PROPOSAL FOR GENERAL EXPLORATION FOR MOLYBDENUM AND ASSOCIATED MINERALIZATION IN MARUDIPATTI SOUTH BLOCK, HARUR-UTTANGARAI MOLYBDENUM BELT, DHARMAPURI DISTRICT, TAMIL NADU (G2), T.S. 57 L/8.

COMMODITY: MOLYBDENUM AND ASSOCIATED MINERALS

BY
GEOLOGICAL SURVEY OF INDIA
STATE UNIT: TAMIL NADU & PUDUCHERRY

PLACE: CHENNAI
DATE: 17.04.2026

SUMMARY OF THE BLOCK FOR G2 LEVEL EXPLORATION GENERAL INFORMATION ABOUT THE BLOCK

	Features	**Details**
	Block ID	MARUDIPATTI SOUTH BLOCK
	Exploration Agency	Geological Survey of India (GSI)
	Commodity	Molybdenum and associated minerals
	Mineral Belt	
	Completion period with entire Time schedule to complete the project	12 months
	Objectives	1. To establish and assess the molybdenum ore body 2. To estimate the resource of molybdenum and associated mineralization.
	Whether the work will be carried out by the proposed agency or through outsourcing	Work will be carried out by the proposed agency (GSI).
	Name/Number of Geoscientists	Two no. Geoscientists
	Expected Field days	Geologist Party days:120 days (each)
1.	**Location**	

	Block boundary corner points	**Sl. no**	**Corner**	**Latitude**	**Longitude**
		1	A	12° 09’ 24.48”	78° 27’ 16.97”
		2	B	12° 09’ 24.63”	78° 27’ 33.78”
		3	C	12° 08’ 25.485”	78° 27’ 12.923”
		4	D	12° 08’ 35.293”	78° 26’ 50.647”
	Villages	Marudipatti and Thamelaripatti Villages			

	Tehsil/Taluk	Harur Taluk
	District	Dharmapuri
	State	Tamil Nadu
2.	**Area**	
	Block Area	1.07 Sq. Km.
	Forest Area	Reserve forest
	Government Land Area	Forest area under state Government
	Charagaha	Data not available
	Private Land Area	20% of the proposed block
3.	**Accessibility**	
	Nearest Rail Head	Morappur (7 Km)
	Road	The area can be accessed via National Highway NH179A, State Highway 6A and 60A
	Airport	Salem in SW Direction (70 km)
4.	**Hydrography**	
	Local Surface Drainage Pattern (Channels)	Small seasonal nalas originating from E-W running direction within the exploration block.
5.	**Climate**	
	Mean Annual Rainfall	December during north-east monsoon period. Occasional showers are experienced during south west monsoon. Occasional rains during June to August are common. The average rainfall for the region varies 600mm to 700 mm
	Temperatures (December) (Minimum) Temperatures (June) (Maximum)	The area has a typical tropical climate. Summer is very hot with temperature ranging from 35°Cto 44°C.
6.	**Topography**	

	Toposheet Number	57 L/08
	Morphology of the Area	The NNE-SSW trending Harur-Uttangarai Molybdenum Belt forms a narrow long undulating stretch between Velampatti South in the south and Uttangarai and beyond in the north. It is about 28 km, long and 1 km, wide belt enclosing a series of minor parallel ridges, mounds and rare mounds cutting across the molybdenum belt. Ridges/mounds are predominantly occupied by charnockite, pyroxene granulite and basic rocks. The maximum height of this area is 433 m. R.L. and the minimum height is 360 m, R.L.
7.	**Availability of baseline geosciences data**	
	Geological Map (1:50K/25K)	Geological map on 1:2000 scale (Source: GSI)
	Geochemical Map	NGCM Map (Source: Bhukosh, GSI)
	Geophysical Map (Aeromagnetic, ground geophysical, Regional as well as local scale GP maps)	Gravity and Magnetic Map (Source: Bhukosh,GSI) Ground geophysical survey (Resistivity survey 9L.km) was completed during G-3 stage of exploration.
8.	**Justification for taking up G2 level Exploration**	1. The Marudipatti South block is part of well-established 28 km strike length of Harur-Uthangarai Molybdenum Belt (HUMB) and geologically forms within 200 km long NNE trending Dharmapuri Shear Rift Zone (DSRZ), Southern Granulite Terrain. 2. The Marudipatti South block was explored as G-4 exploration during FS: 1992-93 and 1994-1995 (GSI). In recent times, the 28 km belt had been categorized as 5 clusters of amalgamated blocks and subsequently the block was explored by G-3 exploration during FS: 2024-25. 3. As an outcome of G-3 exploration in the block, a total of 12 nos. of 1st level borehole to intersect the mineralised zone at 50m vertical depth and 07 nos. of 2nd level boreholes to intersect the mineralised zone at 100m vertical depth were drilled along the sixteen profiles. Molybdenum lodes for boreholes of previous and present

		exploration were delineated for both 1st and 2nd levels which includes twenty seven lodes at 0.01% Mo;eleven lodes at 0.03% Mo and eight lodes at 0.05% Mo cut-offs. 4. Resource of molybdenum ore estimated by cross-section method between 346 m and 256 m RL, is 2.307205 million tonnes with an average grade of 291.96 ppm Mo having an average thickness of 3.52m for a cumulative strike length of 0.912kms at a 100ppm cut-off grade. At 300 ppm cut-off grade, the estimated resource is 0.4276 million tonnes with an average grade of 569.32 ppm Mo having an average lode thickness of 2.34m, for a cumulative strike length of 0.475 km. At 500 ppm cut-off grade, the estimate resource is 0.2354 million tonnes with an average grade of 720.63 ppm Mo having an average thickness of 2.31 m for a cumulative strike length of 0.375 km. The molybdenum ore was also estimated by longitudinal vertical - section in the block. 5. In addition to Mo ore, the block hosts gold (Au) mineralization for a cut of 500ppb of Au. The cross section method estimated a resource of 0.0532 million tonnes with average grade of 758.44ppb Au over 500ppb for a cumulative strike length of 0.154 km for which average thickness of 2.3m. 6. The Marudipatti South Block reveals consistent intersection of the mineralized shear zone (Sh-2) across all boreholes, along with confirmed molybdenum mineralization in most of the boreholes. 7. Based on the outcome of G-3 exploration in the Marudipatti South block, the block is proposed for G-2 stage of exploration. The proposed block has strike length of 1.6 km with wide of 800m for 1.07 sq.km area. The block is proposed with drilling target of 2200m for eight second level boreholes (155±5m for each) at 100m vertical depth with 100m spacing and four third level boreholes (210±10m for each) at 150m vertical depth with 200m spacing 8. Molybdenum and its associated mineralization the structural controlled one, which has lucidly revealed through systematic exploration in the block/belt. The mode of occurrence of molybdenite is fine flaks/dissemination within sheared quartz and gneisses. The pattern of mineralization is lensiodal laterally and vertically within the shear zone, which results the heterogeneity of ore concentration in the established mineralized zone. Therefore, the close spaced boreholes are required in the block for appropriate delineation of ore body's geometry to arrive proper resource estimation. Moreover, molybdenum is categorized as strategic mineral commodity, where the borehole's spacing needs to be adopted in 100-200m range. By considering above aspects, a G-2 stage of exploration is required in the Marudipatti South block.

		9. Upon completion of the G2 stage in the Marudipatti South block, amalgamated Marudipatti Block encompassing Marudipatti South, Central and North blocks with G-2 resource for molybdenum ore can be delineated for the cumulative strike length 4.2km, where already Marudipatti Central and North blocks were completed with G-2 stage of exploration and only the Marudipatti South block is left out for G-2 exploration. This will be helpful while auctioning the Molybdenum cluster blocks in the belt.

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1.1.0 INTRODUCTION

1.1.1 Molybdenum (Mo) is a critical strategic metal widely used in alloy steels, stainless steel, superalloys, lubricants, electrical components, and petrochemical catalysts. Its unique properties—high strength at elevated temperatures, corrosion resistance, and enhanced hardness—make it indispensable for key sectors such as defence, aerospace, energy, infrastructure, oil refining, and renewable energy technologies.

1.1.2 Molybdenite (MoS_2) is the principal ore of molybdenum. About two-thirds of global molybdenum production is as by-product of copper mining and only about onethird is obtained from primary molybdenum mines. In India, by-product concentrates of molybdenum are produced intermittently from uranium ore of Jaduguda mine belonging to Uranium Corporation of India Ltd (UCIL) in Jharkhand.

1.1.3 India's demand for molybdenum has been steadily increasing due to rapid growth in the steel, power, oil and gas, and manufacturing sectors. However, the country has very limited indigenous production and remains largely dependent on imports, making the supply chain vulnerable to global market fluctuations and geopolitical uncertainties. In line with national priorities for critical mineral security and Atmanirbhar Bharat, systematic exploration for molybdenum resources has become essential.

2.1.0 BACKGROUND INFORMATION

2.1.1 The HUMB (Harur Uthangarai Molybdenum Belt) forms a part of the ~200 km long NNE-SSW trending Dharmapuri Shear Rift Zone (DSRZ), a known molybdenum province associated with carbonatite–alkaline complexes within the Southern Granulite Terrain (Fig. 4.1). The HUMB extends for approximately 28 km from Vellampatti in the south to Nochchippatti in the north and is subdivided into three shear zones namely; Harur–Uttangarai Shear Zone (~22 km), ii) Vellakkal RF Shear Zone (~5 km), and iii) Vellakkal West Shear Zone (~1 km).

