Proposal for Manganese in Kawalewada – Sakkardara Block, Tumsar Tahsil, Bhandara District, Maharashtra State for Preliminary Exploration (G3 Stage) under NMET.

(Industrial Mineral)

By

REGIONAL OFFICE – NAGPUR
DIRECTORATE OF GEOLOGY AND MINING
GOVERNMENT OF MAHARASHTRA

Place : Nagpur

Summary of the Proposal for Manganese in Kawalewada-Sakkardara Block, Tumsar Tahsil, Bhandara District, Maharashtra State for Preliminary Exploration (G3 Stage) under NMET.

GENERAL INFORMATION ABOUT THE BLOCK

	Features	**Details**
	Block ID	Kawalewada - Sakkardara Block
	Current Exploration Agency for G3	Directorate of Geology & Mining, Maharashtra Regional Office – Nagpur
	Previous Exploration Agency G4	Geological Survey of India carried out large scale mapping in FSP 1971-72
	G4 stage Geological Report	Preliminary report on appraisal of low-medium phosphorus manganese ore deposits in Chikla-Dongri Buzurg sector (V) and area east of Chikla Extension sector-VA, Bhandara district, Maharashtra by GSI Central Region – in FSP 1971-1972
	Commodity	Manganese
	Mineral Belt	Sausar Belt
	Completion Period with entire Time schedule to complete the project	18 months (including rainy season)
	Objectives	G-3 level of exploration to delineate the Manganese ore body
	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	Yes – Work will be carried out by the proposed agency.
	Name/ Number of Geoscientists	04
	Expected Field days (Geology, Geophysics, Surveyor)	320 Days Geology 100 days Surveyor
1.	**Location**	
	Latitude	21°31’59.79” - 21°33’54.21”
	Longitude	79°47’07.87” - 79°49’44.85”
	Villages	Kandri, Sakkardara, Kawlewada, Sirpur Hamesha
	Tehsil/ Taluk	Tumsar
	District	Bhandara
	State	Maharashtra
2.	**Area (hectares/ square kilometers)**	
	Block Area	8.96 sq.km
	Forest Area	6.80 sq.km

	Government Land Area	0.43 sq.km
	Private Land Area	1.73 sq.km
3.	**Accessibility**	
	Nearest Rail Head	Tumsar Junction Railway Station
	Road	NH 543 K
	Airport	Nagpur Airport
4.	**Hydrography**	
	Local Surface Drainage Pattern (Channels)	Dendritic
	Rivers/ Streams	Bawanthari River and small E-W running nalas.
5.	**Climate**	
	Mean Annual Rainfall	1000 mm (June-August)
	Temperatures (December)(Min) Temperatures (June)(Maximum)	December (Minimum) 18° June (Maximum) 47°
6.	**Topography**	
	Toposheet Number	55 O/14
	Morphology of the Area	The area is gentle undulating in nature with abruptly rising hills. The Manganese reef occupies the southern flank of the ridges with maximum elevation of the ridges is around 381m above MSL. The area where Manganese ore body occurs as E-W running mound shows slopes to north as well as south.
7	**Availability of baseline geoscience data**	
	Geological Map (1:50K/ 25K)	Available (GSI)
	Geochemical Map	Not Available
	Geophysical Map (Aerogeophysical, Ground geophysical, Regional as well aslocal scale GP maps)	Not Available
8	**Justification for taking up Preliminary Exploration**	GSI has conducted various geological exploration in the Bhandara district, including the Sakkardara and adjoining area. Notable efforts include regional and large-scale geological mapping at scales of 1:15,840 and 1:5,000, surface sampling, and surveying conducted in April-May 1972. These studies identified

		manganiferous horizons as detached lenticular outcrops at the contact of biotite gneiss and muscovite schist. Gonditic manganese ore exposures were also documented in trenches and old pits, **forming part of the eastern continuity of the manganese ore horizon from the Chikhala MOIL Mine.** Despite challenges posed by extensive quartz debris, the manganese ore reef was intermittently exposed, revealing widths ranging from 1.5 to 2 meters, often intercalated with gondite. Initial assessments indicated that the ore was mostly Grade III (less than 38% Mn), with previous production of Grade II ore (40% Mn and 0.10% P). **During the preparation of this proposal, the Directorate of Geology and Mining (DGM) conducted traverses along the east-west direction within the specified area. These investigations confirmed the association of Mn gondite with the Mansar Formation, particularly along old pits.** Megascopic Sample analyses indicated that samples manganese content ranging from 35% to 45%. **Based on these detailed observations and adjoining exploration data, it is imperative to conduct a Preliminary Exploration (G3 stage of exploration) in the Kawlewada - Sakkardara Block, District Bhandara, Maharashtra.** This exploration will encompass systematic geological mapping, geophysical surveys, and scout drilling programs. The aim is to accurately delineate the qualitative and quantitative assessment of manganese ore in the region, in accordance with the Mineral (Evidence of Mineral Contents) Rules, 2021. The proposed exploration will enhance our understanding of the manganese ore potential in this area, providing critical data to support future mining and resource development initiatives.

Proposal for Manganese in Kawalewada-Sakkardara Block, Tumsar Tahsil, Bhandara District, Maharashtra State for Preliminary Exploration (G3 Stage) under NMET.

1.0 Block Summary

1.1 Introduction

The Sausar fold belt, stretching across Madhya Pradesh and Maharashtra, is renowned for its Manganese ore mineralization. Within the Sausar group, Manganese ore is predominantly found in the Mansar formation, with additional deposits in the Lohangi formation. Key minerals include braunite, pyrolusite, and psilomelane, along with the Mn silicate rock known as "gondites."

The northern Bhandara district forms part of the Manganese belt within the Sausar Series of rocks, covering an area of approximately 1000 sq.km. Major Manganese ore production in this district comes from areas such as Chikla, Sitasaongi, and Dongri buzurg, operated by MOIL. Additionally, several abandoned mines previously exploited by various mining companies can be found along Gobarwahi and Chikla.

This proposal outlines a G-3 level preliminary exploration program aimed at delineating the manganese mineralization in the specified area.

1.2 Location and Accessibility:

The area is situated at the north-eastern corner of Bhandara district and is on the south-western side of the Bawanthari River, which marks the boundary between Maharashtra and Madhya Pradesh. To the south, it is bordered by the Chandapur Village, surrounded by Chandpur Lake. The western boundary is defined by the eastern tip of the Sitasaongi-Chikhala MOIL area, while the Hirapura Hamesha – kawlewada mark its northern limit. The coordinates for this area range between latitudes 21°31' to 21°33' and longitudes 79°47' to 79°49', falling within Survey of India's Toposheet No. 55 O/14.

Kawlewada-Sakkardara is approximately 27 kilometers from Tumsar, the sub-district headquarters and the area is about 85 kilometers from Bhandara, the district headquarter. Several significant roads connect Sakkardara to nearby regions. The Kandri–Susurdohtola road via Lendezari & Khapa and the Kandri–Lendezari–Alesur–Chikhli road are primary routes providing east-west access. Accessibility is enhanced by the Dongri Buzurg Railway Station, approximately 17 km to the west-northwest, and Chicholi Railway Station, around 21 km to the west-Southwest.

1.3 Physiography:

The Sakkardara area in Bhandara district features a diverse landscape of plains, gentle hills, and river systems. Located in the northeastern part of the district, it is bordered to the north-east by the Bawanthari River, which enhances soil fertility and supports agriculture. The block includes prominent hills east of the Chikhala mines, with elevations up to 485 meters

above mean sea level (MSL). The hilly terrain extends 6 km to the Bawanthari River, a tributary of the Wainganga River.

