PROPOSAL FOR RECONNAISSANCE SURVYE (G4) OF LITHIUM AND POTASSIUM IN MERAK BLOCK (114.19 SQ. KM), LEH (LADAKH) DISTRICT, UNION TERRITORY OF LADAKH

Commodity: Strategic & Critical Mineral

By,

MINERAL EXPLORATION CORPORATION LIMITED

NAGPUR, MAHARASHTRA

PLACE: NAGPUR

DATE: 31.12.2021

Summary of the Block for Reconnaissance Survey (G4 Stage)

GENERAL INFORMATION ABOUT THE BLOCK

	Features	Details
	Block ID	Merak Block, Leh District, UT of Ladakh
	Exploration Agency	Mineral Exploration Corporation Limited
	Commodity	Lithium and Potassium
	Mineral Belt	-
	Completion Period with entire time schedule to complete the project	24 months
	Objectives	Based on the evaluation of geological data available, the present exploration program has been formulated to fulfil the following objectives: 1. To carry out remote sensing study, geological and structural mapping on 1:12,500 scale for identification of Li bearing formation (host rock) with the structural features to identify the surface manifestation and lateral disposition of the mineralisation. 2. To collect surface (bedrock) samples & analyse for Li & K and decide further course of exploration program. 3. In case, analytical results of surface samples are positive and supported by positive evidence for sub-surface extension of concealed ore body then pitting/trenching wherever possible shall be done, which will decide the future course of exploration i.e., G3/G2 category of UNFC. 4. To estimate reconnaissance resources of Li, K and other REE minerals as per UNFC norms and MEMC Rules – 2015 at G4 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	02 (field Geologists) + 01 (HQ Geologists)
	Expected Field days (Geology) Geological Party Days	240 party days
1.	**Location**	

	Latitude	A - 33° 44' 12.59" N B - 33° 40' 43.77" N C - 33° 41' 08.77" N D - 33° 42' 11.85" N E - 33° 43' 31.56" N F - 33° 46' 17.02" N G - 33° 48' 28.62" N
	Longitude	A - 78° 30' 25.61" E B - 78° 35' 08.86" E C - 78° 39' 23.35" E D - 78° 39' 25.61" E E - 78° 39' 07.43" E F - 78° 37' 22.66" E G - 78° 35' 20.19" E
	Villages	Merak, Ketstke
	Tehsil/ Taluk	-
	District	Leh-Ladakh
	State	Union Territory of Ladakh
2.	**Area (square kilometres)**	
	Block Area	114.19 Sq. km.
	Forest Area	-
	Government Land Area	-
	Private Land Area	-
3.	**Accessibility**	
	Nearest Rail Head	Merak is 148 km away from Leh. Nearest railway station is Jammu Jammu Tawi which is 700 km from Leh.
	Road	Leh, the capital of Ladakh is connected by a jeepable road with Manali H.P. and by a metalled road with Srinagar J&K. The roads however, remain closed between November and May due to heavy snow in the mountain Passes. From Leh several motorable roads strikes north from Leh and crosses the Ladakh range through Khardung La (5440m) and is known as the highest motorable road in the world. At Khalsar on the Shyok river, this road bifurcates. While one branch leads west to Chasthang on the Shyok river the other road extend NNW along the Nubra river and extends up to Sasoma. Another road from Leh runs in an ENE direction along the Indus river and continues via Dungti to Damchak on the Indo-Tibet border. A branch of this road extends along the Hankle river and joins Dungti with Hankleand tom more interior areas of Chumur and Zasar on the Indo-Tibet border.
	Airport	Leh Airport (148 km from Merak Village)
4.	**Hydrography**	
	Local Surface Drainage Pattern (Channels)	Dendritic pattern drainage
	Rivers/ Streams	Pangong Tso lake
5.	**Climate**	
	Mean Annual Rainfall	The annual rainfall is 474 mm | 18.7 inch. The least amount of rainfall occurs in October. The average in this month is 19 mm | 0.7 inch. The greatest amount of precipitation occurs in August, with an average of 64 mm | 2.5 inch.
	Temperatures (December) (Min.)	The temperatures are highest on average in August, at around 10.0

	Temperatures (June) (Max.)	°C | 50.1 °F. The lowest average temperatures in the year occur in January, when it is around -20.6 °C | -5.0 °F
6.	**Topography**	
	Toposheet Number	52 K/09, 52K/5, 52K/6, 52K/10
	Morphology of the Area	Highly rugged/Hilly Terrain
7.	**Availability of baseline geoscience data**	
	Geological Map (1:50K/ 25K)	Not Available
	Geochemical Map	Not Available
	Geophysical Map(Aeromagnetic, ground geophysical, Regional as well as local scale GP maps)	Not Available
8.	**Justification for taking up Reconnaissance Survey / Regional Exploration**	Initial field survey in the areas nearby Leh and Ladakh was carried out by MECL team in association with Directorate of Mines and Geology, Union Territory of Ladakh. MECL team collected water samples from all the 9 locations including valleys and lakes and analysed for 11 minerals as mentioned in the chapter no. 3.1. Pangong Tso lake water sample gave a result of 532.24 ppm (Li) and 140.94 ppm (K) values. Further the entire drainage area was delineated using Remote sensing techniques to find out the complete watershed. This exercise found that the major source rock may be within this drainage basin while the eastern side which is also the upstream side of the drainage basin falls within China's land parcel. But sample collected in Pangong Tso lake has multiple sources of which even the block proposed is also a possibility. By carrying out proposed exploration, further decision/strategy can be made for future exploration in the area. Also, MECL Geologists during the field work have found Pegmatite-Granite rock bodies in the nearby areas. So, the initially proposed objective is to map all such pegmatites and any other possibilities on Li & K mineralisation. GSI's earlier mapping data in regional scale indicates the probable promising rock types which may host the above mentioned mineralisation. Hence MECL proposes to carry out reconnaissance level exploration (G4) in the proposed block.

Detailed description on the following titles to be made in the proposal.

1. Introduction

1.0. Preamble

Lithium is a silvery white to grey alkali metal with a metallic luster when fresh, but it is highly reactive and in air quickly tarnishes to a dull silvery-grey and then black. It is the lightest metal, the least dense of all elements that are not gases at 200ºC and can flow on water. In its elemental form, it reacts easily with water, and is potentially explosive. It is also inflammable in oxygen and may ignite when comes in contact to moist air. However, it is not found in nature in elemental form and its compounds are not flammable.

Lithium has excellent electrical conductivity and it is also the most electronegative metal, which is one of the properties that make it ideal for use in batteries. The addition of lithium imparts high mechanical strength and thermal shock resistance in ceramic and glass.

Lithium is most familiar in everyday use in the lithium-ion batteries that power modern society's mobile phones and other portable electronic devices. However, lithium has a wide variety of other used and historically greater quantities have been used in ceramics and glass industries. The principal uses of lithium are in ceramics and glass, batteries, lubricating greases, air treatment, polymers, pharmaceuticals and primary aluminium production.

Global resources of lithium have been estimated by the USGS to be approximately 41 million tonnes, with the largest resources held by Bolivia, Chile, Argentina, the USA, China and Australia. The USGS also estimates that worldwide reserves of lithium are approximately 14 million tonnes with most significant reserves held by Chile, China, Argentina and Australia. India doesn't find any place in the list.

2.0. Background

The exploration of Strategic, Critical and Rare Earth Minerals 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 (G4) for Lithium and Potassium in Merak Block, Leh District, UT of Ladakh.

On enactment of MMDR Amendment Act- 2015, Minerals (Evidence of Mineral Contents) Rule 2015 and Mineral Auction Rules 2015, Govt. of India directed State Government to speed up exploration work for different Mineral Commodities in the respective states.

Accordingly MECL has prepared the proposal for Reconnaissance (G4) level involving identification mineralized areas worthy of further investigation towards deposit identification.