2.1.2 V. Palanisamy et al. (1992–93 & 1993-1994) carried out detailed geological mapping and geochemical survey in Marudipatti South Block. A total of 102 soil samples collected at 200 m line intervals revealed 11 samples with >20 ppm Mo and a maximum value of 80 ppm. Among 29 termite mound samples, 21 showed values between 4 and 125 ppm, with the highest at 125 ppm. Seven number of samples with limonite film have yielded Mo values of 8 to 300 ppm. Sixteen litho-geochemical samples showed Mo values up to 4600 ppm. Seventeen trenches totalling 567 m^3 were excavated across the shear zone and 601 samples were analysed, with 58 showing >100 ppm Mo and a peak value of 1300 ppm. M. Shanmugam et al. (1992–93 & 1993-1994) carried out exploration including drilling of four first-level boreholes (MS-1 to MS-3 and MS-5; total 422.75 m) and one second-level

borehole (MS-4; 201.10 m). The shear zone was intersected as expected at 50 m (I level) and 100 m (II level) depths, with widths up to 35 m (I level) and 12 m (II level). Analysis of core samples (237 samples) showed Mo lodes 1 to 2 in number per borehole with thickness ranging from 1.4 to 5.8 m and grades between 0.017–0.077% Mo. Based on these results, indicated and inferred reserves were estimated as 0.49 million tonnes with 0.026% Mo and 3.06 million tonnes with 0.025% Mo, respectively, at a 0.01% cut-off grade up to 235 m RL.

2.1.3 Based on the outcome of the previous exploration, a G3 stage exploration was taken up during FS 2024-25. In G3 stage exploration resource for molybdenum lodes has been estimated based on data of 24 boreholes including four 1st level and one 2nd level boreholes of previous exploration. Resource estimation by the cross-section method between 346 m and 256 m RLs, indicates an inferred molybdenum resource of 2.307205 million tonnes with weighted average grade of 291.96 ppm Mo with an average thickness of 3.52 m for a cumulative strike length of 0.912 km at 100ppm cut-off grade. At 300 ppm cut-off grade, the estimated resource is 0.4276 million tonnes with an average grade of 569.32 ppm Mo having an average lode thickness of 2.34 m, for a cumulative strike length of 0.475 km. At 500 ppm cut-off grade, the estimated resource is 0.2354 million tonnes with an average grade of 720.63 ppm Mo having an average thickness of 2.31 m for a cumulative strike length of 0.375 km.

2.1.4 Further, all the boreholes intersected Mo lodes are correlated laterally in L-V section and estimated resource for three different cut offs. At 100ppm cut off, the estimated resource is 2.09051 million tonnes with an average grade of 291.26 ppm Mo having an average thickness of 4.2m for a cumulative strike length of 0.912km. At 300 ppm cut-off grade, the estimated resource is 0.39693 million tonnes with an average grade of 565ppm Mo having an average lode thickness of 3m, for a cumulative strike length of 0.475 km. At 500 ppm cut-off grade, the estimate resource is 0.22809 million tonnes with an average grade of 710.83 ppm Mo having an average thickness of 3 m for a cumulative strike length of 0.375 km.

2.1.5 Additionally, resource of gold ore was also estimated by both cross section and L-V section at cut off of 500ppb of Au. The cross section method estimated a resource of 0.0532 million tonnes with average grade of 758.44ppb Au over 500ppb for a cumulative strike length of 0.154 km for which average thickness of 2.3m whereas L-V section estimated resource of 0.05151 million tonnes with average grade of 666ppb Au over 500ppb for a cumulative strike length of 0.154 km for which average thickness of 2.67m

2.1.6 Based on the outcome of G-3 exploration in the Marudipatti South block, the block is proposed for G-2 stage of exploration

3.1.0 LOCATION AND ACCESSIBILITY

3.1.1 The Marudipatti South block is located in the central part of the HUMB (Fig 2.1). The block is located in Dharmapuri district. Within investigation block, borehole location and mineralisation zone can be reached by earthen road. Marudipatti South block is situated 14 km northwest of Harur Taluk and 28 km SW from Uthangarai Taluk. The block is bounded by the Agraharam North Block in the south and Marudipatti central block in the north. The block is situated 7 km away from Ichambadi village, which is on the state highway road from Tirupattur-Salem. The investigation area can be approached from either Harur, Uthangarai or from Morappur by metal road. Harur is a Taluk headquarters 14km from the present investigation block and is well-connected with district headquarter of Dharmapuri (52km). The Harur town has also good connectivity with major city from Salem (62km) (NH-179A) and Dharmapuri (50km) (SH-6A) by national and state highway road. The Harur town is about 278 km SW of Chennai and is well connected by all-weather roads. The nearest rail head is Morappur (about 15 km) on Jolarpettai-Salem broad gauge section of southern railway and nearest airport at Salem.

CARDINAL POINT COORDINATE OF MARUDIPATTI SOUTH BLOCK, HARUR-UTTANGARAI MOLYBDENUM BELT, DHARMAPURI DISTRICT, TAMIL NADU (G2), T.S. 57 L/8.

Cardinal Points	Latitude	Longitude
A	12° 09’ 24.48”	78° 27’ 16.97”
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C	12° 08’ 25.485”	78° 27’ 12.923”
D	12° 08’ 35.293”	78° 26’ 50.647”

4.1.0 PHYSIOGRAPHY, DRAINAGE AND CLIMATE

4.1.1 The NNE-SSW trending Harur-Uttangarai Molybdenum Belt forms a narrow long undulating stretch between Velampatti South in the south and Uttangarai and beyond in the north. It is about 28 km, long and 1 km, wide belt enclosing a series of minor parallel ridges, mounds and rare mounds cutting across the molybdenum belt. Ridges/mounds are predominantly occupied by charnockite, pyroxene granulite and basic rocks. The maximum height of this area is 433 m. R.L. and the minimum height is 360 m, R.L.

4.1.2 The perennial Ponnaiyar River is the major water source near by the current investigation block, which is about 4 km from the block, which flows west to eastwards. It is contributed by several NNE flowing tributaries. Wells and man-made canals are the main source of water for irrigation. Mostly dendritic pattern of drainage pattern is noticed in the investigation area. The area is a gently undulating terrain with a NE-SW ridge having a maximum elevation of 376m above mean sea level.

4.1.3 The study area has a typical tropical climate. Summer is very hot with temperature ranging from 35°Cto 44°C. Winter is moderately cool. Rainfall is low, which is resulting in frequent droughts, especially in summer months. The rainy season for the region spans from October to December during north-east monsoon period. Occasional showers are experienced during south west monsoon. Occasional rains during June to August are common. The average rainfall for the region varies 600mm to 700 mm.

5.1.0 PREVIOUS WORK

5.1.1 Bruce Foote (1879) was the earliest geologist to carry out geological mapping in the North Arcot District and the adjoining Dharmapuri district. Subsequent geological mapping and preliminary mineral investigations in the Dharmapuri district were conducted by Vinayaka Rao (1924–25), Krishnasamy (1949–50), Iyengar and Seshadri (1958–61), and Gopal Rao (1962–63), who mainly documented the general lithological and broad structural characteristics of the area. The occurrence of molybdenum in the region east of the Yelagiri Hills, within the Gudiyattam–Bhavani litho-tectonic belt, came to light in the early 1970s. Ramachandran (1975) and Rao and Shanmugam (1976) delineated a 200 km long NNE-SSW trending molybdenum province associated with alkaline-carbonatite rocks in western Tamil Nadu.

5.1.2 P.S. Rao (1977) undertook regional litho-geochemical sampling within this 200 km long and 5–25 km wide molybdenum belt, extending from south of Gudiyattam in North Arcot through Dharmapuri and Salem to near Bhavani in Coimbatore District. As part of this effort, Rao (1977) collected litho-geochemical samples from the Harur–Alangayam belt, which yielded molybdenum (Mo) values ranging from 6 to 500 ppm. These findings suggested a regional-scale mineralisation related to alkaline-carbonatite activity. Similar

tectonic and lithological settings in the Harur–Uthangarai area led to focused exploration for molybdenum potential. In 1977, P.S. Rao and M. Shanmugam traced molybdenum-bearing quartz veins west of Veiampatti village

5.1.3 Subsequently, Nagal (1977) mapped a 12 sq, km area on 1: 31,680 scale west of Velampatti and Agraharam villages, targeting the mineralised quartz veins. Selvan (1980) conducted regional geological mapping on 1:31,680 scale, identifying six quartz vein zones with 24 mappable veins aligned along NNE–SSW trending shear zones, extending from south of Velampatti to Vellakkal and Kallavi Reserved Forests over a distance of 25 kms. Some veins exhibited visible mineralisation including galena, pyrite, and molybdenite, leading to the designation of the area as the Harur–Uthangarai Molybdenum Belt. Simultaneously, detailed soil sampling, litho-geochemical sampling, and trenching were conducted in the Velampatti sector to assess its molybdenum potential.

5.1.4 V. Palanisamy et al. (1992–93 & 1993-1994) carried out detailed geological mapping and geochemical survey in Marudipatti South Block (Fig. 3.2). A total of 102 soil samples collected at 200 m line intervals revealed 11 samples with >20 ppm Mo and a maximum value of 80 ppm. Among 29 termite mound samples, 21 showed values between 4 and 125 ppm, with the highest at 125 ppm. Seven number of samples with limonite film have yielded Mo values of 8 to 300 ppm. Sixteen litho-geochemical samples showed Mo values up to 4600 ppm. Seventeen trenches totalling 567 m³ were excavated across the shear zone and 601 samples were analysed, with 58 showing >100 ppm Mo and a peak value of 1300 ppm. M. Shanmugam et al. (1992–93 & 1993-1994) carried out exlploration including drilling of four first-level boreholes (MS-1 to MS-3 and MS-5; total 422.75 m) and one second-level borehole (MS-4; 201.10 m) (Fig. 3.3). The shear zone was intersected as expected at 50 m (I level) and 100 m (II level) depths, with widths up to 35 m (I level) and 12 m (II level). Analysis of core samples (237 samples) showed Mo lodes 1 to 2 in number per borehole with thickness ranging from 1.4 to 5.8 m and grades between 0.017–0.077% Mo. Based on these results, indicated and inferred reserves were estimated as 0.49 million tonnes with 0.026% Mo and 3.06 million tonnes with 0.025% Mo, respectively, at a 0.01% cut-off grade up to 235 m RL.