The area has two prominent hill ranges. The northern range, from Chikhla-Sitasaongi mines to Ghanor, runs ENE-WSW with elevations up to 463 meters above MSL. The parallel southern ridge has lower altitudes of 340-300 meters MSL. The terrain features broad alluvial plains to the north, with streams draining east to the Bawanthari River and south to the Chandpur tank. Alluvial lowlands support paddy and sugarcane cultivation, while ridges and hills have scrub jungle and thorny shrubs. The Chandpur North RF has dense mixed vegetation and scattered bamboo, though no large timber trees.

The soil is predominantly alluvial, fertile, and suitable for farming, supporting a variety of crops and local flora. The region's vegetation contributes to its ecological balance, and Sakkardara Lake, despite urbanization challenges, remains an important water body. The region's physiography, with its mix of plains, hills, fertile soil, and well-connected transport networks, makes it a unique and vibrant part of Bhandara district.

1.4 Climate:

The climate of the Kawalewada-Sakkardara area is tropical, with hot summers and moderate winters. The region receives moderate to heavy rainfall during the monsoon season, which is vital for agriculture and the replenishment of water bodies.

The area experiences a moderately dry and wet climate. Summers, spanning from March to June, are dry and hot, with temperatures peaking at 47°C. The monsoon season begins in the last week of June and continues until September, bringing an average annual rainfall of 140 cm. The winter season, from November to February, is characterized by average temperatures of around 21°C.

1.5 Background Geology:

The Sausar Fold Belt (SFB), located on the southern margin of the Central Indian Tectonic Zone, trends in an E-W to ENE-WSW direction. This belt is approximately 35 km wide and extends over 215 km, spanning regions in both Madhya Pradesh and Maharashtra. The SFB is bordered by the Deccan Traps to the north and west, Malanjkhand Granitoids, Chilpis, Nandgaon, and the Dongargarh-Kotri Belt to the east and southeast, and the Gondwana and Sakoli Groups to the south.

The Sausar Group (SSG) is comprised of various formations: Sitasaongi, Lohangi, Mansar, Chorbaoli, Junewani, and Bichua. Lithounits in the Sausar Group include quartzite, quartz-mica schist, calc-silicate, calcitic and pink marble, and manganese/gondite ore. The manganese ore belt of Madhya Pradesh and adjacent parts of Maharashtra, referred to as the Central Belt, consists primarily of intensely deformed and metamorphosed rocks of the Precambrian Sausar Series. This belt stretches approximately 200 km from Balaghat in the east to Nagpur in the west, with a central width of 25 km.

The Precambrian Sausar Group's meta-sediments host manganese ore horizons at three

distinct levels: (i) at the contact of the Mansar Formation and the overlying Chorbaoli Formation (Horizon-I), (ii) within the Mansar Formation (Horizon-II), and (iii) at the contact of the Mansar Formation and the underlying Lohangi/Sitasaongi Formation (Horizon-III). The Dongri-Buzurg Mn deposit, the largest known supergene oxide deposit in the Madhya Pradesh-Maharashtra Manganese Belt, uniquely yields manganese dioxide ore.

The Sausar Fold Belt is a significant Mesoproterozoic mobile belt in the central Indian Peninsular Shield, encompassing over 7000 km² in Maharashtra and Madhya Pradesh. The regional strike of the rocks is generally ENE-WSW in the western and eastern parts, and E-W in the central portion, with a 45°-70° dip due south.

Stratigraphic Succession:

With this geological history, the succession of rocks - the Pre-Sausars, Sausars and Post - Sausars could be depicted as follows:

Stratigraphy		**Rock types**
Recent		Soil and alluvium
Sausar Group	Intrusive	Granite, pegmatite and quartz vein
	Bichhua Formation	Dolomitic marble and quartzite calc-gneisses
	Junewani formation	Quartz Biotite granulites, fine grained Biotite schist, Muscovite Biotite schist, Quartz sillimanite concretions (Tabloids)
	Chorbahuli Formation	Micaceous quartzite, quartz muscovite schist (occasionally garnetiferous), feldpathic muscovite schist, Tabloids
	Mansar Formation	Quartz muscovite schist, Mica schist with Manganese ore horizons, garnetiferous sericite schist, muscovite gneiss
	Lohangi Formation	Pink Marble, white Marble with thin Manganese ore bands, Calc Silicates
	Sitasaongi Formation	Feldspathic Muscovite Schist with intercalated Quartzite
---------- Disconformity ----------		
Pre Sausar Tirodi Biotite Gneiss		Biotite gneiss, augen gneiss, para-gneiss and biotite schist

Table 1: Stratigraphic succession of Sausar group with lithounits (after Khan et al 2002)

A significant portion of the Pre-Sausar, Sausar, and Post-Sausar rock areas in Nagpur and Bhandara districts is covered by soil. The stratigraphic sequence of these rock types has been determined through comprehensive surface and subsurface investigations, including mapping, trenching, quarrying, underground mining, and drilling.

Geology and Structural Set-up of the block:

The primary rock types in the region are biotite schist, muscovite schist, and quartzite, trending generally ENE-WSW and dipping 60° to the south and vertically. These rocks display isoclinal folding, overturned towards the north. The manganese ore horizon, along with the underlying Sitasaongi feldspathic quartz mica-schist and overlying Mansar mica schists, form the southern limb of an overturned iso-anticline that plunges 30°-40° towards the east. The major fold axis trends east-west to ENE-WSW with an axial plane dipping steeply over 60° to the south. The foliation usually trends E-W, varying from N70°E-S70°W to N80°W-S80°E, with steep dips to the south ranging from 40°-80°, and occasionally becoming vertical, especially in the western part of the sector.

Surface evidence is obscured by numerous quartz and pegmatite veins. Predominantly, two sets of joints are noted, particularly in the Sitasaongi quartzites. The strike joints trend E-W to ENE-WSW and dip steeply (65°-80°) to the south and moderately (over 40°) to the north. The transverse set of joints trend N-S with dips varying from 20° to 65° towards the east and west. Additionally, 2 or 3 sets of oblique joints, trending NE-SW with dips varying from 30° to 75° towards the east and west, are also observed. Lineation, represented by grooves and mineral elongation, are mostly found in the immediate footwall rocks (Sitasaongi quartzite) of the manganese ore horizon.

1.6 Mineral Potentiality based on geology:

There are two prominent ore zones running along the northern and the southern hill ranges as per the local geology, with ENE-WSW direction. These are respectively the eastern continuation of northern and southern limbs of the anticlinorium, lying at west of proposed area. The MOIL's Chikhala and Sitasaongi deposits are located on the western part of the northern range. Beyond the east of Chikhala village and Chikhala MOIL mines, there were some mining activities in the past. Presently however, the major part of the ore zone of 5 km extent is not under mining. The southern zone from Gudri eastward up to the bank of Bawanthari was under mining at its eastern tip, at Sakkardara.

The manganese ore horizon in proposed block forms the eastern continuity of that in the Chikla Extension (MOIL) mine, which in turn is the east ward extension of Chikla 'A' (Main) deposit (MOIL). The Chikla main reef is about 5-6 m. in thickness which gradually thins down to a meter at the eastern end of the Chikla extension (MOIL).

However, in the proposed block, the thickness of the manganese ore horizon exposed usually varies between 1.5 and 2.5 m. The manganiferous zone in the form of gondite, composed of quartz, spessartite and manganese pyroxenes in varying proportion, at places grades to pure quartz – spessartite rock. The workable manganese ore is mostly secondary manganese oxides, psilomelane and pyrolusite, occurring as thin impersistent lenses and seams within the gondite.

The area contains several old working pits and trenches, providing subsurface

exposures for observation. The manganese reef is visible along the pit walls. The subsurface of the pit reveals the presence of Mn-bearing gondite, which trends 265° (almost E-W) and dips 50°-60° due south. Some trenches, approximately 100 meters long by 14 meters wide and 8 meters deep, are observed in the block with gondite rock exposed in Sakkaradara Hillock.