Accordingly, MECL has prepared the proposal for G4 level exploration for lithium and potassium in Merak block, Leh district, UT of Ladakh and put up for approval in the forthcoming meeting of Technical cum Cost Committee (TCC) of NMET.

3.0. Location and Accessibility

Merak block is adjacent to Pangong Tso lake, Leh district. It is around 150km from Leh town and lies between the longitude 78.51º to 78.66º and latitude 33.68º to 33.81º. The areas is situated on the toposheet no. 52 K/09 which is restricted by SoI. Pangong Lake is a tourist spot and motorable roads are in good condition between June and October. The nearest railway head is 850 km i.e., Jammu Jammu Tawi and Leh airport is 150 km which is the nearest.

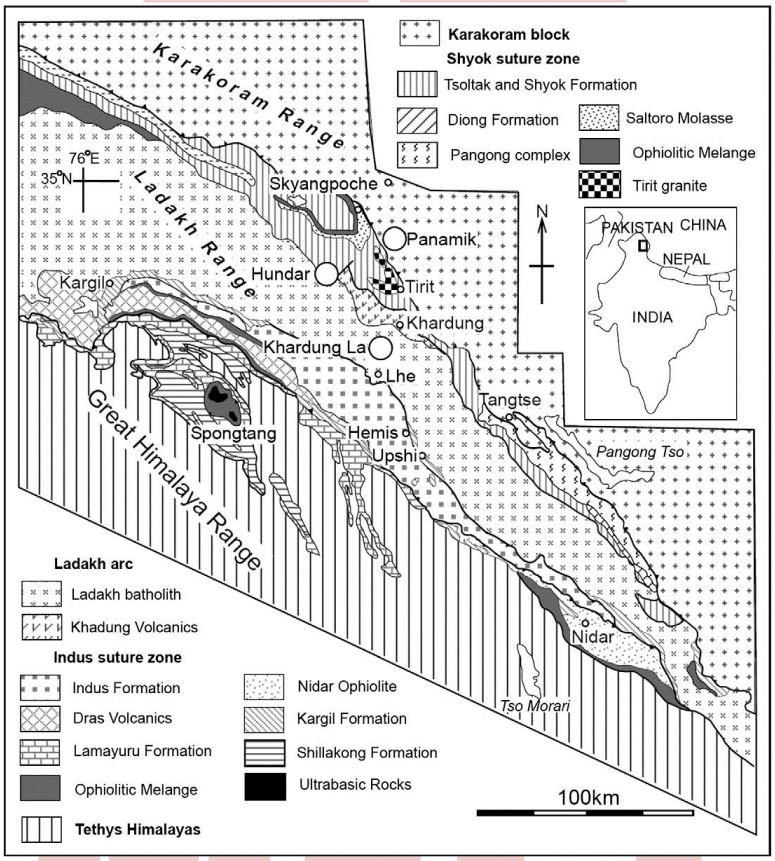
4.0. Physiography

The area is characterized by lofty mountain ranges dissected by deep and often wide, valleys. The main mountain ranges are from north to south the Aglil Mountains, the Chang Chenmo Mountains, the great Karakoram Mountains the Pangong Mountains, the Ladakh, Range, the Zanskar Range and the Kailash Range. The topography of the block in the north-eastern region is almost flat beside Pangong Tso Lake at an altitude of ~ 4261m above MSL and in the south-western region the hills are so rugged and steep with the maximum altitude of ~6724m above MSL. The area is composed of Cretaceous-Tertiary age granitoid and ophiolite rocks and alluvial - glacial deposits of Pleistocene – Holocene age.

2. Regional Geology

The Himalaya mountain chain defines the orogenic belt between Indian and Eurasian continents, where consumption of Neo-Tethyan Ocean and subsequent continental collision took place during Cenozoic (e.g. Goscombe and Gray, 2009; Bhattacharyya and Mitra, 2009). Many workers have studied the Ladakh Himalaya in order to elucidate the geologic and tectonic developments of the suture zones (Rowley, 1996; Weinberg and Dunlap, 2000; Weinberg et al., 2000; Jain et al., 2002; Upadhyay et al., 2004) and the pre- and post-collisional magmatism (Honegger et al., 1982; Debon et al., 1987; Parrish and Tirrul, 1989, Debon and Khan, 1996; Ahmad et al., 1996, 1998, 2008; Singh et al., 2003). These studies have revealed that the Ladakh arc is a plutono-volcanic arc developed in Cretaceous to Eocene time, and is composed of huge mass of granitic rocks with minor amounts of rhyolitic to andesitic volcanic rocks known as Khardung volcanics (Dunlap and Wysoczanski, 2002). The Karakoram block consisting of high-grade metamorphic rocks and

granitic rocks was the southern margin of the Eurasian continent during the Late Mesozoic to early Tertiary time. The ages of pre- and post-collision magmatism are well established by several authors (e.g. Weinberg and Searle, 1998; Weinberg and Dunlap, 2000). However, the age range and distribution of the plutons in the Shyok suture zone between Ladakh arc and Karakoram block are not fully determined yet. A group of Japanese, Indian and Vietnamese geologists, jointly studied the Indus and Shyok suture zones, Ladakh Himalaya, northern India, from 2004 to 2006 field seasons. During the field research, the geologists' team discovered the Hundar granite–diorite complex that intruded into the sedimentary rock sequence in the Shyok suture zone and in turn are intruded by Ladakh batholith.



Geological map of Ladakh Himalaya, NW India showing the major localities. (Modified after Thakur and Rawat, 1992).

The Ladakh Himalaya is composed of five geotectonic units (Figure. 2): Karakoram block, Shyok suture zone, Ladakh arc, Indus suture zone and Tethys Himalayas, from north to south (Thakur and Rawat, 1992). The Karakoram block consists of high-grade metamorphic rocks and granitic rocks. The granites occur as a batholith with dimension extending about 700 km and have intruded into the Palaeozoic to Triassic sedimentary sequences of southern edge of the Eurasian Plate. They are interpreted to represent subduction related magmatism (Debon et al., 1987; Crawford and Searle, 1992), suggesting a subduction zone along the southern

margin of Asian continent (Debon et al., 1987). The magmatic bodies are composed of predominant biotite granite with subordinate two-mica and hornblende-biotite granites. They give ages ranging 130 to 50 Ma (Srimal et al., 1986; Searle, 1991; Debon and Khan, 1996; Sinha et al., 1997; Weinberg and Searle, 1998). In the southern Karakoram Range, post-collisional leucogranites occur widely. They are correlated to Baltoro granite (21–26 Ma, Parrish and Tirrul, 1989) in Kohistan and Tangtse granite (17 Ma, Schärer et al., 1990; Searle et al., 1998) in Ladakh. In Tangtse, leucogranites yield Ar–Ar biotite ages of 11.9 Ma and pegmatite dykes intruding into the Pangong metamorphic complex give 9.7 Ma (Dunlap et al., 1998). In the northeastern side of the Shyok-Nubra confluence, Srimal (1986) reported Ar–Ar biotite and muscovite ages (9.7–13 Ma) of leucogranites and Weinberg et al. (2000) presented a crystallized age (15 Ma) of leucogranite in Tirit. The Shyok suture zone between the Ladakh arc and the Karakoram block is composed of mafic-ultramafic rocks, sedimentary rocks and metamorphic rocks. The sedimentary unit is intruded by mafic-ultramafic rocks on the southwestern margin, and cut by the dextral Karakoram fault in the northeast. Recently, Ehiro et al. (2007) divided the sedimentary unit into the lower Tsoltak Formation and the upper Shyok Formation. The Tsoltak Formation consists mainly of mudstone with minor amounts of sandstone and alternating sandstone and mudstone, and yields Callovian (Middle Jurassic) ammonoids such as Macrocephalites sp. and Jeanneticeras sp. (Ehiro et al., 2007). The Shyok Formation is subdivided into the Lower and Upper Members; the former is composed of sandstone, conglomerate and minor limestone, whereas the latter is volcaniclastic rocks. Limestone of the Lower Member includes Albian (upper part of Lower Cretaceous) orbitolinid foraminifera (Matsumaru et al., 2006).

