PROPOSAL FOR RECONNAISSANCE SURVEY FOR TUNGSTEN AND ASSOCIATED MINERALS

(G-4 STAGE)

HANSPUR BLOCK

NMET FUNDED PROJECT

DISTRICT– JHANSI
UTTAR PRADESH

By

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SEMINARY HILLS NAGPUR

Summary of the Block for Reconnaissance Survey (G-4)

GENERAL INFORMATION ABOUT THE BLOCK

	Features	Details
	Block ID	Hanspur Block (22.37 sq km)
	Exploration Agency	Mineral Exploration & Consultancy Limited (MECL)
	Commodity	Tungsten & Associated Minerals
	Mineral Belt	Quartz veins in Bundelkhand Gneissic Complex (BGC) of UP
	Completion period with entire Time schedule to complete the project	12 Months.
	Objectives	The present exploration program at G4 stage has been formulated to fulfil the following objectives: i) Preparation of Geological map on 1:12,500 Scale. ii) To assess the continuity, with thickness & quality of Tungsten mineralization in quartz vein of BGC iii) Scout boreholes to the tune of 500m will be drilled to assess the depth of mineralized zone. iv) Based on the drilling and mapping, geological resources will be estimated as per MEMC rules iv) To carry out exploration as per Minerals (Evidence of Mineral Contents) Rules, 2015, Mineral Auction Rule – 2015 and MMDR Act – 2015 as to facilitate the Government of India for auctioning of the Tungsten Block.
	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	Work will be carried out by MECL.
	Name/Number of Geoscientists	Two nos. Geoscientist (Field + HQ)
	Expected Field days (Geology, surveyor)	Geologist Party days:180 days
		Surveyor Party days: 30 days
1.	**Location**	The Tungsten Block area falls partly in Survey of India Toposheet No. 54K/14, K/15 and 54O/3, O/4 covers total area of 22.37 sq.km. The block area falls in and around the villages Hanspura, Bharatpur, Kagar, Hanspur, Magarwara; Tehsil- Mauranipur; Dist- Jhansi, Uttar Pradesh.
	Latitude and Longitude	

		Corner cardinal points of Hanspur G4 Block (22.37 sq km) **Sl. No.** / **Point** / **UTM Coordinates (m)** (Northing, Easting) / **DMS Coordinates (WGS-84)** (Latitude, Longitude) 1 / A / 2803721.33 / 299260.91 / 25° 20' 11.952" N / 79° 0' 19.776" E 2 / B / 2801261.27 / 302162.84 / 25° 18' 53.417" N / 79° 2' 4.817" E 3 / C / 2796274.33 / 297231.66 / 25° 16' 9.009" N / 78° 59' 11.228" E 4 / D / 2791490.55 / 294198.97 / 25° 13' 32.093" N / 78° 57' 25.467" E 5 / E / 2793122.39 / 292124.25 / 25° 14' 24.082" N / 78° 56' 10.467" E 6 / F / 2797288.63 / 296541.00 / 25° 16' 41.626" N / 78° 58' 46.004" E
	Villages	Hanspura, Bharatpur, Kagar, Hanspur, Magarwara
	Tehsil/Taluk	Mauranipur
	District	Jhansi
	State	Uttar Pradesh
2.	**Area (hectares/ sq. km)**	
	Block Area	22.37 sq.km (2237.00 Ha)
	Forest Area	Fairly dense mixed jungle (mainly bamboo) in the south-western part of the block and remaining area occupied by private and government land.
	Government Land Area (Bilanam)	Data not available
	Charagaha	Data not available
	Private Land Area	Data not available
3.	**Accessibility**	
	Nearest Rail Head	Jhansi Railway Station (24 Kms).
	Road	The national highway NH-39 connecting Jhansi- Mauranipur passes on the western side of the block. Motorable/ metaled roads are available in the area.
	Airport	Khajuraho around 135 km from the block
4.	**Hydrography**	
	Local Surface Drainage Pattern (Channels)	In Jhansi District, entire system of drainage is a part of Yamuna sub basin of Ganga basin. The area is mainly drained by Betwa, Pahuj, Dhasan, Sukhnai and Jamni rivers and its tributaries. These rivers are perennial in nature. The General flow direction of rivers is North to North –East and follows the slope of the area. In general drainage pattern is dendritic in nature. The Dhasan Rivers drains in the eastern part of the block in Mauranipur and Gursairai blocks. The major tributaries of Dhasan are Lakheri, Sukhai and Kureri rivers which are ephemeral in nature.
	Rivers/ Streams	Betwa on the western side of the block and Dhasan river on the eastern side.
5.	**Climate**	
	Mean Annual Rainfall	The average annual normal rainfall is 885 mm. About 91% of rainfall takes place for June to September (Monsoon Season).
	Temperatures (December) (Minimum) Temperatures (June)	January is the coldest month of the year when the mean daily maximum temperature is 24.10 °C and the mean daily minimum temperature is 9.2°C, May is the hottest month with mean daily maximum temperature is 42.6° C and mean daily minimum temperature is 28.8°C. The mean monthly maximum temperature is 32.6°C and mean minimum

