GEOLOGICAL REPORT ON RECONNAISSANCE SURVEY (G-4 Stage) FOR GOLD IN

BARGUR BLOCK (157.50 sq.km.)

BARGUR BELT OF KOLAR SCHIST BELT,

DISTRICT: KRISHNAGIRI, STATE – TAMIL NADU

(Under NMET Programme)

(TEXT, ANNEXURES AND PLATES)

MINERAL EXPLORATION AND CONSULTANCY LTD.

(Formerly Mineral Exploration Corporation Ltd.)

मिनरल एक्सप्लोरेशन एंड कंसल्टेंसी लिमिटेड

(पूर्व में मिनरल एक्सप्लोरेशन कार्पोरेशन लिमिटेड)

खान मंत्रालय, भारत सरकार का उद्यम, मिनीरत्ना-I सीपीएसई

Ministry of Mines, Govt of India Enterprise, MINIRATNA-I CPSE

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बरगुर ब्लॉक (157.50 वर्ग किमी)में स्वर्ण हेतु आवीक्षण सर्वेक्षण(G-4 स्तर) पर भूवैज्ञानिक रिपोर्ट

कोलार शिस्ट बेल्ट का बरगुर बेल्ट,

ज़िला: कृष्णागिरी, राज्य – तमिलनाडु

अध्याय-1A

कार्यकारी सारांश

1.1.1 बरगुर ब्लॉक क्षेत्र बरगुर बेल्ट का हिस्सा है और तमिलनाडु के कृष्णागिरी जिले में कोलार शिस्ट बेल्ट के दक्षिणी छोर पर स्थित है । बरगुर क्षेत्रस्वर्ण की मौजूदगी के लिए जाना जाता था और बरगुर क्षेत्र में पूर्व के भूवैज्ञानिकों ने स्वर्ण के लिए सकलगुंटा और बंगारागुंटा नाम की दो पुरानी जगहों की रिपोर्ट दी थी । मेसर्स जॉन टेलर एंड संस ने 1940 में इन पुरानी जगहों की जांच की, उसके बाद भारतीय भूवैज्ञानिक सर्वेक्षण (GSI) (1988-89) ने भी खदानों के ढेरों और सतह के सैंपल में स्वर्ण की उत्साहित करने वालीमान (वैल्यू) बताईं।भारतीय भूवैज्ञानिक सर्वेक्षण(GSI) के पूर्व के भूवैज्ञानिकोंका मानना था कि मिग्माटाइट्स/ग्नीस में एम्फीबोलाइट एन्क्लेव ज़्यादातर स्वर्णसे खनिजीकृत (मिनरलाइज़्ड) होते हैं, जैसा कि कोलार शिस्ट बेल्ट में होता है और इसलिए इन एन्क्लेव में खास तौर पर स्वर्ण की पूर्वेक्षण होनी चाहिए।

1.1.2 ऊपरोक्त को ध्यान में रखते हुए, तमिलनाडु के कृष्णागिरी ज़िले में भारतीय सर्वेक्षण की टोपोशीट नंबर 57L/06 के कुछ हिस्सों में बरगुर ब्लॉक में स्वर्ण के लिए मौजूदा आवीक्षण सर्वे (G4 चरण) किया गया है। इसका उद्देश्य स्वर्ण धारित हॉस्ट चट्टानों की पहचान करना और पुराने कार्यचालन की क्षमता और उनके संभावित विस्तार का अंदाज़ा लगाना है, जिसमें लगभग 157.50 sq. km का क्षेत्र शामिल है।

1.1.3 बरगुर ब्लॉक में आवीक्षण सर्वे (G-4 चरण) में फेज़-I का काम शामिल था, जिसमें 157.50 sq.km क्षेत्र में बड़े पैमाने पर जियोलॉजिकल मैपिंग (1:12500 स्केल) शामिल थी। इसमें सोना (Au) और दूसरे जुड़े हुए एलिमेंट्स जैसे Ag, Ni, Co, Cr, Cu, Pb, Zn, V, Ti के लिए 200 बेडरॉक/चैनल सैंपल इकट्ठा करना और उनका विश्लेषण करना शामिल था। साथ ही, PGE कंटेंट के विश्लेषण के लिए 10 चुने हुए सैंपल भी शामिल थे। IP कम रेसिस्टिविटी, SP और मैग्नेटिक सर्वे (कुल 30 Lkm) वाला ग्राउंड जियोफिजिकल सर्वे तय किए गए दो पुराने वर्किंग सब-क्षेत्र(सकलगुंटा और बंगारागुंटा) में किया गया । चरण-I कार्य के परिणाम और एनएमईटी की टीसीसी के साथ समीक्षा के आधार पर, चरण-II कार्य अर्थात 2 बोरहोल में 247 मीटर की कुल परीक्षण ड्रिलिंग बंगारागुंटा उप क्षेत्र में की गई थी, साथ ही संबंधित गतिविधियाँ

अर्थात बोरहोल विचलन सर्वेक्षण और बोरहोल भूभौतिकीय लॉगिंग और संबंधित प्रयोगशाला अध्ययन जिसमें स्वर्ण के लिए बोरहोल कोर नमूने (39 संख्या) का विश्लेषण और आईसीपी-एमएस विधि द्वारा 34 तात्विक विश्लेषण, पेट्रोग्राफिक अध्ययन (09 संख्या), मिनराग्राफिक अध्ययन (09 संख्या) और 3 विशिष्ट गुरुत्व निर्धारण अध्ययन शामिल हैं।

1.1.4 बरगुर क्षेत्र में मिली लिथो यूनिट्स पेनिनसुलर नाइसिक कॉम्प्लेक्स का हिस्सा हैं, जिसमें एम्फीबोलाइट्स और बैंडेड आयरन फॉर्मेशन (मैग्नेटाइट क्वार्टजाइट के रूप में) के लेंस और एन्क्लेव हैं। ग्रेनाइटिक नाइसिक चट्टान के अंदर एक सिंगल मेटाचर्ट एन्क्लेव मैप किया गया है। पेनिनसुलर नाइसिक कॉम्प्लेक्स को ग्रेनाइटॉइड्स (हॉर्नब्लेड बायोटाइट नाइस, बायोइट /एपिडोट नाइस, ग्रैनोडायोराइट, मिग्माटाइट्स) से दिखाया गया है। ये चट्टानें इस क्षेत्र का बड़ा हिस्सा बनाती हैं। इन चट्टानों में जगह-जगह बेसिक डाइक अर्वेधित हुई हैं। कई पतली क्वार्ट्ज और पेग्माटाइट वेंस इस क्षेत्र से गुज़रती हैं। ज़्यादातर मैदानी ज़मीन और पहाड़ियों के बीच घाटी के हिस्से मिट्टी से ढके हुए हैं। मिट्टी से ढके क्षेत्रों में ज़्यादातर खेती होती है।

1.1.5 भूवैज्ञानिक मानचित्रण के दौरान, खनिज क्षेत्रों की पहचान करने के लिए एम्फीबोलाइट, बैंडेड आयरन फॉर्मेशन (बीआईएफ) और मेटा चर्ट का विस्तार से मानचित्रण करने पर मुख्य जोर दिया गया था, यदि कोई हो। बरगुर ब्लॉक क्षेत्र में काराकुप्पम गांव के पश्चिम में स्थित सकलगुंटा और बंगारागुंटा के रूप में स्वर्ण के दो प्राचीन/पुराने कार्य स्थित हैं। सकलगुंटा और पास के बंगारागुंटा में स्वर्ण के पुराने कार्य हॉर्नब्लेंड नीस (मिग्माटाइट्स)/ एम्फीबोलाइट एन्क्लेव में पतली क्वार्ट्ज/पेग्माटाइट वेंसों से जुड़े हैं। वर्तमान अवलोकन के अनुसार, भूमि संशोधनों और मिट्टी के आवरण के कारण पुराने कार्य क्षेत्रों में खनिजयुक्त क्वार्ट्ज वेंसों का कोई निशान नहीं देखा जा सका। क्वार्ट्ज़ वेन्स के साथ या बिना, BIF और मेटा चर्ट आउटक्रॉप्स में सल्फाइड (पाइराइट, पाइरोटाइट) डिसेमिनेशन /स्पेक्स होते हैं और कुछ जगहों पर फेरुगिनाइज़ेशन जैसे कुछ बदलाव संबंधी विशेषताएं देखी जाती हैं।

1.1.6 खनिज विज्ञान अध्ययन से पता चला कि मैग्नेटाइट, स्फीन, पाइरोटाइट और पाइराइट मुख्य खनिज हैं, जो सैंपल में अलग-अलग अनुपात में पाए जाते हैं। इल्मेनाइट, हेमाटाइट, गोएथाइट और चाल्कोपाइराइट आमतौर पर छोटे हिस्से के तौर पर पाए जाते हैं, जबकि डाइजेनाइट, कोवेलाइट, स्फेलेराइट, पेंटलैंडाइट और लिमोनाइट ट्रेस टू एक्सेसरी फेज के तौर पर दिखाई देते हैं।

1.1.7 स्वर्ण और उससे जुड़े दूसरे खनिज तत्व का पता लगाने के लिए बरगुर ब्लॉक क्षेत्र से तलीय बेडरॉक/चैनल सैंपल इकट्ठा किए गए । 200 सैंपल में से, 189 बेडरॉक सैंपल अलग-अलग लिथोनाइट्स जैसे एम्फीबोलाइट +/- क्वार्ट्ज वेन, क्वार्ट्ज वेन वाले शियर्ड एम्फीबोलाइट, बारीक दाने

वाले बड़े एम्फीबोलाइट, मेटा चर्ट, BIF, और बेसिक (डोलराइट) डाइक से इकट्ठा किए गए, जिनमें <0.01 ppm से 0.21 ppm Au तक स्वर्णमान दिखाई गई। कुल 91 बेडरॉक सैंपल का विश्लेषण किया गया जो >0.01 ppm से 0.21 ppm Au और 80 बेडरॉक सैंपल <0.01 ppm Au थे। सकलागुंटा के पुराने कार्यों से एकत्रित क्वार्ट्ज वेंस के साथ एम्फीबोलाइट का केवल एक बेडरॉक नमूना 0.19 ppm Au दिखाता है जबकि बंगारागुंटा के पुराने कार्यों से एकत्रित एक डंप नमूना (क्वार्ट्ज वेंस को शियर्ड एम्फीबोलाइट/ग्निसिक चट्टान के साथ मिश्रित) 0.21 ppm Au दिखाता है। चैनल नमूने (11 संख्या) लक्ष्य मेजबान चट्टानों से एकत्र किए गए क्वार्ट्ज वेंसों के साथ एम्फीबोलाइट का विश्लेषण किया गया जिसमें एयू मान <0.01 ppm Au से 0.02 ppm Au तक था, जबकि मेटा चर्ट आउटक्रॉप के चैनल नमूनों में Au मान 0.03 ppm Au से 0.04 ppm Au दिखाया गया। स्वर्ण के लिए बेडरॉक और चैनल नमूना परिणाम उत्साहजनक नहीं हैं।

1.1.8 कुल 200 सतही बेडरॉक/चैनल नमूनों का विश्लेषण संबंधित तत्वों जैसे Ag, Ni, Co, Cr, Cu, Pb, Zn V और Ti के लिए किया गया। 200 नमूनों में से, 53 सतही बेडरॉक/चैनल नमूनों में Cu मान >200ppm से 1700ppm Cu के बीच पाए गए। पांच बेडरॉक नमूनों में ताम्र (Cu) मान 536.15ppm से 785.19ppm Cu के बीच पाए गए। एक नमूने में बंगारागुंटा क्षेत्र में 1700 ppm Cu का उच्चतम मान दिखाया गया। छह बेडरॉक नमूनों में 215.96ppm Zn से 371.53 ppm Zn मान दिखाए गए । क्षेत्र में एम्फीबोलाइट्स, मेटाचेर्ट से दर्ज किए गए Cu , Zn के ऊंचे मान प्रकृति में छिटपुट हैं और किसी भी लगातार खनिज प्रवृत्ति का संकेत नहीं देते हैं ।Cu और Zn के लिए इन कभी-कभी प्राप्त होने वाले मान को छोड़कर, Ag, Ni, Co, Cr, Pb, और V के लिए संबद्ध तत्वों का रसायनिक विश्लेषण उत्साहजनक नही रहा है।

1.1.9 एम्फीबोलाइट्स और मेटा चर्ट से एकत्र किए गए चयनित नमूनों में से दस का पीजीई सामग्री के लिए विश्लेषण किया गया। दस नमूनों के विश्लेषणात्मक परिणामों ने कुल पीजीई सामग्री 62.30 ppb से 484.24 ppb तक भिन्न होने का संकेत दिया। 10 नमूनों में से, 8 एम्फीबिलिटे नमूनों में Pd मान 62.30 ppb से 342.37 ppbPd के बीच, Ru मान जांच सीमा (5 ppb) से नीचे 31.31 ppb और अन्य तत्व Rh, Os, Ir और Pt मान जांच सीमा (5 ppb) से नीचे विश्लेषण किए गए। दो मेटा चर्ट नमूनों ने 434.93 ppb और 451.32 ppb के Pd मान दिखाए और एक नमूने ने 31.31 ppb का Ru मान दिखाया यह संभावना है कि स्थानीयPd एनरिचमेंट को पास के मैफिक-अल्ट्रामैफिक यूनिट्स से हाइड्रोथर्मली रिमूव किया गया है और मेटाचर्ट में ट्रैप किया गया है । कुल मिलाकर, एम्फीबोलाइट्स में PGE वैल्यू खराब थे और दो मेटाचर्ट सैंपल्स में स्थानीय विसंगतिpd कंसंट्रेशन को छोड़कर उत्साहजनक नहीं थे ।

1.1.10 कुल मिलाकर बेडरॉक और चैनल सैंपल के परिणामों में स्वर्ण और संबद्धतत्वों के लिए उत्साहजनक मान नहीं दिखीं। हालांकि, मिट्टी के कवर और दो पुराने कार्यचलान की मौजूदगी को देखते हुए, किसी भी सबतलीय मिनरल वाले एक्सटेंशन की पहचान करने के लिए ग्राउंड जियोफिजिकल सर्वे का प्लान बनाया गया था। इसके मुताबिक, डिटेल्ड जियोफिजिकल काम के लिए दो सब-ब्लॉक बंगारागुंटा (1.3 sq.km) और सकलागुंटा (1.76 sq.km) चुने गए। सकलागुंटा सब ब्लॉक (18 Lkm) और बंगारागुंटा सब ब्लॉक (12 Lkm) में 100m प्रोफाइल इंटरवल और 20m स्टेशन इंटरवल पर IP-सह-रेसिस्टिविटी, मैग्नेटिक और SP सर्वे (कुल 30 Lkm) सहित ग्राउंड जियोफिजिकल सर्वे किया गया है ।

1.1.11 ग्राउंड जियोफिजिकल सर्वे से पता चला है कि सकलागुंटा ब्लॉक (ब्लॉक-I) में एक सिंगल, कोहेरेंट स्ट्रक्चरल बॉडी के बजाय कई अलग-अलग एनोमलस ज़ोन के साथ मीडियम मैग्नेटिक कॉम्प्लेक्सिटी दिखती है। टोटल मैग्नेटिक इंटेंसिटी (TMI) और मैग्नेटिक एनोमली (MA) मैप्स में ~980 nT का वेरिएशन दिखता है , जिसमें हाई पॉजिटिव और नेगेटिव दोनों तरह की एनोमली हैं, जो मैग्नेटिक मिनरल कंटेंट और सोर्स की गहराई दोनों में अंतर दिखाती हैं। रिडक्शन टू पोल (RTP) ट्रांसफॉर्मेशन इन एनोमली की सिमिट्री को बेहतर बनाता है लेकिन फिर भी एक कंटीन्यूअस N–S-ओरिएंटेड स्ट्रक्चर नहीं दिखाता है जो यह बताता है कि मैग्नेटिक सोर्स डिस्कंटीन्यूअस हैं। इन इंटीग्रेटेड जियोफिजिकल परिणामों के आधार पर, एनालिटिकल सिग्नल (मैग्नेटिक) मैप्स पर तीन बोरहोल प्रपोज़ किए गए थे, जो पहचाने गए बदलाव और शियर जोन को टारगेट करते थे।

1.1.12 बंगारागुंटा (ब्लॉक-II) ब्लॉक में , न्यून से मध्यम मैग्नेटिक ज़ोन में दो बोरहोल का प्रस्ताव दिया गया है। इन जगहों को IP-रेज़िस्टिविटी डेटा से और सपोर्ट मिलता है, जो कम रेसिस्टिविटी और ज़्यादा चार्जेबिलिटी वाले जियोफिजिकल सिग्नेचर दिखाते हैं जो सल्फाइड मिनरलाइज़ेशन का संकेत देते हैं। ब्लॉक के बीच के हिस्से में रेसिस्टिविटी और चार्जेबिलिटी की विसंगतियां 120 मीटर की गहराई तक फैले मिनरलाइज़ेशन को दिखाती हैं। हालांकि, पूरे ब्लॉक में कोई लगातार ट्रेंड नहीं देखा गया, जिससे पता चलता है कि मैग्नेटिक सोर्स ज़्यादा लोकलाइज़्ड और अलग-अलग तरह के हैं।

