proposed Preliminary Exploration (G-3) for Manganese and Associated Minerals in
Dulhapur Block, Dist:Balaghat, Madhya Pradesh**

GENERAL INFORMATION ABOUT THE BLOCK

	Features	Details
	Block ID	Dulhapur Block
	Exploration Agency	APC Drilling & Construction Private Limited
	Previous Exploration Agency	Geological Survey of India (FS2023-24)
	Geological Report (Previous stage Geological Report)	Report on reconnaissance survey for Manganese in Sausar Group of rocks in Piparwani, Agri and Koylari areas, Balaghat and Seoni Districts, Madhya Pradesh, (G-4 Stage)
	Commodity	Manganese and associated minerals
	Mineral Belt	Sausar Fold belt (SFB),Sausar Group
	Completion Period with entire Time schedule to complete the project	11 months.
	Objectives	<p>The objectives of proposed G3 level exploration are as follows.</p> <ul style="list-style-type: none"> ❖ Geological Mapping on 1:2000 scale to delineate the surface outcrops of Manganese ❖ Surface Sampling and chemical analysis ❖ Surface Geophysical Investigation (Electrical Resistivity Tomography(ERT)) ❖ Pitting ❖ To drill 12 Nos. of boreholes to decipher depth persistence and strike continuity of Manganese mineralization. ❖ To estimate the in situ resource of Manganese for G3 stage of exploration and preparation of Geological Report (GR).

		<ul style="list-style-type: none"> ❖ To estimate in situ resource of Manganese reconnaissance category resources (333) of Manganese and associated minerals in the block as per UNFC norms & MEMC Rule- 2015 and Minerals (Evidence of Mineral Contents) Amendment Rule, 2021. 															
	Whether the work will be carried out by the proposed agency or through outsourcing and details thereof. Components to be outsourced and name of the outsource agency	<p>The Geological Mapping, Geochemical studies, Geophysical Investigation, Pitting, Drilling, core logging, sampling and Geological Report writing will be carried out by APC Drilling & Construction Private Limited.</p> <p>Chemical Analyses and Petrographic Studies will be carried out through NABAL accredited outsourcing agencies.</p>															
	Name/ Number of Geoscientists	Geologists: 01 HQ Geologists: 01 Field															
	Expected Field days & HQ (Geology, Surveyor)	Geologist: 100days(Field) Geologist: 30 days (HQ) Surveyor: 30 days															
1.	Location	Dulhapur Block is located 2 km West of Dhabitola , around 3km West of Sitapath and 3 km north of Koylari villages.															
	Latitude & Longitude	<table border="1"> <thead> <tr> <th>Block Corner points / Cardinal Points</th> <th>Latitude</th> <th>Longitude</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>N21.70040</td> <td>E79.61383</td> </tr> <tr> <td>B</td> <td>N21.71381</td> <td>E79.62959</td> </tr> <tr> <td>C</td> <td>N21.69092</td> <td>E79.62958</td> </tr> <tr> <td>D</td> <td>N21.69083</td> <td>E79.61383</td> </tr> </tbody> </table>	Block Corner points / Cardinal Points	Latitude	Longitude	A	N21.70040	E79.61383	B	N21.71381	E79.62959	C	N21.69092	E79.62958	D	N21.69083	E79.61383
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	Villages	Koylari and Dulhapur															
	Tehsil/ Taluk	Tirodi tehsi															
	District	Balaghat district															
	State	Madhya Pradesh															
2	Area (hectares/ square kilometers)																
	Block Area	3.00 Sq.km															

	Forest Area	Nil
	Government Land Area	Forest Land(Open mix jungle)
	Private Land Area	-
3.	Accessibility	The area under investigation is approachable State highway Piparwani to Tirodi town running to the south of the block. The district headquarters Balaghat and Seoni are 80 Kms and 60 Kms respectively
	Nearest Rail Head	Tirodi Rail Head located 10 km to the East of the block
	Road	The proposed block is well connected by Piparwani to Tirodi town running to the south of the block
	Airport	Nagpur Airport
4.	Hydrography	
	Rivers/ Streams	The area is mainly drained by the streams flowing southwesterly and southeasterly. There is also a canal to the SW corner of the proposed block originating from Sitekasa dam and is used for irrigation purposes in the study area.
5.	Climate	The maximum temperature during March and April is about 45 ⁰ C. The minimum temperature during the month December-January is 4 ⁰ C.
	Mean Annual Rainfall	The average annual rainfall is 1200-1300 mm
	Temperature	Winter:Minimum temperatures 12 ⁰ C (December-January) Summer: Max.42 ⁰ C (April - May)
6	Topography	
	Toposheet Number	550/10
	Morphology of the area	Physiographically, the study area is rugged and covered with dense forests. The ridges in the study area are mostly confined to the northern part near Agri, northeastern corner north of Khirki village. The highest elevation is around Dulhapur is 393 MSL and lowest elevation is 360 MSL.
7	Availability of baseline geoscience data	

	Geological Map (1:50K/ 25K)	Geological map on 1:50,000 scale (Source: NGDR/Bhukosh)
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	Geochemical Map	Geochemical Mapping in parts of toposheet no. 55O/10 and 64C/01 in Balaghat and Seoni districts of Madhya Pradesh by Neetu Kumari, Geologist & Shruti Shukla , Geologist
	Geophysical Map (Aeromagnetic, ground geophysical, Regional as well as local scale GP maps)	Gorle, et.al, (2013-14) carried out Geophysical Mapping in the toposheet nos. 55O/9, 10, 11, 13 & 14 parts of Balaghat & Seoni districts, Madhya Pradesh and Nagpur & Bhandara districts, Maharashtra.
8 .	Justification for taking up Reconnaissance Survey / Regional Exploration	<p>Justification:</p> <p>During FS 2023-24 carried out Reconnaissance survey for manganese in Sausar Group of rocks in Piparwani, Agri and Koylari areas, Seoni and Balaghat district, Madhya Pradesh. Identified three potential Mn bearing mineralized zones in the area.</p> <ol style="list-style-type: none"> 1. Dulhapur Mineralized Zone 2. Pathrapet Mineralized Zone 3. Koylari Mineralized Zone <p>The demarcated Mn bearing zones are mostly soil covered with few isolated fragmentary outcrop patterns and nature of mineralization looks like pocket type with pinch and swell nature along the strike as well as in dip direction.</p> <p>The analytical results of BRS collected from three Mineralized Zones shows encouraging values of MnO ranging from 9% to 44.2% with mean value of 26.05%.. While 50 PTS samples shows MnO value ranges from 0.65% to 34.29% with mean value of 18.89%.</p> <p>GSI recommended for geophysical survey (Gravity) be required to establish the strike continuity of Mn bearing zone for demarcating G3 area. Further, Recommended for Preliminary exploration (G3 Stage) in Dulhapur, Koylari and Pathrapet area to establish the strike continuity and depth persistence of the mineralization in the area.</p>

		<p>Based on the evaluation of GSI Reconnaissance survey (G4 Stage) during 2023-24 and assessment of encouraging MnO values, demarcated an area of 3.00 sq.km for Preliminary Exploration(G3 Stage) in Dulhapur Block.</p> <p>It is proposed to carryout Detailed Geological Mapping (1:2000 scale), Geochemical mapping, Surface Geophysical Survey, pitting, trenching and drilling of inclined Bore-holes at 100 m spacing for First Level intersection to intersect mineralization at vertical depth of 60m, to conduct a systematic exploration for Manganese and associated minerals in identifying economical, minable deposit in the state of Madhya Pradesh</p>
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Detailed description

1.0.0 Background information

The Proposed area forms a part of the Sausar Fold belt (SFB) and is located on the central part of Sausar belt. Study area falls in toposheet no 550/10 and is bounded by latitudes 21° 40' 44.7" to N21° 41' 58.6" and longitudes 79° 38' 19.1" to 79° 37' 45.3".

During FS 2023-24 GSI carried out Reconnaissance survey for manganese in Sausar Group of rocks in Piparwani, Agri and Koylari areas, Seoni and Balaghat district, Madhya Pradesh to delineate the potential zones for manganese mineralisation. Carried out large-scale mapping on a 1:12,500 scale in 100 sq. km area in and around Agri, Babai, Dulhapur, Khirki, Koylari, Paraspani, Pathrapet, Piparwani, Pindrai, Pitesur, Pulpula and Wandarev villages. The rock types encountered are crystalline limestone, quartz-muscovite-biotite schist, calc-silicate/amphibolite, biotite gneiss, pink granite, younger pegmatite/quartz veins and some laterite patches. The manganese mineralization in the Sausar Group is found as NNE-SSW to ENE-WSW trending conformable bands enclosed within phyllite and quartz muscovite schist within biotite gneiss, in the form of lenses of varying sizes and intensely deformed and metamorphosed.

Based on the evaluation of GSI Reconnaissance survey (G4 Stage) during 2023-24 and assessment of encouraging MnO values, demarcated an area of 18.00 sq.km for Preliminary Exploration(G3 Stage) in Pathrapet-Koylari- Dulhapur Block.

