PROPOSAL FOR GENERAL EXPLORATION (G2) FOR GOLD AND ASSOCIATED MINERALIZATION IN AMRAPUR WEST BLOCK, HUNGUND-KUSHTAGI SCHIST BELT, EASTERN DHARWAR CRATON, KOPPAL DISTRICT, KARNATAKA

COMMODITY: GOLD AND ASSOCIATED MINERALS

BY

GEOLOGICAL SURVEY OF INDIA
STATE UNIT: KARNATAKA & GOA
BANGALORE,
KARNATAKA

PLACE:
BANGALORE DATE:
17.04.2026

Summary of the Block for G2 Level Exploration GENERAL
INFORMATION ABOUT THE BLOCK

	Features	**Details**
	Block ID	AMRAPUR WEST BLOCK
	Exploration Agency	Geological Survey of India (GSI)
	Commodity	Gold and associated minerals
	Mineral Belt	Hungund-Kushtagi Schist belt
	Completion period with entire Time schedule to complete the project	12 months
	Objectives	To establish the deeper level continuity of the Au and associated mineralization and to estimate the resource in the western extension of the block.
	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	Geologist party days: 250 days at field and 80 days at HQ
1.	**Location**	
	Block boundary corner points	
	Villages	Amrapur
	Tehsil/Taluk	Kushtagi
	District	Koppal
	State	Karnataka
2.	**Area**	

Cardinal Points	**Easting(m)**	**Northing(m)**	**Latitude**	**Longitude**
A	648877.3886	1755381.901	15° 52' 22.810" N	76° 23' 25.783" E,
B	649468.9502	1755977.658	15° 52' 41.960" N	76° 23' 45.909" E,
P	649677.9311	1754570.783	15° 52' 15.096" N	76° 24' 12.820" E,
Q	650275.7518	1755150.09	15° 51' 56.326"N	76° 23' 52.590"E,

	Block Area	0.958 Sq. Km.
	Forest Area	Nil
	Government Land Area	Data not available
	Charagaha	Data not available
	Private Land Area	Most of the area is private land used for cultivation
3.	**Accessibility**	
	Nearest Rail Head	Koppal Railway station (80 Km)
	Road	The area can be accessed via National Highway 50, State Highway 29
	Airport	Hubballi airport in the west direction (200 km)
4.	**Hydrography**	
	Local Surface Drainage Pattern (Channels)	Small seasonal nalas flow through the plains in a north-west to south-east direction.
5.	**Climate**	
	Mean Annual Rainfall	The annual average rainfall recorded is about 600 mm
	Temperatures (December) (Minimum) Temperatures (June) (Maximum)	Minimum temperatures 15^{O}C. Maximum temperatures up to 45^{O}C.
6.	**Topography**	
	Toposheet Number	57A/05
	Morphology of the Area	The proposed area is a flat terrain with low lying portions are covered by trees and shrubs, while the other areas have dry crop cultivation. The terrain is generally flat, soil covered by cultivated fields having a gentle upslope towards east. The elevation ranges from 520m to 566m above MSL.
7.	**Availability of baseline geosciences data**	
	Geological Map	Geological map on 1:12500 scale (Source: GSI)
	(1:50K/25K)	
	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)
8.	**Justification for taking up G2 level Exploration**	1. The area belongs to the Hungund Kushtagi schist belt has the greenstone sequence which is favorable for Archean lode gold-type mineralization and several old working were reported from this belt. 2. During FS 2019-22, Regional Mineral Targeting (RMT) work of Hungund Kushtagi Schist Belt was carried out by GSI and two high grade zones were demarcated with 17.5ppm Au for a drilled width of 1.3m and 1.8ppm Au for a drilled width of 12m in the scout borehole drilled based on the old working, presence of anomalous chargeability, presence of Au value in Soil and BRS (8.27ppm). 3. A G-3 item was taken upon FS 2023-25 which involves 2271.2m drilling, 3 sq.km area of detailed mapping with geophysical components. From the detailed exploration, a mineralized zone with a strike length of approximately 2.5km and a maximum width of about 6.5m has been delineated as discontinuous body based on the mineralization intersected in the boreholes (KKA-1 to KKA-15) within the study area. Based on the encouraging results, a G2 stage investigation was taken up in the Amrapur Central block during the FS: 2025-26. 4. Based on the positive outcome of G3 (FS 2023-25) and G2 investigation (FS 2025-26) at Amrapur; an area of 0.95sq km as Amrapur West block is being proposed for a one-year G2 stage investigation for FS 2026-27 to demarcate the depth persistency and configuration of the mineralized zones in the western part of the Amrapur block.

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1.1.0 INTRODUCTION

1.1.1 Gold has been a precious metal since ancient times owing to its physical and chemical properties of being soft, bright, malleable, ductile and resistant to acids and reagents. Along with its bright yellow colour, it has been in utility in Gems and Jewellery industry playing a significant role in Indian economy. While its industrial applications are comparatively limited, gold remains integral in electronics manufacturing, aerospace technology, and medical devices due to its exceptional conductivity, reflectivity, and corrosion resistance.

1.1.2 Nearly the entire production of gold in India comes from the state of Karnataka with major Neo-Archean deposits in the Dharwar Craton, specifically within the Kolar, Hutti, Gadag, and Chitradurga schist belts. Mineralization is typically hydrothermal, associated with quartz-carbonate-sulphide veins in sheared metabasalts and banded iron formations (BIF).

