

**PROPOSAL FOR (G3) PRELIMINARY EXPLORATION FOR TUNGSTEN AND
ASSOCIATED MINERALIZATION IN GHATTIHOSAHALLI AREA,
CHITRADURGA DISTRICT, KARNATAKA**

COMMODITY: TUNGSTEN AND ASSOCIATED MINERALS



**BY
GEOLOGICAL SURVEY OF INDIA
STATE UNIT: KARNATAKA & GOA
BANGALORE (KARNATKA)**

**PLACE: BANGALORE
DATE: 17/04/2026**

**SUMMARY OF THE BLOCK FOR G3 LEVEL EXPLORATION
GENERAL INFORMATION ABOUT THE BLOCK**

Features	Details				
Block ID	GHATTIHOSAHALLI				
Exploration Agency	GSI, SU: Karnataka & Goa, BANGALORE				
Commodity	Tungsten and associated minerals				
Mineral Belt	Ghattihosahalli Schist Belt				
Completion period with entire Time schedule to complete the project	12 months				
Objectives	To establish the subsurface continuity and estimate the resources of tungsten 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, SU: Karnataka & Goa, BANGALORE).				
Name/Number of Geoscientists	2 (Two)				
Expected Field days	Field days: 250 days at field and 80 days at HQ				
1. Location					
Block boundary corner points	Cardinal Points	Easting(m)	Northing(m)	Longitude	Latitude
	A	636823.448 m	1548602.050 m	76°16' 0.932"E	14°00'16.589"N
	B	637235.608 m	1548938.891 m	76°16'14.729"E	14°00'27.479" N
	C	639710.739 m	1546359.962 m	76°17'36.752"E	13°59'3.117"N
	D	639278.968 m	1545974.578 m	76°17' 22.294" E	13°58'50.652" N
Villages	Ghattihosahalli, Kumminagatta				
Tehsil/Taluk	Holalkere				
District	Chitradurga				
State	Karnataka				
2. Area					
Block Area	2 sq. km				
Forest Area	No forest				
Government Land Area	Data not available				
Charagaha	Data not available				

	Private Land Area	Data not available
3.	Accessibility	
	Nearest Rail Head	Chitradurga Railway Station
	Road	The area can be accessed via State Highway 369 from Chitradurga to Bhadravathi road.
	Airport	Bangalore
4.	Hydrography	
	Local Surface Drainage Pattern (Channels)	The drainage of the area is controlled by some minor streams and streamlets originating from high-standing NNW-SSE trending series of hill ranges of comprised PGC-I, and Sargur Group of rocks. The area is characterized by dendritic to sub-dendritic drainage patterns in the proposed area.
5.	Climate	
	Mean Annual Rainfall	The annual average rainfall recorded is about 573 to 574 mm
	Temperatures (December) (Minimum) Temperatures (June) (Maximum)	Minimum temperatures 15.5° C Maximum temperatures up to 36° C
6.	Topography	
	Toposheet Number	57B/08 & 57C/05
	Morphology of the Area	The proposed area has an undulating topography with ridges and isolated hills in the western, eastern, and central parts with intervening plain areas. The highest elevation is 900 m above Mean Sea Level (MSL) in the central part and the lowest elevation is about 845 m above mean sea level in the eastern part of the proposed area.
7.	Availability of baseline geosciences data	
	Geological Map (1:50K/25K)	Geological map on 1:12500 scale (Source: GSI)
	Geochemical Map	NGCM Map (Source: GSI)
	Geophysical Map (Aeromagnetic, ground geophysical, Regional as well as local scale GP maps)	Gravity and Magnetic Map (Source: GSI)

<p>8. Justification for taking up G3 level Exploration</p>	<ol style="list-style-type: none"> 1. During FS 2022-23, Jitendra Kumar and Ravi Tripathi conducted large-scale mapping in the Ghattihosahalli area to evaluate Molybdenum (Mo) and associated mineralization (Fig: 2). The surface samples show anomalous W, Ni, Ba, Cu, Mo values. They identified three mineralized zones over a 100 sq. km area, with significant Cu-Mo occurrences, including Cu up to 0.45% and Mo up to 0.27%, tungsten values upto 1559 ppm (spot value) from amphibolite and Ni up to 1400 ppm from mafic-ultramafic rocks in the GH Halli schist belt, along with BaO up to 18.17 wt.% from Barite bodies within quartzite. 2. During the FS 2024-25, a G-4 Stage mineral investigation titled “Reconnaissance Survey for Li-Cs-Nb-Ta-W Mineralization in the Chikjajur-Janakal Area, Holalkere-Hosadurga Taluks, Chitradurga District, Karnataka” was carried out by Runjun Borah and Ravi Tripathi. This G4 also included additional sampling for Li-Cs-Nb-Ta-W in the adjacent area where LSM for Cu-Mo was carried out during FS 2022-23. An extensive night survey was conducted to identify tungsten (W)-bearing mineralization, specifically scheelite, leading to the delineation of a 2.5 km long zone of scheelite mineralization within the Ghattihosahalli schist belt. The scheelite grains, ranging from fine, disseminated particles to up to 2 cm in size, angular to sub-angular, exhibited a whitish-blue-yellow colour under short-wave UV radiation. The thickness of the mineralized zone varies from approximately 30 cm to 2.5 m and occurs as pocketed, discontinuous and lensoidal zones within pistachio green, fine- to medium-grained altered ultramafic and amphibolite rocks, mostly at the western contact of the quartzite ridge in the Ghattihosahalli schist belt. 3. The analytical results of BRS and channel samples collected from the mineralised zone are promising, showing W values upto 0.91 wt.% (9100 ppm). The bed rock samples collected proposed area indicate anomalous tungsten values ranging from 500-9100 ppm, channel samples collected from the mineralized zone indicate anomalous assay value of tungsten upto i.e. 0.28 wt%, and in trench samples anomalous tungsten value of 0.1 wt. % x 5m noticed. 4. SEM study have indicated the presence of scheelite grains in association with fluorite, fluorapatite, titanite, and calcite. The mineralogical and textural evidence supports a hydrothermal-metasomatic origin for scheelite mineralization, with fluorine playing a key role in tungsten transport and deposition. Hyalophene a barium rich feldspar mineral is present in the mineralized rock which indicates low-temperature hydrothermal or metamorphic processes. 5. Based on these findings, a G3 stage of investigation has been proposed to assess the subsurface continuity and estimate the resources of tungsten and associated mineralization near Ghattihosahalli village. The proposed work includes detailed geological mapping of a 2 sq. km area at a 1:1000 scale, systematic sampling with the collection of bedrock samples, pitting and trenching and 1000 meters of drilling to delineate the tungsten and associated mineralized zones.
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1.1.0 INTRODUCTION

1.1.1 Tungsten is an important strategic metal having high demand in emerging technologies. Tungsten is the most important metal for thermoemission applications not only because of its high electron emissivity but also because of its high thermal and chemical stability. Scheelite (CaWO_4) and wolframite $(\text{Fe,Mn})\text{WO}_4$ are the major tungsten-bearing minerals formed by magmatic-hydrothermal processes associated with granitic intrusions and related pegmatites.

