

**PROPOSAL FOR PRELIMINARY EXPLORATION (G-3 STAGE) OF CRITICAL
MINERALS IN ATRAR BLOCK (AREA: 23.76 SQ KM)
DISTRICT-CHHATARPUR, MADHYA PRADESH**

COMMODITY: CRITICAL MINERALS

**MINERAL EXPLORATION AND CONSULTANCY LIMITED
DR. BABASAHAH AMBEDKAR BHAWAN
SEMINARY HILLS**

PLACE: NAGPUR

DATE: DECEMBER,2025

Summary of the Block for Preliminary Exploration (G-3 Stage)

GENERAL INFORMATION ABOUT THE BLOCK

Features	Details
Block ID	Atrar Block
Exploration Agency	Mineral Exploration and Consultancy Limited (MECL)
Commodity	Critical Minerals
Mineral Belt	Bundelkhand Gneissic Complex
Completion Period with entire Time schedule to complete the project & Estimated Cost	15 months with about 291.50 Lakhs rupees.
Objectives	<p>Based on the evaluation of geological data available, the present exploration program has been formulated to fulfill the following objectives:</p> <p>PHASE-I</p> <ol style="list-style-type: none">i. Upgradation of previous GSI Mapii. Bedrock sampling and trenching to identify the zone hosting critical minerals and to identify a mineralization rich area of about 3 m for further exploration. <p>PHASE-II</p> <ol style="list-style-type: none">iii. Geophysical Electro-magnetic sounding only in the identified mineral rich area having 200 m station interval along the mineralization. <p>PHASE-III</p> <ol style="list-style-type: none">iv. Geological & Structural mapping on 1:2000 scale for identification of mineral bearing formation with the structural features.v. After the positive outcome of the above activities exploratory drilling of total 1000 m will be carried out in suitable interval.

		vi. To establish the inferred resources for critical minerals as per UNFC norms & Minerals (Evidence of Mineral Contents) Rules- 2015.																																		
	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 the proposed agency. Drilling will be outsourced.																																		
	Name/ Number of Geoscientists	Two nos. of Geoscientist (Geology): (1 Field + 1 HQ) Two nos. of Geoscientist (Geophysics): (1 Field + 1 HQ)																																		
	Expected Field days (Geology) Geological Party Days	Geologist Party Days: 130 Days (Field) Geologist Party Days: 45 Days (HQ) Survey Party Days: 30 Days (Field)																																		
1	Location																																			
	The coordinates of corner points of proposed Atrar block are as follows:																																			
	<table border="1"> <thead> <tr> <th rowspan="2">SL. NO.</th> <th rowspan="2">POINTS</th> <th colspan="2">GCS (DMS)</th> <th colspan="2">UTM Zone-44N (m)</th> </tr> <tr> <th>LATITUDE</th> <th>LONGITUDE</th> <th>NORTHING</th> <th>EASTING</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>A</td> <td>24° 48' 37.49" N</td> <td>079° 34' 4.87" E</td> <td>2744714.38</td> <td>355268.47</td> </tr> <tr> <td>2</td> <td>B</td> <td>24° 49' 4.48" N</td> <td>079° 36' 18.5" E</td> <td>2745505.93</td> <td>359029.21</td> </tr> <tr> <td>3</td> <td>C</td> <td>24° 45' 11.3" N</td> <td>079° 36' 45.06" E</td> <td>2738324.86</td> <td>359702.11</td> </tr> <tr> <td>4</td> <td>D</td> <td>24° 44' 50.69" N</td> <td>079° 35' 8.96" E</td> <td>2737718.51</td> <td>356996.01</td> </tr> </tbody> </table>	SL. NO.	POINTS	GCS (DMS)		UTM Zone-44N (m)		LATITUDE	LONGITUDE	NORTHING	EASTING	1	A	24° 48' 37.49" N	079° 34' 4.87" E	2744714.38	355268.47	2	B	24° 49' 4.48" N	079° 36' 18.5" E	2745505.93	359029.21	3	C	24° 45' 11.3" N	079° 36' 45.06" E	2738324.86	359702.11	4	D	24° 44' 50.69" N	079° 35' 8.96" E	2737718.51	356996.01	
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	Villages	Atrar, Basata, Raipura																																		
	Tehsil/ Taluk	Chhattarpur																																		
	District	Chhattarpur																																		
	State	Madhya Pradesh																																		
2.	Area (hectares/ square kilometers)																																			
	Block Area	23.76 sq km																																		
	Forest Area	Details not available																																		
	Government Land Area	Data Not Available																																		
	Private Land Area	Data Not Available																																		
3	Accessibility																																			
	Nearest Rail Head	Chattarpur Railway station 12 km north from the block.																																		
	Road	NH-39 connecting Jhansi-Chhattarpur-Satna runs 6 km north-east of the proposed block and NH-34 runs 6 km north-west of the proposed block.																																		
	Airport	Khajuraho, 40km																																		