5.1.5 Further exploration in the Marudipatti North Block was undertaken by Shanmugam et al. (1994–95), who mapped 0.8 sq. km on 1:2000 scale. Trenching (504.40 m³) at 50 m intervals across the shear zone and litho-geochemical and soil sampling (121 and 93 samples, respectively) guided the prioritisation of drilling profiles. Six first-level boreholes (MN-1 to MN-6) were drilled to 50 m depth (613.15 m total) at 200–400 m spacing. The estimated resources were 1.17657 million tonnes @ 0.035% Mo (0.01% cut-off), 0.319155 million tonnes @ 0.059% Mo (0.03% cut-off), and 0.17262 million tonnes @ 0.075% Mo (0.05% cut-off), calculated up to 268 m RL (80 m vertical depth). Radhakrishnan (1996–98) expanded the work by drilling seven more boreholes (AMN-1 to AMN-7; 768.2 m total) at 100–150 m spacing. Thirteen boreholes (MN-1 to MN-6 and AMN-1 to AMN-7),

spaced 92–165 m apart, were drilled over two phases. Twelve of them intersected the mineralised shear zone between 330.8 m and 275.04 m RL, with up to five sub-lodes per borehole (true widths 1–3.99 m). Resource estimates for a 1.47 km strike length up to II level (124 m depth) included 2.21953 million tonnes @ 0.035% Mo (0.01% cut-off), 0.41189 million tonnes @ 0.094% Mo (0.03% cut-off), and 0.12994 million tonnes @ 0.087% Mo (0.05% cut-off).

5.1.6 Further exploration by Balasubramanian et al. (1998–2000) included four second-level boreholes each in Marudipatti North (795.30 m) and Central (689.85 m) Blocks, at vertical depth of 120 m and spacing of 200–350 m. In the North Block, the combined I and II level boreholes yielded 1.77303 million tonnes @ 0.039% Mo (0.01% cut-off), 0.340505 million tonnes @ 0.084% Mo (0.03% cut-off), and 0.191475 million tonnes @ 0.10% Mo (0.05% cut-off). In the Central Block, resource estimates were 1.62847 million tonnes @ 0.094% Mo (0.01% cut-off), 0.65737 million tonnes @ 0.116% Mo (0.03% cut-off), and 0.458205 million tonnes @ 0.120% Mo (0.05% cut-off).

5.1.7 In 2015, MECL undertook G-2 stage exploration in the Marudipatti Central Block based on earlier GSI work. They estimated a resource of 2.094 million tonnes @ 0.036% Mo (0.01% cut-off), and submitted the report to the Tamil Nadu state government for auctioning. More recently, during FS 2021–22, Ravichandran et al. (2022) conducted G-2 exploration in the MN-A sector of Marudipatti North Block. Twenty-three boreholes were drilled to a vertical depth of 150 m (III level). For a cumulative strike length of 843 m, resource estimates included 1.9172 million tonnes @ 401 ppm Mo (0.01% cut-off), 0.8476 million tonnes @ 597 ppm Mo (0.03% cut-off), and 0.33906 million tonnes @ 920 ppm Mo (0.05% cut-off). The thickness of molybdenum lodes varied from 1.5 to 15.3 m, with average grades ranging between 0.017–0.15% Mo at a minimum stopping width of 1.5 m.

5.1.8 Based on the outcome of the previous exploration, a G3 stage exploration was taken up during FS 2024-25 (Yuvaraj et al 2025). In G3 stage exploration resource for molybdenum lodes has been estimated based on data of 24 boreholes including four 1st level and one 2nd level boreholes of previous exploration. Resource estimation by the cross-section method between 346 m and 256 m RLs, indicates an inferred molybdenum resource of 2.307205 million tonnes with weighted average grade of 291.96 ppm Mo with an average thickness of 3.52 m for a cumulative strike length of 0.912 km at 100ppm cut-off grade. At 300 ppm cut-off grade, the estimated resource is 0.4276 million tonnes with an average grade of 569.32 ppm Mo having an average lode thickness of 2.34 m, for a cumulative strike length of 0.475 km. At 500 ppm cut-off grade, the estimated resource is 0.2354 million tonnes with an average grade of 720.63 ppm Mo having an average thickness of 2.31 m for a cumulative strike length of 0.375 km. Further, all the boreholes intersected Mo lodes are correlated laterally in L-V section and estimated resource for three different cut offs. At 100ppm cut off, the estimated resource is 2.09051 million tonnes with an average grade of 291.26 ppm Mo having an average thickness of 4.2m for a cumulative

strike length of 0.912km. At 300 ppm cut-off grade, the estimated resource is 0.39693 million tonnes with an average grade of 565ppm Mo having an average lode thickness of 3m, for a cumulative strike length of 0.475 km. At 500 ppm cut-off grade, the estimate resource is 0.22809 million tonnes with an average grade of 710.83 ppm Mo having an average thickness of 3 m for a cumulative strike length of 0.375 km. Additionally, resource of gold ore was also estimated by both cross section and L-V section at cut off of 500ppb of Au. The cross section method estimated a resource of 0.0532 million tonnes with average grade of 758.44ppb Au over 500ppb for a cumulative strike length of 0.154 km for which average thickness of 2.3m wheras L-V section estimated resource of 0.05151 million tonnes with average grade of 666ppb Au over 500ppb for a cumulative strike length of 0.154 km for which average thickness of 2.67m

6.1.0 GEOLOGY OF THE AREA

6.1.1 The Harur-Uthangarai Shear Zone (HUSZ) is a prominent NNE-SSW to NE-SW trending shear zone hosting molybdenum mineralisation. This belt extends over a cumulative strike length of 28 km between Velampatti in the south and Uttangarai in the north occurring within the Dharmapuri Suture Rift Zone. The Marudipatti South Block (MS) falls in the southern part of the Harur – Uttangarai molybdenum belt bounded by Marudipatti Central Block (MC) in the north and Agraharam North Extension Block in the south (ANE)

6.1.2 The Marudipatti South Block exposes lithounits of Ultramafic-mafic-Anorthosite Complexes (Older), Charnockite Group, Migmatite Complex, Alkaline Carbonatite Complexes and Younger Intrusives. The Ultramafic-mafic-Anorthosite Complexes (Older) is represented by metapyroxenite and meta gabbro whereas Charnockite Group is represented by Charnockite with patches or linear bands of pyroxene granulite. The dominant lithologies of the study area including epidotised hornblende gneiss, quartzo-feldspathic gneiss represents Migmatite Complex (PGC-II) and Alkaline Carbonatite Complexes is represented by syenite which is encountered only in boreholes. Further, the quartz vein which is significant for present investigation represents younger intrusives in the study area.

6.1.3 The general trend of foliation varies from NNE–SSW to NE–SW, with moderate to steep dips (50°–75°) towards the northwest. Structurally, the area is characterized by two generations of shearing. The first-generation shear (Sh-1) is a regional shear trending NNE–SSW, concordant with foliation, and is marked by cataclastic deformation and proto-mylonitic fabric. The second-generation shear (Sh-2) is associated with the emplacement of quartz veins and sulphide mineralization, including molybdenite, pyrite, galena, and chalcopyrite. Both at the surface and in the subsurface, Sh-2 is manifested by grain-size reduction, development of mylonitic to phyllonitic fabric including distinct banding, elongation, recrystallized quartz ribbons and closely spaced joints accompanied by intense alterations including epidotization, chloritization, ankeritization, potassic metasomatism,

and ramifying carbonate veins in random orientations. The width of shear zone varies from 8m to 50m with a cumulative strike length of 1.6 km. The general trend of the mineralized shear zone varying from N-S to NNE-SSW in the northern part to NNE-SSW to NE-SW in the southern part with moderate to steep (45o-76 o) dip towards south-easterly direction.

6.1.4 Surface manifestations of mineralization include limonitic coatings and encrustations, as well as boxwork and vuggy textures of cubic morphology in quartz veins. In Marudipatti South Block, molybdenum and associated sulphide mineralization comprising pyrite, galena, and chalcopyrite are shear-controlled (structurally controlled) in nature. The mineralization is confined to the second-generation shear zone (Sh-2), which is spatially associated with the emplacement of quartz veins. In general, mineralization is associated with intense hydrothermal alteration, characterized by epidotization, chloritization, ankeritization, and potassic metasomatism. Petrography, SEM-EDX and EPMA studies reveals that the molybdenum mineralization within the shear zone is predominantly disseminated and fracture-controlled, locally exhibiting smear-type enrichment parallel to the shear plane.

6.1.5 Molybdenite, the principal molybdenum-bearing phase commonly occurs as fine disseminations within quartz veins and mylonitised gneisses. In several instances, molybdenite forms thin lamellae along microfractures parallel to the shear planes or appears smeared along foliation surfaces within the sheared gneiss indicating its structural control. From the core samples it is also evident that richer concentration of molybdenite is confined to mylonitised gneiss with moderate to intense potassic alteration and numerous quartz veinlets. Further, in massive quartz veins, molybdenite is controlled by hairline fractures parallel to shear.

6.1.6 **Common rock types**

Meta-Pyroxenite

Meta-pyroxenite occurs as small, discontinuous enclaves within the epidotised hornblende gneiss, with surface exposures being very scanty. The rock is green to blackish-green in colour, medium- to coarse-grained, and composed predominantly (90–95%) of pyroxene, with minor biotite. Quartzo-feldspathic injections traverse along weak planes within the rock and exhibit stretching and deformation due to post-dating deformations. At the outcrop scale, these enclaves occur as linear bands aligned parallel to the general foliation of the area.