	(Maximum)	temperature is 19.2°C.
6.	**Topography**	
	Toposheet Number	Part of Toposheet No. 54K/14, K/15 and 54O/3, O/4.
	Morphology of the Area	The study area forms part of Bundelkhand plateau. Low dissected hills and valley of structural origin, pediment and pediplain of denudational origin. The block area is characterized by long serrated ridges of quartz reefs.
7.	**Availability of baseline geoscience data**	
	Geological Map (1:50K/25K)	Regional geological map sourced from Bhukosh (1:50K) available.
	Geochemical Map	NGCM Data (Source: Bhukosh)
	Geophysical Map (Aeromagnetic, ground geophysical, Regional as well as local scale GP maps)	Not applicable.
8.	**Justification for taking up Reconnaissance Survey**	1. The proposed area belongs to the Bundelkhand Gneissic Complex which is well known for hosting sulphide minerals viz Pyrite and chalcopyrite in granites and older enclaves, along with large bodies of quartz vein which is hosted by tungsten and tin mineralization. 2. F.S. 2004, GSI under S.P.Nim have carried out “Reconnoitre survey of quartz reefs in Bundelkhand granitoid complex for use as abrasive/refractory minerals in parts of southern Uttar Pradesh”. During reconnaissance survey, total quartz veins were mapped in this area on 1:25000/50000 scale and collected around 201 samples which have given anomalous values for tungsten (i.e >300PPM) 3. In the proposed Hanspur block, a total 13 no of BRS samples are collected by GSI (2004) whose Tungsten analytical values range between **minimum 337 ppm to maximum 762 ppm**. Shri S.P Nim recommended for detailed tungsten investigation in this area for anomalous values of tungsten. 4. Hence, to establish strike and depth continuity of tungsten mineralization in quartz vein it is proposed for taking up the block for G4 exploration as samples collected by GSI have shown anomalous tungsten values. 5. Establishing the extent and depth continuity of the Tungsten rich quartz reef along the strike would lead to upgradation of block for G3 exploration which in turn would facilitate the Govt of India for auctioning the block.

PROPOSAL FOR RECONNAISSANCE SURVEY (G4 LEVEL) FOR TUNGSTEN & ASSOCIATED MINERALS IN THE HANSPUR BLOCK DISTRICT - JHANSI, UTTAR PRADESH

1.0.0 Introduction

Tungsten, also known as wolfram, is a very rare dense lustrous greyish-white to steel grey metal with unique properties. It has highest melting point and has highest tensile strength at temperatures above 16500C and lowest coefficient of expansion of any pure metal. Tungsten does not occur freely in nature as metal, the most important tungsten minerals are Scheelite (CaWO4), Stozlite (PbWO4) and Wolframite, which is a solid solution or a mixture or both of the isomorphous substances' ferrous tungstate (FeWO4) and Manganous tungstate (MnWO4). All primary tungsten deposits are associated with granitic intrusions or with medium-to high grade metamorphic rocks. Tungsten deposits are usually located in orogenic belt resulting from subduction related collision plates.

1.1.1 The total resources of tungsten ore in the country, as per NMI data, as on 1.04.2015 based on UNFC system, has been estimated at 87.39 million tonnes with WO3 content of 1,42,094 tonnes. All these resources are placed under 'Remaining Resources' category. Resources of tungsten-bearing minerals are mainly distributed in Karnataka (42%), Rajasthan (27%), Andhra Pradesh (17%) and Maharashtra (9%). The remaining 5% resources are in Haryana, Tamil Nadu, Uttarakhand and West Bengal.

1.1.2 Critical minerals are those minerals that are essential for economic development and national security. The lack of availability of these minerals or concentration of extraction or processing in a few geographical locations may lead to supply chain vulnerabilities and even disruption of supplies. Based on the resource/ reserve position in the country, production, import dependency, use for future technology/ clean energy, requirement of fertilizer minerals in an agrarian economy, the MOM has notified a set of 30 critical minerals and Tungsten is one of them.

1.1.3 On enactment of MMDR Amendment Act-2015, Minerals (Evidence of Mineral Contents) Rule-2015 and Mineral Auction Rule-2015, Govt. of India directed State Governments and Exploration Agencies to speed up exploration work for critical and strategic minerals, accordingly MECL has identified the proposed Hanspur block for tungsten and associated minerals at Reconnaissance (G-4) level.

2.0.0 Location and Communication

2.1.0 The Hanspur Block falls in Survey of India Toposheet No. 54K/14, K/15 and 54O/3, O/4 and is bounded by the following co-ordinates located in Jhansi district of Uttar Pradesh.

Table: 2.1

Coordinates of Corner Points of Proposed Hanspur Block (22.37 sq km)					
Sl. No.	Point	UTM Coordinates (m)		DMS Coordinates (WGS-84)	
		Northing	Easting	Latitude	Longitude
1	A	2803721.33	299260.91	25° 20' 11.952" N	79° 0' 19.776" E
2	B	2801261.27	302162.84	25° 18' 53.417" N	79° 2' 4.817" E
3	C	2796274.33	297231.66	25° 16' 9.009" N	78° 59' 11.228" E
4	D	2794186.09	295908.11	25° 15' 0.513" N	78° 58' 25.062" E
5	E	2794225.26	293292.31	25° 15' 0.495" N	78° 56' 51.590" E
6	F	2797288.63	296541.00	25° 16' 41.626" N	78° 58' 46.004" E

2.1.1 The Hanspur block is located at a distance of 24 kms from Jhansi district HQ. The nearest railway station is Jhansi. The nearest airport is Khajuraho around 135 km from the block.

2.2.0 Physiography & Drainage

2.2.1 The study area forms part of Bundelkhand plateau. The topography is undulatory plain with isolated hills rising abruptly and form steep and nearly inaccessible scarps. The block area is characterized by long serrated ridges of quartz reefs ranging in NE-SW direction.

2.2.2 The elevation of the block varies from 241m to 413m above mean sea level. The proposed block is part of Yamuna River sub basin, in general drainage pattern is dendritic in nature. The Dhasan Rivers drains in the eastern part of the block in Mauranipur and Gursairai blocks. The major tributaries of Dhasan are Lakheri, Sukhai and Kureri rivers which are ephemeral in nature.

2.3.0 Climate & Rainfall

2.3.1 Climate

January is the coldest month of the year when the mean daily maximum temperature is 24.10 °C and the mean daily minimum temperature is 9.2°C, May is the hottest month with mean daily maximum temperature is 42.6° C and mean daily minimum temperature is 28.8°C. The mean monthly maximum temperature is 32.6°C and mean minimum temperature is 19.2°C.

