PROPOSAL FOR PRELIMINARY EXPLORATION FOR BAUXITE, TITANIUM AND ASSOCIATED MINERALS

(G-3 STAGE)

SISKARI PAT BLOCK

NMET FUNDED PROJECT

DISTRICT– LOHARDAGA, JHARKHAND

By

MINERAL EXPLORATION AND COSULTANCY LIMITED
DR. BABASAHAB AMBEDKAR BHAWAN
SEMINARY HILLS NAGPUR

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

GENERAL INFORMATION ABOUT THE BLOCK

	Features	Details
	Block ID	Siskari Pat Block (0.28 sq km)
	Exploration Agency	Mineral Exploration & Consultancy Limited (MECL)
	Commodity	Bauxite, Titanium & Associated Minerals
	Mineral Belt	Chhattisgarh-Jharkhand belt (Chhota Nagpur Granite Gneiss)
	Completion period with entire Time schedule to complete the project	10 Months
	Objectives	The present exploration program at G3 stage has been formulated to fulfil the following objectives: i) Preparation of Geological map and topographical survey at 1:2,000 Scale. ii) To prove the occurrences of Bauxite zone(s) adjacent to the running Pakhar Bauxite Mine. iii) To check the Bauxite occurrence up to the vertical depth of 30m below ground level. iv) Two bore holes will be drilled upto the basement or 50m depth (whichever is earlier). v) To assess the quality and the thickness of Bauxite horizons in order to upgrade the Bauxite resources at G-3 (333) level in the block as per UNFC norms. vi) Along with Bauxite, resources of Titanium and Associated Minerals will be also reported if encouraging values are encountered. iv) To carry out exploration as per Minerals (Evidence of Mineral Contents) Rules, 2015, Mineral Auction Rule ï 2015 and MMDR Act ï 2015 as to facilitate the Government of Jharkhand for auctioning of the Bauxite 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: 60 days
1.	**Location**	The Siskari Pat Block area falls in Survey of India Toposheet No. 73A/10 and covers total area of 0.28 sq.km. The block area falls in and around the villages Binduatoli, Pakhar, Tehsil-Kisko, Dist- Lohardaga, Jharkhand.
	Latitude and Longitude	**Corner cardinal points of Siskari Pat G3 Block (0.28 sq.km)**

S.No.	*Cardinal Points*	(WGS 84, DMS)		UTM, Zone-45Q	
		Latitude	*Longitude*	*Easting*	*Northing*
1	*A*	23°34' 4.873"N	84° 36' 7.709"E	255255.11	2608450.24
2	*B*	23°34' 4.160"N	84° 36' 10.593"E	255336.55	2608426.92
3	*C*	23°34' 0.823"N	84° 36' 16.309"E	255496.95	2608321.53
4	*D*	23°33' 48.195"N	84° 36' 20.536'"E	255610.36	2607930.95
5	*E*	23°33' 45.878"N	84° 36' 24.927"E	255733.71	2607857.57
6	*F*	23°33' 36.728"N	84° 36' 26.461"E	255772.50	2607575.30
7	*G*	23°33' 36.043"N	84° 36' 28.802"E	255838.56	2607553.12
8	*H*	23°33' 33'.118"N	84° 36' 32.500"E	255941.95	2607461.35
9	*I*	23°33' 31.787"N	84° 36' 31.221"E	255905.00	2607421.00
10	*J*	23°33' 27.787"N	84° 36' 30.060"E	255870.00	2607298.49
11	*K*	23°33' 27.051"N	84° 36' 32.36'4"E	255934.99	2607274.74
12	*L*	23°33' 25.227"N	84° 36' 32.399"E	255935.04	2607218.59
13	*M*	23°33' 22.849"N	84° 36' 23.903"E	255692.83	2607149.44
14	*N*	23°33' 31.738"N	84° 36' 16.086"E	255475.65	2607426.67
15	*O*	23°33' 33'.629"N	84° 36' 19.398"E	255570.57	2607483.29
16	*P*	23°33' 35.924"N	84° 36' 20.501"E	255603.04	2607553.40
17	*Q*	23°33' 42.876"N	84° 36' 16.246"E	255485.92	2607769.32
18	*R*	23°33' 49.220"N	84° 36' 18.216"E	255545.07	2607963.60
19	*S*	23°33' 58.466"N	84° 36' 10.507"E	255331.18	2608251.76
20	*T*	23°33' 59.643"N	84° 36' 6.835"E	255227.63	2608289.71

	Villages	Binduatoli, Pakhar.
	Tehsil/Taluk	Kisko
	District	Lohardaga
	State	Jharkhand
2.	**Area (hectares/ sq. km)**	
	Block Area	0.28 sq.km
	Forest Area	Open jungle, mainly Sal occupies in part of block.
	Government Land Area (Bilanam)	Data not available
	Charagaha	Data not available
	Private Land Area	Data not available
3.	**Accessibility**	
	Nearest Rail Head	Lohardaga Railway Station (40 Kms.), Ranchi Railway Station (115 Kms.)

	Road	The national highway NH-39 passes around 32 km east of the block. Motorable/ metaled roads are available in the area.
	Airport	Ranchi around 115 km from the block.
4.	**Hydrography**	
	Local Surface Drainage Pattern (Channels)	Lohardaga district is drained by the tributaries of three major river of the state viz. North Koel, South Koel and Damodar. The plateau region in west of Lohardaga town is the major water divide for north and south Koel River. The plateau region of the district is highly dissected by down cutting of the tributaries of these rivers. A few natural springs are noted in the area.
	Rivers/ Streams	No major river exists in the area.
5.	**Climate**	
	Mean Annual Rainfall	Average annual rainfall is 1137 mm.
	Temperatures (December) (Minimum) Temperatures (June) (Maximum)	Minimum temperatures 4^{O}C (Nov-Jan) Maximum temperatures up to 42^{O}C (March-June)
6.	**Topography**	
	Toposheet Number	73 A/10
	Morphology of the Area	Siskari Pat Plateau is tableland located in Chota Nagpur plateau forming the watershed between the North and South Koel rivers. The Bauxite deposit under reference is characterized by the extensive blanket of plateau laterite on an almost flat topography, locally known as ñpatò The flatness of the plateau together with well-defined steep scarp faces gives distinct feature to the topography of the deposits with gentle slope towards south-west. The range of elevation of the varies approximately between 610 and 640 m from MSL in plain areas and around 1050 meter in plateau region.
7.	**Availability of baseline geoscience data**	
	Geological Map (1:50K/25K)	Regional geological map sourced from Bhukosh (1:50K) available.
	Geochemical Map	Not applicable.
	Geophysical Map (Aeromagnetic, ground geophysical, Regional as well as local scale GP maps)	Not applicable.
8.	**Justification for taking up Preliminary Exploration**	1. The proposed Siskari Pat (G3) block area lies in the Bauxite bearing plateaus of Chhattisgarh-Jharkhand belt forming a part of the Pre-Cambrian shield of the Indian Peninsula. They consist mainly of Chhotanagpur Granite Gneiss. 2. Preliminary geological work has been carried out by GSI as well as DMG, Jharkhand in the area. MECL & CMPDI has also carried out exploration (G3/G2) in around the adjoining areas which has established occurrence of Bauxite with thickness varying from 4 to 6 m.