The Tsoltak and Shyok Formations are composed of mudstone, sandstone, conglomerate, limestone and volcaniclastic rocks, and are lacking in chert and melanges characteristic of subduction/accretion complexes, indicating that the formations were accumulated in a shallow marine shelf environment. Since the conglomerate includes granitic rocks, provenance of these formations is most probably mature continent and/or volcanic arc. The back arc sediments have been reported in the Shyok suture zone of the Kohistan and Ladakh areas (Crawford and Searle, 1992; Khan et al., 1997; Burg et al., 1998; Robertson and Collins, 2002). But the fore arc sediments and accretion complexes are not observed so far.

The Ladakh arc is composed of huge masses of batholithic rocks with minor amounts of rhyolitic to andesitic rocks that formed by an Andean-type calc-alkaline magmatism related to the subduction of the Neo-Tethys oceanic plate under the Eurasian continental plate during

Early Cretaceous to Late Eocene (Sharma and Choubey, 1983; Jain et al., 2002). This type of batholithic rocks is distributed widely in Himalaya and named the Kohistan batholith in Pakistan, the Ladakh batholith in India, Kailas and Gangdese plutonic complex in South Tibet, Lohit batholith in Arunachal Pradesh. The Ladakh batholith constitutes an important part of the Trans-Himalaya zone, which is about 600 km long and 30–80 km wide. It extends from Astor, Deosai and Skardu in the northwest to Demchuk in the southeast through Leh, Upshi and Lyoma, and comprises mainly biotite hornblende- bearing granodiorite and granite, with minor occurrences of noritic gabbro and diorite (Ahmad et al., 1998). The Ladakh plutonic complex is an I-type granitoid and appears to have been emplaced between 100 and 40 Ma with dominant phase around 66–50 Ma (Honegger et al., 1982). Weinberg and Dunlap (2000) and Dunlap and Wysoczanski (2002) have presented SHRIMP zircon ages of the Khardung volcanics and Gyamsa migmatic complex near Leh where migmatites occur in the western side of the complex and granites, in the eastern side, and reconfirmed the dominant phases (50–70 Ma) of the Ladakh arc around Leh. The collision between the Kohistan–Ladakh arc complex and the Eurasian plate occurred at about 85–100 Ma (Brookfield and Reynolds, 1981; Searle et al., 1999).

The Indus suture zone is the site of demise of the Neo-Tethyan oceanic plate and also the site of collision between the Asian and Indian plates from ~55–50 Ma (Patriat and Achache, 1984; Achache et al., 1984). In Ladakh, the suture zone consists of ophiolite and ophiolitic mélanges of Cretaceous to Tertiary periods (Ahmad et al., 1996, 2008; Upadhyay and Sinha, 1998; Robertson, 2000; Kojima et al., 2001).

The Tethys Himalayas are composed of mainly the fossiliferous sediments of Precambrian to Cretaceous age that were accumulated on the northern margin of the Indian subcontinent (Rao et al., 2006). Its northern part has been metamorphosed under the ultra-high-pressure metamorphic condition (Sachan et al., 2001, 2004; Gouzu et al., 2006).

2.1. Geology of the block

The proposed block is located beside Pangong Tso Lake. Block consists of Alluvium, Moraines, Hillwash & Scree, Amphibolite, Grey Phyllite, Quartzite, Schistose rocks, Pangong metamorphic Complex consisting of Hornblende Schists, Granites, Diorites, Rhyolite, Dacite etc. During the field survey conducted by MECL's Geologist team, Pegmatite veins within Granites, Amphibolites was also found near the proposed blocks. Further detailed geological mapping is proposed in the present field work.

3. Mineral potentiality based on geology, geophysics, ground geochemistry etc. Scope for proposed exploration.

The block consists of Pangong Metamorphic Complex, Kakset Granitoid complex and also Khardung volcanics. The block has pegmatite veins intruding within amphibolite and granites. Proven mineral deposits worldwide make these rock types promising for exploration of Lithium, & Potassium which is also evident from the water samples collected from the adjacent lake. Although the source of water may be from the entire drainage basin, initially a smaller area based on the geology and collected water sample is selected keeping in mind a smaller time duration from June to October for field work to be carried out.

3.1. Observation and Recommendations of previous work.

No previous work in the area for Lithium and Potassium has been carried out by any organization. Mineral Exploration Corporation Limited, Nagpur conducted a field visit to Leh, Ladakh and collected water samples and analysed for 11 radicals with results as per the following:

Sr. no.	Sample ID	Li	K	Cr	Mn	Ni	Cu	Zn	As	Pb	Sc	Y
		PPM										
1	KHURDUNG	31.81	22.92	ND	ND	ND	ND	ND	ND	ND	ND	ND
2	PANANMIC	44.70	5.27	ND	ND	ND	ND	ND	ND	ND	ND	ND
3	SYOK	15.00	3.73	ND	ND	ND	ND	ND	ND	ND	ND	ND
4	PANGONG TSO	532.24	140.94	ND	ND	ND	ND	ND	ND	ND	ND	ND
5	LOMA	14.36	1.90	ND	ND	ND	ND	ND	ND	ND	ND	ND
6	TSOMORIRI	5.11	25.54	ND	ND	ND	ND	ND	ND	ND	ND	ND
7	PUGAVALLEY	131.90	59.33	ND	ND	ND	ND	ND	0.42	ND	ND	ND
8	CHUMATANG	175.64	15.81	ND	ND	ND	ND	ND	3.42	ND	ND	ND
9	TSOKAR	7.98	82.42	ND	ND	ND	ND	ND	ND	ND	ND	ND

Based on the results received from the water samples of Pangong Tso, values of Li and K show promising area to propose for G4 level exploration. Geological map from Bhukosh, GSI was downloaded and no geochemical (NGCM) or geophysical (NGPM) data available for the proposed block area.

3.2. Scope for proposed exploration

The Reconnaissance survey at G4 stage exploration program proposed compromises, Geological mapping (1:12,500 scale), Surface sampling (bedrock, soil, stream sediments), geophysical survey, trenching, drilling of 5 nos. of scout boreholes involving about 500m drilling with associated survey, chemical analysis and geological report preparation.

3.3. Block details

Merak blocks falls in toposheet no. 52 K/09, 52 K/10, 52K/05 and 52K/06 and the area of the block is 114.19 sq. km. The blocks falls in Leh district, UT of Ladakh. Block location in toposheet is given as Plate no. 03. The co-ordinates of the corner points of the block in both Lat-long (DMS) and UTM (meter) is given in the table below:

Corner Points	UTM WGS 84 (Zone no. 44)		Geographic Lat-Long WGS 84		AREA
	X (m)	Y (m)	LATITUDE	LONGITUDE	
A	269051.9	3735768.0	33° 44' 12.59" N	78° 30' 25.61" E	114.19 sq. km.
B	276192.3	3729162.0	33° 40' 43.77" N	78° 35' 08.86" E	
C	282764.6	3729781.0	33° 41' 08.77" N	78° 39' 23.35" E	
D	282867.0	3731723.0	33° 42' 11.85" N	78° 39' 25.61" E	
E	282454.7	3734189.0	33° 43' 31.56" N	78° 39' 07.43" E	
F	279875.0	3739349.0	33° 46' 17.02" N	78° 37' 22.66" E	
G	276819.1	3743476.0	33° 48' 28.62" N	78° 35' 20.19" E	

4. Planned Methodology

The exploration program is proposed in accordance to the objective set for reconnaissance survey (G4) of the block. The Exploration shall be carried out as per Minerals (Evidence of Mineral Contents) Rule – 2015. Accordingly, the following scheme of exploration is formulated in order to achieve the objectives. The details of different activities are presented in subsequent paragraphs.