2.3.2 Rainfall

The average annual normal rainfall is 885 mm. About 91% of rainfall takes place for June to September (Monsoon Season).

3.0.0 Previous Work

3.1.1 The Bundelkhand area is referred by Medlicott (1859) who mapped in various parts of the present Madhya Pradesh between 1860 and 1869. Oldham (1859), Hacket (1870) and Mallet (1868) mapped the granite and gneissic rocks of Bundelkhand province as Bundelkhand Granite. The word “Bundelkhand Gneiss” was coined by Dr. A. M. Heron (1935), who considered it as the oldest rock of Archaean age and correlated it with Banded Gneissic Complex and Berach Granite of Rajasthan.

3.1.2 Gurusiddappa et al. (FS 1984-85), carried out “systematic geological mapping of 1600 sq km area on 1:50,000 scale was undertaken with the objective of mapping the different components of the Bundelkhand Granite-Gneiss Complex to evaluate its structural, petrological events, to scout for the search of mineralised belts in the area covered by granite-gneiss, greenstone, metasedimentary and metavolcanic rocks around Ajnor-Tikamgarh-Bhagwan-Khargapur area of Tikamgarh and Chhatarpur districts of Madhya Pradesh”. In this report it was mentioned about specks, stringers and thin veinlets of pyrite, chalcopyrite, covellite along the joints and minor fracture planes within the grey-gneisses. Indications of specks and stringers of pyrite and chalcopyrite with stains have been reported within the medium-grained pink rock. It was also reported about diaspore and pyrophyllites occurring in the form of pocket deposits along quartz reefs trending northeast with fracture plane within metasedimentary rocks along these reefs cutting across. Few pockets of kaolin occur within the area due to alteration of feldspars.

3.1.3 Large scale mapping and base metal exploration for an area of 600 sq.km of Bundelkhand granitic terrain in Gwalior district were carried out by Chellani and Chakraborty (2001). The chemical analysis of chip samples collected across shear zones/ lineaments at regular intervals indicate a relatively good mineralisation near Lakhnauti but poor mineralisation near Barera, Bilua, Antri and Aniti. Large scale geological mapping and analysis of channel samples collected from 800m long, 4-6m wide NNE-SSW trending shear zone revealed average copper assay value of 2100 ppm average assay width of 2.49m. The maximum value of copper mineralisation was 5625 ppm. Vikash Kumar Suman and Asrar Ahmad (2015-16) reported the presence of specks of sulphide near Sokra village during STM. Large scale mapping on 1:12,500 scale was carried out in parts of Gatholi Kalan, Dongra Khurd, Pyasa, Kusmar, Baron, Gona, Uldana Kalan and Saidpur areas. The pyrophyllite was observed within the groundmass of quartz-sericite-pyrophyllite schist affected by hydrothermal activity due to the intrusion of quartz veins.

3.1.4 During the F.S. 2016-2018, GSI carried out Application of Hyperspectral / Multispectral Remote Sensing techniques to prepare Alteration / Mineralized Zone in Tikamgarh and Jhansi Districts of Madhya Pradesh and Uttar Pradesh respectively. Sulphide and carbonate minerals, such as pyrite, chalcopyrite, azurite and malachite respectively, have been identified during the field work near Laron, Murara, Parara, Kumarpura, Sakera and Baron.

3.1.5 S.P. Nim of Geological Survey of India, during Annual Programme 2000-2001, worked in the region and in his report (February 2004) titled “Report on Reconnoitory Survey of Quartz Reefs in Bundelkhand Granitoid Complex for use as Abrasive/Refractory Minerals in parts of Southern Uttar Pradesh (Item No. MIP/NR/UP/2000/003)”. During reconnaissance survey, total quartz veins were mapped this area on 1:25000/50000 scale and collected around 201 geochemical samples which have given anomalous values for tungsten (i.e >300PPM with a maximum of 1000PPM) had found Tungsten (W) in quartz samples and recommended that Quartz reefs of BGC, have quite promising concentration of tungsten and can be searched for tungsten deposits.

3.1.6 In the proposed Hanspur block a total 13 no of geochemical samples are collected by GSI (2004) whose Tungsten analytical values range between minimum 337 ppm to maximum 762 ppm, which is anomalous for tungsten mineralization. Shri S.P Nim recommended for detailed tungsten investigation in this area.

3.1.7 Mineral Exploration and Consultancy Limited (MECL) has carried out G4 level exploration, which included geological mapping with collection of BRS/SSS/ Soil sampling in Tarichar Khurd block, District: Niwari, State: Madhya Pradesh. This block lies at about 37 km from the proposed block.

3.1.8 MECL based on the exploration work carried out in G-4 level, potential Tungsten bearing areas were marked, where tungsten (W) mineralization is associated with quartz reefs of the block along the complete strike length of the exposed quartz reefs. The quartz reef situated near Devendrapura village has sample collected and analysed for W which has analysed to a value up to 444.62 ppm and also scheelite has been confirmed under short-wave UV ray survey near the high value sample’s location. In Taraichar khurd block, a total of 153 nos. of bed rock, 16 nos. of stream sediment and 25 no. of channel samples have been analysed for tungsten, in which W concentration ranges from 1.34 to 529.28ppm.

3.1.9 Based on the positive anomaly and potential area demarcated for Tungsten (W) mineralization, MECL upgraded the G4 block into Murara(A) and Devendrapura(B) blocks for G3 exploration. The exploration work is currently in progress.