		3.	The MECL team visited the Siskari Pat bock and nearby mine areas. The pits in the existing mines have bauxite occurrences upto 25m depth. The outcrops of Bauxite are observed in the field and the exposed pits in the proposed block have confirmation of the Laterite / Bauxite profile in the Siskari Pat block.
		4.	Bauxite samples were collected from the block showing encouraging results of high Alumina (Al_2O_3) and Titanium (TiO_2) with low Silica (SiO_2) in the range of 39-54%, 7-11% and 1-4%. respectively.
		5.	Considering similar geological setup with known deposits, available literature and previous workerôs recommendations, the area hold potential to explore in detail with holistic exploration approach. Hence, preliminary exploration at G3 stage in the proposed area to be taken up to ascertain the exact potentiality of the prospect for Laterite/Bauxite.
		6.	Existing running Pakhar Bauxite Mine by M/s Hindalco Industries Ltd lying in the south of the proposed block.
		7.	After discussion with State Government, MECL decided to take up the exploration work of Bauxite Titanium & Associated minerals in the Siskari pat Block, District ï Lohardaga, Jharkhand through NMET funding. The positive outcome of the present exploration would be helpful and facilitate the Govt. for auctioning of the block.

PROPOSAL FOR G3 LEVEL EXPLORATION FOR BAUXITE, TITANIUM & ASSOCIATED MINERALS IN THE SISKARI PAT PLATEAU DISTRICT - LOHARDAGA, JHARKHAND

1.0.0 Introduction

1.1.1 The importance of Bauxite is well known in the production of Alumina (Al_2O_3) and also in other industries viz. abrasives, refractory, chemical and cement. The properties like lightness of metal aluminium, its high resistance to atmospheric corrosion and good electrical conductivity make it a popular metal and is being used for making household utensils and therefore known as ópoor manôs goldô The aluminium metal being a good substitute for non-ferrous metals like copper, zinc which are scarce and costly metals has further necessitated development of aluminium industry throughout the world.

1.1.2 Reserves/Resources of Bauxite in the country as on 1.4.2015, as per NMI database, based on UNFC system have been placed at 3,896 million tonnes. These resources include 656 million tonnes Reserves and 3,240 million tonnes Remaining Resources. By grades, about 77% resources are of Metallurgical grade. The resources of Refractory and Chemical grades are limited and together account for about 4%. By States, Odisha alone accounts for 51% of country's resources of Bauxite followed by Andhra Pradesh (16%), Gujarat (9%), Jharkhand (6%), Maharashtra (5%) and MadhyaPradesh & Chhattisgarh (4% each).

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 to speed up exploration work for different Mineral Commodities in the respective states for auctioning of the blocks.

1.1.4 MECL requested DMG, Govt. of Jharkhand for providing information required for preparation of exploration proposal pertaining to Siskari Pat Bauxite deposit, Distt. Lohardaga, Jharkhand vide letter No.: MECL/EXPL/File/DMGJH. /2023-24/1586 Dated: 15.12.2023.

1.1.5 The exploration in the block is to be carried out in G-3 stage. Boreholes will be drilled at 200m x 200m grid interval so that the resources can be estimated at G-3 level. Then the block can be ready for auctioning by Government of Jharkhand.

2.0.0 Location and Communication

2.1.0 The Siskari Pat Bauxite block falls in Survey of India Topo-sheet No.73 A/10 and is bounded by the following Co-ordinates under Siskari Pat plateau which is located in Lohardaga district of Jharkhand.

Table: 2.1
Siskaripat proposed Block Boundary Coordinates

S.No.	Cardinal Points	(WGS 84, Degree Minute Second)		UTM, Zone-45Q	
		Latitude	Longitude	Easting	Northing
1	A	23°34' 4.873"N	84° 36' 7.709"E	255255.11	2608450.24
2	B	23°34' 4.160"N	84° 36' 10.593"E	255336.55	2608426.92
3	C	23°34' 0.823"N	84° 36' 16.309"E	255496.95	2608321.53
4	D	23°33' 48.195"N	84° 36' 20.536'"E	255610.36	2607930.95
5	E	23°33' 45.878"N	84° 36' 24.927"E	255733.71	2607857.57
6	F	23°33' 36.728"N	84° 36' 26.461"E	255772.50	2607575.30
7	G	23°33' 36.043"N	84° 36' 28.802"E	255838.56	2607553.12
8	H	23°33' 33'.118"N	84° 36' 32.500"E	255941.95	2607461.35
9	I	23°33' 31.787"N	84° 36' 31.221"E	255905.00	2607421.00
10	J	23°33' 27.787"N	84° 36' 30.060"E	255870.00	2607298.49
11	K	23°33' 27.051"N	84° 36' 32.36'4"E	255934.99	2607274.74
12	L	23°33' 25.227"N	84° 36' 32.399"E	255935.04	2607218.59
13	M	23°33' 22.849"N	84° 36' 23.903"E	255692.83	2607149.44
14	N	23°33' 31.738"N	84° 36' 16.086"E	255475.65	2607426.67
15	O	23°33' 33'.629"N	84° 36' 19.398"E	255570.57	2607483.29
16	P	23°33' 35.924"N	84° 36' 20.501"E	255603.04	2607553.40
17	Q	23°33' 42.876"N	84° 36' 16.246"E	255485.92	2607769.32
18	R	23°33' 49.220"N	84° 36' 18.216"E	255545.07	2607963.60
19	S	23°33' 58.466"N	84° 36' 10.507"E	255331.18	2608251.76
20	T	23°33' 59.643"N	84° 36' 06.835"E	255227.63	2608289.71

The Siskari Pat plateau is located at a distance of 25-30 kms from Kisko block office. Kisko is connected to Lohardaga district HQ with metal road of about 10 kms. The distance from Lohardaga town to Ranchi the state capital is 75 km, connected by an all-weather metalled road. Thus, Siskari Pat plateau is located at a distance of about 115 km from Ranchi. The nearest railway station is Lohardaga, located at a distance of 40 km from the plateau.

2.2.0 Physiography & Drainage

2.2.1 Siskari Pat Plateau is tableland located in Chota Nagpur plateau forming the watershed between the North and South Koel rivers. The Bauxite deposit under reference is characterized by the extensive blanket of plateau laterite on an almost flat topography, locally known as ñpatò The flatness of the plateau together with well-defined steep scarp faces gives distinct feature to the topography of the deposits with gentle slope towards south-west.

2.2.2 The Lohardaga district covers the south-western part of Chota Nagpur plateau. The range of elevation of the district varies approximately between 610 and 640 m from MSL in plain areas and around 1050 meter in plateau region. The topography of the

district is undulating and rugged. Lohardaga district is drained by the tributaries of three major river of the state viz. North Koel, South Koel and Damodar. The plateau region in west of Lohardaga town is the major water divide for north and south Koel River. The plateau region of the district is highly dissected by down cutting of the tributaries of these rivers.