4.1. Remote Sensing studies

Remote sensing study shall be carried out in the entire 114.19 sq. km. area to identify lineaments, lithological contacts, other structural features and the mineral potential zones through mineral targeting process.

4.2. Geological mapping

Geological mapping will be carried out in the entire block area of 114.19 sq. km. 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. 40 nos. of surface samples of various units for petrological studies and 20 nos. of surface samples for Minerographic studies shall be taken up.

4.3. Geochemical sampling

4.3.1. Bed rock sampling

During the course of geological mapping, the bed rock samples shall be collected from various outcrops. A total of 100 nos. of bed rock samples shall be collected from various litho-units for analysis of 34 element package and 60 samples for REE analysis. Total of 15 and 9 check samples (5% internal and 10% external) will be analysed for the same package respectively.

About 20 samples shall also be analysed for major oxides by XRF (Whole rock analysis).

4.4. Survey

The block boundary will be surveyed by DGPS and total station in WGS 84 datum for demarcation of block boundary points. Plotting on the map for finalization of Geological map on 1:12,500 scale.

4.6. Trenching/Pitting

Shallow trenching/pitting shall be carried out in the potential zones identified based on the results of geological mapping and geochemical sampling. A provision for shallow trenching/pitting on mineralized zones (if any) (1m X 2m deep) with 200 c.m. is kept. Trenching will be carried out on surface upto a depth of 2m depth after removal of soil/weathered column in the area. Locations of trenches/pitting on ground will be decided by field geologist based on positive outcome of the bedrock sampling. A provision of 150 no. primary trench/channel samples each is kept for analysis of 34 elements and 60 samples for REE. Further check samples (5% internal + 10% external) will also be analysed for the same.

4.8. Chemical Analysis

4.8.1. 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 and S radicals will be carried out on 10 nos. of rock samples to check the rock types, their variation in chemical composition.

4.8.2. Petrological & Minerographic 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 20 nos. of sampled from mineralized zoned will be studied for the ore mineral assemblages and their distribution, alteration, enrichment etc. in polished sections (Minerographic studies).

4.8.3. XRD studies

Twenty nos. (20) of composite samples shall be subjected for XRD studies for mineral phase analysis.

4.8.4. Proposed Quantum of Work

Details of the particulars, quantum and targets are tabulated in the table.

Envisaged Quantum of proposed work in Merak Block, Leh district, UT of Ladakh.

S. No.	Item of Work	Unit	Qty.
1.0	**Remote Sensing Studies**		
1.1	Satellite imagery/Aerial photo interpretation studies		
	a) Charges for procurement of satellite imageries	Nos	1
	c) Cost of interpretation in terms of Geologist man days	days	15
2.0	**Geological Mapping (LSM), Other Geological Work**		
2.1	Large scale (LSM) Geological mapping, trenching and drilling	Sq. km.	114.19
	a) Geologist man days (2 Nos.) for Geological mapping, trenching and drilling	days	240
	b) Labour (field) for Geological mapping work (Total 4 Nos i.e. 2 workers per one geologist)	days	480
	c) Surface Sampling -1 Sampler Labour charge not included	day	60
	d) 4 labours/ party (Rs 431/day/labour) (As per rates of Central Labour Commissioner)	day	240
	Sub-Total A (1.0+2.0)		
3.0	**Mineral Investigation**		
3.1	Trenching/Pitting#$		
	a) Excavation of trenches & pits	per cu m	200
4.0	**Laboratory Studies**		
4.1	Chemical Analysis		
	i) Surface sampling (Bed Rock Samples/Soil/Stream Sediment)		
	a) 34 element Package analysis by ICP-MS for surface samples	per sample	300
	b) For REE analysis	per sample	60

	ii) Check Samples (Bed Rock/Soil/Stream Sediment Samples) - 5% Internal & 10% External		
	a) 34 element Package analysis by ICP-MS for surface samples	per sample	45
	b) For REE analysis	per sample	9
4.2	**Pit & Trench, Primary Samples**		
	a) 34 element Package analysis by ICP-MS for surface samples	per sample	100
	b) For REE analysis	per sample	30
	ii) Check Samples - 5% Internal & 10% External		
	a) 34 element Package analysis by ICP-MS for surface samples	per sample	15
	b) For REE analysis	per sample	10
4.3	**Estimation of major oxides by XRF (Whole rock analysis)**		
	Major oxides	per sample	10
4.4	**Whole rock studies**	per sample	10
6.6	**Petrological / Mineragraphic studies**		
	a) Preparation of thin section	per sample	20
	b) Study of thin section for petrography	per sample	20
	c) Digital photomicrograph of thin polished section	per sample	20
6.7	XRD	per sample	20
7.0	**Geologist man days (1 No.) for Geological map & Report (HQ)**	days	90
8.0	**Geological Report Preparation**	Nos	1
9.0	**Preparation of Exploration Proposal**	Nos	1

7.1. Manpower deployment

Manpower deployment list may be provided later

8. Break up of Expenditure

Tentative cost has been estimated based on Schedule of Charges (SoC0 of projects funded by National Mineral Exploration Trust (NMET) w.e.f. 01/04/2020. The total estimated cost is Rs. 646.16 lakhs. The Summary of cost estimates for Reconnaissance Survey (G4) level is given in Table no. I and details of cost estimates is given in table no. IA. Tentative time schedule/Action plan for proposed Reconnaissance Survey (G4) is given in Table no. II.

Table no. I

Summary of Cost estimates for Reconnaissance Survey (G4 level) exploration

Sl. No.	Item	Total Estimated Cost (Rs.)
1	Remote Sensing Studies	135,000
2	Geological Mapping (LSM), Other Geological Work	10,451,464
3	Trenching & Pitting	2,231,100
4	Drilling & associated works	0
5	Laboratory Studies	3,057,623
6	Geologist at HQ	1,080,000
Sub Total (1 to 6)		**16,820,187**
7	Exploration Report Preparation	750,000
8	Proposal Preparation	339,104
9	Peer review charges	10,000
10	GST 18%	3,249,772
Total:		**21,304,062**
Say Rs. In Lakh		**213.04**

9. Timeline:

The entire project is planned tentatively for 24 months with 8 months of field working window in two phases as it is a highly tough terrain (Himalayan terrain). Initially, geological mapping and surface sampling shall be carried out followed by trenching/pitting provided positive results are obtained in the first phase. Field Geo-Scientist can work only during June to September as the entire area will be snow/ice covered during rest of the time. Field workers must carry oxygen cylinders due to its low oxygen levels and for commuting and sample collection mules are to be taken along. The hillocks in the area are very steep and a difficult terrain for field work to be carried out. Geologist deputed there must be very diligent during his field work so as to collect maximum data in small duration.

10. Justification

Initial field survey in the areas nearby Leh and Ladakh was carried out by MECL team in association with Directorate of Mines and Geology, Union Territory of Ladakh. MECL team collected water samples from all the 9 locations including valleys and lakes and analysed for

11 minerals as mentioned in the chapter no. 3.1. Pangong Tso lake water sample gave a result of 532.24 ppm (Li) and 140.94 ppm (K) values. Samples of Pangong Tso lake Silt/clay gave a result of 18.76 ppm.