4.0.0 Geology of the Area

4.1.1 The study area at central part of the Archaean Bundelkhand granite-gneissic complex (~ 3.59 Ga; Saha et al., 2015) comprises granitoid varieties in different shades of colour such as porphyritic and non-porphyritic coarse grained pink granite, medium to fine grained granite with small to large enclaves of older metamorphics/supracrustals. Other important lithounits of study area are linear bodies of quartz reef which from prominent geomorphic features with positive relief in the study area. Supracrustal enclaves are part of green stone belt represented by volcano-sedimentary sequence.

4.1.2 The late phase of igneous activity is manifested by the intrusion of very large bodies of quartz reef. The quartz reefs are prominent in the area and form long ridges. Their outcrop pattern varies from lenticular to elongated ridges with multiple branching at the places. The quartz reefs in the mapped area show NNE-SSW to NE-SW general trend. In this quartz reef we also found the patches of highly crushed and brecciated silicified masses of dark chocolate coloured. In these crushed masses the network of milky quartz veins is absent instead we found clast and fragment of milky quartz which indicate later phase brecciation by which network of milky quartz veins gets crushed and fragmented. In this quartz reef we observed very good cross- cut relationship between at least two generation of quartz veins in the older veins. Conspicuous solution structure such as comb structure is also well developed. At many places, iron encrustations have also been found.

4.1.3 The litho-stratigraphic sequence of the proposed block from is depicted in the table below.

Stratigraphic Sequence of the Hanspur block(G-4)

	Soil/Alluvium
Intrusive	Quartz vein, Dolerite dyke, Quartz reefs, Carbonatite veinlets.
Bundelkhand Granite	Fine grained pink granite, Medium grained granite, Coarse grained pink granite, Coarse grained pink porphyritic granite, Coarse grained grey granite.
Newer Metamorphic Group	Banded Iron Formation (BIF)
Older Metamorphics	Amphibolites, Granodiorite/ Micro-granodiorite

4.1.4 **Common Rock Types**

Various lithounits exposed in the block area and described in the following paragraphs:

4.1.4.1 **Bundelkhand Granite**

(1) The Bundelkhand massif is majorly occupied by a large plutonic complex of a batholithic dimension known as Bundelkhand granite. The emplacement of younger Bundelkhand granitoids is suggested to be resultant of collision related tectonics during the Neoarchean period (Mondal et al., 2002). Based on mutual field relations and petrography, three types of granites were recognized by Basu (1986); (i) coarse grained porphyritic granite, (ii) medium grained porphyritic granite, and (ii) leucogranite, each with numerous sub-types. Four categories of granite have been broadly classified by Roy and Purohit (2018) based on accessory minerals viz; biotite granite, hornblende granite, hornblende-biotite granite and leucogranite. The

granitoids range in composition between quartz diorite and K-feldspar bearing granite. As per the compiled geological map of the study area by Geological Survey of India.

(2) In the area mainly coarse-grained porphyritic granite, medium grained granite and fine-grained granite are prominently exposed. The medium-grained porphyritic granite has the maximum aerial extent. In the block majority of the granite are pinkish in colour and a few places small outcrops of grey granites are exposed.

4.1.4.2 **Quartz Reefs**

(1) One of the most outstanding features of the Bundelkhand Craton is the occurrence of NE–SW trending giant quartz reefs, which occur as large linear hills/ridges rising sharply above the ground over the basement gneisses and granitoids and form prominent physiographic features. Formation of these reefs is considered to be the outcome of tectonically controlled hydrothermal activity along vertical to sub vertical shear zones that formed in response to extensional tectonics at 2.1–2.0 Ga (Pati et al., 2007; Bhattacharya and Singh,OP cit).

(2) In the area major quartz reefs are also trending in NE–SW direction almost in all portions of the block. The quartz reefs are of various colours viz. milky to dull white, buff, greenish, greyish and jasper varieties of quartz are also seen. Dull white, milky white and pinkish white or reddish white or buff colour quartz are common. No pattern is discernible in the disposition of different colours of quartz. These quartz reefs have sharp contact with the granitic rocks of BGC and contact is generally covered by scree/debris/soil. Secondary quartz veins in the quartz reefs are frequently seen. At places, quartz reefs exhibit deep red ferruginous coating on the quartz crystals, which suggests that ferruginous solution activity has taken place in the quartz reef.

(3) Quartz reefs generally show pinching and swelling nature along the strike and also die out probably due to soil cover in between the exposures of reefs. Brecciation and shattering are commonly noted in the reefs and these have undergone polyphase deformation represented by lineaments, faults, different set of secondary quartz veins, different sets of quartz reef. Secondary quartz veins, composed of white quartz, are frequently observed in the quartz reefs.

(4) Above mentioned quartz reefs are the source of Tungsten mineralization in the proposed block along the strike length.

4.1.4.3 **Banded Iron Formation (BIF)**

(1) Banded Iron Formation (BIF) is exposed as linear discontinuous ridges occurring within medium to coarse-grained pink granite and migmatites. BIF is the most conspicuous in the enclave suite of Bundelkhand Massif and is widespread. Compositionally they are banded quartz-magnetite rock, banded magnetite-grunerite rock and banded quartz-grunerite-garnet-actinolite rock. These form low mounds in a peneplained granitic country.

4.1.5 **Justification for taking up the project**

(1) The proposed area belongs to the Bundelkhand Gneissic Complex which is well known for hosting sulphide minerals viz Pyrite and chalcopyrite in granites and older enclaves, along with large bodies of quartz vein which is hosted by tungsten and tin mineralization.

(2) F.S. 2004, GSI under S.P.Nim have carried out “Reconnoitre survey of quartz reefs in Bundelkhand granitoid complex for use as abrasive/refractory minerals in parts of southern Uttar Pradesh”

(3) During reconnaissance survey, total quartz veins were mapped in this area on 1:25000/50000 scale and collected around 201 geochemical samples which have given anomalous values for tungsten (i.e >300PPM)

(4) In the proposed Hanspur block a total 13 no of BRS samples are collected by GSI (2004) whose Tungsten analytical values range between minimum 337 ppm to maximum 762 ppm, which is anomalous for tungsten mineralization. Shri S.P Nim recommended for detailed tungsten investigation in this area.