1.1.3 In India, domestic production of gold has declined over the years, while demand has increased significantly. India's annual gold consumption ranges between approximately 700 and 900 tonnes, making it one of the largest gold consumers globally. This widening gap between production and demand has given high priority to gold exploration in the country. Although gold occurrences have been reported from several regions, the only currently operating major primary gold mine in India is the Hutti Gold Mines Limited at Hutti, Karnataka. Apart from this, no large-scale, economically viable gold deposit has been developed in recent years. In this context, the possibility of working small mineralized bodies located in proximity cannot be ruled out. Therefore, it is necessary to identify and explore such small-sized deposits occurring in clusters to enhance domestic gold production.

2.1.0 BACKGROUND INFORMATION

2.1.1 The Archean Dharwar Craton in South India, covering an area of about 4.5 lakh km2, is bounded to the south by the Pan-African Pandiyan Mobile Belt (PMB); to the north by the end-Cretaceous Deccan Trap underlain and fringed by the Proterozoic Kaladgi and Bhima basins; to the northeast by the Archean Karimnagar granulite belt (KGB) adjacent to the Godavari graben that consists of Proterozoic Pranhita-Godavari basin and Phanerozoic Gondwana basin; to the east by the Arabian Sea (Ramakrishnan and Vaidyanadhan, 2010). The greenstone belts both in EDC and WDC are auriferous, viz., Hutti, Raichur, Ramagiri, Kolar Schist Belts in EDC and Gadag, Chitradurga and Shimoga Schist Belts in WDC.

2.1.2 The proposed area exposes the northern part of NNW-SSE trending volcano-sedimentary HKSB, which is surrounded by the Peninsular Gneissic Complex (PGC) and intrusive younger granitoids equivalent in age to the Clospet Granite. In the NW the Archean supracrustal of the HKSB is overlain by Proterozoic Kaladgi cover sediments of the Kaladgi Basin that in turn are overlain by Deccan basalts. The NW-SE trending Hungund-Kushtagi Schist Belt in the Eastern Dharwar Craton records the tectonic consequences of a transpression regime. It was formed due to Late Archaean oblique convergence in the Dharwar craton.

2.1.3 During their Systematic geological mapping in parts of Tawargeri-Kustagi Schist Belt, two locations with ideal geological set-up for high grade gold concentration are identified from the Tawergeri-Kustagi Schist Belt which require critical examination (Sundaravanam, et al, 1986-87). The study recommended investigation for high grade stratiform-type gold deposits from hill .430 to further northwest upto .472 (T.S. 57 A/I4 and 10) and south of Amrapur (57A/5) to further northwest. This is further encouraged by the presence of an ancient trench in ferruginous chert and dolomite about 500 m south of Amrapur, which according to local people, was dug for gold.

2.1.4 During Preliminary exploration for copper, gold and molybdenum in Kalmangi, Tondshihal, Tavaregere and Kamatgi, in the Hungund-Kushtagi schist belt noticed surface evidences for gold/sulphide mineralisation in the central part of the schist belt at a few localities such as Naranhal, Jajad Gudda, Arbhogapur and Amarapur, over a stretch of about 17 km (Hemant Kumar& Narasimha, 1993). Here, a number of old workings, supposedly to be for gold, are present in the BIF and associated metabasic volcanic rocks which show considerable degree of shearing, brecciation, silicification and carbonitisation. Some of the samples from these workings have analysed gold values ranging from <0.1 g/t to 0.5 g/t Au.

2.1.5 Geochemical sampling of Hungund-Kushtagi-Hagari Schist Belt reported, old gold mining activities in 57 A/5 toposheet in the form of pits, shafts, adits etc (Venkatsubramanian & Kariyanna, FS 1994-95).

3.1.0 LOCATION AND ACCESSIBILITY

3.1.1 The area forms the northern part of Karnataka State. The study area falls in T.S. No. 58A/05 and around Kushtagi town of Koppal district. It is located nearly 425 km from Bangalore city. The area is well connected to Bangalore via NH50 and NH44. The State highway connecting Gangavati-Tawargeri-Lingasugur passes near to the area. Kushtagi-Tawargeri-Sindhanur road also passes near to the area. All the villages of this area are well connected by metalled and non-metalled roads. The nearest railway station is Koppal railway station which is about 80 Km from the field area. Hubballi Airport is the nearest airport which is about 200 km.

CARDINAL POINT COORDINATE OF AMRAPUR WEST BLOCK, DISTRICT: KOPPAL, KARNATAKA (G-2 LEVEL)

Cardinal Points	Easting(m)	Northing(m)	Latitude	Longitude
A	648877.3886	1755381.901	15° 52' 22.810" N	76° 23' 25.783" E,
B	649468.9502	1755977.658	15° 52' 41.960" N	76° 23' 45.909" E,
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4.1.0 PHYSIOGRAPHY, DRAINAGE AND CLIMATE

4.1.1 Geomorphologically, the Amrapur area is a flat terrain with low lying portions are covered by trees and shrubs, while the other areas have dry crop cultivation. The terrain is generally flat, soil covered by cultivated fields having a gentle upslope towards east. The area forms part of a large plate with small isolated hills occupied by dykes.