1.1.13 के परिणामों और NMET के TCC के साथ रिव्यू के आधार पर, एक नॉन-फॉरेस्ट बंगारागुंटा सब-ब्लॉक को टेस्ट ड्रिलिंग के लिए माना गया, जबकि फॉरेस्ट कवर्ड सकलागुंटा सब-ब्लॉक को फॉरेस्ट क्लीयरेंस के मुद्दों और दूसरी दिक्कतों की वजह से बाहर रखा गया। बरगुर ब्लॉक के बंगारागुंटा सब-ब्लॉक (ब्लॉक-II) में जियोफिजिकल विसंगतियों को टेस्ट करने और मिनरलाइजेशन के सब-तलीय परसिस्टेंट होने की पुष्टि करने के लिए न्यून से मध्यम मैग्नेटिक ज़ोन में दो टेस्ट बोरहोल ड्रिल किए गए।

1.1.14 दो टेस्ट बोरहोल (MBG-01 और MBG-02) ने बिना किसी स्वर्ण मिनरलाइज़ेशन के एम्फीबोलाइट्स में सल्फाइड वाले ज़ोन (पाइराइट, पाइरोटाइट और चाल्कोपाइराइट) को इंटरसेक्ट किया। 39 बोरहोल

कोर सैंपल में से, 15 सैंपल में 10.15 ppb से 55.54 ppb Au तक स्वर्ण वैल्यू दिखाई गई और बाकी 14 सैंपल का विश्लेषण<10 ppb Au किया गया। स्वर्ण(<10 ppb से 55.54 ppb Au) के लिए बोरहोल कोर सैंपल के एनालिटिकल रिज़ल्ट खराब और अच्छे नहीं हैं। कुल मिलाकर, बोरहोल के परिणाम उत्साहजनक नहीं हैं।

1.1.15 बोरहोल कोर सैंपल (39 नंबर) का ICP-MS मेथड से 34 एलिमेंट विश्लेषण किया गया और एनालिटिकल परिणामों में कॉपर (32.39-393.18ppm) और जिंक (27.98-205.24ppm) के लिए उत्साहजनक मान नहीं दिखी। 39 सैंपल में से, 37 नंबर सैंपल एनालिटिकल परिणामों में टोटल REE+ Y+Sc कंटेंट 121.06 ppm से 708.75 ppm तक पाया गया, जबकि 2 सैंपल 100 ppm से कम पाए गए। Li, Ti, V, Cr, Co, Ni, Cu, Zn, Ga, As, Mo, Ag, Cd, Sb, Pb, Bi, Th और U के लिए एनालिटिकल परिणामों में खराब मान दिखी और परिणामोंउत्साहजनक नहीं हैं।

1.1.16 बोरहोल जियोफिजिकल लॉगिंग से सल्फाइड ज़ोन को उनकी गहराई और मोटाई के साथ अलग करने में मदद मिली। जियोफिजिकल लॉगिंग ने बोरहोल से इकट्ठा की गई जानकारी की वैल्यू भी बढ़ाई ।

1.1.17 बरगुर ब्लॉक के बंगारागुंटा सब-ब्लॉक में जियोफिजिकल विसंगतियों की जांच के लिए ड्रिल किए गए टेस्ट बोरहोल से पता चला कि ये विसंगतियां सल्फेट और मैजेनाइट एनरिचमेंट से जुड़ी हैं, जिनमें कोई स्वर्णमिनरलाइजेशन नहीं है। इसके अलावा, खास शियरिंग की कमी, कमजोर बदलाव वाले फीचर्स, और स्वर्ण के इंडिकेटर मिनरल्स की कमी, साथ ही ओर माइक्रोस्कोपिक स्टडीज़ से यह कन्फर्म हुआ कि कोई दिखाई देने वाला या शामिल स्वर्ण नहीं है। ICP-MS मेथड से बोरहोल कोर सैंपल विश्लेषण के परिणामों में बरगुर ब्लॉक के बंगारागुंटा सब-ब्लॉक में कॉपर, जिंक और संबद्ध खनिजों के लिए कोई उत्साहजनक मान नहीं दिखी।

1.1.18 सिफारिश:

बरगुर क्षेत्र से तलीय बेडरॉक और चैनल सैंपल विश्लेषण से स्वर्ण या संबद्ध खनिज के लिए कोई उत्साहजनक मान नहीं मिला। एम्फीबोलाइट और मेटाचर्ट सैंपल्स में ताम्र और जास्ता की कुछ बढ़ी हुआमान कभी-कभार ही देखा गया हैं और ये किसी लगातार मिनरलाइज़्ड ट्रेंड का संकेत नहीं देती हैं। इसी तरह, ज़मीन की जियोफिजिकल विसंगतियों की जांच के लिए ड्रिल किए गए दो टेस्ट बोरहोल से बरगुर ब्लॉक के बंगरगुंटा सब-ब्लॉक में 90 m (वर्टिकल डेप्थ) की गवेषित गहराई तक स्वर्ण या संबद्ध धातु के लिए कोई मिनरलाइज़्ड ज़ोन नहीं मिला। हालांकि, ज़्यादा गहरे मिनरलाइज़ेशन की संभावना से इनकार नहीं किया जा सकता, क्योंकि अब तक किए गए सीमित जियोफिजिकल सर्वे और न्यून

गवेषणात्मक वेधन के आधार पर अयस्क शूट ज्योमेट्री और स्ट्रक्चरल कंट्रोल्स को पक्के तौर पर अभी तक स्थापित नहीं किया जा सका है।

अभी वर्तमान में, यथाशीघ्र कोई और गवेषण का कार्य करने की सिफारिश नहीं की जाती है। हालांकि, भविष्य में मैग्नेटोटेल्यूरिक (MT), टाइम-डोमेन इलेक्ट्रोमैग्नेटिक (TDEM), और हाई-रिज़ॉल्यूशन डीप इंड्यूस्ड पोलराइज़ेशन (IP) सर्वे जैसी एडवांस्ड डीप-अर्थ इमेजिंग तकनीकों पर विचार किया जा सकता है ताकि उन अच्छे स्ट्रक्चरल कॉरिडोर को पहचाना जा सके जिनमें गहराई में खनिज हो सकता है, अगर कोई हो तो।

GEOLOGICAL REPORT ON RECONNAISSANCE SURVEY (G-4 Stage) FOR GOLD IN BARGUR BLOCK (157.50 sq.km.) BARGUT BELT OF KOLAR SCHIST BELT, DISTRICT: KRISHNAGIRI, STATE – TAMIL NADU

CHAPTER-1B

EXECUTIVE SUMMARY

1.1.2 The Bargur block area is part of Bargur belt and lies in the southern end of Kolar Schist belt in Krishnagiri District of Tamil Nadu. The Bargur area was known for incidence of gold and two old workings for Gold namely Sakalagunta and Bangaragunta were reported by the previous workers in the past in Bargur area. M/s John Taylor & Sons examined these old workings in 1940, followed by GSI (1988-89) and reported some encouraging gold values in mine dumps and surface samples. Previous workers of GSI opined that the amphibolite enclaves in migmatites/gneisses are mostly mineralised with gold as their counterparts in the Kolar schist belt and these enclaves should therefore be exclusively prospected for gold.

1.1.19 In view of the above, the present Reconnaissance Survey (G4 stage) for gold in the Bargur block in parts of Survey of india Toposheet No. 57L/06 in Krishnagiri District of Tamil Nadu has been undertaken with the objective of identifying gold-bearing host rocks and assessing the potential of the old workings and their possible extensions, covering an area of about 157.50 sq. km.

1.1.20 The Reconnaissance Survey (G-4 stage) in Bargur Block included Phase-I work comprising of Large scale Geological mapping (1:12500 scale) over 157.50 sq.km. area including collection and analysis of 200 Nos. Bedrock/channel samples for Gold (Au) and other associated elements viz. Ag, Ni, Co, Cr, Cu, Pb, Zn, V, Ti and 10 nos. selected samples for analysis of PGE content. Ground geophysical survey comprising of IP cum Resistivity, SP and Magnetic survey (cumulative 30 Lkm) carried out in the demarcated two old working sub areas (Sakalagunta & Bangaragunta). Based on the Phase-I work outcome and review with TCC of NMET, Phase-II work i.e. test drilling totalling 247m in 2 Boreholes was carried out in Bangaragunta sub area along with associated activities i.e. borehole deviation survey & borehole geophysical logging and associated laboratory studies including analysis of borehole core samples (39 nos.) for Gold and for 34 element analysis by ICP-MS method, petrographic studies (09 nos.), mineragraphic studies (09 nos.) and 3 nos. specific gravity determination studies.

1.1.21 The litho units exposed in the Bargur area form the part of Peninsular Gneissic complex with lenses and enclaves of Amphibolites and Banded iron formation (in the form of magnetite quartzite). A single metachert enclave mapped within granitic gneissic rock. The Peninsular gneissic complex represented by granitoids (Hornblede biotite gneiss, Bioite/Epidote gneiss, Granodiorite, Migmatites). These rocks form the major part of the area. These rocks are intruded by basic dykes at places. A number of thin quartz and pegmatite veins traverse the area. The most of the plain lands and valley portions between the hills occupied by soil cover. Soil covered areas are mostly under cultivation.

1.1.22 During the course of the Geological mapping, main emphasis was given to map the Amphibolite, Banded iron formation (BIF) and meta chert in detail to identify the mineralised zones if any. Two ancient/old workings for gold known as Sakalagunta and Bangaragunta located west of Karakuppam village in the Bargur Block area. The Sakalagunta and the nearby Bangaragunta old workings for gold are associated with thin quartz/pegmatite veins in hornblende gneiss(migmatites)/ amphibolite enclaves. As per current observation, no traces of mineralised quartz vein could be were observed in old working areas due to land modifications and soil cover. Surface indications of mineralisation in the area are limited and scanty due to concealed nature of outcrops and soil cover. Amphibolities with or without quartz veins, BIF and meta chert outcrops contain sulphide (pyrite, pyrrhotite) dissemineations/specks and shows some alteration features like ferruginisation at places.

1.1.23 The mineragraphic study of sulphide bearing Amphibolite/Amphibolite with quartz vein, Magnetite quartzite and meta chert samples indicated that magnetite, sphene, pyrrhotite, and pyrite constitute the major minerals, occurring in varying proportions across samples. Ilmenite, hematite, goethite, and chalcopyrite commonly occur as minor constituents, while digenite, covellite, sphalerite, pentlandite, and limonite appear as trace to accessory phases.

1.1.24 Surface Bedrock/ Channel samples were collected from Bargur block area to know the gold and other associated mineral content. Out of 200 samples, 189 bedrock samples collected from varied lithounits viz. Amphibolite +/- quartz vein, Sheared Amphibolite with quartz veins, fine grained massive Amphibolites, Meta chert, BIF, and basic (dolerite) dykes shown gold values ranging from <0.01 ppm to 0.21 ppm Au. Total 91 Bedrock samples analysed >0.01 ppm to 0.21 ppm Au and 80 bedrock samples <0.01 ppm Au. Only one bedrock sample of Amphibolite with quartz vein collected from Sakalagunta old working showed 0.19 ppm Au while one dump sample (Quartz vein mixed with sheared Amphibolite/gneissic rock) collected from Bangaragunta old workings showed 0.21 ppm Au. Channel samples (11 nos.) collected from target host rocks Amphibolite with quartz veins analysed Au values ranging from <0.01 ppm Au to 0.02ppm Au, while channel samples from Meta chert outcrops showed Au values from 0.03 ppm Au to 0.04 ppm Au. Bedrock and channel sample results for Gold are not encouraging.

1.1.25 A total 200 nos. surface bedrock/channel samples were analysed for associated elements like Ag, Ni, Co, Cr, Cu, Pb, Zn V and Ti. Out of 200 samples, 53 surface Bedrock/Channel samples shown Cu values ranging from >200ppm to 1700ppm Cu. Five number bedrock samples shown Copper values ranging from 536.15ppm to 785.19ppm Cu. One sample shown highiest value of 1700 ppm Cu in Bangaragunta area. Six number bedrock samples shown 215.96ppm Zn to 371.53 ppm Zn values. Elevated values for Cu, Zn recorded from Amphibolites, metacherts in the area are sporadic in nature and do not indicate any consistent mineralized trends. Except these sporadic values for Cu & Zn, chemical analysis for other associated elements for Ag, Ni, Co, Cr, Pb, and V are not encouraging.

1.1.26 Ten number of selected samples collected from Amphibolites and Meta chert were analysed for PGE content. Analytical results of ten number samples indicated total PGE content varying from 62.30 ppb to 484.24 ppb. Out of 10 samples, 8 nos. Amphbilite samples showed Pd values ranging from 62.30 ppb to 342.37 ppb Pd, Ru values below detection limit (5 ppb) to 31.31 ppb and other elements Rh, Os, Ir & Pt values analysed below detection limit (5ppb). Two number Meta chert samples shown Pd values of 434.93 ppb & 451.32 ppb and one sample shown Ru value of 31.31 ppb while another sample analysed below detection limit (5 ppb). Values for Rh, Os, Ir & Pt analysed below detection limit (<5 ppb) in metachert. It is likely that localised Pd enrichment is hydrothermally remobalised from nearby mafic-ultramafic units and trapped in fractures of metacherts along with sulphides. Overall, PGE values in amphibolites were poor and not encouraging except the localised anomalous pd concentration in two metachert samples.

1.1.27 The overall bedrock and channel sample results did not show promising values for Gold and other associated elements. However, considering the soil cover and the presence of two old workings, ground geophysical survey was planned to identify any subsurface mineralized extensions. Accordingly, two sub-blocks Bangaragunta (1.3 sq.km) and Sakalagunta (1.76 sq.km) were selected for detailed geophysical work. Ground geophysical survey including IP cum Resistivity, Magnetic and SP survey (cumulative 30 Lkm) has been carried out in Sakalagrunta sub block (18 Lkm) and Bangaragunta sub block (12 Lkm) at 100m profile interval and 20m station interval.

1.1.28 Ground geophysical survey indicated that, Sakalagunta Block (Block-I) exhibit moderate magnetic complexity with several discrete anomalous zones rather than a single, coherent structural body. The Total Magnetic Intensity (TMI) and Magnetic Anomaly (MA) maps show a variation of ~980 nT, with both high positive and negative anomalies, indicating contrasts in both magnetic mineral content and source depth. The Reduction to Pole (RTP) transformation improves symmetry of these anomalies but still not reveal a continuous N–S-oriented structure suggesting that magnetic sources are discontinuous. Based on these integrated geophysical results, three boreholes were proposed over the Analytical Signal (Magnetic) maps targeting the identified alteration and shear zones.

1.1.29 In Bangaragunta (Block-II) block, two boreholes have been proposed within a low to moderate magnetic zone. The locations are further supported by IP-resistivity data, which reveal low resistivity and high chargeability geophysical signatures indicative of sulphide mineralisation. The resistivity and chargeability anomalies in the central part of the block show mineralization extending upto a depth of 120 meters.

However, no continuous trend was observed across the block, suggesting that the magnetic sources are more localized and discontinuous in nature.

1.1.30 Based on the outcome of ground geophysical survey and review with TCC of NMET, one non-forest bearing Bangaragunta sub block considered for test drilling while forest covered Sakalagunta sub block was excluded for want of forest clearance issues and other constraints. Two test boreholes were drilled in low to moderate magnetic zones to test the geophysical anomalies and confirm the sub-surface persistence of mineralisation in Bangaragunta sub block (Block-II) of Bargur block.

1.1.31 Two test boreholes (MBG-01 & MBG-02) intersected sulphide bearing zones (pyrite, pyrrhotite and chalcopyrite) in Amphibolites without any gold mineralisation. Out of 39 borehole core samples, 15 samples showed gold values ranging from 10.15 ppb to 55.54 ppb Au and remaining 14 samples analysed <10 ppb Au. Analytical results of borehole core samples for Gold (<10 ppb to 55.54 ppb Au) are poor and not encouraging. Overall, the borehole results are not encouraging.

1.1.32 Borehole core samples (39 nos.) analysed for 34 element analysis by ICP-MS method and analytical results did not show encouraging values for copper (32.39-393.18ppm) and zinc (27.98-205.24ppm). Out of 39 samples, 37 nos. sample analytical results analysed Total REE+ Y+Sc content ranging from 121.06 ppm to 708.75 ppm, while 2 samples analysed below 100 ppm. Analytical results for Li, Ti, V, Cr, Co, Ni, Cu, Zn, Ga, As, Mo, Ag, Cd, Sb, Pb, Bi, Th and U shown poor values and results are not encouraging.

1.1.33 The borehole geophysical logging helped to delineate sulphide zones along with their depths and thickness. The geophysical logging also enhanced the value of information collected from the boreholes.

1.1.34 The test boreholes drilled to investigate the geophysical anomalies in the Bangaragunta sub block of Bargur block revealed that the anomalies correspond to suphide and magenite enrichment devoid of any gold mineralisatiion. Moreover, the lack of significant shearing, weak alteration features, and absence of auriferous indicator minerals, along with ore microscopic studies confirming no visible or included gold. Borehole core sample analysis results by ICP-MS method did not show any encouraging values for Copper, Zinc and other associated minerals in Bangaragunta sub block of Bargur block.

1.1.35 **Recommendation:**

Surface bedrock and channel sample analyses from the Bargur area did not yield encouraging values for gold or associated minerals. A few elevated copper and zinc values observed in amphibolite and metachert samples are sporadic and do not indicate any consistent mineralized trend. Similarly, the two test boreholes drilled to investigate ground geophysical anomalies did not reveal any mineralized zones for gold or associated metals up to the explored depth of 90 m (vertical depth) in the Bangargunta sub-block of the Bargur block. However, the possibility of deeper mineralization cannot be ruled out, as the ore shoot geometry and structural controls could not be conclusively established based on the limited geophysical surveys and shallow exploratory drilling undertaken so far.