(5) Hence, to establish strike and depth continuity of tungsten mineralization in quartz vein it is proposed for taking up the block for G4 exploration as samples collected by GSI have shown anomalous tungsten values.

(6) Establishing the extent and depth continuity of the Tungsten rich quartz reef along the strike would lead to upgradation of block for G3 exploration which in turn would facilitate the Govt of India for auctioning the block.

5.0.0 Proposed Exploration Programme

5.1.0 Objectives:

The present exploration programme has been formulated to fulfil the following objectives:

1. Preparation of Geological map on 1:12,500 Scale.
2. To assess the continuity, with thickness & quality of Tungsten mineralization in quartz vein of BGC.
3. Scout boreholes to the tune of 500m will be drilled to assess the depth of mineralized zone.
4. Based on the drilling and mapping, geological resources will be estimated as per MEMC rules.
5. To carry out exploration as per Minerals (Evidence of Mineral Contents) Rules, 2015, Mineral Auction Rule – 2015 and MMDR Act – 2015 as to facilitate the Government of India for auctioning of the Tungsten Block.

5.2.0 Scheme of Exploration

To fulfil the objective as given in para 6.0.0, exploration will be carried out in two phases, as given below:

5.2.1 Phase-I

(a) To carry out geological mapping with collection of surface geochemical samples on 1:12,500 scale.

(b) To carry out Trenching work (200 Cu.m) to expose and confirm the strike continuity of the ore body

5.2.2 Phase II

(a) Upon positive interpretation of Geological mapping with collection of samples, trenching and trench sampling, scout drilling involving about 500m will be to carried out to confirm the strike and depth continuity of mineralized zones.

(b) To estimate Reconnoitre ore resources at G4 level as per UNFC norms and Minerals (Evidence of Mineral Contents) Rules 2015

5.3.0 Exploration Scheme

5.3.1 **Detailed Geological Mapping:**

1) The total study area of 22.37 sq. km will be mapped on 1:12,500 scale with the exposures of tungsten and associated mineralisation etc. as available along with the structural details marked on a plan before going for activities like sampling, pitting/trenching etc. A geological plan with pits/trenches, surface features etc. on 1:12,500 scales is to be prepared and finalized before finally leaving the worksite after completion of all exploratory activities. Along with this, luminescent survey will be carried out to locate the potential tungsten bearing areas.

2) Survey: The Block boundary will be surveyed by regular GPS in WGS-84 datum for demarcation of block boundary/corner points. During exploratory drilling all Boreholes will be fixed on the ground whose RL's and co-ordinates will be determined by DGPS.

5.3.2 Geochemical Sampling

5.3.2.1 **Surface sampling (Bed Rock/Soil Sampling):**

During the course of Geochemical Sampling the bed rock and soil samples shall be collected from the exposures for tungsten and associated mineralisation. A total of 100 no of primary samples from bed rock samples will be collected for chemical analysis for assay of 34 elements by ICP-AES/ICP-MS (viz. Li Be B P Sc Ti V Cr Mn Ni Co Cu Zn As Sr Nb Mo Cd Sn Cs Ba La Ta W Pb Bi U Na Mg Al Si K Ca Fe) to delineate the ore zones. In connection with this night traverses will be taken on the Quartz Reef ridges with UV lamp to detect the fluorescence of any tungsten bearing minerals. Total 10 nos of external check samples (10%) will also be analysed for assay of 34 elements by ICP-AES/ICP-MS (viz. Li Be B P Sc Ti V Cr Mn Ni Co Cu Zn As Sr Nb Mo Cd Sn Cs Ba La Ta W Pb Bi U Na Mg Al Si K Ca Fe).

5.3.2.2 **Pitting and Trenching**

Shallow trenching (Excavation) shall be carried out in the tungsten anomaly zones identified based on the results of geochemical sampling. A provision of shallow trenching on mineralized zones (if any) with 200 cubic meters is kept. Locations of

trenches on ground will be decided by field geologist based on tungsten anomaly zones identified and field observations. A provision of 150 nos of primary samples (34 elements by ICP-AES/ICP-MS (viz. Li Be B P Sc Ti V Cr Mn Ni Co Cu Zn As Sr Nb Mo Cd Sn Cs Ba La Ta W Pb Bi U Na Mg Al Si K Ca Fe)) & 15 nos of check (10% External) trench samples are kept for analysis.

5.3.3 **Mineragraphic and Petrographic Studies:**

During the course of Geochemical sampling 10 samples from various lithounits from surface will be studied for petrography in thin section and 10 samples from mineralized zones will be studied for the mineragraphy (ore mineral assemblages and their distribution, alteration, enrichment etc.) in polished sections.

5.3.4 **Scanning Electron Microprobe Studies**

Scanning Electron Microprobe (SEM) has been used for elemental identification and semi-quantitative compositional information of samples with high resolution image of the mineral phases. 10 nos. of tungsten bearing quartz reefs samples to be studied in the SEM-EDX to know the mineralogical and geochemical characteristics of the recorded minerals in the intrusive vein and host rock.

Samples which are positive with tungsten anomalies will be studied.

5.3.5 **Electron Probe Micro-Analysis Studies**

Electron Probe Micro-Analyzer (EPMA) is an analytical tool used to non-destructively determine the chemical composition of small volume of solid materials. Ten numbers of polished thin sections of quartz reef will be collected.

Samples which are positive with tungsten mineralization (wolframite / Scheelite) anomalies will be studied.

5.3.6 **X-Ray Diffraction Studies:**

A total of 10 nos tungsten bearing samples representing the deposit will be subjected to X-Ray Diffraction studies to know about the general distribution pattern of the constituent minerals of the ore.