1.1.2 In India most of the tungsten deposits are associated with Mid-Proterozoic to Late Proterozoic (900-700 Ma) felsic magmatism representing major orogenic cycles and emergence of stable cratons of Indian sub-continent. This special publication articulates, in brief, the results of studies carried out in the field of tungsten exploration in India, by the Geological Survey of India as well as other publications.

1.1.3 In India the Resources of tungsten bearing minerals are mainly distributed in Karnataka (42%), Rajasthan (27%), Andhra Pradesh (17%) and Maharashtra (9%). The remaining 5% resources are in Haryana, Tamil Nadu, Uttarakhand and West Bengal (Indian Minerals, Yearbook 2018, Indian Bureau of mines).

2.1.0 BACKGROUND INFORMATION

2.1.1 The Dharwar Craton, one of the oldest crustal blocks in the Indian Shield, records a long history of crustal evolution from the Archaean to the Proterozoic, shaped by complex tectonic, magmatic, and metamorphic processes. The proposed block is located (Fig: 1) within the WDC and comprises lithologies of the Peninsular Gneissic Complex (PGC) and the Ghattihosahalli Schist Belt (Sargur Group), representing ancient crustal remnants (>3.0 Ga). These rocks are unconformably overlain by the Dharwar Supergroup and intruded by younger granites equivalent to the Chitradurga Granite (Jayananda et al., 2013). The Chitradurga Schist Belt (CSB), a major N-S to NNW-SSE trending greenstone belt, lies to the east of the proposed block and marks an important tectonic boundary in the WDC.

2.1.2 A prominent geological unit within the proposed block is the Ghattihosahalli Schist Belt. It is considered part of the Sargur mafic-ultramafic complex (Swaminath et al., 1981) and extends discontinuously for about 50 km from Mayakonda to Janakal. The belt exhibits a well-defined basement-cover relationship, where PGC gneisses form the basement, overlain by the Dharwar Supergroup, marked by a basal quartz-pebble conglomerate at Nerlakatte. Lithologically, the GH Halli Belt includes meta-ultramafics, amphibolites, metapelites,

orthoquartzites, and aluminous quartzites, occasionally containing baryte (Radhakrishna & Srinivasaiah, 1974). Structurally, the belt forms a north-plunging antiform and has undergone intense ductile deformation associated with the Chitradurga Western Margin Shear Zone (CWMSZ), a late-stage NNW-SSE trending sinistral shear system. The TTG-type gneisses surrounding the belt, although older than 3.0 Ga, show structural continuity with the Dharwar Supergroup, highlighting the prolonged and polyphase tectonothermal history of the region (Sengupta et al., 2020).

2.1.3 This G3 Stage Project is proposed based on the significance findings of scheelite mineralization of the G4 Stage Project Li-Cs-Nb-Ta-W-Ni mineralization in Chikjajur Janakal area, Chitradurga district, FS 2024-25, where additional sampling was carried out near Ghattihosahalli area within LSM area of FS 2022-23. As per the available literature, GSI has carried out mapping and mineral investigation projects in this area between FS 1971-72 and FS 1998-99 with different objectives. Most of the previous work were aimed for the regional assessment of the iron, Mn ore deposits and polymetallic mineralisation in Chitradurga Schist belt and for the investigation for ornamental granite in parts of Hosadurga taluk, Chitradurga district.

2.1.4 Works from Department of Mines and Geology, Government of Karnataka is also there mainly focusing on fuchsite quartzite, barite etc. Bedded barytes intercalated with fuchsite quartzite was discovered in the GH-belt in the year 1974 (Radhakrishna and Srinivasaiah, 1974). Subsequently the GH Halli schist belt was investigated for Barytes as a part of an exploration programme of the Dept. of Mines and Geology, Karnataka (Annaiya and Srinivasaiah, 1976). Srinivasaiah et al., 2015 has reported presence of scheelite within the amphibolite of Ghattihosahalli schist belt near Ghattihosahalli area. They have reported a discontinuous zone of scheelite bearing amphibolite for more than 100 m having values of tungsten up to 396 ppm from the randomly collected samples. The regional geochemical exploration carried out by Paranthaman and Vidyadharan in 1991-92 has revealed anomalous values of Ni up to 8100 ppm; Co value up to 85 ppm, Cr value up to 9900 ppm over ultramafics of GH Halli schist belt.

2.1.5 During FS 2022-23, Jitendra Kumar and Ravi Tripathi conducted large-scale mapping in the Ghattihosahalli area to evaluate Molybdenum (Mo) and associated mineralization (Fig: 2). The sample shows significant W, Ni, Ba, Cu, Mo values. The surface samples show anomalous W, Ni, Ba, Cu, Mo values. They identified three mineralized zones over a 100 sq. km area, with significant Cu-Mo occurrences, including Cu up to 0.45% and Mo up to 0.27%, tungsten values upto 1559 ppm (spot value) from amphibolite and Ni up to 1400 ppm from mafic-

ultramafic rocks in the GH Halli schist belt, along with BaO up to 18.17 wt.% from Barite bodies within quartzite.

2.1.6 During the FS 2024-25, a G-4 Stage mineral investigation titled “Reconnaissance Survey for Li-Cs-Nb-Ta-W Mineralization in the Chikjajur-Janakal Area, Holalkere-Hosadurga Taluks, Chitradurga District, Karnataka” was carried out by Runjun Borah and Ravi Tripathi. This G4 also included additional sampling for Li-Cs-Nb-Ta-W in the adjacent area where LSM for Cu-Mo was carried out during FS 2022-23. An extensive night survey was conducted to identify tungsten (W)-bearing mineralization, specifically scheelite, leading to the delineation of a 2.5 km long zone of scheelite mineralization within the Ghattihosahalli schist belt (Fig.3). The scheelite grains, ranging from fine, disseminated particles to up to 2 cm in size, angular to sub-angular, exhibited a whitish-blue-yellow color under short-wave UV radiation. The thickness of the mineralized zone varies from approximately 30 cm to 2.5 m and occurs as pocketed, discontinuous and lensoidal zones within pistachio green, fine- to medium-grained altered ultramafic and amphibolite rocks, mostly at the western contact of the quartzite ridge in the Ghattihosahalli schist belt.