Meta Gabbro

Meta-gabbro occurs as linear enclaves within epidotised hornblende gneiss throughout the study area, with well-exposed outcrops mainly in the southern part. The rock is greenish-black, fine- to medium-grained, and displays a characteristic gabbroic texture. It is predominantly composed of plagioclase and pyroxene, with minor quartz and fine disseminations of pyrite. Within shear zone, the rock underwent alterations like epidotization and chloritization. Additionally, it is traversed by numerous quartzo-feldspathic veins aligned parallel to the foliation planes, imparting a banded appearance to the rock.

Charnockite

Charnockite occurs widely across the area, predominantly as rounded bouldery outcrops as small linear patches within quartzo-feldspathic and epidotised hornblende gneisses, particularly in the eastern part of the mineralised shear zone. The rounded boulder nature of the charnockite is largely due to the characteristic spheroidal weathering. The rock is hard, compact, massive, medium to coarse grained with greasy quartz, hypersthene, feldspars and occasionally contains garnet. On outcrop scale it looks massive however, on the weathered outcrops this rock shows foliation. At places, it shows effect of migmatization which is manifested by quartzo-feldspathic (leucosome) veins traversing the rock. Further, charnockite hosts enclaves of pyroxene granulite at varying scale.

Pyroxene granulite

Pyroxene granulite occurs as mappable enclaves within epidotised hornblende gneiss and, to a lesser extent, as small enclaves up to one metre in length within charnockite. Disposition of pyroxene granulite appears as alternating layers or bands with epidotised hornblende gneiss, often exhibiting an intertonguing relationship. The rock is generally dense, compact, melanocratic, and medium-grained, displaying a characteristic salt-and-pepper texture. Mineralogically, it is composed of pyroxene, feldspar, hornblende, and, occasionally, garnet. Although garnet is observed in several outcrops, its distribution is inconsistent. Localised segregation of pyroxene is also noted. At many instances, it is traversed by quartzo-feldspathic veins which impart foliated nature to the rock.

Epidotised- hornblende gneiss

Epidotised hornblende gneiss is the predominant lithology exposed in the study area. It is a fine- to coarse-grained, greyish-green rock composed mainly of quartz, feldspar, hornblende, and biotite, with variable amounts of epidote and chlorite. Magnetite occurs as an accessory mineral. The mineralogical composition of the rock varies considerably, ranging from hornblende-rich to quartz-feldspar-rich varieties, and compositionally grades from dioritic to granodioritic. The presence of epidote and chlorite is attributed to alterations such as epidotization and chloritization. Within epidotised hornblende gneiss, enclave of older lithounits are encountered as long linear patches parallel to general trend of the rock. The rock has been affected by two distinct shear events (Sh-1 and Sh-2). The first-generation shear (Sh-1) is marked by the development of a protomylonitic fabric, while the second-generation shear (Sh-2) has induced extensive hydrothermal alteration—such as silicification, epidotisation, chloritisation, carbonatisation, sericitisation, and potash metasomatism accompanied with development of mylonitic to phyllonitic fabric. This shear zone is also associated emplacement of quartz vein at varying scale with molybdenite mineralization.

Quartzo-feldspathic gneiss

Quartzo-feldspathic gneiss occurs as concordant bands within the epidote-hornblende gneiss across the study area and is well exposed on both the western and eastern flanks of the mineralised shear zone. The rock is leucocratic, medium- to coarse-grained, and dominantly composed of quartz and feldspar, with minor streaks of biotite, which is often altered to chlorite. Locally, the rock exhibits a pegmatoidal character, prominently featuring blue quartz as a major constituent. Within the mineralised shear zone, the rock underwent extensive grain refinement which leads to development of phyllonite. Alterations like sericitization, epidotization, chloritization indicative of hydrothermal alteration are common.

Syenite

Syenite is not exposed at the surface but has been identified in the sub-surface, notably in borehole TDMS-16, where it occurs as a 2.43 m thick body. It is pink in colour, coarse-grained,

and primarily composed of K-feldspar with minor biotite. The rock is occasionally traversed by carbonate veins. Additionally, in borehole TDMS-18, syenite appears as thin veins, ranging from 2 to 5 mm in thickness, traversing the epidotised hornblende gneiss along shear planes. The potassic alteration evidenced within the mineralised shear zone (Sh-2) is interpreted to be genetically linked to the emplacement of syenite, indicating its role in hydrothermal alteration processes associated with mineralisation in the study area.

Quartz vein

In Marudipatti South block, at least two generations of quartz vein are evidenced. The first generation is associated with regional shear ie. Sh-1 which is characterized by dominantly blue quartz without any mineralization.

However, the second generation quartz vein is associated with second generation shear hosting molybdenite mineralization in the area. The quartz veins are milky white to grayish / smoky and dirty bluish at places. Within the shear zone, it is crushed, cherty and traversed by closely spaced joints and fractures. Along the shear zone, emplacement of quartz vein is discontinuous in nature. In southern part (from profile P-1 to P-10), quartz vein occurs as small outcrop forms low mound trending in N35E –S35W with moderate dip towards south east direction. It has width upto 12.4m with strike length upto 44m. Besides this fragments of quartz vein are dispersed in the agricultural field and additionally few quartz veins are evidenced in well sections. Occasionally, the quartz veins are associated with ankerite veins in mylonitised gneiss especially on surface.

Prominent exposures of quartz veins within shear zone are exposed as low reef in central part of the study area (from profile P-10 to P-16). The strike of the quartz vein varies from N23E - S23W to N41E-S41W with moderate to sub-vertical dip towards south east direction. It has width upto 24m with strike length of 287m. Towards the northern part (P-16 to P-18), it shows bifurcation and further north of the exposure, quartz veins occur in en-echelon pattern. Further, along the contact with epidotised hornblende gneiss, numerous veinlets of quartz veinlets are traversing along the shear plane.

In the northern part (from profile P-27 to P-31), the quartz vein occurs as discontinuous patches trends in N-S to N23E with moderate dip with width upto 20m and strike length upto 40m.

Surface indications of mineralization in the quartz veins include the presence of vugs and boxwork textures with limonitic staining. Sulphide mineralisation is manifested in the form of pyrite, rare chalcopyrite, galena and fine dust of molybdenite in the quartz veins and occasionally as thin lamellae along hairline fractures. Pyrite, galena with rare chalcopyrite is seen as small chunks and pockets and cubes

7.1.0 OBJECTIVE OF THE PROPOSED EXPLORATION PROGRAMME

1. To establish and assess the molybdenum ore body
2. To estimate the resource of molybdenum and associated mineralization.

8.1.0 PROPOSED SCHEME OF EXPLORATION

8.1.1 Based on exploration history and outcome, Marudipatti South block is proposed for G-2 stage of exploration. The proposed block covers an area of 1.07 sq.km and has strike length of 1.6 km. After completion of this G2 stage exploration, the Marudipatti South block will be added to the amalgamated Marudipatti Block encompassing Marudipatti South, Central and North blocks (North A and North B Blocks) for a cumulative of strike length of 4.2 km of the molybdenum mineralized body.

8.1.2 **Core Drilling:** The investigation is proposed with drilling target of 2200m for eight 2nd level boreholes (155±10m for each) at 100m vertical depth with 100m spacing as infilling between the already drilled boreholes. Further four 3rd level boreholes (210±10m for each) at 150m vertical depth with 400m spacing will also be drilled. Furthermore, if the 3rd level boreholes drilled in the northeastern part of the study area yield encouraging results, an additional 3rd level borehole will be planned in the south at a spacing of 200 m.

8.1.3 **Core Logging:** Geological core logging involves documenting core recovery, lithological variations, structural features, core axis to foliation angles, mesoscale structures (such as folds, faults, and fractures), and shearing features related to mineralisation. Mineralised zones will be based on visual estimation of mineralization. Core samples will also be generated during this process.

8.1.4 **Core sampling procedure and Chemical analysis:** The core sampling interval is generally maintained at 0.5 m. From each drill core, including the mineralized zones will be delineated through visual estimation, will be splitted longitudinally into two equal halves using a mechanical core splitter made of high-quality steel. One half of the split core will be pulverized to -120 mesh, and the powdered material will be reduced to a representative 250 g sample through repeated coning and quartering after thorough homogenization. Around 250 nos. of samples will be drawn from the mineralised part of the core for analysis of Mo, W, Sn, Co, Ni, Pb, Cu, Zn, Ag, Sb and Au. Cu, Pb, Zn, Ni and Co will be analysed by XRF. Mo, W and Sn will be analyzed by ICPMS/ICP-AES whereas Sb will be analysed by VGA (vapour Generation AAS), Au is analysed by GTA(MIBK) and Ag will be analysed by Flame AAS. Additionally, 10% of the duplicate samples will be submitted for check analysis.

8.1.5 **Ore Microscopy**: Ten core samples from the mineralized zones in boreholes will be analyzed to identify ore mineral assemblages at various levels of intersection. These samples will be subjected to mineragraphic studies.

8.1.7 **Determination of Specific gravity:** To calculate the resource, volume of the ore body need to be multiplied with a density factor. Hence, specific gravity will be determined from 10 nos. of core samples selected from the mineralized zones at various intersections.

9.1.0 QUANTUM OF WORK

9.1.1 The following quantum of work has been proposed for G2 level exploration for Molybdenum and associated mineralization in Marudipatti South Block, Harur-Uttangarai Molybdenum Belt:

Sl. No.	ITEMS OF WORK	UNIT	Proposed Quantum for Marudipatti south Block
			G2
1	Drilling (core)	m.	2200 (08 nos. 2nd level intersection and 04 nos. of 3rd level intersection)
2	Borehole Geophysical logging	m	1000
3	Primary Sample (Core) Mo, W and Sn by ICPMS/ICP-AES	Nos.	250
4	Primary Sample (Core) for Cu, Pb, Zn, Ni and Co by XRF method	Nos.	250
5	Primary Sample (Core) for Sb by VGA (vapour Generation AAS),	Nos.	250
6	Primary Sample (Core) for Au by GTA(MIBK)	Nos.	250
7	Primary Sample (Core) for Ag by Flame AAS	Nos.	250
8	Check Sample	Nos.	25
9	Determination of specific gravity	Nos.	10
10	Petrography samples (PS)	Nos.	10
11	Ore Microscopy (OM)	Nos.	10
12	SEM	Nos.	05
13	EPMA	Nos.	05
14	Ore beneficiation	Nos	1
15	**Exploration Report [As per Mineral (Evidence of Mineral Contents) Rule-2015] /UNFC**	Nos.	1
Ore beneficiation has already been carried out in a part of the amalgamated block, specifically within the Marudipatti North Block of the HUMB area			

10.1.0 TIME SCHEDULE AND COST ESTIMATES

10.1.1 The proposed exploration programme is planned in such a way that all the activities like, camp setting, drilling, logging, core sampling and associated geological work and laboratory work will be completed within 10months' time. Report writing will take 4 months' time with 2 month overlapping with laboratory analysis. Thus, the total duration of the project for completion of the above exploration will be 12 months from the date of commencement of the project. Review will be done after 6 months.

