

**PROPOSAL FOR RECONNAISSANCE SURVEY (G4 STAGE)
FOR REE AND BASE-METAL MINERALIZATION
IN TEMI-TARKU-DAMTHANG AREA, EAST SIKKIM
DISTRICT, SIKKIM STATE**

COMMODITY: REE AND BASE-METAL

**BY
MINERAL EXPLORATION CORPORATION LIMITED
DR. BABASAHAH AMBEDKAR BHAWAN
SEMINARY HILLS**

PLACE: NAGPUR

DATE:

Summary of the Block for Reconnaissance Survey (G4 Stage)

GENERAL INFORMATION ABOUT THE BLOCK

	Features	Details
	Block ID	Temi-Tarku-Damthang Block
	Exploration Agency	Mineral Exploration Corporation Limited (MECL)
	Commodity	REE and Base Metals (Cu, Pb, Zn, Ni & Co)
	Mineral Belt	-
	Completion Period with entire Time schedule to complete the project	14 months
	Objectives	Based on the evaluation of geological data available, the present exploration program has been formulated to fulfill the following objectives. i. To carry out Remote Sensing study, Geological & Structural mapping on 1:12500 scale for identification of REE and base metal bearing formation (host rock) with the structural features to identify the surface manifestation and lateral disposition of the mineralized zones. ii. To collect surface (Bedrock/ stream sediment/soil) samples & analyze for REE and base metals to decide further course of Exploration program. iii. To know the subsurface extension of ore body, few scout boreholes will be drilled based on analytical results of surface samples. iv. To estimate reconnaissance resources of REE and base metal as per UNFC norms and Amended Minerals (Evidence of Mineral Contents) Rule-2021 at G-4 level mineral

		exploration.																																															
	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.																																															
	Name/ Number of Geoscientists	Four nos. of Geoscientist (2 Field + 1 HQ +1 Remote Sensing)																																															
	Expected Field days (Geology) Geological Party Days	Geologist Party Days: i. Remote Sensing Study- 10 Days, ii. Field Party Days 180, iii. HQ Party Days- 60 Days																																															
1.	Location																																																
	<table><tr><th colspan="6">Coordinates of Cardinal Points of Temi-Tarku-Damthang Block, East Sikkim</th></tr><tr><th rowspan="2">Cardinal Point</th><th colspan="2">UTM Projection in WGS-84 Datum</th><th colspan="2">Geographic Projection in WGS-84 Datum</th><th rowspan="2">Area in Sq. Km</th></tr><tr><th>Easting</th><th>Northing</th><th>Longitude</th><th>Latitude</th></tr><tr><td>A</td><td>644461.8207</td><td>3010323.9689</td><td>88° 27' 31.1317" E</td><td>27° 12' 29.1113" N</td><td rowspan="6">74.705 sq. km</td></tr><tr><td>B</td><td>634497.5887</td><td>3010281.6223</td><td>88° 21' 29.0044" E</td><td>27° 12' 31.3748" N</td></tr><tr><td>C</td><td>634458.3616</td><td>3020522.9620</td><td>88° 21' 31.6217" E</td><td>27° 18' 04.1563" N</td></tr><tr><td>D</td><td>639547.3085</td><td>3020534.6278</td><td>88° 24' 36.7188" E</td><td>27° 18' 02.7024" N</td></tr><tr><td>E</td><td>639610.7704</td><td>3014912.3090</td><td>88° 24' 36.7200" E</td><td>27° 15' 00.0000" N</td></tr><tr><td>F</td><td>644417.8045</td><td>3014967.7479</td><td>88° 27' 31.4984" E</td><td>27° 15' 00.0105" N</td></tr></table>		Coordinates of Cardinal Points of Temi-Tarku-Damthang Block, East Sikkim						Cardinal Point	UTM Projection in WGS-84 Datum		Geographic Projection in WGS-84 Datum		Area in Sq. Km	Easting	Northing	Longitude	Latitude	A	644461.8207	3010323.9689	88° 27' 31.1317" E	27° 12' 29.1113" N	74.705 sq. km	B	634497.5887	3010281.6223	88° 21' 29.0044" E	27° 12' 31.3748" N	C	634458.3616	3020522.9620	88° 21' 31.6217" E	27° 18' 04.1563" N	D	639547.3085	3020534.6278	88° 24' 36.7188" E	27° 18' 02.7024" N	E	639610.7704	3014912.3090	88° 24' 36.7200" E	27° 15' 00.0000" N	F	644417.8045	3014967.7479	88° 27' 31.4984" E	27° 15' 00.0105" N
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	Villages	Chimche, Birgaon Lukpudung, Damthang, Pokche, Deo, Simkharka, Lakhim, Chimney, Dintam, Tarku, Amla, Tanak, Temi, Daring, Papung, Palak, Rankey, Phyaku, Chirak, Dothang, Ningang, Ben, Namprik, Gagyong, Samrak, Satam, Yangang, Sangma, Dozong, Silingthang, Pathing, Rabong, Alldanra, Kasher, Lingdong, Namphak, Chumthang, Shripatam,																																															

		Karungthang, Ralap
	Tehsil/ Taluk	-
	District	East Sikkim
	State	Sikkim
2.	Area (hectares/ square kilometers)	
	Block Area	74.705 km ²
	Forest Area	Approx. 35% of the block area (Tendong RF, Rayong RF, Rankey RF, Ralp RF, Deorali RF, Wak RF, Pathing RF and Chalamthang (Badamtam) falls under RF.
	Government Land Area	Data Not Available
	Private Land Area	Data Not Available
3.	Accessibility	
	Nearest Rail Head	Siliguri
	Road	National highway (NH510 and NH710) passing in Northern and Southern portion of the block.
	Airport	Pakyong
4.	Hydrography	
	Local Surface Drainage Pattern (Channels)	The general slope of the area is towards east and the drainage is collected by mostly easterly flowing small nallas draining into Tista nadi. There is generally dendritic pattern of drainage in the block. The block area is forested with dense open and mixed jungles and there is scarcity of agricultural land.
	Rivers/ Streams	Tista Nadi (River) present at NE side in the block and few small streams/tributaries of Tista are also present in the block.
5.	Climate	
	Mean Annual Rainfall	Generally average annual rainfall varies between 300cm and 450cm with a maximum of 600cm

		during the monsoon.
	Temperatures (December) (Minimum) Temperatures (June) (Maximum)	Minimum temperatures about 2°C (Dec-Feb), Maximum temperatures up to 32°C (March-June)
6.	Topography	
	Toposheet Number	78A/7 & 78A/8
	Morphology of the Area	The area consists of highly variable hilly terrain with escarpments and deep valleys. Elevation of tarku area is about 970m, Temi is about 1315m and Damthang is about 1990m. Tista Nadi (River) present at NE side in the block which is perennial in nature.
7	Availability of baseline geosciences data	
	Geological Map (1:50K/ 25K)	1:50000 (Bhukosh)
	Geochemical Map	Not Available
	Geophysical Map	Not Available
8.	Justification for taking up Reconnaissance Survey / Regional Exploration	1. Atomic Mineral Division (AMD), Government of India and Teshering Tashi of Department of Mines and Geology Government of Sikkim had reported occurrences of basic intrusive at few places in the area which are anomalous for U-Th-REE mineralization and could mark a potential zone for such mineralization and recommended to be surveyed in greater details. 2. MECL had explored two copper block Dikchu Copper-Zinc deposit (1983) in NE direction and Upper Pachekhani Block (2002) in E direction which are situated within 65km of the proposed block having similar geological setup. 3. During joint field visit (from 21/10/2021 to