The proposal was discussed in the 91 st TCC-1 meeting. The committee reviewed the proposal and observed that about 18 sq. km in the south-western part overlaps with an NMEDT-approved block, and several manganese mining leases exist in the northern part of the area. Further, the committee advised the agency to verify the reserved areas of MOIL and ensure exclusion of such areas while finalizing the proposal. The

agency was advised to verify the reserved areas of MOIL, ensure the area is free from all encumbrances, and omit mining lease areas. Thereafter, the agency may submit a DPR in the next TCC meeting.

Accordingly, APC modified the area for G3 level exploration and proposed Dulhapur Block measuring an area of 3.00 sq.km.

2.0.0 Block Summary

Location and Accessibility

The Dulhapur Block falls in Survey of India Toposheet No. 55O/10 and is bounded by the following co-ordinates.

Block Corner points / Cardinal Points	Latitude	Longitude
A	N21.70040	E79.61383
B	N21.71381	E79.62959
C	N21.69092	E79.62958
D	N21.69083	E79.61383

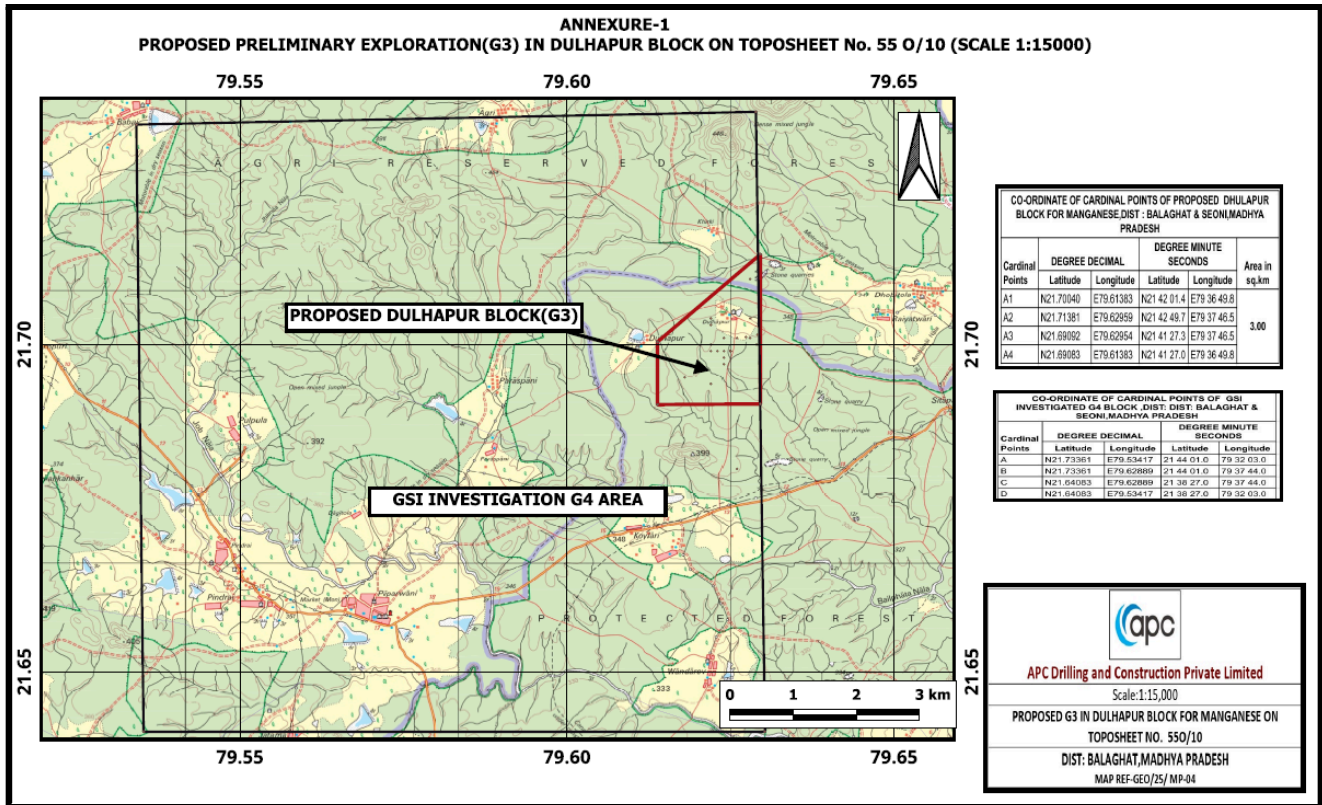


Figure-1: Location of proposed Dulaphur Manganese Block on Toposheet No. 55O/10

Physiography

Physiographically, the study area is rugged and covered with dense forests. The ridges in the study area are mostly confined to the northern part near Agri, northeastern corner north of Khirki village, in the east of Pulpula village and north of Koylari village, composed mainly of pegmatite vein/quartz vein and biotite gneiss. The area is mainly drained by the Jhilimila and Job Nala, flowing southwesterly and southeasterly, later join Bawanthari river. The drainage pattern of the area is sub parallel to sub dendritic type. The drainage pattern is mainly controlled by the structure and lithology of the area.

3.0.0 Previous Work

Geology of Sausar Group of rocks, extending from Chhindwara district of Madhya Pradesh, in the west, to Balaghat district, in the east, and possibly continuing beyond and is interesting for encompassing the majority of the manganese deposits. In 1906 & 1909 Fermor studied the manganese ore bearing Sausar rocks from Sausar tehsil, Chhindwara district of M.P and concluded that these manganese ore deposits are metamorphosed sediments.

The stratigraphic succession suggested by Fermor (1909), West (1936) and by Narayanswami et. al. (1963) is largely accepted for the gneiss and schist belt of Sausar Group of Central India. The rocks of the Sausar Group have been divided (after Narayanswami et al. 1963) into a basal Sitasongi quartz-muscovite schist and gneiss, followed upward by Lohangi marble and calc-silicate/granulite/calc-gneisses, Mansar phyllite and muscovite schist/gneiss having manganese horizons at bottom, middle and top of the formation, Chorbaoli quartz-muscovite schist/gneiss and quartzite Formation, Junewani biotite-muscovite schist/gneiss and biotite granulite Formation and the uppermost Bichua marble and calc-silicate Formation.

According to Chattopadhyay et al. (2001) Tirodi Biotite Gneiss (TBG) forming the basement for Sausar Group (SG) of rocks, records evidence of pre-Sausar tectono-thermal events also. They state that due to intense thrusting, tectonic slicing and folding of both TBG and SG during Sausar Orogeny

Khan et al. (2003) attempted a reinterpretation of geology of Sausar Fold Belt in Madhya Pradesh. Their work reveals that the Tirodi Biotite Gneiss (TBG) constitutes the basement for Sausar Group (SG). The contact between TBG and Sausar Group is tectonized. Metamorphisms in Sausar Group range from green schist to upper amphibolite facies with gradual increase from south to north.

4.0.0 Brief regional geology and structural framework

Regional Geology

The Sausar shaped belt covers an area of about 7500 sq. km. and forms a conspicuous arcuate belt in Central India. The western part of the Sausar Fold Belt falls in the state of Maharashtra, while the eastern part falls in Madhya Pradesh (MP). The belt is about 35 km wide and more than 215 km long and has a prominent southward convexity. Sausar Group hosts the largest productive manganese ore deposits of India, contributing about 80% of the total production of the country. The Sausar belt trends in general NW-SE in its western part in Chhindwara district of MP. In the middle its trend varies from WNW-ESE to E-W to ENE-WSW in parts of Nagpur and Bhandara districts of Maharashtra, while in the east it trends from ENE-WSW to NE-SW in Balaghat district of MP. The present study is located on the central to part of the Sausar belt.

The Sausar Fold Belt (SFB), an important mesoproterozoic fold belt with southern convexity on the southern margin of the Central Indian Tectonic Zone (CITZ) trends E-W to ENE-WSW with about 20 to 40 km wide and 300 to 350km long. The Sausar Fold Belt (SFB) comprises of two major litho tectonic assemblages, viz. Tirodi Biotite Gneiss (TBG) and metasedimentary Sausar Group. The stratigraphic sequence of various formations of the region and as per Khan et al., 2002 generalised sequence of Sausar Group of rocks of this area is given below in Table:

Table -.....
Generalized Stratigraphy of the area (Khan et al., 2002)

Group	Formation	Lithology
Quaternary	Recent Deposits	Alluvium & soils
		Laterite
	Intrusives	Massive potassic granite, pegmatite and quartz veins
		Foliated potassic granite
SAUSAR GROUP	Bichua Formation	White dolomitic marble ± red and yellow chert
	Chorbaoli Formation	Coarse grained, garnetiferous quartz-mica schist with local development of magnetite and garnet.

	Mansar Formation	Fine grained garnetiferous mica schist and quartz-mica schist with thin chert and quartzite and thick horizon of Mn ore and Gondite
	Lohangi Formation	Calc silicate rocks, calc gneiss with subordinate pink calcite marble and minor Mn ore horizons.
	Sitasaongi Formation	Meta grit and micaceous quartzite.
Tectonised Contact		
Pre Sausar Basement (Archaean)	Amgaon Gneiss	Granite gneiss/migmatite
	Tirodi Biotite Gneiss	Multicomponent gneiss e.g. biotite gneiss, migmatitic gneiss, felsic gneiss with small metabasic & mafic granulite enclaves.