SCHEDULED TIME FOR G-2 LEVEL EXPLORATION FOR MOLYBDENUM AND ASSOCIATED MINERALIZATION IN MARUDIPATTI SOUTH BLOCK, HARUR-UTTANGARAI MOLYBDENUM BELT

S.No.	Activities	MONTHS											
		1	2	3	4	5	6	7	8	9	10	11	12
1	Camp setting	■					Review						
2	Core drilling (2 rig)		■	■	■	■		■					
3	Laboratory studies							■	■	■	■		
4	Geologist days (Field)	■	■	■	■	■		■					
5	Core sampling		■	■	■	■		■	■				
6	Camp winding								■	■			
7	Geologist days (HQ)									■	■	■	■
8	Report writing/ Peer 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.**

10.1.2 Cost has been estimated based on actual schedule of rates mandated in the based on Standard Operating Procedure (SOP) for financing Critical Mineral Exploration Projects from NMEDT. The total estimated cost is Rs. 266.38 Lakhs. The summary of cost estimates for this G2 level exploration is given below:

Summary of Cost Estimates

Sl. No.	Item	Total Estimated Cost (Rs.)	Funding
1	Geologist man days Core logging, sampling	0	By GSI
2	Drilling and Related works	**22000000**	**NMEDT**
3	Laboratory studies	0	By GSI
4	Geologist at HQ	0	By GSI
5	Survey work	**5,74,860**	**NMEDT**
6	Exploration Report Preparation	0	By GSI
7	Proposal Preparation	0	By GSI
8	Peer review charges	0	By GSI
9	3d Ore Modeling	0	By GSI
10	Ore Beneficiation	0	By GSI
11	Sub Total (1 to 11)	**22574860**	
10	GST 18%	**4063474.80**	
	Total:	**26638334.80**	
	Say Rs. In Lakh	**266.38**	

Enclosures:

- ***Figure-1*** Location Map of the Proposed Marudipatti South block
- ***Figure-2*** Location of Harur-Uthangarai Molybdenum Belt (HUMB) with proposed block in the regional geological map (1:50000 scale map).
- ***Figure-3*** Map of Harur-Uthangarai Molybdenum Belt with cluster blocks and proposed Marudipatti South Block.
- ***Figure-4*** Detailed Geological Map of Marudipatti South Block with tentative borehole locations
- ***Figure-5*** Map showing Mineralised shear zone with locations of trenches, channel and borehole locations in Marudipatti South Block.
- ***Figure-6*** Geological cross section of Mineralised Shear Zone with molybdenum lodes (100ppm cutoff grade) and their dip influence area for I and II level boreholes in Marudipatti South Block, HUMB, Dharmapuri District, Tamil Nadu
- ***Figure-7*** Longitudinal vertical section of Mineralised Shear Zone with Molybdenum ore bodies (100ppm cutoff grade) and their dip influence area for I and II level boreholes in Marudipatti South Block, HUMB, Dharmapuri District, Tamil Nadu
- Cost Sheet

