GEOLOGICAL REPORT ON

PRELIMINARY EXPLORATION (G-3 STAGE) (PHASE-I) FOR GOLD BY GEOPHYSICAL SURVEY

IN KUDREKONDA AREA (2.74 sq.km)

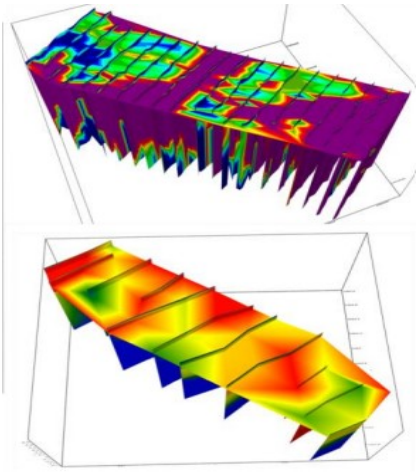
HONNALI GOLD FIELD, SHIMOGA SCHIST BELT

DISTRICT- DEVANGERE, KARNATAKA

(Under NMET Programme)

(TEXT, ANNEXURE AND PLATES)

Panoramic view of Kudrekonda Block



TDEM & MT Sections, Kudrekonda Block

A MINIRATNA-I CPSE

MINERAL EXPLORATION AND CONSULTANCY LIMITED

(Formerly Mineral Exploration Corporation Limited)

Ministry of Mines, Government of India Enterprise

An ISO 9001:2015, 14001:2015 & 45001:2018 Certified Company

CORPORATE OFFICE, NAGPUR

June, 2025

MECL

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MECL

TEXT

कुद्रेकोंडा क्षेत्र (2.74 वर्ग किमी), होन्नाली गोल्ड फील्ड, शिमोगा शिस्ट बेल्ट, जिला: दावणगेरे, कर्नाटक में सोने के लिए प्राथमिक अन्वेषण (G-3 चरण) (चरण-I) पर भूवैज्ञानिक रिपोर्ट

अध्याय-I

1.0.0 कार्यकारी सारांश

1.1.1 होन्नाली गोल्ड फील्ड दक्षिण भारत के शिमोगा शिस्ट बेल्ट का एक महत्त्वपूर्ण भाग है। कुद्रेकोंडा और पलावनाहल्ली, होन्नाली गोल्ड फील्ड की दो प्रमुख स्वर्णक्षेत्र (auriferous) ज़ोन हैं जहाँ 1880 से विभिन्न कंपनियों जैसे होन्नाली गोल्ड माइनिंग कंपनी, होन्नाली ट्रिब्यूट सिंडिकेट और पलावनाहल्ली गोल्ड माइनिंग कंपनी द्वारा भूमिगत खनन कार्य हुआ। कुद्रेकोंडा क्षेत्र में अधिकतम 80 मीटर गहराई तक शाफ्ट द्वारा खनन किया गया। इन कंपनियों द्वारा किए गए अन्वेषण कार्यों में लोड्स का अत्यधिक अनियमित व्यवहार सामने आया, जिसके चलते खनन कार्य बाद में रोक दिए गए।

1.1.2 भूतकाल में तेज खनन गतिविधियों, भूमि प्रवर्तन और खेती के लिए संशोधन ने क्षेत्र में खनिजकरण के कोई निशान नहीं छोड़े हैं।। कम आउटक्रॉप घनत्व, मोटी मिट्टी की परत और सघन खेती के कारण छिपे हुए अयस्क निकाय की स्थिति को समझना कठिन हो गया है।

1.1.3 इन भूवैज्ञानिक अनिश्चितताओं को संबोधित करने के लिए,MECL ने कर्नाटक राज्य के दावणगेरे जिले के कुद्रेकोंडा ब्लॉक में NMET फंडिंग के अंतर्गत गोल्ड के लिए प्रथमिक अन्वेषण (G-3 स्तर) (प्रथम चरण) कार्य शुरू किया है, जिसमें ग्राउंड जियोफिजिकल सर्वे द्वारा गहराई में स्वर्णक्षेत्र ज़ोन की पहचान एवं स्थिति ज्ञात करने का उद्देश्य है।

1.1.4 कुद्रेकोंडा ब्लॉक क्षेत्र 2.74 वर्ग किमी में फैला है, जो कि सर्वे ऑफ इंडिया टोपोशीट नंबर 48N/12 में आता है,लगभग 3 किमी पश्चिम में नयामती और 20 किमी दक्षिण-पश्चिम में हन्नाली, कर्नाटक के दावणगेरेजिले में।।

1.1.5 इस प्रथमिक अन्वेषण कार्य (G-3 स्तर) में स्वीकृत कार्य की मात्रा अनुसार ग्राउंड जियोफिजिकल सर्वे, 2.74 वर्ग किमी क्षेत्र में विस्तृत भूगर्भीय मानचित्रण (1:1000 पैमाने) के साथ स्थलाकृतिक सर्वेक्षण, सतही नमूना संग्रह (30 बेडरॉक/चैनल सैंपल), गोल्ड एवं 34 तत्वों की ICP-MS पद्धति से विश्लेषण, साथ

ही पेट्रोलॉजिकल और मिनिरोग्राफिक अध्ययन सम्मिलित थे। ग्राउंड जियोफिजिकल सर्वे में 360 TDEM (Time Domain Electromagnetic) साउंडिंग और 36 मैग्नेटोटेल्यूरिक (MT) स्टेशनों का सर्वे किया गया। हालांकि स्थानीय ग्रामीणों के विरोध के कारण डीप IP सर्वे (30 Lkm) को 25 अगस्त 2024 को रोकना पड़ा।

1.1.6 क्षेत्र की शैल संरचना धारवाड़ सुपरग्रुप के चित्रदुर्ग समूह की झंडीमट्टी संरचना से संबंधित है। अध्ययन क्षेत्र मुख्यतः मिट्टी से ढका है, जहाँ क्वार्ट्ज-क्लोराइट शिस्ट, क्वार्ट्जाइट और मेटाबेसाल्ट के बिखरे हुए आउटक्रॉप पाए जाते हैं। कुछ स्थानों पर पतली क्वार्ट्ज शिराएँ इन संरचनाओं में घुसी हुई हैं। खेती और मिट्टी की मोटी परत के कारण आउटक्रॉप की दृश्यता सीमित है।

1.1.7 इस क्षेत्र में सोने का खनिजकरण शीयर ज़ोन में क्वार्ट्ज-कार्बोनेट शिराओं में पाया जाता है, जो मेटाबेसाल्ट के साथ संबंधित है। खनिजकरण अपजनक प्रकृति का है और यह पायराइट और आर्सेनोपायराइट जैसे सल्फाइड ले जाने वाली क्वार्ट्ज कार्बोनेट वेनों तक सीमित है, जो कतरनों के क्षेत्र में स्थित हैं। शीयरिंग और वॉल रॉक में सेरिसिटाइज़ेशन, क्लोरिटाइज़ेशन, टूमलीनाइज़ेशन और फुच्सिटाइज़ेशन प्रमुख परिवर्तन हैं। पुराने शाफ्ट जैसे नॉर्थईस्टर्न और टर्नबुल शाफ्ट अब भी वहाँ स्थित हैं। शैल इकाइयों और शाफ्ट की दिशा के अनुसार खनिजकरण का रुझान N40°W-S40°E है। पहले के रिपोर्ट में उल्लिखित टर्नबुल रीफ अब मौजूद नहीं हैं, संभवतः पूर्व की तीव्र खनन गतिविधियों और कृषि कार्यों के कारण।

1.1.8 ग्राउंड जियोफिजिकल सर्वे (TDEM एवं MT) द्वारा क्षेत्र में गहराई में सोना युक्त अयस्क ज़ोन की उपस्थिति को खोजा गया। इन सर्वे ने स्वर्णक्षेत्र सल्फाइड/होस्ट रॉक और अन्य लिथोलॉजी के बीच प्रतिरोधिता के आधार पर भिन्नता दर्शाई। दोनों सर्वेक्षणों के परिणाम यह दर्शाते हैं कि खनिज-नियंत्रित संरचनाओं का विस्तार, जो अध्ययन क्षेत्र के उत्तर और दक्षिण में दो स्थानों पर 400-450 मीटर की गहराई तक बना रहता है, मध्यम निम्न से मध्यम उच्च प्रतिरोधकता के साथ है। कम प्रतिरोधता वाले क्षेत्र (0–100 मीटर गहराई) में पुराने शाफ्ट एवं भूमिगत कार्यों की उपस्थिति के संकेत मिले। दोनों विसंगतियाँ स्वतंत्र और असतत प्रकृति की हैं।

1.1.9 जियोफिजिकल सर्वे से यह निष्कर्ष निकला कि TDEM और AMT विधियाँ कुद्रेकोंडा ब्लॉक में स्वर्ण सल्फाइड्स एवं होस्ट रॉक्स की पहचान के लिए प्रभावी और उपयुक्त हैं। ये विधियाँ गहराई में खनिज संसाधनों की खोज के लिए प्रारंभिक भूगर्भीय जानकारी प्रदान कर सकती हैं। हालांकि सोना ppm स्तर में पाया जाता है, इसलिए जियोफिजिकल विधियों का उपयोग होस्ट रॉक एवं अनुकूल संरचनाओं को लक्षित करने हेतु किया जाता है। धातु यदि ppm स्तर में है, तो उसे सीधे जियोफिजिकल विधियों द्वारा नहीं पहचाना जा सकता।

1.1.10 MECL द्वारा जन-जागरूकता कार्यक्रम एवं कर्नाटक खनन एवं भूविज्ञान विभाग के सहयोग से स्थानीय ग्रामीणों से संवाद करने के प्रयासों के बावजूद जियोफिजिकल सर्वे का विरोध जारी रहा। इसके कारण डीप IP सर्वे बाधित हुआ और अंततः रोक दिया गया। सामुदायिक आपत्तियाँ हल नहीं हो सकीं, जिससे क्षेत्र में आगे का फील्ड कार्य निलंबित हो गया।

1.1.11 इस परियोजना की स्थिति की समीक्षा 30 अप्रैल 2025 को आयोजित 76वीं TCC बैठक में की गई। MECL ने वर्तमान परिस्थितियों में आगे कार्य संभव न होने की सूचना दी। विस्तृत चर्चा के पश्चात समिति ने परियोजना की सीमाओं को स्वीकारते हुए रिपोर्ट जमा करने की अंतिम तिथि 25 जून 2025 तय करते हुए इसे औपचारिक रूप से बंद करने का निर्णय लिया।

1.2.0 सिफारिशें:

TDEM और MT सर्वे डेटा के संयुक्त विश्लेषण के आधार पर दो पहचानी गई विसंगतियों (जो पुराने शाफ्ट क्षेत्रों के अंतर्गत आती हैं) को डीप IP सर्वे और गहरे ड्रिलिंग द्वारा सत्यापित करने की सिफारिश की जाती है। कुल चार बोरहोल प्रस्तावित हैं – तीन उत्तरी विसंगति क्षेत्र में और एक दक्षिणी क्षेत्र में – जिनकी गहराई 250 से 350 मीटर तक होगी।

यह भी अनुशंसा की जाती है कि प्रस्तावित अन्वेषण गतिविधियाँ केवल स्थानीय ग्रामीण समुदाय की सहमति प्राप्त करने और कानून व्यवस्था से संबंधित मुद्दों के समाधान सुनिश्चित करने के पश्चात ही की जाएं, क्योंकि वर्तमान अन्वेषण कार्य स्थानीय विरोध के कारण निलंबित कर दिया गया था।

GEOLOGICAL REPORT ON PRELIMINARY EXPLORATION (G-3 STAGE) (PHASE-I), FOR GOLD IN KUDREKONDA AREA (2.74 sq.km.) HONNALI GOLD FIELD, SHIMOGA SCHIST BELT, DISTRICT: DAVANAGERE, KARNATAKA

CHAPTER-I

1.0.0 EXECUTIVE SUMMARY

1.1.1 The Honnali gold field forms an important part of Shimoga Schist Belt of southern India. Kudrekonda & Palavanahalli form the two major auriferous zones of Honnali gold fields which were known for historical underground mining by various companies floated under different names like Honnali Gold mining Company, Honnali Tribute Syndicate and Palavanahalli Gold Mining Company since 1880. The mining work through shafts has been carried out at maximum 80 m depth in Kudrekonda area. The exploratory works done by these companies revealed a highly erratic behaviour of the lodes and subsequently mining activities were stopped.

1.1.2 Intense mining activity in the past, land enforcement and modification for cultivation has left no traces of mineralisation in the area. Poor outcrop density, thick soil cover and dense cultivation in the area makes it difficult to understand the disposition of concealed ore body and it is still unrevealed.

1.1.3 To address these geological uncertainties, MECL has taken up Preliminary Exploration (G-3 stage) (Phase-I) for Gold by Ground Geophysical Survey in Kudrekonda Block, Davanagere District of Karnataka under NMET funding to identify and locate deeper level extensions of auriferous zones in the area.

1.1.4 The Kudrekonda Block area covering 2.74 sq.km. located in Survey of India Toposheet No. 48N/12, approximately 3 km west of Nyamati and 20 km south west of Honnali in Davanagere District of Karnataka.

1.1.5 The present Preliminary Exploration (G-3 stage) work as per the approved quantum included Ground Geophysical survey, Detailed geological mapping (1:1000 scale) along with topographical survey over 2.74 sq.km area surface sampling (30 Nos. bedrock/channel samples) and analysis for Gold and 34 Element analysis by ICP-MS method along with

petrolographic and mineragraphic studies. Ground Geophysical survey comprising of TDEM (Time Domain Electromagnetic Survey) of 360 soundings and Magneto telluric (MT) Survey 36 stations over 2.74 sq.km. area completed. However, Deep I.P. survey (30 Lkm) could not be executed due to local village people opposition and survey work was stopped on 25th August, 2024.

1.1.6 The rock formations of the area belong to Jhandimatti Formation belonging to Chitradurga Group of the Dharwar Supergroup. The study area predominantly covered by soil with scattered exposures/outcrops of quartz-chlorite schist, quartzite and Metabasalt. Thin quartz-veins intrude these formations at places. Due to extensive agricultural modification and soil cover, outcrop visibility is limited.

1.1.7 Gold mineralisation in the area is associated with the sheared metabasalt carrying quartz-carbonate veins. The mineralization is epigenetic in nature and it is confined to quartz carbonate veins carrying sulphides like pyrite and arsenopyrite, emplaced along shear zones. Shearing and wall rock alteration in the form of sericitisation. chloritisation, tourmalinisation and fuchsitisation are the prominent feature associated with mineralization. Old working abandoned shafts (Northeastern shaft & Turnbull shaft) located in the area. Based on attitudes of litho units and shaft positions the trend of mineralization is $N40^0W$-$S40^0E$. The mineralization in the Kudrekonda area was reportedly associated with the 'Turnbull Reef. The major mineralized quartz reefs mentioned in the previous reports no more exist on the ground as per the current observation possibly due to intense mining activities in the past and land modifications/disturbance for farming.

1.1.8 The Ground Geophysical survey work comprising of TDEM & MT survey carried out in the area to identify deeper extensions and location of gold bearing ore zones in depth. Ground Geophysical survey has clearly differentiated between the auriferous sulphides /host rocks and surrounding litho units by their differences in resistivities. The results of both the surveys show the extension of ore-controlling structures, which persists upto a depth of 400– 450m at two locations in north and south of the study area with moderate low to moderate high resistivity. Low resistivity zones observed at shallow depth (0-100mts) indicate the presence of abandoned shafts & underground old workings filled with saturated debris/voids. Both identified anomalies are independent and discontinuous in nature.

1.1.9 The Geophysical survey results indicated that the TDEM and AMT method is effective and feasible in detecting the distribution of auriferous sulphides and the host rocks in the kudrekonda block. It can provide basic geological information for deep resource exploration. These methods can be used as an available exploration technology for deep prospecting in similar areas. However, gold mineralisation occurs in ppm level, therefore, geophysical methods for gold exploration are planned to target the host/repository rock and favourable structures. Any metal occurring in ppm level cannot be picked by geophysical methods.

1.1.10 Despite MECL's efforts to conduct public awareness programs and engage with local authorities and the Department of Mines and Geology, Karnataka, local villagers continued to oppose the geophysical survey work. Their resistance led to disruption and eventual suspension of the Deep IP survey component. Community objections remained unresolved, resulting in suspension of further field investigations in the area.

1.1.11 The project's status was reviewed in the 76th TCC meeting held on April 30, 2025. MECL reported that no further activities could proceed under the prevailing circumstances. After detailed discussions, 76th TCC-1 committee noted the limitations in the project and agreed to formally close the project following the submission of the Report by June 25, 2025.

1.2.0 RECOMMENDATIONS:

Based on combined Ground Geophysical Survey of TDEM & MT survey data, it is recommended to validate identified two geophysical anomaly zones (falling within the old working shafts) by further Deep I.P. geophysical survey as well as by deep drilling. Total four boreholes proposed (03 Boreholes in Northern Anomaly zone & 01 Borehole in Southern Anomaly zone) to test the integrated geophysical anomalies up to vertical depth from 250m to 350m from ground surface.

It is further recommended that the proposed exploration activities be undertaken only after obtaining the consent of the local village community and ensuring resolution of law-and-order issues, as present exploration work was suspended due to local agitation.

CHAPTER-II

2.1.0 DETAILS OF THE QUALIFIED PERSON(S) / EXPLORATION AGENCY

(To be provided separately for all the qualified persons signing of the report)

Table No 2.1
Details of exploration agency involved during exploration work

TITLE	DETAILS
(a) Name:	Mineral Exploration and Consultancy Limited (Formerly Mineral Exploration Corporation Limited) (A Govt. of India Enterprise; A Miniratna-I PSE) (Ministry of Mines, Govt of India)
(b)Communication Address:	Dr. Babasaheb Ambedkar Bhawan, Highland Drive Road, Seminary Hills, Nagpur-440006.
(c) Contact Mobile No:	0712-2510289, 0712-2511829
(d) E-Mail id:	cmd@mecl.gov.in gm-exploration@mecl.gov.in
(e) Qualification of Technical Personnel	M.Sc. Geology/ Applied Geology
(f) Experience:	Professionals have more than 30+ years of experience
(g) Affiliation to any organization/company, if yes, specify the name of the organization or company.	A Govt. of India Enterprise; A Miniratna-I PSE Ministry of Mines, Govt. of India

2.2.0 DETAILS OF PERSONS ASSOCIATED WITH VARIOUS ASPECTS OF EXPLORATION ASSESSMENT OF RESOURCES AND RESERVES

2.2.1 The list of personnel associated with the execution of different exploration activities carried out in Kudrekonda Block (G-3), District: Davanagere, Karnataka given in the following **Table No-2.2.**

Table-2.2
List of Person(s) associated with the Exploration Work

S No.	Title	Name of the Personnel
1	Overall Guidance	Shri P. Ravindran Nair, G.M (Exploration) Shri Guljar Singh Dhami, G.M. (Geological Services)
2	Overall planning, Coordination & Supervision	Shri P. Ravindran Nair, G.M (Exploration) Shri Guljar Singh Dhami, G.M.(Geological Services) Shri Pradeep Kulkarni, Retd. D.G.M. (Exploration) Shri Mohamad Dasthageer, Manager (Geology) Shri A.B.S.S. Rama Krishna, Manager (Geophysics)
3	Project Management & Field operation	Shri Anil Tiwari, Project Manager (Kumaraswamy Project) Shri A.B.B.S. Rama Krishna, Manager (Geophysics)
4	Physical Execution of Work	
	Geophysics	Shri A.B.B.S. Rama krishna, Manager (Geophysics) Shri Amrit Tiwari, Asst.Manager (Geophysics) Shri Mahindar Esampalli, Sr. Geophysicist Shri Naveen Kumar, Geophysicist Ramesh Kumar. Geophysicist
	Geology	Shri Shubham Kumar, Geologist
	Survey	Shri Biswajit Pal, Tech. Asst.(S&D)
5	Chemical Laboratory	Shri P. Ravindran Nair GM (Exploration)
		Shri Rohit Sharma, Senior Manager (Chemical)
		Dr. Deepti Rahangdale, Manager (Chemical)
		Fawaz SVP, Asst. Manager (Chemical)
6	Petrographic Studies	Shri Sayantan Pal, Manager (Geology)

S No.	Title	Name of the Personnel
7	Data Processing & Documentation	Shri A.B.B.S. Rama krishna, Manager (Geophysics) Shri Amrit Tiwari, Asst.Manager (Geophysics) Shri Mahindar Esampalli, Sr. Geophysicist
		Shri Mohammad Dasthageer, Manager (Geology) Shri Shubham Kumar, Geologist
		Shri Uday A. Patil, Sr. Operator (Computer) Shri N. C. Reddy, Sr. Operator (Computer)
8	Hindi Translation	Shri C.S. Tiwari, Senior Hindi Officer
9	Reprography and Printing	Shri Pratap Singh Negi, Asst. Survey & Map Officer, OIC
		Shri Jagdish Thakral, Retd. Survey & Map OIC
		Shri Durgesh Devarshi, Senior Technical Assistant (S & M)

CHAPTER-III

3.0.0 TITLE AND OWNERSHIP

3.1.0 TITLE OF THE REPORT

GEOLOGICAL REPORT ON PRELIMINARY EXPLORATION (G-3 STAGE) (PHASE-I) FOR GOLD IN KUDREKONDA AREA (2.74 sq.km.), HONNALI GOLD FIELD, SHIMOGA SCHIST BELT, DISTRICT: DAVANAGERE, KARNATAKA

Ownership: Government of Karnataka

Name of Prospector: MINERAL EXPLORATION AND CONSULTANCY LIMITED (Formerly Mineral Exploration Corporation Limited)

Address of Prospector: Dr. Babasaheb Ambedkar Bhavan, High Land Drive Road, Seminary Hills, Nagpur, Pin- 440006

E-mail of Prospector: cmd@mecl.gov.in; gm-exploration@mecl.gov.in

Telephone numbers of Prospector: 0712-2510289; 0712-2511829

3.2.0 DETAILS OF PERIOD OF PROSPECTING

Background Information:

3.2.1 The Honnali gold field forms an important part of Shimoga Schist Belt of southern India. Kudrekonda & Palavanahalli form the two major auriferous zones of Honnali gold fields which were known for historical underground mining by various companies floated under different names like Honnali Gold mining Company, Honnali Tribute Syndicate and Palavanahalli Gold Mining Company since 1880.