5.3.7 **Core Drilling:**

As mentioned above after the completion and review of Phase I exploration work, Phase II involving 500m of core drilling will be carried out. The boreholes will be planned based on the geological mapping, bed rock, pitting/trenching, etc. sampling carried out in the Phase I G4 level exploration programme.

5.3.8 **Core Logging:**

Geological core logging will be carried out systematically by recording carefully the minute details and physical/lithological characters of the rock formations including colour, core recovery, grain size, weathered zone, texture, banding, mineralogical composition, micro-structural/structural details, lithological variations along with visual estimate and under short wave UV light in respect of tungsten ore in boreholes.

5.3.9 **Core Sampling:**

For preparation of samples, the borehole core will be splitted into two equal halves by using core splitter. One half will be powdered to (-) 200 mesh size and the other half

will be kept for future studies. The powdered material will be mixed thoroughly and about 100 gram of samples will be taken for chemical analysis by successive coning and quartering as composite samples and rest of the material (-200 mesh size) will be kept as duplicate half for future reference. It will generate about 100 Nos. core samples and10 nos. check samples (10% External check of composite samples).

5.3.10 **Chemical Analysis:**

All the primary core samples i.e. 100 nos. and check samples will be analysed by ICP-AES/ICP-MS for 34 elements (viz. Li Be B P Sc Ti V Cr Mn Ni Co Cu Zn As Sr Nb Mo Cd Sn Cs Ba La Ta W Pb Bi U Na Mg Al Si K Ca Fe) which may be variable as per indication of other mineralisation. About 10% of primary samples i.e. 10 nos. will be sent to NABL external laboratory as check samples for analysis of 34 elements (viz. Li Be B P Sc Ti V Cr Mn Ni Co Cu Zn As Sr Nb Mo Cd Sn Cs Ba La Ta W Pb Bi U Na Mg Al Si K Ca Fe)

5.3.11 **Specific Gravity:**

5 nos. samples from drill core of mineralised quartz reef from the boreholes will be subjected to specific gravity determination at MECL petrology laboratory by Walker steel yard balance method. This will be used for resource estimation.

5.3.12 Quantum of Work:

The proposed quantum of exploratory work (G4) in the Hanspur block is furnished in Table-5.2

Table 5.2: Proposed Quantum of Work, G4 stage Exploration in Hanspur Block

S. No	Item details	Unit	Quantum
PHASE-I			
1	Geological Mapping (LSM) (1:12,500 scale)	Sq. Km.	22.37
2	Bore Hole Fixation and determination of co-ordinates & Reduced Level (RL) of the boreholes and one reference point by DGPS	Nos.	06
3	Trenching	C .um	200
4	Laboratory Studies		
a) (i)	Bedrock rock samples to be analysed for 34 elements viz. Li Be B P Sc Ti V Cr Mn Ni Co Cu Zn As Sr Nb Mo Cd Sn Cs Ba La Ta W Pb Bi U Na Mg Al Si K Ca Fe	Nos.	100
(ii)	Check samples (10% external) for 34 elements viz. Li Be B P Sc Ti V Cr Mn Ni Co Cu Zn As Sr Nb Mo Cd Sn Cs Ba La Ta W Pb Bi U Na Mg Al Si K Ca Fe	Nos.	10
b)	Trench Samples		
(i)	Primary samples to be analysed for 34 elements viz. Li Be B P Sc Ti V Cr Mn Ni Co Cu Zn As Sr Nb Mo Cd Sn Cs Ba La Ta W Pb Bi U Na Mg Al Si K Ca Fe	Nos.	150
(ii)	Check samples (10% external) for 34 elements viz. Li Be B P Sc Ti V Cr Mn Ni Co Cu Zn As Sr Nb Mo Cd Sn Cs Ba La Ta W Pb Bi U Na Mg Al Si K Ca Fe	Nos.	15
c)	XRD Studies	Nos.	10

S. No	Item details	Unit	Quantum
5	Complete Petrographic Studies	Nos.	10
6	Complete Mineragraphic Studies	Nos.	10
7	Study of Thin section	Nos.	10
8	SEM-EDX Studies	Per hour	16
9	EPMA Studies	Per hour	16
PHASE-II			
10	Core Drilling	M	500
11	Chemical Analysis for Core Samples		
a)	Primary samples to be analysed for 34 elements viz. Li Be B P Sc Ti V Cr Mn Ni Co Cu Zn As Sr Nb Mo Cd Sn Cs Ba La Ta W Pb Bi U Na Mg Al Si K Ca Fe	Nos	100
b)	Check samples (10% external) for 34 elements viz. Li Be B P Sc Ti V Cr Mn Ni Co Cu Zn As Sr Nb Mo Cd Sn Cs Ba La Ta W Pb Bi U Na Mg Al Si K Ca Fe	Nos	10
12	Specific Gravity	Nos.	5
13	Geological Report Preparation {As per Mineral (Evidence of mineral contents) Rule-2015}	Nos.	1

6.0.0 Time Schedule and Cost Estimates

6.1.0 Time Schedule:

The field work will take 04 months for completion Phase I exploration work. The sampling work will take 03 months overlapping 01 month with geological mapping. Laboratory studies will take 02 months overlapping 01 month with sampling work. Thus, Phase I exploration work will be completed in 06 months. Review will be taken up after completion of Phase- I. Phase II will begin after the outcome of Phase I and recommendation of TCC. Phase II core drilling will take another 04 months for completion. Core sampling will take 02 months overlapping with drilling for 02 months. Laboratory studies will take 02 months overlapping with sampling for 01 month. Preparation of Geological Report will take another 02 months to complete overlapping with lab. studies for 01 month. Thus, the total duration of the project will be of 12 months.