		27/10/2021) of MECL and DMMG Sikkim, there observed encrustations of malachite stains on road sections and anomalous value of copper obtained from field samples collected during the visit encourages for Reconnaissance Survey (G-4) in the block.
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Proposal for Reconnaissance Survey (G4 Stage) for REE and base-metal mineralization in Temi-Tarku-Damthang area, East Sikkim District, Sikkim State

1.0.0 INTRODUCTION:

1.1.0 Preamble

- 1.1.1 Rare earths are characterized by high density, high melting point, high conductivity and high thermal conductance. These unique properties i.e., distinctive electrical, metallurgical, catalytic, nuclear, magnetic and luminescent properties make them indispensable for a variety of emerging high end and critical technology applications relevant to India's energy security i.e., clean energy technology, defense, civilian application, environment and economic areas. Demand for REE is expected to continue to grow, especially because of their use in low carbon technology. The ever-increasing demand for these Rare Metals and REE necessitates a concerted effort to augment the resource position of our country.
- 1.1.2 Copper is a soft, malleable, and ductile metal with very high thermal and electrical conductivity. copper is one of the few metals that occurs in nature in directly usable metallic form (native metals) and is an important non-ferrous base metal having wide industrial applications, ranging from defence, space programme, railways, power cables, mint, telecommunication cables, etc. India is not self-sufficient in the production of copper ore. In addition to domestic production of ore and concentrates, India imports copper concentrates for its smelters. The domestic demand for copper and its alloys is met through domestic production, recycling of scrap and by imports.
- 1.1.3 Copper is one of the most recycled metals of all the metals. The recycling of copper scrap is gaining importance worldwide simply because of the fact that recovery of copper metal from scrap requires much less energy than its recovery made from primary source. Besides, it enables conservation of natural resources.
- 1.1.4 Copper with its unique physical, mechanical and electrical properties, has played a vital role in the industrial growth of a Nation. In India, around 75% of demand is met through imports. The increasing demand of copper metal in the country could be eased with the exploration of new copper deposits of economic importance.

- 1.1.5 During preceding decades, no large-scale metal deposit has been discovered in India. However, the possibility of working of small mineral bodies in proximity to each other, though technological advances and increased operational efficiency cannot be ruled out. Therefore, it is necessary and imperative to locate and explore such small metal deposits in cluster.

1.2.0 Background

- 1.2.1 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 Reconnaissance Survey (G-4) for REE and base metal in Temi-Tarku-Damthang area, East Sikkim District, Sikkim State.

1.3.0 Location and Accessibility

- 1.3.1 The proposed Temi-Tarku-Damthang Block area lies in East Sikkim District (Toposheet No 78A/7 & 78A/8) of Sikkim State. Temi place is situated about 46km in SW direction from the Gangtok city. Tarku village is situated about 7km in NE direction from Temi village. Damthang is situated about 17.50 km in west direction from Temi. Block area is well connected by roads and accessible from Gangtok city through National highways (NH510 and NH710) passing in Northern and Southern portion of the block. Most of the villages in the area are well connected to each other and to the highways by motorable roads and tracks. Siliguri Junction is the nearest railhead situated about 112km distance from Gangtok city and Pakyong is nearest airport about 27km from Gangtok.

1.4.0 Physiography, Drainage and Vegetation:

- 1.4.1 The area consists of highly undulating hilly terrain with escarpments and deep valleys. Elevation from MSL of tarku area is about 970m, Temi is about 1315m and Damthong is about 1990m.
- 1.4.2 Tista Nadi (River) present at NE side in the block which is perennial in nature and few small streams/tributaries of Tista are also present in the block. The general slope of the country is towards east and the drainage is collected by mostly easterly flowing

small nalla draining into Tista nadi. There is generally dendritic pattern of drainage in the block.

- 1.4.3 The area having considerable amount of rainfall, distributed all over the year, is covered with thick vegetation. Most of it is forested with dense open and mixed jungles of Chap, Retus and Sal, inhabited with different species of animals. Scarcity of agricultural land in the state has made the local people learn to cultivate in very small and narrow stretches of level ground on the hill slopes. Such cultivation popularly known as terrace cultivation is being practiced as places for producing maize and paddy. Orange, cabbage are also some of the important agricultural products of the area.

1.5.0 Regional Geological setup

- 1.5.1 Sikkim-Darjeeling Himalayas have been defined by four tectonic units from South to North viz i) Foot Hill Belt, ii) Inner Belt, iii) Axial Belt and iv) Trans Axial Blt. Foot Hill Belt comprise of Siwaliks, Gondwanas and Impresistant Buxas. This belt is characterized by close spaced thrusts. The main tectonic unit within foot hill belt is the Main Boundary Fault between Siwaliks and the Gondwanas. This belt is not in Sikkim.
- 1.5.2 Inner belt comprises of metamorphites of Daling-Darjeeling sequence. The characteristic presence in this unit is the presence of Isolated Tectonic window zones' in number of thrust controlled granitoid gneissic bodies (Lingtse and Pendam granite gneisses) which occupy different tectonic and Stratigraphic levels in low grade metamorphic of Dalings.
- 1.5.3 The Axial Belt is defined by highest grade of metamorphic rocks represented by Tsungthang Formation, Calcareous gneiss and Kanchendzongha gneiss (migmatite gneiss). This unit is separated from Inner Belt by Main Central Thrust or MCT which is an important identifiable zone of separation of lithounits all along Himalayas.
- 1.5.4 Trans Axial belt is represented by Tethyan sequence comprising of Everest Pelitic and Calcareous sequence, Lachi series (equivalent to lower Gondwana) and Cho-lhamo series (Jurassic).
- The area of study falls within inner belt along Rangit window zone.

- 1.5.5 The geological formation in the area comprises of Buxa sequence overlain by the rocks of Daling series and underlain by Gondwana group of rocks which can be represented in the following Chronological order.

Table 1.0 Stratigraphic Succession of the area (After, GSI)

Formation/Series	Lithology
Gondwana Series -	Boulder bed, Sandstone carbonaceous Shale, Slates, Phyllites with occasional coal seams.
Buxa Series	Calcareous Slate, Pink or buff coloured Slaty Phyllite/quartzite, pink, Buff or Grey coloured dolomites.
Daling Series	Quartz-Chlorite-Sericitic-Phyllite, Quartzites, quartzitic-phyllite, phyllitic quartzite etc with sulphide mineralization in certain areas.

Tectonostatigraphically, the Daling group of rocks showing as inverted Stratigraphic sequence overlies the stratigraphically younger Gondwana group of rocks.

- 1.5.6 The Rangit Tectonic Window exposes the folded rocks of the Buxa and Gondwana Groups surrounded by the thrust unit of the Daling phyllites and quartzites, forming the Daling Nappe (Sinha Roy, 1972). The Gondwana pebble bed contains boulders and pebbles of dolomite, quartzite and purple slate, indicating their derivation from Buxa rocks. Hence stratigraphically, the Buxa group of rocks are considered older to the Gondwana Group. The age of the Gondwana Group has been fixed as Permo-Carboniferous on the basis of faunal assemblage studies (Sahni and Srivastava, 1956). The age of the Buxa Group of rocks has been tentatively placed, based on the study of stromatolites, between Proterozoic and Lower Palaeozoic (Sinha Roy, 1972). The Buxa sequence is predominantly made up of dolomites (at places stromatolite-bearing), pink dolomitic limestones, purple calc-slates, and grey quartzites which show lateral lithological facies variation.