3.2.2 The mining work through shafts has been carried out at maximum 80-100m depth in Kudrekonda and 30m depth in Palavanahalli. The exploratory works done by these companies revealed a highly erratic behaviour of the lodes simulating pinching and swelling, but the values were reported to be very high. Since they were unable to understand complexity and the behaviour of the lodes, they closed their mining operations.

3.2.3 GSI has carried out exploration work in and around of Kundrekonda & Pallavanahalli area by Bruce Foote (1876), Slater (1902), Smeeth (1909), Sen (1915) and Jayaram (1915) of Department of Mines and Geology, Mysore state. Details on the work done in respect of gold exploration are obtained from the previous geological reports of Puskar Singh (1972-73), Pazhamalainathan (1983-84) and N.Subramani and Manjunath (1994-95).

3.2.4 Reconnaissance survey carried out by GSI (2016-17) in Nyamati Block (including Kudrekonda) suggests that Intense mining in the past and land enforcement has not left any traces of mineralized zone and mineralized quartz veins disposition of concealed ore body is still unrevealed. Geophysical survey by GSI (2016-17) indicated that good correlation has been observed from Magnetic, IP and Resistivity anomalies. Three zones of mineralisation have been identified.

3.2.5 Presence of old workings indicates the past mining activities in the area. Poor outcrop density, thick soil cover and dense cultivation in the area makes it difficult to understand the disposition of concealed ore body and it is still unrevealed. However, the presence of old working shafts makes the area interesting for gold exploration.

3.2.6 In view of the above, Kudrekonda block area was discussed in 55th SGPB of Karnataka and it was informed that area has undergone heliborne survey which revels that mineralisation is deep seated which should be tested through drilling which require up to 700m drilling.

3.2.7 In line with this, MECL formulated Ground Geophysical survey comprising of Time Domain Electromagnetic (TDM) survey to establish the disposition of concealed ore body and based on the outcome, exploratory drilling program may be carried out to figure out the exact potentiality of the deposit.

3.2.8 Accordingly, MECL submitted Preliminary Exploration (G-3 stage) proposal for gold in Kudrekonda-Palvanahalli area over 68.31 sq.km, Shimoga Schist belt, Dist. Devanagere of Karnataka in 46th TCC meeting held on 27th & 28th Oct 2022. After detailed deliberations, Committee opined that the north-western part of the block area i.e. Kudrekonda area (2.74 sq.km) may be considered for G3 stage Exploration (Phase-I). In case of encouraging results in north-western part the entire block may be considered for G3 stage exploration (Phase-II) for drilling. The committee

recommended the proposal for approval of EC for preliminary exploration (G3) (Phase-I) for gold in Kudrekonda area (2.74 sq.km) for geophysical survey comprising of Electromagnetic survey in Shimoga schist belt, District: Devanagere, Karnataka with an estimated cost of ₹116.99 lakh (including GST) in time schedule of 6 months for carrying out proposed work and submission of report.

3.2.9 Subsequently, the project was reviewed by 27th EC held on 10th Jan, 2023 and it was informed that Heliborne low altitude EM data is available for the area and may be considered for demarcation of potential zones and also to incorporate all the geophysical data available before start of the further geophysical survey in the area. EC suggested to put of the project in abeyance till the Heliborne survey work of GSI is completed.

3.2.10 As advised by NMET, low altitude EM data as given in the report on "Heliborne surveys (Magnetic, PTHEM & Radiometric) Data processing and Interpretation over Shimoga schist belt, Karnataka of GSI (FS. 2016-17) & Report on Interpretation & Integration of geological, remote sensing and aero geophysical data over Shimoga Schist belt (2019) was obtained by MECL from GSI and data has been utilised for the formulation of exploration proposal at G3 stage for Gold in Kudrekonda area has been re-submitted in 61st TCC meeting held on 30th & 31st Jan, 2024.

3.2.11 The project was reviewed by 61th TCC Committee and recommended it with suggestion to carryout detailed mapping on 1:1000 scale and geophysical surveys (IP, EM & MT) in the line of proposed grid pattern. The committee recommended for the approval of EC for preliminary exploration (G-3 stage) (Phase-I) for Gold in Kudrekonda area by geophysical survey, Shimoga Schist Belt, Devanagare District, Karnataka over an area of 2.74 sq.km with an estimated cost of 244.68 lakhs (including GST) within time schedule of 12 months.

3.2.12 Subsequently, the 33rd Executive Committee (E.C.) held on 19th February 2024 approved the Preliminary Exploration (G-3 stage) (Phase-I) for Gold in Kudrekonda area by geophysical survey vide Office Memorandum F.No. 23/424/2024-NMET/529, New Delhi, dated, 27th February 2024 **(Annexure No. VIII).**

Details of Period of prospecting:

3.2.13 Following the Office Memorandum (OM), MECL initiated field activities and established base camp. MECL commenced G-3 stage exploration work (Phase-I) comprising of Ground geophysical survey, Detailed geological mapping and surface sampling work on 12th May, 2024 after obtaining all necessary permissions from local authorities. Detailed Geological mapping over 2.74 sq.km. area and collection of bedrock samples (30nos.) completed 15th August, 2024. As per the approved quantum ground geophysical survey comprising of Electromagnetic survey (TDEM) 360 soundings & MT survey 36 stations completed. However, Deep I.P. survey (30 Lkm) could not be commenced due to local village people agitation and survey work was stopped on 25th August, 2024.

3.2.14 Despite continuous engagement with local authorities and community leaders, the resistance could not be resolved. As a result, MECL submitted a formal request to the Secretary, Ministry of Mines and Geology, Government of Karnataka, seeking assistance to facilitate the successful execution of the exploration programme. The issue, along with the overall progress, was discussed during the 69th TCC (26-27 Sep, 2024). Following deliberations, TCC advised MECL to process acquired TDEM & MT survey data and pursue with local authorities for completion of the project.

3.2.15 Subsequently, MECL processed TDEM & MT survey data and findings presented in 73rd TCC meeting held on 30th Jan, 2025. Following deliberations, TCC-1 committee advised MECL to submit all correspondences (action) taken chronologically to NMET and approved time extension of the project for 3 months (i.e. upto 26.05.2025).

3.2.16 Since Sep, 2024, further efforts made by MECL team in coordination with officials from the State DMG, Dist. Collector, Asst. Commissioner & Tahsildar multiple rounds of discussions and public meetings were held to address the community concerns Dist. Collector advised for a two-month deferment of the survey to allow time for further dialogue with the local population.

3.2.17 MECL further approached Dist. Collector & Asst. commissioner to resolve the matter. Asst. Commissioner advised MECL to wait until 1st week of March, 2025 while

efforts were made through the local panchayat & local minister to mediate. Unfortunately, these efforts did not yield a positive outcome.

3.2.18 In parallel, MECL Sought intervention from the Deputy Director (Planning), DMG Karnataka, who took the initiative to approach the District Collector, Davangere, and proposed organizing a public awareness programme in Kudrekonda Village.

3.2.19 The public awareness meeting was held at Kudrekonda Village at 11:00 AM on 8th April 2025, chaired by the Assistant Commissioner, Honnali & attended by Tahsildar, Nymathi, Senior Geologist -Davangere Region (DMG Karnataka), MECL officials, members of the local community, and the Local Panchayat. During the meeting, the Assistant Commissioner clarified that the project was limited to research and exploration and not related to mining operations.

3.2.20 However, the local community remained unconvinced and strongly objected, asserting that the survey was a prelude to gold mining. The situation escalated, and the gathering became hostile. The community issued a stern warning, stating that anyone entering the village for survey work would do so at their own risk and demanded immediate cessation of the meeting. As a result, the awareness programme had to be prematurely concluded without success.

3.2.21 Intimation regarding the status of Kudrekonda Block along with chronological events given to the Director, NMET Secretariat vide letter. No. MECL/EXPL/File/NMET/2025-26/68 dated 21/04/2025. (**Annexure No. VII**).

3.2.22 The project's status was reviewed in the 76th TCC meeting held on April 30, 2025. MECL reported that no further activities could proceed under the prevailing circumstances. After detailed discussions, 76th TCC-1 committee noted the limitations in the project and agreed to formally close the project following the submission of the Report by June 25, 2025.

3.2.23 The Geological Report was peer reviewed by Dr. P.R. Golani, Dy, Director General, GSI (Retd.). Comments/suggestions of peer reviewer have been attended and incorporated in the final Geological Report (Annexure IX). The final review of the project presented in 78th TCC-I committee of NMET held between 26th, 27th & 30th June, 2025 and committee advised to submit the report.

CHAPTER-IV

4.0.0 DETAILS OF THE AREA UNDER STUDY

4.1.0 LOCATION OF THE BLOCK

4.1.1 The Kudrekonda Block area lies in part of Survey of India Toposheet No. 48N/12, which covers an extent of 2.74 sq.km. The block lies in the jurisdiction of Honnali Tahsil of Davanagere District of Karnataka. Kudrekonda village is located south eastern boundary of the block area. The block is bounded by latitudes 14° 07' 55.47" to 14°09' 25.07" N and longitudes 75°31'15.24" E to 75°32'39.76" E. The Co-ordinates of the corner points of the block area both geodetic and UTM are given in below **Table 4.1**. The location map of the block is furnished as **Text Fig No-1** as well as **Plate No-I.**

Table-4.1
Co-ordinates of Corner Points of the block boundary of Kudrekonda Block. Davanagere District, Karnataka

Block Corner Cardinal points	WGS 84 (DD MM SS)		UTM WGS 84 (Zone-43P)	
	Latitude	Longitude	N	E
A	14°09' 06.05"	75°31'15.24"	556215.991	1564564.007
B	14°09' 25.07"	75°31'41.86"	557012.709	1565150.133
C	14° 08' 15.76."	75°32'39.76"	558753.388	1563024.734
D	14° 07' 55.47"	75°32'14.40"	557994.505	1562399.624

4.2.0 ACCESSIBILITY TO THE BLOCK

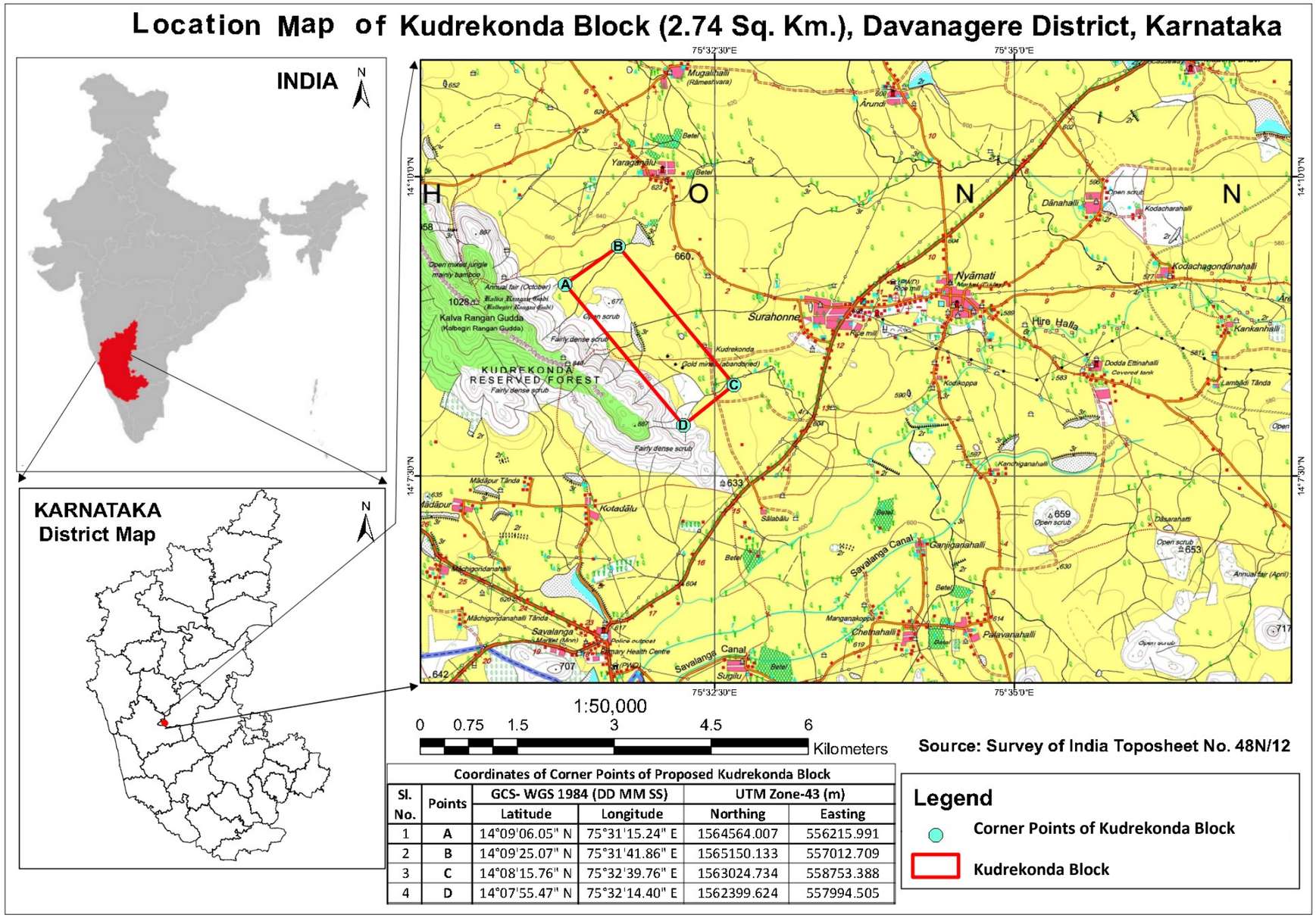
4.2.1 Kudrekonda block is situated about 70 km south west of Davanagere, 30 km north of Shimoga (Shivamogga) and 20 km south west of Honnali. The nearest town/village is Nyamati located about 3 km east of the block area. The block area is accessible through a combination of road and rail networks from the nearest towns and cities.

4.2.2 Motorable/ metalled roads are available in and around the area to approach the villages. The interior parts of the block area are connected by tar, semi-metalled/un-metalled roads. On

the whole, the area is easily accessible by vehicle except few localities where the area is occupied by intense cultivation. The area is approachable from Honnali, Davanagere (District headquarter), Shimoga and Bengaluru by road SH-26 (Shimoga -Honnali-Hospet) to Honnali and Shimoga. SH-57 (Shimoga-Shikarpur) passes nearby the block area and help to connect the area with Shikaripura, Kumsi and Harnahalli.

4.2.3 The nearest railway station is Shivamogga (30km) and Davanagere (70km) on Bengaluru-Arsikere-ubli line. The nearest airport is at Shivamogga (40km), Hunnali (160km) and Kempegowda International Airport, Bengaluru located around 340km from the block area.

Text Figure-1: Location Map of Kudrekonda Block, Davangere District, Karnataka.



Coordinates of Corner Points of Proposed Kudrekonda Block

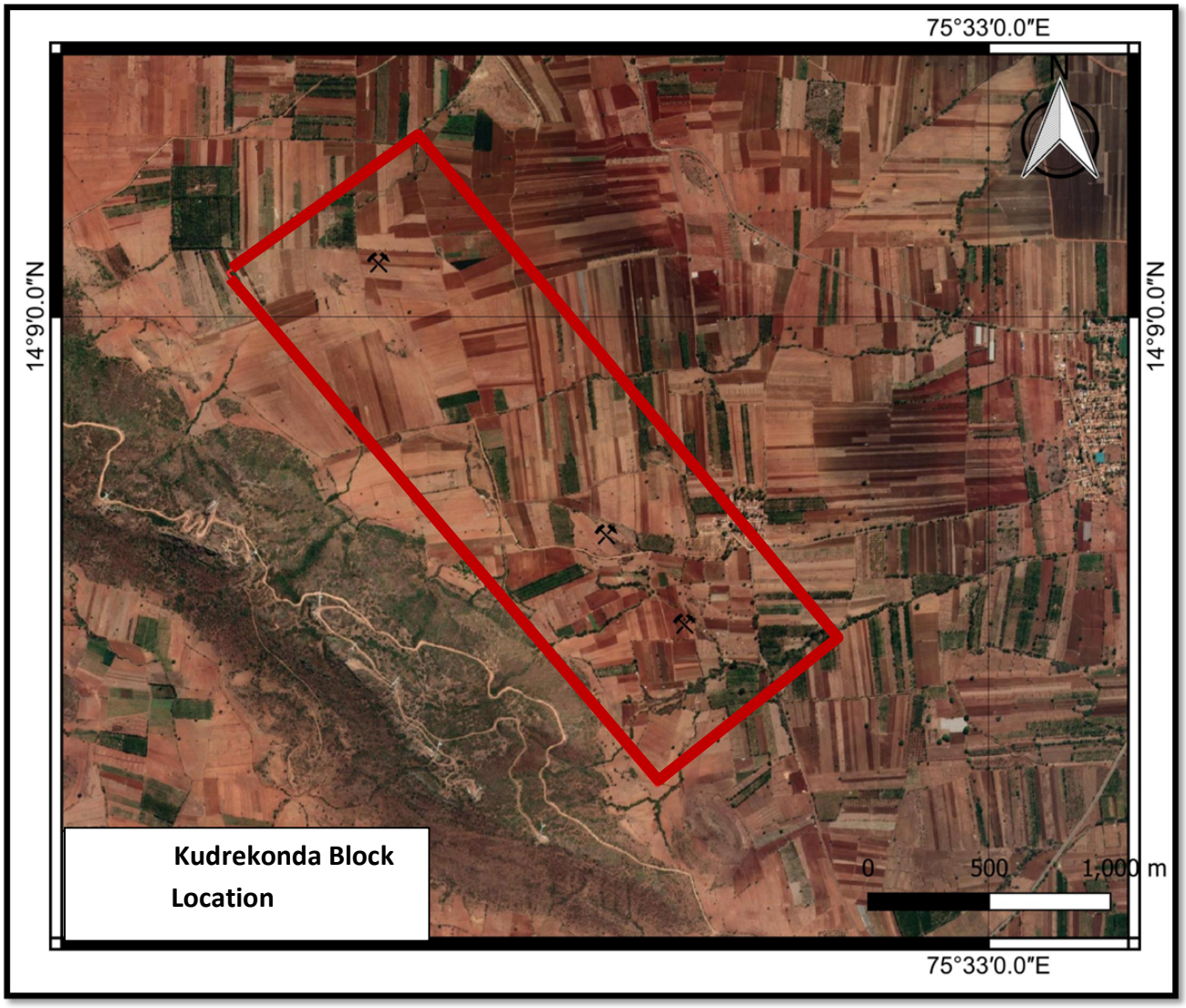
Sl. No.	Points	GCS- WGS 1984 (DD MM SS)		UTM Zone-43 (m)	
		Latitude	Longitude	Northing	Easting
1	A	14°09'06.05" N	75°31'15.24" E	1564564.007	556215.991
2	B	14°09'25.07" N	75°31'41.86" E	1565150.133	557012.709
3	C	14°08'15.76" N	75°32'39.76" E	1563024.734	558753.388
4	D	14°07'55.47" N	75°32'14.40" E	1562399.624	557994.505

4.3.0 DETAILS OF THE AREA WITH LAND USE

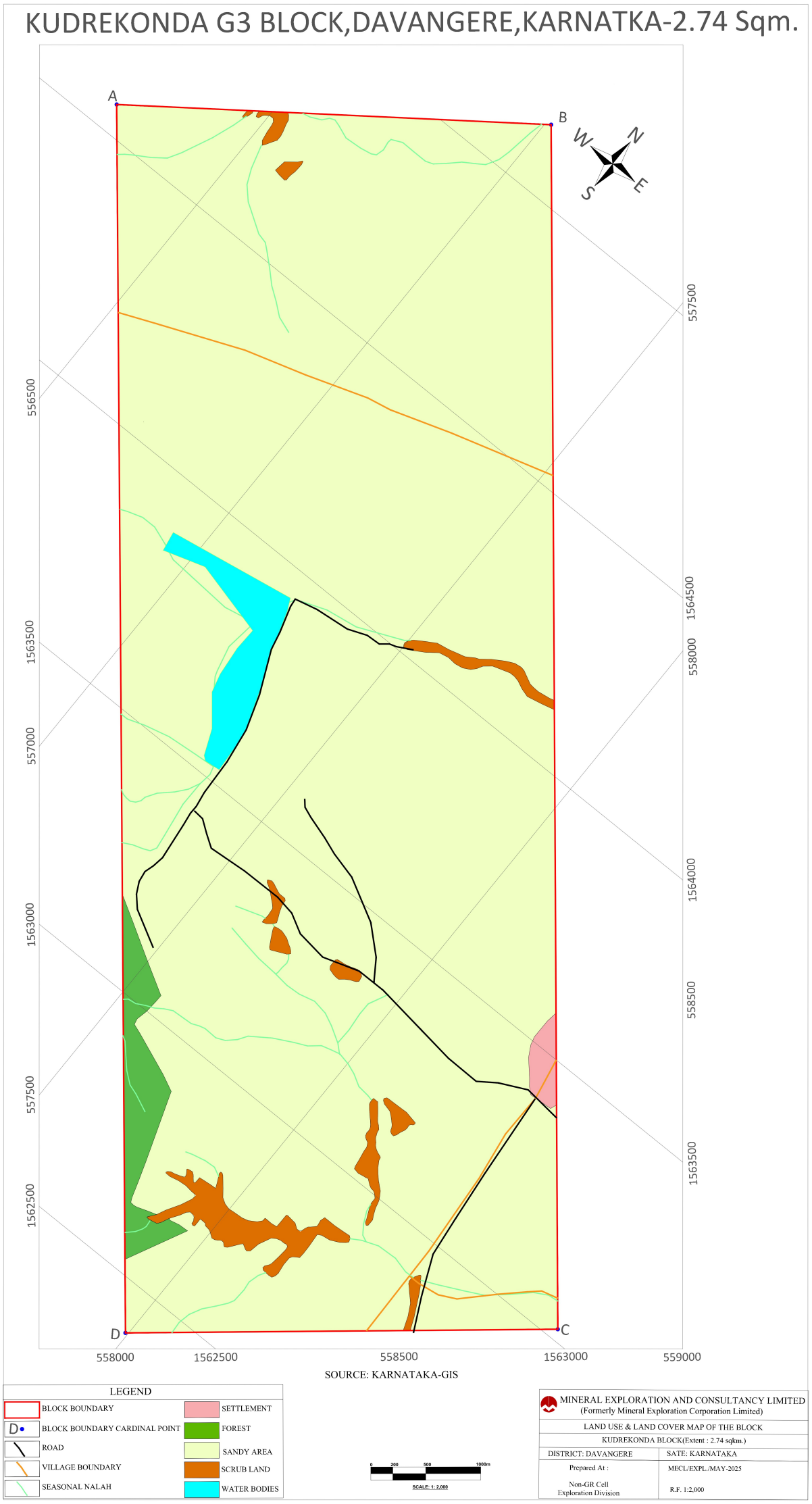
4.2.1 The majority parts of the study area is soil covered, highly cultivated and with scanty outcrops at places. The block area occupies the foot hills of NW-SE trending Kudrekonda hill ranges and the south western corner of the block area marginally shares the boundary of Kudrekonda Reserve forest area. Cadastral details and land details (government, private and forest) of the area are not available. Major part of the area is under intense cultivation. Paddy, ragi, maize and jowar are grown in and around Kudrekonda village. Majority of cropped area is under food crops. Cash crops such as sugarcane, onion, chilly, cotton and plantation crops i.e., arecanut, Neem trees, Tamarind trees and coconut are also grown at some places. As per available land use and land cover map of the block area sourced from Karnataka-GIS the major portion of block area covered by soil cover (sandy area) with intense cultivation with scattered scrub lands and forest cover on south western part of the block area. Water body located in the central part of the block area. Settlement on south eastern part of the block area represent Kudrekonda village. Old working abandoned shafts located within the block area. Satellite imagery sourced from Google Earth and land use and land cover map (LULC) of the block of the study area (Source-Karnataka-GIS) is furnished as **Text Figure No-2 and Text figure No-3** respectively.