At present, no further immediate exploration work is recommended. However, advanced deep-earth imaging techniques such as Magnetotelluric (MT), Time-Domain Electromagnetic (TDEM), and high-resolution deep Induced Polarization (IP) surveys may be considered in the future to delineate favourable structural corridors that may host deeper-seated mineralization, if any.

CHAPTER-2

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 CPSE Ministry of Mines, Govt. of India

MECL

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 for Reconnaissance survey (G-4 Stage) for Gold and associated minerals in Bargur Block, District: Krishnagiri, Tamil Nadu 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 Srikant Sharma, HoD (Exploration) Shri P. Ravindran Nair, G.M (Exploration), Retd.
2	Overall planning, Coordination & Supervision	Shri Srikant Sharma, HoD (Exploration) Shri P. Ravindran Nair, G.M (Exploration), Retd. Shri Pradeep Kulkarni, Retd. D.G.M. (Exploration) Shri Md Dasthageer, Sr. Manager (Geology) Shri Md. Intezar Alam, Manager (Geology) Shri Deepak Bahera, Asst. Manager (Geology)
3	Project Management & Field operation	Shri K. Vanathu Antony, Sr. Manager (Geology)/Project Manager, Sikkal Project
4	Physical Execution of Work	
	Geology	Shri Md Intezar Alam, Manager (Geology) Shri Deepark Bahera, Asst. Manager (Geology) Shri Kolluri Sudheer, Geologist
	Sampling	Shri Md. Intezar Alam, Manager (Geology) Shri Deepak Bahera, Asst. Manager (Geology) Ankush Haridas Wagh, Sr. Tech.(sampling)
	Survey	Shri Pratap Singh Negi, Asst. Survey & Map Officer, OIC Shri Jagdish Kumar Thakral, Retd. Survey and Map Officer Shri Durgesh Devarshee, Asst. Survey Map Officer Shri Apran Hazra, Asst. Survey Map Officer
	Drilling	Shri Arulmani J, Senior Drilling Engineer

S No.	Title	Name of the Personnel
		Shri Niranjan Mardi, Asst. Drilling Officer
	Geophysics	Shri Guljar Singh Dhami, G M (Geological Services) Shri Bimalendu Roy, Manager (Geophysics) Shri Rajat Kumar, (Geophysics)
5	Chemical Laboratory	Shri Shri Srikant Sharma, Head (Exploration) Shri P. Ravindran Nair GM (Exploration), Retd.
		Shri Rohit Sharma, Senior Manager (Chemical)
		Dr. Deepti Rahangdale, Manager (Chemical)
		Fawaz SVP, Asst. Manager (Chemical)
6	Petrographic Studies	Shri Sayantan Pal, Manager (Geology)
7	Data Processing & Documentation	Shri Md Dasthageer, Senior Manager (Geology) Shri Md Intezar Alam, Manager (Geology) Shri Deepark Bahera, Asst. Manager (Geology) Mrs. Moumita Ghosh, Asst. Manager (Geology)
		Shri Uday A. Patil, Sr. Operator (Computer) Shri N. C. Reddy, Sr. Operator (Computer)
8	Reprography and Printing	NEM GR Cell

CHAPTER-3

TITLE AND OWNERSHIP

3.1.0 TITLE OF THE REPORT

GEOLOGICAL REPORT ON RECONNAISSANCE REPORT (G4 Stage) FOR GOLD IN BARGUR BLOCK, BARGUR BELT OF KOLAR SCHIST BELT, DISTRICT-KRISHNAGIRI, STATE-TAMIL NADU

Ownership: Government of Tamil Nadu

Name of Prospector: 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)

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 India ranked 6th in the world gold production in the year 1905. Now, India is not among the leading gold-producing nations globally. China, Russia, Australia, Canada, USA, Kazakhstan, etc. are among the top global miners by production. As per the Indian Bureau of Mines most recent data, domestic gold production in 2021-22 stood at approximately 1,251 kg of primary gold, representing an ~11 % increase over the previous year; during that period about 491,000 t of ore was mined at an average grade of ~3.20 g/t, while ~482,000 t of ore was treated at ~2.88 g/t gold content (IBM). India’s gold reserves and resources (primary) as of April 1, 2020, have been estimated at ~607.26 tonnes of metal, of which ~92.76 tonnes are in the “Reserves” category and

~514.50 tonnes fall under "Remaining Resources." (IBM). Karnataka accounts for nearly 99 % of the reported production, with Jharkhand contributing marginally. Exploration activity has seen renewed emphasis under various government schemes (e.g. through NMET funding and GSI initiatives) and new geological reports have been transferred to states such as Madhya Pradesh, Jharkhand and Karnataka for potential auction and further evaluation. Despite these efforts, domestic production remains negligible relative to consumption. Gold demand in India continues to be satisfied predominantly through imports, with import volumes running into several hundred tonnes annually.

3.2.2 The Bargur block is part of Bargur belt and lies in the southern end of Kolar Schist belt. Chigargunta Gold mine is away from Bargur by about 50km. The Bargur area is known for incidence of gold and two Ancient gold workings in Bargur area namely Sakalagunta and Bangaragunta were examined by M/s John Taylor & Sons in 1940s. 22 samples of soil collected from old dumps and shafts of Sakalagunta analysed 1.6 to 9.5 g/t gold. 15 out of 32 samples of soil and quartz collected from Bangaragunta analysed 1.5 g/t to 8 g/t gold (GSI, 1990, Records v (123 (5) p 169-183).

3.2.3 In FS 1988-89, GSI had conducted Large Scale Mapping (1:25000 scale) in part of toposheet No. 57 L/6 followed by Detailed Mapping (1:2000 scale) in selective areas (nearby old workings) including trenching and thorough sampling. The trenching work has established a 75 m. long mineralised zone trending in N.15°-20°W-S15°-20°E direction. The width of the zone varies from 0.65 m to 4.45 m. and the gold values are ranging from 0.2 to 0.96 g/t of (weighted average) gold. The mineralised rock is amphibolite with very thin pegmatite veins. Chemical analysis of surface samples revealed gold concentrations ranging from 0.1 to 0.9 g/t. Additionally, a quartz vein sample from the Bangaragunta old working dump yielded 12 g/t of gold. Further work was recommended for tracing the strike continuity of the zone.

3.2.4 Previous workers of GSI recommended that the amphibolite enclosures/bands within migmatites/gneisses are mostly mineralised with gold as their counterparts in the Kolar schist belt and these enclaves should therefore be exclusively prospected for gold.

3.2.5 In light of the above, MECL has formulated a G4 stage Reconnaissance survey program for Gold and associated minerals in Bargur area with the objective of identifying gold-bearing host rocks and assessing the potential of the old workings and their possible extensions, covering an area of about 157.50 sq. km.

3.2.6 In this connection, DGM, Govt. of Tamil Nadu given consent to MECL for carrying out Reconnaissance survey (G-4) for Gold in Bargur block, Dharmapuri/Krishnagiri District, Tamil Nadu vide letter No.2804/MM11/2020 dated 08.11.2023.

3.2.7 The Reconnaissance survey exploration proposal (G4) for Gold and associated minerals in Bargur block was disucussed in 60th Technical Cum-Cost Committee (TCC) of NMET meeting held on 27th & 28th Dec, 2023. Based on deliberations, committee recommended the proposal for approval of EC for "Reconnaissance Survey (G-4 stage) for Gold in Bargur Block, Kolar Schist Belt, District- Krishnagiri, Tamil Nadu" over an area of 157.50 sq.km with an estimated cost of Rs. 250.28 lakh (including GST) within time schedule of 12 months.

3.2.8 Subsequently, the 33rd meeting of Executive Committee (EC), NMET (19th February 2024) approved the project and the same was intimated to MECL vide MoM letter No. F.NO.23/420/2024-NMET/525 dated 27th February, 2024. **(Annexure No. XII).**

<u>Details of Period of prospecting:</u>

3.2.9 Following the Office Memorandum/ sanction order from NMET, MECL initiated field activities and established base camp at Krishnagiri under administrative control of MECL's Sikkal project. MECL commenced G-4 stage exploration work (Phase-I) comprising of large scale geological mapping (1:12500 scale) over entire 157.50 sq.km. area, collection and analysis of surface Bedrock/channel samples (200 nos.) for Gold and associated minerals (Ag, Ni, Co, Cr, Cu, Pb, Zn, V, Ti) & 10 nos. samples for PGE analysis.

3.2.10 Bedrock and channel sample collected from varied litho units not shown any promising values for Gold, associated minerals (Ag, Ni, Co, Cr, Cu, Pb, Zn, and V) and PGE. Only one sample bedrock sample of Amphibolite with quartz vein collected from Sakalagunta old workings shown 0.19 ppm Au while another one dump material sample collected from Bangaragunta old working shown 0.21 ppm Au. Moreover, land modification has left no traces of mineralisation in old working bearing areas. Mostly the area is conceled under soil cover. Based on the exising old workings, previous work, conceaed nature of outcrops two old working bearing areas viz. Sakalagunta area (1.76 sq.km.) and Bangaragunta area (1.3 sq.km.) and have been demarcated to target for ground geophysical survey to figure out the potentiality and concealed extensions of mineralisaion if any.

3.2.11 The project was reviewed with 71st TCC-1 and based on deliberations committee advised to carry out Ground geophysical survey in the identified two old working areas as per the approved quantum. MECL commenced Ground geophysical survey comprising of I.P. cum Resisitivity, SP and Magnetic carried out in the area. Total cumulative 30 Lkm survey (18 Lkm in Sakalagunta & 12 Lkm in Bangaragunta) at 100m profile interval and 10m station interval accomplished. Ground geophysical survey indicated some anomalous zones in these two sub areas.

3.2.12 Subsequently, the project was reviewed with 75th TCC-I for ongoing progress and status. Findings of Ground geophysical survey along with test borehole plan were discussed in 77th TCC-1 meeting. Based geophysical anomalies, total 5 scout borehoels (660m) planned (3 Bhs in Sakalagunta sub area & 2 Bhs in Bangaragunta sub area) to test the anomalies in depth. MECL sought approval for additional drilling (160m) and a timeline extension of six months. MECL appraised the committee that delay in work was due to forest clearance issue and other constraints. The committee did not approve additional drilling and asked MECL to give justifications for timeline extension.

3.2.13 In response, MECL sent all details and justification to NMET through letter No. **MECL/ EXPL/File/NMET/2025-26/167, dated 31/05/2025**. The project was reviewed with 78th TCC-1 meeting. MECL informed the committee that Bargur Block area (157.57 sq.km.) has total four reserve forest areas and covers approx. 41% of total Block area. Large extent of area, cultivated lands is other constraints. Formal forest clearance was under process. Field activities were completed with knowledge and informal concurrence by forest officials. Field activities were delayed due to delays in obtaining forest permissions and other constraints. Out of the two sub blocks, one block (Sakalagunta) falls in Reserve Forest and another one (Bangaragunta) falls in non-forest area. Acccording to forest officials, the area is close to elephant corridor (Maharajkadai). This was also another constraint for forest clearance. Keeping in view the delays in obtaining forest clearance, other constraints and timeline of the project, it was decided to take up test drilling in non-forest Bangaragunta sub block and excluded forest covered Sakalagunta sub block. Accordingly, 78th TCC-1 committee recommended drilling of two test boreholes in Bangaragunta sub-block only and extended timeline of the project up to 31.10.2025 for submission of the report.

3.2.14 MECL commenced drilling activities on 22nd July, 2025 and co ncluded on 31st Aug, 2025. Total 2 Nos. test boreholes (MBG-01 & 02) totalling 247.0m drilled to test the geophysical anomalies and to confirm sub-surface gold or associated mineralisation in Bangaragunta sub block of Bargur block. Scout drilling along with borehole deviaton survey and borehole geophysical logging accomplished in the area.

3.2.15 Draft Geological Report was peer reviwed by Shri K. Shashidharan, Dy Director (Retd.) and suggested comments were attended and incorporated in the report. The final review of the project was presented in 85th TCC-I committee of NMEDT held on 27th Nov & 1st Dec, 2025 for submission of final Report. Based on deliberations, Committee advised to submit the Final Geological Report by 15th Dec, 2025.

CHAPTER-4

4.0.0 DETAILS OF THE AREA UNDER STUDY

4.1.0 LOCATION AND ACCESSIBILITY OF THE BLOCK

4.1.1 The study area is situated in and around Bargur, Kandikuppam, Karakuppam, Vartanapalli, Gollapalli, Godleri, Modugampalli, Kattur, Oppathavad of Krishnagiri District, Tamil Nadu.

4.1.2 The Bargur Block is situated in the northeastern part of Krishnagiri District, Tamil Nadu, covering an area of about 157.50 sq. km. The block lies between latitudes 12°32′02.08″N to 12°41′22.65″N and longitudes 78°15′51.41″E to 78°23′26.02″E, falling on the Survey of India Topo Sheet No. 57L/06. The terrain is generally undulating to hilly with forest cover in parts, interspersed with agricultural fields and small settlements. The block represents a mix of rural and semi-forested landscape, located to the northeast of Krishnagiri town. The block location is shown in **Plate-I** and **Text Figure-1**. The locational co-ordinates (Geographic & UTM) of the cardinal points of the Bargur Block, Krishnagiri District, Tamil Nadu are in given in **Table 4.1**.

Table-4.1

Co-ordinates of the corner points of the block boundary of Bargur Block, Krishnagiri District, Tamil Nadu

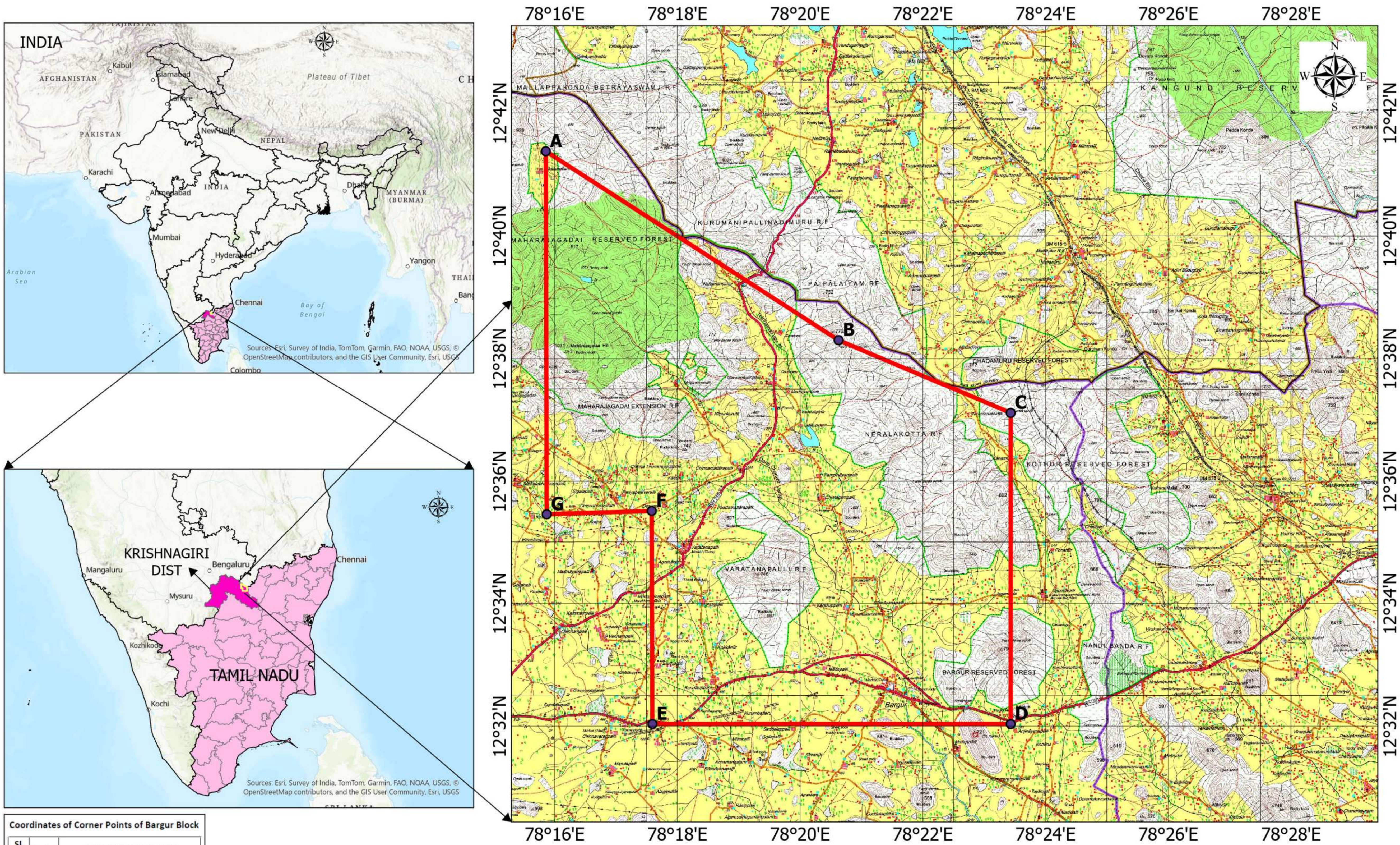
Sl. No.	Point	GCS-WGS1984 (DMS)	
		Latitude	Longitude
1	A	12°41'22.65" N	78°15'51.41" E
2	B	12°38'18.03" N	78°20'37.69" E
3	C	12°37'06.72" N	78°23'26.00" E
4	D	12°32'02.08" N	78°23'26.02" E
5	E	12°32'02.08" N	78°17'35.65" E
6	F	12°35'30.94" N	78°17'35.00" E
7	G	12°35'27.67" N	78°15'52.33" E

4.2.0 ACCESSIBILITY TO THE BLOCK

4.2.1 The road network in and around the Bargur block is moderately developed and provides good connectivity to nearby urban and regional centres. National high way (NH-48) connecting to Krishnagiri- Tirupattur and Vaniambadi passing through the southern part of the block and NH-42 (formaly NH-219) connecting to Krishnagiri to Kuppam passing through the central part of the block. These roads provide good connectivity of the block area to the major towns and cities. A network of village roads (metalled/unmettaled) exist in the area, linking interior villages to Bargur and Krishnagiri towns. The hilly and forest cover areas are served by unmetalled or forest tracks used seasonally for agricultural and forest access.