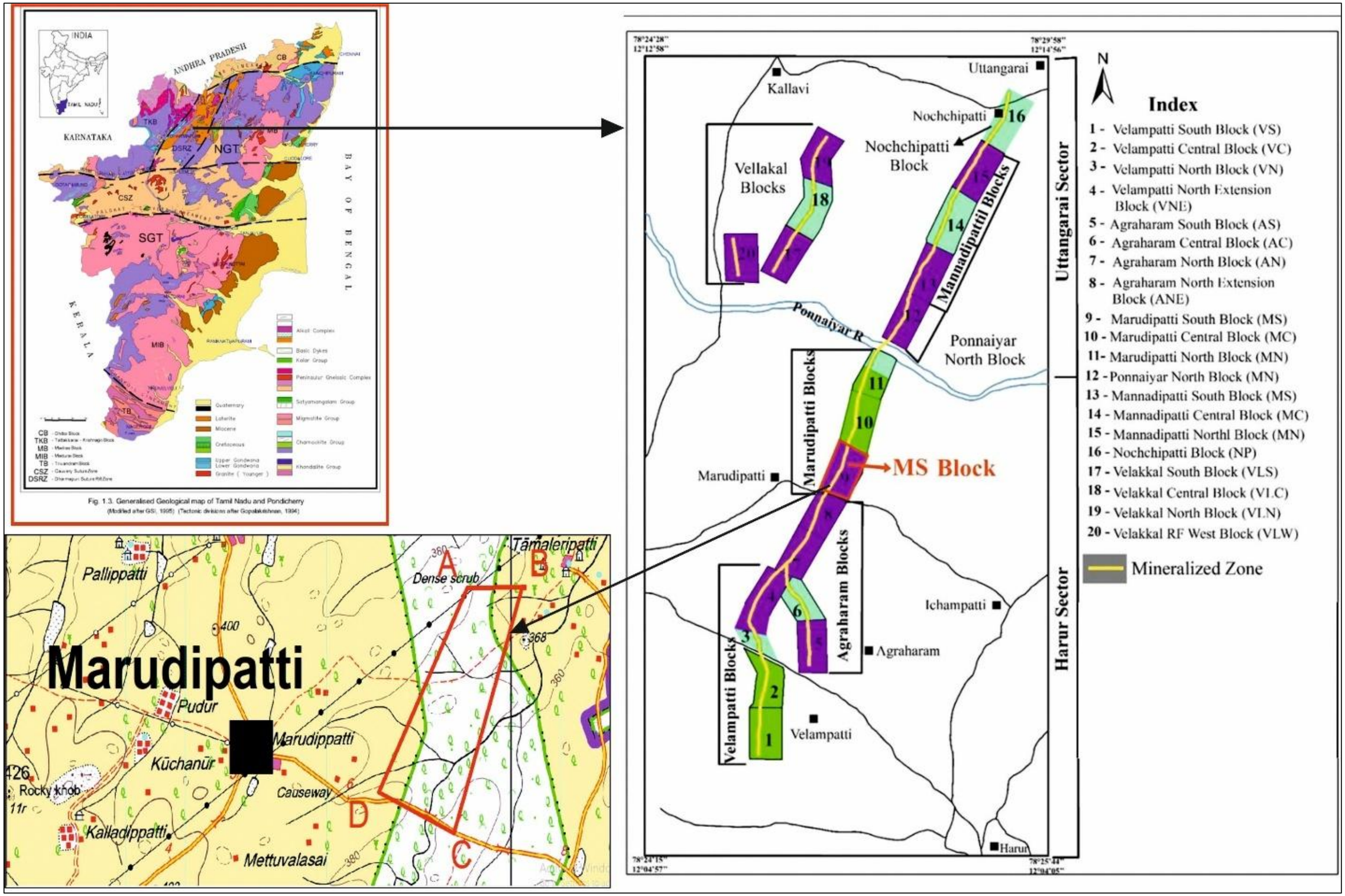


Figure 1 Location map of proposed Marudipatti south block

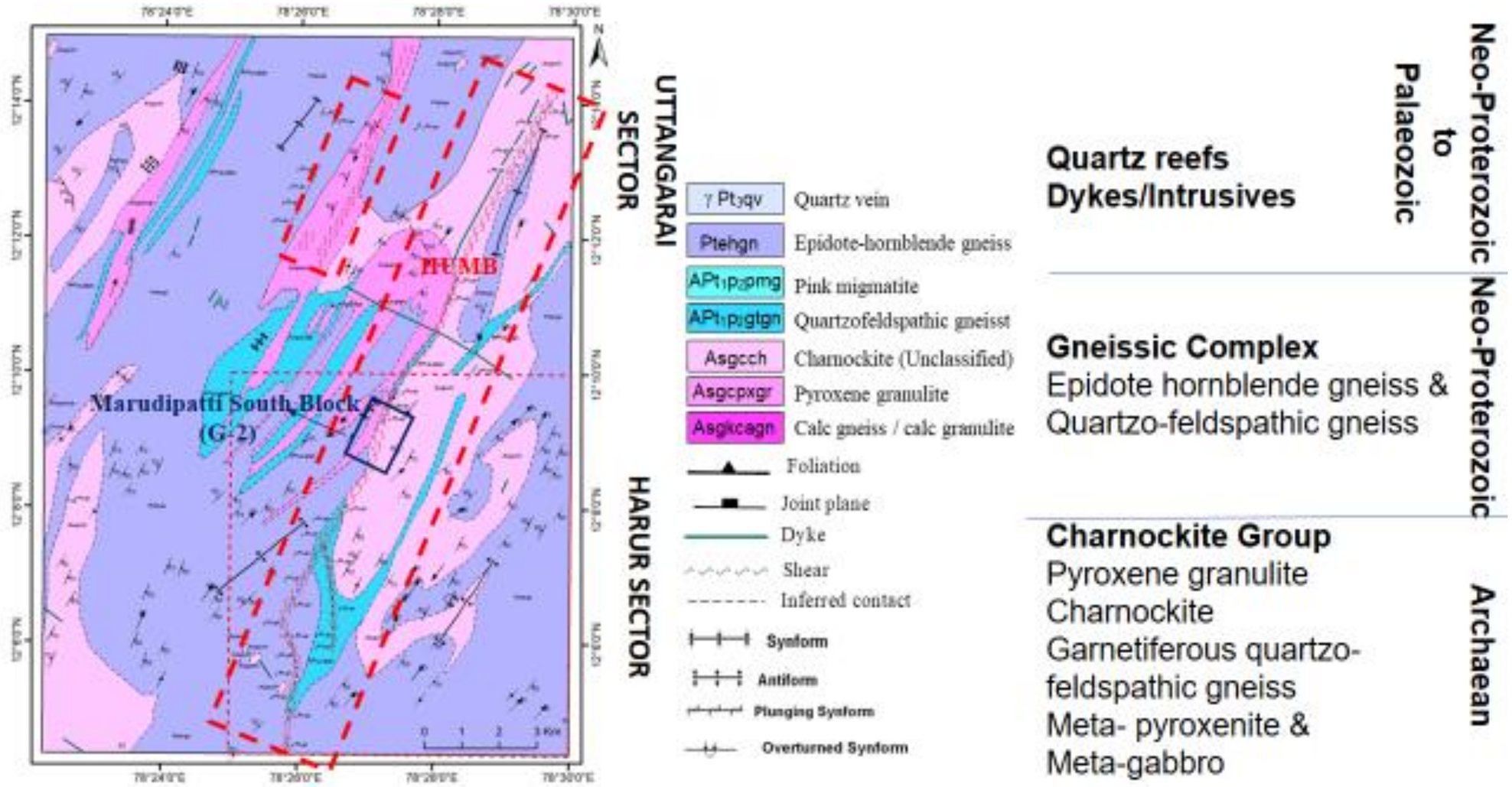
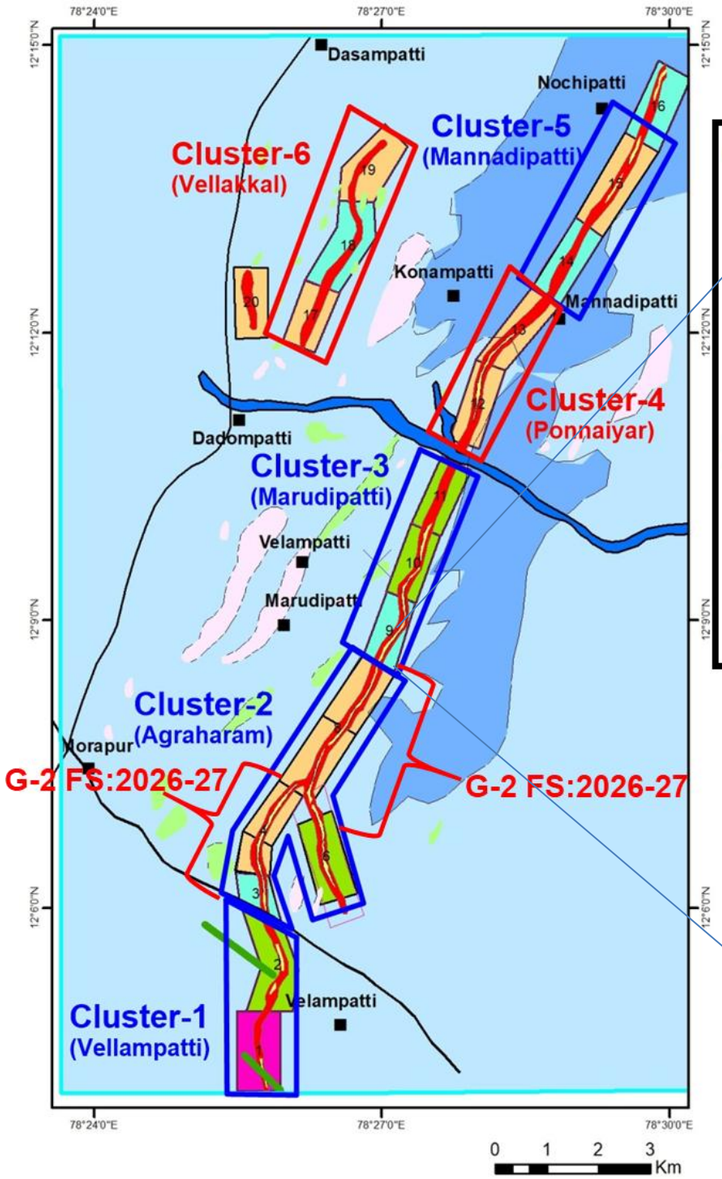


Figure 2 Location of Harur-Uthangarai Molybdenum Belt (HUMB) with proposed block in the regional geological map (1:50000 scale map)



GSI Clusters
Cluster-1 (Vellampatti)
Cluster-2 (Agraharam)
Cluster-3 (Marudipatti)
Cluster-5
(Mannadipatti)

MECL Clusters
Cluster-4 (Ponnaiyar)
Cluster-6 (Vellakkal)

Figure 3 Map of Harur-Uthangarai Molybdenum Belt with cluster blocks and proposed Marudipatti South Block

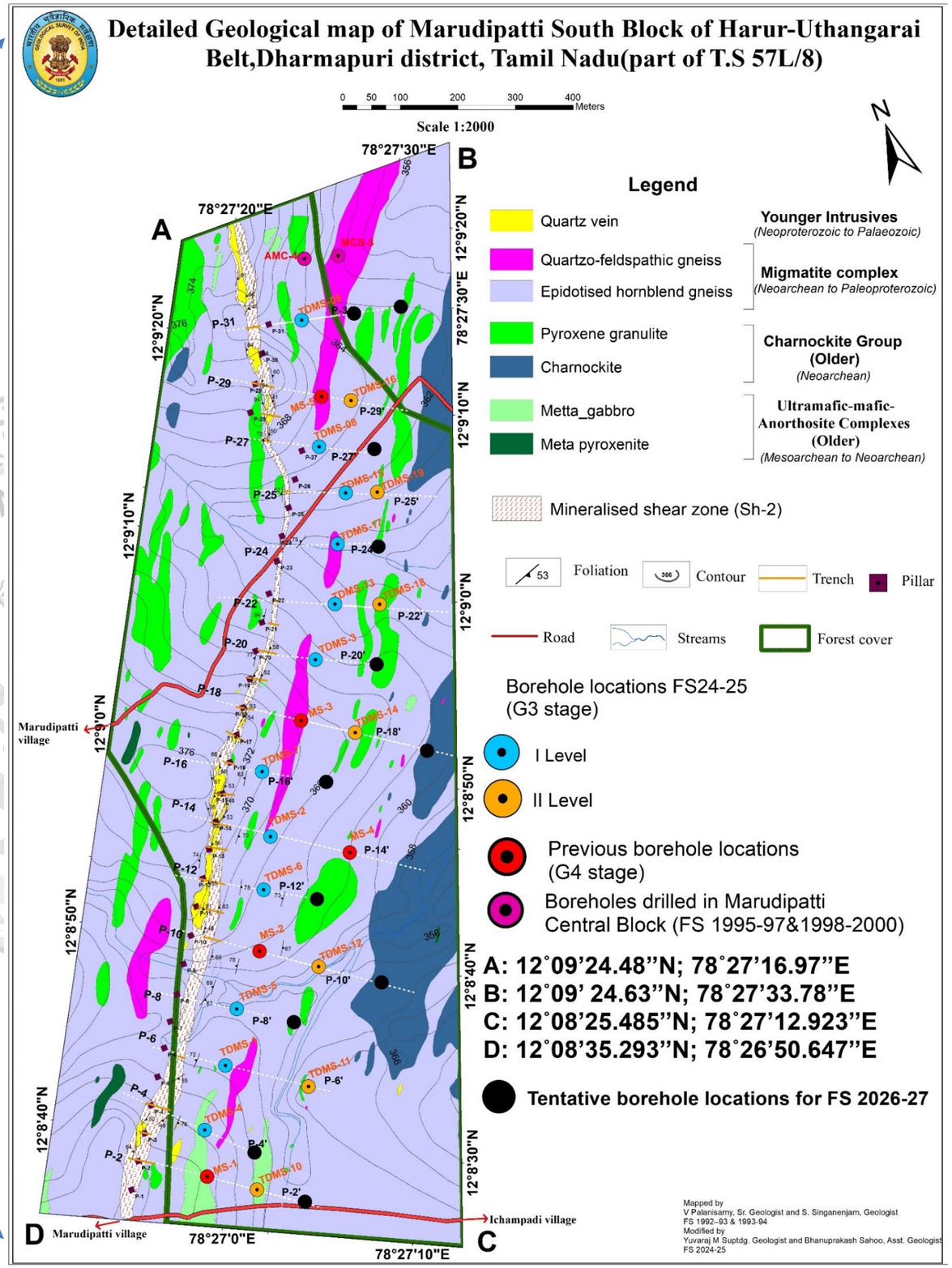


Figure 4 Detailed Geological Map of Marudipatti South Block with tentative borehole locations