Further the entire drainage area was delineated using Remote sensing techniques to find out the complete watershed. This exercise found that the major source rock may be within this drainage basin while the eastern side which is also the upstream side of the drainage basin falls within China's land parcel. Pangong Tso lake has multiple sources of which even the block proposed is also a possibility. By carrying out proposed exploration, further decision/strategy can be made for future exploration in the area. Also, MECL Geologists during the field work have found Pegmatite-Granite rock bodies in the nearby areas. So, the initially proposed objective is to map all such pegmatites and any other possibilities on Li & K mineralisation. GSI's earlier mapping data in regional scale indicates the probable promising rock types which may host the above mentioned mineralisation. Hence, MECL proposes to carry out reconnaissance level exploration (G4) in the proposed block.

11. References

1. Achache, J., Courtillot, V., Xiu, Y., 1984. Paleogeographic and tectonic evolution of southern Tibet since middle Cretaceous time: new paleomagnetic data and synthesis. Journal of Geophysic Research 89, 311–339.

2. Ahmad, T., Islam, R., Khanna, P.P., Thakur, V.C., 1996. Geochemistry, petrogenesis and tectonic significance of the basic volcanic units of the Zildat ophiolitic melange, Indus Suture Zone, eastern Ladakh, India. Geodinamica Acta 9, 222–233.

3. Ahmad, T., Thakur, V.C., Islam, R., Khanna, P.P., Mukherjee, P.K., 1998. Geochemistry and geodynamic implications of magmatic rocks from the Trans-Himalayan arc. Geochemical Journal 32, 383–404.

4. Ahmad, T., Tanaka, T., Sachan, H.K., Asahara, Y., Islam, R., Khanna, P.P., 2008. Geochemical and isotopic constrains on the age and origin of the Nidar ophiolitic complex, Indus suture zone, Ladakh, India. Tectonophysics 451, 206–224.

5. Berthelsen, A., 1953. On the geology of the Rupshu District, N.W. Himalaya: A contribution to the Problem of the Central Gneisses. Meddelelser fra Dansk Geologisk Forening 12, 350-415.

6. Bhattacharyya, K., Mitra, G., 2009. A new kinematic evolutionary model for the growth of a duplex - an example from the Rangit duplex, Sikkim Himalaya, India. Gondwana Research 16, 697–715.

7. Brookfield, M.E., Reynolds, P.H., 1981. Late Cretaceous emplacement of Indus Suture Zone, ophiolitic mélange and an Eocene–Oligocene magmatic arc on the northern edge of the Indian plate. Earth and Planetary Science Letters 55, 157–162.

8. Burg, J.P., Bodinier, J.L., Chaudhry, S., Hussain, S., Dawood, H., 1998. Infra-arc crust/ mantle transition and intra-arc mantle diapirs in the Kohistan Complex (Pakistani Himalaya): petro-structural evidence. Terra Nova 10, 74–80.

9. Crawford, M.B., Searle, M.P., 1992. Field relationships and geochemistry of precollisional (India-Asia) granitoid magmatism in the central Karakoram, northern Pakistan. Tectonophysics 206, 171–192.

10. Debon, F., Khan, N.A., 1996. Alkaline orogenic plutonism in the Karakoram batholith: the Upper Cretaceous Koz Sar complex (Karamber valley, N. Pakistan). Geodynamica Acta 9, 145–160.

11. Debon, F., Le Fort, P., Dautel, D., Sonet, J., Zimmermann, J.L., 1987. Granites of western Karakorum and northern Kohistan (Pakistan): a composite Mid-Cretaceous to upper Cenozoic magmatism. Lithos 20, 19–40.

12. de Sigoyer, J., Guillot, S., Dick, P., 2004. Exhumation of the ultrahigh pressure Tso Morari unit in eastern Ladakh (NW Himalaya): A case study. Tectonics 23, TC3003.

13. Dunlap, W.J., Wysoczanski, R., 2002. Thermal evidence for early Cretaceous metamorphism in the Shyok suture zone and age of the Khardung volcanic rocks, Ladakh, India. Journal of Asian Earth Sciences 20, 481–490.

14. Dunlap, W.J., Weinberg, R.F., Searle, M.P., 1998. Karakoram fault zone rock cool in two phases. Geological Society, London 155, 903–912.

15. Ehiro, M., Kojima, S., Sato, T., Ahmad, T., Ohtani, T., 2007. Discovery of Jurassic ammonoids from the Shyok Suture Zone to the northeast of Chang La Pass, Ladakh, northwest India and its significance. Island Arc 16, 124–132.

16. Goscombe, B.D., Gray, D.R., 2009. Metamorphic response in orogens of different obliquity, scale and geometry. Gondwana Research 15, 151–167.

17. Gouzu, C., Itaya, T., Hyodo, H., Ahmand, T., 2006. Cretaceous isochron ages from K–Ar and 39Ar–40Ar dating of eclogitic rocks in the Tso Morari Complex, Western Himalaya, India. Gondwana Research 9, 426–440.

18. Honegger, K., Dietrich, V., Frank, W., Gansser, A., Thoni, M., Trommsdorff, V., 1982. Magmatism and metamorphism in the Ladakh Himalaya (the Indus–Tsangpo suture zone). Earth and Planetary Science Letters 60, 253–292.

19. Jain, A.K., Singh, Sandeep and Manickavasagam, R.M., 2002. Himalayan Collision Tectonics. Gondwana Research Group Memoirs, 7, 114.

20. Khan, M.A., Stern, R.J., Gribble, R.F., Windley, B.F., 1997. Geochemical and isotopic constraints on subduction polarity, magma sources, and palaeogeography of the Kohistan intraoceanic arc, northern Pakistan Himalaya. Geological Society, London 154, 935–946.

21. Kojima, S., Ahmad, T., Tanaka, T., Bagati, T.N., Mishra, M., Kumar, R., Islam, R., Khanna, P.P., 2001. Early Cretaceous radiolarians from the Indus suture zone, Ladakh, northern India. News of Osaka Micropaleontologists, Special Volume 12, 257–270.

22. Mishra, P. K., Anoop, A., Jehangir, A., Prasad, S., Menzel, P., Schettler, G., Naumann, R., Weise, S., Anderson, N., Yousuf, A. R., Gaye, B., 2014. Limnology and modern sedimentation patterns in high altitude Tso Moriri Lake, NW Himalaya – implications for proxy development. Fundamental of Applied Limnology 185, 325-348.

23. Matsumaru, K., Ehiro, M., Kojima, S., 2006. On Orbitolina (Foraminifera) from the Shyok Suture Zone, Kashmir, NW India. Journal of the Palaeontological Society of India 51, 43–49.

24. Robertson, A.H.F., 2000. Formation of melanges in the Indus Suture Zone, Ladakh Himalaya by successive subduction-related, collisional and post-collisional processes during Late Mesozoic–Late Tertiary time. In: Khan, M.A., et al. (Ed.), Tectonics of the Nanga Parbat Syntaxis and the Western Himalaya: Geological Society, London, Special Publication, vol. 170, pp. 333–374.

25. Robertson, A.H.F., Collins, A.S., 2002. Shyok Suture zone, N Pakistan: Late Mesozoic– Tertiary evolution of a critical suture separating the oceanic Ladakh Arc from the Asian continental margin. Asian Earth Sciences 20, 309–351.

26. Rowley, D.R., 1996. Age of initiation of collision between India and Asia: a review of stratigraphic data. Earth and Planetary Science Letters 145, 1–13.

27. Srivastava, P., Bhambri, R., Kawishwar, P. & Dobhal, D. P., 2013: Water level changes of high altitude lakes in Himalaya-Karakoram from ICE Sataltimetry. Journal of Earth System Science 122, 1533-1543.

28. Steck, A., Epard, J.-L., Vannay, J.-C., Hunziker, J., Girard, M., Morard, A., Robyr, M., 1998. Geological transect across the Tso Morari and Spiti areas-the nappe structures of the Tethys Himalaya. Eclogae Geologicae Helvetiae 91, 103–121.