4	Hydrography	
	Local Drainage (Channels)	Major drainage in the area is Ken River, flowing from west to east. The other major stream next to Ken is Kail Nadi, flow from west to east. Smaller streams forming dendritic to sub-rectangular pattern drain the whole area all the stream courses appear to have been controlled by joints.
	Surface Pattern (Rivers/ Streams)	
5	Climate	
	Mean Annual Rainfall	Subtropical climate condition exists within the area. Average rainfall is about 1257 mm. The temperature ranges between 40 to 47.60 c. The predominant wind direction is North West -south east.
	Temperatures (Maximum) (Minimum)	Maximum Temperature: 46.2°C Minimum Temperature: 4.2°C
6	Topography	
	Toposheet Number	54 P/09 & 54 P/10
	Physiography of the Area	Physiographically the area is characterised by rugged and undulating topography with moderately high hills interspaced by stretches of alluvium.
7	Availability of baseline geosciences data	
	Geological Map (1:50K/ 25K)	1:50000 (NGDR) GSI Map (Scale: 1:12500) FSP:2018-19
	Geochemical Map	NGCM, RMT report, GSI Report
	Geophysical Map	Available
8.	Justification for taking up Reconnaissance Survey / Regional Exploration	<ol style="list-style-type: none"> Ahirwar and Rana (2021) carried out Regional Mineral Targeting (RMT) project in the area and identified 12 Mineral Potential Blocks (MPB), present proposed block is one of the 12 MPB The selection of the Atrar Block is based on multiple geological, structural and geochemical criteria that collectively enhance its mineralisation potential. Reconnaissance sampling by GSI yielded several anomalous metal values, including: <ul style="list-style-type: none"> ❖ 712 ppm W in quartzite from Himmatpura ❖ 521 ppm W from the Gopalpura quartz vein ❖ 818 ppm Cr and 229 ppm Ni from Badwaha amphibolite

		<ol style="list-style-type: none">4. These anomalous values—well above crustal background—indicate an active mineralization system.5. Bouguer gravity highs in the northern sector (Bagwaha) indicate concealed mafic intrusions, favourable for Ni–Cr mineralisation.6. Moderate gravity zones around Rampura, Digaria and Gopalpura coincide with reported metal anomalies, confirming structurally controlled mineralisation trends.7. Integration of geological, geochemical, geophysical and remote sensing data identifies multiple overlapping favourable indicators, strongly supporting the need for systematic G4 reconnaissance exploration.
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PROPOSAL FOR PRELIMINARY EXPLORATION (G-3 STAGE) OF CRITICAL MINERALS IN ATRAR BLOCK, DISTRICT –CHHATARPUR, STATE -MADHYA PRADESH (AREA: 23.76 SQ.KM.)

1.0.0 INTRODUCTION:

- 1.0.1 India's growing industrial and strategic sectors—steel, alloy manufacturing, superalloys, energy storage, aerospace and defence—depend heavily on critical minerals such as Nickel (Ni), Chromium (Cr) and Tungsten (W). Consumption of these minerals has increased sharply, while indigenous production remains insufficient to meet national requirements. Tungsten, in particular, is classified as a critical and strategic metal due to its essential use in defence-grade hardmetals, high-density alloys and cutting tools. Nickel and Chromium constitute integral components of stainless steel, battery technologies, superalloys, catalysts and electroplating industries.
- 1.0.2 Given the limited known deposits of these metals in India, systematic exploration in favourable geological terrains is of paramount importance. The Bundelkhand region, characterised by ancient granitoid complexes, mafic–ultramafic intrusions and quartz vein systems, presents favourable geological conditions for diverse mineralisation styles, including hydrothermal and magmatic types.
- 1.0.3 The Atrar Block has been identified as a promising target based on reconnaissance work by the Geological Survey of India (GSI), which has indicated anomalous values of Ni, Cr and W in various lithologies including quartzite, amphibolite and mafic intrusives. These preliminary indications necessitate a structured exploration programme at the G4 level, including reconnaissance mapping, sampling, trenching and integrated interpretation.