1.7 Scope for proposed exploration:

The Directorate of Geology and Mining, Government of Maharashtra, has conducted a preliminary traverse in the proposed block through large scale mapping and surface sampling. This traverse indicates the potential presence of manganese in the area. To delineate the manganese horizon, detailed mapping and scout drilling must be carried out.

To meet these objectives, a preliminary exploration (G-3) in the Kawlewada-Sakkardara Block, District Bhandara, Maharashtra, is proposed. This exploration will include geological mapping, a topographic survey, and a drilling program. The exploration will be conducted in accordance with the Mineral (Evidence of Mineral Contents) Rules, 2021. The proposed scheme of exploration has been formulated to achieve the objectives.

Objectives of the Proposed Preliminary Exploration (G-3 Stage):

1. To conduct geological survey at a 1:12500 scale to delineate the rock types of manganese-bearing formations, along with structural features such as strike, dip, lineation, and foliation.
2. To identify occurrences of manganese ore mineralization through detailed geological mapping at a 1:5000 scale.
3. To perform channel/bed rock sampling at regular intervals to uncover manganese bodies concealed under soil and lateritic cover.
4. To drill boreholes up to an apparent depth of 90-100 meters to confirm the strike and depth persistence of manganese ore bodies mapped in the area.
5. To estimate manganese ore resources (333) in the block in accordance with UNFC norms and the Minerals (Evidence of Mineral Contents) Amendment Rules, 2021.

2.0 Previous Work

2.1 Previous Exploration in the adjoining areas:

Systematic geological mapping for Manganese was first conducted by P.N. Datta of the Geological Survey of India (GSI) in 1893-94, leading to the discovery of the majority of major deposits in the Bhandara district. Fermor (1909) provided a comprehensive account of the geology, mineralogy, petrology, and manganese ore of Madhya Pradesh (MP), and was the first to coin the term "Sausar" for the metasedimentary rock associated with manganese ore deposits, a term later modified by West (1936). Major parts of the Bhandara district were mapped by Fermor between 1931-1933, with subsequent remapping by Chatterjee.

Mapping of the manganese belt in MP and Maharashtra was re-initiated in 1951 under the overall coordination of Straezek. The entire area was mapped by different workers between 1951 and 1957, with detailed studies presented in the GSI Bulletin across seven parts (Narayanswami et al., 1963; Rao, 1970; Narayanswami, Venkatesh, 1971; Subramanyam, 1973; Shukla, Anandalwar, 1973; Chakraborty, 1973; Vemban Nagarajaiah, 1974).

In 1972, the Geological Survey of India conducted a rapid reconnaissance of several potential lease-free areas in the manganese ore belt, in response to the Government of India's priority to assess manganese ore deposits with low to medium phosphorus content. This assessment aimed to meet the estimated demand for one million tonnes of manganese ore required for internal consumption in pig iron and ferro-manganese plants. Based on the reconnaissance survey, preliminary appraisals in selected blocks began in 1974, followed by detailed exploration through large-scale mapping, geophysical surveys, and sampling in 1976.

GSI carried out large scale mapping in Gobarwahi-Karli-Asalpani Sector, Kurmura-Lamanhura-Pangadi Sector, Dongri Buzurg – Chikhala Sector and Chikhala- Ghangor area of Bhandara district. Dongri Buzurg- Chikala sector and Chikala-Ghangor is in the vicinity of proposed area for exploration. Chikala block of 5 km length, the intervening area between these two large deposits is found to contain 0.5m to 2m thick horizon which is mostly gonditic and quarzitic. The ore is a supergene oxidation product, occurring as small pockets. Based on the two regional test holes, the low-grade horizon is mapped. In Chikhala-Ghanor Extension block, a small deposit of low grade, high phosphorous ore over a strike length of 690m and 1.5m is mapped.

2.2 Previous Exploration in the proposed area:

GSI conducted a reconnaissance survey during the 1971-1972 field session across the proposed and adjoining areas, covering four sectors: Chikla-Dongri Buzurg (Sector V), Chikla Extension (Sector VA), Bawanthari River-Ghanor North (Sector VB), and the area south of Sector VB (Ghanor South, Sector VC). Out of which, the sectors VB and VC are part of the proposed exploration area.

Gonditic manganese ore exposures were identified in trenches within Sectors VB and VC, forming part of the eastern continuity of the manganese ore horizon in Sector VA. The assessment of manganese ores was challenging due to extensive vein quartz debris throughout the area. However, in Sector VC, the manganese ore reef was intermittently exposed in trenches and test pits, varying in width from 1.5 to 2 meters and intercalated with gondite in certain locations. Within this region, GSI focused on mapping. Surface observations suggested that the ore was predominantly of Grade III (less than 38% Mn), although historical production records indicated Grade II quality ore (40% Mn and 0.10% P).

The GSI report recommended detailed geological mapping, sampling, and exploratory drilling to quantitatively and qualitatively assess manganese mineralization in the area.

3.0 Block Description

3.1 Proposed Kawalewada-Sakkardara block is located in Tumsar Tehsil of Bhandara district, Maharashtra, India. The area, mapped on Survey of India's Toposheet No. 55 O/14, lies between latitudes 21°31' to 21°33' and longitudes 79°47' to 79°49'.

The details of block corner points with UTM datum are mentioned below.:

Block corner points / Cardinal Points	Datum - WGS 1984, UTM Zone - 44N		Latitude	Longitude
	Easting	Northing		
A	374245.30	2383981.86	21°33'15.37"	79°47'07.87"
B	377377.70	2385152.17	21°33'54.21"	79°48'56.44"
C	377977.91	2384546.51	21°33'34.66"	79°49'17.47"
D	378754.40	2383067.38	21°32'46.75"	79°49'44.85"
E	375262.96	2381649.84	21°31'59.79"	79°47'43.87"

Table 2: Block corner points/ Cardinal points for proposed area

4.0 Planned Methodology:

The exploration will be carried out as per Mineral (Evidence of Mineral Contents) Rule-2021. Accordingly, the following scheme of exploration is formulated in order to achieve the objectives.

4.1 Topographic Survey:

The prospect area would be tied up with the triangulation network and contouring/topographical survey will be carried out in the block area and the surface features will be picked up and marked on a map on 1:10000 scale. The reduced levels and co-ordinates of boreholes would be determined. The block boundary will be surveyed by DGPS & total station in WGS-84 Datum for demarcation of Block Boundary points and ancillary area to facilitate the state governments for auctioning of block.

4.2 Geological Mapping:

Regional geological mapping on 1:12500 scale will be carried out in the entire block by taking geological traverses. The contacts of different formations, identification of different rock formation, structural features, etc., will be carried out. The geological map on 1:12500 scale will be generated based on the detail geological mapping of the block and interpretation of exploration data.

To delineate specific manganese zones, detailed geological mapping will be conducted at a 1:5000 scale over a 4 sq.km area. This will involve surface sampling, pitting, trenching, and channel sampling to map the detailed traverses of the area.

4.3 Surface Sampling:

Surface sampling will be conducted systematically to assess manganese ore mineralization in the proposed area. A grid pattern will be established, and samples will be

collected at regular intervals from various locations, including old pits, trenches, and outcrops. Total 110 surface samples will be collected and each sample will be carefully labeled and documented, noting lithological characteristics and structural features. Collected samples will be prepared and analyzed in a laboratory for manganese (Mn) content, as well as associated elements like iron (Fe) and silica (SiO_2). The results will be integrated with geological mapping data to delineate potential ore bodies and guide further exploration activities.