4.4.0 MINERAL(S) UNDER INVESTIGATION

4.4.1 Kudrekonda block (2.74 sq.km.) was explored for Gold mineralisation at G3 Stage (Phase-I) by during present investigation.



Text Figure-2: Location Map of Kudrekonda Block on satellite imagery



TextFigure-3: Land use and Land cover Map of Kudrekonda Block, District- Davanagere, Karnataka

CHAPTER-V

5.0.0 PHYSIOGRAPHY AND ENVIRONMENT

5.1.0 RELIEF OF THE AREA WITH MINIMUM AND MAXIMUM ELEVATION, DRAINAGE PATTERN, NATURAL WATER COURSES, RESERVOIRS, ETC.

5.1.1 The major portion of the area is covered by plain land and highly upgraded due to agricultural activities. Only south western side of the area has undulating to rugged topography which passes through foot hills of a linear ridge Kalvirangangudda having maximum elevation of 680m from MSL in south western margin of the block whereas southeaster margin has lowest evaluation of 624m from MSL.

1.3.2 The area is drained by few of NE flowing streams originating from the northern slopes of the Kalvarangan Betta. These streams pass through the auriferous zones and join with the east flowing Hire Halla, a major tributary to the Tungabhadra River.

1.3.3 The drainage pattern in hilly area parallel to sub parallel and other parts of drainage pattern is dendritic to sub dendratic in nature. Savalanga canal passes approx. 1.5 km south from the block.

5.2.0 ROADS, RAILWAY TRACK, ELECTRIC TRANSMISSION LINE, TELEPHONE LINE, ETC.

5.2.1 Kudrekonda village is accessible from Nyamati and Honnali by road. The interior block area is accessible by unmetalled/katcha roads. No major roads (National/State Highways), railway tracks and power transmission lines exist in Kudrekonda Block area except village apprach roads

5.3.0 HOST POPULATION (LOCAL TRIBES), HUMAN SETTLEMENTS WITHIN AND NEARBY THE AREA

5.3.1 s per the Census of India 2011, Davangere district had a total population of 1,945,497, with 986,400 males and 959,097 females. The district recorded an average literacy rate of 75.74%, showing no change from the 2001 figure. Literacy

among males stood at 82.40%, while among females it was 68.91%, reflecting a persistent gender gap in educational attainment.

5.3.2 The overall sex ratio of Davangere district improved slightly from 952 females per 1000 males in 2001 to 972 in 2011. The child sex ratio (0–6 years) also showed minor improvement, rising from 946 to 948 girls per 1000 boys during the same period. These figures compare favorably with the national average of 940 as per the 2011 Census.

5.3.3 In 2011, a total of 298 families in Davangere district were reported to be living without any roof cover, either on the footpaths or in open areas. These households accounted for 1,175 people, representing approximately 0.0604% of the district's total population.

5.3.4 Urban regions in Davangere district were home to 32.33% of the population (629,010 people). Among them, males numbered 318,133 and females 310,877. The urban sex ratio stood at 977 females per 1000 males, and the child sex ratio was 952. The 0–6 age group population in urban areas was 69,961 (35,842 boys and 34,119 girls), making up 11.27% of the urban population. Urban literacy was high at 84.02%, with male literacy at 88.19% and female literacy at 79.77%. A total of 469,717 people in urban areas were literate.

5.3.5 Total 67.67% lives in rural areas (total: 1,316,487). Rural sex ratio: 970; child sex ratio: 946; rural literacy: 71.77%. Gender wise, male and female literacy stood at 79.63 and 63.69 percent respectively. In total, 838,823 people were literate of which males and females were 471,688 and 367,135 respectively.

5.3.6 The details of the Population Census 2011, of Davanagere District are given in **Table-5.1.**

Table-5.1: Census Data of Davanagere district, Karnataka

Description	Urban	Rural
Total Population	629,010	1,316,487
Population (%)	32.33 %	67.67 %
Male Population	318,133	668,267

Description	Urban	Rural
Female Population	310,877	648,220

(Source: www.census2011.co.in)

5.4.0 SOCIO DEMOGRAPHIC PROFILE OF THE AREA AND NEARBY

5.4.1 The total population of Davangere district was 1,945,497 in 2011, compared to 1,790,952 in 2001. The district experienced a population growth of 8.63% during the decade. In 2001, the population growth was 14.86% compared to 1991. The district made up 3.18% of the total population of Karnataka in 2011. As per language data from the 2011 census, Kannada was the predominant language spoken by 77.27% of the population, followed by Urdu (13.87%), Telugu (3.03%), Lambadi (3.01%), and Marathi (1.04%).

5.5.0 HISTORICAL SITES AND ARCHAEOLOGICAL MONUMENTS, PLACES OF WORSHIP, PUBLIC UTILITIES ETC.

5.5.1 Davangere, from Chitradurga, Shimoga, and Bellary, has sites like Kundwada Lake, Harihar Temple, Shantisagar, and antelope sanctuary at Jagalur (77.23 sq.km). Tungabhadra River borders multiple taluks.

5.5.2 Santhebennur Pushkarani is a well-known architectural sacred pond.

5.5.3 Shantisagara (27 sq.km) is Asia's second largest lake; built in 11th/12th century. Veerabhadreshwara Temple, Kali Temple, Sri Siddheshwara Temple and Sri Krishna temple are major temples near Shantisagara.

5.5.4 Religious places include several temples and a mosque across Davangere.

5.5.5 P Nyamati has schools, colleges, health center, banks, post office. Kudrekonda has primary schools.

5.5.6 Davangere town has main government hospital, private healthcare, banks, hotels, market, and infrastructure.

5.6.0 FORESTS, SANCTUARIES, NATIONAL PARK AND WILD LIFE SANCTUARIES ETC.

5.6.1 The block area occupies the foot hills of NW-SE trending Kudrekonda hill ranges and the south western corner of the block area is marginally shares the boundary of Kudrekonda Reserve forest area.

5.6.2 No national parks and wild life sanctuaries exist within Kudrekonda block area and in its proximity.

5.7.0 FLORA AND FAUNA

5.7.2 The common species of flora in and around the area include crepe myrtle (lanceolata), kadam, thaasal (tiliaefolia), simpoh (pentagyna), teak, kindal, In dian-laurel, rosewood, Indian kino tree, fig tree, mangosteen, Kydia calycina, indigo, toddy palm, Ceylon oak, jalari, jamba tree, slow match tree, thorny bamboo and clumping bamboo, Mathi, Honne, Nandi and Tadasalu. Kalviranggudda RF (extreme south western part of block area) include wide variety of species such as bamboo, teak, sandal wood, eucalyptus, cashew tree, and shrubs.

5.7.3 Fauna found in and around the area include jungle cat, jackal, wild dog, mouse deer, common langur, bonnet macaque, slender loris, small Indian civet, common palm civet, pangolin, porcupine and squirrel.

5.8.0 WATER BODIES SUCH AS RIVER, NALA, STREAM, RESERVOIR, ETC

5.8.1 There is dendritic pattern of drainage forming few seasonal nalas in the flat areas within the block with one water body (pond) located in the central part of the block area. The existing pond is being used for irrigation. No major Rivers, reservoir exist in the area.

5.9.0 CLIMATIC CONDITIONS

5.9.1 The study area experiences a semi-arid zone with a dry climate. The temperature ranges from minimum 17.5°C during January to maximum of 44°C during May. The Taluk is known for its hot summer and dry weather, persists for a major part of the year from the end of February to the beginning of June. The cold weather starts

with the recession of south-west monsoon in November and lasts till the end of February. The days during winter season are pleasant and nights are cold. Fog in the morning is common during the winter months.

5.9.2 The area receives an average rain fall about 60 cm through the south-west monsoon, beginning from the first week of June till October. Maximum rainfall is received during the months of August and September.

5.10.0 OTHER PHYSIOGRAPHIC, SOCIAL AND ENVIRONMENTAL FACTOR

5.10.1 Kudrekonda, in semi-arid central Karnataka, has loamy soils and moderate climate with seasonal rainfall, mainly during the monsoon months. Socially, Kudrekonda village reflects a typical rural set up with a close-knit agrarian community, where agriculture and allied activities form the backbone of the local economy.

5.10.2 The Kudrekonda area forms the part of Honnali gold field and were known for historical underground mining by various companies since 1880. Old working abandoned shafts located in the area.

5.10.3 Environmentally, the area faces challenges such as water scarcity during dry months but it benefits from traditional farming practices and community.

CHAPTER-VI

6.0.0 INFRASTRUCTURE

6.1.0 LOCAL INFRASTRUCTURE WITH ROADS, RAILWAYS, PORT FACILITIES, ELECTRICITY, WATER ETC. WITH DISTANCE FROM THE AREA. DETAILS OF NEABY INDUSTRIES IN THE AREA WHICH MAY USE THE MINERAL COMMODITY LIKELY TO BE MINED.

6.1.1 Davanagere district has a population density of 333 per sq. km (2001), higher than Karnataka's average of 276. The land is largely used for agriculture (59.49%), with uncultivated (14.12%) and forest areas (13.68%). Iron, manganese, quartz, and limestone are notable mineral reserves. The district has two perennial rivers (Tungabhadra and Sasalahalla), 411 minor tanks, and Shantisagara lake. Educational institutions include over 2,000 schools and several colleges. Healthcare infrastructure comprises 62 PHCs and 8 major hospitals. Davanagere is well connected by road via NH-48, NH-13. Harihar- Davangere rail line connects it to Bangalore-Goa and Mumbai. It has high accessibility on Air with 4 international and 2 domestic airports while the Karwar, Mangaluru (Mangalore) and Goa Port aid connectivity across sea. (www.davanagere.nic.in)

CHAPTER-VII

7.0.0 GEOLOGY

7.1.0 REGIONAL GEOLOGY

7.1.1 The Shimoga schist belt occupies a major part on the western side of the Karnataka State, which is a part of the Dharwar Craton. It forms the main extent of the schistose rocks deposited within the middle part of the larger Shimoga basin. To the south lies the Bababudan belt and to the west the Kudremukh belt while the central region forms the Shimoga belt. It is a NW-SE trending broad arcuate belt, covers an area of 25,000km^2 and extends from Tarikere valley in the south to Rathnagiri in Maharashtra. It is separated from Bababudan and Western ghats belts by TTG gneisses but linked through small arms of schists (Ramakrishnan et.al, 2010). Islands of granite basement within the belt are exposed at Honnali, Shimoga and Saulanga. Shimoga schist belt dominantly exposes rocks equivalent to Chitradurga Group along with older Bababudan and PGC. The lower Bababudan Group is represented by minor bands of amphibolite, quartzite and garnetiferous mica schist. This is followed by main extent of the Chitradurga Group containing shallow- water greywacke and cherty BIF in the northern section of the belt. (Text Figure-4).

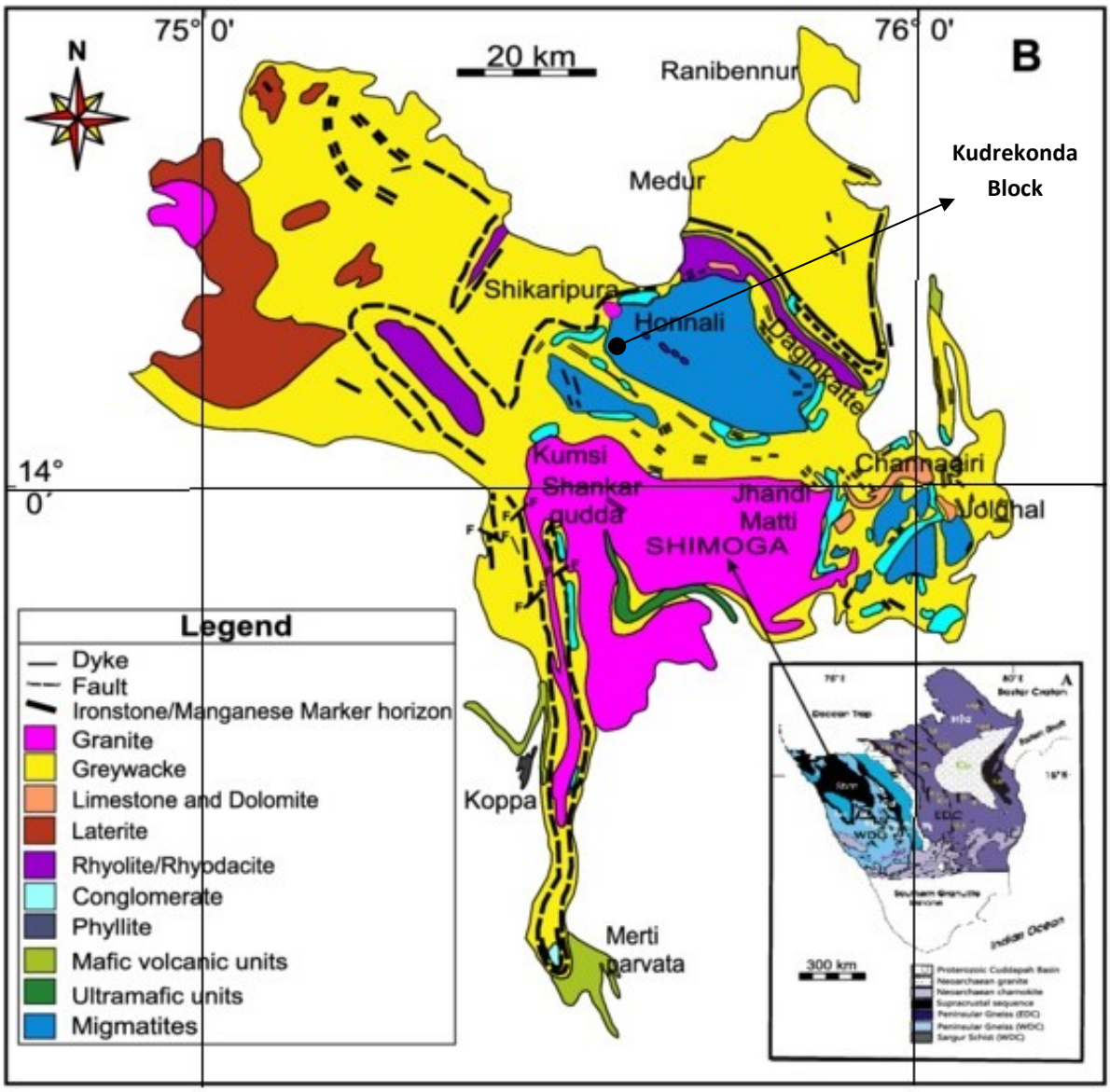
7.1.2 The stratigraphy is characterized by rapid thickening and thinning of major wedges of sedimentary rocks. Quartzite and phyllite rest unconformably over the basement. They are characterized by rapid facies variation along and across strike and include mixed-pebble conglomerate, current bedded quartzite, dolomitic and calcareous limestones, manganiferous phyllite and slate interbeded with chlorite phyllite and quartzite. This is followed by lenses of conglomerate. Apart from these, various basic and ultra basic intrusions are also reported from the Shimoga belt. The belt has highly irregular configuration due to intense folding and they are related to the island like domal masses of gneiss and granitoids.

7.1.3 The schist belt is renowned for manganese and gold occurrences and witnessed several mining activities for both the commodities throughout the history.

7.1.4 The wide aerial extent, presence of clustered gneissic and granitoid dome complexes within Dharwar rocks and inaccessible forests which cover major portion of the schist belt makes the stratigraphy of Shimoga schist belt less studied. It closely follows the stratigraphy of Chitradurga schist belt. The following stratigraphic sequence is proposed for Shimoga schist belt after P. Harinadha Babu et.al in 1981 given in **Table No. 7.1.**

Table No-7.1
Regional Stratigraphy (Source: Geological Survey of India)

Lithology		**Age**
Neoptoterozoic	Cudappah Super group	Conglomerate, Sandstone, shale, limestone
Meso to Neo proterozoic		Conglomerate, orthoquartzite, Dolomite limestone, Dolomitic shale, Phyllite, Quartzite
….……Eparchean unconformity…….		
Paleo to meso proterozoic	Younger intrusives	Mafic dyke swarms (dolerite/gabbro)
Archean	Peninsular gneissic complex	Gneisses with intruding granodiorite and granite
Archean	Dharwar Super group	Metabasalt, Acid volcanic, BIF
Archean	Older metamorphics (Sargur equivalents)	Amphibolite, hornblende biotite schist with occasional bands of banded magnetite quartzite (BMQ), Fuchsite quartzite, Ultramafite



Text Figure -4 :Geological map of the Shimoga Schist Belt showing different lithologies and the study area (after Harinadha Babu et al. 1981).

7.1.5 Regionally, the area around of Kudrekonda exposes Peninsular Gneiss, Chitradurga Group of Shimoga schist belt, traversed by younger intrusive like basic dykes and quartz veins of Palaeoproterzoic age. Major rock types in the region are Savalanga Granite/ Honnali Gneiss forming base at gneiss with enclaves of ultramafics and

metabasalt which are overlain by Jhandamatti formation of Chitradurga Group of rocks represented by quartz-chlorite schist associated with polymict conglomerate, metabasalt, quartzite and banded ferruginous quartzite with thin bands of argillites. These formations are later intruded by ultramafics, basic dykes and quartz veins. Regional geological map sourced form Bhukosh portal showing the location of Kudrekonda block area is given in **Plate No. II.**

7.1.6 During FS 2016-17, GSI carried out Reconnaissance survey for gold in Nyamati Block in parts of Davanagere and Shimoga Districts, Karnataka. Large Scale geological mapping Reconnaissance survey on the scale of 1: 50,000 was carried out in the toposheet no. 48N/12. Based on the ground evidences for gold mineralization, presence of old workings and shafts in the area, and availability of outcrops the Nyamati block was identified for large scale mapping. Moreover the Nyamati block exposes the sheared contact of Shimoga Schist Belt and PGC which would be a favourable place for mineralization. Large scale mapping has been carried out on 1:12500 scale around Kudrekonda-Palavanahalli-Holalur area to assess the gold mineralization in the area. An area of 150 sq.km was covered and different lithounits and structural elements are delineated to understand the control of mineralization. The area under investigation exposes Peninsular Gneiss, Chitradurga Group of Shimoga schist belt, traversed by younger intrusives like basic dykes and quartz veins of Palaeoproterzoic age. High quality vector/raster LSM map of Nyamati Block is not available in the GSI Report sourced from NGDR portal. However, an attempt has been made to show the location of Kudrekonda block superimposed over available large scale geological map of Nyamati Block is shown as **Text Figure-5.**

7.2.0 REGIONAL STRUCTURE

7.2.1 The area has undergone three phases of deformation. Various primary and secondary structures are well recorded in the rocks. Primary structure like color banding, ripple mark, current bedding, cross bedding are well preserved in quartzites of Jhandimatti Formation. Bedding is also seen in the BIF which is marked by colour variation and compositional variation. Secondary structures like foliation plane are also seen in the conglomerates, quartz chlorite schist and metabasalts. The schist belt, in the area

forms a geosynclinal trough between Honnali gneissic dome and Savlanga gneissic dome. In general, the trend of the bedding/foliation varies from NW-SE to N-S with dip varying from 30° to 75° towards northeast to east.