1.0.0 BACKGROUND

- 1.0.1 On enactment of MMDR Amendment Act- 2015, Minerals (Evidence of Mineral Contents) Rule 2015 and Mineral Auction Rules 2015, Govt. of India directed State Government to speed up exploration work for different Mineral Commodities in the respective states. Accordingly, MECL has prepared the proposal for Reconnaissance (G4) level involving identification of mineralized areas worthy of further investigation towards deposit identification.
- 1.0.2 The Exploration for strategic, critical, rare metals, rare earths elements, PGE and precious metals is given top priority by Govt. of India after amendment of MMDR act 2015. Keeping this in view, the present proposal is being put up for Preliminary

Exploration (G-3) of Critical minerals in Atrar Block, Chhattarpur District, Madhya Pradesh.

2.1.0 LOCATION AND ACCESSIBILITY

2.1.1 The proposed Atrar block covers an extent of 23.76 sq km area and lies in Chhattarpur district (Toposheet No. 54P09 & 54P10), Madhya Pradesh. The major villages located within the proposed block are Atrar, Basata, Raipura. All the villages in the area are well connected to each other and to the highways by motorable roads and tracks. The nearest railway station is at Chhattarpur which is about 12 km to the north of the proposed block. The nearest airport is at Khajuraho which is about 40 km SE of the proposed block. The location map of the proposed block is provided as Plate No- I. The detailed location of the boundary points is given in Table 1.

Table 1: Coordinates of Corner Points of Proposed Atrar block, Chhattarpur district, Madhya Pradesh

SL. NO.	POINTS	GCS (DMS)		UTM Zone-44N (m)	
		LATITUDE	LONGITUDE	NORTHING	EASTING
1	A	24° 48' 37.49" N	079° 34' 4.87" E	2744714.38	355268.47
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2.2.0 PHYSIOGRAPHY

2.2.1 Physiographically the area is characterized by rugged and undulating topography with moderately high hills interspaced by stretches of alluvium.

2.3.0 DRAINAGE

2.3.1 Major drainage in the area is Ken River, flowing from west to east. The other major stream next to Ken is Kail Nadi, flow from west to east. Smaller streams forming dendritic to sub-rectangular pattern drain the whole area all the stream courses appear to have been controlled by joints.

3.1.0 REGIONAL GEOLOGY

3.1.1 The proposed study area forms a part of the Bundelkhand Granitoid–Gneiss Complex, one of the oldest crustal blocks of the Indian Shield, comprising mainly Archaean to early Proterozoic granitoids and their metamorphic enclaves. This craton represents a stable continental nucleus dominated by tonalite–trondhjemite–granodiorite (TTG) suites and later granitic plutons emplaced during multiple magmatic episodes. The terrain exhibits a mosaic of grey granites, pink porphyritic granites, granitic gneisses, pegmatites, quartz reefs, amphibolites and mafic dykes, reflecting long-lived tectono-magmatic activity.

These rocks collectively define a high-grade metamorphic terrane, structurally reworked by regional shearing and multi-phase plutonism.