Table 6.1

TIME SCHEDULE/ACTION PLAN FOR RECONNAISSANCE SURVEY (G-4) FOR TUNGSTEN & ASSOCIATED MINERALS IN HANSPUR BLOCK, DISTRICT - JHANSI, UTTAR PRADESH.

Sl. No.	Activities	Unit	MONTHS												
			1	2	3	4	5	6		7	8	9	10	11	12
1	Camp Setting	day							REVIEW						
2	Geologist Party days in Field (1 Party)	day													
3	Survey Party days (1 Party)	day													
4	Core Drilling (1 rig)	m.													
5	Sampling Party days, Core Sampling	day													
6	Camp Winding	day													
7	Laboratory Studies	Nos.													
8	Geologist Party days in HQ (1 Party)	day													
9	Report Writing & Peer review	day													
NOTE:															
1	**Commencement of project may be reckoned from the day the exploration acreage is available along with all statutory clearances.**														
2	**Time loss on account of monsoon/agricultural activity/forest clearance/local law & order problem/ lockdown etc. will be additional to above time line.**														

6.2.0 Cost Estimates:

Tentative cost has been estimated based on Schedule of Charges (SoC) of projects funded by National Exploration Trust (NMET).

The total cost estimate of **Rs. 186.94 Lakhs** is being proposed for completion of exploratory work up to G4 level. Activity wise break-ups of the same are furnished below:

Table 6.2

Sl. No.	Item	Total
1	Geological Work	30,98,312.00
2	Mineral Investigation (Pitting/Trenching,Core Drilling,etc.)	83,63,600.00
3	Laboratory Studies	33,02,455.00
4	**Sub total**	**1,47,64,367.00**
5	Report	7,38,218.35
6	Peer Review	30,000.00
7	Proposal Preparation	3,10,051.71
	Total	**1,58,42,637.06**
8	GST (18%)	28,51,674.67
Total cost including 18% GST		**1,86,94,311.73**
SAY, in Lakhs		**186.94**

REFERENCES

1. Chellani, S.K. and Chakraborty, Uttam. (2001): Lakhnauti basemetal occurrence in Bundhelkhand Craton, District, Gwalior, Madhya Pradesh.
2. MECL (2022): Geological Report on Reconnaissance Survey (G-4) For Copper, Lead, Zinc and Gold in Laron Block, District: Jhansi, State: Uttar Pradesh
3. S.P. Nim (2004): Report on Reconnoitory Survey of Quartz Reefs in Bundelkhand Granitoid Complex for use as Abrasive/Refractory Minerals in parts of Southern Uttar Pradesh.

Annexures:

1. Location Plan
2. Regional Geological Plan
3. Block Geological plan with Samples

78°57'30"E

79°0'0"E

25°20'0"N

25°17'30"N

25°15'0"N

627
873
662
805
618
573
731
606
674
877
755
750
614
639
679
679
572
493337
719
759
627
719
762
68
68
75
70
69
75

N
W
E
S

Geology Map showing Proposed Bangra Block (over an extent of 22.37 sq. km.), Jhansi District, Uttar Pradesh.

Legend

PROPOSED BANGRA BLOCK

GSI SAMPLE LOCATION WITH TUNGSTEN VALUES

LITHOLOGY

- AMPHIBOLITE
- COARSE GRAINED, PORPHYRITIC GRANITE
- FINE GRAINED GRANITE
- FINE GRAINED PINK GRANITE
- MEDIUM GRAINED GRANITE
- PEGMATITE/ACID INTRUSIVES/QUARTZOFELDSPATHIC VEINS

DYKE

- APLITE
- QUARTZITE
- QUARTZ REEF
- BASALT
- DOLERITE
- CLEAVAGE/FOLIATION/SCHISTOSITY (S1)

1:50,000

1 0.5 0 1 2 3 4 Kilometers

Regional Geology Map showing Proposed Bangra Block (over an extent of 22.37 sq. km.), Jhansi District, Uttar Pradesh.

N

78°45'0"E 78°50'0"E 78°55'0"E 79°0'0"E 79°5'0"E 79°10'0"E

25°25'0"N 25°20'0"N 25°15'0"N 25°10'0"N

Legend

PROPOSED BANGRA BLOCK

LITHOLOGY

- ALLUVIUM
- AMPHIBOLITE
- CHLORITE SCHIST
- COARSE GRAINED, PORPHYRITIC GRANITE
- ENCLAVES OF OLDER METAMORPHICS (UNCLASSIFIED)
- FINE GRAINED GRANITE
- FINE GRAINED PINK GRANITE
- GRANITE GNEISS
- GREY MICACEOUS SAND, SILT AND CLAY
- GREY SAND, SILT AND CLAY
- MEDIUM GRAINED GRANITE
- MEDIUM GRAINED PINK GRANITE
- METASEDIMENTS
- MIGMATITE
- PEGMATITE/ACID INTRUSIVES/QUARTZOFELDSPATHIC VEINS
- SAND/CHANNEL ALLUVIUM
- SILT-CLAY WITH KANKAR & QUARTZO-FELSPATHIC SAND

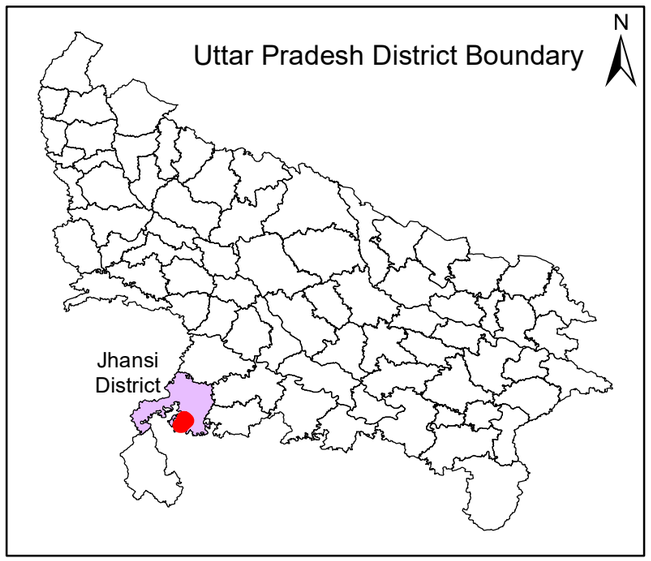
DYKE

- APLITE
- QUARTZITE
- QUARTZ REEF
- QUARTZ VEIN
- BASALT
- DOLERITE
- BEDDING
- CLEAVAGE/FOLIATION/SCHISTOSITY (S1)
- JOINT