7.3.0 REGIONAL METAMORPHISM

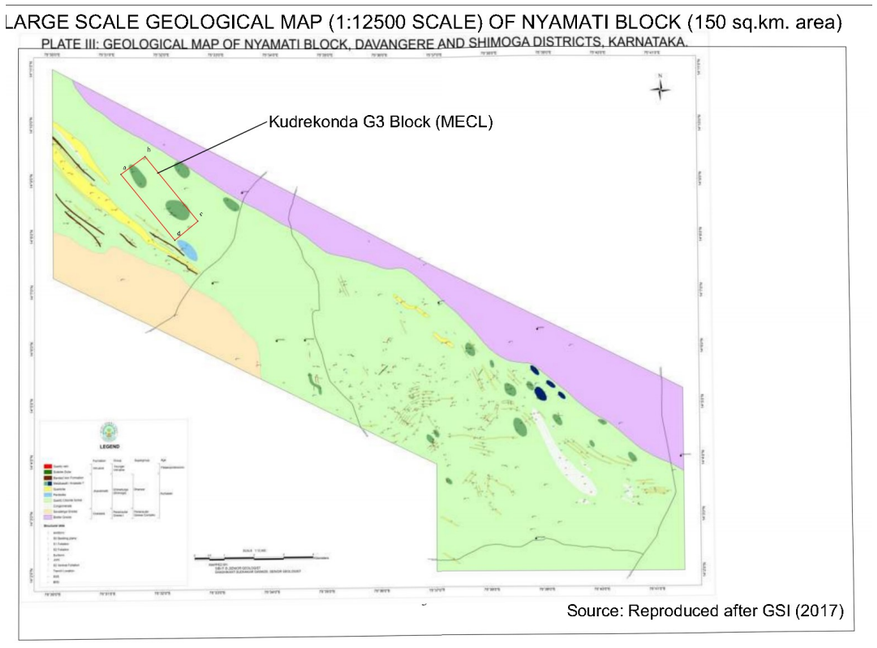
7.3.1 The following are the mineral assemblage for the rock types observed around the area.

- Gneiss : biotite + quartz + feldspar
- Quartz-chlorite schist : quartz + chlorite + biotite + carbonate
- Quartz-sericite schist : quartz + sericite + little chlorite
- Quartz-chlorite-carbonate schist : quartz + chlorite + carbonate
- Metabasalt : hornblende + plagioclase + chlorite + quartz
- Ultramafic : tremolite + talc + epidote

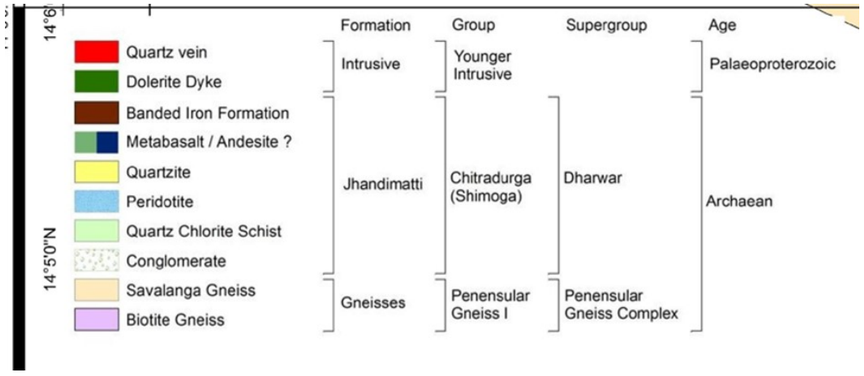
The mineral assemblage found in schistose rocks and associated metabasalt suggest that these rocks have undergone green schist facies of regional metamorphism. The presence of biotite in some schistose rock and biotite + quartz and feldspar in migmatite suggest that the rock have undergone amphibolite grade. From this mineral assemblage it is clear that the rock have undergone green schist facies lo amphibolite facies of regional metamorphism.

Text Figure -5 : Part of Large scale Geological map (LSM) of Nyamati Block with Location of Kudrekonda G3 Block

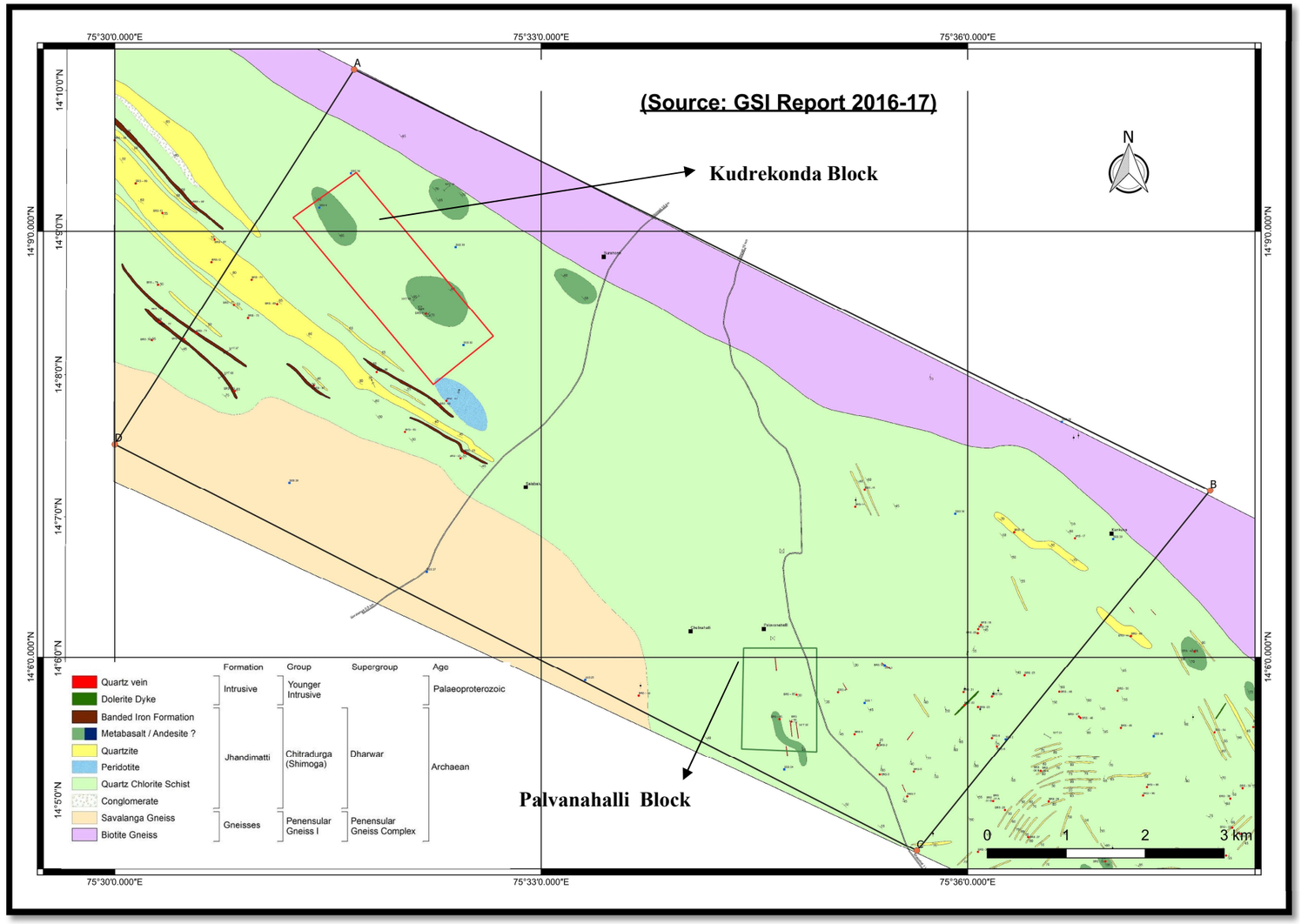
Key Map



Source: Reproduced after GSI (2017)



Part of Large scale Geological map with Location of Kudrekonda Block



7.4.0 GEOLOGY OF THE BLOCK

7.4.1 The study area mainly covered by top loamy soil cover with intense cultivation activities. Most of the rock outcrops obliterated in the area due to cultivation purpose. Scanty outcrops seen in the area at few places. Rock types exposed in the study area are Quartz-chlorite-schist/Chlorite schist, quartzite and meta basalt representing Jhandimatti Formation belonging to Chitradurga group of Dharwar Super group. These formations are intruded by thin quartz veins at places. The local stratigraphic succession of the Kudrekonda block is given below.

Table 7.2 Local stratigraphic succession of the area.

Group		Lithology
	Recent	Top soil/Alluvium
	Younger intrusive	Quartz veins
Dharwar Super group	Jhandimatti Formation of Chitradurga Group	Meta-basalt
		Quartzite
		Quartz Chlorite schist/Chlorite schist

7.4.2 During present investigation, Kudrekonda block was covered by detailed geological mapping on 1:1000 scale over 2.74 sq.km. area. The interpreted geological map of Kudrekonda block area with location of bedrock samples and old working shafts given as **Plate No. III.**

7.5.0 DESCRIPTION OF ROCK TYPES

The major litho units observed in the area during mapping are described below.

A. <u>Quartz chlorite schist/Chlorite schist:</u>

It is the most widespread litho unit of the area and mainly occurs as concealed litho unit under soil cover. It is pale green to greenish in colour, medium to fine grained. The rock is flaky and schistose in nature. The rock composed mainly of quartz, chlorite, sericite and minor amount of biotite. The quartz chlorite schist occurs as inseparable alternate unit with quartz sericite schist in the area. The change from quartz-sericite schist to quartz-chlorite schist is gradual. Quartz- chlorite schist is

seen as intercalation within carbonated metabasalt. It shows variations in its characters including colour, texture, and grain size from outcrop to outcrop. This litounit is interbedded with quartzite at places.

Photo-7.1: Field Photograph showing Chlorite schist rock

(A) Well developed schistosity along NW-SE in Chlorite schistose rock, Kudrekonda (B) Chlorite schistose rock with sulphide specks exposed at contact of meta basalt near Northern shaft.

Under thin section (Quartz Chlorite Calcite Schist# MKK/P3), Quartz occurs as fine to very fine anhedral grains, often clustering in lensoidal pockets. Chlorite occurs as fine flaky aggregates showing parallel alignment. Calcite is present as fine to medium subhedral to anhedral grains and patches in dissemination. Opaques (magnetite) are seen present as fine subhedral to euhedral disseminated grains showing association with chlorite. Reddish ferruginous fillings and patches are noted in areas, mostly in association with calcite. The specimen is showing feeble magnetism. Under thin section (Quartz sericite schist/phyllite) MKK/P4) Quartz occurs as very fine grains and as lensoidal clusters showing parallel alignment. Sericite is present as very fine flaky segregations showing parallel alignment and micro-crenulations. Very fine dirty clayey fillings are noted along the foliation. Opaques are noted as very fine specks in accessories. (Pmg-1) Under thin section (Sericite-chlorite-quartz schist/phyllite # MKK/P2), Sericite occurs as very fine flaky aggregates, segregating into thin to moderately thick bands and showing parallel alignment and micro-crenulation. Chlorite is present as very fine flaky aggregates showing parallel alignment. Quartz occurs as very fine anhedral grains, often

clustering in lensoidal pockets. Very fine dirty clayey fillings are seen present along the foliation.

B. Quartzite:

Scattered outcrops of quartzite are noticed in the study area as the most of the area is concealed under soil cover. Kudrekonda area lies at foot hills of Kalvi Rangan Gudda (Kudrekonda Hill range). Quartzite is well exposed on east and western slope of Kalvi Rangan Gudda. Quartzite of dull white to pale green colour. The colour difference is due to the presence of fuchsite. Occasionally it is ferruginous. The rock is hard, compact, medium to coarse grained, highly jointed with major minerals quartz, sericite and fuchsite (at places). In general, the rock is trending in N30W-S30E to N60W-S60E and dipping 50 to 65 degrees towards NE. Primary structures like cross bedding, ripple marks are frequently noticed in this unit. Presence of malachite also noticed at places in the quartzite.

Photo-7.2: Photograph showing Quartzite outcrops in Kudrekonda area

(A): Quartzite outcrop, 0.4km SW of Kudrekonda village. (B): Pale greenish quartzite (fuchsitic) exposed near extreme NW of Kudrekonda block (Foot hills of Kudrekonda Hill range, Kalvi Rangan Gudda)

Under thin section (Quartzite#MKK/P1), the specimen is mostly composed of quartz, occurring as fine to very fine subhedral grains showing very tight quartzitic texture. Quartz is also seen present as coarse lensoidal porphyro-clasts comprising medium to moderately coarse grains. Fuchsite/ muscovite are present as very fine flaky aggregates showing crude alignment and often seen present as along periphery

of lensoidal quartz porphyro-clasts. Opaques are noted as fine to very fine subhedral to anhedral grains in accessories. Reddish ferruginous fillings are often seen associated with fuchsite/ muscovite aggregates. Under thin section (Quartzite with chlorite fillings#MKK/P5), Quartz occurs as medium to fine anhedral grains showing tight sutured contacts, undulose extinction and evidence of recrystallization. Chlorite has intruded as thin to moderately thick fracture fillings, comprising very fine micro-crystalline flaky aggregates. Very fine clay minerals are seen intruded along pores and cavities. Opaques are noted as very fine specks in accessories. (Pmg-2)

3. Metabasalt:

Metabasalt is one of the important lithounits of the mapped area. It is exposed as lenses within the quartz chlorite schist. The gold mineralization in the area is closely associated with metabasalt with mineralized quartz veins and most of the old workings are restricted to this unit only. The metabasalt of the area occurs as discontinuous bands or lenses within the schist and occupies the plain lands around central and northern part of the block area. At places, metabasalt is light grey to greenish grey in colour, fine grained and highly foliated. At places it is chloritised, sericitised and limonitised. Sheared meta basalt with/without quartz veins seen in road cutting sections near southern old working shaft (Turnbull) west of Kudrekonda village. Silicified and carbonatised metabasalts are seen in the vicinity of old workings. Numerous pyrite and pyrrhotite specks are observed in metabasalt of this area. General trend of the foliation plane of metabasalt is N40W–S40E to N50W-S50E with dip varying from 50 to 65 degrees towards NE.

Photo-7.3: Field photograph showing Meta basalt outcrops

(A): Exposed fresh outcrop of Meta-basalt and sheared meta basalt along the road cutting near southern shaft (Turnbull). (B) Meta Basalt with quartz vein intrusion exposed in cutting section..

4. Quartz Vein:

A number of minor quartz veins of different generations cutting across different litho units are present in this area. It is reported that the most important quartz vein is exposed in the foot wall side of main ADIT west of Kudrekonda. In earlier report (Bruce Foote, 1876) it is referred as 'Turnbull's reef' and it is having a strike continuity of 200 m. A few of the quartz veins in Kudrekonda and Palvanahalli are auriferous in nature and targeted for gold in the past. However, the gold mineralization associated with these quartz veins are discontinuous and highly erratic. The mineralized quartz veins are excavated and removed from the area in the past. Extensive mining activity in the past and land enforcement/modification has left no traces of mineralised quartz vein in the area. No traces of other mineralised quartz veins seen in the area. A semi translucent thin quartz veins trending NW-SE direction exposed within chlorite schist in the western part of the block area. Most of the quartz veins observed in the area are devoid of sulphide mineralisation.

Photo-7.4: Field photograph showing metabasalt dyke exposure.

(A): Quartz vein intruded in Meta basalt showing pinch and swell behaviour, SW of Kudrekonda village. (B) Quartz vein exposed on western part of Kudrekonda village.

5. Soil cover/Alluvium:

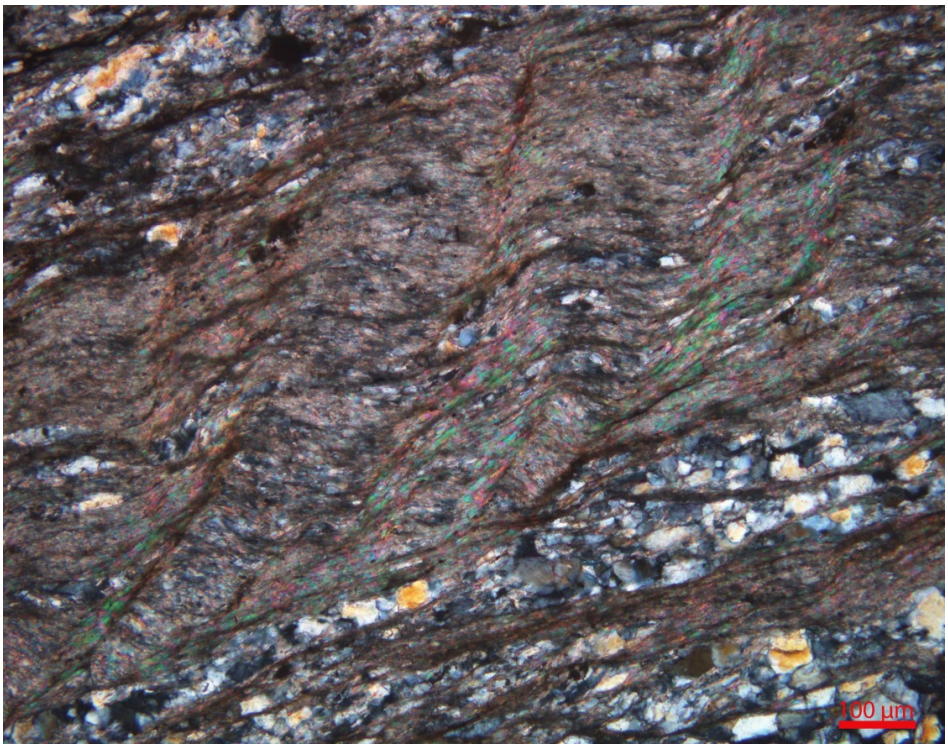
The major part of the block area is covered by top loamy soil and alluvium. Intense cultivation activities being taken up in the area. As the area is concealed under soil cover, few scanty isolated outcrops are rarely seen. Soil is brownish, greyish to brownish grey, loose, cohesive, sandy, poorly sorted miceous soil occurring in the area is product of weathering of parent rock underneath. The total areal extent of soil cover constitutes about 95% of the block area and thickness varies from 0.50m to more than 3.00m.

Photo-7.5: Field photograph showing soil cover in Kudrekonda area.

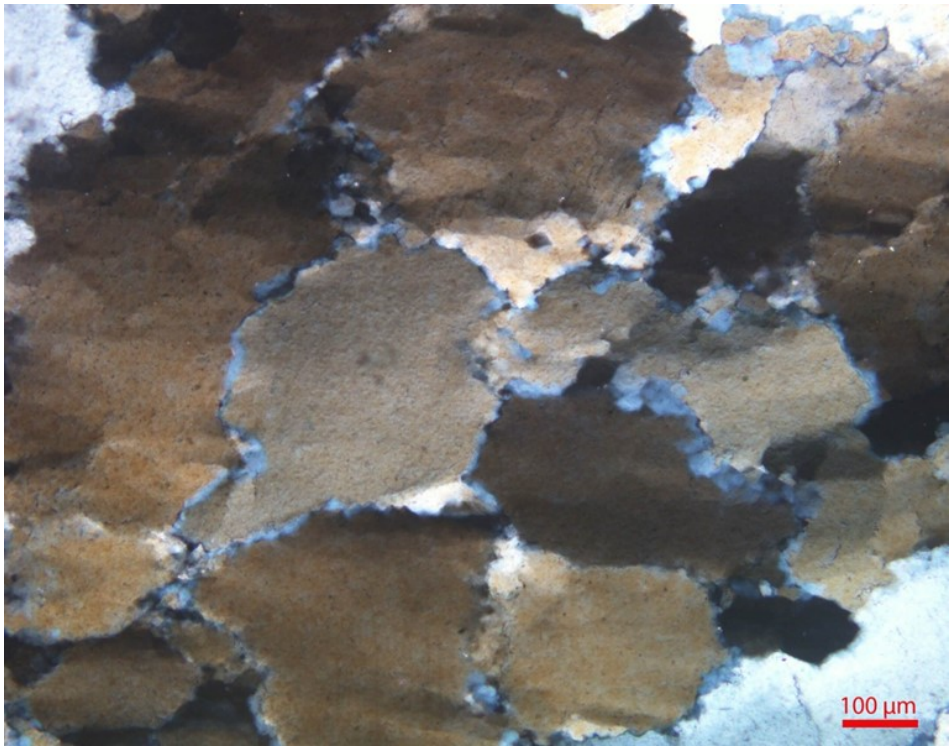
(A): Soil cover exposed (1m depth) west of Kudrekonda. (B) Panoramic view of Kudrekonda block, mostly occupied by intense cultivation activities.

7.6.0 PETROGRAPHIC STUDY:

7.6.1 A total of 5 Nos. of surface rock samples collected from different litho-unit have been subjected for petrographic studies at MECL laboratory, Nagpur. The findings of petrographic study have been discussed along with the description of rock types in the area. However, the petrographic study report has been attached as **Annexure No-IV.** The photomicrographs of the thin sections are given as Pmg-1 & Pmg-2.



Pmg – 1: Photomicrograph showing association and parallel alignment of quartz and sericite in quartz-sericite phyllite as seen under crossed nicols.
Specimen No. : MKK/P4 Magnification : 100X



Pmg – 2: Photomicrograph showing medium to fine anhedral grains of quartz with tight sutured contacts, undulose extinction and evidence of recrystallization in quartzite as seen under crossed nicols.
Specimen No. : MKK/P5 Magnification : 100X

7.7.0 STRUCTURE:

7.7.1 The rocks of the area show well developed structural features like primary structure and secondary structure. The important primary structure is bedding which is well preserved in quartzite. In general, the trend of the bedding is NW-SE with dip varying from 50° to 68° towards NE.

7.7.2 The schistosity developed in the meta-sedimentaries and the meta-volcanics strikes NW-SE in the northern part and NW-SE to almost N-S in the southern part showing a near parallelism with the trend of bedding. The foliation dips, range from 50^0 to 75^0 north-eastwards.

7.8.0 MINERALISATION IN THE BLOCK

7.8.1 Mineralisation in the area is associated with the sheared metabasalt carrying quartz-carbonate veins. The mineralization is epigenetic in nature and it is confined to quartz carbonate veins carrying sulphides like pyrite and arsenopyrite, emplaced along shear zones. According to the earlier reports, quartz vein is considered as the carrier of gold in Kudrekonda area. Shearing and wall rock alteration in the form of sericitisation. chloritisation, tourmalinisation and fuchsitisation are the prominent feature associated with mineralization (GSI, 2017).

7.8.2 The area has been worked by different companies since 1880 and explored gold bearing quartz veins up to 80 meters. Prior to it, the area was known for its gold washing and panning from both alluvial and eluvial materials. A series of old working shafts observed in the area. The mineralization in the Kudrekonda area was reportedly associated with the 'Turnbull Reef'. It was reported that about 1.5m width smoky sheared quartz vein exposed in the ADIT. The vein disappears towards northwest and a series of shafts were observed in the northwestern direction, probably for targeting the Turnbull Reef. The quartz reefs, quartz carbonate veins/veinlets are found auriferous and mined extensively in the past.