4.1.2 The area is drained by two shallow channelled second order tributaries. The drainage is through numerous irrigation tanks which are now connected to the waterbodies (Reservoir/tanks). A small nalas flow through the plains in a north-west to south-east direction along the shear zone. Apart from these, small seasonal nalas flows from the elevated areas of north-east and south west.

4.1.3 The climate of the area is dry almost round the year and the summer is generally hot, starts from March and is very hot from May to June. The area is in the semi-arid zone experiencing a hot and dry climate and is drought prone. The temperature ranges from 15ºC (minimum) in winter to the 45ºC (maximum) in summer. The rainfall is highly erratic and inadequate. The area receives an average rainfall of 600 mm.

5.1.0 PREVIOUS WORK

5.1.1 Hemantha Kumar and Narasimha (1995) carried out specialized thematic mapping on 1:25,000 scale and preliminary exploration for basemetals and gold in the northern parts of the Kushtagi Schist Belt. The exploration brought to light the auriferous nature of the rocks at a few stretches in the area. The workers have also reported the presence of V, Cr, Co, Ni, Cu and Zn from metavolcanics.

5.1.2 Shashi Ranjan and Laxmi Nandan Deori (2017) carried out G4 investigation with 335 sq.km reconnaissance survey, 150 sq.km large scale mapping (LSM) on 1:12,500 scale in north of Tawargeri area. According to them the rocks of the area are subjected to three phases of tectonism and are represented by characteristic fold geometry and orientation.

5.1.3 Abhilash, Deepu & Praseetha (2023) carried out Regional Mineral Targeting (RMT) work of Hungund Kushtagi Schist Belt and based on the presence of anomalous chargeability in geophysical studies, presence of Au value in Soil and BRS, one scout borehole was drilled. Two zones were demarcated based on the encouraging values.

5.1.4 **FS 2023-24:** Abhilash P.K, & Lekshmi S (2023-24) carried out Preliminary Exploration for gold and associated mineralization in and around Amrapur area, Hungund-Kushtagi Schist Belt, Eastern Dharwar Craton, Karnataka (G3 stage) with 1000m drilling and 2 sq.km area of detailed mapping. Altogether 7 boreholes have been drilled including RMT scout borehole in which all the boreholes intersected five Au bearing zones at approximately 520 to 434m RL. The Au mineralization is present in all boreholes extending up to a strike length of 1000 m at different RLs with varying width from 1 to 10.3m indicating discontinuous zones as the mineralization is shear controlled. A total of 1000m Au mineralized zone has been established based on the chemical analysis during this FSP.

FS 2024-25: Lekshmi & Kimnunchoi (FS 2024-25) carried out the detailed mapping of 1 sq.km in the extended Amrapur block and a total of 1271.2m was drilled with 8 first level boreholes from which 423 core samples were generated and analyzed. Au mineralized zones were intersected most of the boreholes (7 nos.) and established 600m mineralized zone based on the anomalous values. Bed rock samples have shown the gold values ranging from 38 to 2740ppb.

A total of 15 boreholes were drilled in the block for FS 2019-22 (RMT) and FS 2023-25. Based on the drilled boreholes and analytical results from 15 boreholes (KKA-1 to KKA-15) completed during the FS 2023–25, along with the infilling boreholes (KKA-16,17, 19 and 20) drilled during FS 2025–26, ten Au mineralized zones have been delineated. The mineralization intersected on boreholes has been projected on the surface and 2.5km strike length in discontinuous manner has been established with varying width from 1 to 6.5m. Among the delineated zones, Zone-2B is considered the main zone, as it contains comparatively higher-grade gold (Au). Therefore, all boreholes are planned to target Zone-2B. The grade of Au in Zone-2B varying from 0.11 to 23.55g/t and RL from 487m to 478m. The other major zone ie., Zone-3B, intersected between RL 452 m and 442 m, has an average Au grade ranging from 0.22 to 5.78 g/t which is continuous for 250m and extended to a strike length of 650m.

6.1.0 GEOLOGY OF THE AREA

6.1.1 The Dharwar Craton exposes a granite-greenstone ensemble composed predominantly of granitoids, gneisses and greenstone (schist) belts and late to post tectonic granites (Closepet Granite and its equivalents) which were intruded by mafic dyke swarms. The area is made up of parts of the three major greenstone belts, viz. Sandur Schist Belt, Hungund-Kushtagi and the hook shaped Hutti-Maski Greenstone belt, of Dharwar Supergroup, Peninsular Gneissic Complex (PGC-I), Closepet Granite of Archaean to Palaeoproterozoic age and Badami Group belonging to Kaladgi Supergroup of Neoproterozoic age. The Hungund and Kushtagi Schist Belt trending NW-SE is deep-seated in the vast expanse of the PGC gneiss/Granitoid complex to the north and NE of the Sandur belt. The Hungund- Kushtagi Group is represented by Ilkal, Mudenur Formations and Kalmangi Layered Complex. A major NW-SE trending shear zone passes through the center of the belt along which numerous old workings for gold are reported (Manikyamba et al., 2004).