4.4 Pitting and Trenching:

Pitting and trenching will be conducted to expose subsurface manganese ore bodies and gather detailed geological information. Trenches will be excavated at regular intervals along pre-defined transects, typically 1 to 2 meters wide, with depths and lengths varying based on the local geology and ore body characteristics. Pits will be strategically located in areas of interest, including old workings and mineralized zones, to provide vertical profiles of the subsurface geology.

Each trench and pit will be mapped, and samples will be collected from exposed sections for laboratory analysis. The collected data will be integrated with other exploration results to accurately delineate the extent and quality of manganese mineralization in the area.

4.5 Exploratory Drilling:

Based on the results of geological mapping, sampling, and trenching, the decision regarding the area to drill the boreholes will be made.

The exploration aims to elevate the deposit to a G-3 level of exploration. Depending on the outcomes at this level, further close-spaced grid drilling will be proposed to advance the deposit to a G-2 level. This progression will assist the State Government of Maharashtra in facilitating the auctioning of the blocks.

Details of Proposed Boreholes		
Sr. No.	Proposed Boreholes	Proposed Depth to be drilled (m)
1	PBH 1	100.00
2	PBH 2	100.00
3	PBH 3	100.00
4	PBH 4	100.00
5	PBH 5	100.00
6	PBH 6	100.00
Total	06 Boreholes	600 m

Table 3: Details of proposed boreholes with drilling meterage

The depth of the boreholes may be up to 90-100 meters.

4.6 Core Sampling:

The mineralized part of drill core will be sampled as Primary sample. The length of each sample will be kept 0.50m within the ore zone depending upon the width of particular

type of manganese ore and its physical character. The representative powdered samples of (-) 200 # size will be prepared by stage wise grinding of the borehole core samples and by reducing the weight of sample by repeated coning and quartering. A final finished sample of 500 gram (- 200 mesh) will thus be prepared. One part around 100gm sample will be sent to chemical laboratory for analysis, second part will be preserved in the camp as duplicate sample, the 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 cores of rocks 3 m immediately on the footwall and 3 m immediately on the hanging wall of mineralized zones would be sampled at 1.0 m interval, as far as possible, depending upon the intensity of mineralization, change in lithology and core recovery etc.

a) Around 120 nos of core samples (100 No Primary & 20 No Check samples) might be generated from the mineralized zone intersected in the boreholes. All the primary and internal check samples for manganese mineralization will be analysed for 6 radicals' i.e. Mn, SiO2, P2O5 Fe2O3, MnO2 and Acid Insoluble.

b) Around 5% and 10% of primary samples will be sent to DGM, Chemical Laboratory and other NABL External Labs as internal and external check samples respectively for analysis of six radicals i.e., Mn, SiO2, P2O5 Fe2O3, MnO2 and Insoluble.

c) Composite samples would be prepared from the mineralized zones of primary drill core samples of each borehole as well as from the mineralized zones demarcated in the channels. A total of 30 nos. of composite sample would be generated from drill cores and be analysed for manganese mineralization i.e., Mn, SiO2, P2O5 Fe2O3, MnO2 and Acid Insoluble.

4.7 Petrographic and Mineragraphic Studies

Thin and polished section studies on outcrop samples and drill cores 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 5 specimens each for petrographic and mineragraphic studies has been kept.

4.8 Specific Gravity Determination:

To derive the tonnage factors, 20 nos manganese bearing drill core samples are proposed to be studied for specific gravity determination. The samples are to be drawn from ore zones/ mineralized zones.

5.0 Nature Quantum and Target

5.1 The exploration will involve a combination of surface sampling, pitting, trenching, geological mapping, and drilling to assess the manganese ore potential in the Kawlewada-Sakkardara Block. The detailed of quantum to be proposed is as follow:

Sl. No.	Item of Work	Unit	Proposed Quantum of work
1	Regional Geological Mapping (1:12500)	Sq.km	8.96
2	Detailed Geological Mapping (1:5000)	Sq.km	4.00
3	Surface Sampling	Nos	120
4	Pitting and Trenching	cu. m.	120
5	Exploratory Drilling Boreholes	Nos	06
6	Total drilling meterage	Meters	600
7	Sample Analysis		
	A. Primary samples (Surface samples + Core Samples)		
	i) Chemical Analysis of Surface Samples: Primary samples for 6 radicals i.e., Mn, MnO_2, Fe_2O_3, SiO_2, P_2O_5, and Acid insoluble.	Nos	120
	ii) Chemical Analysis of Core Samples: Primary samples for 6 radicals i.e., Mn, MnO2, Fe2O3, SiO2, P2O5, and Acid insoluble.	Nos	120
	B. Composite Samples (Core Samples)		
	Composite samples will be analyzed for 6 radicals i.e., Mn, MnO_2, Fe_2O_3, SiO_2, P_2O_5, and Acid Insoluble.	Nos.	30
8	Petrographic and Mineragraphic Studies	Nos	5
9	Specific gravity determination	Nos	30
10	Report Preparation (Digital format)	Nos.	--

Table 4: Nature quantum and proposed target to fulfil the exploration

6.0 Manpower Deployment

6.1 To efficiently conduct the exploration activities within the proposed timeframe, the following manpower deployment is planned:

Senior Geologist	01
Geologist	01
Junior Geologist	02
Surveyor	02
Driller	01
Assistant Driller	01
Driver	02
Labors	20

Table 5: Required Officials/ manpower for completion of proposed project

7.0 Break-up of expenditure:

7.1 The project cost with provisional escalation is estimated at say **Rs. 2,51,49,894.95**, the details of item wise cost estimate with inbuilt actual escalation and same has been considered for subsequent years for Geological and Laboratory studies and is given in Table no. 6 and the summary is given below:

Sl. No.	Item	Estimate as per SoC 2020-21
A	Geological mapping and other geological related work	₹ 71,71,000.00
B	Survey Work	₹ 10,46,800.00
C	Trenching/ Pitting	₹ 3,99,600.00
D	Drilling	₹ 92,29,100.00
E	Laboratory studies	₹ 23,13,765.00
F	**Total (A+B+C+D+E)**	**₹ 2,01,60,265.00**
G	Geological Report preparation	₹ 7,50,000.00
H	Peer Review	-
I	Provision of Exploration Proposal	₹ 4,03,205.30
J	**Total (F+G+H+I)**	**₹ 2,13,13,470.30**
K	GST (18% of Sl. No. 8)	₹ 38,36,424.65
L	**Total cost including 18% GST (I+J)**	**₹ 2,51,49,894.95**

Table 6: Estimated expenditure for the completion of project

*** Details of expenditure is provided as annexure.*

8.0 Time Schedule:

8.1 The proposed exploration scheme is scheduled to be completed within a 18-month period, including the rainy season. This timeframe encompasses all exploration activities and the preparation of the geological report. A detailed schedule is attached below.