Both the Buxa and Gondwana rocks are co-folded into repeated isoclinal anticlines and synclines, with plunges towards northwest and northeast. In the Rangit valley section, these fold-axes vary from NNE-SSW to E-W and NNW ESE.

1.6.0 Geology of the Block

1.6.1 The study area falls within the Daling allochthonous group. The higher tectonic positions, especially near Damthang, Chimche and parts of Tendong peak are occupied by crystalline rocks. These rocks are stratigraphically older and believed to be thrust over the Daling Group of rocks. The Buxa groups of rock occurs in the para-autochthonous belt and within Rangit Tectonic Window. These rocks are overlain by the Daling through Thrusting.

1.6.2 The Daling Group of rocks are made up of chlorite sericite Phyllite and quartzose Phyllite, quartzites, varbed Phyllite, slates and quartz intrusive. These monotonous suite of litho units constitute major part of the study area save for the dyke/ sill igneous intrusive, coal along fault/ thrust planes and carbonate rocks emplaced structurally. The most prominent among the units are quartzites. They form most of the escarpment faces and show pinch and swell structures. They come in different colours from buff to pure white. The coarse-grained white quartzite usually has sedimentary structures (Cross bedding) preserved. In the study area, this unit is very prominent and appears to be resistant to minor localized warping, faulting and folding. They are brittle and much more competent than the phyllites. The fracture/ fissure intensity per unit meter in them is much higher than other litho units. The phyllites of the Daling come in different hues and fabric. They are usually chloritic and/ or chlorite sericitic. They are fissile, thinly laminated, with numerous kinks, drag folds, micro folds and the chloritic phyllites are host to innumerable quartz veins either along foliations/ schistosity planes or across the foliations. The phyllites, in general, are soft and form major part of the Daling group.

1.6.3 The basic igneous intrusive is found within the Dalings. It behaves as a sill in one place and as a dyke in other. Near Maniram-Banjyang, it starts from thrust contact between the Daling and Buxa Group of rock. Here, it behaves as a sill between buff coloured slate. The intrusive is located at Jaubari and Chimche areas as a dyke. According to the Atomic Mineral Division, Government of India, radioactive anomaly is highest wherever this intrusive is seen.

The study area is structurally highly disturbed. The structural elements are so haphazardly emplaced around the belt that their interpretation becomes meaningless.

1.7.0 Mineral potentiality based on geology, geophysics, ground geochemistry etc.

- 1.7.1 In preliminary investigation of basic intrusive around Parbing (South Sikkim) by Teshering Tashi of Department of mines and Geology Government of Sikkim Gangtok there is reported occurrences of basic intrusive at few places and according to Atomic Mineral Division (AMD), Government of India, radioactive anomaly is highest wherever this intrusive is seen.
- 1.7.2 T.N Parthasarathy et.al. (1990) of AMD In his research paper under the title “Potash feldspar-rich alkaline rocks of Rangit tectonic window, South Sikkim: their genesis and relation to uranium, thorium, and REE mineralizations in the area” has mentioned the zone of U-Th-REE mineralization is spatially confined to the Buxa-Gondwana tectonic zone, into which the ‘alkaline’ rocks have been emplaced. The major uranium-thorium anomalies in this zone are located at Subuk (in Rangit Valley), Sikkip (SW of Subuk) and at Longkhola-Phalidanda (further WSE) all along the strike direction, namely ENE-WSW. In all the above cases, U-Th mineralization restricted to the interbanded transitional facies rocks between the underlying phyllites and dolomites, and the overlying quartzite unit, highly brecciated and at places showing mylonitic features (Surendra Sagar and Parthasarathy, 1989). The main ore minerals identified in the mineralized samples from the above locations are, xenotime and thorite at Sikkip, brannerite and davidite at Subuk and uraninite at Long Khola. This would clearly point out to the presence of U-Th-REE mineralization along this zone. With respect to this zone, the alkaline bodies occur either a few meters above or below, and at some places, like Sikkip, they show complete crushing and transformation to crocidolite schists, derived from the riebeckite of the original rock. At other places, where they have escaped such deformation, they show euhedral Biotite in a groundmass of hornblende and aegirine-acmite with the development of potash feldspar porphyroblasts. On this basis, this could mark a potential zone for such mineralization and needs to be surveyed in greater details. Presently, the rocks along this zone show evidences of significant deformation nearer the tectonic contact and very little deformation away from the contact, towards the Gondwana Group of rocks below. Time-wise, the mineralization phase will have to be earlier to the Buxa-Gondwana thrusting, namely sometime between Cretaceous and Palaeocene.

They had collected 9 samples of potash-rich alkaline rocks of south Sikkim which had given of trace element content as below mentioned range. All data in parts per million (ppm)*

Table:I.A

**Trace element content of potash-rich alkaline rocks collected in the field
(T.N Parthasarathy et.al. (1990) of AMD)**

Sampel No.	Nb	Zr	Y	Rb	Sr	Ba	Pb	Zn	K/Rb	Rb/Sr
S1-S9	48-334	620-5631	79-217	83-162	45-1662	212-3509	12-738	119-385	393-796	0.090-3.35

*Analysis of samples carried out at the XRF Laboratory, Atomic Minerals Division, Hyderabad, using WDXRFS techniques.

1.7.3 During the joint field visit of MECL and Department of Mines and Geology, Government of Sikkim from 21/10/2021 to 27/10/2021 for possibility of preparing exploration proposals for REE in the area, there encountered encrustations of malachite stains on road sections at two places in Quartz-Chlorite-Sericite-phyllite of Daling Series, one is around 2km from Damthang- Namchi road section and another is at east of Pokche khola village in this proposed block. The two samples collected from these locations subjected for Cu and associated elements analysis under hand held XRF and gave results as mentioned below-

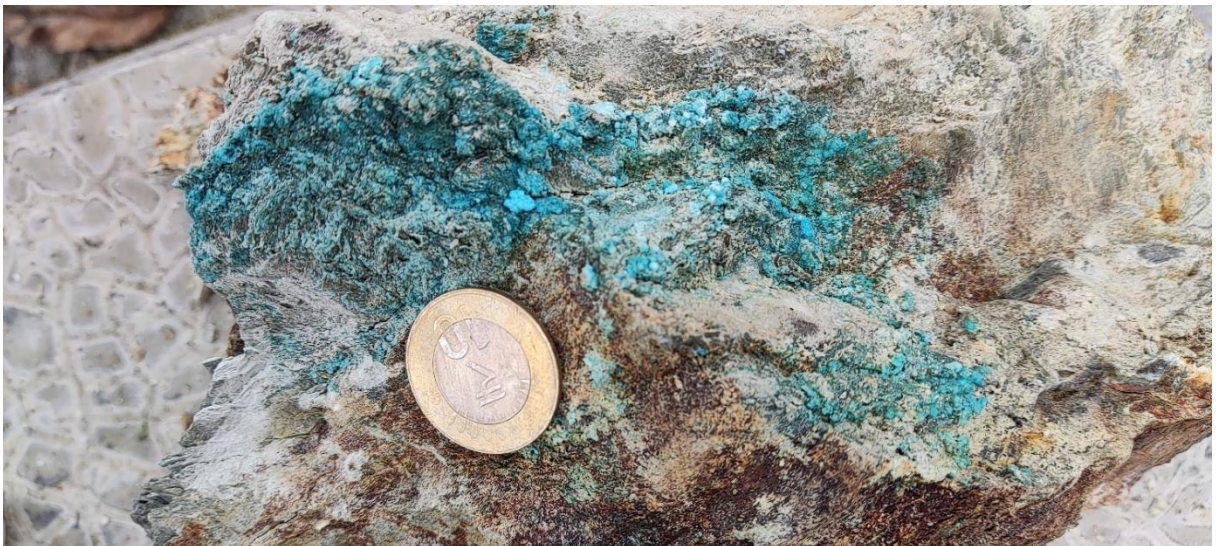
Table:I.B

Results of samples collected from the place of malachite encrustation encountered under hand held XRF (MECL & DMMG joint field visit)