6.1.2 A total of 3.0 Sq. Km of Detailed Mapping was carried out in 1:1,000 scale, in which 2.0 Sq Km during the FS 2023-24 and 1.0 Sq. Km in FS 2024-25. The primary geological objective was to delineate the gold bearing lithologies as well as to identify

and record the disposition of the various rock types in the block. The rock types of Amrapur area belonging to Hungund-Kushtagi schist belt, Layered Mafic-Ultramafic Complex, Closepet Granite and acid intrusives. Hungund-Kushtagi schist belt of Dharwar craton in the Amrapur block are represented by acidic volcanics, Metabasalt and Amphibolite belonging to Ilkal formation banded Iron Formation, Carbonaceous phyllite and Ferro-dolomite belonging to Mudennur Formation. Similarly, Hornblende Gabbro represents the Kalmangi Mafic-Ultramafics. Pink alkali feldspar granite represents the Closepet Granite Formation. Apart from this gabbro, Dolerite and quartz veins are identified in the area. The repeated nature of felsic volcanics and mafic volcanics is indicating the area undergone bimodal volcanism.

6.1.3 Gold mineralization Hungund Kushtagi schist belt, especially in Amrapur area is associated banded ferruginous chert, sheared metabasalt, sheared felsic volcanic (rhyolite), and carbonaceous phyllite that have undergone extensive metamorphism. Shearing and brecciation in banded ferruginous chert sheared metabasalt, sheared felsic volcanic (rhyolite), and carbonaceous phyllite have been increased the hydrothermal activity in the area. In Amrapur area gold mineralization is found in association with sulphide especially pyrite and pyrrhotite. Sulphides found as disseminations and veins. The disseminated sulphides are common in sheared metabasalt and shared rhyolite. In carbonaceous phyllite the sulphide found as veinlets. Sem study during the RMT, FS 2019-23 and FS 2023-24, suggests that gold mineralization in Amrapur area found in two stages one is well within the sulphide and the other is in between the grain boundaries.

6.1.4 The gold mineralization in the Hungund Kushtagi Schist Belt is primarily epigenetic. Extensive hydrothermal alteration, including sericitization, silicification, and limonitization, suggests that mineralizing fluids altered the host rocks post-formation, characteristic of epigenetic processes. The occurrence of smoky quartz veins containing gold, which cross-cut the host rocks, further supports an epigenetic origin, as these veins formed from hydrothermal fluids intruding into existing structures. Additionally, gold is associated with sulfide minerals such as pyrite, chalcopyrite, and pyrrhotite, often found along schistosity planes and in quartz veins, indicating that these minerals

6.1.5 The S2 foliations are the dominant structural fabric which is near parallel to the S1 foliation planes. The trend of S2 plane is generally varies from NW-SE to NNW-SSE which dips subvertical to vertical towards northeasterly and southwesterly. Structural features such as minor folds, fractures and shear zones in Amrapur block act as conduits for hydrothermal fluids, aligning with alteration zones that mark fluid pathways and structural traps for gold concentration. The major shear zone passing through the block in NW-SE direction is observed in the form of mylonitisation, development of S-C fabric, gash veins, rotation of clast, development of asymmetrical fold and stretching minerals leading to lineation (ribbon quartz). The trend of shear zone is parallel to regional foliation trend of schist belt, shows both dextral and sinistral sense of shear.

6.1.6 **Common rock types**

Detailed mapping in the Amrapur block bring out various lithologies such as massive and sheared felsic volcanics, mafic volcanics, chlorite schist, amphibolite, BIF, granite, quartz-ankerite vein and quartz veins. The mineralization is controlled by shearing in the area irrespective of lithologies.

Amphibolite: The oldest lithounit of the Hungund Kushtagi Group in the study area is the amphibolite, prominently forming discontinuous NW-SE linear detached bodies in the eastern and northwestern parts of the Amrapur block. Notable exposures of amphibolite are found near the water tank in the southeastern part, measuring approximately 50 meters in length and 10 meters in width, and another exposure in the northwestern part, measuring about 150 meters in length and 50 meters in width. The amphibolite shares its boundaries with acidic volcanic rocks and metabasalt, with sharp contacts in places. Hand specimens of the amphibolite are generally greenish-black, fine to medium-grained, and foliated, consisting mainly of mafic minerals with preferred orientation, plagioclase feldspar, and a small amount of quartz. At places the amphibolite is sheared and intersected by cryptocrystalline quartz and epidote veins along the schistose plane, containing pyrite in both disseminated and stringer forms.

Metabasalt: The predominant lithology exposed along the Hungund Kushtagi schist belt and the present study area is metabasalt, which primarily associates with acid volcanics and meta-sedimentaries. The Amrapur block exhibits alternating bands of metabasalt and acid volcanic (rhyolite), reflecting the bimodal nature of volcanism in the region. Two types of metabasalt are identified: a minor massive type and a major schistose type, with well-developed schistosity in the latter. In many locations, the schistose metabasalt is sheared, and several quartz and ankerite veins, ranging from 0.5 cm to 50 cm, intrude along the schistosity plane. The metabasalt generally trends NW-SE, with a moderate to steep dip (60° to 80°) in the NE direction. Its contact with acidic volcanics is sharp, while the contact with metasedimentaries is gradational. The metabasalt is extensively altered to chlorite schist and quartz chlorite schist with carbonate veining in certain areas, breaking into diamond-shaped fragments due to the intersection of foliation and cleavage planes. Megascopically, the schistose metabasalt is fine to medium-grained, light to dark green, foliated, sheared, and shows profuse carbonate alteration.