No.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Camp Setting	■	■																
2	Topographic Survey		■	■	■	■	■												
3	Geological Mapping & Sampling		■	■	■	■	■	■	■	■									
4	Pitting/Trenching							■	■	■									
5	Surface Drilling (1 rigs)									■	■	■	■	■					
6	Survey Party days		■	■	■	■	■												
7	Geologist Man days	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
8	Sampler Man days		■	■	■	■					■	■	■	■	■				
9	Camp Winding																	■	■
10	Laboratory Studies			■	■	■	■	■	■	■	■	■	■	■	■	■			
11	Report Writing with Peer Review													■	■	■	■	■	■

Table 7: Time schedule for proposed project (in months)

9.0 References

9.1 M. Chandradas, 2006, Final Report on Prospecting And Assessment Of Manganese Ore in Gobarwahi-Karli-Asalpani Belt, Bhandara District, Maharashtra, Geological Survey Of India

9.2 A.S.Khan, Geologist (Sr) A. K. Dawande, Geologist (Sr) & & A. Chattopadhyay, Geologist (Jr), R.K. Singhai Geologist (Sr) 2005, Progress Report On Specialised Thematic Mapping In Sausar Fold Belt In Goreghat – Lendejhari Area, Balaghat District, Madhya Pradesh And Bhandara District, Maharashtra (Parts Of Toposheets No. 55 O/10 & 11) Field Season 1999-2000, Geological Survey Of India

9.3 Khan A.S., Huin A.K., and Chattopadhyay.A, 1998: Specialized Thematic Mapping in sausar belt in Deolapar and Paoni area Nagpur and Bhandara district, Maharashtra for elucidation of stratigraphy structure metamorphic history and tectonic. Records Geological Survey of India, 131(6) page 31-35

9.4 Preliminary report on appraisal of low-medium phosphorus manganese ore deposits in Chikla-Dongribuzurg sector (V) and area east of Chikla Extension sector-VA, Bhandara district, Maharashtra (Field Season 1971-72) by M. Suryanarayana Geologist (Sr.) K. G Bhoskar Geologist (Jr.) Y. V. Mahurkar Geologist (Jr.). Geological survey of India.

9.5 Suryanarayan, M. Mulay V.V and Bhoskar, K.G. (1974) Report on the reconnaitory survey of Low-medium phosphorous manganese ores in selected sectors in Nagpur District. and Bhandara District, Maharashtra. Unpub. rep. Geol. Surv. Ind.

9.6 Suryanarayan, M. Mulay V.V and Bhoskar, K.G. (1971-1972) Preliminary report on appraisal of low-medium phosphorus manganese ore deposits in Chikla-Dongribuzurg sector (V) and area east of Chikla Extension sector - VA, Bhandara district, Maharashtra (Field Season 1971-72)

Deputy Director
Directorate of Geology & Mining,
Government of Maharashtra

Officer-in-charge
Manganese Prospecting Scheme
Tah. Tumsar, Dist-Bhandara

List of Annexures and Plates

Annexure 1: Cost estimate sheet for Preliminary Explorations
Annexure 2: Field Photographs

Plate 1: Proposed block boundary with location index.
Plate 2: Proposed block boundary over existing Regional Geological map.
Plate 3: Proposed Borehole Location Map
Plate 4: Proposed block boundary over topographic map on 1:50,000.
Plate 5: Proposed block boundary over land use/ Accessibility map

DIRECTORATE OF GEOLOGY AND MINING - GOVERNMENT OF MAHARASHTRA
Cost Estimate for Preliminary Exploration (G3) at Kawlewada-Sakkardara Manganese Block
[Area 8.96 sq. km, No.of BH:6 , Borehole depth range-100 m each; Schedule timeline- 18 months]

S. No.	Item of Work *	Unit *	Rates as per NMET SoC 2020-21		Estimated Cost of the Proposal		Remarks
			SoC- Item No. *	Rates as per SoC * (a)	Qty. (b)	Total Amount (Rs) (a*b)	
A	**Geological Mapping Other Geological Work & Surveying**						
	Geological mapping, (1:12,500 scale) & Trenching , drilling work						
i	a. Charges for Geologist per day (Field) for geological mapping & trenching work, drilling	day	1.2(b)	₹ 11,000.00	320	₹ 3,520,000.00	
ii	b. Labours Charges; Base rate	day	5.7	₹ 700.00	1920	₹ 1,344,000.00	Amount will be reimbursed as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher.
	c. Charges for Geologist per day (HQ)	day	1.2 (a)	₹ 9,000.00	200	₹ 1,800,000.00	
	d. Charges for one Sampler per day (1 Party)	one sampler per day	1.5.2	₹ 5,100.00	50	₹ 255,000.00	
	e. Labours (4 Nos)	day	5.7	₹ 700.00	360	₹ 252,000.00	
	Sub Total- A					**₹ 7,171,000.00**	
B	**Survey work**						
a	DGPS Survey for BH fixation & RL determination	Per Point of observation	1.6.2	₹ 19,200.00	4	₹ 76,800.00	
b	Charges of Surveyor (1 party) for Geophysical survey layout work & Block boundary demarcation	one surveyor per day	1.6.1	₹ 8,300.00	100	₹ 830,000.00	
c	Labours Charges for survey work;	day	5.7	₹ 700.00	200	₹ 140,000.00	
	Sub-Total B					**₹ 1,046,800.00**	
C	**Trenching/Pitting**						
	a) Excavation of Trenches	per cu.m	2.1.1	₹ 3,330.00	120	₹ 399,600.00	
	Sub-Total C					**₹ 399,600.00**	
D	**DRILLING (after review)**						
1	Drilling up to 300m (Hard Rock)	m	2.2.1.4a	₹ 11,500.00	600	₹ 6,900,000.00	
2	Borehole deviation Survey by Multishot Camera	m	2.2.6	₹ 330.00		₹ -	

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)	
3	Land / Crop Compansation (in case the BH falls in agricultural Land)	per BH	5.6	₹ 20,000.00	3	₹ 60,000.00	
4	Construction of concrete Pillar (12"x12"x30")	per borehole	2.2.7a	₹ 2,000.00	6	₹ 12,000.00	
5	Transportation of Drill Rig & Truck associated per drill (2 rigs)	Km	2.2.8	₹ 36.00	4800	₹ 172,800.00	
6	Monthly Accomodation Charges for drilling Camp (up to 2 Rigs)	month	2.2.9	₹ 50,000.00	6	₹ 300,000.00	
7	Drilling Camp Setting Cost	Nos	2.2.9a	₹ 250,000.00	1	₹ 250,000.00	
8	Drilling Camp Winding up Cost	Nos	2.2.9b	₹ 250,000.00	1	₹ 250,000.00	
9	Road Making (Flat Terrain)	Km	2.2.10a	₹ 22,020.00	15	₹ 330,300.00	
10	Drill Core Preservation	per m	5.3	₹ 1,590.00	600	₹ 954,000.00	
	Sub Total D					**₹ 9,229,100.00**	

E	**LABORATORY STUDIES**						
1	**Chemical Analysis**						
i)	**Surface / Bedrock samples (10% External)**						
	a. Qualitative analysis	Nos	4.1.1	₹ 8,157.00	70	₹ 570,990.00	
	b. Qualitative analysis - external	Nos	4.1.1	₹ 8,157.00	10	₹ 81,570.00	
ii)	**Trench bed Samples from Trench**						
	a. Qualitative analysis	Nos	4.1.2	₹ 8,157.00	30	₹ 244,710.00	
iv)	**Trench Check samples (10% External)**						
	a. Qualitative analysis	Nos	4.1.2	₹ 8,157.00	10	₹ 81,570.00	
v)	**BH Core samples**						
	a. Qualitative analysis	Nos	4.1.2	₹ 8,157.00	120	₹ 978,840.00	
vi)	**BH Core Check samples (10%External)**						
	a. Qualitative analysis	Nos	4.1.2	₹ 8,157.00	30	₹ 244,710.00	
2	**Physical & Petrological Studies**						
i	Preparation of thin section	Nos	4.3.1	₹ 2,352.00	5	₹ 11,760.00	
ii	Study of thin section	Nos	4.3.4	₹ 4,232.00	5	₹ 21,160.00	
iii	Preparation of polish section	Nos	4.3.2	₹ 1,549.00	5	₹ 7,745.00	
iv	study of polished section	Nos	4.3.4	₹ 4,232.00	5	₹ 21,160.00	
v	Digital Photographs	Nos	4.3.7	₹ 280.00	5	₹ 1,400.00	
vii	Sp. Gravity	Nos	4.8.1	₹ 1,605.00	30	₹ 48,150.00	
	Sub Total E:					**₹ 2,313,765.00**	