12. List of Plates:

1. **Location Map**
2. **Watershed basin map (Regional Scale)**
3. **Regional Geology Map**
4. **Block Geology Map**

Table no. 1A - Tentative time schedule/Action plan for proposed Reconnaissance Survey (G4)

Estimated cost for Reconnaissance Survey (G-4) for Lithium and Potassium in Merak Block, Leh District, Union Territory of Ladakh							
S. No.	Item of Work	Unit	Rates as per NMET SoC 2020-21		Estimated Cost of the Proposal		Remarks
			SoC- Item-S. No.	Rates as per SoC	Qty.	Total Amount (Rs)	
1.0	**Remote Sensing Studies**						
1.1	Satellite imagery/Aerial photo interpretation studies						
	a) Charges for procurement of satellite imageries	Nos	1.1.a	0	1	-	If required; will be reimbursed as per actual
	c) Cost of interpretation in terms of Geologist man days	days	1.1b	9,000	15	135,000	
	Sub-Total 1.0					**135,000**	
2.0	**Geological Mapping (LSM), Other Geological Work**						
2.1	Large scale (LSM) Geological mapping, trenching and drilling					-	
	a) Geologist man days for Geological mapping, trenching (for field)	days	1.2 and 6	11,000	240	2,640,000	
	b) Labour (field) for Geological mapping work	days	5.7	431	480	206,880	Amount will be reimburse as per the notified rates for unskilled labour by the Central Labour Commissioner or respective State Govt. whichever is higher
	c) Surface Sampling -1 Sampler Labour charge not included	day	1.5.2	5100	40	204,000	
	d) labour charges for sampling	day	5.7	431	160	68,960	Amount will be reimburse as per the notified rates for unskilled labour by the Central Labour Commissioner or respective State Govt. whichever is higher
	Sub-Total					**3,119,840**	
	Sub-Total 2.0		para 5 of SoC	3.35 times higher than the normal SoC		**10,451,464**	**Field activities in Remote and inaccessable terrain existing in north eastern states (Rates are 3.35 times)**
3.0	**Mineral Investigation**						
3.1	Trenching/Pitting[#$]						
	a) Excavation of trenches & pits	per cu m	2.1.1	3,330	200	666,000	
	Sub-Total					**666,000**	
	Sub-Total 3.0		para 5 of SoC	3.35 times higher than the normal SoC		**2,231,100**	**Field activities in Remote and inaccessable terrain existing in north eastern states (Rates are 3.35 times)**
4.0	**Drilling**					-	
4.1	a) Drilling up to 300m Rigs) (Medium Hard Rock)	per m	2.2.1.4 a	11,500	0	-	
4.2	Borehole deviation survey	per m	2.2.6	330	0	-	
4.3	Borehole pillaring					-	
	a) construction of concrete pillar (12"x12"x30")	per borehole	2.2.7.a	2,000	0	-	
	b) Borehole plugging by cement	per m	2.2.7.b	150	0	-	
4.4	Transportation of drill rigs & truck associated per drill (To & Fro from HQ)	per km	2.2.8	36	0	-	
4.5	Monthly accommodation charges for drilling camp	monthly	2.2.9	50,000	0	-	This incudes 5 months for mapping and 5 months for drilling
4.6	a) Drilling camp setting (2 rigs)	per drill	2.2.9a	250,000	0	-	
4.7	b) Drilling camp winding (2 rigs)	per drill	2.2.9b	250,000	0	-	
4.8	Approach road making in hilly terrain	per km	2.2.10b	32,200	0	-	
4.9	Drill core preservation	per m	5.3	1590	0	-	It is proposed to preserve all the cores drilled as it is a strategic project
4.10	Demarcation Fixation of borehole and determination of co-ordinates & Reduced Level (RL) of the boreholes by DGPS (including charges for labours deployed for the work)	Per point of observation	1.6.2	19,200	0	-	
	Sub-Total					**-**	
	Sub-Total 4.0		para 5 of SoC	3.35 times higher than the normal SoC		**-**	**Field activities in Remote and inaccessable terrain existing in north eastern states (Rates are 3.35 times)**

5.0	**Laboratory Studies**						
5.1	Chemical Analysis						
	i) Surface sampling (Bed Rock Samples/Soil/Stream Sediment)						
	a) 34 element Package analysis by ICP-MS for surface samples	per sample	4.1.14	7,731	100	773,100	
	b) For REE analysis	per sample	4.1.7	5,380	60	322,800	
	ii) Check Samples (Bed Rock/Soil/Stream Sediment Samples) - 5% Internal & 10% External					-	
	a) 34 element Package analysis by ICP-MS for surface samples	per sample	4.1.14	7,731	15	115,965	
	b) For REE analysis	per sample	4.1.7	5,380	9	48,420	
5.2	**Pit & Trench, Primary Samples**					-	
	a) 34 element Package analysis by ICP-MS for surface samples	per sample	4.1.14	7,731	150	1,159,650	
	b) For REE analysis	per sample	4.1.5a	5,380	30	161,400	
	ii) Check Samples - 5% Internal & 10% External					-	
	a) 34 element Package analysis by ICP-MS for surface samples	per sample	4.1.14	7,731	23	173,948	
	b) For REE analysis	per sample	4.1.5a	5,380	8	43,040	
5.3	**Estimation of major oxides by XRF (Whole rock analysis)**						
	Major oxides	per sample	4.1.15a	4,200	10	42,000	
5.4	**ii) BH Core Sampling, Primary & Check samples (5% internal +10% External)**					-	
	a) 34 element Package analysis by ICP-MS for surface samples	per sample	4.1.14	7,731	0	-	
	a) For REE analysis	per sample	4.1.7b	5,380	0	-	
	ii) Check Samples - 5% Internal & 10% External					-	
	a) 34 element Package analysis by ICP-MS for surface samples	per sample	4.1.14	7,731	0	-	
	a) For REE analysis	per sample	4.1.7b	5,380	0	-	
5.5	**Whole rock studies**	per sample	4.1.15a	4,200	0	-	
5.6	**Petrological / Mineralographic studies**					-	
	a) Preparation of thin section	per sample	4.3.1	2,353	20	47,060	
	b) Study of thin section for petrography	per sample	4.3.4	4,232	20	84,640	
	c) Preparation of polished section	per sample	4.3.2	1,549	0	-	
	d) Study of polished section for mineragraphy	per sample	4.3.4	4,232	0	-	
	e) Digital photomicrograph of thin polished section	per sample	4.3.7	280	20	5,600	
5.7	XRD	per sample	4.5.1	4000	20	80,000	
	Sub-Total 5.0					**3,057,623**	
6.0	**Geologist man days (1 No.) for Geological map & Report (HQ)**	**days**	1.2	**9,000**	**120**	**1,080,000**	
	Total (1.0 to 6.0)					**16,955,187**	
7.0	**Geological Report Preparation**	Nos	5.2	For project exceeding Rs. 150 lakh but less than Rs. 300 Lakh - to A minimum Rs. 7.5 lakh or 3% of the value of work which ever is more	1	**750,000**	Reimbursement will be made after submission of the final Geological Report in Hard Copies (5 Nos) and the soft copy to NMET.
8.0	**Preparation of Exploration Proposal**	**Nos**	**5.1**	2% of the Cost or Rs. 3.8 Lakhs whichever is lower	**1**	**339,104**	will be reimbursed after submission of the Hard Copies and the soft copy of the final proposal along with Maps and Plan as suggested by the TCC-NMET in its meeting while clearing the proposal.
9.0	**Report Peer Review Charges**	**lumpsum**	**As per EC decision**	**10000**	**1**	**10,000**	
	Total Cost without GST (1 to 9)					**18,054,290**	
11.0	**Provision for GST (18%)**					**3,249,772.24**	GST will be reimburse as per actual and as per notified prescribed rate
	Total Estimated Cost with GST					**21,304,062**	
					Say, in Lakhs	**213.04**	
Notes:							
	If any part of the project is outsourced, the amount will be reimbursed as per the Paragraph 3 of NMET SoC and Item no. 6 of NMET SoC. In case of execusion of the						
*	Marked items not indicated in SoC and required to be taken up during the course of exploration shall be charged separately (as peractuals)						
$	Trenching/Pitting dimensions are tentative may vary depending upon the geology and field conditions						
i	Satellite imageries shall be procured from website/NRSA as the case may be and procurement charges if any shall be charged at actuals.						
#	2nd level of work shall be carried out after review of 1st level work i.e. Geological mapping, geochemical sampling, pitting/trenching and analysis						
	All Field related activities are 3.35 times calculated as the area is in himalayan terrain						