Felsic volcanics (Meta-rhyolite)/ Quartz Porphyry: This lithounit occurs in association with metabasalt, amphibolites, quartz sericite schist exposed in all stretches of the area. Two varieties of rhyolite are present in study area: 1) Phyric 2) Aphyric. Phyric rhyolite is fine-grained, light-colored volcanic rock is characterized by its porphyritic texture, which includes larger, well-formed crystals (phenocrysts) of quartz set in a finer-grained groundmass. The presence of these phenocrysts gives the rhyolite a distinctive spotted appearance. In the Amrapur block, alternating bands of phyric rhyolite and metabasalt highlight the bimodal nature of the region's volcanism. The rhyolite bands typically trend NW-SE and can exhibit a sharp contact with the metabasalt, but a more gradual transition when interfacing with meta-sedimentary

units. This phyric rhyolite often shows evidence of alteration, including the development of secondary minerals such as chlorite and carbonate, which can significantly modify the rock's original texture and composition. Aphyric rhyolite is another important lithology within the Hungund Kushtagi schist belt and the study area. Unlike phyric rhyolite, aphyric rhyolite lacks larger, well-formed crystals (phenocrysts) and has a more uniform, fine-grained texture. This light-colored volcanic rock is typically associated with metabasalt and meta-sedimentary rocks. The rock is sheared to mylonite to ultramylonite stage and rotated phenocrysts stretched along the regional foliation. Schistosity may be developed in some of the rhyolite bands, indicating deformation processes. This rhyolite often shows evidence of alteration, including the development of secondary minerals such as chlorite and carbonate, which can significantly modify the rock's original texture and composition.

Carbonaceous Phyllite: In the Amrapur area, carbonaceous phyllite serves as a significant marker horizon, comparable to Banded Iron Formation (BIF), due to its presence in all boreholes drilled in the region. This fine-grained, grey-colored, and schistose rock contains quartz, feldspar, and mica, exhibiting a layered structure typical of schistosity. Extensive drilling has revealed that the carbonaceous phyllite stretches over 1 km in length, with a width varying between 4 and 20 meters. Sulfide minerals, primarily pyrite, pyrrhotite, and chalcopyrite, are commonly associated with the carbonaceous phyllite. These sulfides are predominantly found along the schistosity planes, appearing as veins, and occasionally as disseminations throughout the rock. In carbonaceous phyllite, fine-grained graphite or other carbonaceous materials give the rock a dark color.

Banded Iron Formation: The Banded Iron Formation of the study area represented by Banded ferruginous quartzite. The rock exposed as the linear, discontinuous bands with varying thickness from 15cm to 2m. Several parallel bands of BIF are demarcated in the Amrapur block. The rock is fine to medium grained, consists of alternate band of quartzite and ferruginous bands which define the bedding in the rock. The thickness of individual compositional lamellae varies from paper thin upto 15 cm. basically in ferruginous band, the mineral are hematite and magnetite. The rock is very hard, compact, folded and altered at few places. There is one old working observed in the banded ferruginous quartzite. The rocks within old workings are sheared, brecciated and limonitized. At many places the Banded ferruginous quartzite is associated with ferro-dolomite. The gash veins observed in BIF indicating brittle ductile domain of deformation. The BIF is highly carbonated and limonitized. Silicification also can be observed from the BIF. The carbonate development over BIF and associated rock types is quite common in low lying areas. Au mineralization is associated with the sulphides mostly pyrite is associated with the BIF.

Younger Granite: The Younger Granites are intruded tongue and apophysis along the contacts of Schist belts. Towards the North easter corner of the Amrapur block exposed the Pink Granite of closepet formation and which is continuing towards east of the Amrapur block. It is pink in colour, composed of feldspar (phenocryst), quartz

and biotite. Rotated phorphyroclast of feldspar indicates the shearing of the later intruded felspar veins meanwhile the rock is highly mylonatised due to intense shearing.

Gabbro dyke: All lithounits of the Amrapur block are intruded by fine- to medium-grained gabbro dykes. These melanocratic dykes are notable for being undeformed and unaltered, composed primarily of plagioclase and pyroxene, with minor accessory minerals. The gabbro dykes generally trend at 110°. In the southern portion of the mapped area, a significant gabbro dyke, approximately 700 meters in length, cuts across all lithounits. This dyke varies in width from 10 to 80 meters.

Quartz veins: These are the youngest acid intrusive in the study area which have intruded the majority of lithounits and have concordant and discordant relationship. Three types of Quartz vein have been observed during mapping: 1. Sulphides bearing white to smoky limonitised quartz vein 2. Quartz carbonate vein 3. Milky white quartz with tourmaline. Quartz veins are ranging from 10cm to 5m in length and width varying from 5cm to 1m. most of the smoky quartz vein are having sulphide as pyrite and milky white quartz are devoid of any sulphide in the Amrapur block.

7.1.0 OBJECTIVE OF THE PROPOSED EXPLORATION PROGRAMME

The present exploration programme has been formulated to fulfill the following objectives:

1. To establish the deeper level continuity of the Au and associated mineralization and to estimate the resource in the western extension of the block

8.1.0 PROPOSED SCHEME OF EXPLORATION

8.1.1 In accordance with the objectives set for G-2 level exploration in Amrapur West Block, the exploration programme is proposed to carry out in one phase. However, during the initial work priority will be given to establish the surface mineralization through Bed rock sampling, pitting and trenching, subsequently, systematic drilling, core sampling, and other associated geological and laboratory work will be performed. The exploration shall be carried out as per Mineral (Evidence & Mineral Contents) Rule -2015, Mineral Auction Rule-2015 and MMDR Amendment Act-2015. The details of different activities to be carried out are presented in subsequent paragraphs.