2.3.0 Climate & Rainfall

2.3.1 Climate

The district experience warm humid climate with three well defined seasons i.e. Summer, Winter and Monsoon. The winters commence from middle November and extend up to middle of March. December is the coldest month. During winter the temperature goes down to 4^0C. Summer starts from middle of March and continues up to middle of June, when the temperature shoots upto 42^0C.

2.3.2 Rainfall

The monsoon sets in by the middle of June and continues till the middle of October. The annual normal rainfall in the district is 1137 mm. 83.5% of total rainfall occurs during the monsoon months only.

3.0.0 Previous Work

3.1.0 The first account of the Bauxite and the aluminous laterite of India were given by Sir C.S. Fox in 1923 (Mem. Geol. Survey of India, XLIX,1923). The discovery of a large number of Bauxite deposits in erstwhile Bihar, now Jharkhand came to light in 1943-47 as a result of the field work carried out by Dr. M.K. Roy Chowdhury of G.S.I. Subsequently, Dr. Roy Chowdhury (1958, 1965) presented a detailed account of the geology and the economic aspect of the individual deposits of Bauxite of Jharkhand and M.P. The results of his work are well documented in the Memoirs of the Geological Survey of India, Volume-85, published in 1958.

Bauxite deposits of the area around Lohardaga, Jharkhand erstwhile Bihar, were investigated during the field-season 1961-62 by N. Majumdar of GSI and report titled ñReport on the Bauxite Deposits near Lohardaga Area Ranchi District, Biharò was published in 1963.

Existing running Pakhar Bauxite Mine by M/s Hindalco Industries Ltd lying in the south of the proposed block.

4.0.0 Regional Geology

4.1.0 The Bauxite bearing plateaus of Chhattisgarh and Jharkhand belt form a part of the Pre-cambrian shield of the Indian peninsula. They consist mainly of Chhotanagpur Granite Gneiss. Inclusions of quartzite and older basic rocks belonging to the Older Metamorphic Group occasionally occur in the area. The western part of the Ranchi upland is occupied by a raised tract which is senso stricto form dissected plateau (locally called ñpatò) varying in heights from 1038 to 1065m above mean sea level (M.S.L), averaging around 1050 from M.S.L. These dissected plateaus are invariably capped with Laterite and Bauxite.

4.1.1 The Gondwana coalfields of the Damodar and Auranga basins lie to the north of the Ranchi upland. The Pre-cambrian rocks of Singhbhum lie in the south; the Purulia sub-plains in the east and the Bauxite bearing plateaus are located in the western part of Ranchi plateau. The laterite profiles on the ópatôare underlain by clayey and ferruginous sediments of Upper Gondwana Age (?). The regional succession of the area after Roy Chowdhury (1958) is as given in table below.

Table 4.1

Age		**Formation**
Recent		Alluvium, conglomerate and carbonaceous shale
Tertiary to Recent		Laterite, Bauxite and lithomarge
Upper Cretaceous	Deccan Trap Infra Trappean (Lameta)	Basaltic lavas
		Calcified ï silicified rocks
		Grit
		Impure limestone
Cuddapah or earlier (?)		Newer dolerites
ARCHAEAN	Chhotanagpur Granite Gneiss	Vein rocks, pegmatite or graphic granite, aplite, quartz veins and quartz / tourmaline rocks
		(?) Pseudo-diorite, granites and gneisses
		(?) Diorite
		(?) Ultra-basic igneous rocks
	DHARWAR Iron Ore Series or Older Metamorphics	Phyllite, mica-schist, quartzite, lime-silicate rocks and basic rocks

4.2.0 **Block Geology**

The Siskari Pat plateau is a part of great tableland of Chhotanagpur Granite Gneiss. The Bauxite /laterite profile could be seen along the ghat section leading to the hill top of Siskari Pat Plateau. The reported major basal rocks of the area are metamorphic comprising quartzite, phyllite, mica-schist etc. Presence of traps and /or Upper Gondwana sediments at the base of laterite profile may be thin and patchy.

4.2.1 **Occurrence of Bauxite in the Area**

The occurrence of Bauxite in the lateritic sequence are mainly boulder/pocket type, consists of Bauxite cobbles, boulders and pebbles with interbinding material of ferruginous laterite, morrum and clays. Closed spaced Bauxite boulders are also seen spreading over a short distance. Lensoidal, pinch & swell types of structures are observed in the cross section nearby Serendag west block, Lohardaga district and as such there is no significant pattern found in occurrence of Bauxite boulder within the zone of bauxitization. Narrow and impersistent bands and patches of non-ore intervene the Bauxite zone. Hence, occurrence of Bauxite in the area is erratic in

nature. Siskaripat plateau is the west extension of Pakhar Pat. In old abandoned pits 2m ï 4m of Bauxite has been observed.

4.2.1 The general geologic sequence of the Lohardaga after Roy (1973) is given below in the table:-

Table 4.2

Age	**Formation**
Recent	Soil and/or alluvium
Late Tertiary	Upper (Ferruginous) laterite Bauxite
Upper Gondwana (?) (Mahadeva Series)	Sedimentary clay and clayey sandstone with intercalated bands of ferruginous sandstone, shale and mudstone.
----------Unconformity----------	
Pre-Cambrian	Chhotanagpur Granite Gneiss Older Metamorphics including mafic rock.

5.0.0 Proposed Exploration Programme

5.1.0 Objectives

Preliminary exploration (G3) of Bauxite,Titanium and Associated Minerals in the Siskaripat block is to be carried out:

1. Preparation of Geological map and topographical survey at 1:2,000 Scale.
2. To prove the occurrences of Bauxite zone(s) adjacent to the running Pakhar Bauxite Mine.To check the Bauxite occurrence up to the vertical depth of 30m below ground level.
3. Two bore holes will be drilled upto the basement or 50m depth (whichever is earlier).
4. To assess the quality and the thickness of Bauxite horizons to upgrade the Bauxite resources at G-3 (333) level in the block both quantitatively and qualitatively.
5. Along with Bauxite, resources of Titanium and Associated Minerals will be also reported if encouraging values are encountered.
6. To carry out exploration as per Minerals (Evidence of Mineral Contents) Rules, 2015, Mineral Auction Rule ï 2015 and MMDR Act ï 2015 as to facilitate the Department of Mines & Geology (DMG), Government of Jharkhand for auctioning of the Bauxite block.

5.2.0 Exploration Scheme

5.2.1 Topographic Survey:

The area under investigation i.e. Bauxite plateau around Siskari Pat Plateau measuring about 0.28 Sq. Km. will be surveyed with triangulation network. The length of the block in the longer axis is 1.39 km and the maximum width of block is 0.45 km. The block will be tied up with survey network by triangulation station. Contouring is to be carried out at 2m interval. Reduced level of the boreholes and survey stations are to be determined with reference to the Survey of India Bench Mark as available at the plateau top. All the boreholes, important surface features, survey stations & Pits are

to be marked and tied with the survey network. The block boundary and the borehole points will be surveyed by DGPS & Total Station in WGS-84 datum.