2.1.7 The analytical results of BRS and channel samples collected from the mineralised zone are promising, showing W values upto 0.91 wt.% (9100 ppm). The bed rock samples collected proposed area indicate anomalous tungsten values ranging from 500-9100 ppm, channel samples collected from the mineralized zone indicate anomalous assay value of tungsten upto i.e. 0.28 wt%, and in trench samples anomalous tungsten value of 0.1 wt. % x 5m noticed.

2.1.8 SEM study have indicated the presence of scheelite grains in association with fluorite, fluorapatite, titanite, and calcite. The mineralogical and textural evidence supports a hydrothermal-metasomatic origin for scheelite mineralization, with fluorine playing a key role in tungsten transport and deposition. Hyalophene a barium rich feldspar mineral is present in the mineralized rock which indicates low-temperature hydrothermal or metamorphic processes.

2.1.9 Based on these findings, a G3 stage of investigation has been proposed to assess the subsurface continuity and estimate the resources of tungsten and associated mineralization near Ghattihosahalli village. The proposed G3 block is defined by the coordinates: A: 76.267, 14.005; B: 76.271, 14.008; C: 76.294, 13.984; D: 76.290, 13.981. The proposed work includes detailed geological mapping of a 2 sq. km area at a 1:1000 scale, systematic sampling with the collection of bedrock samples, pitting and trenching and 1000 meters of drilling to delineate the tungsten and associated mineralized zones. Night-time UV lamp surveys to be conducted to identify scheelite-bearing tungsten mineralisation. Using a handheld shortwave UV lamp

(254 nm) and UV-protective glasses, outcrops, float and vein material to be scanned systematically along pre-planned traverses. Bluish-white fluorescence spots to be recorded with GPS, marked, and sampled for chemical analysis.

2.1.10 The tungsten occurrence in the proposed area, found in serpentized ultramafic and amphibolite rocks near the western contact of quartzite within the GH Halli schist belt, will be thoroughly investigated during geological mapping. The study will focus on understanding the distribution, characteristics, and relationship of tungsten mineralization within these specific rock types and geological settings. Given that the schellite mineralization in the GH Halli schist belt is pockety, discontinuous, and lensoidal, the drilling plan involves boreholes at regular intervals across the full width of the schist belt. This approach will ensure comprehensive sampling and help capture the variability of the mineralization, as it occurs in scattered pockets throughout the belt.

3.1.0 LOCATION AND ACCESSIBILITY

3.1.1 The area under investigation is part of Holalkere Taluk of Chitradurga district of Karnataka and located near the Ghattihosahalli and Kumminagatta villages

3.1.2 Survey of India Toposheet Number: The proposed area falls under Survey of India toposheet numbers 57B/04, 57B/08, 57C/01 and 57C/05.

3.1.3 Block coordinates:

Cardinal Points	Easting(m)	Northing(m)	Longitude	Latitude
A	636823.448 m	1548602.050 m	76°16' 0.932"E	14°00'16.589"N
B	637235.608 m	1548938.891 m	76°16' 14.729" E	14° 00'27.479" N
C	639710.739 m	1546359.962 m	76°17'36.752"E	13°59'3.117"N
D	639278.968 m	1545974.578 m	76°17' 22.294" E	13°58'50.652" N

4.1.0 PHYSIOGRAPHY, DRAINAGE AND CLIMATE

4.1.1 PHYSIOGRAPHY: The proposed area has an undulating topography with ridges and isolated hills in the western, eastern, and central parts with intervening plain areas. The highest elevation is 900 m above Mean Sea Level (MSL) in the central part and the lowest elevation is about 845 m above mean sea level in the eastern part of the proposed area.

4.1.2 DRAINAGE: The drainage of the area is controlled by some minor streams and streamlets originating from high-standing NNW-SSE trending series of hill ranges of comprised PGC-I, and Sargur Group of rocks. The area is characterized by dendritic to sub-dendritic drainage patterns in the proposed area.

4.1.3 CLIMATE: Karnataka State is divided into the 10 various Agro-climatic zones. Central Dry Agro Climatic zone of Karnataka is one of 2nd most drought prone agro climatic zone next

to northern dry zone. The Central Dry agro climatic zone is located in the Southern part of Karnataka State comprises of 5 Districts namely Chitradurga (6), Davanagere (3), Tumkur (6), Hassan (1) and Chikmagalur (1) districts comprises of 17 Taluks having total geographical area of 1943830 Sq. Km. The agriculture is predominant and main occupation of rural population and about 65% of the area is rain fed.

The climate of Central Dry agro climatic zone of Karnataka is arid to semi-arid with fairly dry and hot summer. Winter is fairly cold and sets in the month of November and continues till the middle of February. Summer is hot and dry which commences from mid of February and ends by the month of June with mean maximum temperature around 36°. The average annual rainfall is 620 mm.

5.1.0 PREVIOUS WORK:

5.1.1 Paranthaman, S. et.al. 1992, carried-out regional geochemical exploration to evaluate the ore potentiality of the mafic-ultramafic suite of rocks in parts of Ghattihosahalli schist Belt. They collected a total of 1880 litho and pedo-geochemical samples from the variants of ultramafics i.e., metpyroxenite, talc tremolite actinolite schist, tremolite actinolite chlorite schist and amphibolite etc. from Janakal village in the south upto Talya village in the north on a grid of 250m x 50m to 500m and were analysed for Cu, Pb, Zn, Ni, Co, Cr, Zr, V, Ga, Ag, and Au, etc. The analytical results of the samples collected from various lithounits have not yielded any distinct zone or pattern worthy of further exploration for any of the base or precious metals in the area. However, a few stray anomalous values of Ni up to 8100 ppm; Co up to 85 ppm, Cr up to 9900 ppm were reported. One sample had given Ni-3500 ppm from the soil profile developed over ultramafic rock from this area.

5.1.2 During FS 2017-19, Reconnaissance survey for multimetallic mineralization in and around Nerlakere, Madadakere, Gollarahalli, and Kanchipura areas in parts of T.S. nos. 57C/5, 57C/6, and 57C/10 of Chitradurga district, Karnataka” (Stage: G-4) was carried out by Abhilash et. al., 2019. The forecited block is SE of the current investigated block of FS 2023-24. Based on the field work and laboratory studies, there are four interpreted incidence zones of gold were established in the investigated area.