8.1.2 **Trenching:** Trenching will be carried out to check the strike continuity of the mineralization zones. In the present study, 75 cu. m. pitting/ trenching with 75 nos. samples is proposed.

8.1.3 **Channel sampling:** Systematic channel sampling will be carried out to check the surface anomaly and continuity of the mineralized zone. Samples will be collected after tearing off the weathered part. Around 1 Kg of rock sample will be collected for each sample. The interval of the samples from a channel will be judicially calculated by the field geologist, with strong justification. In this way, 30 nos. of samples will be collected.

8.1.4 **Sample processing and chemical analysis:** Each of the collected 30 (BRS) and 75 (PTS) samples will be entirely powdered to -120 mesh size for Au analysis and -200 mesh size for associated minerals. Following the initial crushing and powdering the samples at -120 mesh size, representative samples of around 250 grams are drawn through successive reduction using the coning and quartering method. After drawing samples for gold, rest of the sample will then be powdered to -200 mesh size and representative samples of around 150 grams are drawn through successive reduction using the coning and quartering method. The samples of -120 mesh size will be subjected to gold analysis by AAS-MIBK (805 nos.) and Fire Assay (300 nos.) methods and 1105 nos. of samples of - 200 size will be subjected to analysis of by AAS method. Around 10% of the samples, i.e. 15 nos. will be analyzed as check samples.

8.1.5 **Topographic Survey:** Topographical survey has been carried out in the block area in G-3 stage of exploration during FS 2023-25. All the surface features have been marked on a map on 1: 1000 scale. However, during the present study, borehole point fixing and boundary point fixing will be carried out.

8.1.6 **Core Drilling:** The present exploration scheme is prepared by proposing 19 nos. of inclined boreholes based on the work carried out during the G3 stage level exploration, viz, geological mapping, surface sampling, pitting/ trenching, drilling and core sampling. Initially 6 first level boreholes will be carried out as an infilling borehole at 100m spacing considering the boreholes drilled during G3 level exploration and 11 second level boreholes will be carried out at 100m interval and two third level boreholes are planned to check the depth persistency.

8.1.7 **Core Logging:** Geological core logging will be carried out systematically by recording carefully the minute details and physical/lithological characters of the rock formations including colour, core recovery, grain size, weathered zone, texture, banding, mineralogical composition, micro-structural/structural details, shear zones, fracture system, lithological variations along with visual estimate in respect of sulphide mineralization in the core.

8.1.8 **Core sampling procedure and Chemical analysis:** For preparation of samples, the borehole core will be splitted into two equal halves by using core splitter. One half will be powdered to -120 mesh size and the other half will be kept for future studies. Around 1000 nos. of samples will be drawn from the potential part of the core for analysis of gold and associated minerals (Ag, Cu, Pb, Zn, As, W, Sb, Bi) i.e. sheared quartz veins, sheared fracture system etc., will be marked. Following the initial crushing, representative samples of around 250 grams are drawn through successive reduction using the coning and quartering method into -120 mesh size for gold. After drawing samples for gold, each of the 1000 samples will again be powdered to -200 mesh size. Representative samples of around 150 grams are drawn through successive reduction using the coning and quartering method from the 1000 samples. The samples of -120 mesh size will be subjected to gold analysis by AAS-MIBK method and based on the results selected 100 samples will be analyzed for Au using Fire

Assay method. The other 1000 samples of - 200 size will be subjected to analysis of Ag, Cu, Pb, Zn, As, W, Sb, Bi by AAS method. Around 10% of the samples, i.e. 100 nos. will be analyzed as check samples.

8.1.9 **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 mineralogic studies.

8.1.10 **Determination of Specific gravity/ Geotechnical studies:** To calculate the resource, volume of the ore body needs 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. In addition to the specific gravity, few samples will be submitted for porosity, uniaxial compressive strength and tensile strength determination.

8.1.11 **Ore beneficiation studies:** Bulk sample of mineralized zone collected from all the boreholes and surface samples upto 200 to 300 kg will be sent to Indian Bureau of Mines (IBM), Bengaluru for beneficiation studies.

9.1.0 QUANTUM OF WORK

9.1.1 The following quantum of work has been proposed for G2 level exploration for Au and associated minerals in Amrapur West block:

Sl. No.	ITEMS OF WORK	UNIT	Proposed Quantum
	Single Phase Work		
1	BRS/ Channel sampling	Nos.	30
2	PTS sampling	Nos.	50
3	PCS	Nos.	10
4	Excavation (Pitting/Trenching)	Cu. m	75
5	Ore microscopic Study	Nos.	10
6	Petrological study	Nos.	10
7	Drilling (Core)	m.	3500
8	Geophysical Logging	m.	1750
9	Core sampling	Nos.	1000
10	Check Samples	Nos.	100
11	EPMA	Nos.	5
12	SEM	Nos.	5
13	Geo-technical studies	Nos.	10
14	Ore beneficiation	Nos.	1
15	**Exploration Report [As per Mineral (Evidence of Mineral Contents) Rule-2015] /UNFC**	Nos.	1

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 field and laboratory analysis. Thus, the total duration of the project for completion of the above exploration will be 12 months after initiation of the field work.