7.8.3 The major mineralized quartz reefs mentioned in the previous reports no more exist in the area due to the modification of land. Intense mining in the past and land enforcement/modification has not left any traces of mineralized quartz veins in the area. Poor outcrop density, thick soil cover (about 3m) and dense cultivation in the mapping area makes it difficult to trace the disposition of concealed ore body.

Photo-7.6: Hand specimen showing Quartz Chlorite schist with sulphides.

(A): Disseminated sulphides (Chalcopyrite, pyrite) in Qtz Chlorite schist rock (B) Qtz. Chlorite schist with chlorination and specks of Chalocpyrite

Photo-7.7: Hand specimen showing Meta basalt with sulphides.

(A): Disseminated sulphides (Chalcopyrite, pyrite) in Meta basalt (B) Malachite stains in Meta basalt.

Photo-7.8: Field photograph showing old working shafts (Northeastern Shaft)

(A & B): Old working-1 & 2: North Eastern shaft. Old workings reached up to 105m depth as reported by previous workers.

Photo-7.9: Field photograph showing old working shafts (Turnbull shaft).

(A & B): Old working-3 & 4: Turn-Bull shaft, about 500m west of Kudrekonda village

7.9.0 MINERAGRAPHIC STUDY:

7.9.1 A Total 5 Nos. of samples collected from meta basalt/sheared meta basalt, quartz chlorite schist and quartz vein sample with sulphides have studied for mineragraphic study by preparing polished section. The study of polished section reveals that major (>5%) ore mineral composition comprising of Goethite, Magnetite, Hematite, Chalcopyrite, Pyrite. Rutile/Anatase. Minor (<5% to >1%) and accessory (<1% to >0.1%) constitutes Digenite, Chalcopyrite, pyrite, Limonite, Anatase. Pyrrhotite and Chalcopyrite occurs as traces.

7.9.2 Quartzite (fuchsitic) (MKK/M1) under polished section, Goethite is present as patchy fillings associating reddish limonitic fillings with it. Magnetite occurs as fine to medium anhedral to subhedral and patchy grains. Hematite is seen present as very fine grains along fractures as fillings. Anatase is noted as very fine grains in association with hematite. Pyrrhotite and chalcopyrite are noted as very fine specks in traces.

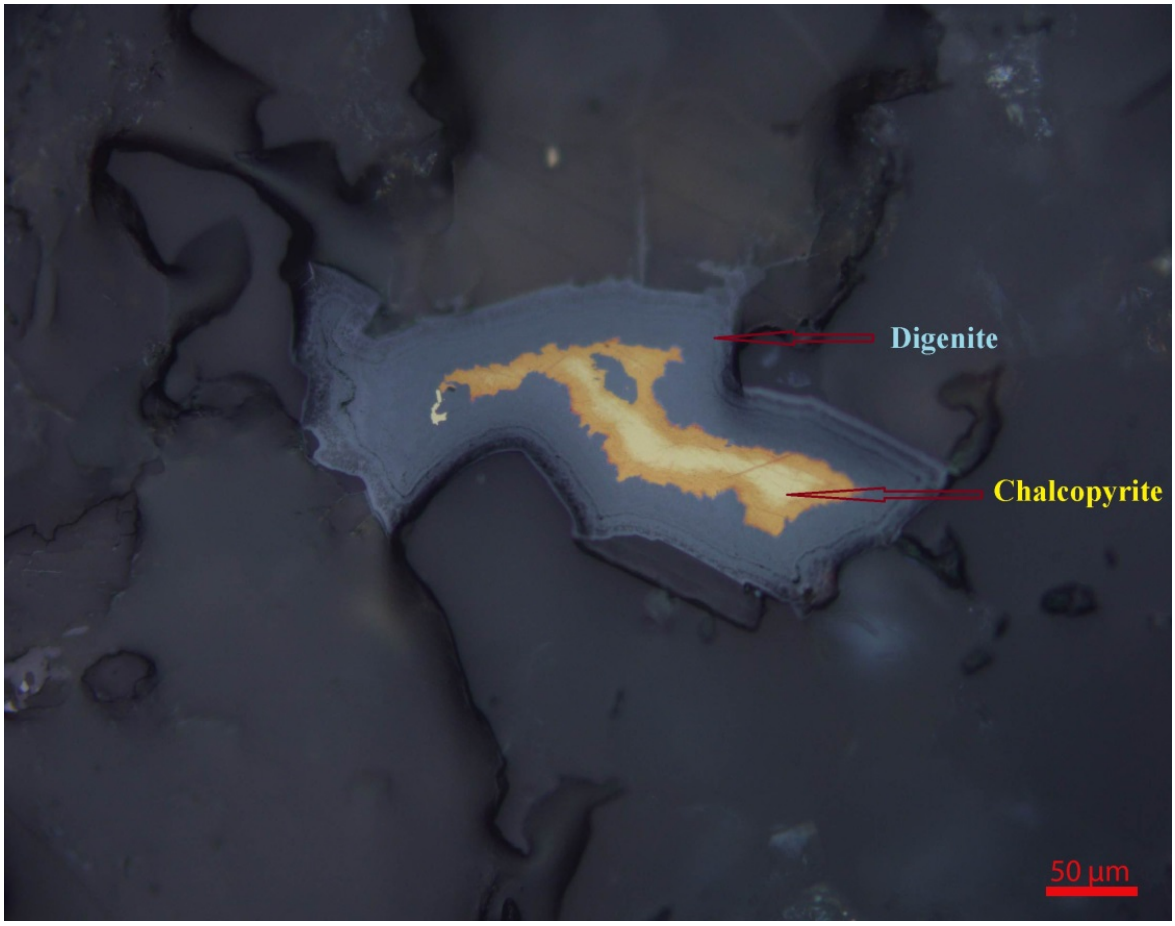
7.9.3 Metabasalt (MKK/M2) Magnetite occurs as very fine to fine subhedral to anhedral and skeletal grains disseminated throughout the specimen. Chalcopyrite is noted as fine to very fine grains in accessories. Digenite is found present as very thin corona around chalcopyrite periphery. The specimen is showing feeble magnetism.

7.9.4 Sheared metabasalt (MKK/M3) Magnetite is present as very fine to fine subhedral to anhedral and bladed grains disseminated throughout the specimen. Digenite occurs as anhedral grains and patches. Chalcopyrite is noted as very fine specks and fine anhedral grains, often being replaced by digenite from periphery. Pyrite occurs as very fine specks in accessories. The specimen is showing feeble magnetism. (Pmg-3)

7.9.4 Quartz vein (MKK/M4) Chalcopyrite occurs as fine anhedral grains and patches. Pyrite occurs as fine to very fine anhedral grains. Magnetite is present as very fine specks, blades and patches. (Pmg-4)

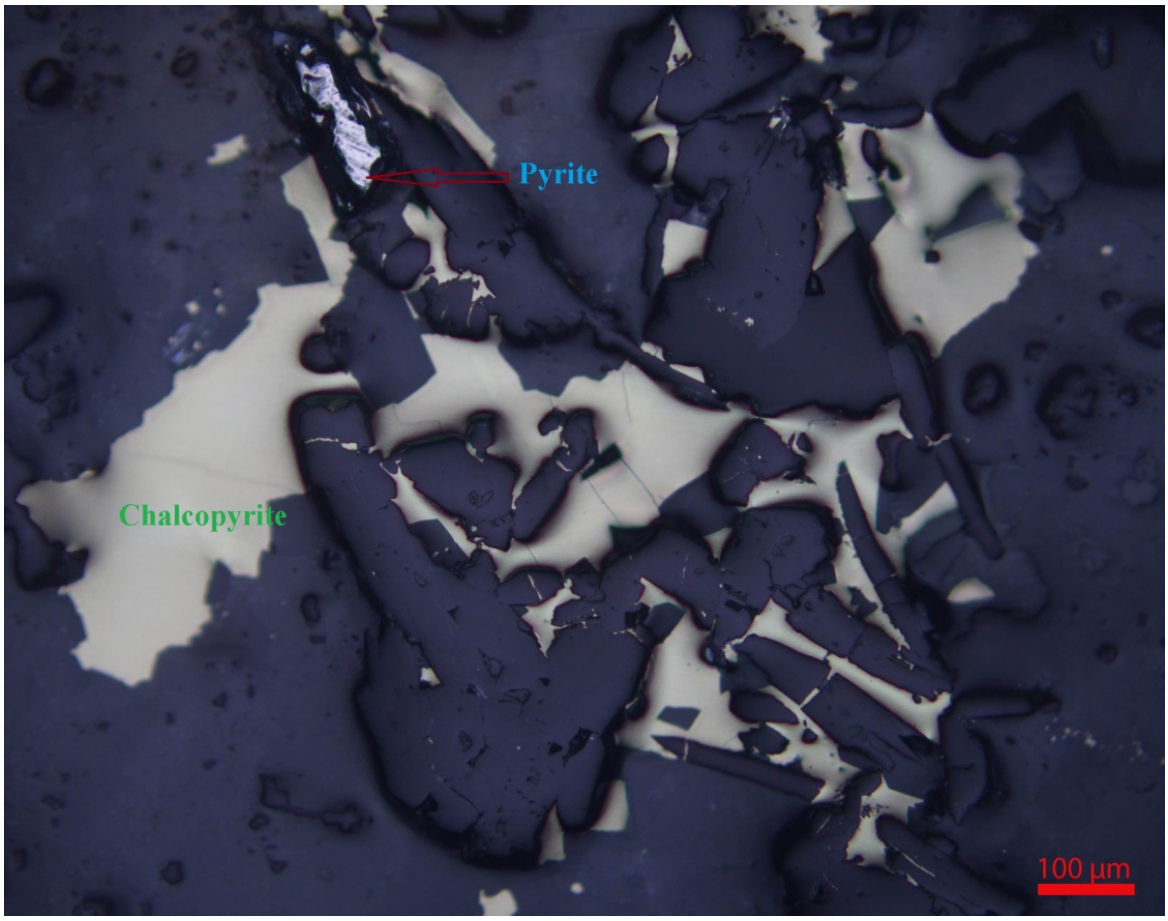
7.9.5 Quartz chlorite schist (MKK/M5) Hematite and rutile/ anatase are present as very fine specks and blades along fractures as fillings. Magnetite occurs as very fine subhedral to anhedral grains. Chalcopyrite is noted as very fine specks in traces.

7.9.6 The sample wise details of the mineragraphic studies are presented as **Annexure-V** and the photomicrographs of the polished sections are given as **Pmg-3 & Pmg-4.**



Pmg – 3: Photomicrograph showing anhedral grain of chalcopyrite being replaced by digenite from periphery as seen under reflected light.

Specimen No. : MKK/M3 **Magnification : 200X**



Pmg – 4: Photomicrograph showing anhedral grains and patches of chalcopyrite and associated fine anhedral grain of pyrite as seen under reflected light

Specimen No. : MKK/M4 **Magnification : 100X**

CHAPTER-VIII

8.0.0 PREVIOUS EXPLORATION

8.1.0 DETAILS OF PREVIOUS EXPLORATION CARRIED OUT BY OTHER AGENCIES

8.1.1 Bruce Foote (1900) first mapped this area. He classified the quartz reefs of the Honnali gold field into three systems based on their strike and considered the Kudrekonda, Surahonne and Palavanahalli groups as the most important. He observed that the "Turnbull reef" belonging to Kudrekonda was found to yield free gold.

8.1.2 Later, Slater (1902), Smeeth (1909), Sen (1915) and Jayaram (1915) of Department of Mines and Geology, Mysore state also mapped this area. They revealed the lithological details and made a passing reference to the old workings for gold in Kudrekonda - Palavanahalli area. According to them the rocks are of igneous origin.

8.1.3 In 1954, C.K.R Shastry of GSI carried out geological mapping in Kudrekonda-Palavanahalli area and has given a brief description of the gold occurrences. He described that the country rock in Kudrekonda block is chlorite schist with intercalations of quartz-schist.

8.1.4 Narayanamurthy (1960, 61, 62, 63 and 1964) of GSI carried out mapping in the area and according to him the rocks of the area belong to two distinct groups namely the metasedimentary and metavolcanic groups. The Honnali gneissic complex formed the basement for schistose rock. He reported that the metavolcanics occurring around Kudrekonda and Palavanahalli are the host rock for the auriferous quartz veins which were worked by the ancients.

8.1.5 Later on, in 1972-73, Puskar Singh prepared a sketch map of Kudrekonda block on 1:2000 scale. Later Thakkar et. al. (1979) mapped this area mainly to establish the relationship between Honnali gneissic complex and the overlying metasedimentary rocks.

8.1.6 In 1983-84, Pazhamalainathan carried out large scale mapping (1: 31,360), pitting, trenching and analysed the samples for gold. According to Pazhamalainathan et al. the area is divided into two prospecting blocks; Kudrekonda block and Palavanahalli block. Kudrekonda block is divided into three different zones naming Kudrekonde zone, Salabalu zone and Surahonne zone. Kudrekonda zone is 600m long lying west of Kudrekonda village and mineralisation is associated with quartz-chlorite schist with vein and veinlets of quartz. Tota nine old workings spaced at 20 to 100 m interval were located over a strike length of 420 m in Kudrekonda. The ore shoot is lenticular in shape and referred as Turnbull's reef in old reports. It has yielded ore with an average gold value 6.2g/t. Salabalu zone is traceable from the southern slope of Δ450, (NW of Salabalu village) towards north west for a strike length of 400m. This zone is associated with quartz-chlorite schist and quartz-carbonate veins. Surahonne zone is located north of Kudrekonda and south of Surahonne and is hosted within meta andesite. Thin quartz veins and quartz-carbonate veins are seen within the meta andesite.

8.1.7 During 1994-95 field season, N. Subramani and Manjunatha carried out second generation mapping (1:25,000 scale) and geochemical sampling in Kudrekonda-Palavanahalli areas, encompassing the old workings for gold. They identified three mineralized zones in the area as Kudrekonda, Palavanahalli and Surahonne where the mineralisation is hosted by quartz veins within carbonated and fractured metabasalt. The adit samples indicate gold value of 10.24 g/t over a width of 1 m. The assay of trench samples indicates gold values of 0.24 to 0.77 g/t over a width of 3 m. The bedrock samples indicate gold values of 0.11 to 0.6 g/t over a width of 2 m.

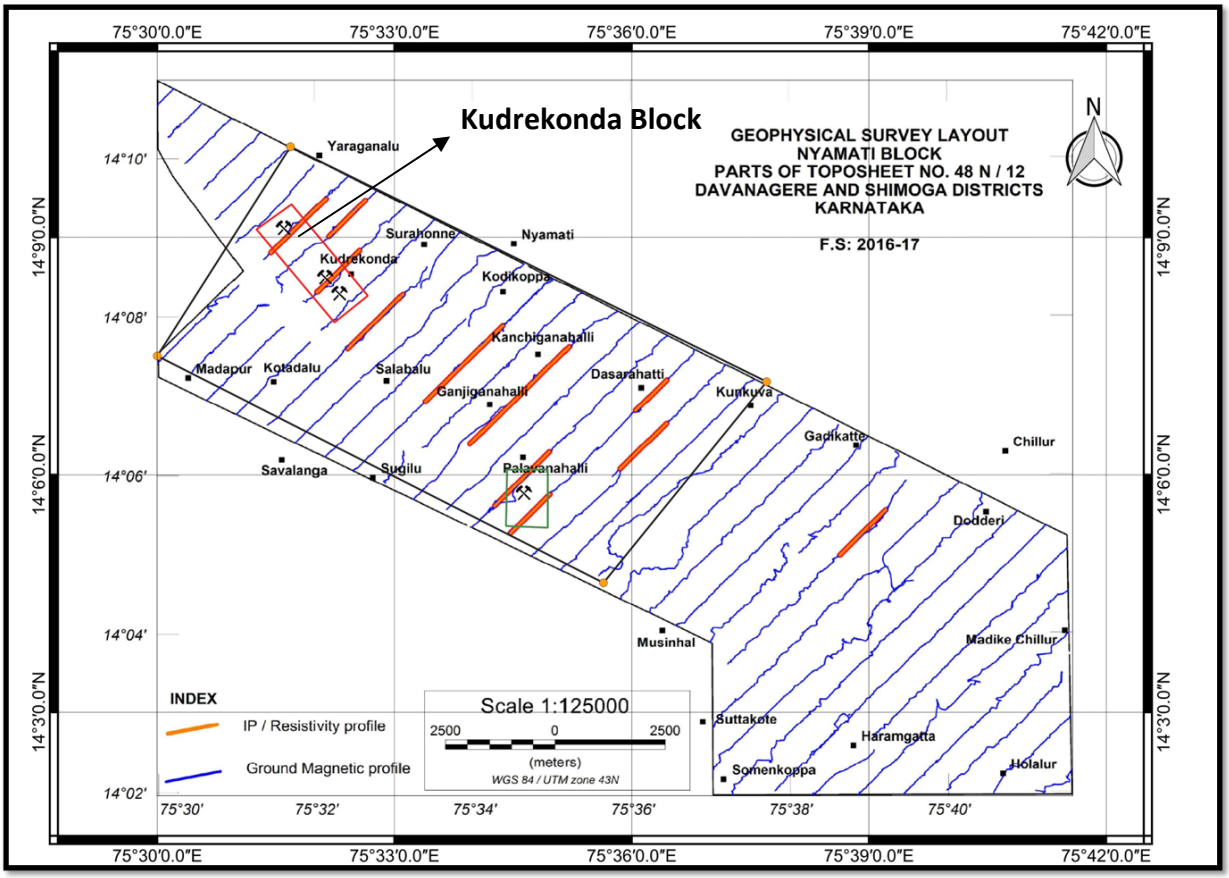
8.1.8 After gap of 10 years during F.S 2014-15, Nimmy K. C et. al carried-out investigation for gold in this area to assess the auriferous potentiality which included large scale mapping (LSM) of 81 sq.km on 1:12,500 scale, surface sampling and detailed mapping of 2.0 sq.km on 1:1,000 scale. Analytical results of a bed rock sample showed Au up to 450 ppb.

8.1.9 In same field season, Jayesh Chaurasia and Lekhram Deshmukh carried out preliminary investigation for gold in Nyamati-Kunchenhalli area by LSM and DM. Although no encouraging gold values have been recorded in this area but a bed rock sample collected from metabasalt has yielded Cu values up to 4500 ppm, another

BRS collected from meta-basalt with carbonates has yielded Ni up to 1500 ppm and one bed rock sample collected has yielded Cr up to 4980 ppm were reported.

8.1.10 Part of kudrekonda block was also covered under NERP program in which an area of about 450 sq. km was covered by reconnaissance mapping on 1: 50,000 scale and 150 sq.km area by large scale mapping on 1:12500 scale Sibi P. B. & others in Nyamati block during FS:2016-17. It was taken up as G4 investigation to locate possible zones of gold mineralization of the area. An area of about 450 sq. km was covered by reconnaissance mapping on 1: 50,000 scale and 150 sq.km area by large scale mapping on 1:12500 scale in Survey of India Toposheet No. 48N/12. 100 Bed-rock samples, 100 Pitting and trenching samples, 50 Stream sediment samples, 11 Petrological samples, 10 Petrochemical sample and 1 Ore microscopic sample was collected. Total 150 m3 of trenching followed by 100 trench samples were collected from the area.

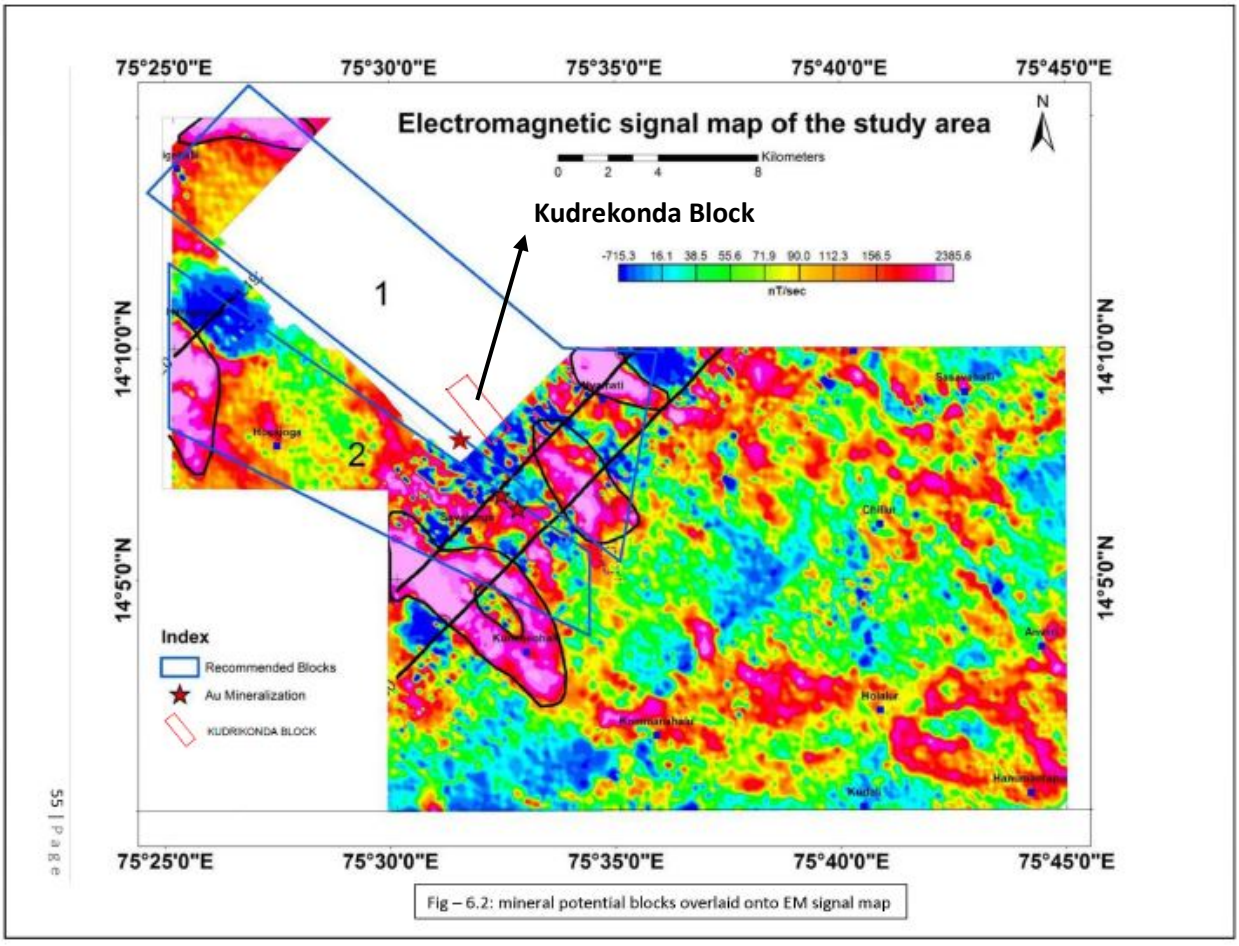
8.1.11 As part of G4 investigation, Ground Geophysical survey (FS 2016-17) comprising magnetic, IP and resistivity carried out in the Nyamati block with traverse interval of 700 mts on 37 profiles with traverse length of 1.3 km to 9.5 km carried out to understand the subsurface nature of mineralization of previously reported auriferous zones and old workings. The magnetic, IP and resistivity surveys in Nyamati block are fairly successful in demarcating lithological contacts and structural features. Good correlation has been observed from Magnetic, IP and Resistivity anomalies. The area proposed for mineralization trending NW-SE direction which matches with the regional trend of schist belt. Resistivity and IP surveys were carried out over 11 profiles with station interval of 10 m. Out of which a total of four traverses were laid in Kudrekonda area, three traverses in Ganjiganahalli area and remaining four traverses were laid southern-east part of Ganjiganahalli area (which falls under Palvanahalli area). In Kudrekonda area a total of four IP and Resistivity profiles ((Text Figure-6).) were laid 700m interval across the linear magnetic anomalies L-5, L-7, L-8 and L-9. The Apparent resistivity and Chargeability profile are reflected in the form of high and low anomalies over linear magnetic anomalies (Text Figure-6). Geophysical survey conducted under this program identified three zones of mineralization in Kudrekonda, Palavanahalli as well as in Ganjiganahalli (area between Kudrekonda- Palavanahali).