5.2.2 **Detailed Geological Mapping:**

The total study area of 0.28 Sq. km. will be mapped on 1:2000 scale with the exposures of laterite, Bauxite etc. as available at the top of the plateau along with the structural details marked on a plan before going for activities like drilling, sampling, pitting etc. A geological plan with topographical contours, borehole points, pits, surface features etc. on 1:2000 scales is to be prepared and finalized before finally leaving the worksite after completion of all exploratory activities.

5.2.3 **Drilling:**

Seven (07) vertical boreholes (coring) at 200m x 200m grid are proposed for G3 stage of exploration. The shape of the proposed Siskari Pat Bauxite block is irregular. In order to establish the continuity of ore body, taking into account the boulder/pocket nature of deposit, boreholes have been proposed to have better control on resource estimation. The boreholes will be drilled by core drilling methods up to lithomarge to estimate G3 level Bauxite resources. As the floor of the Bauxite zone is not known and targeting minimum 5m intersection of lithomarge in order to check the possibility of REE concentration, the average depth of the boreholes is considered to be 30 m. Out of 07 boreholes,02 borehole is proposed to be drilled upto 50m or basement (whichever is earlier). Total 250.00 m of drilling is involved in the proposed G3 stage of exploration. The details of proposed boreholes are given the table No 5.1.

TABLE NO. 5.1

DETAILS OF PROPOSED BOREHOLE (CORE DRILLING)
G-3 LEVEL OF EXPLORATION

SL NO	Proposed Borehole no.	Proposed Depth To be Drilled (m)
1	PBH 1	50.00
2	PBH 2	30.00
3	PBH 3	30.00
4	PBH 4	30.00
5	PBH 5	30.00
6	PBH 6	30.00
7	PBH 7	50.00
	TOTAL	**250.00**
Grand Total 07 Boreholes: 250 m *		

Note: *The location and depth of the proposed boreholes is tentative and may subject to change as per actual geological and field conditions.

5.2.4 **Geological Core Logging:**

Geological core logging will be carried out carefully by recording minute details and lithological characters of the rock formations including colour, texture, mineralogical composition, structural details, lithological variations along with visual estimate in respect of Al_2O_3 content encountered in the boreholes. At this stage, the overburden,

the roof and floor of the Laterite/Bauxite zones are to be marked as the deposit is of high alumina and low silica Bauxite type.

5.2.5 **Core Sampling:**

Borehole cuttings, the material which will be obtained by dry drilling, will be dried in sunlight and sampled for a uniform length of 1.00m so that each sample falls between fixed reduced levels in all the boreholes. But the top and the bottom samples will usually be less than 1.00m length as the R.L of the collar of the borehole and the floor of Bauxite zone will be in fraction of whole number. Later, keeping in view the boulder/ pocket nature of the deposit, the sampling will be carried out according to lithological changes. In Bauxite zone, the sample length will be reduced from 1m to 0.50m if required, while in the transition zone / Laterite and clay zone the length of sample may increase. Each sample thus obtained, will be crushed to (-) 60 mesh size and its quantity will be further reduced to 500 grams by coning and quartering. The material will be further crushed to (-) 120 mesh size. Two representative samples weighing about 100 grams each will be taken from this, one of which will be sent for primary analysis for five radicals, i.e., Al_2O_3, SiO_2, Fe_2O_3, TiO_2 & LOI and others samples needs to be kept for the purpose of check analysis. The remaining 300 grams sample will be kept for preparation of composite samples for analysis of spectroscopic, XRD, total available alumina and reactive silica, other elements and REE, etc.

5.2.6 **Check Samples:** 10% of the total primary samples shall be analyzed for 5 radicals as internal check analysis and 5% of the total primary samples will be analyzed from other NABL accredited laboratory as external checks to test the reliability of sampling and analytical data.

5.2.7 **Borehole Composite Samples:** After receipt of analytical results of primary samples of the borehole core, Bauxite zones will be marked at Ó30% Al_2O_3 & < 5% SiO_2 and Ó 30% Al_2O_3 & < 8% SiO_2 for each of the boreholes. For each of the Bauxite zones encountered in boreholes, composite samples shall be prepared by mixing each primary sample within the respective zone in their length proportions and reducing the sample by coning and quartering method for drawl of final sample to be analyzed for 7 radicals viz. Al_2O_3, SiO_2, Fe_2O_3, TiO_2, V_2O_5, P_2O_5 & LOI respectively. Borehole core composite samples will also be analyzed for 14 radicals viz. Al_2O_3, SiO_2, Fe_2O_3, TiO_2, V_2O_5, P_2O_5, LOI, MnO, MgO, CaO, Na_2O, K_2O, SO_3, & Organic Carbon.

However, provision for analysis of 35 nos. of composite sample for 07 radicals and 15 nos. of composite sample for 14 radicals has been made in the proposal which may vary depending upon actual no. of Bauxite zone encountered in the boreholes.

5.2.8 **Analysis for Reactive Silica and "Total Available Alumina" Content:**

14 Nos. of composite samples will be analyzed for "Total available alumina" and Reactive Silica content. The samples should be selected in such a manner that the entire Bauxite bearing areas are represented by them.

5.2.9 **Specific Gravity and Porosity determination:**

Apparent specific gravity of core samples will be determined by waxing method with a Walkerôs Steel Yard balance. The same specimens after powdering to (-) 100 mesh size will have to be used for determination of their true specific gravity by Pycnometry using Kerosene. The porosity values need to be calculated from the apparent and true specific gravity values. A total of 05 nos. of samples are to be subjected to determination of specific gravity and porosity respectively.

5.2.10 **Determination of Bond Work Index:**

5 Nos of samples (-150) mesh size will be subjected for determination of Bond work Index to know the nature & grindability properties of Bauxite ore.

5.2.11 **Pitting for Bulk Density:**

Bulk density will be determined in field by putting 1m X 1m X 1m pit. Two pits will be taken up for determination of bulk density.

5.2.12 **Spectroscopic Studies:**

The drill core samples need to be studied for 34 elements distribution by Emission Spectroscope. Semi-quantitative analysis for sample package i.e. 16 other elements viz. Li, Ga, In, Be, Ge, Mo, Cr, Ta, W, Ba, Co, Rb, Sr, Zr, Nb, Ni ;16 REE viz. La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Sc, Y; 02 Actinides viz. U, Th, needs to be carried out by mass spectroscopic studies ICP-AES/ICP-MS (sequential technique).

5.2.13 **Mineragraphic and Petrographic Studies:**

To know about the mineralogical composition and interrelation among the constituent minerals 10 rock specimens from the area will be taken up for Petrographic studies. 10 nos. of ore specimens from the Bauxite zones will also be studied in polished section to know about the constituent ore minerals, their mode of occurrence, textures and other mineragraphic characteristics of Bauxite.