5.1.3 The incidence of molybdenite was observed in quartz vein intruded within gneiss along NE-SW strike plane with low angle dip towards NW at 500 m south west of Ghattihosahalli village by the core faculties, FTC Chitradurga, 2017. Initially three grab samples were collected from the quarry and analytical results showed 7707 ppm, 413 ppm and 274 ppm values of Mo revealing a positive indication of its occurrence. Subsequently, an area of 5 sq km in and around

the reported spot was probed in detail by core faculties, FTC Chitradurga, 2017 and reported 77 ppm of Mo value at 1.5 km SE of the reported spot (Raju et. al., 2017).

5.1.4 Jitendra Kumar and Ravi Tripathi (FS2022-2023) has carried out large scale mapping in the Ghattihosahalli area for evaluating Molybdenum and associated mineralization. They have reported significant W, Ni, Ba, Cu values in the area. They identified three mineralized zones over a 100 sq. km area, with significant Cu-Mo occurrences, including Cu up to 0.45% and Mo up to 0.27%, tungsten values upto **1559 ppm** (spot value) from amphibolite and Ni up to 1400 ppm from mafic-ultramafic rocks in the GH Halli schist belt, along with BaO up to 18.17 wt.% from Barite bodies within quartzite.

5.1.5. Geochemical distribution maps of Cu, Mo, Cs, Nb, Ta, and W under the National Geochemical Mapping (NGCM) programme (Toposheets 57B/4, 57B/8, 57C/1 and 57C/5) shows the anomalous tungsten signatures in the area during the FS: 2019-20.

5.1.6 Runjun Borah and Ravi Tripathi (FS: 2024-25) has carried out G4 stage of investigation in and around Chikjajur–Janakal Area and in addition, they have carried out sampling work in the Ghattihosahalli area focusing Li-Cs-Nb-Ta–W Mineralization in Holalkere–Hosadurga Taluks of Chitradurga District, Karnataka. During investigation, in the Ghattihosahalli area, an extensive night survey has been done using short-wave UV light led to the delineation of a ~2.5 km long scheelite-bearing zone within the Ghattihosahalli schist belt. Scheelite occurs as fine disseminations to coarse, angular to sub-angular grains up to 2 cm in size, exhibiting characteristic whitish-bluish-yellow fluorescence under UV radiation. The mineralized zone varies in thickness from ~30 cm to 2.5 m and is manifested as pocketed, discontinuous, and lensoidal bodies within pistachio-green, fine- to medium-grained altered ultramafic and amphibolite rocks, predominantly localized along the western contact of the quartzite ridge.

During the course of work in the Ghattihosahalli Schist Belt, a total of 45 bedrock samples (BRS) and 20 channel samples (CS) were collected from different lithological variants including pegmatites (BRS: n-35), quartzite (BRS: n-1), amphibolite (BRS: n-1; CS: n-2), and ultramafic rocks (BRS: n-8; CS: n-18). The highest spot value of tungsten was recorded from amphibolite with 0.91 wt.% WO_3 (9100 ppm). Additionally, 10 bedrock samples collected from ultramafic-mafic variants during work yielded encouraging WO_3 values ranging from 0.10 wt.% to 0.53 wt.%, with an average of 0.197 wt.%. In contrast, the analytical results obtained from pegmatite samples do not show any significant tungsten enrichment.

A total of 20 channel samples collected from mafic–ultramafic variants indicate anomalous concentrations of WO_3 ranging from 0.02 wt.% to 0.26 wt.% over 1 m channel length. Four channel samples collected from ultramafic rocks near the contact with fuchsite-

bearing quartzite yielded significant intercepts upto 0.28 wt.% WO_3 over 2 m. Furthermore, five trenches have been carried out in the Ghattihosahalli area, out of which trench T-10 shows anomalous values of 0.10 % WO_3 over 5 m length, with individual values ranging from 0.09% to 0.28%. Maximum value of tungsten is obtained in the contact zone, between rocks of schist belt and sheared older granite gneiss, indicating structural control of mineralisation.

The mineralisation represents shear-controlled hydrothermal tungsten mineralisation occurring as disseminated grains and veinlets within weak zones developed in the Ghattihosahalli Schist Belt. The mineralisation is particularly prominent near the western contact of fuchsite-bearing quartzite with amphibolite/ultramafic rocks, as well as along the contact between the schist belt and the surrounding gneissic terrain. The occurrence of tungsten minerals as disseminations and quartz veinlets within these structurally weak zones suggests strong structural control and hydrothermal fluid activity associated with deformation along the schist belt contacts.

SEM studies confirm scheelite in association with fluorite, fluorapatite, titanite, and calcite, and the mineralogical–textural characteristics support a hydrothermal-metasomatic origin, with fluorine playing a key role in tungsten mobilization and deposition. The presence of hyalophane (Ba-rich feldspar) additionally suggests involvement of low-temperature hydrothermal to metamorphic processes in the evolution of the mineralized system.

6.1.0 GEOLOGY OF THE AREA

6.1.1 The proposed area lies within the Western Dharwar Craton (WDC), part of the Archean Dharwar Craton, whose crustal evolution from the Archean to Proterozoic is marked by the development of ancient supracrustal enclaves (Sargur-type), the Older and Younger Gneissic Complexes, extensive schist belts (Dharwar-type), Younger (Closepet) Granites, and later dyke swarms. Based on lithology, metamorphic grade, magmatism, structural features, and geochronology, the craton is divided into the Eastern and Western Dharwar Cratons, separated by the Chitradurga Eastern Margin Shear Zone. In the WDC, high-grade Sargur supracrustals occur as narrow bands, enclaves, and tectonic slices within the Peninsular Gneissic Complex (PGC, >3.0 Ga), which unconformably underlies the Dharwar Supergroup. The Dharwar Supergroup, comprising the Bababudan and Chitradurga Groups, represents a stable platformal sequence deposited above a marked unconformity locally identified by quartz-pebble conglomerate near Nerlakatte. Younger granites, equivalent to the Chitradurga granite, intruded the various lithounits in multiple pulses.

Regionally, the area is situated west of the Chitradurga Schist Belt, a N–S to NNW–SSE trending granite–greenstone belt extending ~400 km from Gadag to Srirangapatna. The Mesoarchean Ghattihosahalli Belt forms the western margin of this schist belt and is considered

part of the Sargur mafic–ultramafic complex. It is a narrow, NW–SE trending supracrustal belt extending discontinuously for ~50 km from Mayakonda to Janakal and occurs as a synformal keel within 3.1 Ga TTG gneisses of the PGC. Lithologically, it comprises meta-ultramafics, amphibolites, metapelites, orthoquartzite, aluminous quartzite, and minor baryte lenses.