4.2.2 The nearest major town is Krishnagiri, located about 12–15 km west of Bargur, which also has the nearest railway connectivity. The nearest major railhead is Jolarpettai Junction on Chennai-Bengaluru main line located about 35–40 km east of Bargur, which serves as a key hub with direct connections to Chennai, Bengaluru, Coimbatore, and other major cities. Tirupattur railway station, about 30–35 km east, offers regional connectivity and is suitable for passenger movement and light logistics. Towards the northwest, Kuppam railway station in Andhra Pradesh, about 45 km away, provides convenient access via the Krishnagiri–Bargur–Kuppam route. Additionally, Dharmapuri station, around 55–60 km southwest, lies on the Salem–Bengaluru line and offers an alternative approach from southern Tamil Nadu. The closest airports are at Salem (around 85 km south) and Bengaluru (around 120 km northwest), ensuring regional accessibility to the block.

Text Figure-1: Location Map of Bargur Block, East Krishnagiri District, Tamil Nadu



Coordinates of Corner Points of Bargur Block

Sl. No.	Point	GCS-WGS1984 (DMS)	
		Latitude	Longitude
1	A	12°41'22.65" N	78°15'51.41" E
2	B	12°38'18.03" N	78°20'37.69" E
3	C	12°37'06.72" N	78°23'26.00" E
4	D	12°32'02.08" N	78°23'26.02" E
5	E	12°32'02.08" N	78°17'35.65" E
6	F	12°35'30.94" N	78°17'35.00" E
7	G	12°35'27.67" N	78°15'52.33" E

Scale: 1:75,000

0 1.25 2.5 5 Kilometers

MINERAL EXPLORATION & CONSULTANCY LIMITED

LOCATION MAP

BARGUR BLOCK

(AREA: 157.50 SQ KM RESPECTIVELY)

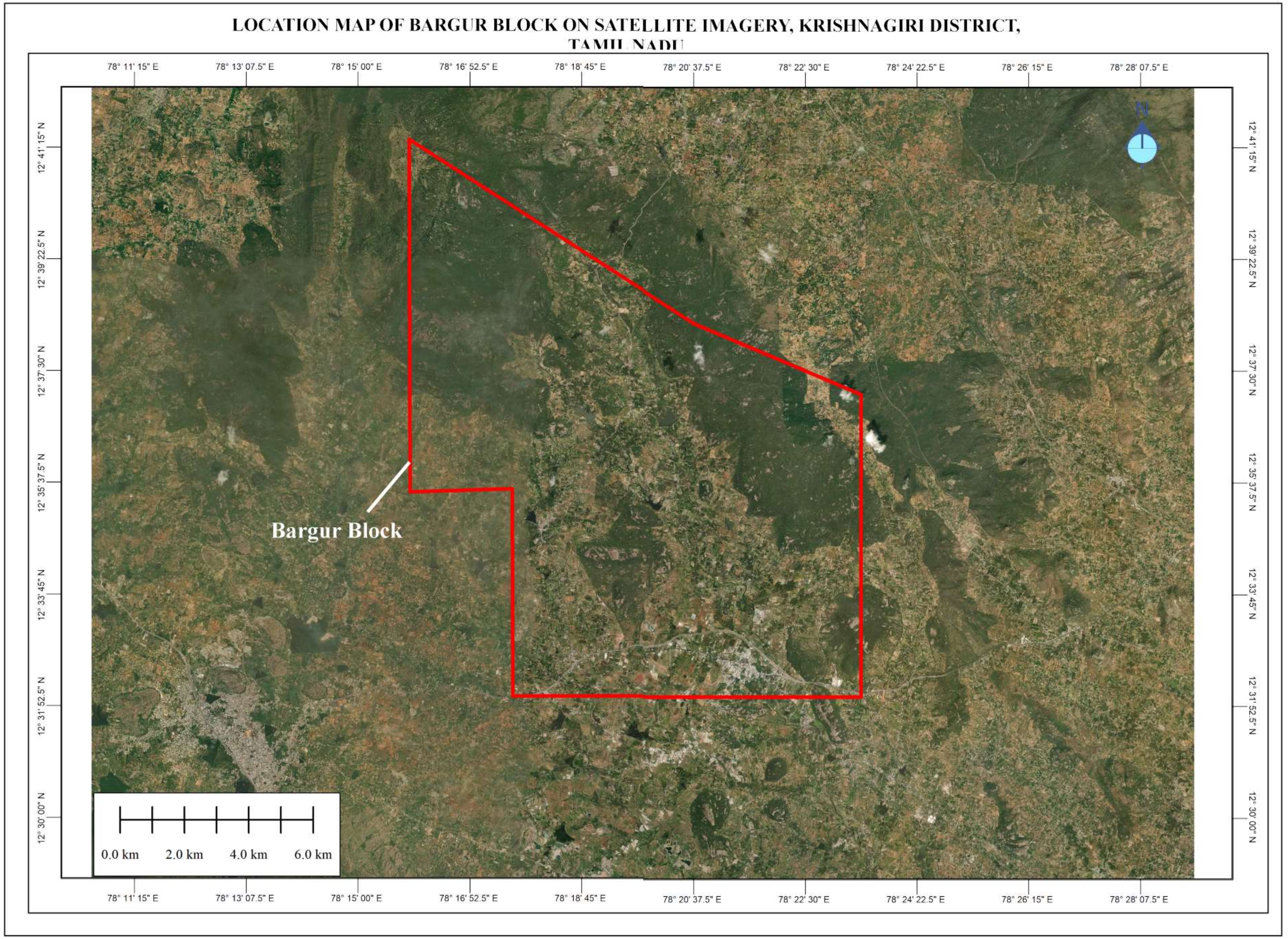
KRISHNAGIRI DISTRICT, TAMIL NADU

(PART OF TOPOSHEET NO. 57L06)

PROCESSED AT: EXPLORATION DIVISION, MECL, NAGPUR

MECL/EXPL/OCTOBER-2025	PLATE-I	1

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



4.3.0 DETAILS OF THE AREA WITH LAND USE

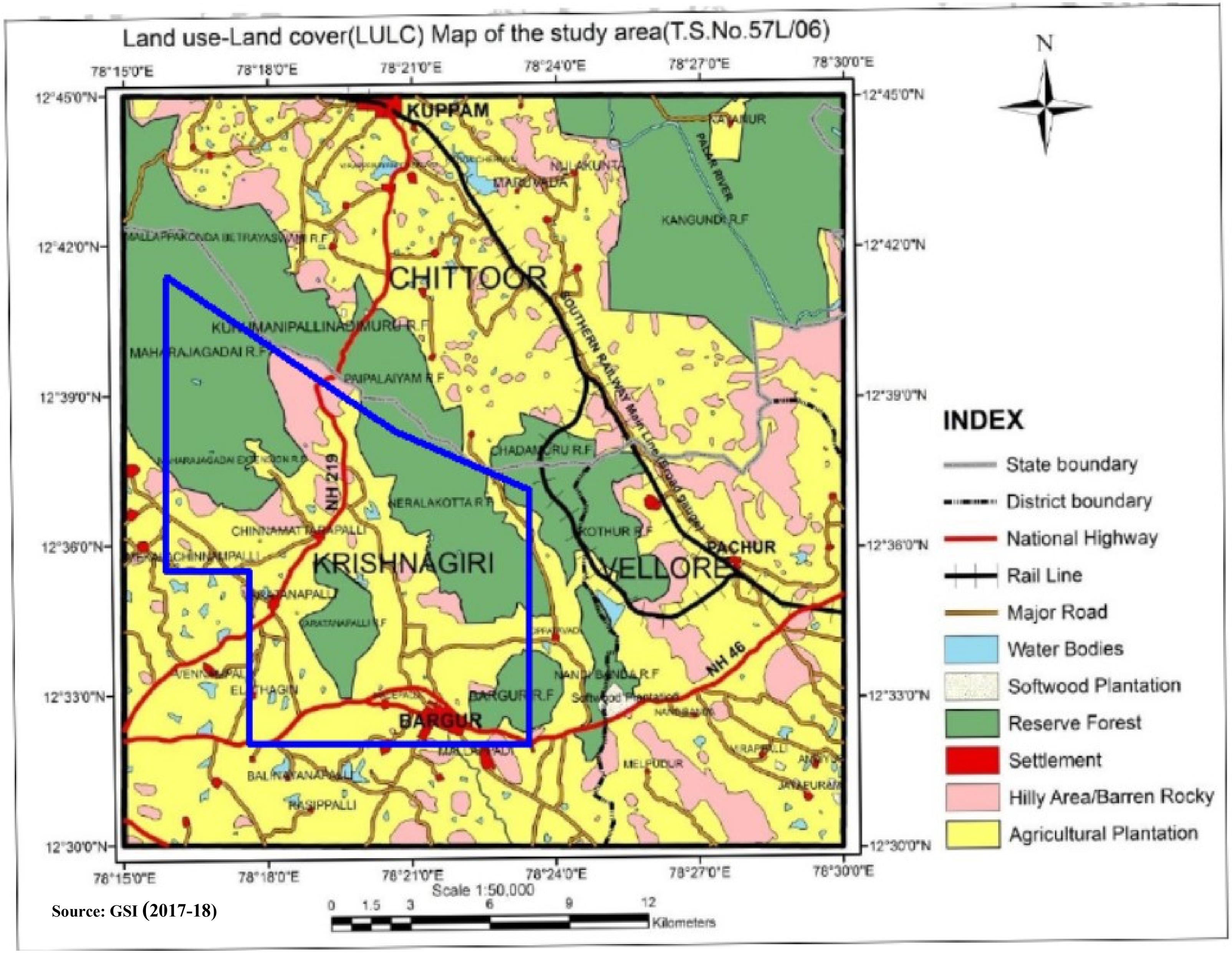
4.3.1 The Bargur Block in Krishnagiri District, Tamil Nadu, covering an area of about 157.50 sq. km, presents a diverse mix of land use and land cover typical of the eastern uplands of the district. The terrain is predominantly undulating to hilly, with a combination of forested hills, cultivated valleys, and rural settlements. The Bargur Block, outlined in blue boundary on the Land Use–Land Cover (LULC) Map (Topo Sheet No. 57L/06), represents a mixed landscape of forested hills, agricultural plains, and rural settlements in the Krishnagiri District, Tamil Nadu. A major portion of the northern, eastern and central sectors of the block is covered by Reserve Forest, forming part of the Maharajagadai R.F. Maharajagadai Extension R.F. Nerallkotta R.F, Vartanapalli R.F. and Bargur R.F. These forested areas consist mainly of dry deciduous and thorny vegetation, interspersed with scrub and rocky outcrops typical of the Eastern Ghats terrain. The forests play an important ecological role, serving as watersheds for local streams and providing habitat for wildlife and forest-dependent communities.

4.3.2 The central and western parts of the block are dominated by agricultural land and plantations, where crops such as ragi, groundnut, paddy, and millets are cultivated along with mango and banana orchards on gentle slopes. Agriculture here is largely rain-fed, supported by village tanks, ponds, and seasonal nalas. Small settlements such as Bargur are concentrated along NH-48 and nearby roads, forming rural habitations surrounded by farmlands. The central part (margins of forest lands) of hilly and rocky terrain, representing non-cultivable lands with sparse vegetation and exposed rock formations. Overall, the Bargur block exhibits a balanced land-use composition of about 40–45% agriculture, 35–40% forest and scrubland, 5–8% settlements, and around 10% hilly or barren rocky terrain. Land use-Land cover (LULC) map of study area is given as **Text Fig No. 3.**

4.4.0 MINERAL(S) UNDER INVESTIGATION

4.4.1 Bargur block (157.50 sq.km.) explored for Gold at G4 Stage during present investigation.

Text Figure-3: Land use-Land cover (LULC) Map of the study area.



Source: GSI (2017-18)

CHAPTER-5

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 Bargur Block in Krishnagiri District, Tamil Nadu, exhibits a moderately undulating to hilly terrain typical of the Eastern Ghats. The area presents a rugged hilly terrain rising to a maximum height of 1031 m above MSL with broad undulating plains in between. Denudational/ residual hills occupy the area surrounded by undulating terrain. The plains are generally at minimum elevation of 460 m. The highest peak of the area is Maharajagadai hill (Δ1031m).

5.1.2 The drainage pattern is mainly dendritic to sub-dendritic, reflecting the influence of the hard rock terrain. Numerous seasonal streams and first-order tributaries originate in the forested highlands and flow southwards to join ultimately the Ponnaiyar River system, which forms the major drainage outlet south of the block. These streams support a network of small tanks, ponds, and check dams which are essential for irrigation and groundwater recharge. There is one water body namely Ottkuppam lake near Medugampalli village located noth central part of the block area mostly used for irrigation purpose.

5.1.3 The block does not contain any large reservoirs within its boundary. Krishnagiri Reservoir, located about 15–20 km to the south west, is the nearest major water body influencing local hydrology. Overall, the relief and drainage of the Bargur Block indicate moderate surface runoff, good local recharge potential, and dependence on monsoon-fed tanks and streams for agricultural and domestic water needs

5.1.4 The block location depicted on google satellite imagery is shown as **Text Figure No.2.**

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

5.2.1 The Bargur block has a moderately developed road network with good connectivity to nearby towns. NH-48 (Krishnagiri–Tirupattur–Vaniyambadi) passes through the southern part, and NH-42 (Krishnagiri–Kuppam) runs through the central part of the block. Village roads connect interior areas to Bargur and Krishnagiri, while hilly and forested zones are accessed through unmetalled or forest tracks used seasonally.

5.2.2 Krishnagiri, about 12–15 km west of Bargur, is the nearest major town with railway access. The nearest major railhead is Jolarpettai Junction (35–40 km east), connecting to major cities. Tirupattur (30–35 km east), Kuppam (45 km northwest), and Dharmapuri (55–60 km southwest) provide additional rail connectivity. The nearest airports are at Salem (85 km south) and Bengaluru (120 km northwest).

5.2.3 The block area is crossed by overhead electric transmission lines supplying power to rural habitations and agricultural pumps, with distribution substations located near Bargur. Telephone and mobile network coverage is generally good in the plains and settlements along major roads, though it becomes weaker in the interior forested and hilly zones. Overall, the block has adequate transport, power, and communication infrastructure.

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

5.3.1 As per Census 2011, the Bargur Block of Krishnagiri District, Tamil Nadu, had a total population of approximately 1,09,000 persons, distributed across 36 revenue villages and several smaller hamlets. The population density averages around 690 persons per sq. km, with the northern and western parts being more densely inhabited due to better agricultural land and connectivity. Bargur town, serving as the block headquarters, is the largest settlement and functions as the administrative, educational, and commercial centre for nearby villages. Agriculture and allied activities form the mainstay of livelihood.

5.3.2 The Scheduled Caste (SC) population constitutes around 15–18%, while the Scheduled Tribe (ST) population forms about 6–8% of the total, with the Malayali tribe being the major indigenous group residing in the southern and eastern forested hills of the block. These tribal communities are primarily dependent on agriculture, livestock rearing, collection of minor forest produce, and daily wage labour. The settlements in forest and hilly areas are typically small, dispersed hamlets with limited access to road and communication infrastructure, whereas villages along the highways and the Krishnagiri–Bargur corridor have better amenities such as electricity, schools, and healthcare. Overall, the Bargur block's demographic profile, as per Census 2011, reflects a rural-dominated, agrarian population with a modest share of tribal inhabitants and a gradually improving socio-economic infrastructure. Krishnagiri district population statistics and administrative division and population of the district as per census 2011 is given in **Table 5.1 and 5.2** respectively.

Table 5.1: Administrative Division and population (Census 2011) of Krishnagiri District, Tamil Nadu.

Indicator	Value
Total Area	5,143 sq. km
Rural Population	1,345,246 (71.6%)
Urban Population	534,563 (28.4%)
Literacy Rate	72.41% (Male: 80.72%, Female: 63.91%)
Scheduled Castes (SC)	11.55% of total population
Scheduled Tribes (ST)	1.19% of total population
Total Taluks	5
Total Development Blocks	10

Indicator	Value
Total Revenue Villages	641
District Headquarters	Krishnagiri

Table 5.2: Administrative Division and population (Census 2011) of Krishnagiri District, Tamil Nadu.