Metamorphism and Structure

The area records the imprints of contact as well as regional metamorphism at different localities and on different rock types. The contact metamorphism is caused by a huge batholithic mass of biotite gneiss known as Tirodi gneiss. The calcareous bodies appear to be floating masses within biotite gneiss and record contact metamorphic assemblages arranged in a zoned fashion (Banerjee et.al.1995). The periphery of the calcareous masses represents a high temperature assemblage and occurs adjacent to the biotite gneiss. Regional metamorphism are recorded in the rocks like biotite schist, calc-silicates and amphibolite. Sausar Group rocks underwent metamorphism varying from lower greenschist in the south and southeast to upper amphibolite facies in the north and northwest.

The Sausar rocks are known to have undergone three phases of deformation. Tight, isoclinal to recumbent folding along NE-SW to ENE-WSW axial trend marks the first phase of folding and produces S1 schistosity. The second phase of isoclinal folding is essentially co-axial but non co-planar to F1 folds and produced shallow dipping S2 axial plane cleavages. Banerji et al. (1995) reported the presence of a series of sinuous mylonite zones and all the major manganese deposits of the area are reported to have epigenetically emplaced within these mylonite zones.

Geology of the area

The LSM reveals that the study area comprises metasedimentary rocks represented by crystalline limestone, quartz-muscovite-biotite schist, calc-silicate/ amphibolite, biotite gneiss. These metasedimentary rocks are intruded by pink granite, younger pegmatite/quartz veins

Description of Lithounits

Crystalline Limestone :Crystalline limestone is exposed in the form of three bands namely Hathigarh-Pindrai, Pathrapet-Koylari and Paraspani measuring 3.5 Km long 6.5 Km long and 8.0 Km long respectively. It is coarse crystalline, white coloured and dolomitic in nature, dark coloured patches are also often observed along the

contact. The contact is shared with biotite gneiss and at some places a calc-silicate band occupies the contact. At the contact of crystalline limestone and biotite gneiss development of a brownish red garnet like mineral chondrodite and a black coloured octahedral mineral identified as spinel is seen occurring with the dark coloured patches

Quartz-muscovite-biotite-schist:

The quartz-muscovite/sericite schist occurs as narrow patches within biotite gneiss near Koylari, Dulhapur, Paraspani and north of Pathrapet village. It is silvery to greenish grey coloured, fine grained, and composed of muscovite, biotite, chlorite and small amounts of opaques. The rock is well foliated with well-developed schistosity (S1). It makes close association with the manganese mineralization in the study area as it occurs as thin envelope with mineralized zones.

Calc-silicate and amphibolite:

Banerji et al. 1995 considered the dark coloured bands to be calcsilicates/ granulites. The rocks are green to greenish grey in colour, medium grained and show a saccharoidal texture. However, at some places, the rocks show recrystallisation of amphibole (hornblende) and a local hypidiomorphic texture is observed. Recrystallisation of green minerals viz. hornblende, epidote and chlorite is also often observed within the calc-silicates when they are intruded by pink-granite/pegmatoid

Biotite gneiss:

Biotite gneiss is the most abundant lithology showing several textural and mineralogical variations and it is wrapping all other lithounits of the study area. The variation in mineralogy and texture is essentially caused by the presence of so many bands/patches of calc-silicates of variable mineral composition and their further digestion. It is variously named as "Tirodi biotite gneiss" (Narayanaswami et al., 1963), "Junewani gneiss" (Shukla and Anandalwar, 1973). Shrivastava et al. (1994), considered the biotite gneisses to be intrusive within the Sausar metasediments.

Pink Granite:

Small intrusive bodies of pink granite are exposed at a few places near Pindrai, north of Koylari village, near Dulhapur and in the north of Khirki village. The pink granites are the youngest intrusives followed only by pink feldspar bearing pegmatites and quartz veins

Pegmatite/Quartz vein:

Major exposures are observed near Koylari, Paraspani, Dulhapur, Pulpula and South of Pitesur village. Most of the quartz reefs contain pink feldspar in variable amount and have been grouped with pegmatites and not as quartz reefs by previous workers. Pegmatite occurs as 2-3 m wide veins ranging in length from about 10m to more than 500m. Mostly they trend ENE-WSW and is concordant to the regional foliation, at places, it contains coarse muscovite books and long tourmaline crystals. The ENE-WSW trending pegmatites appear to be the earliest pegmatites and the NNE-SSW trending ones represent the last phase of igneous activity (Banerjee et al. 1995).

Laterite:

These laterite cappings are dark reddish brown in colour. These are manganiferous and ferruginous in nature and occur as irregular patches over crystalline limestone. Laterite patches are also observed near Pulpula village associated with calc-silicate and amphibolite patches. Typical lateritic/bauxite structures like pisolitic, oolitic and iron solution activity features are observed in the study area

Structure:

The rocks of the Sausar Group show polyphase deformation and metamorphism. The Sausar Fold Belt shows an overall WNW-ESE to E-W to ENE-WSW arcuate trend from west to east. The major folds found in the area are broadly NE-SW to E-W trending, low-moderate plunging anticlines and synclines

Primary structure: Represented by bedding or colour/compositional banding in calc silicate rock, calcitic and dolomitic marbles. In pure calcitic and dolomitic marbles bedding is not easily deciphered but in impure variety it is represented by widely spaced silica, epidote rich partings as observed near Agri village.

Secondary structure: These include gneissosity, schistosity, lineation, slickensides, fractures and joints, folds and pinch and swell structures.

Foliations:

The regional strike of the rock in this area is ENE-WSW, which is defined by pervasive foliation. As the rocks in this area are intensively folded and metamorphosed, foliation is well developed. Gneissosity in Biotite gneiss is represented by alternate light (Felsic) and dark coloured (Mafic) layers. Throughout the area mylonitic foliation (Sm) showing parallelism with the S1 surfaces, is also dominant along certain linear zones. The mylonitic foliation has steep to moderate northerly dips. The mylonitic foliation occurs in all the manganese deposits viz. Jagantola, Lougur, Bharweli, Tirodi and Sukli-Sitapathore (Banerjee et.al. 1995).

Lineations:

The down dip mineral lineation formed by stretching of feldspars is observed in biotite gneiss at the south of Koylari village and in the southwest of Pitesur village. In the study area slickensides are also observed. In the study area, slickensides are observed within biotite gneiss in the south of Koylari village

Folds:

Three phases of folding have been observed, imprints of which are available throughout the area. The first generation fold F1 could be interpreted from the regional ENE-WSW foliation. The second fold F2 is responsible for folding the regional foliation S1 into overturned isocline to near recumbent folds. The general overturning of the F2 folds is towards the south. The F2 folds show a plunge of around 20°-25° towards southwest with reference to the S1 foliation surfaces, taken to be axial planar to F1 folds, the F2 folds are co-axial but non co-planar with F1. The F3 folding has caused widely spaced S3 fracture cleavages. Intersection between F2 and F3 folds, at many places, forms structures very similar to the sedimentary ripples, which are very common especially at the contact zone between competent and incompetent layers,

viz. between Mn ore band and between biotite gneiss and schist. Such types of structures are observed in the old working in the east and southeast of Koylari village.

Pinch and Swell structures:

Pinch and swell structures are observed in foliations (S1) of biotite gneiss, quartz muscovite schist and calc silicate rocks. In the study area pinching and swelling is observed in quartzofeldspathic vein within biotite gneiss. The manganese mineralization associated with quartzofeldspathic rock hosted within biotite gneiss is also showing pinch and swell nature

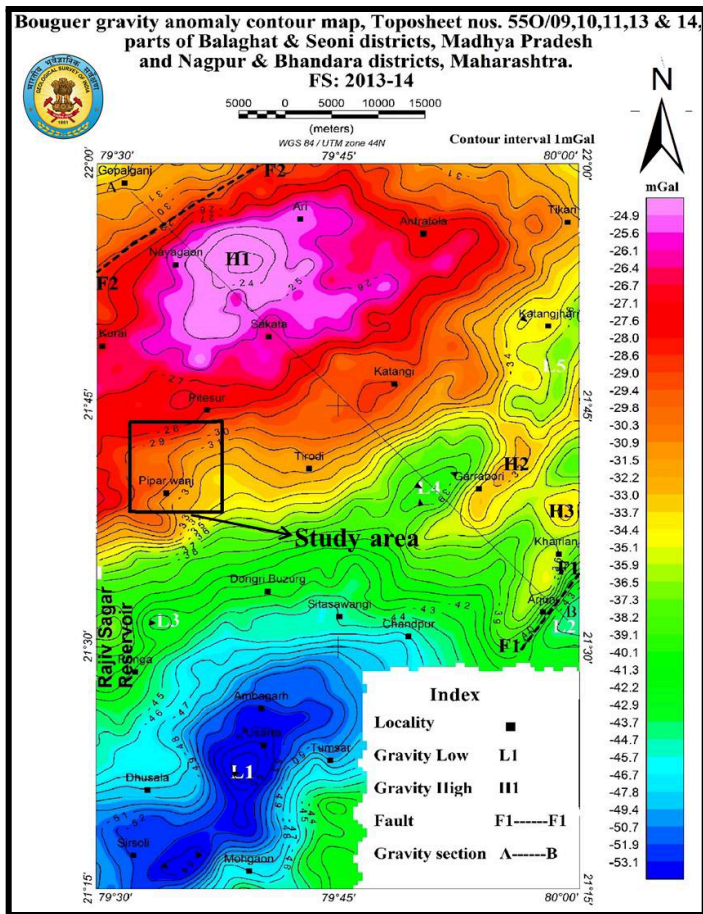
Mineralogy of the ore zones and ore textures:

Nature of mineralization looks like pocket type with pinch and swell nature along the strike as well as in dip direction. Manganese mineralization in the study area is associated with quartzo-feldspathic rock with thin envelope of quartz mica schist.