F	**Total A to E**					**₹ 20,160,265.00**	
G	**Geological Report Preparation**	**5 Hard copies with a soft copy**	**5.2**	**5.2 (i/ii/iii/iv)**		**₹ 750,000.00**	Reimbursement will be made after submission of the final Geological Report in Hard Copies (5 Nos) and the soft copy to NMET.
H	**Peer review Charges**		**As per EC decision**				

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)	
I	**Preparation of Exploration Proposal (5 Hard copies with a soft copy)**	**5 Hard copies with a soft copy**	**5.1**	2% of the Cost or Rs. 5.0 Lakhs whichever is less		₹ **403,205.30**	EA will be reimbursed after submission of the Hard Copies and the soft copy of the final proposal along with Maps and Plan as suggested by the TCC-NMET in its meeting while clearing the proposal.
J	**Total Estimated Cost without GST**					₹ **21,313,470.30**	
K	**Provision for GST (18% of J)**					₹ **3,836,424.65**	GST will be reimburse as per actual and as per notified prescribed rate
L	**Total Estimated Cost with GST**					₹ **25,149,894.95**	
				or Say Rs. In Lakhs		₹ **251.50**	

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.**

Field Photographs

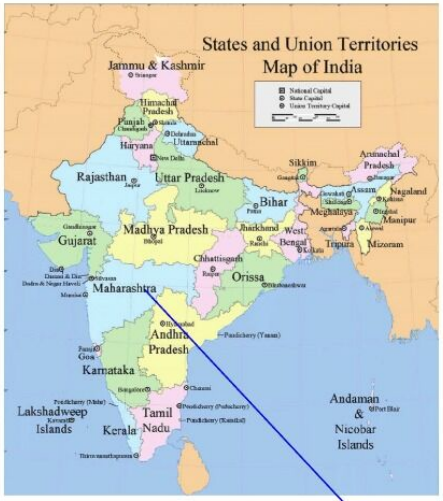
Figure 1: Presence of Muscovite Schist in the old excavated area, confirming the Mansar Formation Stratigraphy in the proposed area (Location- 377598, 2382840)

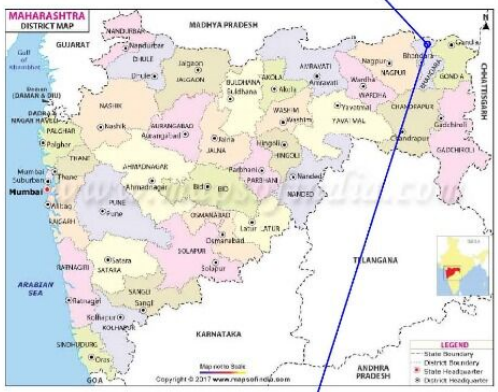
Figure 2: Old excavation on the inferred Mn reef for surficial Mn consumption by local people. Gondite Host rock is exposed in open parts. (Location: 378088, 2383207)

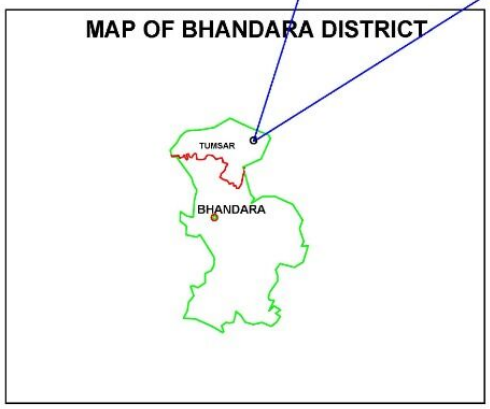
Figure 3: Waterlogged old excavated pit in the area, Mn reefs seen alongside the excavated pit wall. Regional trend for pit is E-W. (Location: 377931, 2383157)

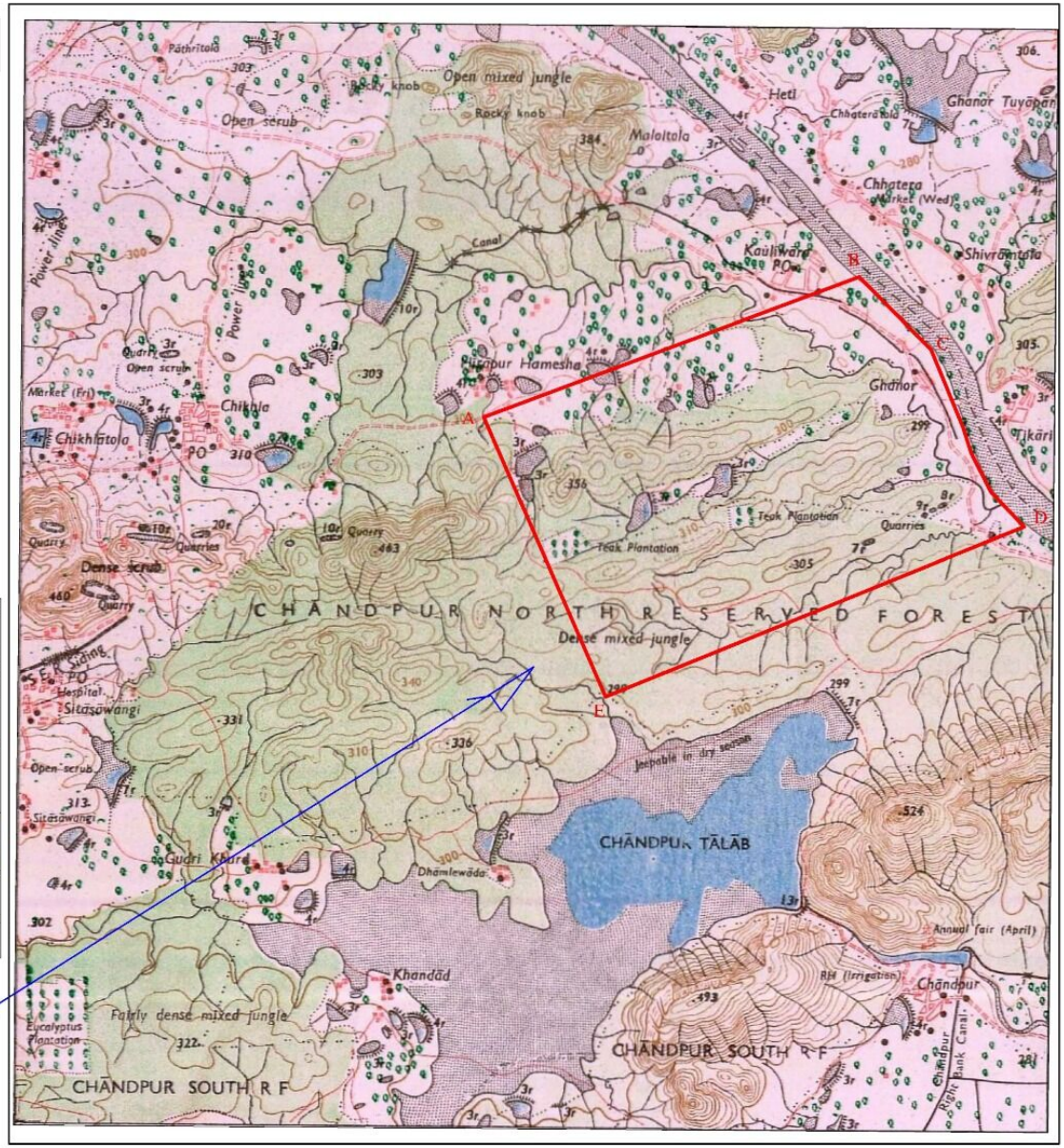
Figure 4: Unexcavated parts of Mn reef with host Gonditic rock along the inferred Mn reef. (Location- 377420, 2382882)