SCHEDULED TIME FOR G-2 LEVEL EXPLORATION (G2) FOR GOLD AND ASSOCIATED MINERALIZATION IN AMRAPUR WEST BLOCK, HUNGUND-KUSHTAGI SCHIST BELT, EASTERN DHARWAR CRATON, KOPPAL DISTRICT, KARNATAKA

Sl. No.	Activities	MONTHS											
		1	2	3	4	5	6	7	8	9	10	11	12
1	Camp setting						Review						
2	Channel sampling												
3	Trenching												
4	Laboratory studies												
5	Core drilling (2 rig)												
6	Geologist days (Field)												
7	Core sampling												
8	Camp winding												
9	Geologist days (HQ)												
10	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. 413.00 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	Excavation	By GSI	By GSI
3	Drilling	3,50,00,000	By NMEDT
4	Survey Work	By GSI	By GSI
5	Laboratory Studies	By GSI	By GSI
	Sub Total (1 to 5)	3,50,00,000	
6	Exploration Report Preparation	By GSI	By GSI
7	Proposal Preparation	By GSI	By GSI
8	Peer review charges	By GSI	By GSI
9	3D modelling	By GSI	By GSI
10	Beneficiation Study	By GSI	By GSI
	Sub Total (1 to 10)	3,50,00,000	
	GST 18%	63,00,000	
	Total:	**4,13,00,000**	
	Say Rs. In Lakh	**413.00**	

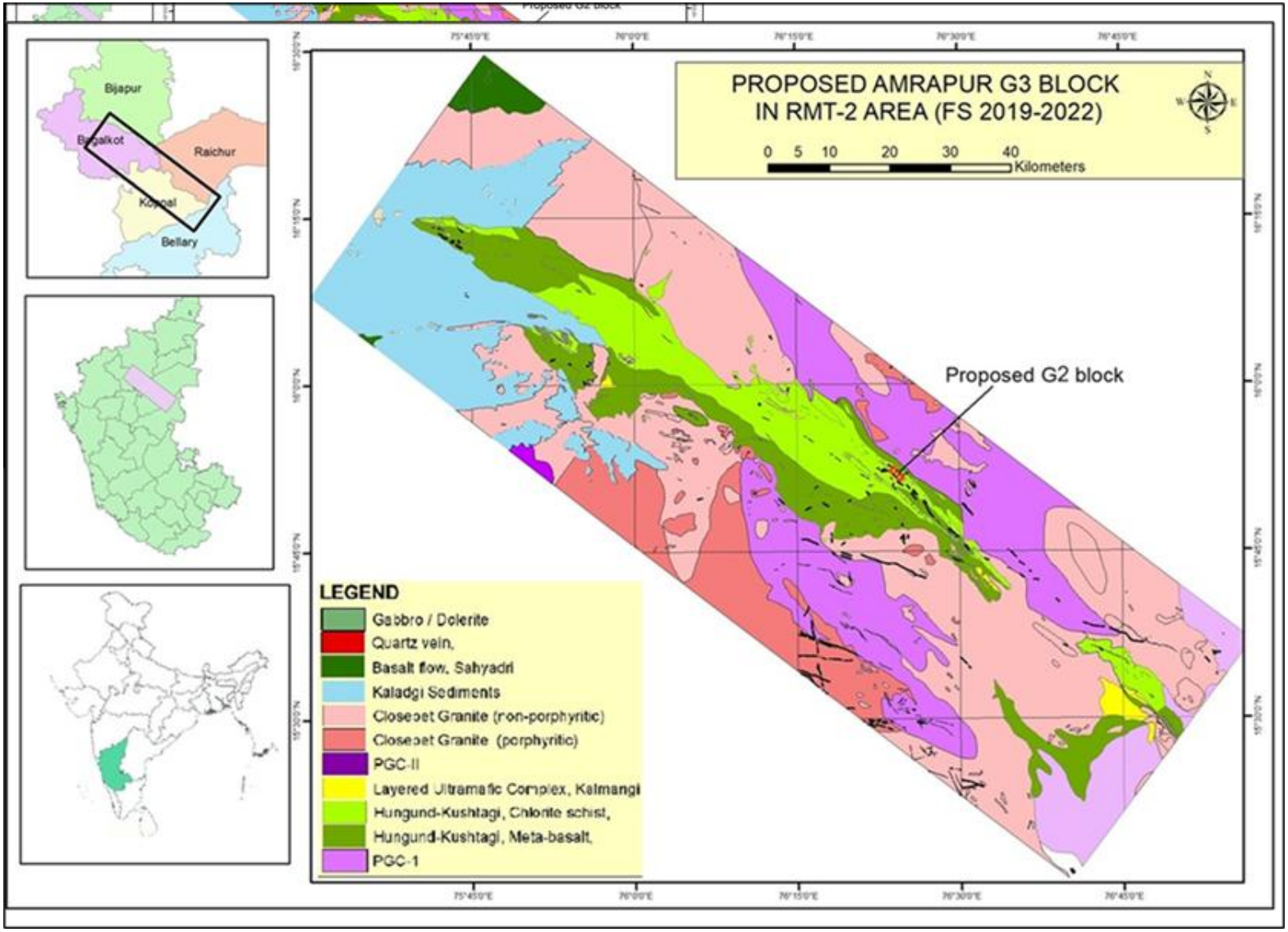

Fig. 1: Location map of proposed Amrapur West (G2) block shown over the Geological map of RMT block.