Sl. No.	Administrative Unit	Headquarters / Main Town	No. of Revenue Villages	Population (2011)	Male	Female	Sex Ratio (F/1000 M)	Remarks
1	**Krishnagiri Taluk**	Krishnagiri	145	412,289	210,346	201,943	960	Includes district HQ and major trade centre
2	**Hosur Taluk**	Hosur	178	539,668	274,464	265,204	967	Highly urbanized and industrialized region
3	**Denkanikottai Taluk**	Denkanikottai	124	266,797	134,570	132,227	983	Includes forest and tribal areas
4	**Pochampalli Taluk**	Pochampalli	96	233,793	117,226	116,567	994	Predominantly rural and agricultural
5	**Uthangarai Taluk**	Uthangarai	98	427,262	212,976	214,286	1006	Southeastern taluk with mixed terrain and forest areas
—	**Total (Krishnagiri District)**	—	**641**	**1,879,809**	**949,582**	**930,227**	**980**	—

5.4.0 SOCIO DEMOGRAPHIC PROFILE OF THE AREA AND NEARBY

5.4.1 The socio-demographic profile of the Bargur Block and its surrounding areas in Krishnagiri District, Tamil Nadu, as per Census 2011, reflects a predominantly rural and agrarian population with growing semi-urban influences near Krishnagiri town and the Krishnagiri–Hosur corridor. The block had a total population of around 1.09 lakh persons, comprising 55,000 males and 54,000 females, with a sex ratio of about 980 females per 1000 males, closely aligning with the district average. The literacy rate in Bargur stands at approximately 71–73%, with male literacy higher than female literacy, indicating moderate educational development and improving access to schools and adult education programmes.

5.4.2 Economically, the population is largely engaged in agriculture, horticulture, livestock rearing, and small-scale trade, while some members of the younger generation are employed in nearby industrial areas such as Krishnagiri, Hosur, and Shoolagiri. Scheduled Castes (SCs) constitute about 15–18%, and Scheduled Tribes (STs) form around 6–8% of the total population, with the Malayali tribe being predominant in the southern and eastern forested hills. The area exhibits a mixed cultural composition, where rural farming communities coexist with indigenous tribal groups. Basic infrastructure facilities such as roads, electricity, schools, health centres, and communication facilities are available. Overall, the socio-demographic character of the region depicts a moderately developed rural society, steadily progressing in literacy, connectivity, and livelihood diversification while retaining strong agricultural and cultural roots.

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

5.5.1 The Bargur Block and its adjoining areas in Krishnagiri District, Tamil Nadu, possess a blend of historical, cultural, and religious significance, reflecting the region's long-standing heritage within the Tamil heartland. Though the block itself does not contain any major protected archaeological sites, the nearby Krishnagiri region is rich in historical monuments, including Krishnagiri Fort, an ancient hill fort built during the Vijayanagara period and later strengthened by the Nayakas and Tipu Sultan. Traces of megalithic burial sites, stone circles, and hero stones (virakal) have been reported from parts of Krishnagiri, Pochampalli, and Bargur, indicating early human settlements and warrior traditions in the area.

5.5.2 Religiously, the region hosts several ancient temples and places of worship, such as the Arulmigu Maragathambigai Chandra Choodeswarar Temple at Hosur, Sri Kattu Veera Anjaneya Temple near Bargur, and various village temples dedicated to Mariamman, Perumal, and Vinayagar, which serve as cultural and spiritual centres for the rural population. Mosques and small churches are also present, reflecting the area's religious diversity. Public utilities such as schools, health sub-centres, primary health centres (PHCs), community halls, and panchayat offices are available in major villages and towns. The Bargur–Krishnagiri road corridor supports a growing semi-urban setup with access to electricity, telecommunication, and transportation services, ensuring connectivity and improving living standards. Overall, the area presents a harmonious blend of heritage, faith, and functional civic infrastructure, typical of rural Tamil Nadu's evolving socio-cultural landscape.

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

5.6.1 The Bargur Block in Krishnagiri District, Tamil Nadu, contains extensive dry deciduous and thorn forests forming part of the Eastern Ghats. Most of these are included in the Maharajagadai, Neralakotta, Vartanapalli and Bargur Reserved Forest, managed under the Krishnagiri Forest Division. The terrain consists of hills, rocky slopes, and valleys covered with mixed vegetation and scrublands. These forests are ecologically important for soil and water conservation, biodiversity, and as a livelihood source for local tribal and rural communities.

5.6.3 There are no national park or wild life sanctuary lies within the Bargur block or in its close proximity.

5.7.0 FLORA AND FAUNA WITHIN AND NEARBY

5.7.1 The high hill range of the area is covered by dry deciduous and semi evergreen forest. The important variety of timber trees like Rose wood (*Dalbergia sissoo*), Teak (*Tectona grandis*), Sandal (*Santalum Alba*) are present along with Babul (*Acacia nilotica*) low-thorny bushes, shrubs and creepers. In the low plain areas tamarind, mango, banyan, coconut and Indian gooseberry (*Phyllanthus emblica*), Chebulic Myrobalan (*Terminalia chebula*), Karanj (*Millettia pinnata*) are noticed. The cash crops raised are rice (*Oryza sativa*), banana (*Musa seuminata*), coconut (*Cocos nucifera*) and sugarcane (*Saccsarum officinarum*), bamboo (*Bambusa bambos*), neem (*Azadirachta indica*). The hilly area forms parts of reserved forest as well as wild life sanctuary and have mixed deciduous growth of bamboo (*Dendrocalamus strictus*), ichan (*Phoenix Sylvestvis*), mango (*Mangifera Indica*) and firewood yielding trees.

5.7.2 Wild animals noticed in forest areas namely bonnet monkey (*Mecca radiate*), jackal (*Canis indicus*), Wild cats (*Felis chaus*), Sambar (*Rusa unicolor*), Spotted Deer (*Rusa alfredi*), Gaur (*Bos gaurus*), Wild boar (*Sus scrofa*) and reptile python, russets, wiper, monitor lizard, whip snake garden lizard, Elephant (*Elephas maximus Indicas*), deer (*Cervus axis*), fox (*Vulpes vulpes*) and rabbit (*Oroyctolagus*). (Ref. GSI report by R.Gopalakrishnan, F.S 1988-90).

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

5.8.1 There are no major water bodies, rivers and reservoirs exist within the Bargur block area. There is one water body namely Ottkuppam lake near Medugampalli village located noth central part of the block area mostly used for irrigation purpose. Krishnagiri Reservoir, situated about 15–20 km west, is the nearest significant water body influencing regional hydrology

5.9.0 CLIMATIC CONDITIONS

5.9.1 The climate of the Bargur Block in Krishnagiri District, Tamil Nadu, is generally tropical and semi-arid, characterized by hot summers, moderate rainfall, and mild winters. The area experiences three distinct seasons — summer (March to May), southwest monsoon (June to September), and northeast monsoon (October to December). The average annual rainfall ranges from 700 mm to 900 mm, received mainly during the northeast monsoon period. Temperatures during summer (April, May) often reach 38°C to 40°C, while in winter they drop to around 18°C to 20°C, particularly in the hilly and forested regions. The humidity remains moderate, with drier conditions prevailing from January to May. Due to its undulating terrain and forest cover, the southeastern hilly areas of Bargur are relatively cooler compared to the surrounding plains.

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5.10.0 OTHER PHYSIOGRAPHIC, SOCIAL AND ENVIRONMENTAL FACTOR

5.10.1 The Bargur Block in Krishnagiri District forms part of the undulating and hilly physiographic terrain of the Eastern Ghats, comprising rocky hillocks, pediplains, and narrow valleys. The soils are mostly red loamy to gravelly, derived from gneissic rocks, and are moderately fertile, supporting dryland farming and horticulture. The social environment is predominantly rural and agrarian, with agriculture, livestock rearing, and small-scale trading as major occupations. The presence of tribal communities, particularly the Malayali tribe in forested regions, adds to the area's social diversity and traditional ecological knowledge.

5.10.2 Environmentally, the region holds significance due to its forest cover, biodiversity, and watershed role within the Ponnaiyar River basin. While deforestation, soil erosion, and seasonal water scarcity are observed in some parts, ongoing efforts in afforestation, rainwater harvesting, and rural development programmes are helping to improve environmental sustainability and livelihood resilience in the area.

CHAPTER-6

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 The Bargur Block in Krishnagiri District, Tamil Nadu, is well connected by road and rail networks, ensuring good accessibility to regional centres and industrial hubs. The National Highways NH-44 and NG-48 through the the block, connects to major towns and ciites like Krishnagiri (12 km), Bengaluru (90 km), Salem (85 km), and Chennai (270 km). The nearest major railway junctions are Jolarpettai Junction (35–40 km east) and Dharmapuri (55–60 km southwest), both on the Chennai–Bengaluru line, while Kuppam station lies about 45 km northwest. The area has reliable electricity supply, with rural feeders and 11 kV/33 kV substations located near Bargur and Mallachandram, and extensive telephone and mobile connectivity across the plains. Water for domestic and agricultural use is drawn from village tanks, borewells, and small check dams, while major water needs are supplemented by the Krishnagiri Reservoir, located about 20 km west. There are no port facilities within or near the district; the nearest seaport is Chennai Port, approximately 270 km away by road.

6.1.2 In terms of industrial infrastructure, the Krishnagiri–Hosur industrial corridor is a major economic zone within 60–70 km of the Bargur block. This belt hosts several engineering, automobile, granite processing, and electrical industries, particularly around Hosur, Shoolagiri, and Krishnagiri. Small-scale industries near Kaveripattinam and Krishnagiri are involved in stone cutting, brick making, and agro-processing, which could utilize non-metallic and building materials if mined locally. Additionally, granite, quartz, feldspar, and iron ore-based industries operate within the district and may benefit from future mineral production in the Bargur area. The availability of road connectivity, power, and proximity to industrial centres provides favourable conditions for the transport, processing, and utilization of any mineral commodity likely to be explored or mined within the block.

CHAPTER-7

7.0.0 GEOLOGY

7.1.0 REGIONAL GEOLOGY

7.1.1 The litho-units exposed in the region belong to the Older Metamorphites, Charnockite Group, and Kolar Group (Dharwar Super Group) of Archaean age; the Peninsular Gneissic Complex (PGC-II) of Archaean to Palaeoproterozoic age; basic intrusives of Meso-Proterozoic age; and an Alkali Complex of Neo-Proterozoic age.

7.1.2 The region has undergone multiple cycles of metamorphism, deformation, migmatisation, and igneous activity, as evidenced by the lithological assemblages and structural setup.

7.1.3 The older metamorphites, such as ferruginous quartzite, occur as enclaves and folded bands within granitoid gneiss. The area also comprises well-foliated and highly folded rocks of pyroxene granulite of the Charnockite Group, schistose amphibolite/meta-basalt, and quartzo-feldspathic gneiss (Champion Gneiss) of the Kolar Group. Banded ferruginous quartzite of the Kolar Group occurs as lenses and linear bands within PGC-II.

7.1.4 Grey migmatite and hornblende-biotite gneiss of PGC-II occupy most of the area, representing migmatised derivatives from older granulitic rocks. PGC-II includes grey migmatite, hornblende-biotite gneiss, pink migmatite, and granitoid gneiss.

7.1.5 During the Late Proterozoic period, Tamil Nadu witnessed large-scale extensional tectonism associated with alkaline-carbonatite activity, represented by epidote-hornblende gneiss in the eastern and southeastern parts of Toposheet No. 57L/06. Meso-Proterozoic dolerite dykes trend mostly WNW–ESE and NW–SE, with occasional ENE–WSW trends. They occur almost throughout the area. These basic dykes are mostly doleritic and occasionally gabbroic in composition, varying in length and width. They form strike ridges and can be easily recognised by their dark colour and sub-rounded bouldery outcrops.

Regional stratigraphic succession brought by Gopalakrishnan (1988-89) is given in the **Table 7.1.**

Table 7.1
Regional stratigraphic succession of the study area (after Gopalakrishnan-1988-89)

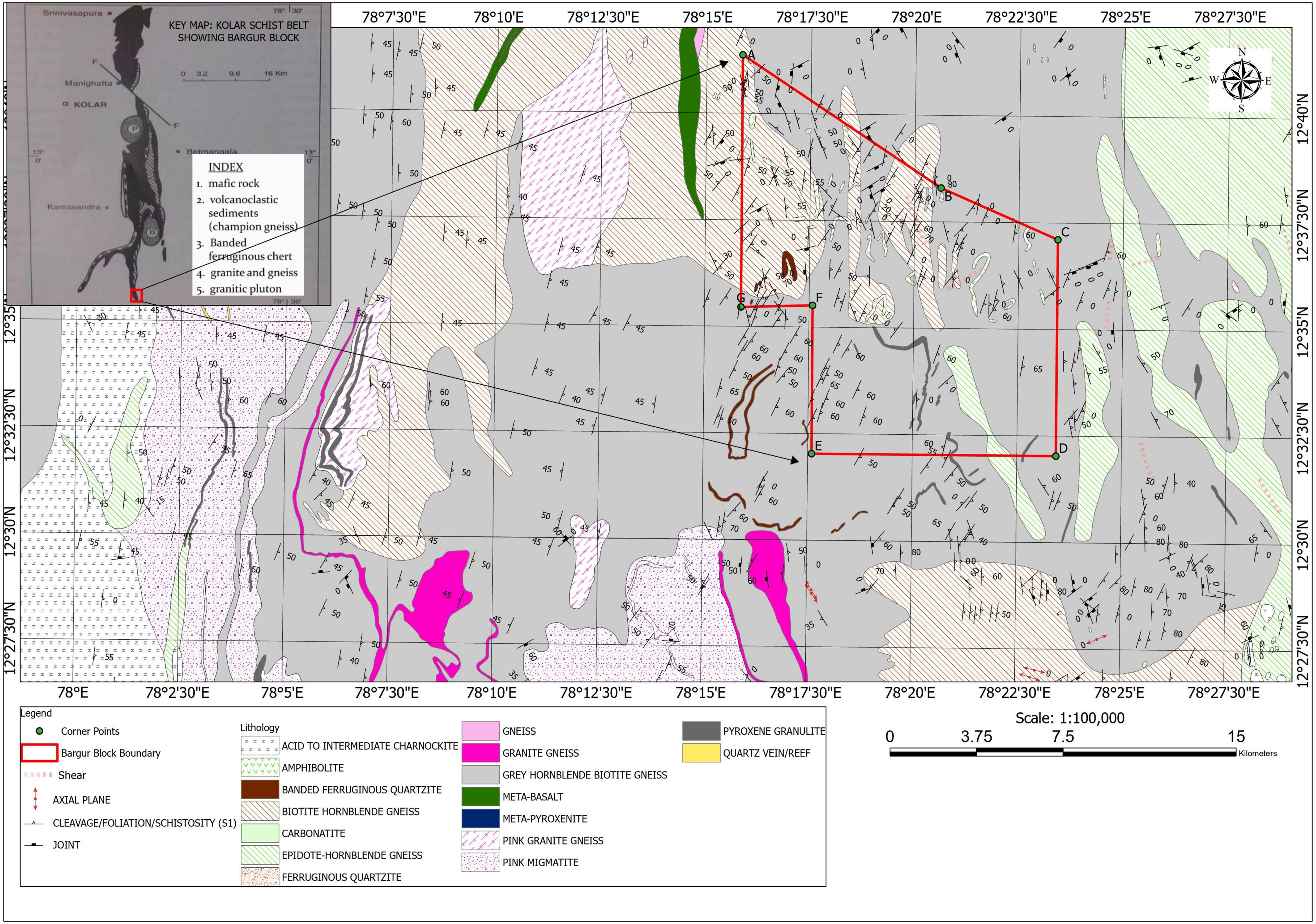
Age	**Group**	**Litho-units**
	Recent to Sub-recent	Soil/kankar
	Acid Intrusive	Quartz and Pegmatite veins
	Basic Intrusive	Dolerite, Pyroxenite, Gabrro
Archean	Peninsular Gneissic Complex	Migmatite Hornblede Biotite gneiss, Biotite gneiss, Granite
Archean	Kolar Schist Belt	Champion Gneiss Amphibolite Banded ferruginous Quartzite Metachert

7.1.6 The Bargur block area forms part of the Bargur Belt and lies at the southern end of the Kolar Schist Belt. The Bargur Belt in Tamil Nadu represents the southern extension of the eastern tail of the Kolar Schist Belt. Hornblende schist and amphibolite occur in the southern part of the Kolar Schist Belt, where they have been designated as the Bargur Series (Gopalakrishnan et al.). These are included in the Kolar Group (Subramanian and Selvan, op. cit.). Regional geological map with location of the Bargur block is shown **Text Figure-4.**

7.1.7 The Bargur Series (Formation) comprises hornblende schist, amphibolite, banded iron formation, and mica schist. The easternmost schist belt of Karnataka (Kolar Schist Belt), traced in a north–south direction, extends southward into Dharmapuri District, Tamil Nadu, where it splits into two arms. The rock types here are similar to those of the Kolar Schist Belt and include biotite and hornblende gneisses, amphibolites, banded ferruginous quartzite, quartzo-feldspathic gneiss, and quartz-sericite schist.

7.1.8 Banded Iron Formations (BIFs), consisting mainly of quartz and iron oxides, form a significant component of the Bargur Series. The common mineral constituents of the iron formation in amphibolite facies are quartz and magnetite, with or without grunerite and cummingtonite. In granulite facies, this assemblage is supplemented by hedenbergitic clinopyroxene, orthopyroxene, and garnet. The iron formation represents a platformal depositional environment (Naqvi and Rogers, op. cit.). Mafic granulites associated with the iron formations are meta-igneous, as indicated by the composition of constituent magnetites. The Cr, Ni, Mn, V, and Ti contents are lower in magnetites of the iron formations compared to those in mafic granulites (Subba Reddy and Prasad, 1982).