- 3.1.2** The dominant rock types in the region include coarse- to fine-grained granites, hornblende-bearing granites and grey granites forming the main structural backbone of the Bundelkhand massif. Older metamorphic enclaves such as quartzite, amphibolite, schist and banded gneiss occur as xenoliths and roof pendants within younger granitic bodies, indicating assimilation during magma emplacement. These enclaves preserve significant mineralogical and structural signatures of pre-granitic crustal evolution and act as favourable hosts for mafic-related mineralisation. Quartz reefs, often brecciated and ferruginous, traverse the granitoid terrain and form prominent ridges marking brittle deformation zones.
- 3.1.3** The regional structural architecture is defined by a network of NE–SW, NW–SE and N–S trending lineaments, shear zones and fracture corridors. NE–SW trending quartz reefs represent major regional shears, displaying intense silicification, brecciation and hydrothermal alteration. Mafic dykes intrude the granitoid complex in predominantly NW–SE trends, representing late-stage Proterozoic magmatic events. These structures form significant geological controls for fluid movement and emplacement of mineralisation, especially where lineament intersections coincide with quartz veins or mafic contacts. The structural pattern strongly influences the localisation of hydrothermal alteration zones observed in remote sensing data.
- 3.1.4** The interplay of granitoid magmatism, mafic intrusions and shear-controlled hydrothermal activity has created a favourable environment for polymetallic mineralisation, particularly Ni, Cr and W. Mafic and amphibolite bodies provide a source for Cr–Ni enrichment, while the quartz reefs and breccia zones facilitate tungsten-bearing hydrothermal fluids. Remote sensing and field studies have confirmed widespread argillic, phyllic, propylitic and ferruginous alteration, characteristic of a hydrothermal system active along regional structure. Together, these geological, structural and metamorphic attributes make the region highly prospective for metallic mineral deposits and justify further systematic exploration.

Table No. 2.1: Litho-Stratigraphic succession in the western part of BGC (after Shrivastava et. al 2001, Gaur et al. 2016, Tank et al. 2018)

Supergroup / Group	Litho Units
Alluvium / Soil	Chambal Alluvium: Light Grey, fine to medium grained micaceous sand with lenses of grey and pink granite pebbles, calcareous and iron nodules

Supergroup / Group	Litho Units
	Banda alluvium: Reddish brown silt clay with lenses of reddish quartzo-feldspathic sand and occasional basal conglomerate and grit
Unconformity	
Deccan Traps	Basaltic Lava Flows
Unconformity	
Vindhyan Super Group	A thick pile of sedimentary rocks comprising of sandstone, limestone, shale, Orthoquartzite and conglomerates
Unconformity	
Bijawar Group	A sequence of sedimentary / metasedimentary rocks comprising of quartzite, slate, shale, tuffaceous shale, quartzitic sandstone with subordinate bands of ferruginous and calcareous rocks
Unconformity	
Bundelkhand Granitoid Complex (BGC)	Basic Intrusives: Dolerite and gabbro dykes, quartz reefs and veins. Pegmatite/aplite veins granite porphyry. Leucogranite. Pink granite: fine to monzo granite. Grey granite: fine to Monzo granite, migmatite and gneisses
Older Metamorphic group	Amphibolite, hornblende diorite, metasediments and BIF

3.2.0 GEOLOGY OF THE BLOCK

3.2.1 Atrar block is dominated by rock units belonging to the Bundelkhand Granitoid Complex, with subordinate enclaves of older metamorphic rocks and a suite of mafic intrusions. The granitoids occur as massive to locally sheared bodies, displaying pink, grey and porphyritic varieties with medium- to coarse-grained textures. Within the granitic terrain, isolated bands and lenses of amphibolite, quartzite, chlorite schist and ferruginous breccia occur as relic enclaves and tectonic fragments. These rocks provide essential insights into the pre-granitic basement architecture and serve as potential hosts for Cr–Ni mineralisation and structural traps for hydrothermal tungsten deposition.

3.2.2 One of the most prominent geological features of the block is the system of NE–SW trending quartz reefs, some of which are 1–5 m thick and traceable across several kilometres. These reefs frequently show brecciation, ferruginisation and silicification, suggesting repeated structural reactivation and hydrothermal fluid influx. In several locations such as Himmatpura, Ajnar, Gopalpura and Digaria, quartz veins show intense argillic to phyllic alteration with iron-oxide staining and sulfide mineralisation. These alteration zones correlate strongly with geochemical anomalies, particularly high tungsten values in quartzite at Himmatpura and W–Cu–Pb in hydrothermally altered veins at Gopalpura.

3.2.3 The block contains multiple NW–SE trending mafic dykes and isolated amphibolite bodies, which are critical in understanding the source of Ni and Cr mineralisation.