INDEX MAP









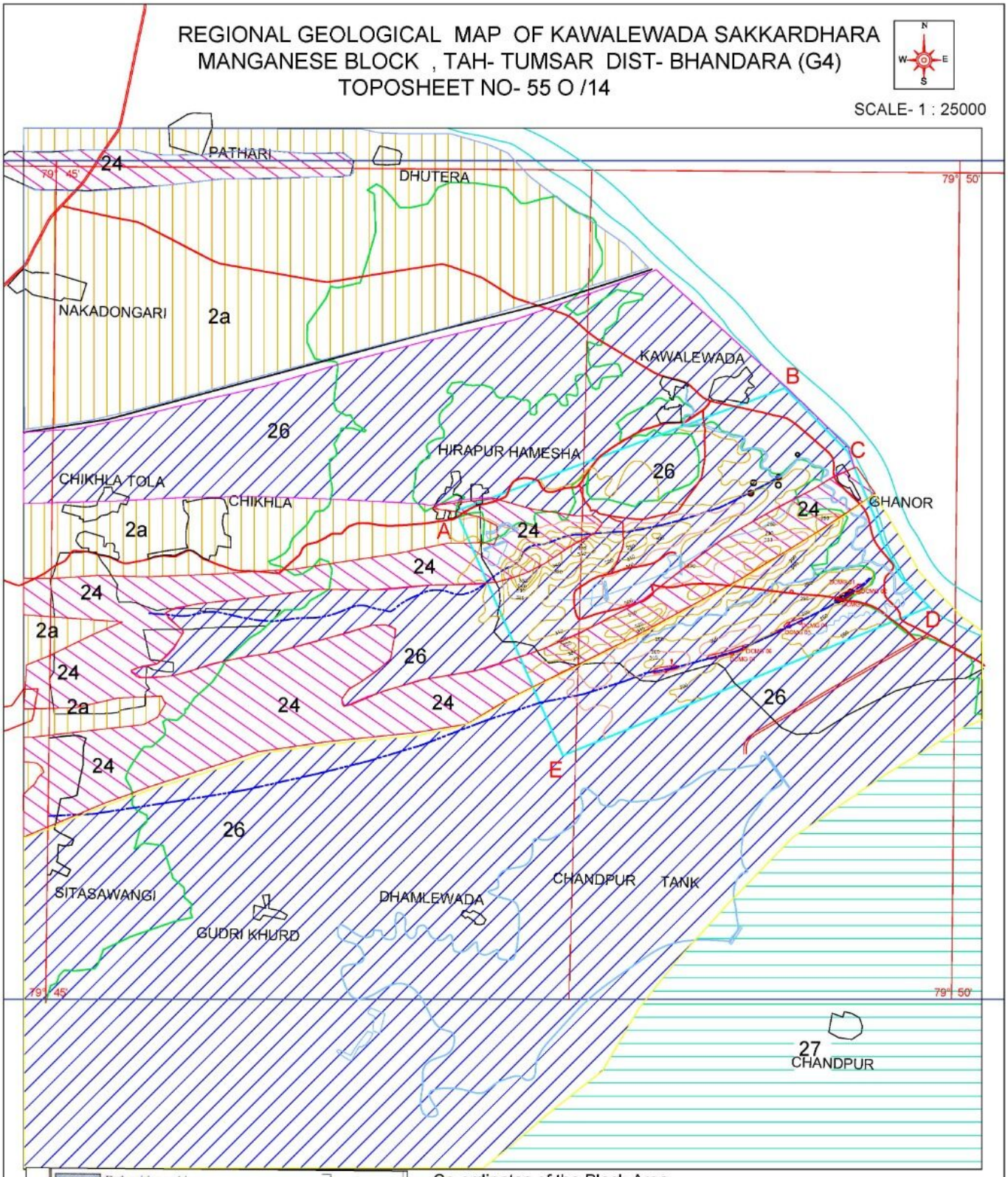
PROPOSED BLOCK (AREA 8.96 SQ.KM)

SCALE 1: 50000

DIRECTORATE OF GEOLOGY AND MINING
OFFICE OF DEPUTY DIRECTOR, NAGPUR REGION

REGIONAL GEOLOGICAL MAP OF KAWALEWADA SAKKARDHARA MANGANESE BLOCK , TAH- TUMSAR DIST- BHANDARA (G4)
TOPOSHEET NO- 55 O /14

SCALE- 1 : 25000



28	Dolomitic marble
27	Quartzite and quartz-muscovite schist
26	Muscovite-biotite schist, phyllite
25	Calc-gneiss and pink marble
24	Quartz-muscovite schist, feldspar-muscovite schist and intercaled quartzite

Sausar Group

2	Granitic gneisses
2a	Granitic gneisses with migmatite/ granite
1	Granulite

Tirodi Gneissic Complex

PR(

Co-ordinates of the Block Area

A	21° 33' 15.37"	79° 47' 07.87"
B	21° 33' 54.21"	79° 48' 56.44"
C	21° 33' 34.66"	79° 49' 17.47"
D	21° 32' 46.75"	79° 49' 44.85"
E	21° 31' 59.79"	79° 47' 43.87"

Total area ABCDE = 8.96 Sq. Km
Forest Area = 6.80 Sq. Km
Non-Forest Area = 2.16 Sq. Km