Structurally, the belt is folded into northerly plunging antiforms and is strongly affected by ductile shearing and mylonitisation, producing asymmetric S-folds and well-developed shear fabrics. The western margin is defined by the Chitradurga Western Margin Shear Zone (CWMSZ), a major NNW–SSE trending sinistral shear with two principal splays that converge east of Janakallu village, resulting in the present linear and lensoid disposition of the belt within the PGC.

6.1.2 Regional stratigraphy: The lithounits exposed in the proposed area belong to Sargur Group, PGC-I, younger granites, and Proterozoic mafic dykes. The regional stratigraphy of the area is given in Table no.1.

Table no.1: Regional stratigraphy (after Swami Nath and Ramakishnan, 1981)

Proterozoic mafic dykes, Charnockite Younger Granite (2500-2600 Ga)	
Dharwar Supergroup (2600-2800 Ga)	Chitradurga Group -----Disconformit----- Hiriyur Formation Ingaldhal Formation Vanivilas Formation
	-----Disconformity----- Bababudan Group Mulaingiri Formation Santaveri Formation Allampura Formation Kalsapura Formation
-----Deformed Angular unconformity-----	
Peninsular Gneiss with trondjemite-granodiorite plutons (>3000 Ga)	
-----Intrusive/tectonic contact-----	
Sargur Group (3100-3300 Ga)	Ultramafic-mafic layered complex. Tholeiitic amphibolite, Komatiites, BIF, Quartzite, pelite, marble and calc silicate rocks
-----Intrusive/tectonic contact-----	
Gorur Gneiss (3300-3400 Ga)	

6.1.3 Metamorphism and Structure: The overall structural trend of lithounits in the proposed area is NNW–SSE. The Ghattihosahalli Belt comprises three major tectonic components: the Sargur supracrustals in the west, the Peninsular Gneissic Complex (PGC) enclosing the Sargur rocks, and the volcano-sedimentary succession of the Bababudan Group of the Dharwar

Supergroup. Although the Sargur unit represents the oldest component, it occurs as a synformal keel within the PGC, and the entire assemblage is folded into northerly plunging antiforms with the Kummanaghatta PGC forming the core. The PGC is highly reworked and remobilised, displaying planar fabrics that are broadly conformable and co-folded with the Sargur lithologies. An angular unconformity separates the Sargur–PGC basement from the Dharwar cover sequence, locally marked by the deformed quartz-pebble conglomerate at Neralekatte. Structurally, the Sargur–PGC assemblage shows a NW–SE trend, whereas the Dharwar cover rocks exhibit N–S to NNW–SSE trends, confirming the older and unrelated nature of the Sargur supracrustals with respect to the Dharwar Supergroup.

COMMON ROCK TYPE

Ultramafics: Ultramafic rocks of the Ghattihosahalli Belt are mainly serpentinites interpreted as altered peridotitic komatiites. Preservation of spinifex textures and locally deformed nodular structures confirms their extrusive komatiitic volcanic origin. Serpentinites are typically weakly schistose and composed of antigorite and chrysotile with subordinate carbonate, chlorite, tremolite, and talc, while more schistose varieties are actinolite-rich with minor chlorite and talc, reflecting progressive metamorphic overprinting.

Amphibolites: Ultramafics occur in close association with mafic rocks represented by streaky amphibolite (meta-pyroxenite) and finely foliated amphibolite. Streaky amphibolite is massive to weakly foliated, fibrous in appearance, and composed mainly of hornblende and actinolite with plagioclase, chlorite, epidote, and accessory quartz, carbonates, sphene, and rare relict pyroxenes. Finely foliated amphibolite is banded, showing parallel alignment of hornblende and plagioclase with accessory magnetite and sphene. Local granitisation near contacts with the Peninsular Gneissic Complex (PGC) suggests syn- to post-tectonic felsic interaction, while the absence of gradational contacts among ultramafics and amphibolites indicates discrete volcanic events or separate flow units.

Metasediments: Metasedimentary rocks constitute ~20–25% of the belt and occur intimately with mafic–ultramafic units, indicating subaqueous volcanosedimentary deposition. Quartzites/cherts contain quartz with variable pyrite, kyanite, fuchsite, and locally sillimanite. Thin, discontinuous baryte bands and lenses occur conformably within chromiferous quartzite near mafic–ultramafic contacts, while crystalline carbonate lenses are commonly associated with streaky amphibolite. These associations suggest a volcanic-exhalative origin related to hydrothermal activity during submarine volcanism, typical of Archean greenstone environments.

Peninsular Gneissic Complex: The PGC forms extensive exposures along both margins of the belt and includes grey biotite gneiss, quartzofeldspathic gneiss, and migmatites. Supracrustal rocks of the Sargur Group occur as enclaves and xenoliths within the gneisses, indicating intrusive relations. Quartzo-feldspathic pegmatite veins cut the supracrustals and locally induce migmatization, demonstrating that emplacement of the PGC postdated the supracrustal sequence and that subsequent partial melting and metamorphic reworking significantly modified the original lithologies.

7.1.0 OBJECTIVE OF THE PROPOSED EXPLORATION PROGRAMME

To establish the subsurface continuity and estimate the resources of tungsten mineralization.

8.1.0 PROPOSED SCHEME OF EXPLORATION

8.1.1 In accordance with the objectives set for G-3 level exploration in the Ghattihosahalli Block, the exploration programme is proposed to be carried out in two systematic phases. Phase-I will comprise detailed geological mapping, topographic survey, systematic bedrock and channel sampling, pitting/trenching, and integrated ground geophysical investigations to delineate lithological contacts, structural features, alteration zones, and surface manifestations of tungsten mineralisation. Based on the outcome of Phase-I, Phase-II will involve systematic exploratory drilling, core logging, and detailed sampling to evaluate the subsurface continuity, grade, and thickness of mineralisation. The entire exploration programme will be executed in accordance with the provisions of the Mineral (Evidence of Mineral Contents) Rules, 2015, Mineral Auction Rules, 2015, and the Mines and Minerals (Development and Regulation) Amendment Act, 2015.