Amphibolite exposures near Badwaha and Digaria show elevated Cr (up to 818 ppm) and Ni (up to 229 ppm) values, indicating enrichment of these metals within mafic protoliths. These intrusives, often magnetic and Fe–Mg rich, form prominent ridges and linear belts and frequently display shearing, chloritisation and sulphidation. Their contact zones with quartzite and granitic gneiss are prime targets for disseminated or vein-controlled Ni–Cr sulphidemineralisation.

3.2.4 The local structural pattern is governed by NE–SW, NNW–SSE and NW–SE trending fractures, shear zones and brittle faults. The NE–SW lineaments control the emplacement of quartz reefs, while the NW–SE intrusives reflect late Proterozoic dyke injections. In many locations, cross-cutting relationships between these structural systems are associated with enhanced alteration and metal enrichment. Hydrothermal mineralisation, including pyrite, chalcopyrite, malachite, and scheelite, is observed along these structures. The combination of brittle deformation, hydrothermal alteration and mafic–felsic contacts creates multiple favourable micro-environments for deposition of tungsten-bearing quartz veins and Cr–Ni bearing mafic bodies, justifying the focus of the proposed exploration programme.

4.0.0 PREVIOUS WORK

4.1.0 The word “Bundelkhand Gneiss” was coined by Heron (1935), who considered it as the oldest rock of Archaean age and correlated with Banded Gneissic Complex and Berach Granite of Rajasthan. Geological Survey of India undertook the first systematic survey of the Bundelkhand region during FS 1873-77. Medlicot (1859) has given the first geological account of the Bundelkhand area, describing schist and Banded Iron formation (BIF) at Baretha.

4.1.1 Jhingran and Puri (1956) studied the Bundelkhand Granite in detail. They described that Bundelkhand Granite is dominantly granodiorite in composition, grading locally into adamellite. Singhain & Bejarniya (1988) carried out systematic geological mapping in parts of 54O/12. They reported Molybdenite in medium grained grey granite injection, SE of Manpura. They also reported gossan capping which is indicative of sulphide NE of Rampura and malachite stains NE of Gotet, both in east-west trending quartz reefs.

4.1.2 A two-year Regional Mineral Targeting (RMT) project was carried out to find potential areas for mineral occurrences after integration of thematic maps from geological mapping (GM), geochemical mapping (GCM), geophysical mapping (GPM) and Remote Sensing (RS) followed up by ground validation, throughout in general and anomalous

zones in particular, over an area of 3000 sq. km. to bring out to regional anomalies based on predictive modeling of the data

4.1.2.1 The RMT project is having three main objectives viz. characterising of nature of mineralization in the BGC, search mineralisation, and identification of potential blocks for exploration work

4.1.2.2 Geological map of 1:50K scale is the base map for the RMT project

4.1.2.3 The study area consists of mainly the variants of granites and enclaves of older supracrustal (gneiss/amphibolite) of various dimensions belonging to Bundelkhand Granitoid Complex (BGC).

4.1.2.4 The Archaean granites intruded by felsic (quartz and pegmatite) and basic/mafic dykes.

4.1.2.5 The shearing effect is also observed in quartz reefs, During field work it was also observed that basemetal and pyrophyllite mineralization in the area is controlled by quartz reefs/veins. The presence of diamond was also confirmed from Angore ultramafic bodies by the earlier workers in the area.

4.1.3 **Lineaments are very important in search of mineralization** as these are the weak zones that may serve to localize magmatic-related ore-forming fluids, with the implication that lineament mapping might be used as an exploration guide for ore deposits.

4.1.3.1 In the study area, lineaments are mainly represented by quartz reefs and basic dykes which are clearly observed in remote sensing studies.

4.1.3.2 A comparison of the alteration pattern and lineament density map showed a good correlation indicating that primary mineralization in the area may be structurally and tectonically controlled

4.1.3.3 Based on the results of the interpretation and integration with reported mineralization, high values of GCM data and field validation, it is observed that all the reported mineralization is present mainly around the lineaments and these lineaments were also influenced by the high GCM values of copper, molybdenum, nickel, pyrophyllite, gold and REE.