Sample No	Analysis (Concentration in PPM)								
	Cu	Pb	Zn	Ni	Co	Ti	Fe	Al	Si
L-6	55188.00	18.33	59.67	52.33	198.00	3318.00	23212.67	106983.00	143031.70
L-19	3647.67	17.33	38.33	34.67	21.33	2512.33	33839.33	57956.67	233803.00



Field Photograph of encrustations of malachite stains at east of Pokche khola village on road section.



Field Photograph of encrustations of malachite stains around 2km from Damthang-Namchi road section.

1.7.4 MECL had carried out techno-feasibility study on behalf of MoM of the Dikchu Copper-Zinc Deposit (1983) and had established ore reserve about 0.45 million tones containing 2.82% Cu and 0.90% Zn. Out of the total ore reserve, about 0.30 million tones contains an average of 3% Cu and 1%Zn of which falls under the developed and proved category. The investigated lode extents for about 564 meters in length, 100 meter in vertical depth and 1.25 meters in thickness. The Dikchu Copper-Zinc Deposit is located about 64km in NE direction of the Malachite encrustation found in the proposed block.

1.7.5 MECL had also done Geological exploration on behalf of MoM for Copper in Upper Pachekhani Block in East Sikkim (2002) and had established a total of 35420 tonnes of ore resources with a grade of 1.21% Cu in the block. The Upper Pachekhani Block is located about 62km in East direction of the Malachite encrustation found in this proposed block.

1.8.0 Previous Work

1.8.1 The Geological Survey of India (GSI) has completed systematic geological mapping of 90% of accessible land on 1:50000 scale and carried out mineral exploration mostly around parts of South, West and East Sikkim. The State Department of Mines and Geology has been working on site specific geological & geo-technical study, on a prioritized basis, both the agencies have found large deposits of low- value-high bulk minerals besides base metal occurrences mostly within the Daling Group of rocks called Gorubathan Formation.

1.8.2 T.N Parthasarathy et. Al. (1990) of AMD has mentioned the zone of U-Th-REE mineralization is spatially confined to the Buxa-Gondwana tectonic zone, into which the ‘alkaline’ rocks have been emplaced, details are mentioned under above para no 1.7.2.

1.8.3 As regards to ploy metalliferous deposits in the State, Copper-Lead-Zinc deposit at Bhotang, Rangpo, has been under exploitation by Sikkim Mining Corporation. Other base metal deposit under consideration for exploitation by the Government is the Dikchu Copper-Zinc project, details of reserve mentioned in para no 1.7.4.

1.8.4 MECL had also done Geological exploration for Copper in Upper Pachekhani Block in East Sikkim (2002), details mentioned in para no.1.7.5.

1.8.5 As per a paper published by C.S. Dubey et al. (2009) rare ultrapotassic syenites forming the Sikkim Igneous Formation occur as linear bodies (10 to 65 m in length), mainly within the Proterozoic Daling phyllites and occasionally at the contact of the Daling Formation with the Buxa Formation (Lower Palaeozoic), in Tashiding-Khamdong-Sang area in parts of the Sikkim Himalaya. Syenites are exposed near Tashiding and northeast of Khamdong and trend sub-parallel to the phyllites intercalated with quartzites. The foliation of phyllites and intercalated quartzites follows the potassic syenite intrusions. The foliation of phyllites and intercalated quartzites follows the potassic syenite intrusions. Mafic volcanic rocks are found interbedded with Upper Paleozoic sedimentary sequence and low-grade metamorphics in Daling and Buxa Formation of the area. The occurrence of nepheline syenites was also reported in Maniram-Bhanjyang area, South Sikkim by the geologist of the Department of Mines and Geology, Govt. of Sikkim during their field visit.

2.0.0 Observation and Recommendations of previous work.

2.0.1 T.N Parthasarathy et. Al. (1990) of Atomic Mineral Division (AMD), Government of India and Teshering Tashi of Department of Mines and Geology Government of Sikkim had reported occurrences of basic intrusive at few places in the area which are anomalous for U-Th-REE mineralization and could mark a potential zone for such mineralization and recommended to be surveyed in greater details. Occurrences of malachite stains in the road section in the area also suggest for exploration in the block. So, it is worthwhile to test this area to delineate the mineralization for the further exploration work for REE and Cu with associated minerals. Since the proposed exploration work is reconnaissance (G-4) level exploration, the possibility of other mineralization will also be tested.

3.0.0 Scope for proposed exploration.

3.0.1 The Reconnaissance survey at G-4 stage exploration program proposed comprises, Geological mapping (1:12,500 scale), Surface sampling (Bedrock, Soil, Stream Sediments), Trenching, drilling of few Nos of scout boreholes involving about 500m drilling with associated survey, chemical analysis, physical analysis and geological report preparation.

3.1.0 Block description

3.1.1 The proposed Block area falls in Survey of India Toposheet No 78A/7 & 78A/8 of Sikkim State and covers 101.656 Sq.km in around villages of Chimche, Birgaon Lukpudung, Damthang, Pokche, Deo, Simkharka, Lakhim, Chimney, Dintam, Tarku, Amla, Tanak, Temi, Daring, Papung, Palak, Rankey, Phylaku, Chirak, Dothang, Ningang, Ben, Namprik, Gagyong, Samrak, Satam, Yangang, Sangma, Dozong, Silingthang, Pathing, Rabong, Alldanra, Kasher, Lingdong, Namphak, Chumthang, Shripatam, Karungthang, Ralap of East Sikkim District of Sikkim. The block location in topo sheet is given in **PLATE-I**. The Co-ordinates of the corner points of the block area both geodetic and UTM are given in **Table No.-II.A**.

Table:II.A

Coordinates of Cardinal Points of Temi-Tarku-Damthang Block, East Sikkim					
Cardinal Point	UTM Projection in WGS-84 Datum		Geographic Projection in WGS-84 Datum		Area in Sq. Km
	Easting	Northing	Longitude	Latitude	
A	644461.8207	3010323.9689	88° 27' 31.1317" E	27° 12' 29.1113" N	74.705 sq. km
B	634497.5887	3010281.6223	88° 21' 29.0044" E	27° 12' 31.3748" N	
C	634458.3616	3020522.9620	88° 21' 31.6217" E	27° 18' 04.1563" N	
D	639547.3085	3020534.6278	88° 24' 36.7188" E	27° 18' 02.7024" N	
E	639610.7704	3014912.3090	88° 24' 36.7200" E	27° 15' 00.0000" N	
F	644417.8045	3014967.7479	88° 27' 31.4984" E	27° 15' 00.0105" N	

4.1.0 Planned Methodology

4.1.1 The exploration program is proposed in accordance to the objective set for reconnaissance survey (G-4) of the block. The Exploration shall be carried out as per Minerals (Evidence of Mineral Contents) Amended Rule-2021. Accordingly, the

following scheme of exploration is formulated in order to achieve the objectives. The details of different activities to be carried out are presented in subsequent paragraphs.