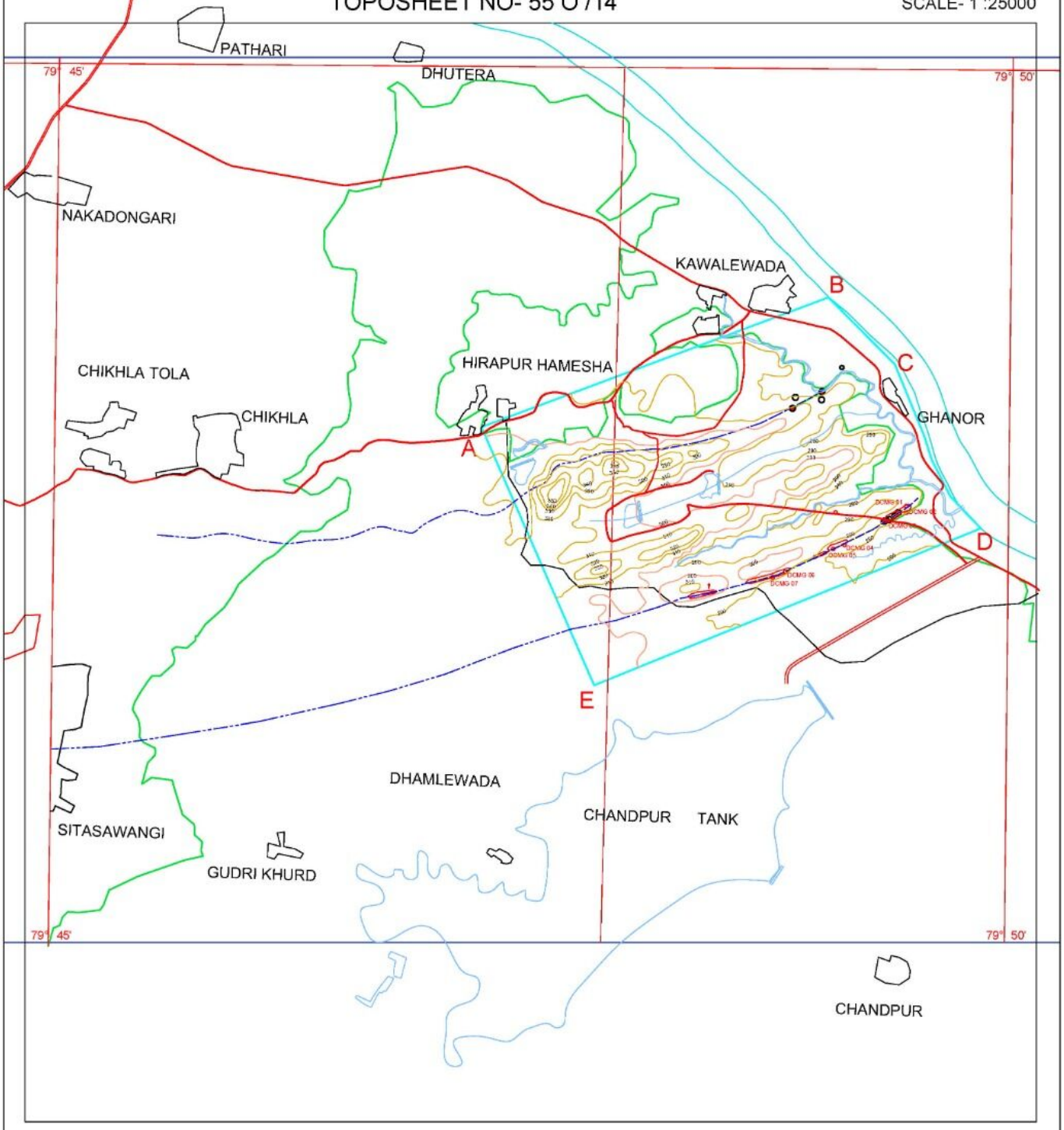
LEGEND :-

- Area ABCDE Proposed
- Sample Location,DCMG
- Old Pit
- Inferred Mn Ore body
- Forest Area

DIRECTORATE OF GEOLOGY AND MINING
GOVT. OF MAHARASHTRA
REGIONAL OFFICE NAGPUR

PROPOSED BLOCK BOUNDARY OVER TOPOGRAPHIC MAP OF KAWALEWADA SAKKARDHARA MANGANESE BLOCK (G4)
TAH- TUMSAR DIST- BHANDARA
TOPOSHEET NO- 55 O /14

SCALE- 1 :25000



LEGEND :-

- Area ABCDE Proposed
- Sample Location,DCMG
- Old Pit
- Inferred Mn Ore body
- Forest Area

Co-ordinates of the Block Area

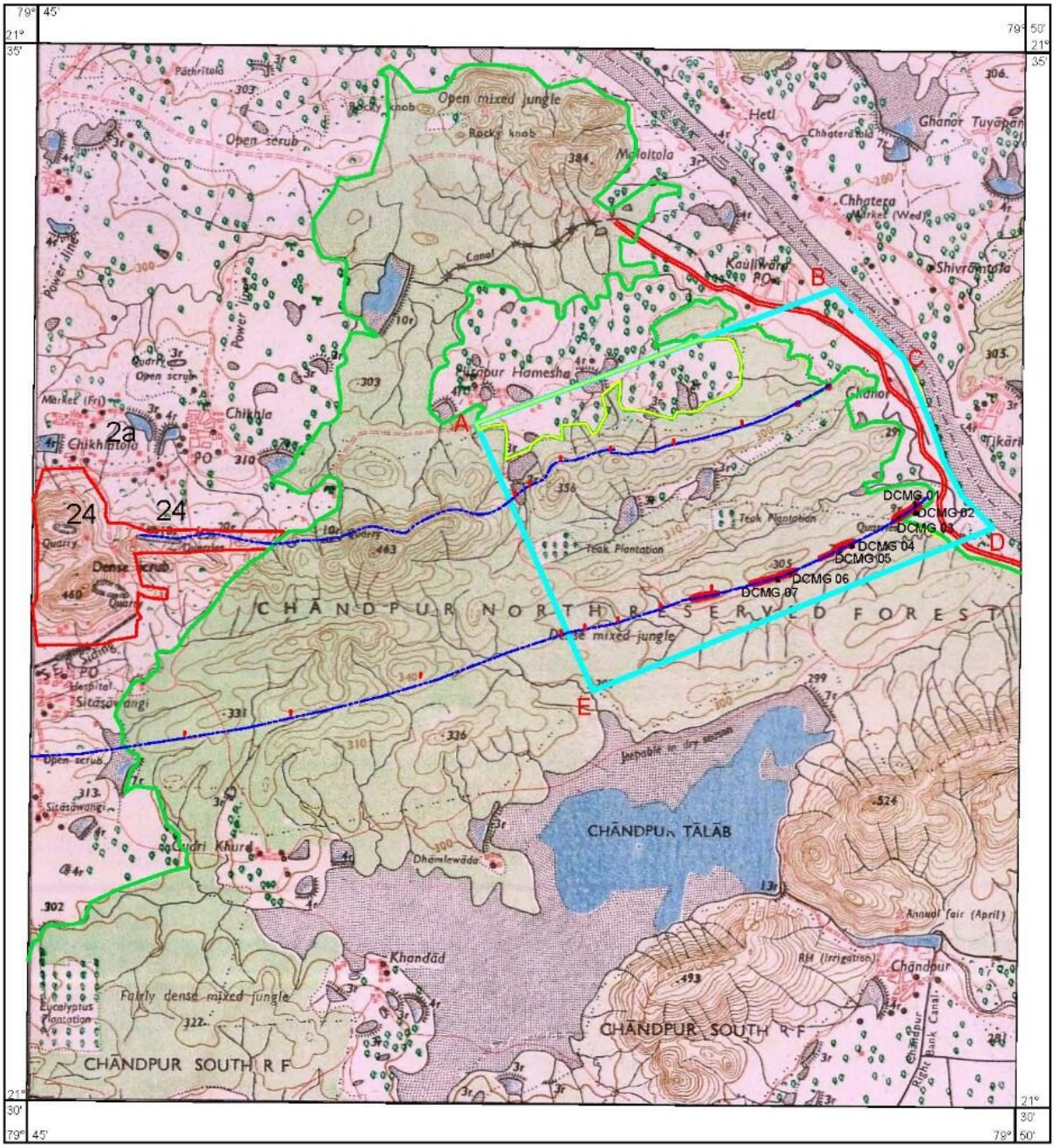
A	21° 33' 15.37"	79° 47' 07.87"
B	21° 33' 54.21"	79° 48' 56.44"
C	21° 33' 34.66"	79° 49' 17.47"
D	21° 32' 46.75"	79° 49' 44.85"
E	21° 31' 59.79"	79° 47' 43.87"

Total area ABCDE = 8.96 Sq. Km
Forest Area = 6.80 Sq. Km
Non-Forest Area = 2.16 Sq. Km

DIRECTORATE OF GEOLOGY AND MINING
GOVT. OF MAHARASHTRA
REGIONAL OFFICE NAGPUR

PROPOSED BLOCK BOUNDARY OVER TOPOGRAPHIC MAP OF KAWALEWADA SAKKARDHARA MANGANESE BLOCK (G4) TAH- TUMSAR DIST- BHANDARA TOPOSHEET NO- 55 O /14

SCALE- 1 : 50000



LEGEND :-

- Area ABCDE Proposed
- Sample Location, DCMG
- Old Pit
- Inferred Mn Ore body
- Forest Area

Co-ordinates of the Block Area

A	21° 33' 15.37"	79° 47' 07.87"
B	21° 33' 54.21"	79° 48' 56.44"
C	21° 33' 34.66"	79° 49' 17.47"
D	21° 32' 46.75"	79° 49' 44.85"
E	21° 31' 59.79"	79° 47' 43.87"

Total area ABCDE = 8.96 Sq. Km
Forest Area = 6.80 Sq. Km
Non-Forest Area = 2.16 Sq. Km

DIRECTORATE OF GEOLOGY AND MINING
GOVT. OF MAHARASHTRA
REGIONAL OFFICE NAGPUR