4.1.4 **NGPM Data:**

4.1.4.1 The study area is covered by ground and aerial geophysical mapping. In ground geophysical mapping, Bouguer gravity and magnetic data analysis was carried out. The Bouguer

- 4.1.4.2 The gravity map shows two high anomaly zones (outside RMT area) and a major gravity low zone having ENE-SWS trend. Low zone appears due to presence of sandstone in Bijawar basin.
- 4.1.4.3 The magnetic anomaly contour map shows that the area exhibits a dominant magnetic high anomaly in the central to eastern part of the area. The magnetic high anomaly originated in the northern part may be due to the presence of mafic intrusives.
- 4.1.4.4 These high magnetic zones were checked during field work and observed that at places it coincides with the presence of mafic-ultramafic bodies. The RSAS has demarcated few important blocks for PGE, diamond and copper in the area.
- 4.1.5 **JUSTIFICATION: Prospectivity** analysis was carried out by using geological (lithology and quartz), structural (lineament and shear zones) and geochemical datasets. A predictive potential map was prepared using spatial modeling techniques like Boolean AND & Boolean OR logic model.
- 4.1.6 Atrar block was one of the identified blocks for W values ranged between 280-1718 ppm in pegmatite
- 4.1.7 The integrated geological, geophysical and remote-sensing studies carried out over the Himmatpura–Atrar region clearly establish the area as a high-potential corridor for polymetallic mineralisation, particularly Ni, Cr and W. The Bouguer gravity anomaly map delineates distinct high, moderate and low anomaly zones, with the northern high-gravity zone near Bagwaha reflecting concealed basic/mafic intrusions at depth—favourable hosts for Ni–Cr enrichment. Moderate gravity zones coinciding with Rampura, Digaria and Gopalpura align with known anomalous samples, indicating structurally controlled mineralisation zones in mixed granitic–mafic settings. Remote sensing using ASTER alteration mapping reveals well-developed argillic, phyllic, propylitic and ferric-iron alteration along the dominant NE–SW quartz reefs and shear-controlled fractures, confirming active hydrothermal alteration systems. Field validation supports these signatures, with widespread ferruginisation, epidote-bearing propylitic zones, and sulphide mineralisation (pyrite, chalcopyrite, molybdenum) at several localities. Critically, chemical analyses show high W (712 ppm) in Himmatpura quartzite, high W–Cu–Pb in Gopalpura hydrothermally altered veins, and significant Cr–Ni anomalies in Digaria and Badwaha amphibolite.

5.0.0 PLANNED METHODOLOGY

5.1.0 Based on the evaluation of geological data available, the present exploration program has been formulated to fulfill the following objectives:

PHASE-I

- Upgradation of previous GSI LSM Map
- Bedrock sampling and trenching across exposed gossans, quartz veins and structurally favourable zones to validate subsurface continuity and to identify a mineralization rich area of about 3 m for further exploration.

PHASE-II

- Geophysical Electro-magnetic sounding only in the identified mineral rich area having 200 m station interval along the mineralization.

PHASE-III

- Geological & Structural mapping on 1:2000 scale for identification of mineral bearing formation with the structural features.
- After the positive outcome of the above activities exploratory drilling of total 1000 m will be carried out in suitable interval.
- To establish the inferred resources for critical minerals as per UNFC norms & Minerals (Evidence of Mineral Contents) Rules- 2015.
- Utilize the results of this Programme to define the exploration strategy for upgradation of the block to subsequent phases.

The details of different activities to be carried out are presented in subsequent paragraphs.

PHASE-I

5.2.0 GEOLOGICAL MAPPING

5.2.1 Upgradation of the already existing GSI Map will be carried out in the entire 23.76 sq km area on 1:12,500 scale to delineate mineral-bearing lithounits, document structural controls (shear zones, faults, fractures), and identify alteration zones, breccia bodies, and mafic/ultramafic intrusives for assessing their surface expressions and lateral continuity of potential mineralised zones.