5.2.14 **X-Ray Diffraction Studies:**

A total of 05 Nos Bauxite samples representing the Siskari Pat deposit will be subjected to X-Ray Diffraction studies to know about the general distribution pattern of the constituent minerals of the ore. The samples should be selected from the borehole composite samples in a pattern to represent the Bauxite ore of the Siskari Pat deposit.

5.2.15 **Quantum of Work:**

The proposed quantum of exploratory work (G3) in the Siskari Pat block is furnished in Table-5.2.

Table 5.2: Proposed Quantum of Work, G3 stage Exploration in Siskaripat Bauxite Block

S. No	Item details	Unit	Quantum
1.	Topographic Survey (Contour interval 2m) & Geological Mapping (1:2000 scale)	Sq. Km.	0.28
2.	Bore Hole Fixation and determination of co-ordinates & Reduced Level (RL) of the boreholes and demarcation of lease hold boundary points by DGPS	Nos.	27
3.	Core drilling (200m x 200 grid) 07 boreholes. Out of 07 BHs,05 BHs of 30 m depth to be drilled up to lithomarge and 02 borehole are proposed to be drilled upto 50m or basement (whichever is earlier)	m	250.00
4.	Pitting for determination of Bulk density (1mX1mX1m) ï 2Nos.	C .um	2
5.	Sampling & Chemical Analysis		
A)	Primary samples to be analyzed for 5 radicals viz. Al_2O_3, SiO_2, Fe_2O_3, TiO_2 & LOI		
i.	Borehole Core samples	Nos.	175
ii.	Check samples (10% internal)	Nos.	17
iii.	Check samples (5% external)	Nos.	9
B)	Composite samples		
i.	Borehole Core samples, (to be analyzed for 7 radicals, viz. Al_2O_3, SiO_2, Fe_2O_3, TiO_2, V_2O_5, P_2O_5 & LOI)	Nos.	35
ii.	Composite Core samples (14 radicals, viz. Al_2O_3, SiO_2, Fe_2O_3, TiO_2, V_2O_5, P_2O_5, LOI, MnO, CaO, MgO, K_2O, Na_2O, SO_3 & Organic carbon)	Nos.	15
iii.	Total available Alumina and Reactive Silica content	Nos.	14
6.	Physical Studies		
a).	ICP-AES/ICPMS (sequential technique) for 34 elements i.e. 16 other elements viz. Li, Ga, In, Be, Ge, Mo, Ni, Cr, Ta, W, Ba, Co, Rb, Sr, Zr, Nb ;16 REE viz. La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Sc, Y; 02 Actinides viz. U, Th.	Nos.	14
b).	X-RD studies	Nos.	05
7.	Petrographic Studies	Nos.	05
8.	Mineragraphic Studies	Nos.	05
9.	Preparation of Polished Section & Thin Section (05+05)	Nos.	05+05 = 10
10.	Sp. Gravity & porosity determination	Nos.	05
11.	Determination of Bond Work Index	Nos.	05
12.	Geological Report Preparation {As per Mineral (Evidence of mineral contents) Rule-2015}	Nos.	01

6.0.0 Time Schedule and Cost Estimates

6.1.0 **Time Schedule:**

The field work will take 06 months for completion. The laboratory studies will take additional 2 month from the date of completion of field work. Preparation of

Geological Report will take 3 months with one month overlapping period with laboratory studies. Thus, the total duration of the project will be of 10 months.

TABLE 6.1: TIME SCHEDULE/ACTION PLAN FOR PRILIMINARY EXPLORATION (G-3) FOR BAUXITE, TITANIUM & ASSOCIATED MINERALS IN SISKARI PAT BLOCK, DISTRICT- LOHARDAGA, JHARKHAND.													
Sl. No.	**Activities**	**Unit**	**MONTHS**									
			1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	Camp Setting	Nos.										
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	Nos.										
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. 105.58 Lakhs** is being proposed for completion of exploratory work up to G3 level. Activity wise break-ups of the same are furnished below:

Table: 6.2

Summary of Activity wise Cost Estimates		
Sl. No.	**Activities**	**Estimated Cost (Rs.) - G3 level**
1	**Geological work**	**36,07,800**
2	**Mineral Investigation (Drilling & Pitting-Trenching)**	**33,29,450**
3	**Laboratory studies (Chemical Analysis, Physical & Petrological Studies & Geotech. Lab)**	**13,97,139**
Sub-Total		**83,34,389**
4	**Proposal Preparation**	**1,66,688**
5	**Geological Report Preparation**	**4,16,719**
6	**Peer review charges**	**30,000**
Total		**89,47,796**
7	**GST (18%)**	**16,10,603**
Total Cost including 18% GST		**1,05,58,400**
SAY IN LAKHS		**105.58**

7.0.0 Justifications

7.1.0 Preliminary geological work has been carried out by GSI as well as DMG, Jharkhand in the area. MECL & CMPDI has also carried out exploration in around the adjoining area which has established occurrence of Bauxite with thickness varying from 4 to 6 m. The outcrops of Bauxite are observed in the field and the exposed pits in the proposed area have confirmation of the Laterite / Bauxite profile in the block. The above fact signifies that the plateau is potential Bauxite bearing and may have a good prospect to be explored to G3 level.

The MECL team visited the Siskari Pat bock and nearby mine areas. The pits in the existing mines have bauxite occurrences upto 25m depth. The outcrops of Bauxite are observed in the field and the exposed pits in the proposed block have confirmation of the Laterite / Bauxite profile in the Siskari Pat block. Team collected Bauxite samples from the block showing encouraging results of high Alumina (Al2O3) and Titanium (TiO2) with low Silica (SiO2) in the range of 39-54%,7-11% and 1-4%. respectively. Results are given below for the reference:

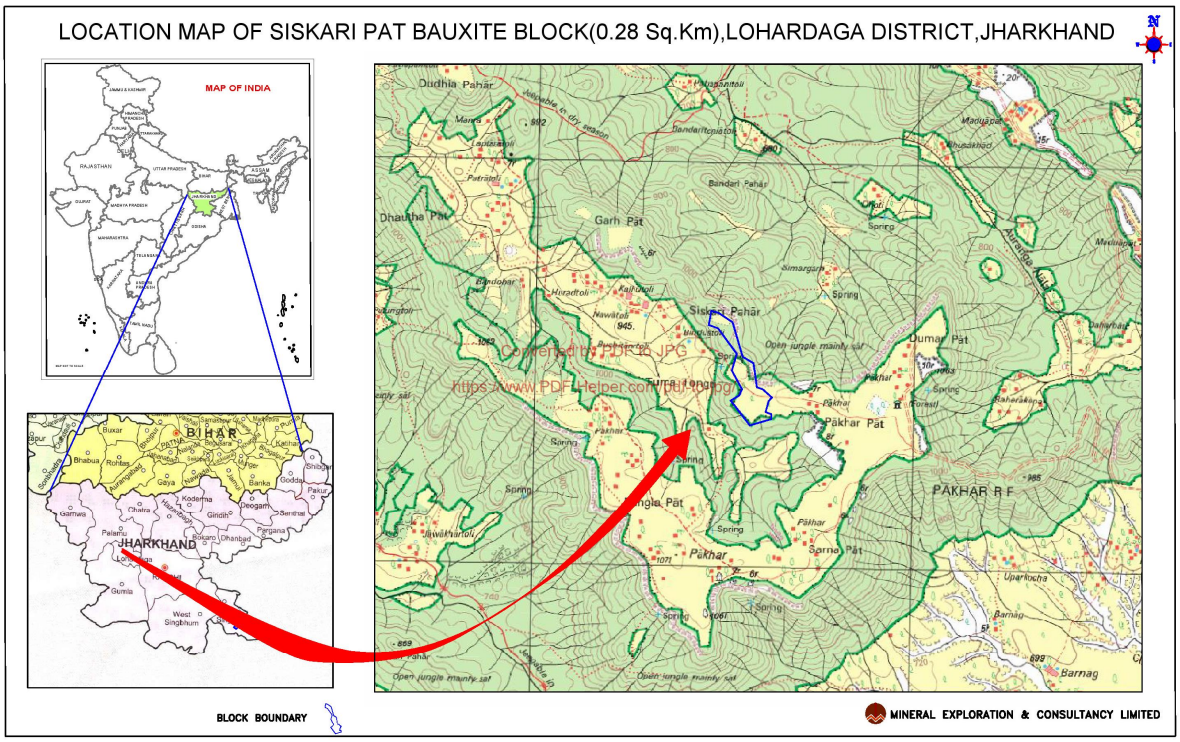
Sample ID	Al_2O_3(%)	SiO_2(%)	Fe_2O_3(%)	TiO_2(%)	LOI (%)
MSB ï 01	54.34	1.45	2.06	10.63	30.97
MSB ï 02	49.13	1.96	10.43	10.76	27.26
MSB ï 03	39.33	4.42	28.66	7.01	20.17

7.2.0 DMG, Government of Jharkhand discussed with MECL to take up exploration work of Bauxite blocks in the Lohardaga districts of Jharkhand for up gradation of the area as per the MMDR Amendment Act and Mineral Auction Rule, 2015 to enable the state government for auctioning of the Bauxite blocks. On discussion with Jharkhand Government, MECL decided to take up the exploration work of Bauxite for G3 level and accordingly prepared the proposal for G3 Level exploration in the Siskaripat Block, District ï Lohardaga, Jharkhand through NMET funding.

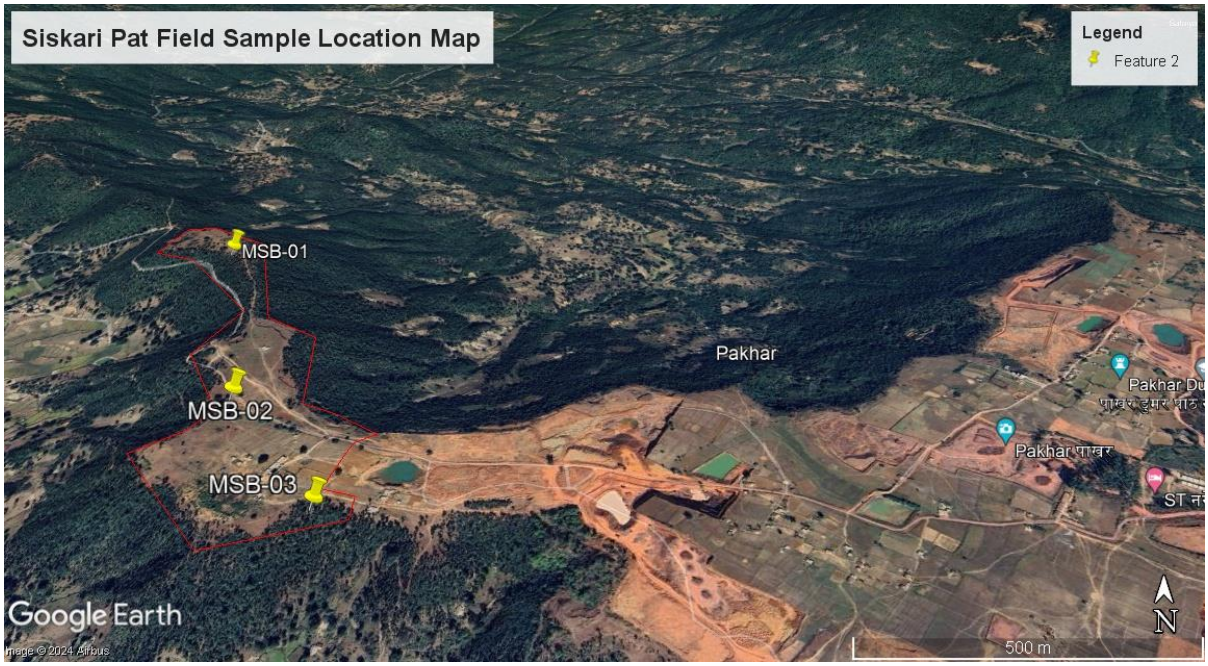
List of Plates:

1. Location Plan.
2. Field Sample Location Map
3. Regional Geological Map.
4. Siskari Pat Block and Adjacent Pakhar pat Mine Location Map
5. Proposed Borehole Location Plan