4.0.4 Geophysical Exploration :

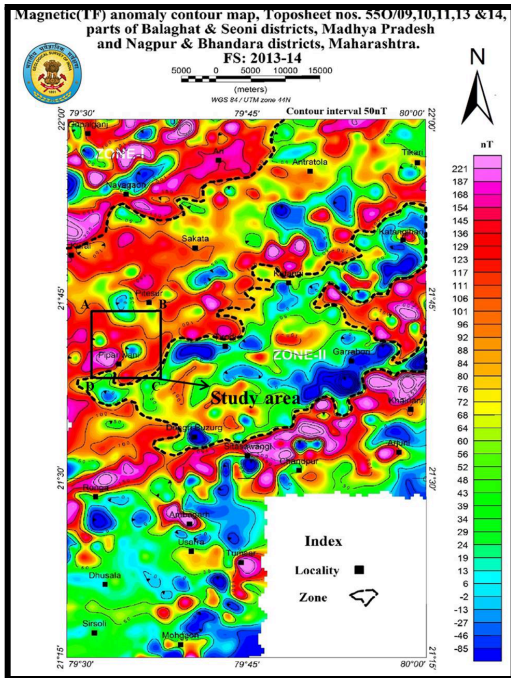
Gorle, et.al, (2013-14) carried out Gravity, Magnetic (TF) and DGPS surveys in the toposheet nos. 55O/9, 10, 11, 13 & 14 parts of Balaghat & Seoni districts, Madhya Pradesh and Nagpur & Bhandara districts, Maharashtra.

Gravity Survey: The gravity map has brought out a number of gravity „highs“ and „lows“. A prominent elliptical shaped NE-SW trending low gravity (L1), which splits into two distinct closures, have been observed in the southern part, may be due to formation having low density material (granite). Elongated elliptical shaped two gravity low (L 3) and (L4) zones have been observed towards northeast of Ronga and west of Garrabori. It is due to felsic intrusion within the Sausar group of rocks. Gravity low (L5) is observed in the northeastern part, may be due to presence of low density material (Schist and crystalline limestone rocks).The northwestern and eastern part of the area is represented by three (H1,H2 and H3) prominent gravity high zones



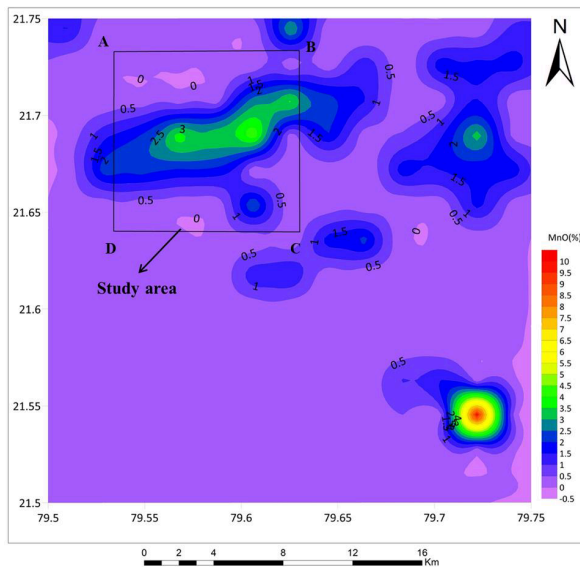
Magnetic Survey

The general trend of the magnetic (TF) anomaly contours is in NE-SW direction over the Laterite/Basalt (Zone-I) in the northwestern part of the area. Numerous high frequency bipolar anomalies magnetic lows of low dominant nature are recorded over the Sausar Group of rocks (Zone-II), passing through west of Dongri Buzurg, Sitasawangi, Garrabori and Katanghari north. Most of the manganese mines exist within this Zone-II. Study area comes in between Zone-I and Zone-II where bipolar magnetic anomalies dominated by magnetic highs are observed over Tirodi gneisses



Details of geochemical mapping:

The GCM carried out by Neetu Kumari et al. (2017-18) in the parts of Toposheet 55O/10 shows that the MnO value varies from 0.05% to 4.45% with an average of 0.1%. The geochemical distribution pattern show the maximum concentration of MnO marked over biotite gneiss and crystalline limestone



Geochemical dispersion and contour map of toposheet no. 55O/10 showing location of the present study area (Neetu Kumari et.al. 2017-18)

5.0.0 Scope for proposed exploration.

The proposed Preliminary Exploration (G3 Stage) for Manganese and associated Minerals in Dulhapur Block, comprises of Geological mapping of 3.00 Sq.km area on 1:2000 scale, Surface/ Geochemical sampling (Bedrock), Surface Geophysical Survey, Trenching, Drilling of 12 Nos. of inclined boreholes involving about 700 m of drilling, associated survey, chemical analysis, Petrological analysis and estimation of resources under G3 category and Geological Report preparation.

Objectives

The objective of the proposed Exploration is to carry out G-3 level exploration work in the block has been formulated in accordance with the previous work carried out by GSI during 2023-24 and also as per Mineral (Evidence of Mineral Contents) (MEMC) Rule-2015 & Mineral (Auction) Rules-2015 to fulfill the following objectives:

- ❖ To carry out detailed geological mapping on 1:2000 scale and demarcate the rock types of Manganese bearing formations with the structural features i.e. strike, dip, lineations / foliations etc.
- ❖ To demarcate subsurface manganese ore body on the basis of surface geophysical survey after completion of geological mapping
- ❖ Surface Sampling (Grab/Bedrock samples) & chemical analysis
- ❖ To carry out surface Geophysical Investigation by Electrical Resistivity tomography (ERT).
- ❖ Trenching work
- ❖ To drill boreholes to prove depth continuity up to 30 m vertical depth in 1st Level and 50 m vertical depth in 2nd Level
- ❖ To estimate Manganese ore resources (333) in the block as per UNFC norms & Amendment Act 2021 of Mineral (Evidence of Mineral Contents) Rules- 2015.

6.0.0 Planned Methodology

The exploration scheme is proposed in accordance with the objective set for Preliminary Exploration (G-3) in the block, in accordance with Minerals (Evidence of Mineral Contents) Rule-2015 and Amendment 2021. Accordingly, the following scheme of exploration is formulated.

6.0.1 Topographical Surveying

Topographical survey will be carried out in the block area, with contouring at 5 m/3m interval. All the surface features including geological outcrop & Pits/ Trench will be picked up and marked on a map on 1:2000 scale. The Blocks boundary shall be surveyed by DGPS in WGS-84 datum for demarcation of block boundary/corner points. RL's and co-ordinates of survey and Borehole points will be determined with reference to the Survey of India Bench Mark as available.

6.0.3 Geological Mapping (1:2,000 Scale)

The detailed geological mappings on 1:2000 scale will be carried out in the entire block by taking geological traverses in the block, to demarcate the surface manifestations and lateral disposition of the mineralized zones along with the structural features i.e. strike, dip, lineation / foliations etc to have structural control of the area. The contacts of different formations, identification of different rock formation, structural features, etc., will be carried out in detail. The geological map on 1:2000 scale will be generated based on the detail geological mapping of the block and interpretation of G-3 level exploration data along

6.0.5 Bed Rock Sampling

During the course of Geochemical mapping, grab, the bed rock / channel along with soil samples will be collected from the surface exposures to examine the grade of ore. A total of 25 no of primary samples will be analyzed for manganese mineralizations ten (10) radical Mn, SiO₂, Al₂O₃, Fe₂O₃, Cao, Mgo, Na₂O,K₂O,MnO₂, P₂O₅ and Insolubles & LOI.

6.0.3 Surface Geophysical Survey :

Surface Geophysical Survey:

- 10 Lime Km of Electrical Resistivity tomography (ERT) is proposed to be carried upto the depth of 100 meter.

6.0.6 Trenching

Trenching will be carried out on the surface up to a depth of 2 m after removal of soil/weathered column in the area. Trenching shall be carried out in the potential zones identified and samples will be collected from pit wall/floor sections, based on the observations of geological mapping and the results of geochemical sampling and Geophysical Investigation. A provision of pitting in mineralized zones (Trenching (1 x5 x2 m) 100 cubic meters is proposed from 10 No. of pits with provision of collection of 50 Nos. of trench samples.