Text Figure-6: Geophysical layout map with IP & Magentic profiles (GSI,2017)

8.1.12 GSI (2019) carried out heliborne surveys for Magnetic, PTHEM & Radiometric, data processing and interpretation over Shimoga schist belt, Karnataka. The five strong anomaly zones are observed in electromagnetic data which could be due to subsurface conductive bodies. The zones of strong electromagnetic response in early, middle and late time window of EM data identified in central and western part of the area is proposed for detail investigation as these zones could be favourable for gold / sulphide mineralization. The time domain electromagnetic data of Heliborne geophysical survey of GSI (2019) carried out in the area (excluding Kudrekonda area) reveals that the response is observed in late time window shows that mineralization continues in deep. IP surveys, resistivity sounding and sampling through deep trenching are recommended to be carried out in the area that will prove to be helpful in assessing the depth continuity and economic viability of the possible

mineralized zones. The location of Kudrekonda block is shown on the Airborne Time Domain Electromagnetic map in which no profiles fall within the block **(Text Figure-7**)



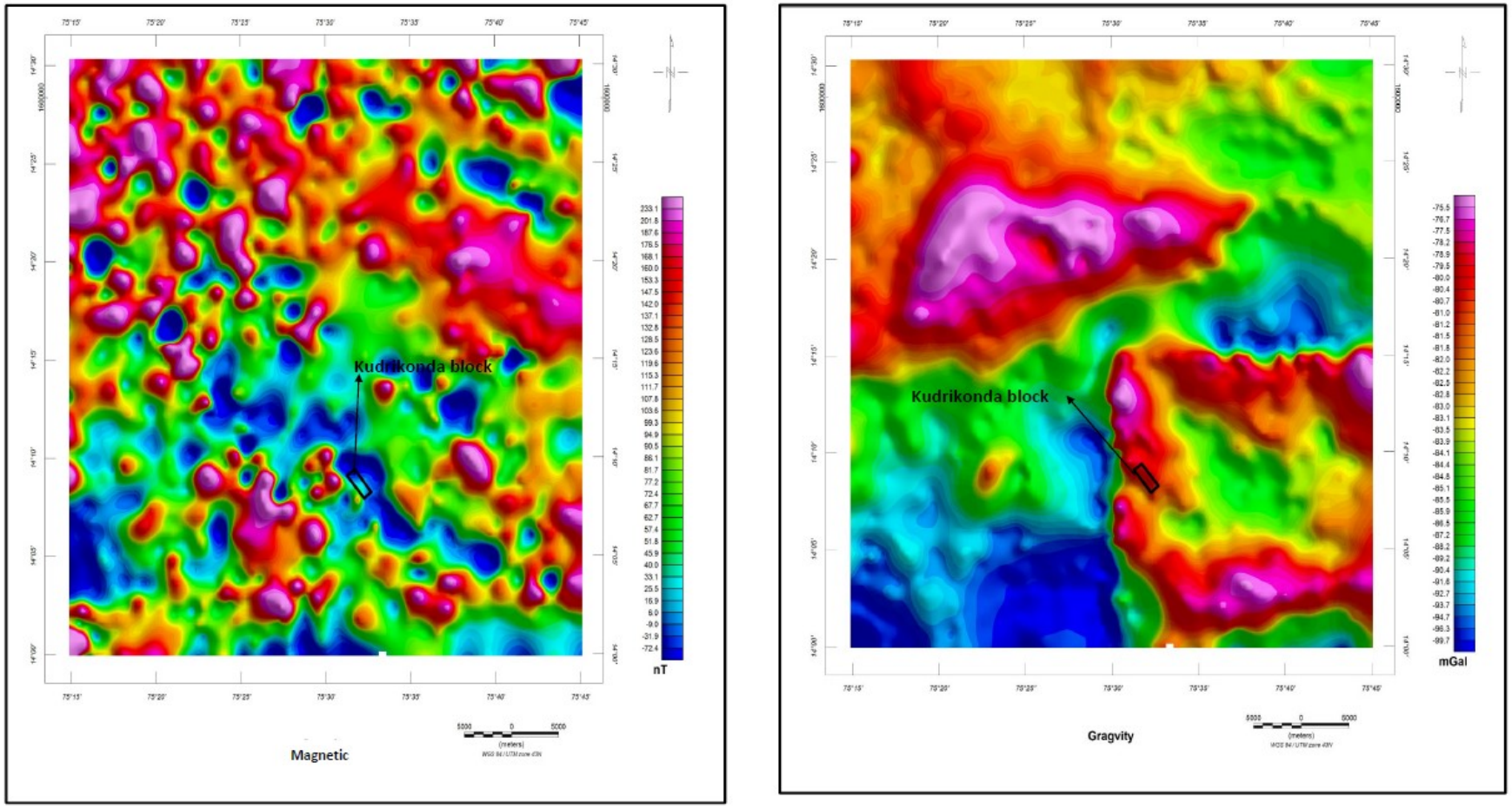
Text Figure-7: Electromagnetic signal map of the study area (GSI, 2019)

9.1.8 NGPM data of toposheet No. 48N/12 shows that there is no single point of gravity and magnetic geophysical stations falling in the block area. However, the interpretation was done based on the interpolated data and it is characterised by low magnetic anomalies and moderate Baouger gravity with the block area. The anomalies are favourable for gold mineralisation. Magnetic & Gravity anomaly map of toposheet no. 48N/12 (NGPM) with kudrekonda block location, is shown as Text Figure-8.

9.2.1 Geochemical survey **(**NGCM) data is not available for Toposheet No. 48 N/12.

MAGNETIC & GRAVITY ANOMALY MAP OF TOPO SHEET NO. 48N/12 WITH KUDRIKONDA BLOCK,

DEVANAGARE DISTRICT. KARNATAKA (Source: NGPM/BHUKOSH)



Text Figure-8: Magnetic & Gravity map of TS No. 48 N/12 (source: NGDR)

CHAPTER-IX

9.0.0 GROUND GEOPHYSICAL SURVEY

9.1.0 INTRODUCTION

9.1.1 All available previous geological, ground geophysical survey data and Heliborne survey (Magnetic, PTHEM & Radiometric) data & NGPM data pertaining to Kudrekonda area consulted and data has been utilised for the formulation of Ground Geophysical survey proposal at G3 stage for Gold in Kudrekonda area.

9.1.2 During present investigation, an integrated ground geophysical survey comprising of TDEM, MT & Deep IP planned for the Kudrekonda block area to identify deeper extensions, continuity and the location of gold bearing ore zones.

9.1.3 The contrast in the physical properties of the mineralised zone and the host rock forms the basis of Geophysical Survey. The physical properties for different host rocks & gold are shown in below **Table 9.1.**

Table -9.1 Physical Properties of different host rocks & gold

Ore/ rock	Chemical composition	Density (g/cc)	Mag. Sus 10^{-3}CGS
Carbonates	$CO3^{2-}$	2.7 to 2.8	0 to 0.01
Chlorite	ClO^{-2}	2.6 to 3.3	10^{-3} to 10^{-6}
Tourmaline	$XY_3Z_6(T_6O_{18})$ $(BO_3)_3V_3W$ Where : X can be Na, Ca, K, etc, Y ca can be Li, Mg, Fe^2 etc and Z can be Mg, AI, Fe^3, Cr^3	2.82–3.32	3.4 to 0.58 x 10^{-6}
Quartz	SiO_2	2.6-2.8	.00063
Gold	Au	19.2	-1.4X10^{-9}

9.1.4 In the assigned area the Geophysical Survey was carried out for delineating mineralised zone along with depth, strike and extent of occurrence if any.

9.2.0 OBJECTIVE AND SCOPE OF THE WORK

9.2.1 Based on the evaluation of available previous Geophysical & Geological data and reported known occurrence of gold mineralization in and around Kuderekonda block area, the present exploration program has been planned to carry out integrated geophysical surveys Time Domain Electromagnetic (TDEM) Magneto Telluric (MT) and Deep Induced Polarization (IP) to delineate potential mineralized zone.

9.2.2 The scope of work consisted of Acquisition, Processing and Interpretation of ground Time Domain Electromagnetic (TDEM), Magneto-telluric (MT) and Deep Induced Polarization survey data. The Geophysical Survey has to be carried out with 100m as profile interval and 50m as station interval in a grid pattern (100 x 50 mts) with 360 stations for TDEM Survey, for MT 250 x 250mts with 36 stations and 30-line km for Deep I.P with 100mts as profile line and 20mts as station spacing with 100x 20mts as grid pattern covering an area of 2.73 sqkm. The main objective of the Geophysical survey was to delineate gold ore zones and other associated minerals if any.

9.3.0 SURVEY LAY OUT

9.3.1 A base camp for geophysical party was established at Shivamogga, Shivamogga District Karnataka. Total 6 members team equipped with Time Domain Electromagnetic, Magneto-telluric and Deep I.P & DGPS, Total Station and GPS was engaged for the work.

9.3.2 The field activities consisted of the following:

- Fixing of survey points in 100m x 50m grid for TDEM.
- Fixing of survey points in 250m x 250m grid for MT.
- Acquisition of TDEM and MT.
- Field QC of acquired data on day-to-day basis.

Total quantum of work i.e. area surveyed and stations recorded in the block are given below Table No. 9.2.

Table -9.2 Quantum of Ground geophysical work carried out in Kudrekonda area.

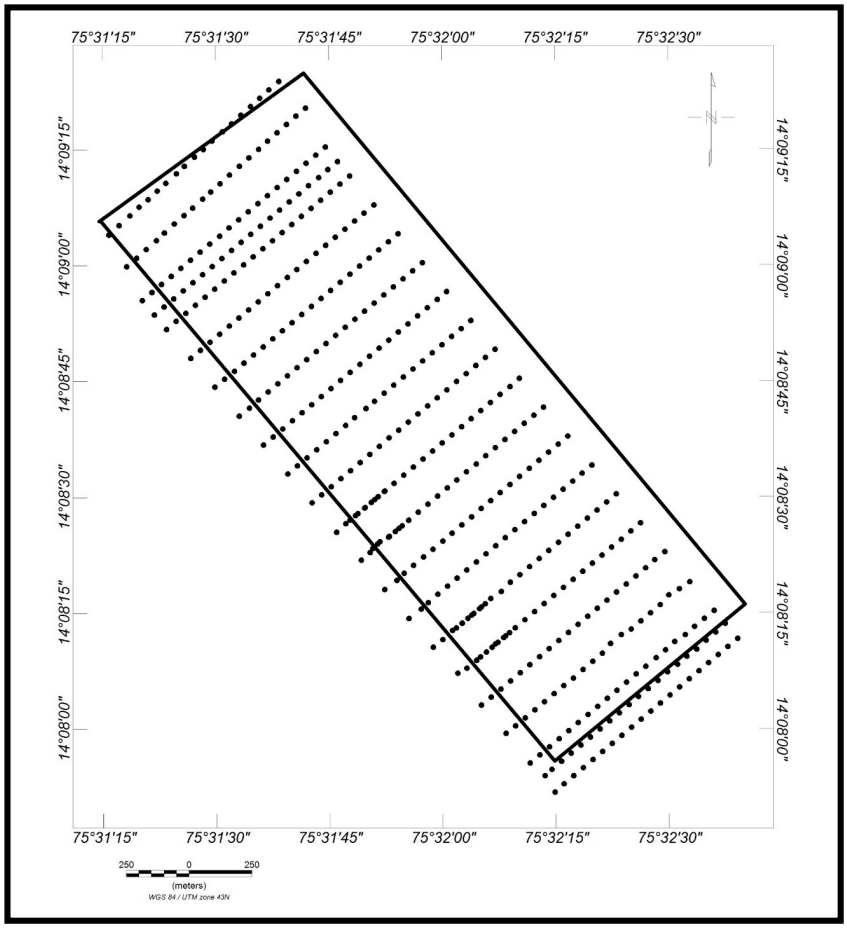
S.No	Method	Approved	Acquired	Grid	Profile Directiom
1	Time Domain Electromagnetic	360 Stations	440	100 x 50m	N45°E
2	Magneto-telluric	36 Stations	36	250 x 250m	N45°E
3	Deep I.P	30 Lkm	**Suspended**		

9.3.3 Due to Local village agitation Deep I.P Survey was suspended and with the guide lines of NMET several meetings along with Local Administration and with District Commissioner was held with villages but still the problem persists. Hence the Deep I.P Survey was suspended.

9.3.4 The Lay-Out map the block is shown in Text Figure 9.3 with the location of traverse lines and stations of observations.

Table 9.3: Block boundary Coordinates and Survey Parameters

Survey Block Boundary			Parameter	Area (Sq. Km.)	Grid (m x m)	Stations
Cardinal Points	Easting	Northing				
A	556216.2	1564564.06	Time Domain Electromagnetic and Magnetotelluric	2.73	100 X 50 (TDEM)	440
B	557012.78	1565150.13			250 X 250 (MT)	36
C	558753.43	1563024.74				
D	557994.63	1562399.77				



TEXT FIGURE. 9.1 : Block boundary of Kuderekonda Block along with Traverse Line and Survey Station

9.4.0 DATA REDUCTION AND PROCESSING

9.4.1 Instrument Details:

Table 9.4 : Instrument Details

TIME DOMAIN ELECTROMAGNETIC (TDEM) SYSTEM	
Type	Terra TEM-24 & Terra TX-50
Make	Monex GeoScope
Output Current	1 to 50 amperes
Wave Form	50% duty cycle
Loop size	500m x 500m
Synchronization	GPS
Output Power	6 K Watt
Software	Zond 1D/2D
MAGNETO TELLURIC	
Type	Geoprad-8
Make	AGCOS
Effective frequency band	43,000 to 0.0001 Hz
Input Impedance	10MΩ
Accuracy of synchronisation	$\pm 1 \times 10^{-6}$

Synchronization	GPS
Power supply	12V internal battery
Software	Zond 1D/2D
SURVEYING	
Type	DGPS (PPK)
Make	Trimble (R8s)
Sensitivity	10 cm
Accuracy	+/- 1 cm
Range	Upto 30 Km

9.5.0 Field Data Acquisition:

9.5.1 The survey stations were fixed in the grid pattern with line interval of 100 m and station spacing as 50 m for TDEM and 250 x 250m for TDEM using DGPS and demarcated locations by putting pegs with marked line and station number.

9.6.0 DISCUSSION OF RESULTS

9.6.1 **TIME DOMAIN ELECTROMAGENTIC SURVEY:**

The TDEM method is known for its high-resolution imaging of subsurface conductive layers. For investigations targeting depths of up to 500 m, a 300 m × 300 m transmitter loop was employed, with station spacing maintained at 50 m. As part of the standard TDEM survey protocol, multiple readings were taken at each station using an induction coil sensor. These readings involved variations in transmission periods, current repetition rates, and ramp times to optimize data quality.

A transmitter current of up to 50 A was injected into the ground to generate a strong electromagnetic field capable of penetrating deeper subsurface layers. Data acquisition was performed using appropriately selected time windows to capture responses at various depths. To ensure accurate synchronization between the transmitter and receiver, both systems were synchronized using GPS.

The TDEM response is influenced by several factors, including rock type, porosity, pore fluid conductivity, and the mineral content of the solid matrix. Low resistivity values are typically associated with the presence of sulphide minerals and increased porosity, particularly in sericitized rocks. In contrast, high resistivity values are commonly linked to quartz-rich zones, intrusive rocks, and areas of silicification.

The processed TDEM data provided final outputs that clearly reflected variations in resistivity both laterally and vertically. The methodology adopted in this study proved highly effective in detecting zones of auriferous and disseminated sulphide mineralization, as well as in facilitating lithological and structural mapping

The TDEM survey revealed that gold ore mineralization in the study area occurs as discontinuous ore bodies or lodes, trending approximately NW–SE, sub-parallel to the regional structural trend of the area's geology. This mineralization anomalies appears to be structurally controlled, primarily localized along shear zones, faults, and fracture systems—conditions that are geologically favorable for ore deposition.

Two distinct low-resistivity zones were interpreted as anomalous zones, which correlate with the locations of historical mining shafts. These anomalies indicate the occurrence of subsurface mineralization. The TDEM results also indicate that the subsurface in the study area is not homogeneous. Northern and Southern parts of the survey block may reveals the association of sulphide minerals in quartz-carbonate veins or the possibility of occurrence of concealed auriferous type sulphide occurring as lensoidal ore bodies with limited strike length.

Thus, modelling of the TDEM data indicates the presence of two moderate low-resistivity zones with limited strike extension within the study area. Overall, the ground TDEM survey concluded that the property indicates the presence of auriferous sulphide bodies particularly within the marked anomalous zones (Figure 3.1)

9.6.2 MAGNEOTO TELLURICS SURVEY:

The measurements were taken along profiles 4 and 5 also Profile 10 & 11 to cross the shaft section for correlation of TDEM and MT as well as old working. Both profiles were 1000 m in length, with 4 measurement points at 250 m intervals along N45°E trend. The inversion data in slice of the along the shafts were plotted and shown in Figure (3.2)

It has been observed that the shaft, which was mainly composed of slate and mica-schist were exposed in few areas at old working shaft area. Occasionally, granite can be observed in the study area. Thus, the moderate low resistivity anomaly is

presumed to be the geophysical response of auriferous sulphide bearing formations, whereas the increase in resistivity at 280–340 m and 420–480 m vertically indicates that the auriferous sulphides is in the form of lensoidal bodies bounded by quartz/ granite formations. Thus this indicates that the auriferous sulphide body is not continuous and is being intermittently interrupted by high resistive formations and it corroborates with the findings of TDEM. The low resistivity occurrence in both shaft areas indicates the filling of void zones saturated debris.

Two steeply dipping, moderate low resistivity anomalous zones in the inverted section indicates the occurrence of auriferous sulphide zones which persists from shallow to deeper upto a depth of 400-450mts. The zone is being intermittently interrupted by high resistive formations. Thus, the alternate occurrence of moderate low zones are bounded with high resistivity material within the 350 m cumulative zone. This indicates the presence of intermittent zones of auriferous sulphide bounded by resistive formations and the location of shaft. This increase in moderate low resistivity zone extends beyond shaft depth indicating the continuity of auriferous formation upto a depth of 400 - 450mts. It has been observed that the shallow part of the moderate low resistivity zone is dipping steeply toward NW which coincides with the dip of the host rocks. Thus, this moderate low resistivity shallow anomaly zone may be interpreted as the geophysical response of shaft filled with debris. and beyond the shaft, the depth can be indicated as auriferous body hosted by quartz veins.

According to previous surveys and Geological mapping the old working locations were identified and are typical corroborating with the moderate low resistivity zones identified which may be a pathfinder for association for auriferous sulphide ores zones in the study area. The presence and overlapping of the above-mentioned anomalies with TDEM zones indicated by the AMT method coincides with the extension of gold-bearing ore zones. However, this should be verified by Deep I.P survey as well as drilling.