1:50,000

2 1 0 2 4 6 8 Kilometers

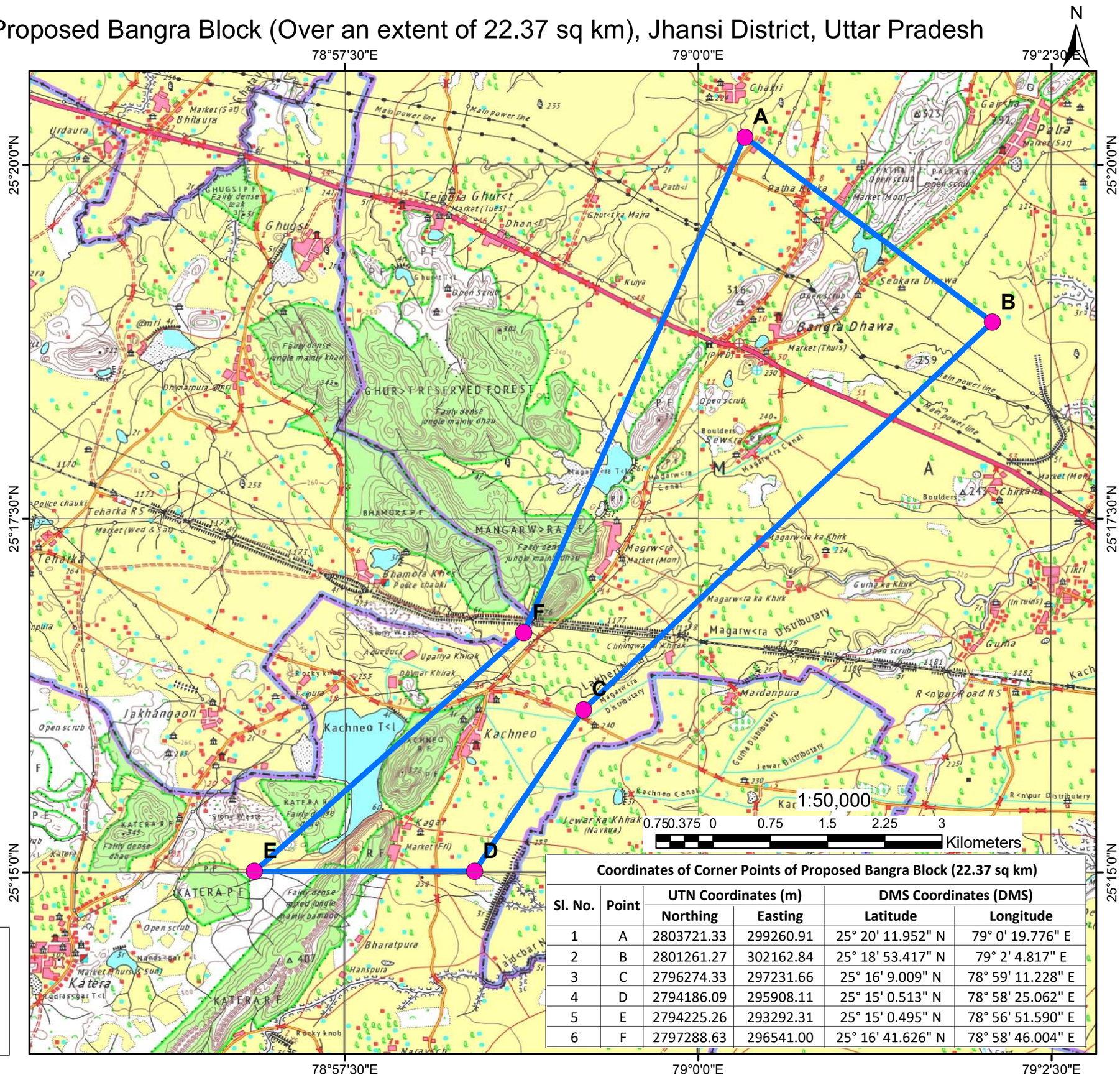
Location Map showing Proposed Bangra Block (Over an extent of 22.37 sq km), Jhansi District, Uttar Pradesh



Source: Part of Toposheet No. 54K/15 and 54O/3

Legend

- Corner Points of Proposed Bangra Block
- Proposed Bangra Block



Coordinates of Corner Points of Proposed Bangra Block (22.37 sq km)

Sl. No.	Point	UTN Coordinates (m)		DMS Coordinates (DMS)	
		Northing	Easting	Latitude	Longitude
1	A	2803721.33	299260.91	25° 20' 11.952" N	79° 0' 19.776" E
2	B	2801261.27	302162.84	25° 18' 53.417" N	79° 2' 4.817" E
3	C	2796274.33	297231.66	25° 16' 9.009" N	78° 59' 11.228" E
4	D	2794186.09	295908.11	25° 15' 0.513" N	78° 58' 25.062" E
5	E	2794225.26	293292.31	25° 15' 0.495" N	78° 56' 51.590" E
6	F	2797288.63	296541.00	25° 16' 41.626" N	78° 58' 46.004" E