8.1.2 Phase-I: During Phase-I, the identified block area of about 2.0 sq. km will be mapped on a 1:2000 scale to delineate lithological units, contacts, folds, faults, shear zones, quartz veins, and alteration features. Particular emphasis will be placed on identifying surface manifestations of tungsten mineralisation associated with mafic-ultramafic rocks and their contact with quartzite. Night surveys using UV lamps will also be carried out to identify scheelite-bearing zones based on fluorescence characteristics. A detailed topographic survey will be undertaken using DGPS and Total Station tied with nearby GTS stations. The survey will be carried out on a 1:1000 scale with contour intervals of 2 m, and the block boundary will be demarcated in WGS-84 datum. Following geological mapping, pitting and trenching will be undertaken to expose mineralised zones within mafic-ultramafic rocks and along their contacts with quartzite gneiss. Trenches will be oriented across the strike of mineralised zones to determine the true width and continuity of mineralisation. Approximately 75 cubic metres of trenching/pitting is proposed. Systematic bedrock and channel sampling will be carried out across mineralised

exposures at surface and within trenches after removal of weathered material. Channel samples will be collected at 1 m intervals, with approximately 2 kg of sample per metre. Around 145 samples will be processed through crushing and pulverising to -200 mesh, and representative portions of about 250 g will be prepared using the coning and quartering method for chemical analysis of tungsten and associated elements. During the phase, an integrated ground geophysical survey of about 20 line kilometres comprising magnetic, gravity, and radiometric methods is proposed. Magnetic surveys will help delineate mafic-ultramafic bodies and structural discontinuities, gravity surveys will identify density variations between ultramafic rocks, quartzite, and mineralised zones, and radiometric surveys will assist in detecting alteration signatures and scheelite-associated anomalies. Survey lines will be oriented across the strike of lithological units and mineralised zones to maximise anomaly detection. The integrated interpretation of geological, geochemical, and geophysical data will be utilised to identify concealed extensions of mineralisation and prioritise drilling targets.

8.1.3 Phase-II: Based on encouraging results obtained from Phase-I, Phase-II exploration will involve systematic exploratory drilling to evaluate the subsurface continuity of tungsten mineralisation. A total of 12 first-level boreholes are proposed to intersect mineralisation at about 30 m vertical depth, with anticipated borehole depths of 60-70 m. In addition, two second-level boreholes are proposed to intersect mineralisation at around 60 m vertical depth, with anticipated depths of 110-120 m. Boreholes will be spaced at approximately 200 m intervals in accordance with G-3 stage norms. Each borehole will be supported by systematic surface sampling, including channel, trench, bedrock, and pitting samples, to correlate surface mineralised zones with subsurface mineralised bands. Drill cores will be logged in detail, recording lithology, colour, core recovery, RQD, grain size, texture, weathering, banding, mineralogical composition, alteration features, fractures, and shear zones. Core samples will be collected systematically for geochemical analysis of tungsten and associated elements.

Detailed petrological investigations along with SEM and EPMA studies will also be undertaken to characterise the mineralogy and chemistry of tungsten-bearing phases. The integrated interpretation of geological, geochemical, geophysical, and drilling data will ultimately be utilised to delineate mineralised zones and evaluate the tungsten resource potential of the block.

9.1.0 QUANTUM OF WORK

Sl.no.	ITEM OF WORK	UNIT	Proposed quantum of work for Ghattihosahalli Block
			G3
<u>Phase -I</u>			
1	Geological mapping (1:2000 scale)	Sq. Km	2
2	Primary sample (BRS) for W, Ba, Mo, Pb, Zn, Cu, Ni, Cr, Co, Sn	Nos.	60
3	Primary sample (PCS) for Major, Minor, Trace elements and REEs	Nos.	10
4	Thin Section study	Nos.	15
5	EPMA	Nos.	05
6	SEM	Nos.	05
7	Geophysical Survey Magnetic/gravity/Radiometric	Line km (lkm)	20
8	Surface exploration Pitting/trenching (PT)	cum.	75
9	Primary sample (PTS) for W, Ba, Mo, Pb, Zn, Cu, Ni, Cr, Co, Sn	Nos.	50
<u>Phase-II</u>			
10	Geotechnical Studies Specific Gravity/Bulk Density	Nos.	10
11	Drilling (Core)	m.	1000
12	Primary Sample (Core) for W, Ba, Mo, Pb, Zn, Cu, Ni, Cr, Co, Sn	Nos.	250
13	Check Sample (Core + Channel) for W, Ba, Mo, Pb, Zn, Cu, Ni, Cr, Co, Sn	Nos.	25
14	Primary Sample (Core) for Au by Fire Assay	Nos.	25
15	Geophysical logging (m)	m.	500

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, trenching, channel sampling, drilling, logging, core sampling and associated geological work and laboratory work will be completed within by January, 2027. Remaining Report writing will take 3 months' time with one month overlapping with laboratory analysis. Thus, the total duration of the project for completion of the above exploration will be 12 months from the initiation of the field work.

ESTIMATED COST FOR G-3 LEVEL EXPLORATION FOR TUNGSTEN AND ASSOCIATED MINERALIZATION IN GHATTIHOSAHALLI AREA, CHITRADURGA DISTRICT, KARNATAKA													
Sl. No.	Activities	MONTHS											
		1	2	3	4	5	6	7	8	9	10	11	12
1	Camp setting						Review						
2	Geological Mapping/ Topographic Survey												
3	Channel sampling												
4	Trenching												
5	Geophysical Survey												
6	Laboratory studies												
7	Core drilling (2 rig)												
8	Geologist days (Field)												
9	Core sampling												
10	Camp winding												
11	Geologist days (HQ)												
12	Report writing/ Peer review												

10.1.2: Cost has been estimated based on actual schedule of rates mandated in the circular OM No. 6/2/2015-NMET/588 dated 4/12/2025 and 6/2/2015-NMET (Part-1)/825 dated 10/2/2026 for NMET funded Projects. The total estimated cost is Rs. 118.00 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.)	
1	Geological Work	By GSI	By GSI
2	Geophysical Work	By GSI	By GSI
3	Excavation	By GSI	By GSI
4	Drilling	1,00,00,000	By NMEDT
5	Survey Work	By GSI	By GSI
6	Laboratory Studies	By GSI	By GSI
	Sub Total (1 to 6)	1,00,00,000	
7	Exploration Report Preparation	By GSI	By GSI
8	Proposal Preparation	By GSI	By GSI
9	Peer review charges	By GSI	By GSI
10	3D modelling	By GSI	By GSI
	Sub Total (1 to 10)	1,00,00,000	
	GST 18%	18,00,000	
	Total:	1,18,00,000	
	Say Rs. In Lakh	118.00	