5.2.2 Collection of samples during mapping and Sampling programme includes 100 no of Bedrock chip through channel sampling from quartz veins, altered granites, and mafic intrusives. All samples will be analysed for 34 elements through ICP–MS, focusing on: REE suite, W, Mo, Cu, Ni, Cr, Ta, Nb, Li, Rb, Cs, and associated pathfinder elements. This will help establish multi-element geochemical anomalies for prioritising targets. 10% of all the Primary Samples will be sent for external check in NABL External Labs by ICPMS method

5.3.0 EXPLORATORY MINING (PITTING /TRENCHING)

5.3.1 A Total 100 cu.m of trenching is proposed. Systematic channel sampling will be carried out along both exposed walls. After cleaning and preparing the trench faces, continuous channels will be cut at a uniform interval of 2–3 metres along the entire trench length. Each channel will be oriented perpendicular to the geological structures to capture true lithological and mineralisation variation. Representative chips will be collected from a 5–7 cm deep and 8–10 cm wide channel using geological hammer and chisel. The same procedure will be repeated on the opposite wall to obtain duplicate geological representation, resulting in approximately 50 samples from both walls. All samples will be properly bagged, labelled, documented and sent for geochemical analysis

5.3.2 100 trench samples has been proposed which will be analysed for 34 elements through ICP–MS, focusing on: REE suite, W, Mo, Cu, Ni, Cr, Ta, Nb, Li, Rb, Cs, and associated pathfinder elements. This will help establish multi-element geochemical anomalies for prioritising targets.

5.3.3 10% of all the Primary Samples will be sent for external check in NABL External Labs by ICPMS method

5.4.0 PETROLOGICAL, MINERAGRAPHIC STUDIES, XRD &EPMA STUDY

5.4.1 During the course of Geological mapping and sampling 15 nos. of samples from outcrops of various lithounits will be collected to carry out Petrography and Minerography. These samples would be drawn from ore zones and host rocks.

5.4.2 To know the different mineral phases which can possibly host REE, 10 samples will be studied by XRD method. Whole-rock XRD on representative fresh and altered samples (pegmatite, quartzite, gossan, altered granite, amphibolite) to identify primary mineralogy

5.4.3 A provision of 10 hours of EPMA study is also kept.

PHASE-II

5.5.0 GEOPHYSICAL SUREVEY

5.5.1 On the basis of mapping and systematic geological sampling through bedrock and trench prospective areas of approximately 3 sq km will be identified where geophysical survey will be carried out. Geophysical Electro-magnetic survey will be carried out by TDEM at 200 m station interval along the identified lineaments or mineralised zone during Phase-I mapping.

PHASE-III

5.6.0 DETAILED MAPPING

5.6.1 The integrated results from geological mapping, bedrock, geochemical analyses, and geophysical surveys will be reviewed in the TCC. Based on this review, any prospective zone having an approximate area of 3 sq km will be identified and taken up for detailed mapping and systematic drilling.

5.7.0 TOPOGRAPHICAL CONTOURING, BOREHOLE & BLOCK BOUNDARY POINTS FIXATION

5.7.1 Topographical Contouring in 1:2000 scale has been proposed in the identified 3 sq km area with total station.

5.7.2 Demarcation of lease boundary, Fixation of borehole and determination of co-ordinates & Reduced Level (RL) of the boreholes by DGPS has been proposed for all block boundary points and drilled boreholes.

5.8.0 EXPLORATORY DRILLING (OUTSOURCING)

5.8.1 Total 1000m systematic drilling will be carried out and it is proposed to undertake 10 boreholes, each of approximately 100 m depth. Core samples will be collected at a 1 m

interval in mineralised or altered zones and at a 1 m interval in barren or unaltered sections. Based on this sampling scheme, each drillhole is expected to yield 20 core samples, resulting in a total of approximately 200 samples from the entire drilling programme. These samples will be systematically logged, split, and submitted for geochemical, petrographic, and mineralogical analyses to characterise lithology, alteration, and mineralisation patterns, providing critical input for defining further exploration targets.

5.8.2 All samples will be analysed for 34 elements through ICP–MS, focusing on: REE suite, W, Mo, Cu, Ni, Cr, Ta, Nb, Li, Rb, Cs, and associated pathfinder elements. This will help establish multi-element geochemical anomalies for prioritising targets.