Table no. II: Tentative Time Schedule/action plan for proposed Reconnaissance Survey (G4) for Lithium and Potassium in Merak Block, Leh District, UT of Ladakh

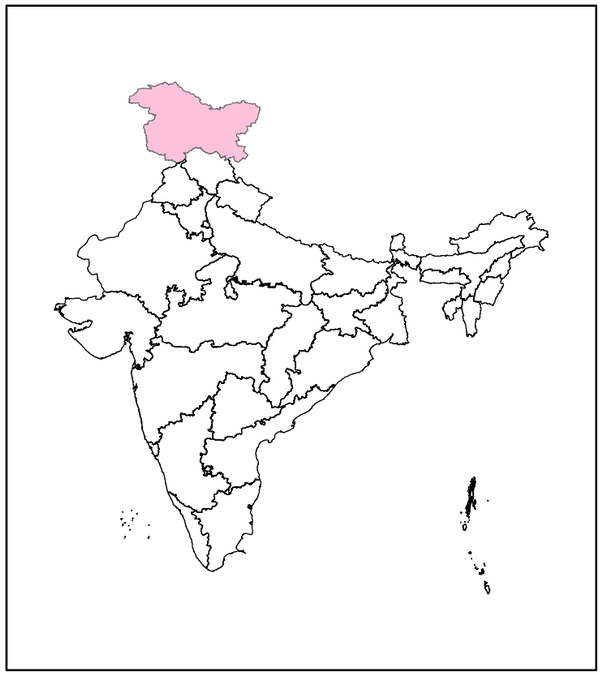
Table - II: Tentative Time schedule / Action plan of Reconnaissance Survey (G-4) for Lithium and Potasssium (Li and K) in Merak Block, Leh District, Union territory of Ladakh

S.No.	Activities	MONTHS																							
				Field Working window at Ladakh region				Non_Working duration at Ladakh region								Field Working window at Ladakh region				Non_Working duration at Ladakh region					
		1	2	3	4	5	6	7	8	9	10	11	12		1	2	3	4	5	6	7	8	9	10	11	12
1	Remote Sensing studies																								
2	Camp setting																								
3	Geological mapping & Sampling																								
4	Sample preparation (days)																								
5	Analytical work																								
6	Exploratory mining for trenching																								
7	Sample preparation (Trench/Pitting samples)																								
8	Analytical work																								
9	Camp winding																								
10	Geologist at HQ																								
11	Geological report																								
12	Peer Review																								

REVIEW

* 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 & order problems will be addition to above time line.



78°25'0"E
78°30'0"E
78°35'0"E
78°40'0"E
33°50'0"N
33°45'0"N
33°40'0"N
N
PANGONG TSO
Mari
14010 ±
15270
Merak
Kakstet
KAKSTET
21436
13980 ±
Toku
KN6
KN7
KN8
Proposed G4 Block
(Merak Block)
Area - 114.19 Sq. km.
GARAVAN ROUTE
Loi
Yogma
Kundo
Barma
Monbarri
Kailung
Kongta La
Kohank Yogma
(camping ground)
Tachungkaru
(camping ground)
Lumba
(camping ground)
Phanka (camping ground)
Phinmich
(camping ground)
Har Lungpa
Nama
14230 ±
0 1.75 3.5 7 10.5 14
Kilometers

मिनरल एक्सप्लोरेशन कार्पोरेशन लिमिटेड
Mineral Exploration Corporation Ltd.
Govt of India Enterprise. A Miniratna PSE.

78°0'0"E 79°0'0"E 80°0'0"E 81°0'0"E

35°0'0"N 34°0'0"N 33°0'0"N 32°0'0"N

LADAKH PLATEAU

Shyok River

LAC

78.622757, 33.771352

Leh

Sumxi Co

Orba Co

Gozha Co

Bangdag Co

Lumajangdong Co

Gyézê Caka

Tso Moriri

Kar Tso

INDIA

CHINA

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USG
METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the G

Legend

- Sample Location
- LAC
- Drainage
- Extent
- Watershed Boundary
- International Boundary

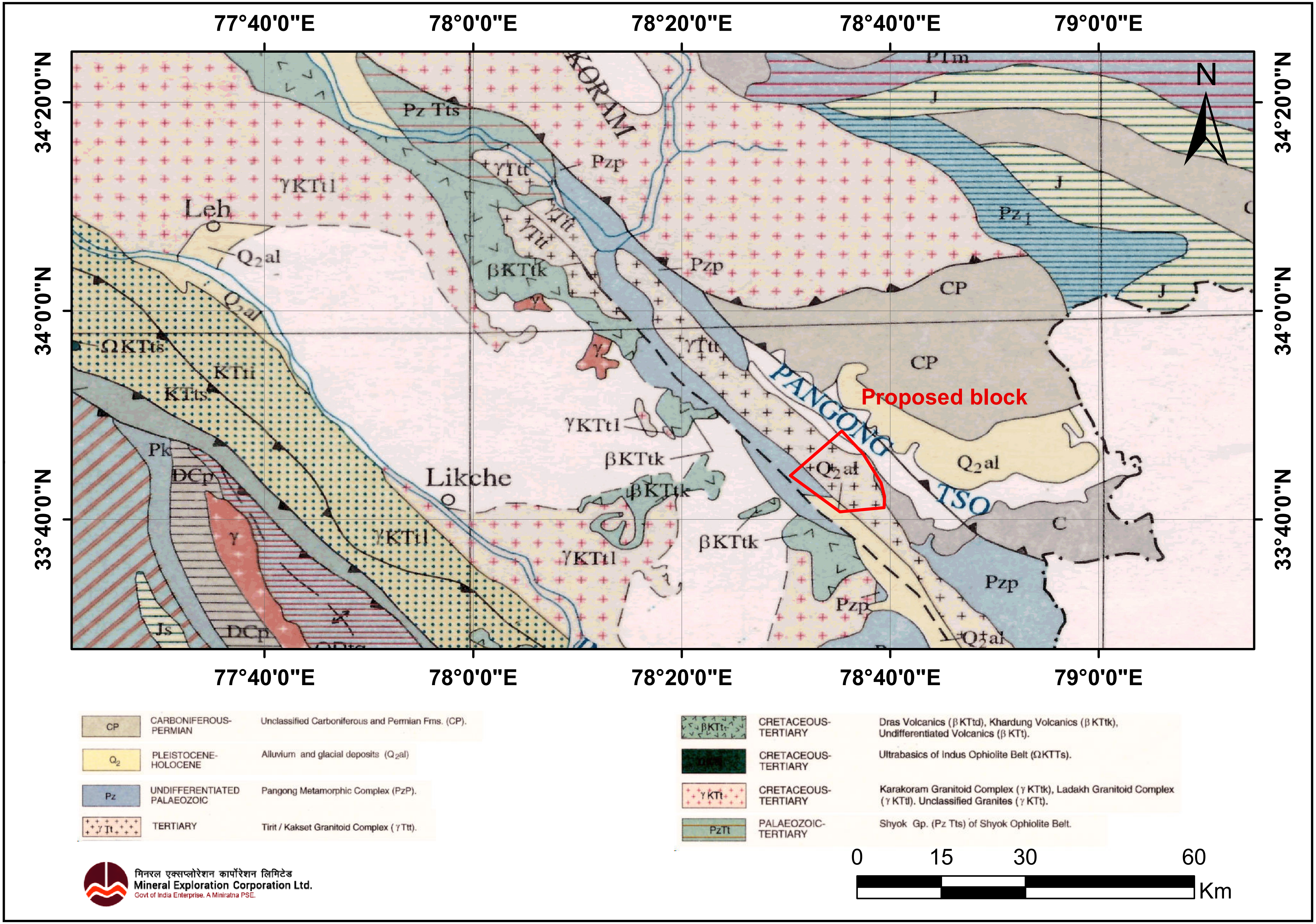
52F/11	52F/15	52J/3	52J/7	52J/11	52J/15	52N/3
52F/12	**52F/16**	**52J/4**	**52J/8**	**52J/12**	52J/16	52N/4
52G/9	**52G/13**	**52K/1**	**52K/5**	**52K/9**	**52K/13**	52O/1
52G/10	52G/14	**52K/2**	**52K/6**	**52K/10**	**52K/14**	52O/2
52G/11	52G/15	52K/3	**52K/7**	**52K/11**	**52K/15**	52O/3
52G/12	52G/16	52K/4	52K/8	52K/12	52K/16	52O/4