6.0.7 Exploratory Drilling:

Based on the outcome of geological mapping & Geophysical survey, analytical results of surface, grab samples and to verify the strike and depth continuity of manganese mineralization, the detailed drilling at close spaced grid at 100 m is proposed for the known mineralised area to bring the deposit to G-3 level. Tentatively, a total of 12 of exploratory Inclined boreholes involving 700 m of exploratory drilling (Diamond core drilling) have been earmarked for G-3 level of exploration. The azimuth and angle of inclination of the proposed boreholes will be decided by the field geologist once the attitude (strike & dip) of mineralized zones (host rock) is deciphered after geological mapping and trenching/pitting. The boreholes have been planned in such a manner that it is presumed to intersect the Mn ore bands at deeper levels. It is expected that the Mn ore band will extend both laterally & vertically along the dip direction.

6.0.8 Drill Core Logging and Sampling

The borehole cores would be logged systematically. Viz. details of the litho units, colour, structural feature, texture, mineralization, core recovery and Manganese ore type would be recorded.

6.0.9 Core Sampling

The mineralized part of the drill core from each borehole will be sampled as the primary sample. The individual sample will be split into two equal halves and one part will be preserved in the core box for future reference and will be stored in core library, after completion of the project. The whole samples shall be splitted through coning and quartering in field. One part will be sent to the NABL accredited Laboratory for analysis, second part will be preserved in the camp as duplicate sample, third part will be utilized for preparing composite sample for individual ore band and the fourth part will be kept as either check sample or sample to be used for any other specific purpose. The length of each sample will be kept 1m within the ore zone depending upon the width of particular type of Manganese ore and its physical character. The length of each sample will be kept 0.50 m-1.0m depending upon the width of particular types of Manganese ore and its physical character. Around 150 core samples will be generated from 12 boreholes. The primary core samples will be analyzed for ten (10) radical Mn, SiO₂, Al₂O₃, Fe₂O₃, Cao, Mgo, Na₂O,K₂O,MnO₂, P₂O₅ and Insolubles & LOI.

6.0.10 Check Samples: External Check samples will be 10% of the total primary samples(23No. of samples) will be sent to NABL accredited Labs for analysis of ten (10) radical Mn, SiO₂, Al₂O₃, Fe₂O₃, Cao, Mgo, Na₂O,K₂O,MnO₂, P₂O₅ and Insolubles & LOI.

6.1.2 Petrographic & Mineragraphic Studies

Thin and polished section studies on drill cores as well as out-crop samples would be done for ascertaining the petrographic and mineragraphic characteristics. These samples would be drawn from ore zones and host rocks. A provision of 10 specimens (5 specimens from core samples and 5 specimens from outcrop samples) for petrographic and 10 specimens (5 specimens from core samples and 5 specimens from outcrop samples) for mineragraphic studies has been kept in G-3 level.

6.1.4 Specific Gravity Determination

Bulk Density Determination

A provision of 5 nos pits in Manganese ore zone is kept for assessment of bulk density of Manganese ore. The dimension of the pit will be 1 m x 1 m x 1 m.

7.0.0 Nature Quantum and Target

The Quantum of work proposed in the block is given below:

Sl. No.	Description and Nature of Work	Unit	Target
A	GEOLOGICAL WORK AND SURVEYING		

1	Geological Mapping (1:2000 scale)	Sq. km	3.00
2	Topographic Survey (Contour interval 5m) at 1:2000 scale	Sq. km	3.00
3	Bore Hole Fixation and determination of co-ordinates & Reduced Level (RL) of the boreholes and demarcation of lease hold boundary points by DGPS	Nos.	12
4	Boundary survey by DGPS	Nos.	4
5	Bedrock samples		25
6	Trenching (1 x5 x2 m)10 No. of Pit	Cum.	100
B	SURFACE GEOPHYSICAL SURVEY		
7	ERT(Electrical Resistivity tomography) 250 m spacing	Line km	10
C	EXPLORATORY DRILLING		
8	Drilling up to 300m (Hard Rock)	m	700
9	Drill Core Preservation	Per m	200
D	Sampling & Chemical Analysis		
10	Primary samples to be analyzed for 7 radicals viz. Al₂O₃, SiO₂, Fe₂O₃, TiO₂ , V, Ga & LOI		225
i)	Bedrock samples	Nos .	25
ii)	Trench/ Pit samples	Nos .	50
iii)	Borehole Core samples	Nos .	150
iv)	Check samples (10% external)	Nos .	23
11	Spectroscopic Studies		
	ICP-AES/ICPMS (sequential technique) for 34 elements i.e. 16 other elements viz. Li, Ga, In, Be, Ge, Mo, Ni, Cr, Ta, W, Ba, Co, Rb, Sr, Zr, Nb ;16 REE viz. La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Sc, Y; a 02 Actinides viz. U, Th.		10
b	X-RD studies for mineral identification		10
12	Petrological Studies		
	i) Preparation of thin section	Nos.	10
	ii) Study of Thin Section plus photomicrographs	Nos.	10
13	Mineragraphic Studies (Surface & Core samples)		
14	Bulk Density	Nos.	5
E	Geological Report Preparation -As per MEMC Rules-2015	Nos.	1

8.0.0 Time Schedule and Cost Estimates

Time Schedule: The total duration of the project proposed is 10 months.

Time Schedule for Preliminary Exploration (G-3) for Manganese and associated minerals in Dulhapur Block, Districts: Balaghat & Seoni State: Madhya Pradesh

Sl. No.	Activities	Months												
		1	2	3	4	5	6	7	8	9	10			
1	Camp Setting	■												
2	Geological Mapping & Sampling (Bed Rock /Pit/Grab)	■	■											
3	Survey Work(1 Party) (Topography + BH Survey)						■							
4	Surface Geophysical Survey	■	■											
5	Trenching		■											
6	Drilling					■	■	■	■					
7	Geological Work(1 Geologist)	■	■			■	■	■	■	■				
8	Sampling Work -BRS/Pit/Core Samples		■			■	■	■	■	■				
9	Camp Winding													
10	Laboratory Studies		■	■		■	■	■	■	■	■			
11	Geological Work/ Report Writing									■		■	■	
12	Peer Review and Report Submission									■			■	■

9.0.0 Cost Estimates:

Tentative cost has been estimated based on the Schedule of Charges (SoC) of projects funded by National Exploration Trust (NMET). The total cost estimate of Rs. 176.14 Lakhs(Including GST) is being proposed for completion of exploratory work up to G-3 level. Activity wise break-ups of the same are furnished below

Activity wise break up of cost of the project

Sl.No.	Item	Total Cost
1	Geological Work	2731188
2	Surface Geophysical study	693800
3	Trenching	412500
4	Laboratory Studies	1124750
5	Drilling	9398000
	Sub total	14360238
6	Report	250000
7	Peer Review	30000
8	Proposal Preparation	287205
	Total	14927443
9	GST (18%)	2686940
10	Total cost including 18% GST	17614383

10.0.0 Justifications

- During FS 2023-24 carried out Reconnaissance survey for manganese in Sausar Group of rocks in Piparwani, Agri and Koylari areas, Seoni and Balaghat district, Madhya Pradesh. Identified three potential Mn bearing mineralized zones in the area.
 1. Dulhapur Mineralized Zone
 2. Pathrapet Mineralized Zone
 3. Koylari Mineralized Zone
- The demarcated Mn bearing zones are mostly soil covered with few isolated fragmentary outcrop patterns and nature of mineralization looks like pocket type with pinch and swell nature along the strike as well as in dip direction.
- The analytical results of BRS collected from three Mineralized Zones shows encouraging values of MnO ranging from 9% to 44.2% with mean value of 26.05%.. While 50 PTS samples shows MnO value ranges from 0.65% to 34.29% with mean value of 18.89%.
- GSI recommended for geophysical survey (Gravity) be required to establish the strike continuity of Mn bearing zone for demarcating G3 area. Further, Recommended for Preliminary exploration (G3 Stage) in Dulhapur, Koylari and Pathrapet area to establish the strike continuity and depth persistence of the mineralization in the area.
- Based on the evaluation of GSI Reconnaissance survey (G4 Stage) during 2023-24 and assessment of encouraging MnO values, demarcated an area of 3.00 sq.km for Preliminary Exploration (G3 Stage) in Dulhapur Block.
- It is proposed to carry out Detailed Geological Mapping (1:2000 scale), Geochemical mapping, Surface Geophysical Survey, pitting, trenching and drilling of inclined Bore-holes at 100 m spacing for First Level intersection to intersect mineralization at vertical depth of 60m, to conduct a systematic exploration for Manganese and associated minerals in identifying economical, minable deposit in the state of Madhya Pradesh

Reference:

1. Report on reconnaissance survey for Manganese in Sausar Group of rocks in Piparwani, Agri and Koylari areas, Balaghat and Seoni Districts, Madhya Pradesh, (G-4 Stage) (field season 2023-24) (September, 2024) Item-No. CR-024036- M2AFGBM-MEP/NC/CR/SU-MP-JAB/2023/46856