4.2.0 Remote Sensing Studies

4.2.1 Remote sensing study shall be carried out in the entire 74.705 sq. km area to identify the lineaments, lithological contacts, other structural features and the mineral potential zones through mineral targeting process.

4.3.0 Geological Mapping (1:12,500 Scale)

4.3.1 Geological mapping will be done in the entire 74.705 sq. km area on 1:12,500 scale. Rock types, their contact, structural features will be mapped. Surface manifestations of the mineralization available along with their surface disposition will be marked on map. Surface samples and borehole samples of various lithounits for petrological studies and mineragraphic studies will be done.

4.4.0 Geochemical Sampling

4.4.1 Bed Rock and Stream sediment Sampling:

During the course of Geological mapping bed rock, stream and soil sediment samples shall be collected from the outcrops and within the study area which will be total about 130 nos within which 100 Nos of sample may be for basemetals and 30 Nos samples may be analyzed for REE.

4.4.2 Channel Sampling

During the investigation, channels may be cut directly on the fresh surface of the exposed lithounits across the visible mineralisation. A total about 130 nos of channel samples may be collected within which 100 Nos of sample may be analysed for basemetals and 30 Nos samples may be analyzed for REE.

4.5.0 Surveying:

4.5.1. Survey party shall be associated with during scout borehole fixation and determination of reduced level and co-ordinates of the boreholes by DGPS only.

4.6.0 Exploratory Mining (Trenching):

4.6.1 Shallow trenching/Pits (Excavation) shall be carried out in the potential zones identified based on the results of geological mapping and geochemical sampling. A provision of shallow trenching on mineralized zones (if any) (1m wide X 2m deep) with 100 cubic meters is kept. Trenching will be carried out on surface up to a depth of 1 m (maximum 2 m depth from surface) after removal of soil/weathered column in

the area. Locations of trenches on ground will be decided by field geologist based on field observations (positive outcome of the bedrock sampling). A provision of 100 no of primary trench/channel samples each is kept for analysis within which 80 Nos of samples shall be prepared for analysis of basemetals and associated minerals and 20 nos of samples shall be analysed for REE. The trench walls will be mapped on 1:200 scale.

4.7.0 Core Drilling:

4.7.1 Based on Geological Mapping, results of trench samples, Geochemical Sampling, the extension of the mineralized zones (ore bodies) will be marked. To find out the potentiality of mineralized zones in strike & dip direction, few scout boreholes involving about 500m of drilling will be carried out for upper (first) level of intersection of mineralized zones. The azimuth and angle of inclination of the proposed boreholes will be decided by the field geologist once the attitude (strike & dip) of mineralized zones (host rock) is deciphered after geological mapping.

4.8.0 Drill Core Logging:

4.8.1 The drill core will be logged for rock types, structural features, textures, intersection of ore zones, types of mineralization and occurrence of various ore minerals. The logging for determination of Rock Quality Designation/determination (RQD) will also be undertaken.

4.9.0 Drill Core Sampling:

4.9.1 During geological logging of drill core, mineralized zone will be marked on the basis of concentration of ore minerals and lithology. Total 125 no of primary samples each shall be generated and shall be analysed for REE, Cu and associated minerals depending on the indication of mineralization.

4.10.0 Chemical Analysis

4.10.1 Whole Rock Analysis:

Whole Rock analysis for SiO_2 , Al_2O_3 , Fe_2O_3 , TiO_2 , MnO , CaO , MgO , Na_2O , K_2O , H_2O , P_2O_5 , CO_2 , & S radicals will be carried out on 15 nos. of rock samples to check the rock types, their variation in chemical composition.

4.10.2 Petrological & Mineragraphic Studies:

During the course of Geological mapping and core logging 20 nos. of samples from various litho units from outcrop and borehole core will be studied for petrography and

15 nos. of samples from mineralized zones will be studied for the ore mineral assemblages and their distribution, alteration, enrichment etc. in polished sections (Mineragraphic studies).

4.10.3 Chemical Analysis:

All the primary samples, Internal (5% of primary samples) and external check samples (10% of primary samples) generated for basemetals and associated minerals from bed rock, stream sediments, surface channel, trenching and borehole core samples shall be analysed for Cu, Pb, Zn, Ni and Co by AAS method. However All the primary samples, Internal (5% of primary samples) and external check samples (10% of primary samples) generated for REE from bed rock, stream sediments, surface channel, trenching and borehole core samples shall be analysed by ICPMS.

4.11.0 Core Preservation

4.11.1 One single boreholes with full length and only the mineralized part from rest of the boreholes shall be preserved properly and handed over to NMET as per future direction.

4.12.0 Preparation of Geological Report

4.12.1 After completion of exploration work and receipt of analysis, exploration report at G-4 level shall be prepared and 5 nos of hard copies along with soft copy shall be submitted to NMET after peer review.

5.1.0 Proposed Quantum of work

5.1.1. Details of the particular, Quantum and the targets are tabulated in **Table No.- V.A.**

Table No-V. A

Envisaged Quantum of proposed work in Temi-Tarku-Damthang Block, East Sikkim

Sl. No.	Item of Work	Unit	Target
1	Remote Sensing Studies	Sq. Km	74.705
2	Large Scale Mapping (1:12500)	Sq km	74.705
3	Geochemical Sampling (Bed Rock/Soil/ Stream sediment)		
	a) For Cu, Pb, Zn, Ni & Co	Nos.	100
	b) for REE	Nos.	30
	c)Channel sample on bedrock For Cu, Pb, Zn, Ni & Co	Nos.	100
	d) Channel sample on bedrock for REE	Nos.	30
4	Trenching	Cu m	100
	Channel Samples within trench For Cu, Pb, Zn, Ni & Co	Nos.	80
	Channel Samples within trench for REE	Nos.	20