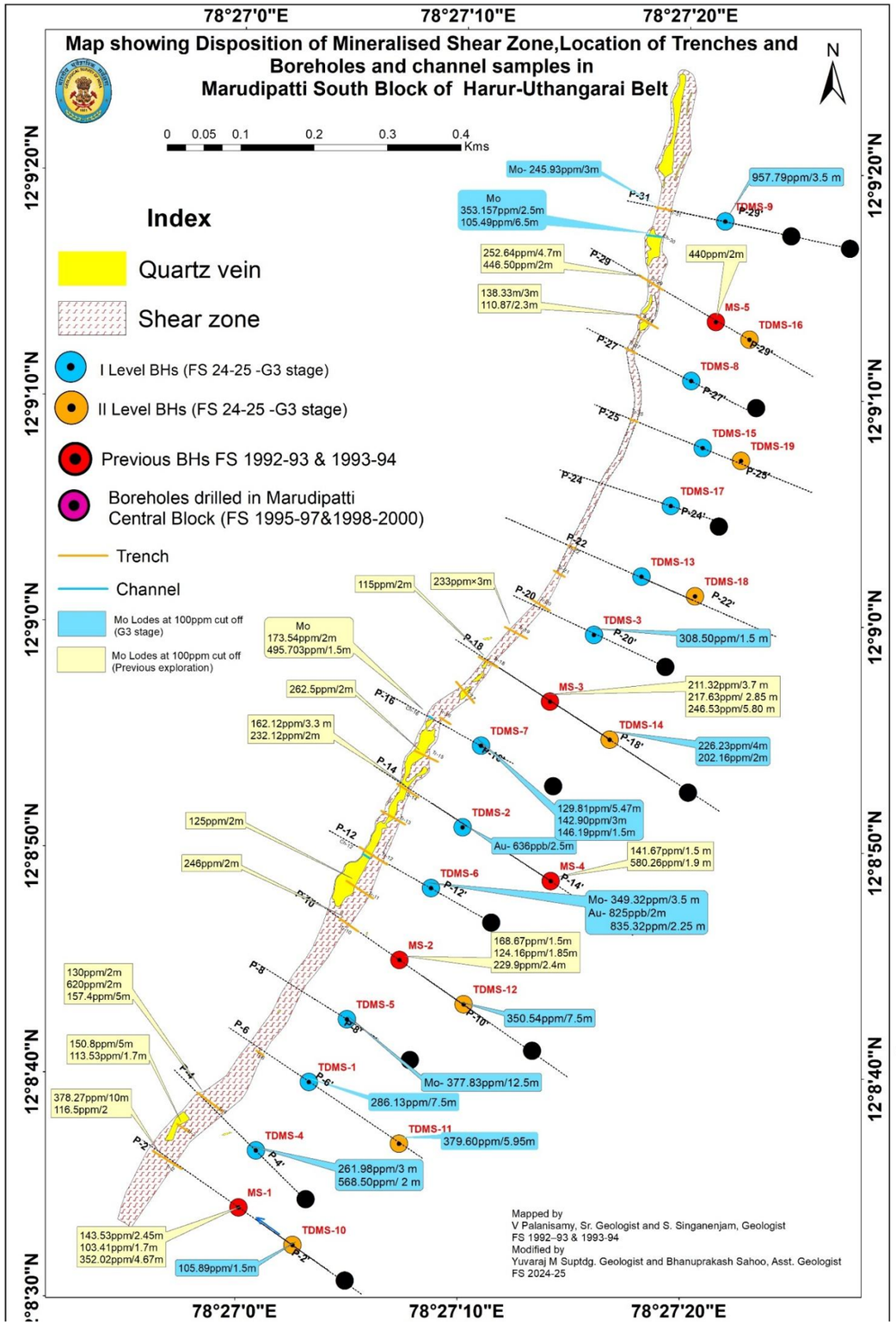
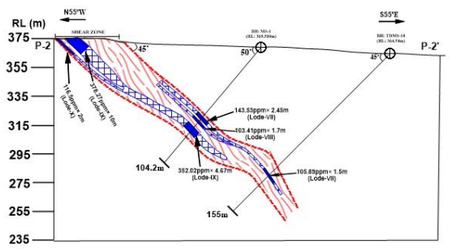


Figure 5 Map showing Mineralised shear zone with locations of trenches, channel and borehole locations in Marudipatti South Block

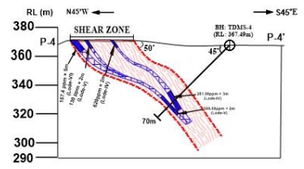
Geological cross-sections of mineralised shear zone with molybdenum lodes (100ppm cutt-off grade) and their dip influence area for I &II level boreholes in Marudipatti South Block, Harur Uthangarai Molybdenum Belt, Dharmapuri District, Tamil Nadu.

SCALE 40 m 0 40 m

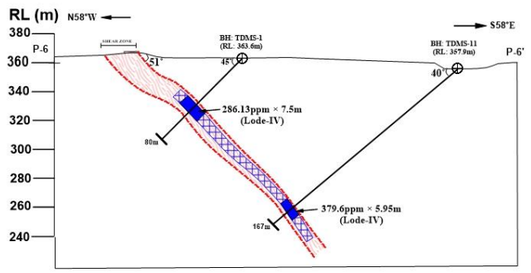
BHs: MS-1 & TDMS-10 on profile:P2-P2'



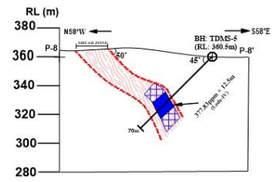
BHs: TDMS-4 on profile:P4-P4'



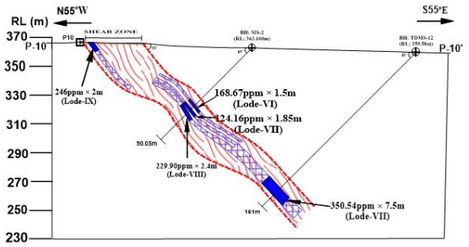
BHs: TDMS-1 & TDMS-11 on profile:P6-P6'



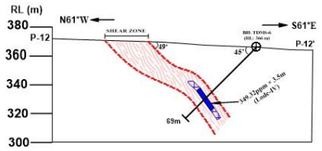
BHs: TDMS-5 on profile:P8-P8'



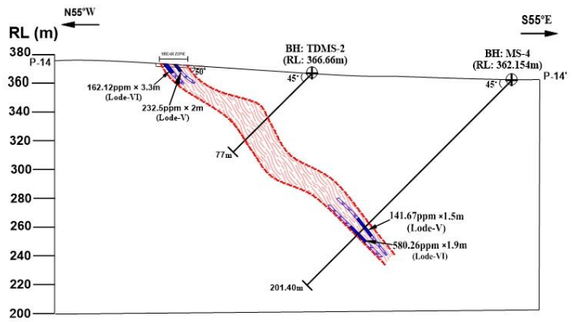
BHs: MS-2 & TDMS-12 on profile:P10-P10'



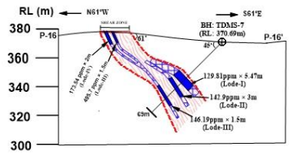
BHs:TDMS-6 on profile:P12-P12'



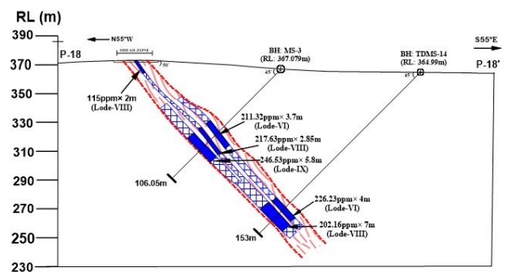
BHs: TDMS-2 & MS-4 on profile:P14-P14'



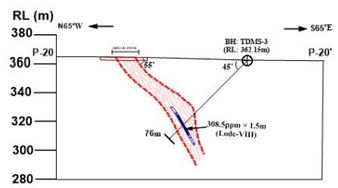
BHs: TDMS-7 on profile:P16-P16'



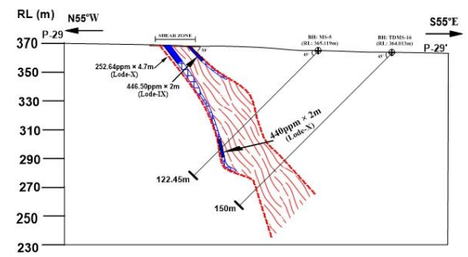
BHs: MS-3 & TDMS-14 on profile:P18-P18'



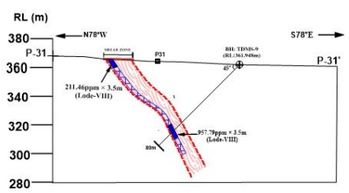
BHs: TDMS-3 on profile:P20-P20'



BHs:MS-5 & TDMS-16 0N Profile:P29-P29'



BH: TDMS-9 on profile:P31-P31'



Index

- Mineralise shear zone
- Intersected Molybdenum lode
- Interpreted Molybdenum ore lode
- Inclind I & II level borehole

BH:TDMS-01 to TDMS-19 drilled in FS 2024-25
BH: MS-01 to MS-05 drilled in FS 1992-93 &1993-94

Prepared by
Yuvaraj M. Supt. Geologist
Bhanuprakash Sahoo, Asst. Geologist
SU:TN&P,GSI

Figure 6 Geological cross section of Mineralised Shear Zone with molybdenum lodes (100ppm cutoff grade) and their dip influence area for I and II level boreholes in Marudipatti South Block, HUMB, Dharmapuri District, Tamil Nadu

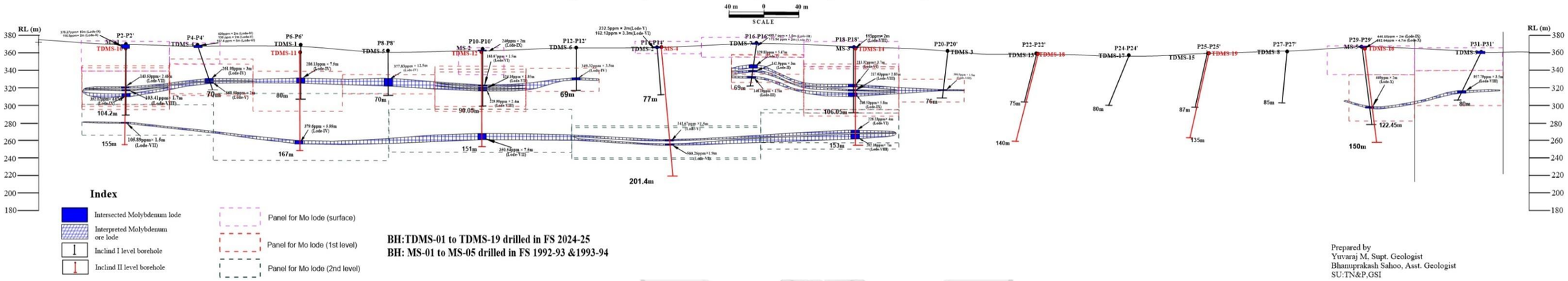


Figure 7 Longitudinal vertical section of Mineralised Shear Zone with Molybdenum ore bodies (100ppm cutoff grade) and their dip influence area for I and II level boreholes in Marudipatti South Block, HUMB, Dharmapuri District, Tamil Nadu