Location Map

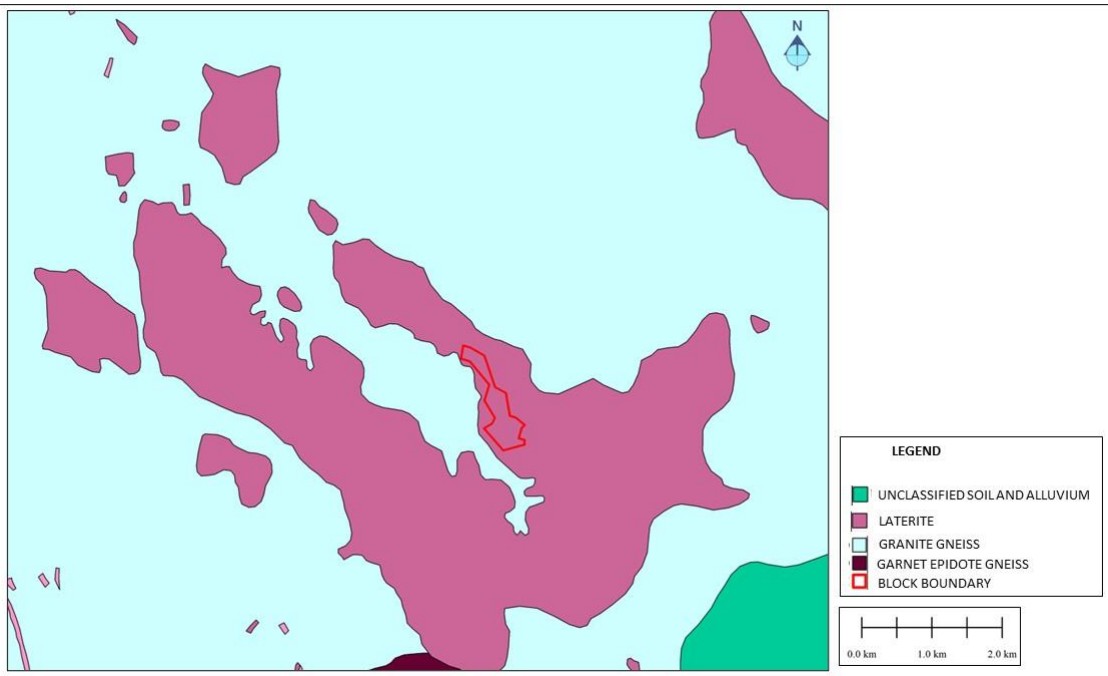


Sample Location Map



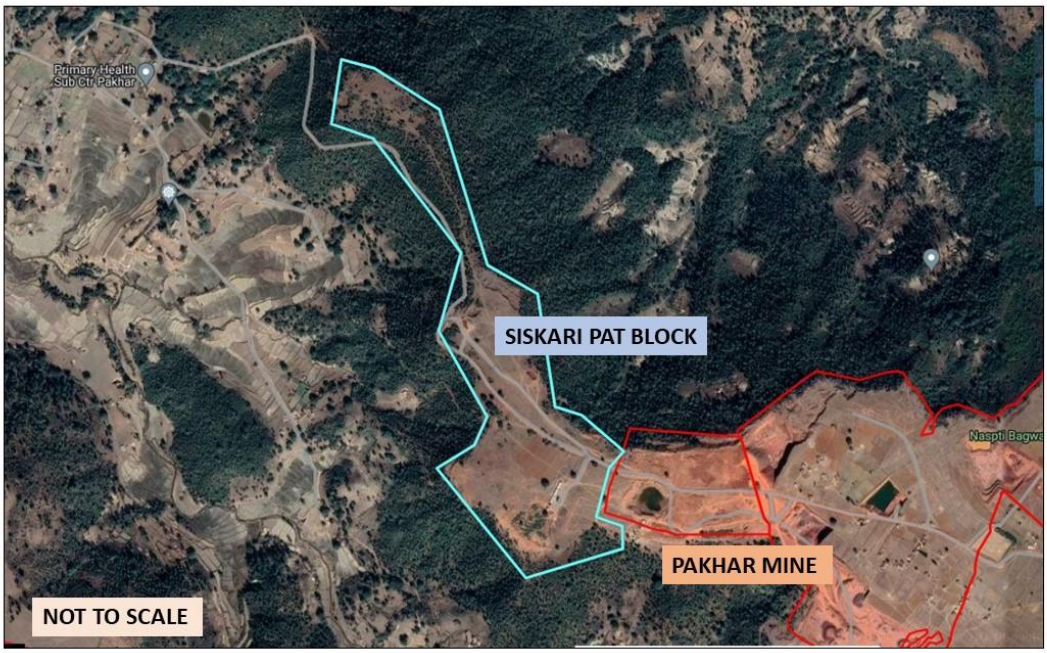
Geological Map

REGIONAL GEOLOGICAL MAP OF SISKARI PAT BLOCK (0.28 SQ KM), LOHARDAGA DISTRICT, JHARKHAND

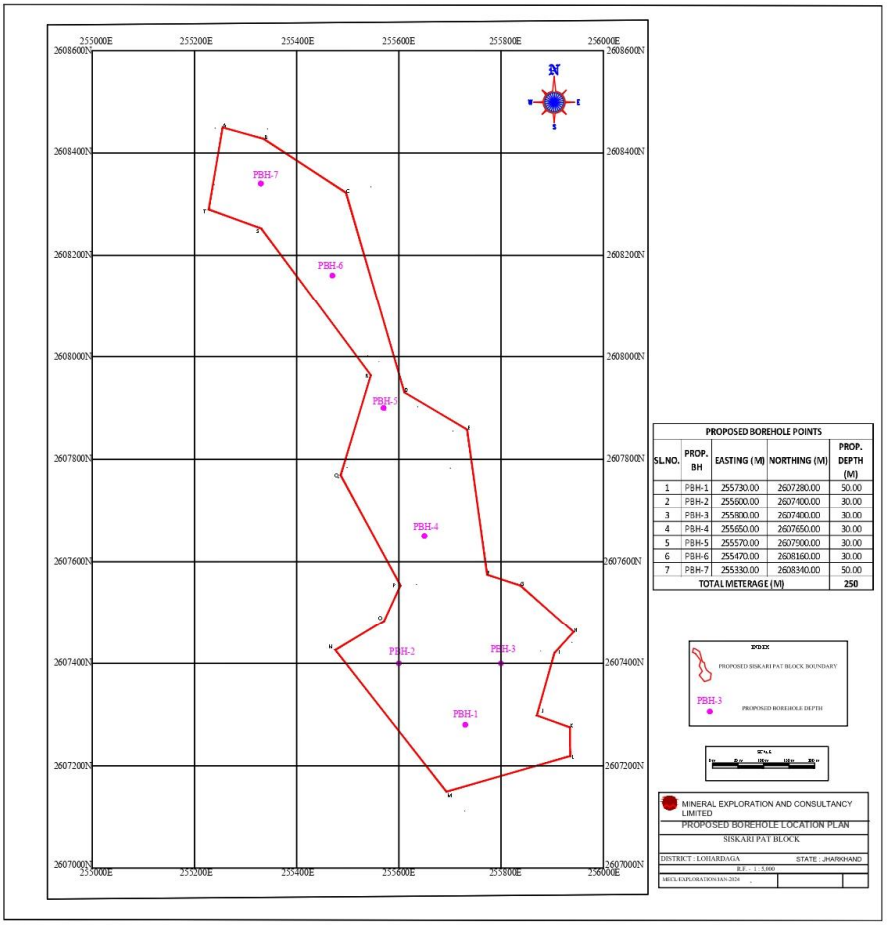


Siskari Pat Block and Adjacent Pakhar pat Mine Location Map

SISKARI PAT BLOCK ADJACENT PAKHAR MINE CONCESSION, LOHARDAGA DISTRICT, JHARKHAND



Proposed Borehole Location Plan



PROPOSED BOREHOLE POINTS

SL.NO.	PROP. BH	EASTING (M)	NORTHING (M)	PROP. DEPTH (M)
1	PBH-1	255730.00	2607280.00	50.00
2	PBH-2	255600.00	2607400.00	30.00
3	PBH-3	255800.00	2607400.00	30.00
4	PBH-4	255650.00	2607650.00	30.00
5	PBH-5	255570.00	2607900.00	30.00
6	PBH-6	255470.00	2608160.00	30.00
7	PBH-7	255330.00	2608340.00	50.00
TOTAL METERAGE (M)				250

COST ESTIMATE FOR PRILIMINARY EXPLORATION (G-3) FOR BAUXITE,TITANIUM & ASSOCIATED MINERALS IN SISKARI PAT BLOCK
DISTRICT- LOHARDAGA, STATE- JHARKHAND
Total Area - 0.28 sq km; Nos. of Boreholes - 07 ; Completion Time - 10 Months