Sl. No.	Item of Work	Unit	Target
5	Drilling (coring)*		
	a) Drilling	m	500
6	Laboratory Studies		
	I. Geochemical Sampling (Bed Rock/Soil/ Stream sediment)		
	i) Primary Samples		
	a) Cu, Pb, Zn, Ni & Co by AAS	Nos	100
	b) REE by ICPMS	Nos	30
	ii) Check Samples (5% Internal + 10% External)		
	a) Cu, Pb, Zn, Ni & Co by AAS	Nos	15
	b) REE by ICPMS	Nos	5
	II. Channel Samples on Surface expousures		
	i) Primary Samples		
	a) Cu, Pb, Zn, Ni & Co by AAS	Nos	100
	b) REE by ICPMS	Nos	30
	ii) Check Samples (5% Internal + 10% External)		
	a) Cu, Pb, Zn, Ni & Co by AAS	Nos	15
	b) REE by ICPMS	Nos	5
	III. Trench Samples		
	i) Primary Samples		
	a) Cu, Pb, Zn, Ni & Co by AAS	Nos	80
	b) REE by ICPMS	Nos	20
	ii) Check Samples (5% Internal + 10% External)		
	a) Cu, Pb, Zn, Ni & Co by AAS	Nos	12
	b) REE by ICPMS	Nos	3
	III. Drill Core Samples*		
	i) Primary Samples		
	a) Cu, Pb, Zn, Ni & Co by AAS	Nos	100
	b) REE by ICPMS	Nos	25
	ii) Check Samples (5% Internal + 10% External)		
	a) Cu, Pb, Zn, Ni & Co by AAS	Nos	15
	b) REE by ICPMS	Nos	4
7	Petrological Samples (Surface & BH Core Samples)		
	a) Preparation of Thin Section	Nos	20
	b) Study of Thin Section	Nos	20
8	Mineragraphic Studies (Surface & BH Core Samples)		
	a) Preparation of Polished Section	Nos	15
	b) Study of Polished Section	Nos	15
9	Whole Rock Analysis		
	For SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ , TiO ₂ , MnO, CaO, Na ₂ O, K ₂ O+H ₂ O, MgO, P ₂ O ₅ , CO ₂ , & S.	Nos	15

Sl. No.	Item of Work	Unit	Target
10	Report Preparation (5 Hard copies with one soft copy)	Nos.	1
11	Preparation of Exploration Proposal (5 Hard copies with a soft copy)	Nos.	1
* The work to be decided after review of Geological Mapping, surface/Stream sediment/soil sampling, and trench sampling.			

6.1.0 Manpower Deployment

6.1.1 Manpower deployment List may be provided later.

7.1.0 Break-up of Expenditure

7.1.1 Tentative Cost has been estimated based on Schedule of Charges (SoC) of projects funded by National Mineral Exploration Trust (NMET) w.e.f. 01/04/2020. The total estimated cost is **Rs. 452.07 Lakhs**. The summary of cost estimates for Reconnaissance Survey (G-4 Level) is given in **Table No.-VII.A** and details of cost estimates is given in **Table No. –VIII.A**. Tentative Time schedule/action plan for proposed Reconnaissance Survey (G-4) for REE and base metal (Cu, Pb, Zn, Ni & Co) is given in **Table No. VII-B**.

Table No-VII.A

Summary of Cost Estimates for Reconnaissance Survey (G-4 Level) Exploration

Sl. No.	Item	Total Estimated Cost (Rs.)
1	Remote Sensing Study	90,000.00
2	Geological Work	24,11,240.00
3	Pitting & Trenching	3,30,000.00
4	Drilling	74,39,540.00
	Sub total	102,70,780.00
	Additional 3.35%	341,05,613.00
5	Geologist at HQ	5,40,000.00
4	Laboratory Studies	20,80,892.00
	Sub total	368,16,505.00
5	Report	11,04,495.15
6	Peer Review	10,000.00
7	Proposal Preparation	3,80,000.00
	Total	383,11,000.15
8	GST (18%)	68,95,980.03
Total cost including 18% GST		452,06,980.18
SAY, in Lakhs		452.07

Table No-VIII.A							
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	REMOTE SENSING STUDY						
a	Cost of interpretation in terms of Geologist Man days	day	1.1b	9,000	10	90,000	
b	Chargest of procurement of imageries	No.	1.1a	-	-	-	As per actual cost incurred on
	Sub-Total A					90,000	
B	GEOLOGICAL WORK						
a	Charges for Geologist at field for mapping, channel sampling and trenching	day	1.3	11,000	180	19,80,000	
b	Labour Charges for Geologist; Base rate - Rs. 437/ per day	day	5.7	437	360	1,57,320	Amount will be reimburse as per the
c	Charges for Sampler for geochemical, channel and core samples	one sampler per day	1.5.2	5,100	40	2,04,000	
d	Labour Charges for Sampling Work; Base rate - Rs. 437/ per day	day	5.7	437	160	69,920	Amount will be reimburse as per the
	Sub-Total B					24,11,240	
C	PITTING AND TRENCHING ⁵						
a	Trenching	Cu m	2.1.1	3,300	100	3,30,000	
	Sub-Total C					3,30,000	
D	DRILLING						
1	Drilling up to 300m (Hard Rock)	m	2.2.1.4a	11,500	500	57,50,000	Will be done after review of mapping, geochemical sampling & analytical work and Geophysical Survey
2	Borehole deviation Survey by Multishot Camera	m	2.2.6	330	500	1,65,000	
3	Land / Crop Compansation (in case the BH falls in agricultural Land)	per BH	5.6	20,000	5	1,00,000	Amount will be reimburse as per actuals or max. Rs. 20000 per BH with certification from local authorities
4	Construction of concrete Pillar (12"x12"x30")	per borehole	2.2.7a	2,000	5	10,000	
5	Transportation of Drill Rig & Truck associated per drill (1 rigs) 1650km to & fro from Nagpur/ Rig	Km	2.2.8	36	3,300	1,18,800	Certification in this regard is required to be provided
6	Monthly Accomodation Charges for drilling Camp (up to 2 Rigs)	month	2.2.9	50,000	5	2,50,000	
7	Drilling Camp Setting Cost	Nos	2.2.9a	2,50,000	1	2,50,000	
8	Drilling Camp Winding up Cost	Nos	2.2.9b	2,50,000	1	2,50,000	
9	Approach Road Making (Hilly Terrain)	Km	2.2.10b	32,200	5	1,61,000	Road Making will be considered as per the requirement and Road Making Charges will be reimbursed for max. 4 km.
10	DGPS Survey For BH Coordinate	Nos	1.6.2	19,200	5	96,000	
11	Charges for surveyor	one surveyor per day	1.6.1a	8,300	5	41,500	
12	Labour Charges for Survey Work; Base rate - Rs. 437/ per day	day	5.7	437	20	8,740	Amount will be reimburse as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher
13	Drill Core Preservation	per m	5.3	1,590	150	2,38,500	Amount will be reimbursed after
	Sub Total D					74,39,540	
	Sub Total B to D					101,80,780	
E	Additional Rate for exploration work in remote and inaccessible terrain in North Eastern States and Hilly Terrain of Himalaya		para 5 of SoC	3.35 times higher than the normal SoC		341,05,613	Certification that area falls in remote and inaccessible terrain in North Eastern State and/or Hilly Terrain of Himalaya region
F	Charges for Geologist at HQrs for data processing	day	1.3	9,000	60	5,40,000	