List of Plates:

1. Location Plan of Proposed Dulhapur block on Topoisheet No. 55 O/10 (1:15000) **(ANNEXURE-1)**
2. Location of Proposed Dulhapur block on Regional Geological Map (1:15000) **(ANNEXURE-2)**

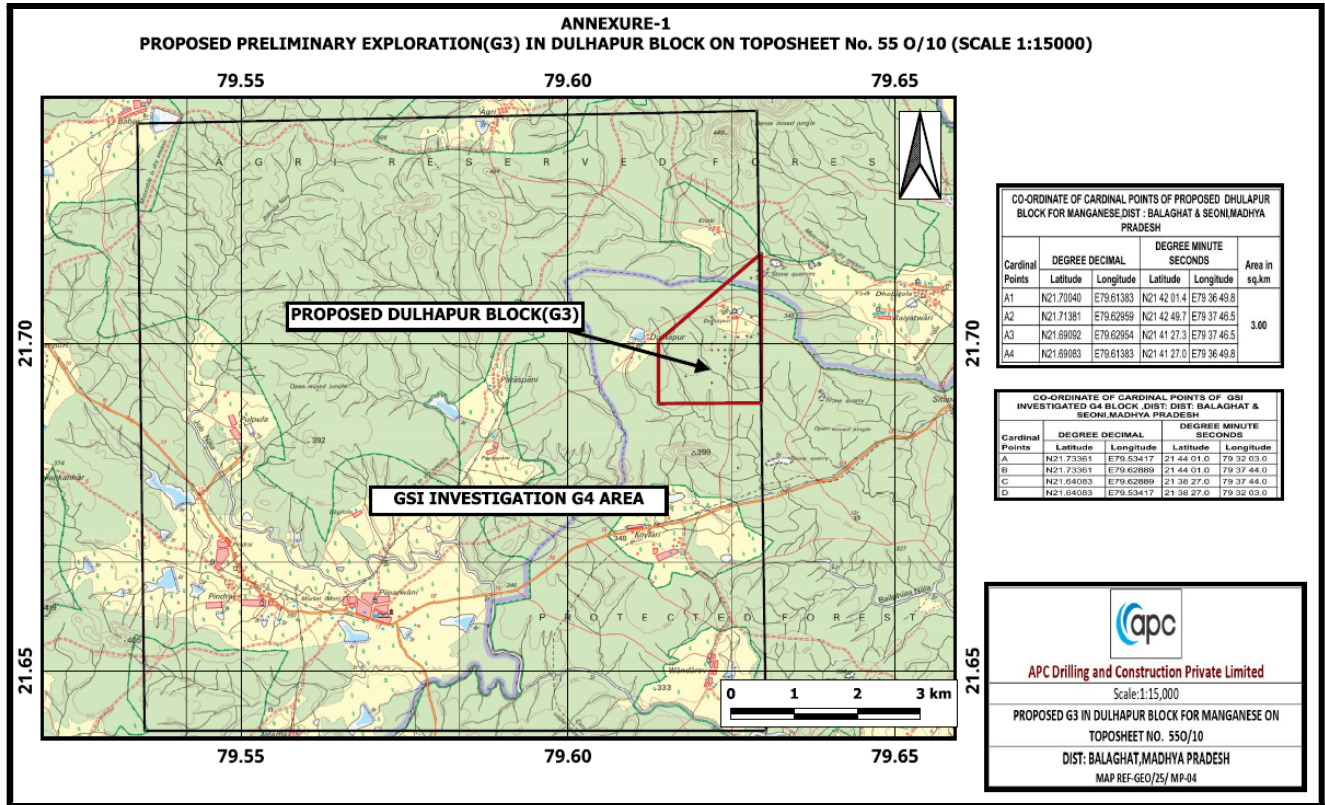


Figure-2: Location Plan of Proposed Dulhapur Block on Topoisheet No. 55 O/10

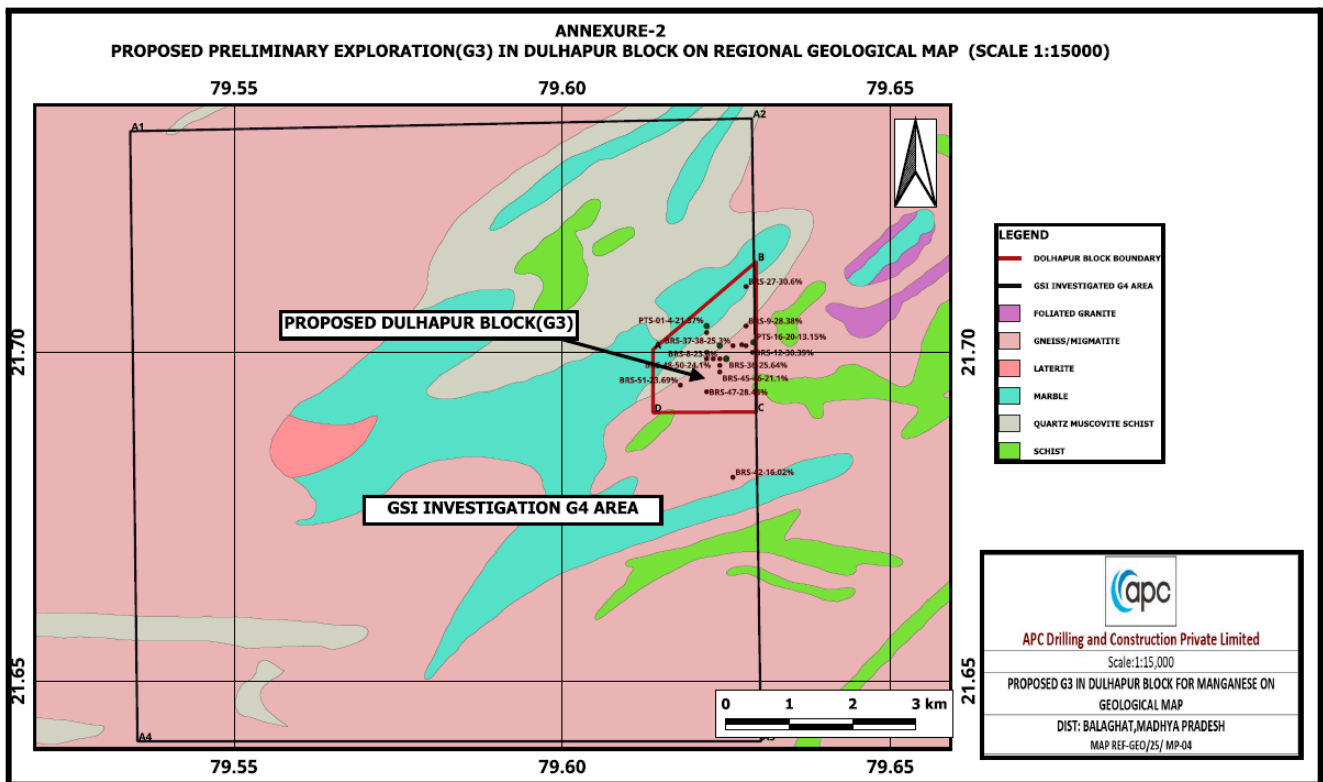


Figure-3: Location of Proposed Dulhapur Block on Regional Geological Map

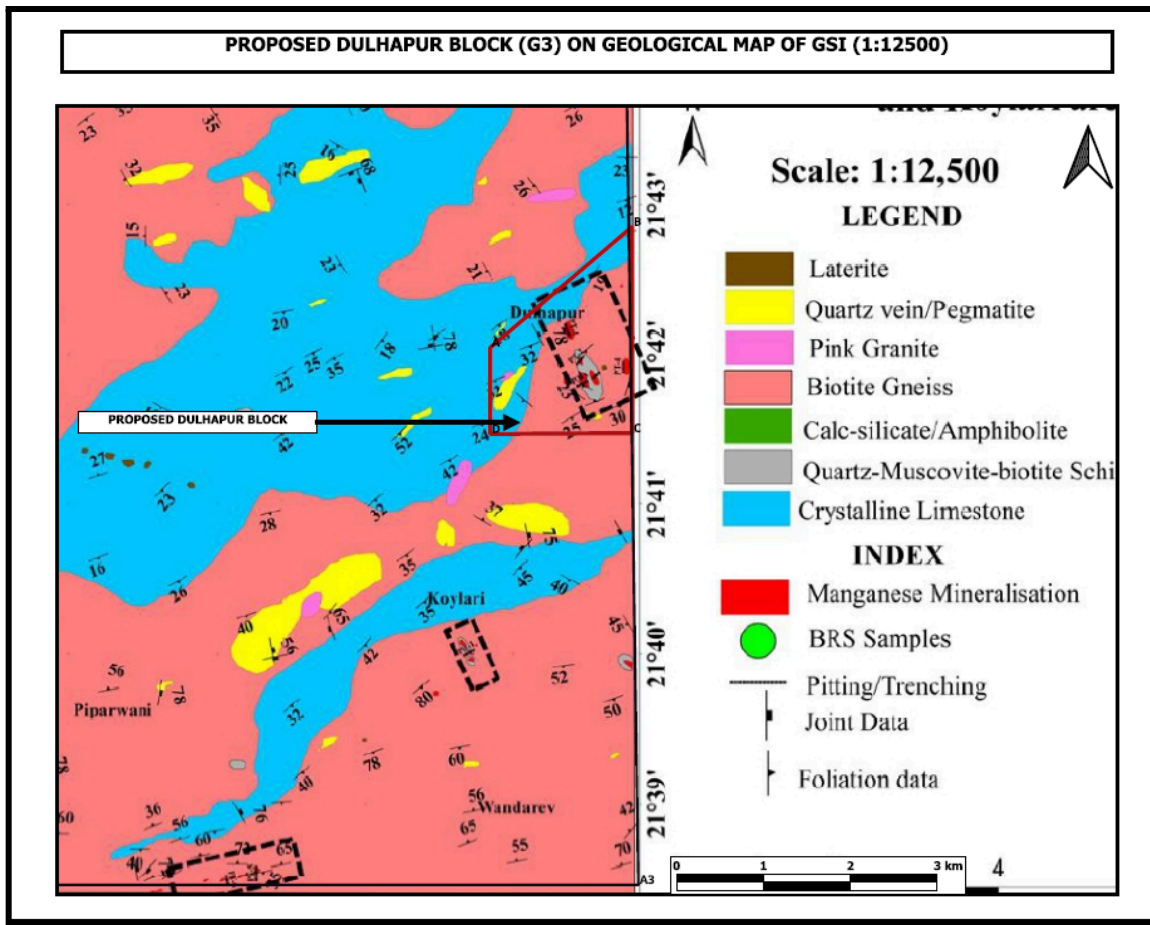


Figure-4: Location of Proposed Dulhapur Block on GSI Geological Map

Detailed estimated cost of the project is given in table below:

Preliminary Exploration (G-3) for Manganese and associated minerals in Dhulapur Block, Districts: Balaghat & Sseoni State: Madhya Pradesh [Block area- 3.00 sq. km; Schedule timeline- 10 months; BH-12 Nos; 10 BHs 1st Level; 2 BHs 2nd Level BH depth (1st level): 50m & (2nd level): 100 m, Total Drilling meterage- 700 m; Review- After 3 & 6 months]							
SL No.	Item of Work	Unit	Rates as per NMET SoC		Estimated Cost of the Proposal		Remarks
			SoC-Item -SI No.	Rates as per SoC	Qty.	Amount (Rs)	
A	GEOLOGICAL WORK & TOPOGRAPHICAL SURVEY (1:2000 scale)						
i	Detailed Geological Mapping	day	1.1	18300	3.00	54900	
	Charges for one Geologist- Field	day	1.2.1a	14500	100	1450000	
ii	Charges for one Geologist - HQ	day	1.2.1a	10500	30	315000	

iii	2 labours / Party(As per rates of Central Labour Commissioner)	day	5.8	556	200	111200	Amount will be reimburse as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher
iv	Sampling Party days-1 Samplers Labour charge not included	day	1.2.1b	7850	32	251200	
v	4 labours/ party (As per rates of Central Labour Commissioner)	day	5.8	556	128	71168	Amount will be reimburse as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher
vi	Survey Party Days for DGPS topographical contour survey, BH fixation and RL determination	day	1.3.1	10500	30	315000	
vii	Boundary survey by DGPS	Nos	1.3.2	24000	4	96000	
viii	4 labours for surveyor	day	5.8	556	120	66720	
Sub Total- A						2731188	
B	Surface Geophysical Survey						
i	ERT(Electrical Resistivity tomography) 250 Line spacing	L.km	3.6a	58880	10	588800	
iii	Geophysicist HQ	days	3.18	10500	10	105000	
Sub Total- B						693800	
C	PITTING / TRENCHING						
i	Trenching (1 x5 x2 m)10 No. of Pit	Cu m	2.1.2	4125	100	412500	
Sub Total- C						412500	
D	DRILLING						
i	Drilling upto 300m (Hard Rock) (2 rigs)	m	2.2.1.1 d	10000	700	7000000	BH-12 Nos; 10 BH: 1st Level; 2 BH: 2nd level. BH (1st level;30 m): 50m depth & (2nd level; 60m): 100 m depth, Total Drilling meterage- 700 m)
ii	Land / Crop Compensation	per BH	5.6	30000	12	360000	

iii	Construction of concrete Pillar (12"x12"x30") (18 BH Pillar +4 Boundary Pillar)	per borehole	2.2.7	2000	16	32000	(12 BH Pillar +4 Boundary Pillar)