S.N	Item of Work	Unit	Rates as per NMET SoC 2020-21		Estimated Cost of the Proposal		Remarks
			SoC-Item -Sl No.	Rates as per SoC	Qty.	Total Amount (Rs)	
A	**GEOLOGICAL WORK**						
1	**Geological mapping,Borehole logging & Sampling & Report writing**						
a	Charges for one Geologist per day at HQ	day	1.3	9,000	45	405,000	
b	Charges for Geologist party per day at field	day	1.3	11,000	180	1,980,000	
c	1 party Labour (2 Nos each party)	day	5.7	504	360	181,440	Amount will be reimbursed as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher
d	Charges for one Sampler per day (1 Party)	one sampler per day	1.5.2	5,100	30	153,000	
e	Labours (4 Nos)	day	5.7	504	120	60,480	Amount will be reimbursed as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher
2	**Survey (on 1:2000 Scale)**						
a	Topographical survey & surface contouring at 2m interval	day	1.6.1a	8,300	30	249,000	
b	Bore Hole Fixation and determination of co-ordinates & Reduced Level (RL) of the boreholes and demarcation of lease hold boundary points by DGPS	Per Point of observation	1.6.2	19,200	27	518,400	07 BH point & 20 Boundary points
c	2 party Labour (2 Nos each party)	day	5.7	504	120	60,480	Amount will be reimbursed as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher
	SUB-TOTAL A					**3,607,800**	
B	**MINERAL INVESTIGATION**						
1	**Pitting &Trenching**						
a	Pitting for determination of bulk density (1mx1mx1m)-2 nos.	per cu. m	2.1.2	3800	2	7,600	
2	**DRILLING**						
a	Dry Core Drilling up to 30-50 m (07 BHs, NQ size)	m	2.2.1.1b	6,775	250	1,693,750	Out of 07 BHs,05 BHs of 30 m depth to be drilled up to lithomarge and 02 borehole are proposed to be drilled upto 50m or basement (whichever is earlier)
b	Land / Crop Compensation (in case the BH falls in agricultural Land)	per borehole	5.6	20,000	7	140,000	Amount will be reimbursed as per actuals or max. Rs. 20000 per BH with certification from local authorities.
c	Construction of concrete Pillar (12"x12"x30")	per point	2.2.7a	2,000	27	54,000	07 BH points & 20 Boundary points
d	Transportation of Drill Rig & Truck associated per drill	Km	2.2.8	36	1,700	61,200	
e	Monthly Accommodation Charges for drilling Camp	month	2.2.9	50,000	5	250,000	
f	Drilling Camp Setting Cost	Nos	2.2.9a	250,000	1	250,000	
g	Drilling Camp Winding up Cost	Nos	2.2.9b	250,000	1	250,000	
h	Road Making (Rugged/Hilly Terrain)	per km	2.2.10b	32,200	7	225,400	Road Making will be considered as per the requirement and Road Making Charges will be reimbursed accordingly.
i	Drill Core Preservation	per m	5.3	1,590	250	397,500	
	SUB-TOTAL B					**3,329,450**	
C	**LABORATORY STUDIES**						
1	**Chemical Analysis**						
i)	**Primary samples**						
a	Analysis for 5 radicals i.e. Al2O3, SiO2, Fe2O3, TiO2 & LOI	Nos	4.1.15a	4,200	175	735,000	
ii)	**Check samples Internal (5%) and External(10%)**						
a.	Analysis for 5 radicals i.e. Al2O3, SiO2, Fe2O3, TiO2 & LOI	Nos	4.1.15a	4,200	26	110,250	
iii)	**Composite samples**						
a.	Analysis for 7 radicals, viz. Al_2O_3 , SiO_2 , Fe_2O_3, TiO_2, V_2O_5, P_2O_5 & LOI	Nos.	4.1.15a	4,200	35	147,000	
b.	Analysis for 14 radicals, viz. Al_2O_3, SiO_2, Fe_2O_3, TiO_2, V_2O_5, P_2O_5, LOI, MnO, CaO, MgO, K_2O, Na_2O, SO_3 & Organic carbon.	Nos.	4.1.15a	4,200	15	63,000	
iv)	**Analysis for Bauxite**						
a.	Combined determination of Tri hydrate Alumina (THA-40°c) and Mono hydrate Amumina (MHA- 240°c) & Reactive Silica	Nos.	4.1.17a	6,700	14	93,800	
b	Determination of Bond Work Index	Nos.	4.1.17e	10,000	5	50,000	
	Sub-Total -1					**1,199,050**	
2	**Physical & Petrological Studies**						
i)	XRD studies for identification of minerals (Random)	Nos.	4.5.1	4,000	5	20,000	
ii)	ICP-AES/ICP-MS (sequential technique) sample package for 34 elements i.e. 16 other elements viz. Li,Ga,In,Be,Ge,Mo,Cr,Ta,W,Ba,Co,Rb,Sr,Zr,Nb,Ni ;16 REE viz. La,Ce, Pr,Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu,Sc,Y; 02 Actinides viz. U,Th.	Nos.	4.1.14	7,731	14	108,234	
iii)	Preparation of thin section	Nos.	4.3.1	2,353	5	11,765	
iv)	Complete Petrographic Studies	Nos.	4.3.4	4,232	5	21,160	
v)	Preparation of polished thin section	Nos.	4.3.2	1,549	5	7,745	
vi)	Complete Minerographic Studies	Nos.	4.3.4	4,232	5	21,160	
	Sub-Total -2					**190,064**	
3	**Geotechnical Laboratory**						
i.	Specific Gravity Determination	No.	4.8.1	1,605	5	8,025	
	Sub Total- 3					**8,025**	
	SUB-TOTAL C					**1,397,139**	
D	**Total - A to C**					**8,334,389**	
E	**MISCELLANEOUS CHARGES**						
1	**Preparation of Exploration Proposal (5 Hard copies with a soft copy)**	5 Hard copies with a soft copy	5.1	2% of the aaproved project cost or Rs. 3.8 Lakhs whichever is lower		**166,688**	EA has to submit 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
2	**Geological Report Preparation**		5.2	For the projects having cost more than Rs. 300 lakhs - A minimum of Rs. 9 lakhs or 5% of the value of work whichever is more subject to a max. amount of Rs. 20 lakhs		**416,719**	EA has to submit the final Geological Report in Hard Copies (5 Nos) and the soft copy to NMET
3	**Peer review Charges**		As per EC decision			**30,000**	
	Total Estimated Cost without GST					**8,947,796**	
	Provision for GST (18%)					**1,610,603**	GST will be reimbursed as per actual and as per notified prescribed rate
	Total Estimated Cost with GST					**10,558,400**	
	Say in Lakhs (Rs.)					***105.58***	

Note - 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 execution of the project by NEA on its own, a Certificate regarding non-outsourcing of any component/ project is required.