G	LABORATORY STUDIES						
I	Chemical Analysis						
I	Primary & Check Samples from Surface outcrop and steam sediments						
i)	Primary samples						
	a. For Cu, Pb, Zn, Ni & Co by AAS	Nos	4.1.7a	2,506	100	2,50,600	
	b. For REE by ICPMS	Nos	4.1.13	5,380	30	1,61,400	
ii)	Internal check samples (5%)						
	a. For Cu, Pb, Zn, Ni & Co by AAS	Nos	4.1.7a	2,506	5	12,530	
	b. For REE by ICPMS	Nos	4.1.13	5,380	2	8,070	
iii)	External check samples (10%)						
	a. For Cu, Pb, Zn, Ni & Co by AAS	Nos	4.1.7a	2,506	10	25,060	
	b. For REE by ICPMS	Nos	4.1.13	5,380	3	16,140	
II	Primary & Check Samples of Channel Sample						
i)	Primary samples						
	a. For Cu, Pb, Zn, Ni & Co by AAS	Nos	4.1.7a	2,506	100	2,50,600	
	b. For REE by ICPMS	Nos	4.1.13	5,380	30	1,61,400	
ii)	Internal check samples (5%)						
	a. For Cu, Pb, Zn, Ni & Co by AAS	Nos	4.1.7a	2,506	5	12,530	
	b. For REE by ICPMS	Nos	4.1.13	5,380	2	8,070	
iii)	External check samples (10%)						
	a. For Cu, Pb, Zn, Ni & Co by AAS	Nos	4.1.7a	2,506	10	25,060	
	b. For REE by ICPMS	Nos	4.1.13	5,380	3	16,140	
III	Primary & Check Samples from Trench						
i)	Primary samples						
	a. For Cu, Pb, Zn, Ni & Co by AAS	Nos	4.1.7a	2,506	80	2,00,480	
	b. For REE by ICPMS	Nos	4.1.13	5,380	20	1,07,600	
ii)	Internal check samples (5%)						
	a. For Cu, Pb, Zn, Ni & Co by AAS	Nos	4.1.7a	2,506	4	10,024	
	b. For REE by ICPMS	Nos	4.1.13	5,380	1	5,380	
iii)	External check samples (10%)						
	a. For Cu, Pb, Zn, Ni & Co by AAS	Nos	4.1.7a	2,506	8	20,048	
	b. For REE by ICPMS	Nos	4.1.13	5,380	2	10,760	
IV	Primary & Check Samples from Drill Core						
i)	Primary samples						
	a. For Cu, Pb, Zn, Ni & Co by AAS	Nos	4.1.7a	2,506	100	2,50,600	
	b. For REE by ICPMS	Nos	4.1.13	5,380	25	1,34,500	
ii)	Internal check samples (5%)						
	a. For Cu, Pb, Zn, Ni & Co by AAS	Nos	4.1.7a	2,506	5	12,530	
	b. For REE by ICPMS	Nos	4.1.13	5,380	1	6,725	
iii)	External check samples (10%)						
	a. For Cu, Pb, Zn, Ni & Co by AAS	Nos	4.1.7a	2,506	10	25,060	
	b. For REE by ICPMS	Nos	4.1.13	5,380	3	13,450	
2	Physical & Petrological Studies						
	i) Preparation of thin section	Nos	4.3.1	2,353	20	47,060	
	ii) Complete petrographic study report	Nos	4.3.4	4,232	20	84,640	
	iii) Preparation of polish section	Nos	4.3.2	1,549	15	23,235	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.
	iv) Complete mineragraphic study report	Nos	4.3.4	4,232	15	63,480	
	v) Digital Photographs	Nos	4.3.7	280	15	4,200	GST will be reimburse as per actual and as per notified prescribed rate
	vi) Whole Rock Analysis	Nos	4.1.15a	7,568	15	1,13,520	
	Sub-Total -G					20,80,892	
H	Total A +E+ F+G					368,16,505	
I	Geological Report Preparation	5 Hard copies	5.2	For the projects having cost		11,04,495	EA has to submit the final Geological Report in
J	Peer review Charges		As per EC decision			10,000	
K	Preparation of Exploration Proposal (5 Hard copies with a soft copy)	5 Hard copies with a soft copy	5.1	2% of the Cost or Rs. 3.8 Lakhs whichever is lower		3,80,000	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.
L	Total Estimated Cost without GST					383,11,000	
M	Provision for GST (18% of L)	%				68,95,980	
N	Total Estimated Cost with GST					452,06,980	
or Sav Rs. , In Lakhs;						452.07	
Note:							
\$	Trenching/Pitting dimensions are tentative may vary depending upon the geology and field conditions						
#	2nd level of work shall be carried out after review of 1st level work i.e. Geological mapping, geochemical sampling and analysis						

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.

Table No. VII-B.

Tentative Time schedule/action plan for proposed Reconnaissance Survey (G-4) for REE and base metal.

			1	2	3	4	5	6	REVIEW	7	8	9	10	11	12	13	14		
1	Remote sensing study																		1 month
2	Camp Setting	Month																	1 month
3	Geological Mapping	Month																	5 Months
4	Pitting /Trenching	Cu.m																	100 Cu m
5	Surface Drilling (1 rig)	m																	500m
6	Geologist Party days (2Party)	Party days																	180 Days
7	Sampling Party days (1 party)	Party days																	40 days
8	Surveyor Party days (1Party)	Party days																	5 days
9	Camp Winding	Month																	1 month
10	Laboratory Studies	Month																	7 Months
11	Geologist Party days, HQ (1Party)	Party days																	60 days
12	Report Writing with Peer Review	Month																	4 months
* Commencement of project will be reckoned from the day the exploration acreage is available along with all statutory clearances. *Time loss on account of monsoon/agricultural activity/forest clearance/local law and order problems will be addition to above time line.																			

7.2.0 The proposed exploration programme envisages geological mapping, surface sampling, geophysical survey, trenching, scout drilling, sample preparation and laboratory studies, which will be completed within 14 months, geological report preparation will take 4 months including peer review which will take 1 month with one month overlapping with lab works. Therefore, a total of 14 months is planned for completion of the entire proposed programme. The entire gamut of exploration works i.e., up to drilling work is taking 14 months, as the area falls within reserve forest and highly hilly terrain. Tentative Time schedule/action plan for proposed Reconnaissance Survey (G-4) for REE and base metal is given in Table No.VII.B.

8.0.0 Justifications:

- 8.0.1 Atomic Mineral Division (AMD), Government of India and Teshering Tashi of Department of Mines and Geology Government of Sikkim had reported occurrences of basic intrusive at few places in the area which are anomalous for U-Th-REE mineralization and could mark a potential zone for such mineralization and recommended to be surveyed in greater details.
- 8.0.2 MECL had explored two copper block Dikchu Copper-Zinc deposit (1983) and Upper Pachekhani Block (2002) which are situated within 65km of the proposed block having similar geological setup.
- 8.0.3 During joint field visit (from 21/10/2021 to 27/10/2021) of Mineral Exploration Corporation Ltd., Nagpur and Department of Mines and Geology, Sikkim, there observed encrustations of malachite stains on road sections and anomalous value of copper obtained from field samples collected during the visit encourages for Regional Exploration(G-4) in the block.
- 8.0.4 Based on the evaluation of previous work, the present Reconnaissance Survey program at G-4 level has been prepared. The Geological Mapping combined with surface, stream and soil sampling will be helpful in assessing the disposition of the mineralized zones, structural features like shears and faults if any. The Exploration will be helpful in estimation of reconnaissance resources of REE, Copper, Lead, Zinc, Nickel and Cobalt in the block.