Text Figure-4: Regional Geological map of Bargur Block



7.2.0 REGIONAL STRUCTURE

7.2.1 Structurally, the area exhibits imprints of polyphase deformation. The general foliation trend in gneiss is NNE–SSW, with local variations to N–S. Dips are generally moderate to steep and mostly easterly. Faults trending NE–SW, ENE–WSW, and NW–SE are observed in the northern and northeastern parts of the area (Ref: Iyengar B.R.C., 1961).

7.2.2 The general foliation trend of the rock types varies from N–S to NNE–SSW, with moderate to steep dips on either side. In places, stretched quartz grains show linear disposition parallel to the foliation. Small xenoliths in gneisses also exhibit linear alignment conforming to the foliation trend.

7.2.3 The overall dip of these rocks suggests that they have been folded isoclinally, with fold axes dipping generally towards ESE. A few localised antiformal and synformal folds occur within the area. West of Bargur, the foliation dip changes to westerly, forming a small anticline with an axis trending approximately N–S for about a mile. Several minor folds are also observed. Tight isoclinal folds, with fold axes trending N–S to NNE–SSW, are shown by amphibolites and banded iron formations and may represent the earliest (F1) folding phase. These early folds are co-axial with the foliation trend. Amphibolite and banded iron formation also display plunging open folds with fold axes trending NNE–SSW to NE–SW, plunging 20°–40° towards NE or SW. These plunging folds post-date F1 folds, representing F2 deformation (F2 over F1). (Ref: Gopalakrishnan R., 1990).

7.2.4 Joints are present in all rock types, with three main sets trending N–S to NNE–SSW, ENE–WSW, and NW–SE. The dips vary from 80° on either side to vertical. The migmatised derivatives are well jointed.

7.3.0 REGIONAL METAMORPHISM

7.3.1 The area falls within the transition zone represented by admixture of hornblende-biotite gneiss, migmatite, biotite gneiss and numerous enclaves of amphibolites, pyroxenite, BFQ etc. These litho assemblages represents amphibolites grade of metamorphism. Retrograde metamorphism observed in the area where retrograde mineral assemblages were observed in sections. Numerous shear planes have been noticed in granite gneiss/migmatite gneisses and amphibolites as well as BFQ. The shear zone plays a vital role for retrogradation of mineral phases. Further, these shear zones also appear to be conduits for fluid and heat transfer for migmatisation and granulite metamorphism (Ref: Jayananda et.al.,2003). Earlier workers pointed out that the shear deformation was active throughout during magmatic accretion, metamorphism and cooling. This area had undergone multiple cycles of metamorphism, deformation, migmatisation and igneous activity as evidenced from the lithological assemblages and structural set up. The rocks of the area represent the lower granulite facies assemblage as well as their fenitised members. They have undergone retrogression in stages to amphibolite and epidote-hornblende facies. The migmatites indicate three phases of deformation along N-S (F1), NNW-SSE (F2) and ENE-WSW (F3) directions.

7.4.0 MINERALISATION IN THE REGION

7.4.1 Gold mineralisation in the region is localised along zones of high deformation which are ductile to brittle in nature. Though shear zones of different orientation are seen, only those which have a near parallel relationship to the foliation of the country rock are found to be mineralised. Those that transect the foliation at high angles are much younger, ductile in nature and are barren (Ref: K. Shashidharan, Debasish Roy, M.M.Mukherjee and W.K. Natarajan et.al (1983-84)). The mineralised shear zones are characterised by a strong mylonitic foliation and profuse hydrothermal alteration. Major changes in silicate mineralogy and texture in and around the shear zones reflect the onset of extensive hydrothermal alteration that accompanied mineralisation. Sericitisation, silicification, tourmalinisation, flouritisation and carbonatisation are the wall rock alteration noticed. The ferruginous quartzite at 1.5 km. NE of Varatanapalli (607 hill) shows sulphur stains and disseminations of pyrite, chalcopyrite and arsenopyrite (?). (Ref: B.R.C. Iyengar et.al 1961). Quartz occurs as veins, veinlets and pods parallel to the shear zone foliation and appears to be liberated from the wall rock.

7.4.2 Two ancient old workings Sakalagunta and the nearby Bangaragunta old workings reported for gold associated with vein quartz in hornblende gneiss/ amphibolite enclaves in migmatites. Gopalakrishnan (1990) reported that the Sakalagunta pit lies 1.75 km WSW of Karakuppam on the crest of an antiformal fold in amphibolite, with the fold axis trending NNE–SSW and plunging about 40° to the SSW. The pit, roughly 8–12 m across and ~3 m deep, has partly collapsed due to slumping, debris, and fallen amphibolite slabs. A narrow mineralised quartz vein is exposed on the east and south walls, and the old working appears to have followed the plunge of mineralisation. The Bangaragunta working is exposed in a well cut about 500 m west of Karakuppam, showing a south-southwesterly inclined adit about 1 m wide and 1.5 m high, with its length unkonw as it submerged in water. A quartz vein fragment from the dump assayed 12 g/t Au, while amphibolite with quartz veinlets assayed 0.2 g/t Au. These occurrences are in the southward continuity of the Kuppam arm of the famous Kolar Schist Belt. (Gopalakrishnan, 1990).

7.5.0 GEOLOGY OF THE BLOCK

7.5.1 The litho units exposed in the area form the part of Peninsular Gneissic complex with lenses and enclaves of Amphibolites and Banded iron formation (in the form of magnetite quartzite) of Kolar Group of Rocks, The Peninsular gneissic complex represented by granitoids (Hornblede biotite gneiss, Bioite/Epidote gneiss, Granodiorite, Migmatites). These rocks form the major part of the area. All these rocks are intruded by basic dykes. A number of thin quartz and pegamtite veins traverse the area. A single meta chert enclave of mappable dimension noticed northwest of Vartanapalli.

7.5.2 During the course of the mapping, main emphasis was given to map the amphibolite and banded iron formation in detail and also to identify additional mineralised zones if any. During the course of mapping, ancient/ old working namely Sakalagunta and Bangaragunta in Bargur block located. The local stratigraphic succession of the area is given below **Table No. 7.2.**

Table 7.2: Local stratigraphic succession of the study area.

Age	**Group**	**Litho-units**
	Recent to Sub-recent	Soil/kankar
	Acid Intrusive	Quartz and Pegmatite veins
	Basic Intrusive	Dolerites
Peninsular Gneissic Complex (Archean)	Peninsular Gneissic Complex	Granitoids including hornblende Biotite gneiss, biotite gneiss, granites, migmatites
Archean Granite Green stone Belt	Kolar Schist Belt	Amphibolite Banded ferruginous Quartzite Metachert

7.5.3 The main lithounits intersected in the test boreholes drilled by MECL in Bargur block are Amphibolites and Granitoides (biotite hornblede gneiss/altered biotite hornblede gneiss).

7.5.4 During present investigation, Bargur block was covered by large scale geological mapping on 1:12500 scale over 157.50 sq.km. area. The interpreted geological map of Bargur block with location of bedrock samples/channels, old working and drilled borehole locations given as **Plate No. III.**

7.6.0 DESCRIPTION OF DIFFERENT LITHO UNITS

The detailed megascopic charactersitics and petrography description of rocks exposed/ intersected in the boreholes in the area are given below.

1. **Metachert:** A single meta chert enclave of mappable dimension is mapped west of Godleri. This was previously reported by GSI (1990). Megascopically, tt is an extremely hard, dense, fine grained quartz bearing rock containing sulphide disseminations mostly pyrite. Metachert follows the foliation trend of the surrounding rocks.

Under polished section (MBBR/M6), pyrite occurs as fine to very fine subhedral to anhedral disseminated grains. Chalcopyrite and sphalerite are present as very fine grains/ specks in association with pyrite and also occurs as very fine inclusions within pyrite. Sphene is noted as very fine wedges, anhedral patches and fillings. Galena occurs as very fine specks in association with chalcopyrite-sphalerite in traces.

2. **Amphibolite:** Amphibolite is observed in the study area as enclaves, lenses, bands, lenticular bodies and as round to sub-round masses within the gneissic coutry. Mapping has brought out 15 major and few minor amphibolite bands in the area. The bands are tighly folded and highly deformed at places. It exhibits gradational contact with BIF while sharp contact with gneiss at many places. at places, Amphibolites follow the trend of the foliation of the host granitic gneissic rock. It is fine to medium grained, coarse grained, foliated, schistose at places. Three types of amphibolites are noticed, namely schistose, coarse-grained/tufted and fine grained. The schistose variety is common and the other two types are seen at a few places. Amphibolites weakly sheared at places. Mostly, Amphibolites are traversed by thin vein quartz and contain sulphides at places. Sulphides (pyrite, pyrhhotie, minor chalcopyrite at places) occurs as fine dessiminations in quartz veins within the amphibolite. Amphibolites show alteration features like ferruginisation at places.

Under the microscope (MBBR/P5), the rock comprises hornblende/uralite, plagioclase, diopside, epidote, tremolite–actinolite, and sphene as major minerals, with opaques and chlorite as minor constituents. Hornblende/uralite replaces pyroxenes and occurs as fine- to medium-grained subhedral patches, while plagioclase and diopside appear as prismatic grains. Epidote develops as fine aggregates after plagioclase and amphibole, and tremolite–actinolite forms acicular aggregates replacing pyroxenes. Sphene occurs as fine wedges and anhedral patches with relict opaques, and chlorite replaces pyroxenes and amphiboles. Ferruginous patches and fillings are also observed.

Under the microscope (MBBR/P5, MBG/P2), Amphibolites show greenish-grey, fine- to medium-grained rocks with granular to schistose texture. They consist mainly of hornblende/uralite, plagioclase, and pyroxenes (diopside/augite), along with epidote, tremolite–actinolite, chlorite, sphene, opaques, calcite, and ferruginous matter. The minerals display partial alignment, and pyroxenes are altered to tremolite–actinolite and chlorite. Epidote occurs as granular aggregates around plagioclase and amphiboles, and sphene contains relict opaques. The assemblage and alteration textures suggest metamorphosed mafic to ultramafic protoliths of amphibolite facies with localized retrogression.

3. **Banded Iron Formation (BIF):** Banded Iron Formation represented by Banded magnetite quartzite occurs as lenses and bands trending parallel to the foliation trend of the country rock i.e, Granitoids/gneisses. The general trend of foliation of the rock varies from N-S to NNE-SSW direction with dip amount varies from 65° to 75° towards eastern side. Banded magnetite quartzite outcrops found near Vartanapalli village. In general, this unit is maily composed of quartz, magnetite with grunerite and ferruginous matter as minor constituents. Disseminations of sulphides (pyrite, pyrrhotite) noticed at places. Alternating light grey (quartz rich) and dark grey (magnetite rich) bands impart a distinct layer fabric, Effects of silicification were also seen

Under microscope (Ref. MBBR/P4), magnetite quartzite consists of quartz, magnetite as major minerals and grunerite as minor mineral. Quartz occurs as fine to medium anhedral to subhedral grains showing compact contacts. Opaques (magnetite) are present as fine to very fine euhedral to subhedral grains, often segregating in thin sub-parallel bands. Grunerite occurs as fine to very fine subhedral prismatic and rhombic grains. Reddish ferruginous patches and fillings are noted in areas. The specimen showing magnetism.

Under polished section (MBBR/M2), magnetite occurs as fine to medium subhedral grains, segregating into thin to moderately thick sub-parallel bands and is showing strong magnetism. Hematite is present as subhedral grains, patches and very fine lamellae. Goethite occurs as thin filling along the banding and also noted as very thin criss-cross fillings. Pyrite and pyrrhotite are present as very fine to fine disseminated grains/ specks. Chalcopyrite is noted as very fine specks in association with pyrite and pyrrhotite. Covellite is seen present as very fine patches in association with chalcopyrite and pyrite. The specimen is showing strong magnetism.

4. **Granitoids**

Granitoids including Hornblede biotite gneiss, epidote hornblede gneiss, migmatites are the most abundant lithounit exposed in the area. Good exposures of this rock are seen around Vertanapali, Keel pungoorthi, Chinthagampalli villages, and within the Maharajakadai, Neralakotta, Vertanapali and Bargur reseve forest. At places the rock types exhibit typical migmatitic structures such as magmatic, and gneissic and folded structures at places. Most of the rocktypes are highly deformed and showing gneissosity. This suit of rocks was earlier called as granite gneiss/granitoid gneiss, hornblende-biotite gneiss, quartzo-felspathic gneiss and migmatite by the previous workers. All these rock types have been clubbed under Granitoids and individual rock type characteristics are described in subsequent paragraphs.

Grey Hornblende/Biotite Gneiss is the predominant rock type of the area. In general, the hornblende-biotite gneiss is highly weathered. They generally strike N.N.E.-S.S.W. with an easterly dip of 45°. They are generally greenish or greyish in colour depending on the proportion of the hornblende present. The composition varies from hornblende rich variety to a quartz-feldspar-rich variety. While the essential constituents of the rock as a whole are vitreous quartz, feldspar and hornblende; quartz in particular is conspicuously blue in colour. There are considerable variations in texture also, varying from very coarse grained to extremely fine-grained types. While this variation is more often gradual, there are also cases where abrupt variations are found occurring as thin veins or streaks within the parent body. These fine-grained varieties are aplitic in nature, consisting of considerable amount of quartz and feldspar. The hornblende as well as the feldspar in these gneisses, are considerably altered leaving behind blue quartz (Elathgiri).

Epidote Hornblende Geniss are mostly grey in colour, but in places these look greenish due to presence of hornblende or epidote. They are essentially made of common vitreous quartz, orthoclase, microcline and biotite. Occasionally plagioclase feldspar is also present in minor proportion. Xenoliths of hornblende and biotite schists are often found in the gneisses. These are probably formed by migmatisation of the older schists. The rocks are well foliated and frequently enclose xenoliths of older hornblende schists.

The major mineral assemblages of these Granitoids are plagioclase, microcline/ orthoclase, actinolite-tremolite, quartz, biotite etc. Besides honblende, sericite, chlorite etc. are présent as accessory minerals. The general trend of foliation of the rock varies from N-S to NNE-SSW direction with with dip amount varies from 40° to 76° on either side.

Under microscope, (Granodiorite /MBBR/P1) is a medium to coarse grained rock showing hypidiomorphic granular texture. Plagioclase and microcline/orthoclase occur as medium to coarse subhedral grains, while quartz is present as medium to moderately coarse anhedral grains and patches. Biotite and muscovite appear as fine to medium flakes, flaky segregations, and patches within pockets. Sphene occurs as fine to very fine wedges, and apatite as fine to very fine subhedral to subrounded grains. Chlorite is observed as fine flakes and patches associated with biotite, whereas sericite appears as very fine flaky aggregates developed after the alteration of plagioclase. Calcite is noted as very fine fillings in localized areas.

The Hornblende gneiss (MBBR/P2) is a medium grained rock showing gneissosity, Hornblende occurs as medium subhedral prismatic to rhombic grains and irregular patches showing parallel alignment. Plagioclase is present as medium subhedral prismatic grains displaying crude alignment and minor saussuritization. Actinolite–tremolite appear as fine to medium platy grains, locally replacing hornblende. Quartz occurs as medium to fine anhedral grains and patches associated with plagioclase. Epidote is present as anhedral patches developed after plagioclase alteration, while sphene occurs as fine disseminated wedges. Chlorite appears as pseudomorphic patches replacing amphiboles, and opaques are seen as fine to very fine anhedral grains and patches. Sericite develops as fine flaky aggregates after plagioclase alteration.

The altered meta granodiorite (MBBR/P6) is a medium grained rock showing granular texture. Plagioclase occurs as medium subhedral prismatic grains and turbid patches showing intense sericitization. Quartz appears as fine to medium anhedral to subhedral grains, often clustered in pockets. Sericite forms as very fine flaky aggregates developed after plagioclase alteration. Opaques occur as fine to very fine subhedral to anhedral grains, patches, and streaky disseminations. Tremolite is present as fine to medium acicular aggregates, while epidote occurs as fine to very fine subhedral grains and anhedral patches developed after plagioclase alteration. Biotite appears as fine accessory flakes.

Petrographic study indicates that, granodioritic to quartz-dioritic gneissic suite (MBBR/P1, P2, P3, P6 & MBG-01) comprises medium- to coarse-grained rocks showing hypidiomorphic granular to gneissic textures. The dominant mineral constituents are plagioclase, quartz, microcline/orthoclase, biotite, and hornblende, with epidote, actinolite–tremolite, chlorite, sericite, sphene, and opaques occurring as accessories. Plagioclase generally appears as medium subhedral prismatic grains, often exhibiting saussuritization and sericitization, while quartz occurs as anhedral to subhedral grains and patches. Hornblende and biotite display subhedral prismatic forms, locally aligned to define gneissosity, especially in samples MBBR/P2 and MBG/P-01. Epidote, chlorite, and actinolite–tremolite frequently replace plagioclase and amphiboles, reflecting metamorphic overprinting. Opaques occur as fine to medium subhedral to anhedral grains and patches, and sphene as fine disseminated wedges. The rocks are moderately altered, with varying degrees of sericitization, chloritization, and amphibole alteration, as observed in MBBR/P6, indicating retrograde metamorphic effects. Overall, the petrographic features suggest derivation from granitic to dioritic protoliths, subsequently subjected to regional metamorphism and deformation, giving rise to the observed gneissic and metasomatic characteristics.