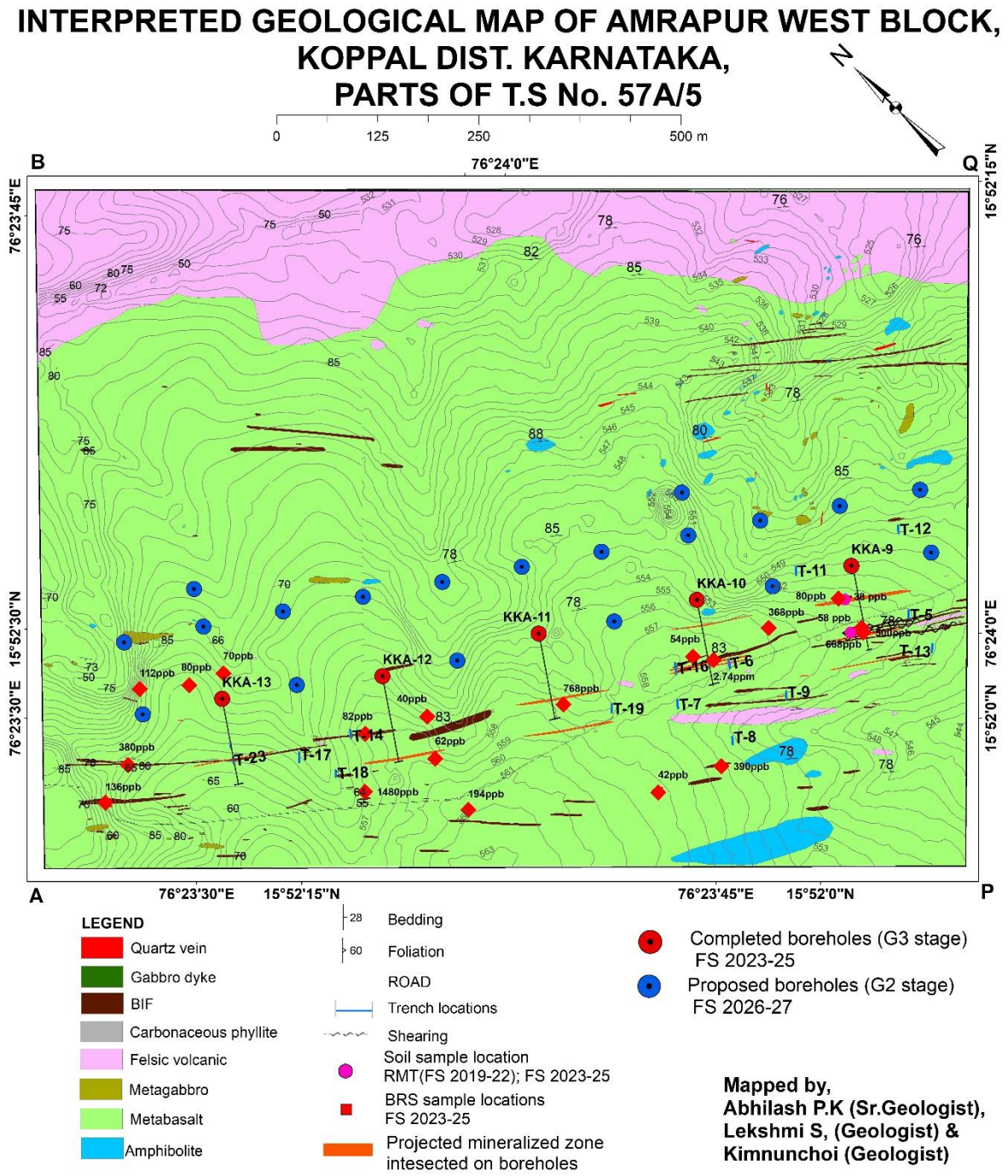

Fig. 2 Proposed Amrapur West (G2 stage) block with proposed borehole locations.

ESTIMATED COST FOR G-2 LEVEL EXPLORATION FOR GOLD AND ASSOCIATED MINERALIZATION IN AMRAPUR WEST BLOCK, HUNGUND-KUSHTAGI SCHIST BELT, EASTERN DHARWAR CRATON, KOPPAL DISTRICT, KARNATAKA **Total Area – 0.96 Sq. Km; Drilling- 3500.00m, Completion Time - 15 Months, Review: after 6 months of project initiation**							
Sl. No.	**Item of Work**	**Unit**	**Rates as per NMET SoC 4/12/2025**		**Total Cost of the Project**		**Remarks**
			SoC-Item-Sl.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	3500	**35000000**	Out-sourced/NMEDT
b	Borehole Deviation Survey by Multishift survey tool (interval 6m; azimuth and inclination to be recorded)	per shot	2.2.5	330	583	**Nil**	
c	Land / Crop Compensation (in case the BH falls in agricultural Land)	per BH	5.6	30000	19	**Nil**	
d	Construction of concrete Pillar (12"x12"x30")	per BH	2.2.7a	2000	19	**Nil**	
e	Borehole plugging with cement	per BH	2.2.8	10000	19	**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	1590	970	**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	1750	Nil	By GSI
	SUB TOTAL					**35000000**	
	Provision for GST (18%)					6300000	GST as applicable
	Total Estimated Cost with GST					**41300000**	
				or Say Rs. In Lakhs		**413.00**	