5.8.3 10% of all the Primary Samples will be sent for external check in NABL External Labs by ICPMS method

5.9.0 PETROLOGICAL, MINERAGRAPHIC STUDIES

5.9.1 During the course of exploratory drilling 05 nos. of drillcore samples from various lithounits will be collected to carry out Petrography and Minerography. These samples would be drawn from ore zones and host rocks.

6.0.0 PROPOSED QUANTUM OF WORK

6.0.1 Details of the particular, Quantum and the targets are tabulated in **Table No.-6.0**

Table No- 6.0

Envisaged Quantum of proposed work

Sl. No.	Item of Work	Unit	Target
PHASE-I			
1	Upgradation of Geological Map	Sq km	23.76
2	Exploratory Mining: Trenching	cu. m.	100
3	Geochemical Sampling & Laboratory Studies		
i	Bedrock samples for REE suite, W, Mo, Cu, Ni, Cr, Ta, Nb, Li, Rb, Cs, and associated pathfinder elements (100 Primary Samples + 10 External Check Samples)	Nos	110
ii	Pit/Trench samples for REE suite, W, Mo, Cu, Ni, Cr, Ta, Nb, Li, Rb, Cs, and associated pathfinder elements (100 Primary Samples + 10 External Check Samples)	Nos	110
iii	Petrological Samples (Surface Samples)	Nos	15
iv	Mineragraphic Studies (Surface Samples)	Nos	15
v	XRD Mineral phase analysis	Nos	10
vi	EPMA studies	Hrs	10
PHASE-II			
1	Geophysical Electro-magnetic TDEM Survey	Sounding	200

Sl. No.	Item of Work	Unit	Target
PHASE-III			
1	Geological Mapping (1:2000 scale)	Sq km	3.00
2	Topographical Survey	Sq km	3.00
3	Borehole and Block boundary Fixation	Nos.	15
4	Drilling (Outsourcing)		
i	Exploratory Drilling	m	1000
ii	Drill core samples for REE suite, W, Mo, Cu, Ni, Cr, Ta, Nb, Li, Rb, Cs, and associated pathfinder elements (200 Primary Samples + 20 External Check Samples)	Nos	220
5	Petrological Samples (Surface Samples)	Nos	05
6	Mineragraphic Studies (Surface Samples)	Nos	05
7	Report Preparation (5 Hard copies with a soft copy)	Nos.	1
8	Preparation of Exploration Proposal (5 Hard copies with a soft copy)	Nos.	1

7.0.0 BREAK-UP OF EXPENDITURE

7.1.0 Tentative Cost has been estimated based on Schedule of Charges (SoC) of projects funded by National Mineral Exploration and Development Trust (NMEDT) w.e.f. 05/12/2025. The total estimated cost is **Rs. 291.50 Lakhs**. The detailed cost sheet is given as Annexure-I.

8.0.0 TIMELINE

8.0.1 The entire project is planned tentatively for 15 months. Initially, geological mapping and surface bedrock sampling along with Geophysical survey shall be carried out followed by drilling provided positive results are obtained in the first phase of sampling.

Estimated time schedule for Preliminary Exploration (G-3) for Critical minerals in Atrar Block, Districts: Chhattarpur, State: Madhya Pradesh; [Schedule timeline- 15 months]																	
S. No.	Particulars	Months/ Days	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Camp Setting	months															
2	Geological Mapping	months															
3	Survey days	days															
2	Geophysical Work	months															
5	Trenching	cu.m															
6	Drilling (1 rig)	m															
7	Geologist days	days															
8	Sampling days	days															
9	Camp winding	months															
10	Laboratory Studies	months															
11	Geologist days, HQ	days															
12	Report Writing with Peer Review	months															

List of Plates

1. Plate –I: Location Map of Atrar block (23.76 sq km), District: Chhatarpur, State: Madhya Pradesh.
2. Plate–II: Regional Geological Map showing Atrar block (23.76 sq km), District: Chhatarpur, State: Madhya Pradesh.
3. Plate–III: Block Geological Map showing Atrar block (23.76 sq km), District: Chhatarpur, State: Madhya Pradesh.

List of Annexure

1. Detailed Cost sheet of Atrar block (23.76 sq km), District: Chhatarpur, State: Madhya Pradesh