iv	Miscellaneous charges -Transportation of Drill Rig, Accomodation of Drill Camp, Camo setting & winding,Construction of Approach Road and	Lumps um	2.2.9	-	-	1400000	if Drilling cost >50 lakhs & < 1 Cr, 20% of the Drilling cost with Maximum of 15.0 Lakhs
v	Drill Core Preservation (One complete borehole plus mineralised cores of all the remaining BHs)	Per meter	X	1590	200	318000	1 complete BH + mineralised zone
vi	Bore Hole Fixation and determination of co- ordinates & Reduced Level of the boreholes by DGPS	Nos	1.3.2	24000	12	288000	12
Sub Total- D						9398000	
E	LABORATORY STUDIES						
1	Chemical Analysis						
	Primary & Check samples for Manganese BRS/Pit/Chip/Channel/BH samples)						
	a. Primary Samples for Complete analysis of Manganese 10 radical (Mn, SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ , Cao, Mgo, Na ₂ O,K ₂ O,MnO ₂ , P ₂ O ₅ and Insolubles)	Nos	4.1.11	3900	225	877500	BH-150 BRS-25, Trench-50
	b.Check samples(10%) for Complete analysis of Manganese 10 radical (Mn, SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ , Cao, Mgo, Na ₂ O,K ₂ O,MnO ₂ , P ₂ O ₅ and Insolubles)	Nos	4.1.11	3900	23	87750	
	d.ICP-AES/ICPMS (sequential technique) for 34 elements i.e. 16 other elements viz. Li, Ga, In, Be, Ge, Mo, Ni, Cr, Ta, W, Ba, Co, Rb, Sr, Zr, Nb ;16 REE viz. La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Sc, Y; 02 Actinides viz. U, Th.	Nos	4.1.15	7400	10	74000	Per BH 1 samples
2	Petrological samples (BH Core Samples)						
i	Preparation of thin section	Nos	4.3.1	500	10	5000	
ii	Study of Thin Section plus photo micrographs	Nos	4.3.4	2800	10	28000	
3	Mineral Physics Studies						

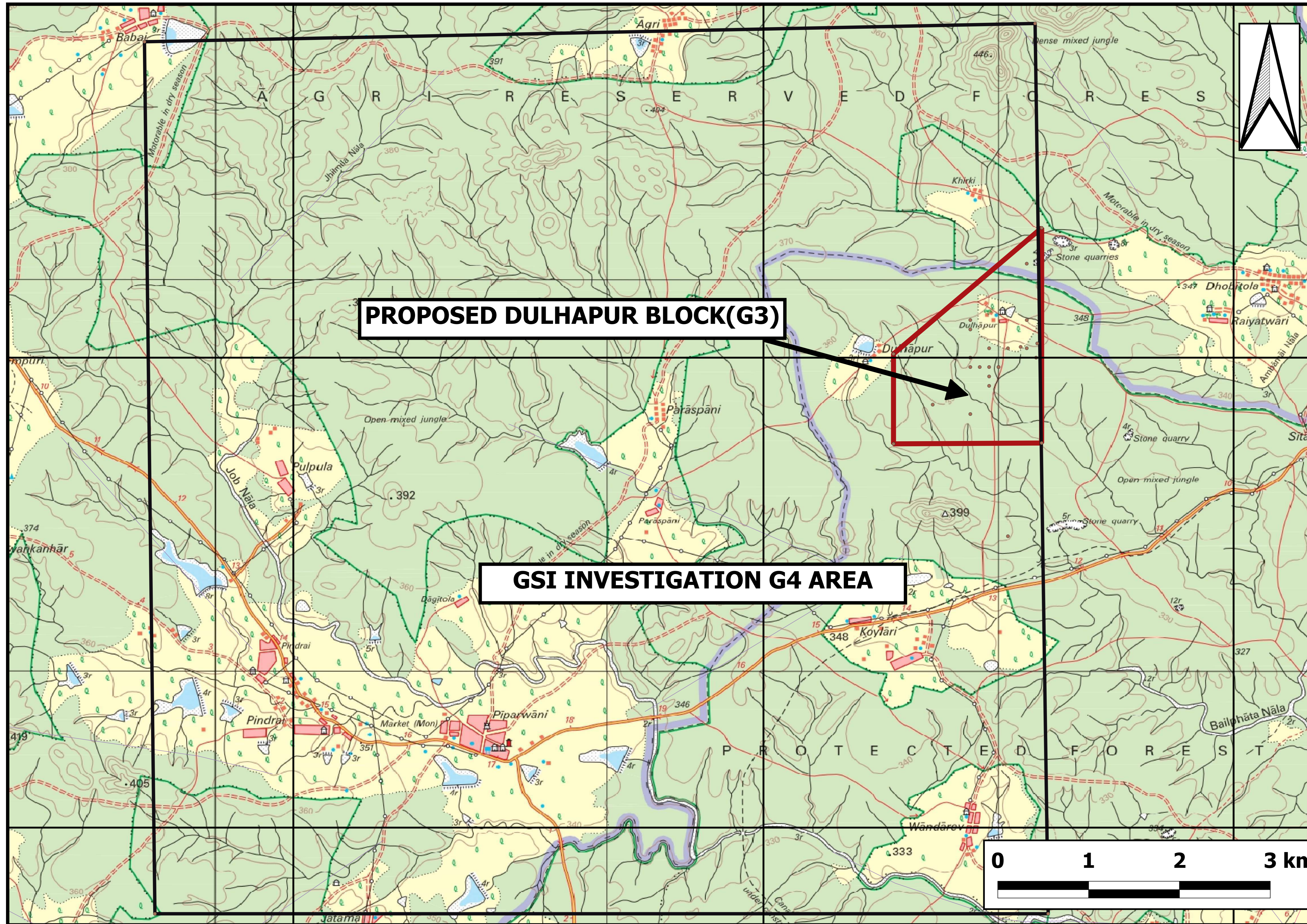
	XRD Analyses for identification of minerals (Random)		4.5.2	4000	10	40000	
	Bulk Density		4.8.3	2500	5	12500	
	Sub Total- E					1124750	
	Total A to E					14360238	
E	Geological Report Preparation - including charges of typing text,, table etc., digitization of maps/ sections etc.,		5.2	Cost per 5 copies of report along with soft copy		250000	Total cost of the project exceeding 150lakhs 7.5 lakhs is considered
F	Peer review Charges		As per EC			30000	
G	Preparation of Exploration Proposal	5 Hard copies with a soft copy	5.1	2% of the Cost or Rs. 5.0 Lakhs whichever is lower		287205	
H	Total Estimated Cost without GST					14927443	
I	Provision for GST (18% of I)					2686940	GST will be reimburse as per actual and as per notified prescribed rate
J	Total Estimated Cost with GST					17614382	
	or Say Rs. In Lakhs					176.14	
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 excusion of the project by NEA on its own, a Certifiante 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.						
6	All the Geological Reports and data are to be uploaded on NGDR as per MERT template by the agency						