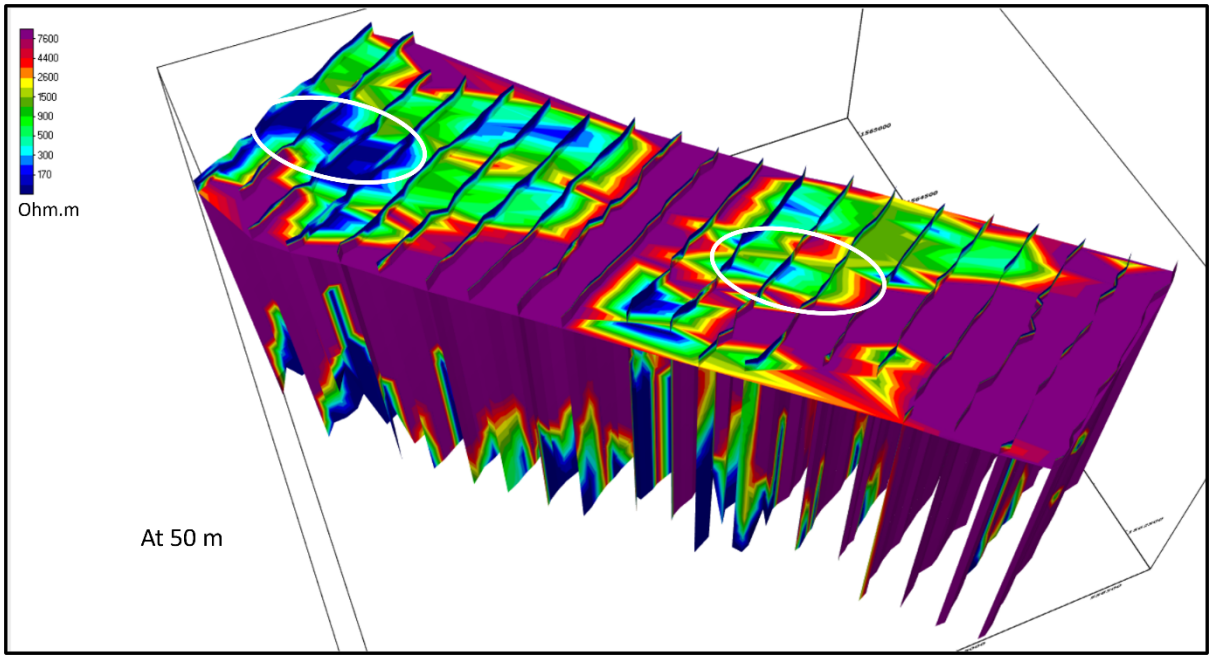


Figure 9.2: Zones marked on TDEM Sections

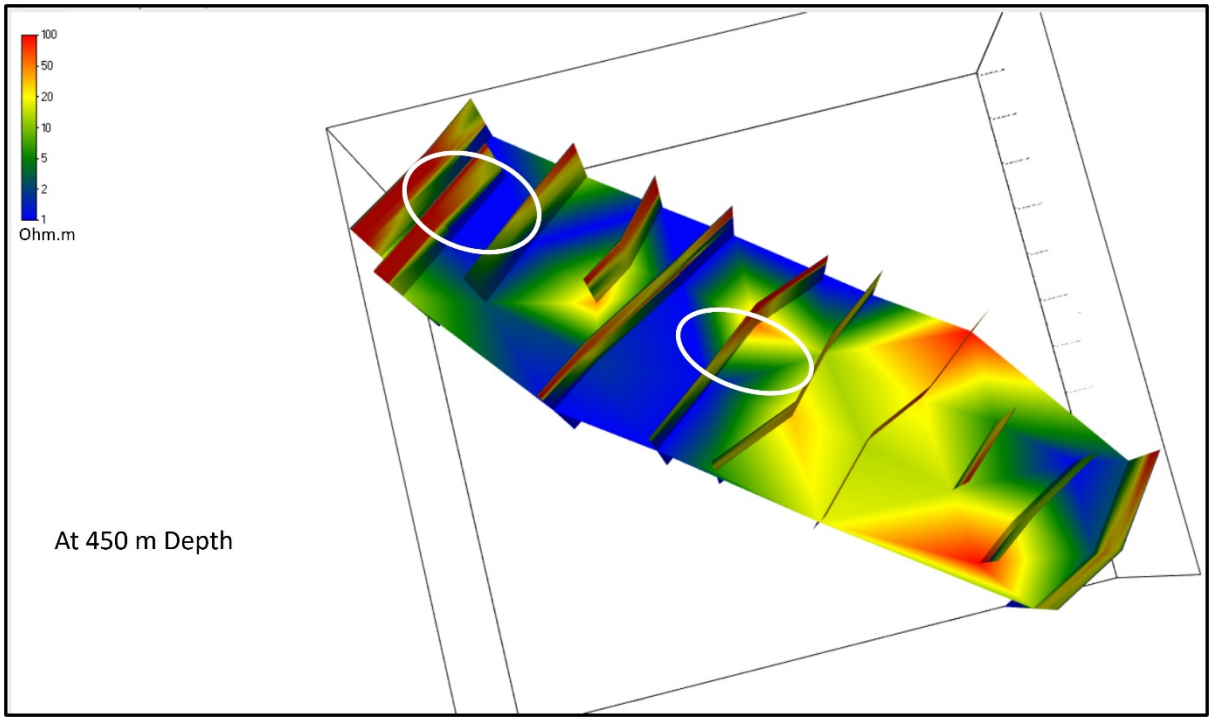


Figure 9.3: Zones marked on MT Sections

9.7.0 CONCLUSIONS AND RECOMMENDATIONS

9.7.1 The Ground Geophysical survey has clearly differentiated between the auriferous sulphides /host rocks and surrounding litho units by their differences in resistivities. The results of both the survey shows the extension of ore-controlling structures, which persists upto a depth of 400 -450m at two locations in North and south of the study area with moderate low to moderate high resistivity. Low resistivity zones observed at shallow depth (0-100mts) indicate the presence of abandoned shafts & underground old workings filled with saturated debris/voids.

9.7.2 The survey results indicated that the TDEM and AMT method is effective and feasible in detecting the distribution of auriferous sulphides and the host rocks in the kudrekonda block. It can provide basic geological information for deep resource exploration. These methods can be used as an available exploration technology for deep prospecting in similar areas. However, gold mineralisation occurs in ppm level, therefore, geophysical methods for gold exploration are planned to target the host/repository rock and favourable structures. Any metal occurring in ppm level cannot be picked by geophysical methods.

9.7.3 Based on combined Ground Geophysical Survey of TDEM & MT survey data, it is recommended to validate identified two geophysical anomaly zones (falling within the old working shafts) by further Deep I.P. geophysical survey as well as by deep drilling. Total four boreholes proposed (03 Boreholes in Northern Anomaly zone & 01 Borehole in Southern Anomaly zone) to test the integrated geophysical anomalies up to vertical depth from 250m to 350m from ground surface. (Figure 11.7.1).

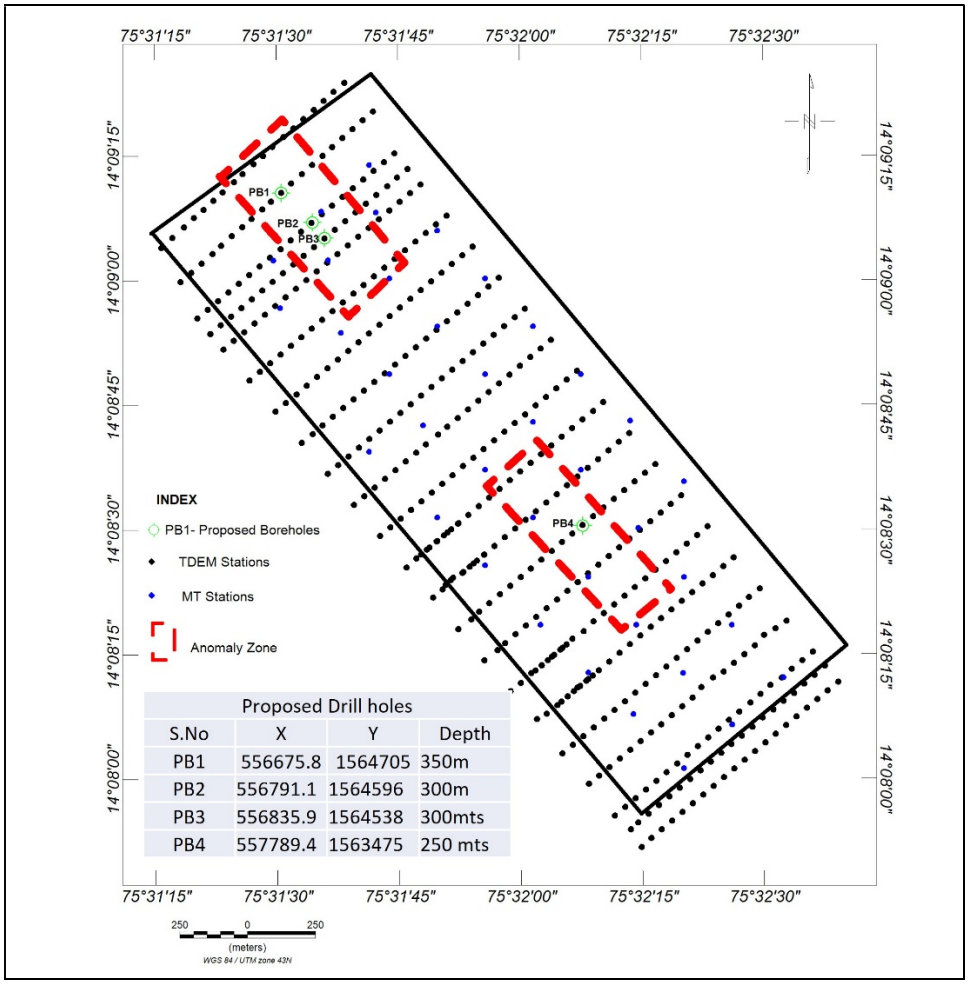


Figure 9.4 Proposed Borehole locations

Note: The proposed boreholes depths are indicated as vertical target depths.

Hence, inclined boreholes with suitable angle are to be planned to intersect the vertical target depths.

9.7.4 Report on Ground Geophysical Survey (Time Domain Electromagnetic & Magneto telluric Survey) for Gold in Kuderekonda Block, District Davanagere, Karnataka is enclosed as **Annexure-VII.**

CHAPTER-X

10.0.0 EXPLORATION UNDERTAKEN DURING CURRENT INVESTIGATION

10.1.0 Background Information

10.1.1 Kudrekonda Block was proposed at G-3 level (Phase-I) of exploration for Gold by Ground Geophysical survey. The Exploration has been carried out as per Minerals (Evidence of Mineral Contents) Amendment Rules, 2021 to achieve the following objective.

i.) To carry out Detailed geological mapping on 1:1000 scale associated with surface geochemical sampling (bedrock/channel) and analysis to identify the surface manifestations and lateral disposition of the Gold bearing mineralized zones

ii.) To carry out integrated ground geophysical survey comprising of TDEM, MT and Deep IP survey over 2.74 sq.km area to identify mineralization zone at deeper levels.

iii.) To carry out TDEM & Deep IP survey cumulatively 30 Lkm at 100m traverse interval with 50m and 10m station interval respectively.

iv.) To carry out MT survey (36 stations) at 250m x 250m grid to cover the entire block area.

Based on the positive outcome of ground geophysical survey further course of action will be decided.

10.1.1 Ground geophysical survey carried out during present exploration and interpretation has already discussed in previous Chapter- IX.

10.2.0 Exploration Methodology

10.2.1 The components of G-3 level of exploration for Gold in Kudrekonda Block to full fill the above-mentioned objective in accordance with MEMC rule 2015 (amended till 2021) as approved by NMET is furnished in the **Table No. 10.1** and the field component wise description has been given in subsequent paragraphs.

Table – 10.1
Summarised Table showing Component wise proposed quantum of Work vs. Actual achievement by MECL in Kudrekonda Block

S. No.	Item of Work	Unit	Target (Qty.)	Achieved (Qty.)
A	**Geological Mapping Other Geological Work & Surveying**			
1	i. Detailed Geological mapping, (1:1000 scale) & Surface samples (Bedrock/Channel/soil)	**sq.km**	2.74	2.74
	ii. Collection of Surface samples (Bedrock/channel/soil)	**Nos.**	30	30
2	Survey work			
b	Topographical survey	**Sq.km**	2.74	2.74
B	**GEOPHYSICAL SURVEY**			
i	IP Survey	**Line km**	30	suspended
ii	Electro Magnetic survey (profiling/sounding)	**Sounding**	360	360
iii	Magneto-Telluric (MT) survey	**stations**	36	36
C	**LABORATORY STUDIES**			
1	Chemical Analysis			
i)	Geochemical Sampling-Surface samples (Bedrock /Channel/Soil)			
	a. Au by Fire Assay	**Nos**	30	30
	b) 34 Elements by ICPMS	**Nos**	30	30
ii)	Surface Check samples (10% External)			
	a. Au by Fire Assay	**Nos**	3	3
2	Physical & Petrological Studies			
i	Preparation & study of thin section	**Nos**	5	5
iii	Preparation & study of polish section	**Nos**	5	5
v	Digital Photographs	**Nos**	5	5
D	**Geological Report**	**Nos.**	1	1

10.2.2 The Preliminary exploration (G-3 stage) (Phase-I) for Gold in Kudrekonda block by Geophysical survey included Ground geophysical survey (Electro magnetic survey & Magneto Telluric Survey stream sediment), detailed geological mapping (1:1000 scale) and Topographical survey over 2.74 sq.km. area collection and analysis of surface samples (Bedrock/Channel) and associated laboratory studies. Ground geophysical survey exploration methodology and findings discussed in Chapter No.

IX. The component wise exploration methodology pertaining to Geological mapping and surface sampling has been described in subsequent paragraphs.

10.2.3 Topographical Survey

Topographical contour survey has been carried out in the entire 2.74 sq.km. area in the Kudrekonda Block located in part of Survey of India toposheet no 48N/15. Topographical survey map used to understand the topography, roads, and drainage/water bodies of the mapped area and also used as a base map for the Geological mapping. Topographical map prepared on 1:1000 scale, however due to size limitations in plotter the map produced on 1:4000 scale. **(Plate No. III)**

10.2.4 Geological Mapping

Detailed Geological mapping taken up in the total area of 2.74 sq. km on 1:1000 scale. For recording precise sample location and to carry out a geological survey, handheld GPS of Garmin 10X has been used. The coordinates had been recorded in UTM coordinate system with WGS 1984 datum. The entire area is occupied by soil cover and is under intense cultivation. Most of the outcrops are obliterated and only few scattered outcrops/exposures are seen at places. Lithological units, attitude of rock types and lithological contacts were mapped and location of old workings have been located. Major litho units mapped in the area are Quartz chlorite schist/Chlorite schist, Metabasalt/sheared metabasalt, quartzite have been mapped ignoring minor variations. Attitude of structural features of rocks, foliation, bedding, joints were recorded by brunton compass. Variation of lithologies along with the structural elements were systematically recorded and the readings and sample locations recorded in the field were plotted and produced in the form of interpreted geological map and given as **Plate No.III**. Geological mapping done on 1:1000 scale, however due to size limitations in plotter the map produced on 1:4000 scale. The description of lithology has already been furnished in Chapter No VII.

10.2.5 Surface Sampling

In accordance with the approved NQT, the present G-3 stage exploration (Phase-I) has been carried out with the surface sampling only which includes collection of 30 nos of Bedrock chip sampling including 3 nos. of channel samples. Moreover, total 5 nos. BRS samples collected for petrographic and mineragraphic studies from different lithologies exposed in the block.

The sampling technique has been described in detail in the Chapter-XII.

10.2.6 Chemical Analysis

Chemical analysis of 30 nos. bedrock/channel samples were subjected to gold analysis (by fire assay method) and for 34 element trace analysis (by ICP-MS method carried out in MECL's Chemical Laboratory, Nagpur. The details of chemical analyses are given in **Annexure-I & II**

10.2.7 Discussion on Geochemical Analyses

A. Bedrock/Channel Samples:

The Gold mineralization in the Kudrekonda area was reportedly associated with the 'Turnbull Reef. Based on attitudes of litho units and shaft positions the trend of mineralization is $N40^0W$-$S40^0E$. The major mineralized quartz reefs mentioned in the previous reports no more exist on the ground as per the current observation. Land enforcement/modification for cultivation purpose has left no traces of mineralized quartz veins in the area.

During the course of mapping, litho units showing signatures of sulphides presence or suspected for sulphide potential with alternation features were sampled to confirm the existence of mineralization through geochemical abundance. Total 27 nos Bedrock samples and 3 nos. channel samples collected from the block area for analysis of Gold (Au) and 34 element analysis (Li, Sc, Cr, Co, Ni, Cu, Zn, As, Y, Mo, Ag, Cd, In, Sb, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Ta, W,

Pb, Bi, Th and U. The details of collected bed rock samples are provided for Au in **Annexure-I-A** and for 34 trace element analysis in **Annexure-I-B**. The location of samples along with Au value shown on Geological map of Kudrekonda **(Plate-III).** The collected samples are categorized in 4 groups namely Metabasalt/Sheared metabaslat, Quartz vein, Quartz chlorite schist/chlorite schist and quartzite and their analytical details are provided for Au in **Table 10.2.**

Table 10.2: Bedrock/Channel sample details for Gold in Kudrekonda Block

S.No	Lithology	AU (ppm)			
		Total Samples (Nos.)	Min (ppm)	Max (ppm)	Mean (ppm)
1	Metabasalt/sheard metabasalt	11	<0.01	0.02	0.015
2	Quartz vein/Quartz with sheared metabasalt/chlorite rich rock	11	<0.01	4.27	<0.01 (n=10) 4.27 (n=1)
3	Quartz chlorite schist/chlorite schist	4	<0.01	0.01	0.01
4	Quartzite	4	<0.01	<0.01	<0.01
	Total	**30**			

Out of 27 nos bedrock samples, only one old working dump sample (MKK/BR/23) of Chlorite rich quartz vein with sulphide disseminations collected from Northeastern shaft old workings shown 4.27 ppm Au. 3 bedrock samples shown 0.01 ppm Au to 0.02 ppm Au and remaining 21 bedrock samples shown <0.01 ppm Au. Total 3 channel samples collected from metabasalt/sheared metabasalt outcrops shown <0.01 ppm Au.

Out of total 30 No.s bedrock/channel samples, 2 Nos. bedrock samples of Meta basalt (MKK/BR/04 & MKK/BR/13)) shown 103.23 ppm Co, 420.94 ppm Cr, 728.90 ppm Ni and 52.06 ppm Co, 465.64ppm Cr, 261.06ppm Ni respectively. 3 Nos. channel samples of Metabasalt/sheared meta basalt shown Co values ranging from 40.50ppm to 62.17ppm, Cr values from 421.76ppm to 534.78 ppm and Ni values from 228.78 ppm to 312.61ppm.

Analytical results of surface samples do not show any significant values for gold and other associated minerals.

10.2.8 Petrographic Study

Petrographic study was carried out on 5 nos of samples collected from different litho units i.e., Quartz chlorite schist/quartz sericite schist and quartzite. The findings of petrographic study have been discussed along with the description of rock types in the area. However, the petrographic study report has been attached as **Annexure No-IV.**

10.2.9 Mineragraphic Study

Total 5 nos of samples collected from quartz vein, metabasalt/sheared metabasalt and quartzite with sulphides have been subjected to mineragraphic study by preparing polished section. The mineragraphic study report has been attached as **Annexure No-V.**

10.2.10 Preparation of Geological Report:

Geological Report has been prepared in Corporate Office, MECL, Nagpur by integration of geological and geophysical survey data. AutoCAD, ArcGIS software and Oasis Montaj etc. has been used for preparation of various maps. The report has been written using Microsoft word and excel 2021 version.

CHAPTER-XI

11.0.0 LOCATION OF DATA POINTS

11.1.0 ACCURACY AND QUALITY OF SURVEY

11.1.1 During the present investigation, topographical survey has been carried out. The Block area is located near Kudrekonda village in Davanagere District of Karnataka. Kudrekonda Block covers an area of 2.74 sq.km falling Survey of India Toposheet No.48N/12. Survey site is located about 3km west of direction from Surahonne and approximately 70 km from Davangere, District headquarters of Karnataka.

Block Location

SL	LAT/LONG	WGS-84 DATUM (DMS)
1	LATITUDE	14°09'25.07" N to 14°07'55.47" N
2	LONGITUDE	75°31'15.24" E to 75°32'39.76" E

TECHNICAL SPECIFICATION OF DGPS

MAKE	***TRIMBLE DGPS***
MODEL	***R8-S***
YEAR OF PURCHASE	***2017***

a*) <u>MEASUREMENT ACCURACY</u>*:

- *PPK Mode (Static)*
- *Horizontal – 3 mm +0.1 ppm or better.*
- *Vertical – 3.5 mm +0.4 ppm or better.*

11.1.2 The survey work has been carried out with the help of DGPS (Make-Trimble GNSS System, Model-R8s). The DGPS Base Station B-1 was established on road side ground centre pillar near Kudrekonda village. Particulars of base station are given below **Table No.11.1**

Table-11.1
The R.L & Coordinate of Base station determined by DGPS instrument in WGS-84 Datum. (UTM Zone 43 North)

Station ID	WGS-84 (DMS)		UTM ZONE - 43		R.L (Meter)	Feature Code
	Latitude	Longitude	Northing (Meter)	Easting (Meter)		
B-1	N14°08'44.40790"	E75°31'45.99082"	1563901.176	557139.365	660.330	DGPS BASE STATION

11.1.3 Topographical contour survey work carried out in the area as it is part of the scope of the work. Topographical contours generated at 2m interval. Surface features like road, water bodies, settelements etc. taken and shown in topographical map as **Plate No. III.**

11.2.0 QUALITY AND ADEQUACY OF TOPOGRAPHIC CONTROL

11.2.1 The survey work has been carried out with the help of DGPS (Make-Trimble GNSS System, Model-R8s) for higher level measurement accuracy. In order to have control on survey work, one base station B-1 has been fixed. After competition of field survey work, raw data was downloaded from DGPS Instrument and data has been through Trimble Business Centre software ***(TBC)*** for generating point list summary and Base line processing report. Survey work carried out by the experienced qualified surveyor as per the prevailing standard procedures.

CHAPTER-XII

12.0.0 SAMPLING TECHNIQUES AND SAMPLE PREPARATION

12.1.0 Sampling

12.1.1 Surface Sampling has been carried out in the Kudrekonda Block includes Bedrock/Channel samples during the course of geological mapping. A total of 30 nos. of BRS including 3 nos. channel samples collected from available outcrops, section cutting exposures, old working dump material for analysis of Au by fire assay method and 34 element by ICP-MS method.

12.2.0 Nature, quality and appropriateness of sample preparation technique

12.2.1 Sampling methodology adopted for bedrock and channel is different from each other. The detailed description of sampling methods for each type of sample has already been discussed in subsequent paragraphs.