Basic dykes: All the rock types of the area are intruded by basic dykes of gabbroic/doleritic composition. Dykes are generally dark grey to black in colour, fine to medium-grained, hard, and compact in nature and in some places, shows alteration. The basic dykes are mostly doleritic and occasionally gabbroic in composition with varying length and width and often trend in a E-W to NW-SE direction. These dykes form strike ridges and are easily recognized by their dark coloured and sub rounded bouldery outcrops. The major minerals present are plagioclase feldspar and pyroxene, with minor amounts of hornblende, biotite etc.

Acid Intrusives: Acid intrusives in the form of thin quartz and pegmatite veins traversing granitic gneissic rocks and Amphibolites in the area. These veins appear to be fracture fillings as well as along the foliation planes.

Recent Alluvium/ Soil: A significant portion of the block (approx. 40%) is covered by top soil, which are mainly in the central and southern part of the block. The soil is mostly silty clay to clayey in the pediplain areas while it is mainly sandy to silty in hilly areas. At places, soil type is loamy soil and gravelly soil. The soil is earthy brown in colour, fine to medium grain size, In some areas soil is mixed with boulder of weathered zone. The depth of soil cover varies from 0.30m to >3.0m at places. Top soil occurring in the area is product of weathering of parent rock underneath. Part of the area is under cultivation.

7.5.1 **Field Photographs** :

Photo-1: Fine grained Amphibolite outcrop

Photo-2: Amphibolite outcrop with quartz vein

Photo-3 Sheared Amphibolite with alteration and sulphides

Photo-4 Amphibolite outcrop with Quartz vein

Photo-5 Magnetite quartzite outcrop with sulphides, NW of Vartanapalli

Photo-6 Metachert ? with sulphides, NW of Vartanapalli

Photo-7 Schistose Amphibolite outcrop with quartz veins

Photo-8 Amphibolite enclave in Hornblede/biotite gneissic rock

Photo-9 Hornblede biotite gneiss (PGC) showing gneissocity (N-S).

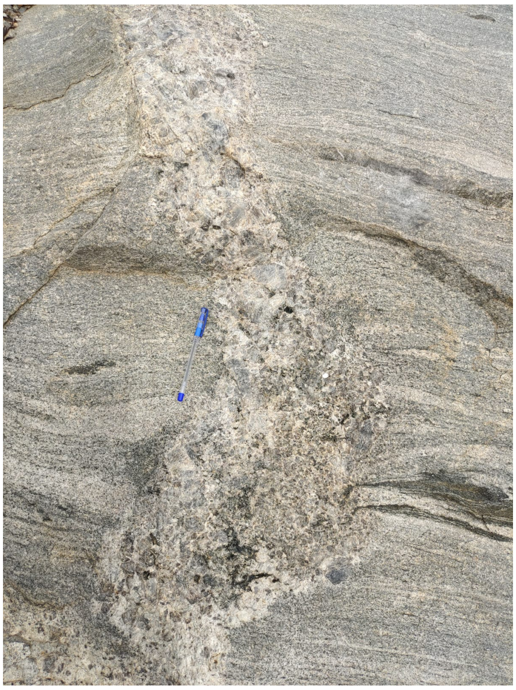


Photo-10 Pegmatite vein within Hornblede biotite gneiss (PGC) outccrop

Photo-11 Amphibolite enclaves within host rock Hornblede biotite gneiss (PGC)

Photo-12 Quart vein with host rock Hornblede biotite gneiss (PGC)

Photo-13 Ferruginised Amphibolite with specks of sulphides

Photo-14 Sakalagunta old working mostly filled with dump debris, Near Karakuppam

Photo-15 Bangaragunta old working, sealed/closed adit exposed on wall cut, Near Karakuppam

7.5.3 **Borehole Core Photographs** :

Photo-16: Borehole core photograph showing schistose Amphibolite with carbonate veins followed by silicified Amphibolite (MBG-01: Depth 95.0m – 100m)

Photo:17: Borehole core photograph showing Gt.bearing schistose Amphibolite with thin quartz veins with pyrite dessiminations. (MBG-02: Depth.123.00-124.70m)

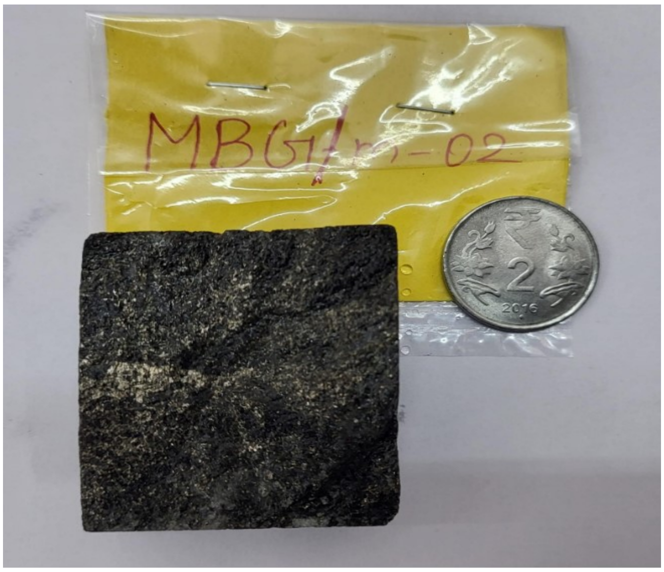
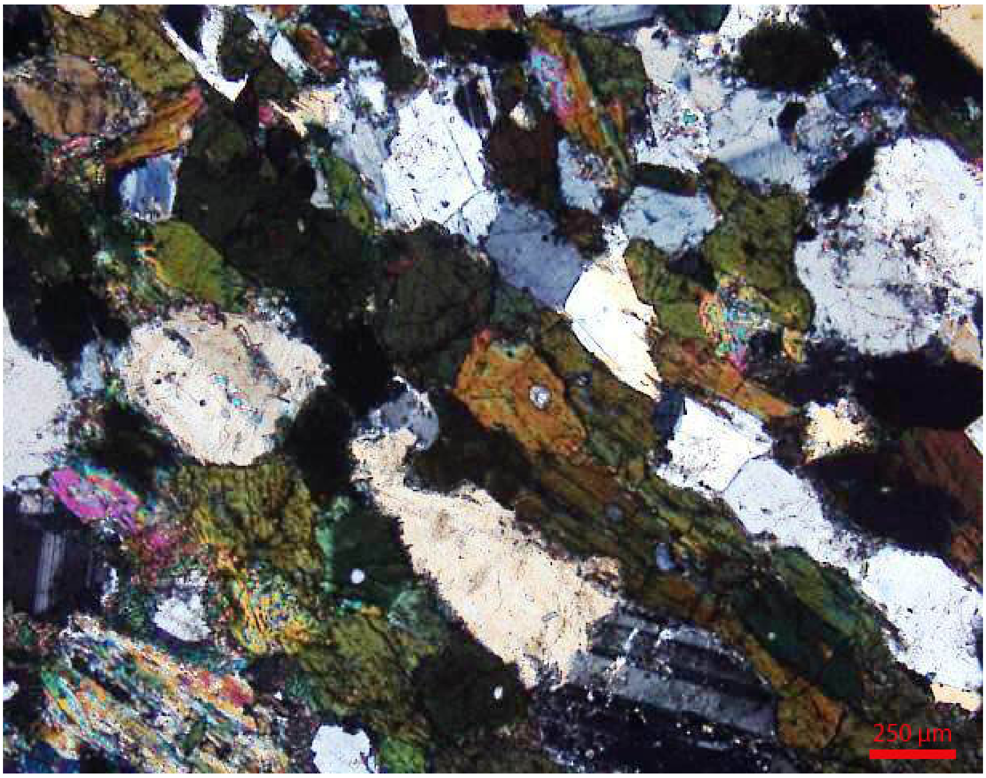


Photo:18: Borehole core photograph showing Amphibolite mostly with pyrrhotite and specks of pyrite (MBG-01/MBG/M-2: @104.80-104.90m)

Photo:19: Borehole core photograph showing Amphibolite with pyrite disseminations (MBG-02/MBG/M-3 @ 94.10-94.20m)

7.7.0 PETROGRAPHIC STUDY:

7.7.1 A total of 9 Nos. of rock samples collected from varied litho units exposed in the field and intersected in the bloreholes have been subjected to petrographic studies at MECL petrology laboratory, Nagpur. The findings of petrographic study have already been discussed along with the description of rock types. The petrographic study report has been attached as **Annexure No-VII.** The photomicrographs of the thin sections are given as **Pmg-1 to Pmg-3**.

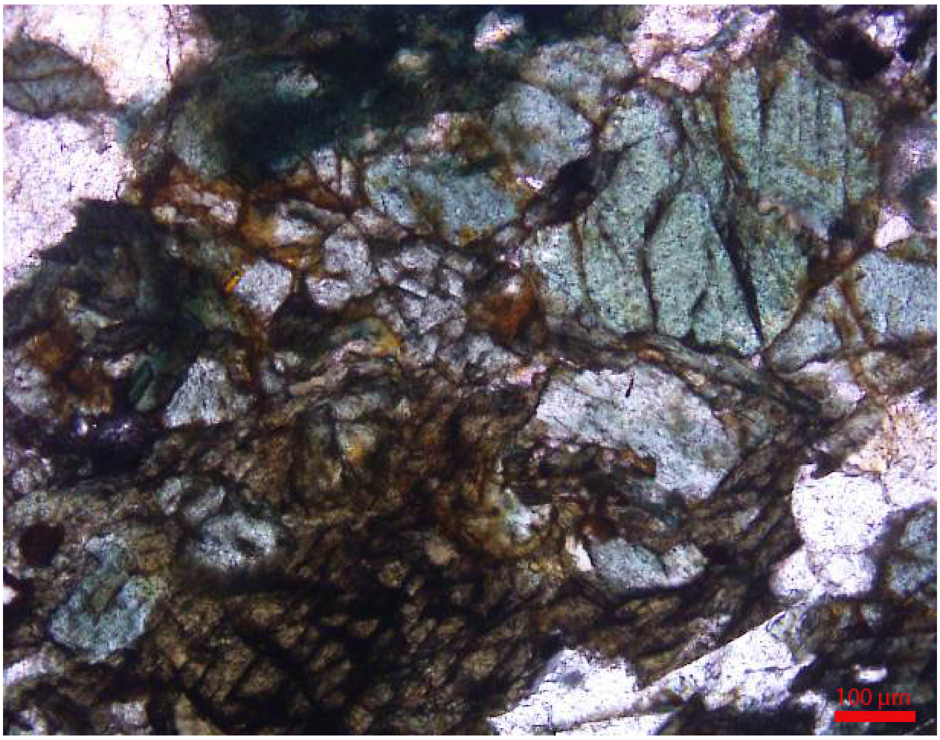


Pmg – 1: Photomicrograph showing association and parallel alignment of amphiboles, plagioclase and quartz in quartz-diorite gneiss/ hornblende gneiss as seen under crossed nicols.

Specimen No. : MBBR/P2 **Magnification : 40X**

Pmg – 2: Photomicrograph showing association of plagioclase, quartz and biotite in granodiorite as seen under crossed nicols.

Specimen No. : MBBR/P3 **Magnification : 40X**



Pmg – 3: Photomicrograph showing relicts of diopside being replaced by hornblende/ uralite and chlorite as seen under plane polarized light.

Specimen No. : MBBR/P5 **Magnification : 100X**

7.8.0 STRUCTURE

7.8.1 The general trend of foliation of the rock types varies from N-S to NNE-SSW direction with dip amount ranging from 40° to 76° on either side. Number of minor folds are noticed in the amphibolite and gneissic country rock. Joints are seen mainly in granitoids and amphibolite. Three sets of joints noticed trending along N-S to NNE-SSW, ENE-WSW and NW-SE directions and the dip amount varies from steep to near vertical on either side.

7.9.0 MINERALISATION IN THE BLOCK

7.9.1 Two old gold workings namely Sakalagunta and Bangaragunta were located in the Bargur block.. Gopalakrishnan (1989) of GSI reported that Sakalagunta working occurs on the crest of an antiformal fold in amphibolite, trending NNE–SSW with a 40° plunge to the SSW. The pit (8–12 m across and ~3 m deep) exposes a narrow mineralised quartz vein, indicating that mining followed the plunge of mineralisation. Nine trenches (112 m^3) excavated near Sakalagunta delineated a 75-m long mineralised zone trending N15°–20°W to S15°–20°E, with widths varying from 0.65–4.45 m and weighted average gold values of 0.2–0.96 g/t. The mineralisation is hosted in amphibolite with thin quartz/pegmatite veins. The Bangaragunta working, exposed in well cut about 500m west of Karakuppam showing a south-southwesterly inclined adit about 1m wide and 1.5m high, with its full length submerged. A quartz vein fragment from the dump assayed 12 g/t Au.

7.9.2 As per current observation, Sakalagunta old working is mostly filled with dumps/soil debris material. The area is mostly soil covered with scanty outcrops. Due to concealed nature and land modifications/enforcement no mineralised quartz vein is seen in the area at present. Bedrock samples and channel samples collected from the the area have not shown any promising values for Gold and associated minerals. Only one sample (MBBR-91) of Amphibolite with quartz vein collected from Sakalagunta sub block area shown 0.19 ppm Au. Another old working namely Bangaragunta is located about 1.2km East of Sakalagunta old working. An Adit exposed in well cut is closed/sealed and length of the adit is unknown. Bedrock/channel sample collected from the area have not shown any promising gold values (<0.02 ppm Au). Only one dump sample of quartz mixed with amphibolite and gneissic rock collected from nearby old working shown 0.21 ppm Au. Sample analysis for other other elements not encouraging.

7.9.3 Surface Manifestation: Surface expression of mineralisation in the Bargur Block is limited due to extensive soil cover and land modification around the old workings. Only faint surface indications, such as ferruginisation and scattered sulphide specks within amphibolite, BIF and metachert outcrops, were recorded during mapping. No exposed mineralised quartz veins are visible at present in the Sakalagunta & Bangaragunta old workings and nearby areas.

7.9.4 Mode of Occurrence and Nature of Mineralisation: The mineralisation appears to be associated with thin quartz/pegmatite veins occurring within amphibolite enclaves hosted by hornblende gneiss and migmatites. Sulphides are mostly present as disseminations and fine-grained specks rather than as well-developed veins. Subsurface intersections from limited drilling confirm sulphide-bearing zones within amphibolite and amphibolite–quartz vein linkages, but no auriferous quartz reefs were identified. The occurrence suggests a weak and discontinuous mineralisation system.

7.9.5 Ore and Gangue Mineralogy: Mineragraphic studies show major ore minerals include magnetite, sphene, pyrrhotite, and pyrite, typically forming fine disseminations to medium-grained aggregates (>5%–1% visual sulphide content). Minor phases include ilmenite, hematite, goethite, and chalcopyrite, while digenite, covellite, pentlandite, sphalerite, and limonite occur as minor and trace constituents. Magnetite shows martitisation and secondary hematite/goethite development, indicating post-mineral oxidation and limited supergene modification.

7.9.6 Controls on Mineralisation: No clear structural controls on mineralisation are observed due to poor exposure and absence of continuous quartz vein systems. However, as per previous workers, the old working in Sakalagunta occurs on the crest of an antiformal fold in amphibolite and mineralisation is associated with quartz/pegmatite veins in amphibolite enclaves hosted within the Peninsular Gneissic Complex suggesting structural and lithological control.

7.9.7 Alteration Characteristics: Profound alteration signatures not noticed in the area. Ferruginisation and silicification in amphibolite and metachert observed at places. Oxidation features such as martitised magnetite, goethite and limonite suggest post-mineral weathering. No pervasive sericitisation, carbonate alteration or sulphidation halos typical of robust lode gold systems were noted in the drilled boreholes.

7.9.8 During the course of the mapping, main emphasis was given to map the amphibolite, banded iron formation (BIF) and meta chert in detail to identify the mineralised zones if any in the area.