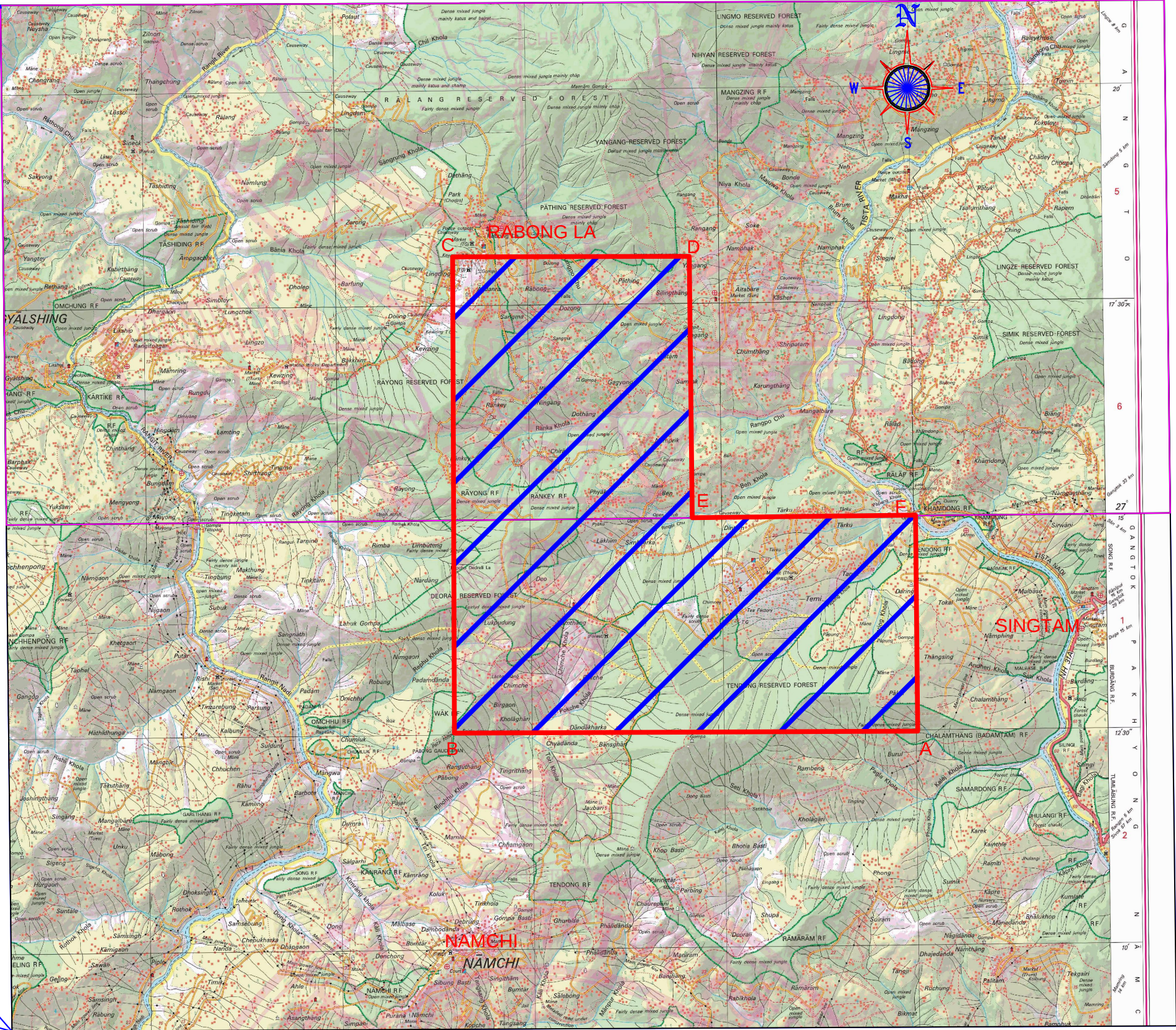
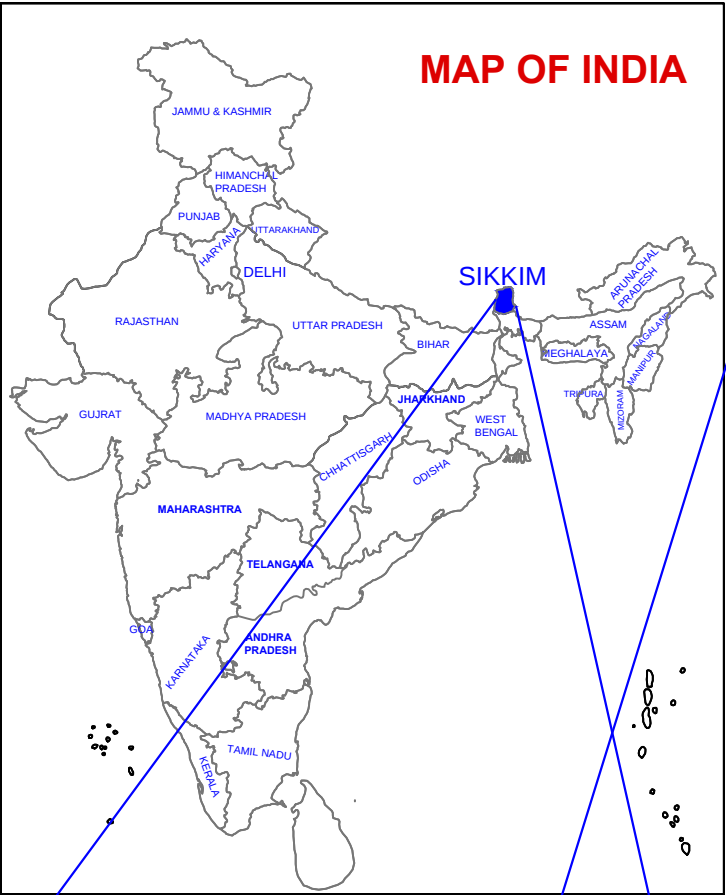
- 8.0.5 The Reconnaissance Survey will help in planning of detailed exploration program (in case upgraded to G-3/G-2 level) which in turn will facilitate the state Government for Action of Block.

9.0.0 References:

1. T.N Parthasarathy et. al. (1990) of Atomic Mineral Division: Potash feldspar-rich alkaline rocks of Rangit tectonic window, South Sikkim: their genesis and relation to uranium, thorium, and REE mineralizations in the area
2. Teshering Tashi (Field Session 1991-92) Department of mines and Geology Government of Sikkim Gangtok: Preliminary investigation of basic intrusive around Parbing (South Sikkim).
3. C.S. Dubey et al. (2009) : Geochemistry and Geochronology of K-rich Syenites from Sikkim, Eastern Himalaya.
4. Mineral Exploration corporation Ltd.(1983): Exploration Report of Dikchu Copper-Zinc Deposit, Sikkim.
5. Mineral Exploration corporation Ltd. (2002): Geological report on Exploration for copper, Upper Pachekhoni Block, District-East Sikkim, Sikkim.
6. Geological Survey of India. Bhukosh Map (1:50000scale) of Geology.
7. K.K Luitel (2019), Department of Mines and Geology, Sikkim: Proposal on detailed exploration of Rare Earth minerals in Nepheline Syenite deposits in parts of South, West and East District of Sikkim.

List of Plates

1. Plate-I: Block Location Map of Temi-Tarku-Damthang Block, East Sikkim, Sikkim State.
2. Plate-II: Geological Map (1:50000 Scale) on the basis of Bhukosh (GSI) of Temi-Tarku-Damthang Block, East Sikkim, Sikkim State.



MINERAL EXPLORATION CORPORATION LIMITED

LOCATION MAP
TEMI-TARKU-DAMTHANG AREA
NOT TO SCALE

DISTRICT : EAST SIKKIM

STATE : SIKKIM

Prepared by : Exploration Division,
MECL, Nagpur.

Processed at : Non Coal IT.Centre,
MECL, Nagpur.

MECL / EXPLORATION / JANUARY-2022

PLATE NO - I

1

Block Geological Map of Temi Tarku Damthang Block