12.2.2 Sampling techniques:

A. Bedrock Samples: A total of 27 nos. of bed rock samples (BRS) were collected systematically from varied litho units (meta basalt, quartz chlorite schist, quartzite, quartz vein, old working dump material) exposed in the study area. The Bedrock chip samples were collected by chipping exposed rock units in 1 m radius by sledge hammer (5kg) and chisel. During the sampling, surface was properly cleaned and each sample was collected in separate plastic bags. After collecting each sample, all the instruments were properly cleaned before proceeding for next sample collection to maintain quality and to avoid contamination. The sample locations are plotted on geological map (**Plate No-IV**). First, each Bedrock sample of around 2 kgs collected from the field was crushed. After crushing, the crushed samples were mixed thoroughly and reduced the sample size to 500 gm by coning and quartering. These representative samples were powdered and completely passed through (-) 200 mesh size sieves from which 100 gm sample packed in polythene sample pouch and

submitted for chemical analysis for Au by fire assay method and for 34 trace element analysis by ICP-MS method by MECL Laboratory, Nagpur.

B. Channel Samples: Channel samples were collected from the suitable exposed outcrops/ sections where alteration features and sulphide incidence are noted. The channelling was done cutting across the strike direction of the zone by using proper hammer and chisel. The zone was marked properly on the surface using colour paint. Channel sample were collected with an interval of 1m based on the type of mineralization/lithology Chipped samples were collected along the channel cut and packed in polythene sample bags with proper labelling. While sampling, due care was taken to avoid contamination of samples. The sample locations are plotted on geological map (**Plate No-IV**). A total of 03 Nos. channel samples were collected from road cutting section exposed metabasalt/sheared metabasalt. Samples sent for analysis for Au by fire assay method and 34 trace element analysis at MECL Laboratory, Nagpur.

12.3.0 Quality control procedures adopted during sampling

12.3.1 The samples have been prepared under the supervision of geologist and qualified sampling technician. During the sampling, surface was properly cleaned and each sample was collected in separate plastic bags for bedrock/channel samples. After collecting each sample, all the instruments were properly cleaned before proceeding for next sample collection to maintain quality and to avoid contamination. After collecting the chip samples all samples properly packed in polythene samples bags with proper labelling. The entire samples were transported to MECL central sample processing unit located in Nagpur. It has been thoroughly checked that none of the sample bags were damaged during transportation.

12.3.2 Further measures have been taken during sieving and pounding/grinding of samples. The sieve and containers have been cleaned after processing of each sample to avoid contamination and measures have also been taken to avoid loss of powder in air.

12.4.0 Measures taken to ensure that the sampling is representative of the in-situ material collected.

12.4.1 It is very important to submit the representative sample of collected material for geochemical analyses. Bed rock/channel samples quantity has been reduced to 500 grams by coning and quartering method after thoroughly mixing to maintain the homogeneity of the samples. All measures taken that samples remain representative in nature of in situ material collected.

12.5.0 Appropriateness of grain size

12.5.1 In accordance with the standard sampling procedures, it has also been observed that smaller the particle size, higher the homogeneity of the sample as well as higher the dissolvability during the chemical analysis. As per the standard practice, Bedrock/ Channel samples are generally pounded to (-) 200 mesh size for analysis of Au and associated 34 element.

CHAPTER-XIII

13.0.0 DRILLING TECHNIQUE AND DRILL SAMPLING EMPLOYED

13.1.0 Drilling work was not in the scope of present exploration.

CHAPTER-XIV

14.0.0 SUB-SAMPLING TECHNIQUES AND SAMPLE PREPARATION

14.1.1 As drilling was not in the scope of present exploration work, hence drill core samples has not been generated in the present exploration. The sampling technique of bed rock/channel samples has been discussed in Chapter XII

CHAPTER-XV

15.0.0 QUALITY OF ASSAY DATA AND LABORATORY TESTS

15.1.0 THE NATURE, QUALITY AND APPROPRIATENESS OF THE ASSAYING AND LABORATORY PROCEDURES

The primary samples have been analysed for Gold (Au) by fire assay method and 34 elements analysis by ICP-MS method at Chemical Laboratory of MECL, Nagpur. The methodology of chemical analysis is described in the following paragraphs.

15.1.1 Analysis of Gold (Au) by fire assay method.

Samples are prepared as weighted 50 fusion pots in a batch. Prior to using fusion pots for weighing a visual inspection inside the fusion pot is performed. The sample is weighed 50g in a fusion crucible containing flux of Lead monoxide, sodium carbonate, borax, silica, silver nitrate fused in a preheated fusion furnace 1050^0C for 45 minutes and the molten melt is poured into a cast iron mold. The lead botton is separated from the slag and oxidized in a cupellation furnase keeping in a cupel for one hour. The obtained Prill is cooled and digested in aqua regia and aspirated in Atomic Absorption Spectrometer for ppm levels.

15.1.2 Methodology of Chemical Analyses by ICP-MS

Chemical Laboratory, MECL, Nagpur is having Agilent make ICPMS 7800 model for elemental analyses. ICP-MS (inductively coupled plasma-mass-spectrometry) is a technique to determine low-concentrations (ppb = parts per billion = µg/l) and ultra-low-concentrations of elements (ppt = parts per trillion = ng/l). ICP-MS can also measure elements at concentrations up to 100s or even 1000s of parts per million (ppm). Accuracy and precision (standard deviation) for 34 of these elements is either excellent (<5%) or good (5–10%).

15.1.3 SOP for 34 Element Analysis by ICP-MS

Procedure:

1. **Acid Digestion Method**

a) **Weigh and Add Acids:** Place ~0.1–0.5 g of powdered sample in a PTFE vessel. Add ~3 mL concentrated HF + 1-2 mL concentrated $HClO_4$. Cover loosely with a PTFE lid or watch glass.

b) **Heat to Dryness:** Gently heat at 150–200 °C under the hood. The acid will react, dissolving most matrix; white fumes indicate silica removal. Continue heating until nearly dry (residual melt).

c) **Evaporate to Near Dryness:** Carefully evaporate to a small volume, then add ~1–2 mL concentrated HNO_3 and heat again to remove HF residues. If fuming ceases, add fresh $HClO_4$ (0.5–1 mL) and repeat to ensure all organics are oxidized.

d) **Re-dissolve:** Cool the vessel and add ~2 mL concentrated HCl or aqua regia (HCl:HNO_3 3:1) to re-dissolve any residue. Then dilute with 5–10 mL 2% HNO_3, transfer to a 50–100 mL volumetric flask, and dilute to volume with ultrapure/Millipore water.

2. **ICP-MS Calibration and Tuning**

Inductively Coupled Plasma Mass Spectrometer (ICP-MS) instruments must be warmed up and tuned before each run. Start the plasma and allow ~30 min stabilization. Use a commercial tune solution to adjust torch position, nebulizer gas flow, sample depth, lens voltages, and RF power. Optimize for high count rates and low oxide formation.

a. Calibration: Prepare multi-element calibration standards covering the expected concentration range (e.g. 0.1–100 µg/L). Include a calibration blank and at least 4 non-zero. It is common to match the acid matrix of standards to samples (e.g. 2% HNO_3 + a few % HCL).

b. Sample Introduction and Data Acquisition

Introduce samples via an auto sampler and nebulizer (typically concentric or cyclonic) into the plasma.

c. Target Elements (34-Element Suite)

The 34-element geochemical ICP-MS suite typically includes major, minor and traces metals plus all rare earths. Report elemental concentrations in appropriate units (e.g. ppm or mg/kg) on a dried sample basis.

3. Quality Control (CRMs, Blanks, Duplicates)

a) **CRM:** Digest and analyze at least one certified reference material (geochemical standard of similar matrix) as an unknown. Recoveries should be within ~10% of certified values.

b) **Blanks:** Process method blanks (all reagents, no sample) through digestion and analysis to detect contamination. Instrument blanks (2% HNO_3) should also be run.

c) **Duplicates/Replicates:** Include sample duplicates or matrix spike duplicates to assess precision. Relative percent difference (RPD) between duplicates should typically be <10–20%.

d) **Calibration Checks:** Run a second source standard or CCV to check calibration drift. Internal standard signals should remain within ~80–120% of initial intensities.

15.2.0 NATURE OF QUALITY CONTROL PROCEDURES ADOPTED

15.2.1 The standard procedure of quality control has been adopted during the chemical analysis in Chemical laboratory, MECL, Nagpur which includes

(i) Analysis of Certified reference materials/measurement standards
(ii) Analysis of blind samples
(iii) Use of QC samples and control charts
(iv) Analysis of blank samples
(v) Analysis of spiked samples
(vi) Analysis in duplicate samples

15.3.0 CHECK ANALYSIS FROM THIRD PARTY NABL ACCREDITED LABORETORY

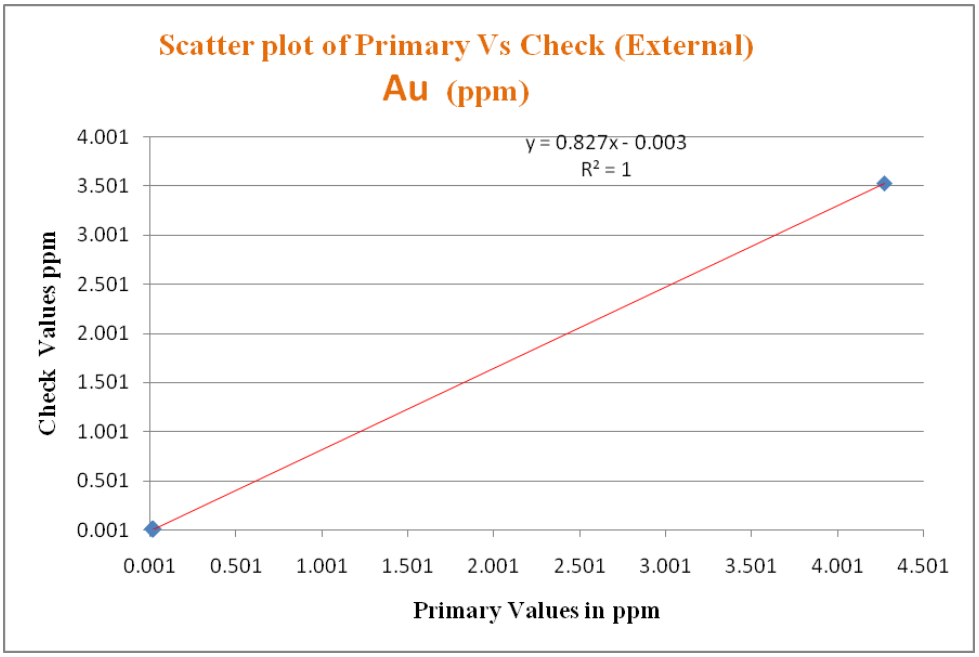
15.3.1 In accordance to the standard practice of quality assurance and quality control, total 3 Nos. of primary samples (10% of primary samples) have been analysed as external check samples for Au in NABL accredited laboratory i.e. M/s Shiva Analyticals Laboratory, Bengaluru. In order to assess the reliability of homogeneity

of primary samples and repeatability of their chemical analysis with primary samples results of MECL laboratory. External check sample results of M/s Shiva Analyticals Laboratory has been compared with primary sample results for gold and found no major or significant difference between the results. The details of Primary and External Check samples for Au are given in the **Annexure-III.**

15.3.2 The comparative studies of primary Vs External check analysis for Gold (Au) is given in **Table-15.1** and scatter plots is represented as **Text Figure- 10.**

Table-15.1: Comparison of Primary vs Internal Check Samples for Gold

SL. NO.	COMPARISION INDEX	Primary Analysis for Cu (ppm)	External Check Analysis for Cu (ppm)
1	No. of Sample pairs	03	
2	Arithmetic Mean	1.433	1.183
3	Standard Deviation	2.006	1.66
4	Standard Error of Mean	1.158	0.958
5	Variance	4.024	2.755
6	Mean of Deviation	0.25	
7	Correlation coefficient	0.999	
8	Paired T value	1.252	
9	F Test value	1.461	



Text Figure 10: Scatter Plot of primary V/s Check (External) Analysis Au (ppm)

15.3.3 The data set for primary Vs external check analysis comprises 03 pairs of samples. (10% of primary samples). Table-15.1 shows that the difference in arithmetic mean, standard deviation, standard error of mean and variance of primary and external check samples are not high. The value of R^2 given in scatter plot (Text Figure – 10) is 0.999, which is close to 1.00 and indicates a good correlation in primary and external check analysis.

15.3.4 The statistical and comparative studies for primary Vs external check samples shows the repeatability of the analysis for Au i.e. insignificant differences between primary and external check analysis, which support the reliability of sampling procedure.

15.4.0 SECURITY AND CHAIN OF CONTROL OF SAMPLES

15.4.1 The samples have been prepared at centralized mechanized sampling unit with proper lebeling and tag and sent to chemical laboratory in supervision of qualified sampling technician. The samples have been transported from field to sample processing unit with proper sealing of sampling bags and the same has been verified in the sampling unit before opening the bags. At the sampling unit, standard procedure has been followed and all the precautionary measures have been taken to avoid the contamination. Further the remaining samples are propoerly preserved with sample tags for any future reference under the custody of the company.

CHAPTER-XVI

16.0.0 MOISTURE

16.1.0 METHOD OF DETERMINIATIONOF MOISTURE CONTENT

Moisture content has not determined.

CHAPTER-XVII

17.0.0 BULK DENSITY

17.1.0 METHOD OF DETERMINIATION AND RESULT

The present exploration has been carried out at G-3 level, i.e., Preliminary Exploration for Gold by Geophysical survey and geological mapping surface sampling with an objective to identify prospective area of further mineral exploration. Hence, only surface sampling has been carried out. Drilling of boreholes was not in the scope of present exploration. As a result, bulk density or specific gravity has not been determined.

CHAPTER-XVIII

18.0.0 BENEFICIATION STUDIES AS MAY BE REQUIRED

18.1.0 DETAILS OF BENEFICIATION STUDIES

18.1.0 Beneficiation studies have not been carried out in the present exploration as it was out of the scope of the approved quantum of work.

CHAPTER-XIX

19.0.0 RESOURCE ESTIMATION TECHNIQUES

19.1.0 Resource has not been estimated at this stage of exploration.

CHAPTER-XX

20.0.0 REPORTING OF RESOURCES

20.1.0 As mentioned in the Chapter – XIX, resource has not been estimated in the present stage of exploration.

CHAPTER-XXI

21.1.0 SUMMARY AND RECOMMENDATIONS

21.1.1 SUMMARY

21.1.1 The Kudrekonda Block, part of the Honnali gold field within the Shimoga Schist Belt of Southern India, has been historically significant for gold mining activities since the 1880s. Major auriferous zones such as Kudrekonda and Palavanahalli were historically mined through shafts to depths of 80 meters by several now-defunct companies. Mining operations ceased after early exploration revealed highly erratic lode behavior, making extraction unviable. The region presents challenges for modern exploration due to thick soil cover, dense cultivation, and minimal outcrop visibility.

21.1.2 Due to past mining activity, land use changes, and agricultural modifications, visible signs of mineralization have been obliterated. The area now has a thick soil cover and is densely cultivated, which, along with poor rock outcrop density, hampers surface geological interpretation. These conditions make it difficult to trace the disposition of any concealed ore bodies, which remain undetected.

21.1.3 Intense mining activity in the past, land enforcement and modification for cultivation has left no traces of mineralisation in the area. Poor outcrop density, thick soil cover and dense cultivation in the area makes it difficult to understand the disposition of concealed ore body and it is still unrevealed.

21.1.4 To address these geological uncertainties, MECL taken up Preliminary Exploration (G-3 stage) (Phase-I) for Gold by Ground Geophysical Survey in Kudrekonda Block, Davanagere District of Karnataka under NMET funding to identify and locate deeper level extensions of auriferous zones in the area.

21.1.5 The Kudrekonda Block area covering 2.74 sq.km. located in Survey of India Toposheet No. 48N/12, approximately 3 km west of Nyamati and 20 km south west of Honnali in Davanagere District of Karnataka.

21.1.6 The present Preliminary Exploration (G-3 stage) work as per the approved quantum included Ground Geophysical survey, Detailed geological mapping (1:1000 scale) along with topographical survey over 2.74 sq.km area surface sampling (30 Nos. bedrock/channel samples) and analysis for Gold and 34 Element analysis by ICP-MS method along with petrolographic and mineragraphic studies. Ground Geophysical survey comprising of TDEM (Time Domain Electromagnetic Survey) of 360 soundings and Magneto telluric (MT) Survey 36 stations over 2.74 sq.km. area completed. However, Deep I.P. survey planned for 30 Lkm could not be executed due to local village people opposition and survey work was stopped on 25th August, 2024.

21.1.6 The rock formations of the area belong to Jhandimatti formation belonging to Chitradurga Group of the Dharwar Supergroup. The study area predominantly covered by soil with scattered exposures/outcrops of quartz-chlorite schist, quartzite and Metabasat. Thin quartz veins intrude these formations at places. Due to extensive agricultural modification, soil cover outcrop visibility is limited.

21.1.7 Gold Mineralisation in Kudrekonda area is associated with the sheared metabasalt carrying quartz-carbonate veins. The mineralization is epigenetic in nature and it is confined to quartz carbonate veins carrying sulphides like pyrite and arsenopyrite, emplaced along shear zones.. This epigenetic mineralization is often accompanied by wall rock alteration features such as sericitization, chloritization, tourmalinization, and fuchsitization. Abandoned old workings like the Northeastern and Turnbull shafts were located in the field. Based on geological features and shaft alignments, the mineralization trend is N40°W–S40°E direction. However, earlier reported mineralized quartz reefs like the Turnbull Reef are no longer observable, due to intense mining activities in the past and land modifications/disturbance for farming.

21.1.8 The Ground Geophysical survey work comprising of TDEM & MT survey carried out in the area to identify deeper extensions and location of gold bearing ore zones in depth. Ground Geophysical survey has clearly differentiated between the auriferous sulphides /host rocks and surrounding litho units by their differences in resistivities.

The results of both the surveys show the extension of ore-controlling structures, which persists upto a depth of 400– 450m at two locations in north and south of the study area with moderate low to moderate high resistivity. Low resistivity zones observed at shallow depth (0-100mts) indicate the presence of abandoned shafts & underground old workings filled with saturated debris/voids. Both identified anomalies are independent and discontinuous in nature.

1.1.9 The Geophysical survey results indicated that the TDEM and AMT method is effective and feasible in detecting the distribution of auriferous sulphides and the host rocks in the kudrekonda block. It can provide basic geological information for deep resource exploration. These methods can be used as an available exploration technology for deep prospecting in similar areas. However, gold mineralisation occurs in ppm level, therefore, geophysical methods for gold exploration are planned to target the host/repository rock and favourable structures. Any metal occurring in ppm level cannot be picked by geophysical methods.

1.1.12 Despite MECL's efforts to conduct public awareness programs and engage with local authorities and the Department of Mines and Geology, Karnataka, local villagers continued to oppose the geophysical survey work. Their resistance led to disruption and eventual suspension of the Deep IP survey component. Community objections remained unresolved, resulting in suspension of further field investigations in the area.

21.1.12 The project's status was reviewed in the 76th TCC meeting held on April 30, 2025. MECL reported that no further activities could proceed under the prevailing circumstances. After detailed discussions, 76th TCC-1 committee noted the limitations in the project and agreed to formally close the project following the submission of the Report by June 25, 2025.

21.2.0 RECOMMENDATIONS

21.2.1 Based on combined Ground Geophysical Survey of TDEM & MT survey data, it is recommended to validate the identified two geophysical anomaly zones (falling within the old working shafts) by further Deep IP geophysical survey as well as by deep drilling. Total four boreholes proposed (03 Boreholes in northern anomaly zone & 01 Borehole in southern anomaly zone) to test the integrated geophysical anomalies up to vertical depth from 250m to 350m from ground surface.

It is further recommended that the proposed exploration activities be undertaken only after obtaining the consent of the local village community and ensuring resolution of law-and-order issues, as present exploration work was suspended due to local agitation.

CHAPTER-XXII

PLATES AND MAPS

22.1.0 List of Plates

Sl. No.	Plate No	Title	R.F
1.	I	Location map of Kudrekonda Block, Davanagere District, Karnataka	NTS
2.	II	Regional Geological Map Showing Kudrekonda Block, Davanagere District, Karnataka	1:50,000
3	III	Surface Topographical Map, Kudrekonda Block, Davanagere District, Karnataka	1:4,000
4.	IV	Interpreted Detailed Geological map of Kudrekonda Block, Davanagere District, Karnataka	1:4,000

CHAPTER-XXIII

23.0.0 ANNEXURE / ENCLOSURES TO THE REPORT

The report includes all the relevant annexure and maps, plans, sections, photographs etc. List of annexures, tables, maps, plans, sections, photographs, Text figures & etc are provided in the Geological Report.

CHAPTER-XXIV

24.0.0 ANY OTHER INFORMATION

24.1.0. Any other information as may be available or required by any authority as prescribed.

24.1.0 REFERENCES

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CHAPTER-XXV

25.0.0 CERTIFICATION

25.1.0 CERTIFICATION

This is to certify that geological report has been prepared in respect of Preliminary Exploration (G-3 Stage) (Phase-I) for Gold by Ground Geophysical Survey in Kudrekonda Block (2.74 sq.km. area), District: Davanagere, State: Karnataka by Mineral Exploration and Consultancy Limited (MECL) on behalf of National Mineral Exploration Trust (NMET). The report has been prepared in accordance with the Minerals (Evidence of Mineral Contents) Rule 2015 specified under Mineral Auction Rule, 2015 and amended up to 2021.

NAME: **SHRIKANT SHARMA**
DESIGNATION: **HEAD OF DEPARTMENT (EXPLORATION)**

DATE:

LOCALITY INDEX

Locality	Latitude (N)	Longitude (E)
Honnali	14^0 14’ 19”	75^0 38’ 46”
Kalvi Rangan Gudda	14^0 08’ 56”	75^0 30’ 28”
Kudrekonda	14^0 08’ 31”	75^0 32’ 26”
Nyamati	14^0 08’ 57”	75^0 34’ 31”
Palavanahalli	14^0 06’ 12”	75^0 34’ 36”
Salabalu	14^0 07’ 12”	75^0 32’ 55”
Savalanga	14^0 06’ 08”	75^0 31’ 30”
Surahone	14^0 08’ 49”	75^0 33’ 28”