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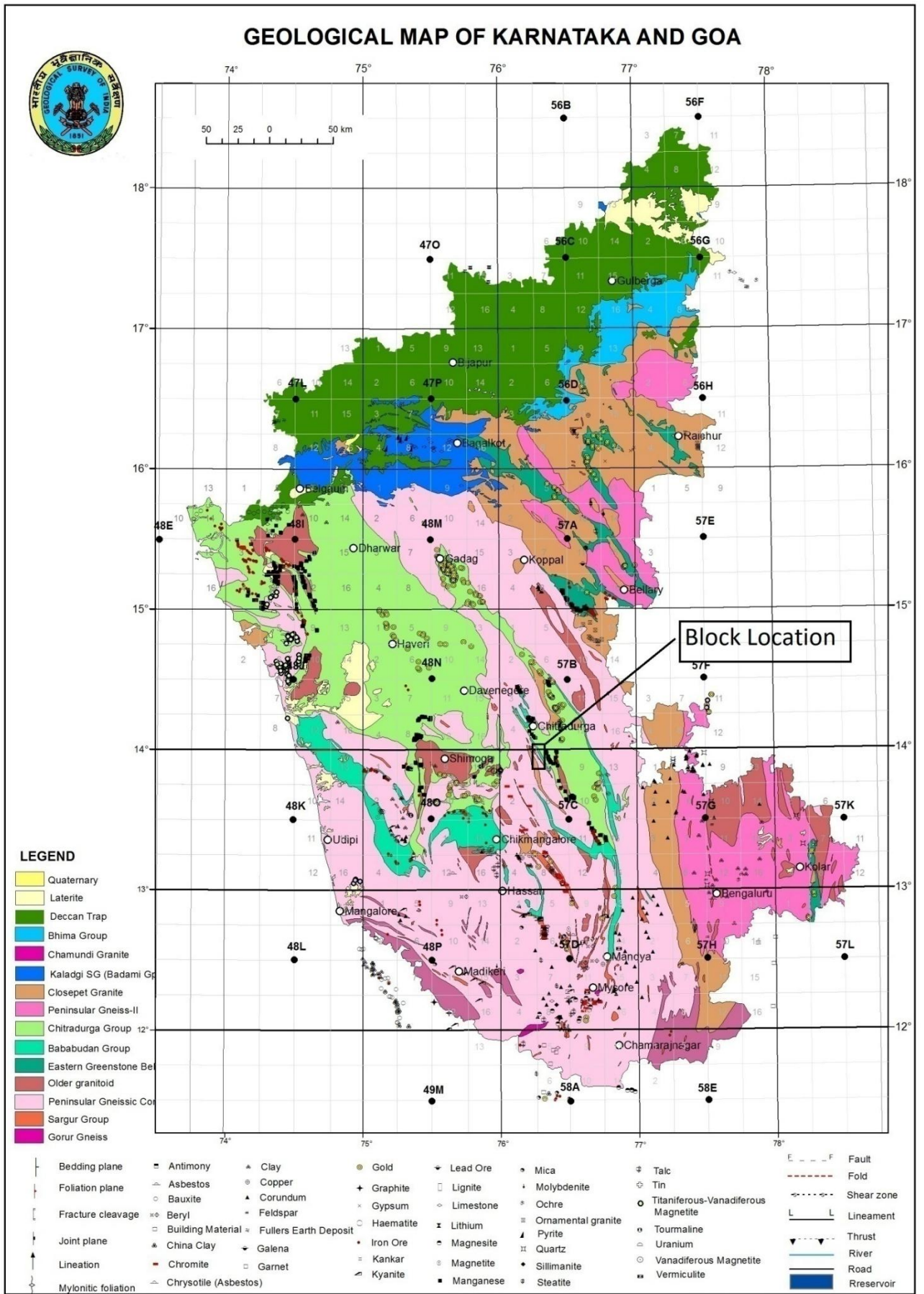


Fig: 1- Geological map of Karnataka and Goa showing the location the proposed area.

Proposed G3 block overlaid on the LSM map of FS 2022-23

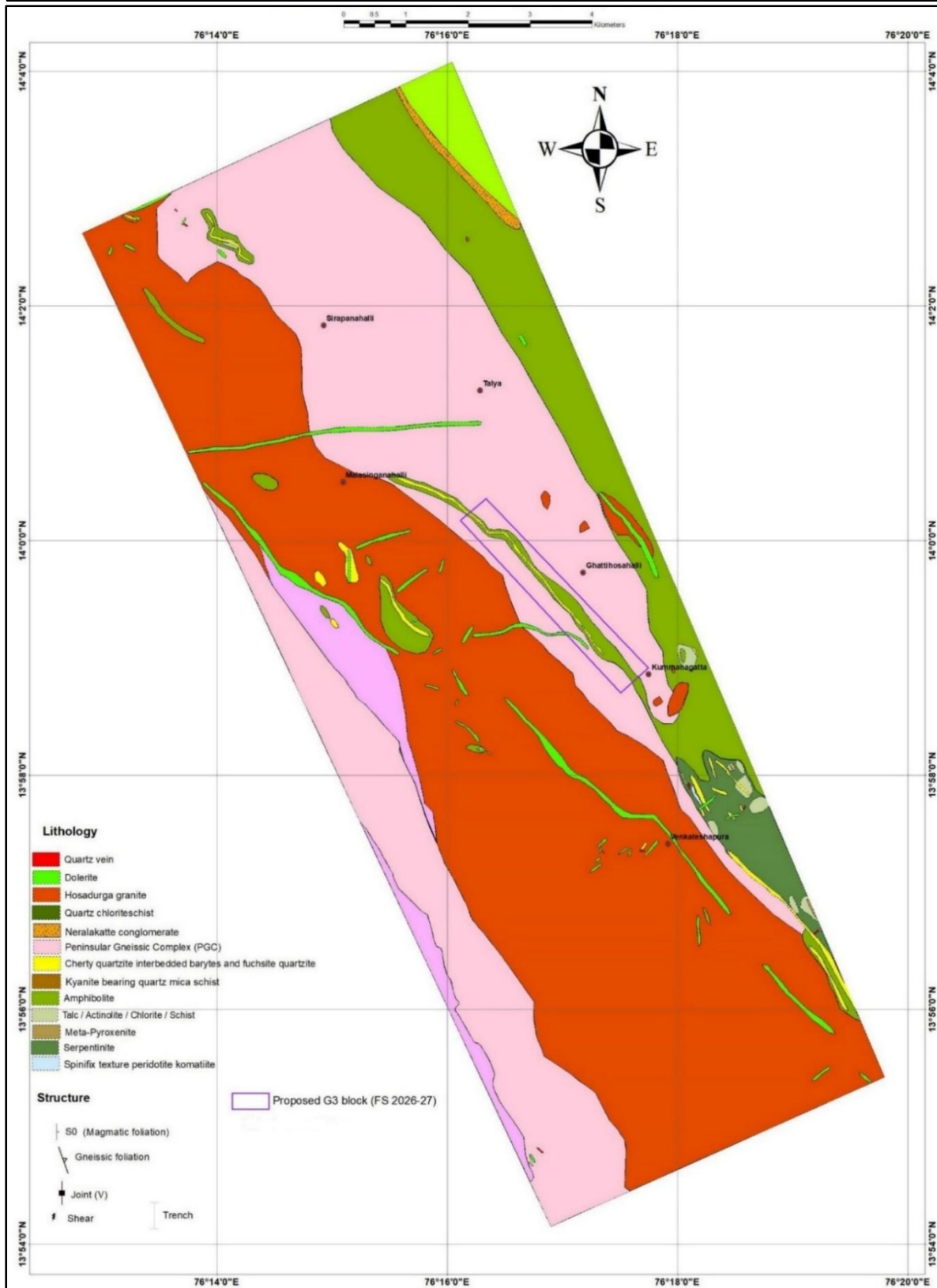


Fig:2- Proposed G3 block overlaid on LSM map (1:12500) of FS 2022-23.