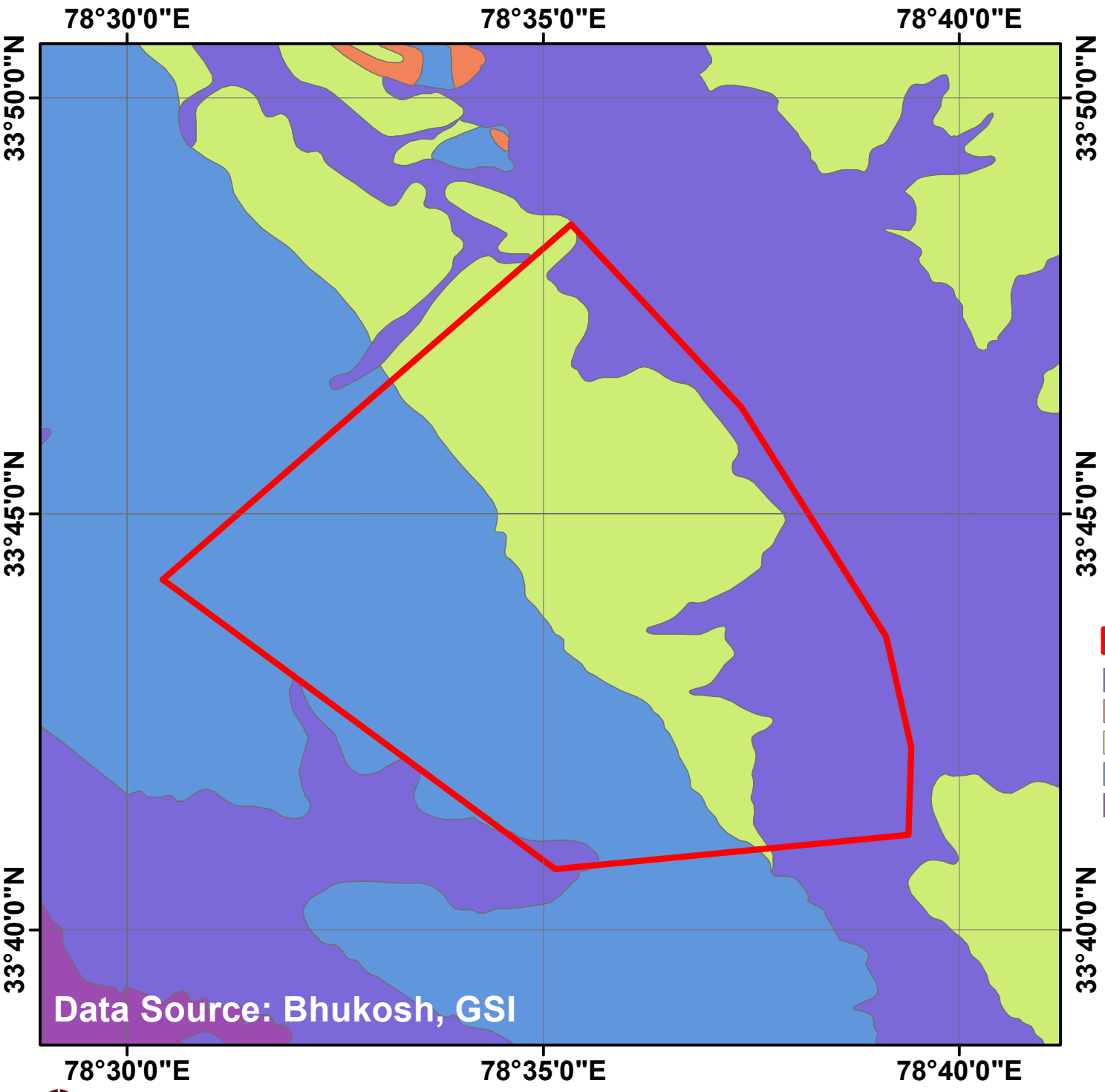
77°45'00" 79°00'00" 34°15'00" 33°15'00"

Area : 4285 Sq.km

मिनरल एक्सप्लोरेशन कार्पोरेशन लिमिटेड
Mineral Exploration Corporation Ltd.
Govt of India Enterprise, A Miniratna PSE.

0 20 40 80 120 160 Km


77°40'0"E
78°0'0"E
78°20'0"E
78°40'0"E
79°0'0"E
34°20'0"N
34°0'0"N
33°40'0"N
N
Leh
Likche
PANGONG TSO
Proposed block
KORAM
CP
Q2al
Pzp
PTm
J
Pz1
C
γKTtl
γTtt
βKTtk
ΩKTts
KTti
KTts
Pk
DCp
Js
γ
Pz Tts
CP CARBONIFEROUS-PERMIAN Unclassified Carboniferous and Permian Fms. (CP).
Q2 PLEISTOCENE-HOLOCENE Alluvium and glacial deposits (Q2al)
Pz UNDIFFERENTIATED PALAEOZOIC Pangong Metamorphic Complex (PzP).
γTt TERTIARY Tirit / Kakset Granitoid Complex (γTtt).
βKTt CRETACEOUS-TERTIARY Dras Volcanics (βKTtd), Khardung Volcanics (βKTtk), Undifferentiated Volcanics (βKTt).
CRETACEOUS-TERTIARY Ultrabasics of Indus Ophiolite Belt (ΩKTTs).
γKTt CRETACEOUS-TERTIARY Karakoram Granitoid Complex (γKTtk), Ladakh Granitoid Complex (γKTtl). Unclassified Granites (γKTt).
PzTt PALAEOZOIC-TERTIARY Shyok Gp. (Pz Tts) of Shyok Ophiolite Belt.
0 15 30 60
Km
मिनरल एक्सप्लोरेशन कार्पोरेशन लिमिटेड
Mineral Exploration Corporation Ltd.
Govt of India Enterprise. A Miniratna PSE.



N
W
E
S

Merak Block, Ladakh (Proposed G4 Block)

Legend

- Merak Block
- ALLUVIUM, MORAINES, HILLWASH & SCREE
- AMPHIBOLITE
- GREY PHYLLITE, QUARTZITE AND SCHIST
- HORNBLENDE GRANITE AND DIORITE
- RHYOLITE, DACITE, AGGLOMERATE & ULTRABASICS

0 1 2 4 6 8 Kilometers

मिनरल एक्सप्लोरेशन कार्पोरेशन लिमिटेड
Mineral Exploration Corporation Ltd.
Govt of India Enterprise, A Miniratna PSE.