ESTIMATED COST FOR G-2 LEVEL EXPLORATION FOR MOLYBDENUM AND ASSOCIATED MINERALIZATION IN MARUDIPATTI SOUTH BLOCK, HARUR-UTTANGARAI MOLYBDENUM BELT, DHARMAPURI DISTRICT, TAMILNADU
Drilling- 2200 m, Work plan- 8 nos. of 2nd level and 04 nos. of 3rd level boreholes,
Completion Time – 12 Months, Review: after 6 months

Nature and Quantum of work in the project	
(a) Drilling (m)	2200 m
(b) GPBH logging	1000 m
(c) CS (core sample)	250 nos.
(d) PS (Petrography studies)	10 nos.
(e) OM (Ore microscopy)	10 nos.
(f) SEM	05 nos.
(g) EPMA	05 nos.
(h) Chemical Analysis	250 nos.
(i) Determination of specific gravity	10 Nos.
(j) Beneficiation	1 Nos

Sl. No.	Item of Work	Unit	Rates as per NMET SoC 2020-21		Total Cost of the Project		Remarks
			SoC-Item-S. No.	Rates as per SoC	Qty.	Total Amount (Rs)	
A	**GEOLOGICAL WORK**						
a	Charges for two Geologist per day at HQ	day	as per Govt rates	-	80	0	No claims for Head quarter-based officers
b	Charges for two Geologist per day at field (including 1 Supervisory officer for 10 days)	day	as per Govt rates	0	250	0	Field expenses incurred by Geologists (Hired Vehicle, accommodation and living expenses as per entitlement, rental and other charges related to maintenance of camps. Electricity charges, Water, internet charges, Fuel, consumables and other incidental expenses necessary for staying and working in the field) **Funding by GSI**
c	Labor for Geologist (02 nos.)	day	as per Govt rates	0	500	0	Labor charges as per the Central Labor Commission rates published annually or the respective State Govt., whichever is higher. Here rate is taken as Rs.614 for 4 labourers **Funding by GSI**
d	Sample processing work including marking of samples, core splitting, crushing and powdering of samples, coning and quartering, packing and labelling of samples, preparation of beneficiation samples etc	day	12.1b	0	240	0	Amount will be reimburse as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher **Funding by GSI**
e	Charges for engaging skilled, semi-skilled and unskilled workers for attending work associated with the mineral exploration project in the field camp	Day	5.8	0	300	0	labor charges as per the Central Labor Commission rates published annually or the respective State Govt., whichever is higher. Here rate is taken as Rs.954 for 1 skilled worker for preparation of bills and record keeping in the camp/ field area. **Funding by GSI**

f	Watch and ward charges for the permanent camp	day	As per Govt. rates	0	300	0	In the case of in-house operations and Government camp. Watch and ward are employed in 3 shifts/ day **Funding by GSI**
Sub-Total A						**0**	**Funding by GSI**
B	**DRILLING**						
a	Drilling in/Drilling in Hard rock/ Strata: HQ size borehole up to 400 m Depth and NQ Size beyond 400 m depth in case of NQ size drilling is done before 400 m depth, the rate shall decrease by 20%	m	2.2.1.1.d	10,000	2200	2,20,00,000	Generally, out-sourced services will be used. In such case, actual charges for outsourced drilling will be paid. In case of in-house drilling expenses on account of expenses relating to field staff (Same as A.b) along with fuel and other costs related to operation of drilling rigs will be incurred **Funding by NMEDT**
b	Borehole Deviation Survey by Multishift survey tool (interval 6 m; azimuth and inclination to be recorded)	per shot	2.2.5	-	367	NIL	
c	Land/ Crop Compensation (in case the BH falls in agricultural Land)	per BH	5.6	-	2	NIL	
d	Construction of concrete Pillar (12"x12"x30")	per bore hole	2.2.7.a	-	12	NIL	
e	Borehole plugging with cement	per bore hole	2.2.8	0	12	NIL	
f	Miscellaneous Charges (Transportation of Drilling Rig, accommodation for Drilling Camp, Camp setting and winding, construction of approach road and Drill core preservation)	Lumpsum	2.2.9.4	For Drilling cost >2 Cr: 10% of the Drilling Cost with a maximum ceiling of Rs. 25 Lkh		NIL	
g	Drill Core Preservation- One complete BH plus mineralized cores of all the BHs of the block/ prospect to be preserved in GI Core boxes and subsequently transported to the notified core repository.	per m	X	0	390	NIL	
h	GSI Drilling camp inspection	day	as per govt rates	0	5	0	in case of outsourcing by GSI, Executive engineer will visit the field camp. **Funding by GSI**
i	Borehole Geophysical Logging	m	3.1.2	0	1000	0	As per the clarification sought from NMEDT, it is informed that per m rate is Rs. 622.25/m **Funding by GSI.**
Sub-Total B						**2,20,00,000**	**Funding by GSI.**
C	**SURVEY WORK**						

a	Demarcation of lease boundary, Fixation of boreholes and determination of coordinates and reduced level (RL) of the boreholes by DGPS (including charges of labourers deployed for the work)- use of CORS Network system for all DGPS is compulsory	Per Point of observation	1.3.2	24,000	16	3,84,000	12 boreholes and 4 boundary points * In case of in-house drilling will include the rate of surveyor, 3 labourers, instrument maintenance and ACMS, consumables and software and computer charges, per day transportation **Funding by NMEDT.**
b	Charges of one qualified surveyor with Total station for carrying out topographical survey in different RF and surface contouring at different interval, fixation of borehole and determination of co-ordinates and reduced Level (RL) of the boreholes with total station etc. a) Charges of one surveyor per day (without labour) (Up to 4 labourers will be allowed per surveyor)	one surveyor per day	1.3.1	10,500	15	1,57,500	* In case of in-house drilling will include the rate of surveyor, 4 labourers, instrument maintenance and ACMS, consumables and software and computer charges charges, per day transportation **Funding by NMEDT.**
c	Labours Charges for survey work;	day		556	60	33,360	Amount will be reimbursed as per the notified rates for unskilled labor by the Central Labour Commissioner or respective State Govt. whichever is- 4 Labours for surveyor **Funding by NMEDT.**
Sub-Total C						**5,74,860**	**Funding by NMEDT.**
D	**LABORATORY STUDIES**						
1	**Chemical analysis**						
i)	**Primary samples (Borehole samples)**						
	a. For Mo, W and Sn by ICPMS/ICP-AES	Nos.	4.1.15	7400	250	0	As per actuals in case of out-sourced sample analysis. *For in-house analysis, expenditure on account of chemicals, consumables, CAMC or equipment, Labour charges, report preparation & printing charges and other incidental expenses necessary for running the laboratories will be incurred against these items. **Separate proposal for utilizing SOC charges for meeting laboratory expenses is being prepared. In case the same is approved then amount will be claimed as per SOC charges of GSI subject to NMEDT SOC as the ceiling.
	b. For Cu, Pb, Zn, Ni and Co by XRF method	Nos.	4.1.15	4200	250	0	
	c. For Sb by VGA (vapour Generation AAS),	Nos.		4200	250	0	
	d. For Au by GTA(MIBK)	Nos.	4.1.7b	4400	250	0	
	e. For Ag by Flame AAS	Nos.		4200	250	0	
ii)	**External Check samples (10%)**	Nos.			25		
iii)	**Petrographic & mineragraphic samples (Surface + Bh Core samples)**						
a	Preparation of thin section	Nos.	4.3.1	500	10	0	
b	Complete petrographic study report	Nos.	4.3.4	2800	10	0	
c	Preparation of polished section	Nos.	4.3.3	700	10	0	
d	Complete mineragraphic study report	Nos.	4.3.4	4232	10	0	
vi)	**Lab studies**						
a	EPMA** per hour	Nos.	4.4.1	10500	5	0	
b	SEM** per hour	Nos.	4.4.1	10500	5	0	
vii)	Specific gravity determination	Nos.	4.8.1	2500	10	0	
Sub-Total D						**0**	
Total (A-D)							
** 2 Man days							

E	**Geological Report Preparation**	5 Hard copies with a soft copy	5.2	For the projects exceeding Rs.300 Lakhs: A Minimum of Rs. 9 lakhs or 3% of the work whichever is more		**0**	Direct and indirect costs related to preparation of project proposal and project report shall also include office and outsourced man-power costs associated with dedicated sections / cells directly involved in implementation of NMET-DT funded projects.
G	**Preparation of Exploration Proposal (5 Hard copies with a soft copy)**		5.1/28th EC	2% of the cost or Rs. 5.0 lakh - whichever is lower		**0**	
H	**Peer review Charges**		As per EC decision			**0**	*Applicable if outsourced for peer review
I	**3D Ore Body modeling using compatible software**		day	5,300	15	**0**	Cost of man days for the utilization of software and laboratory
	Beneficiation Study for G2 stage mineral exploration project (Complete laboratory scale ore dressing investigation involving studies for recovery of mineral by various physical beneficiation methods)	4.7.2	Per sample		1	**0**	
J	**Total Estimated Cost without GST**					**2,25,74,860**	
K	**Provision for GST (18% of H)**					**40,63,4748.0**	
L	**Total Estimated Cost with GST**					**2,66,38,3348.0**	GST as applicable
	Say Rs. in Lakhs					**26638**	

Note -

1. 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 EA on its own, a Certificate regarding non outsourcing of any component/project is required.