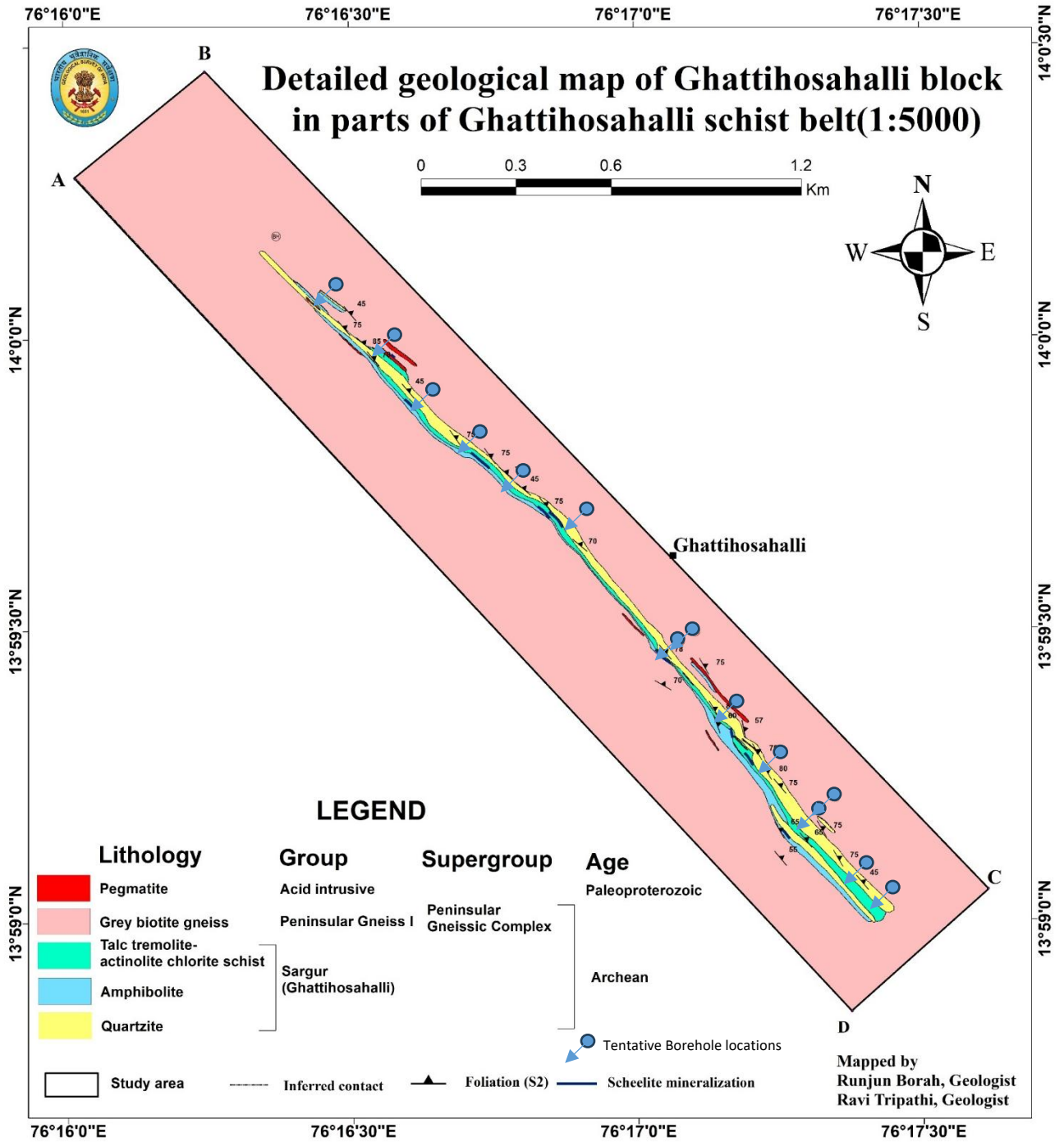


Fig:3 Large scale geological map of proposed G3 block in parts of Ghattihosahalli schist belt (1:5000) of FS 2024-25 showing proposed borehole locations.

ESTIMATED COST FOR G-3 LEVEL EXPLORATION FOR TUNGSTEN AND ASSOCIATED MINERALIZATION IN GHATTIHOSAHALLI AREA, CHITRADURGA DISTRICT, KARNATAKA							
Sl. No	Item of Work	Unit	Rates as per NMET SoC 4/12/2025		Total Cost of the Project		Remarks
			SoC-Item-SI.No.	Rates as per SoC	Qty.	Total Amount (Rs.)	
A	DRILLING						
a	Drilling in/ Drilling in Hard rock/ Strata: HQ size borehole up to 400m Depth and NQ Size beyond 400m depth in case of NQ size drilling is done before 400m depth, the rate shall decrease by 20%	m	2.2.1.1d	10000	1000	10000000	Outsourced/NMEDT
b	Borehole Deviation Survey by Multishift survey tool (interval 6m; azimuth and inclination to be recorded)	per shot	2.2.5	330	167	Nil	
c	Land / Crop Compensation (in case the BH falls in agricultural Land)	per BH	5.6	30000	14	Nil	
d	Construction of concrete Pillar (12"x12"x30")	per BH	2.2.7a	2000	14	Nil	
e	Borehole plugging with cement	per BH	2.2.8	10000	14	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 >1 Cr and less than 2 crores: 15 % of the Drilling Cost with a maximum ceiling of Rs.20 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	1590	410	Nil	
h	GSI Drilling camp inspection	day	as per govt. rates	6699	5	Nil	By GSI
i	Borehole Geophysical Logging	5 BHS of 350 m each	3.12	622.25	500	Nil	By GSI
	SUB TOTAL					1000000	
	Provision for GST (18%)					1800000	GST as applicable
	Total Estimated Cost with GST					11800000	
				or Say Rs. In Lakhs		118.00	