**ANNEXURE-1
PROPOSED PRELIMINARY EXPLORATION(G3) IN DULHAPUR BLOCK ON TOPOSHEET No. 55 O/10 (SCALE 1:15000)**

79.55

79.60

79.65




21.70

21.65

CO-ORDINATE OF CARDINAL POINTS OF PROPOSED DHULAPUR BLOCK FOR MANGANESE, DIST : BALAGHAT & SEONI, MADHYA PRADESH					
Cardinal Points	DEGREE DECIMAL		DEGREE MINUTE SECONDS		Area in sq.km
	Latitude	Longitude	Latitude	Longitude	
A1	N21.70040	E79.61383	N21 42 01.4	E79 36 49.8	3.00
A2	N21.71381	E79.62959	N21 42 49.7	E79 37 46.5	
A3	N21.69092	E79.62954	N21 41 27.3	E79 37 46.5	
A4	N21.69083	E79.61383	N21 41 27.0	E79 36 49.8	

CO-ORDINATE OF CARDINAL POINTS OF GSI INVESTIGATED G4 BLOCK, DIST: DIST: BALAGHAT & SEONI, MADHYA PRADESH					
Cardinal Points	DEGREE DECIMAL		DEGREE MINUTE SECONDS		Area in sq.km
	Latitude	Longitude	Latitude	Longitude	
A	N21.73361	E79.53417	21 44 01.0	79 32 03.0	3.00
B	N21.73361	E79.62889	21 44 01.0	79 37 44.0	
C	N21.64083	E79.62889	21 38 27.0	79 37 44.0	
D	N21.64083	E79.53417	21 38 27.0	79 32 03.0	



APC Drilling and Construction Private Limited

Scale: 1:15,000

PROPOSED G3 IN DULHAPUR BLOCK FOR MANGANESE ON TOPOSHEET NO. 550/10

DIST: BALAGHAT, MADHYA PRADESH

MAP REF-GEO/25/ MP-04

79.55

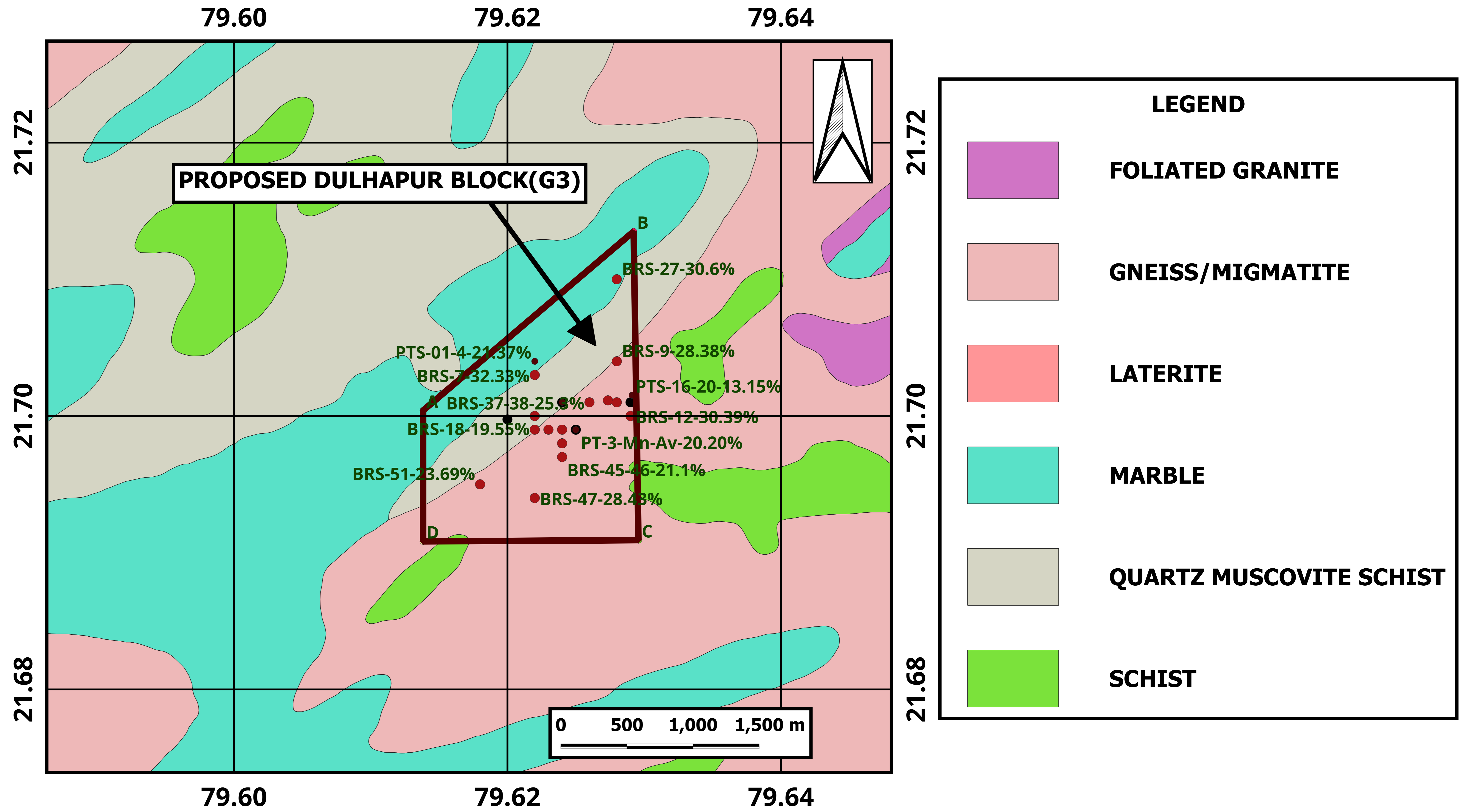
79.60

79.65

21.70

21.65

ANNEXURE-2
PROPOSED PRELIMINARY EXPLORATION(G3) IN DULHAPUR BLOCK ON REGIONAL GEOLOGICAL MAP (SCALE 1:10000)



PROPOSED DULHAPUR BLOCK (G3) ON REGIONAL GEOLOGICAL MAP (1:12500)

Scale: 1:12,500

LEGEND

LEGEND
DULHAPUR-MANGANESE BLOCK — routes

	CALC GNEISS
	FOLIATED GRANITE
	GNEISS/MIGMATITE
	GRANITE
	LATERITE
	MARBLE
	MUSCOVITE SCHIST
	QUARTZ MICA SCHIST
	QUARTZ MUSCOVITE SCHIST
	QUARTZITE
	SCHIST

INDEX

	Manganese Mineralisation
	BRS Samples
	Pitting/Trenching
	Joint Data
	Foliation data