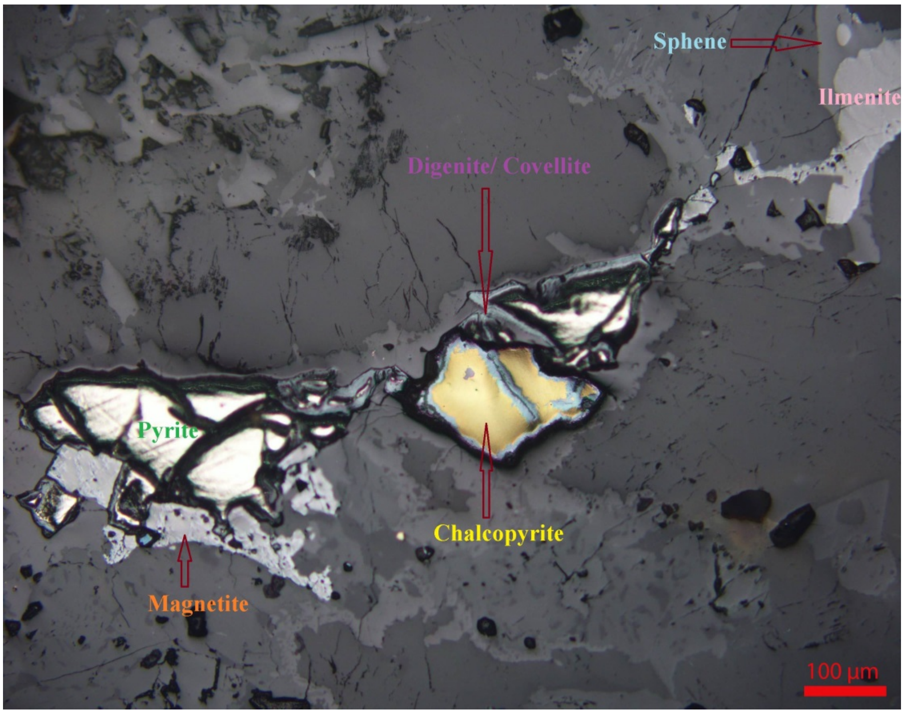
7.9.9 A few elevated copper and zinc values observed in amphibolite and metachert samples are sporadic and do not indicate any consistent mineralized trend. Similarly, the two test boreholes drilled to investigate ground geophysical anomalies did not reveal any mineralized zones for gold or associated metals up to the explored depth of 90 m (vertical depth) in the Bangargunta sub-block of the Bargur block

7.10.0 MINERAGRAPHIC STUDIES OF MINERALISED CORE SAMPLES

7.10.1 A total of 09 number of polished sections of bedrock and suspected mineralized core samples intersected in the boreholes subjected to mineragraphic studies. The mineragraphic study of the Bargur Block shows that magnetite, sphene, pyrrhotite, and pyrite constitute the major ore minerals, occurring in varying proportions across samples. Ilmenite, hematite, goethite, and chalcopyrite commonly occur as minor constituents, while digenite, covellite, sphalerite, pentlandite, and limonite appear as trace to accessory phases. Magnetite frequently shows martitisation and replacement by hematite and goethite, whereas sphene often encloses relicts of ilmenite. Sulphide assemblages include pyrite, pyrrhotite, and chalcopyrite, with late-stage secondary copper sulphides (covellite, digenite, chalcocite) replacing primary chalcopyrite and pyrite. Pentlandite exsolutions within pyrrhotite and goethite–limonite associations reflect supergene alteration. Overall, the ore assemblage indicates a complex magnetite–ilmenite–sulphide paragenesis, modified by oxidation and secondary enrichment processes.

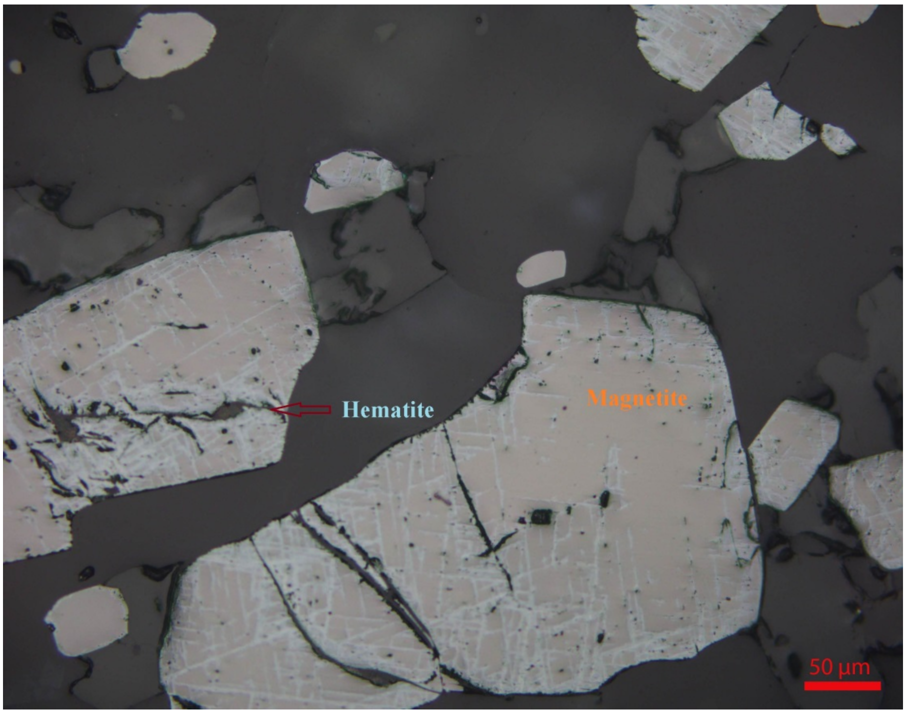
The sample wise details of the mineragraphic studies are presented as **Annexure-VIII** and the photomicrographs of the polished sections are given as **pmg-4 to pmg-10.**

1) **Magnetite** is a dominant phase in samples MBBR/M1, M2, M3, M4, and MBG/M-03, occurring as fine to medium subhedral to anhedral grains, often showing martitisation and replacement by hematite and goethite
2) **Sphene**, another major phase in MBBR/M1, M3, M4, and M5, encloses fine ilmenite relicts and occurs as wedges or patchy grains.
3) **Pyrrhotite** is prominent in MBG/M-01, M-02, and M-03, forming disseminated grains and veinlets, often enclosing chalcopyrite and showing pentlandite exsolutions
4) **Pyrite** occurs in several samples (MBBR/M1–M3, M6, MBG/M-02) as disseminations or fine grains, occasionally replaced by chalcopyrite and secondary
5) **Ilmenite** appears as a significant phase in MBBR/M4, M5, and MBG/M-03, commonly intergrown with magnetite or included within sphene.
6) copper sulphides like covellite, digenite, and chalcocite (MBBR/M1, M3, M5).
7) **Chalcopyrite** is widely present in trace to minor quantities (MBBR/M1–M6, MBG/M-01, M-02, M-03), often associated with pyrite and pyrrhotite, showing replacement by covellite and digenite
8) **Goethite and limonite,** noted in MBBR/M1, M3, M5, and M4, occur as alteration products of magnetite and sulphides, marking late-stage oxidation.



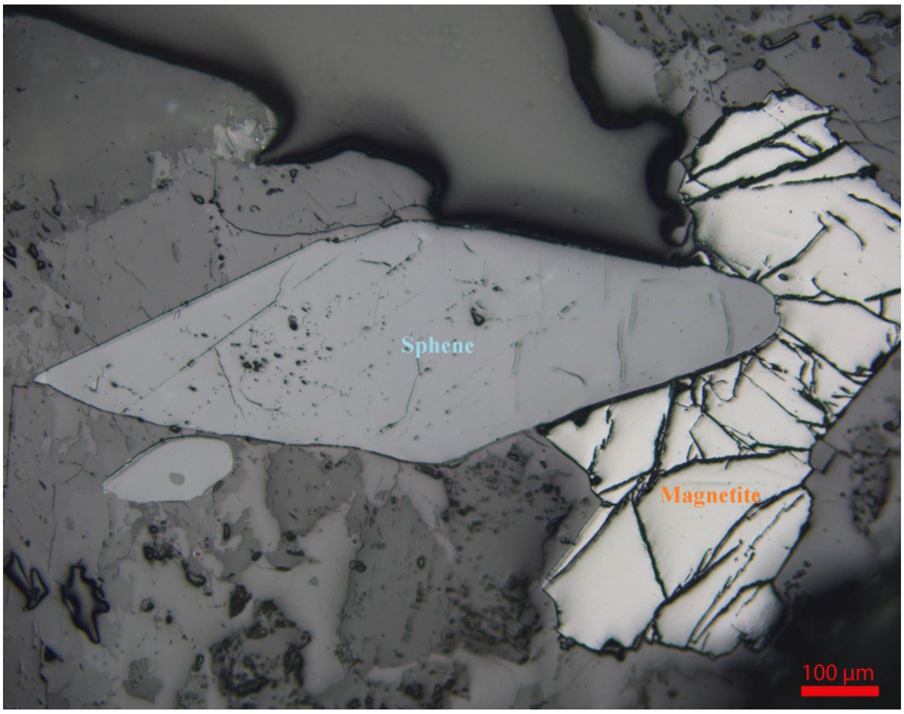
Pmg – 4: Photomicrograph showing chalcopyrite is being replaced by digenite-covelite fillings; ilmenite is being replaced by sphene and associated pyrite and magnetite grains as seen under reflected light.

Specimen No. : MBBR/M1 **Magnification : 100X**



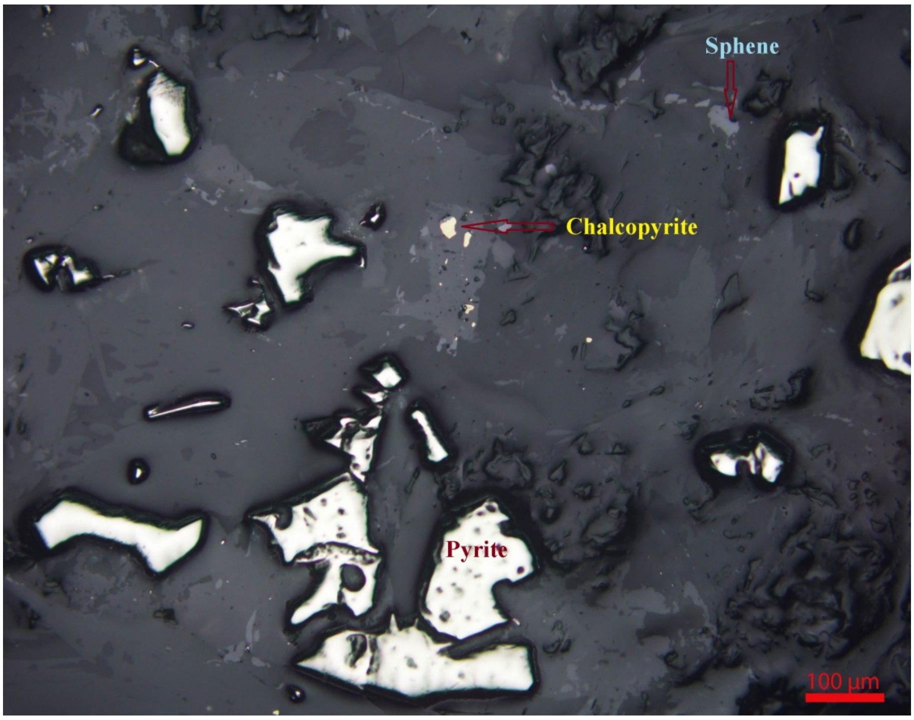
Pmg – 5: Photomicrograph showing martitisation of magnetite as seen under reflected light.

Specimen No. : MKBMS01 **Magnification : 200X**



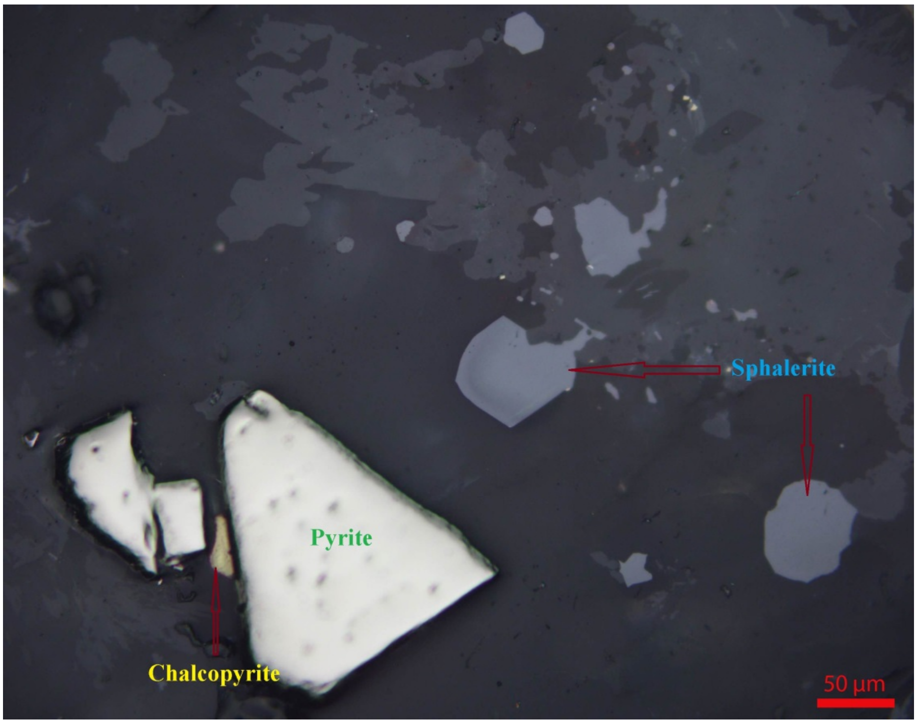
Pmg – 6: Photomicrograph showing sphene wedges and associated magnetite grain as seen under reflected light.

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



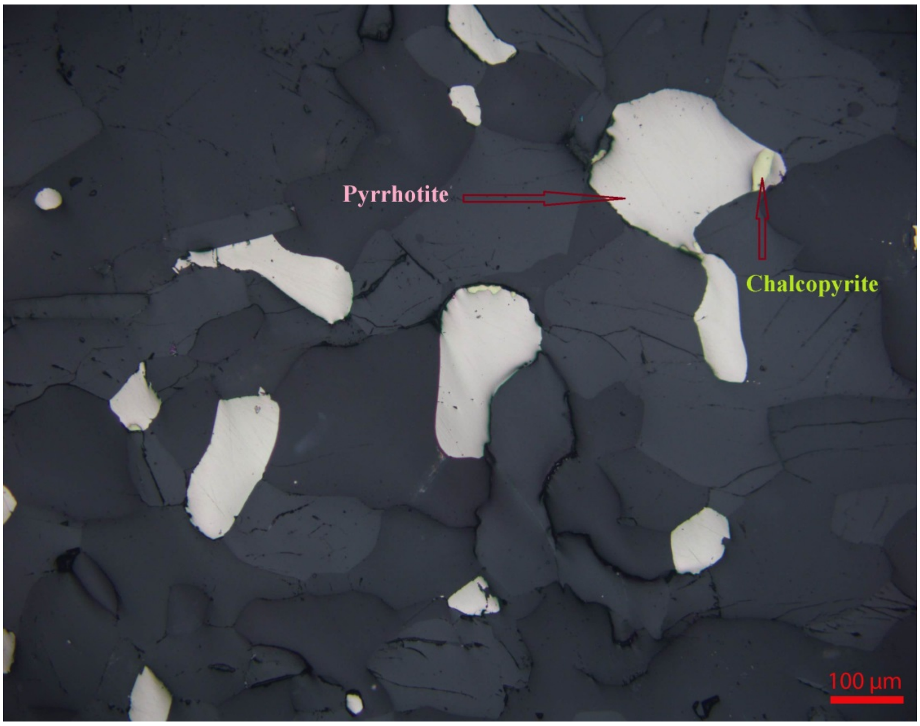
Pmg – 7: Photomicrograph showing fine anhedral grains of pyrite and associated very fine chalcopyrite specks and sphene patches as seen under reflected light.

Specimen No. : MBBR/M6 **Magnification : 100X**



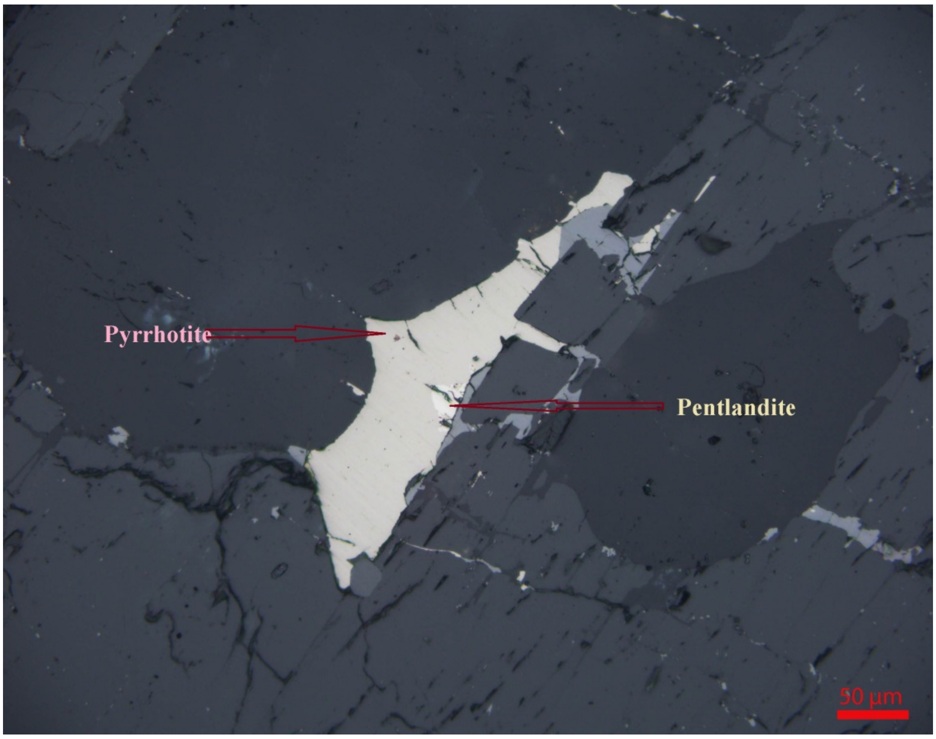
Pmg – 8: Photomicrograph showing fine anhedral grains of pyrite associating very fine specks/ grains of sphalerite and chalcopyrite as seen under reflected light.

Specimen No. : MBBR/M6 **Magnification : 200X**



Pmg – 9: Photomicrograph showing fine disseminated grains of pyrrhotite associating chalcopyrite with it as seen under reflected light.

Specimen No. : MBG/M-01 **Magnification : 100X**



Pmg – 10: Photomicrograph showing very fine patchy exsolutions of pentlandite within pyrrhotite as seen under reflected light.

Specimen No. : MBG/M-03 **Magnification : 200X**

CHAPTER-8

8.0.0 PREVIOUS EXPLORATION

8.1.0 DETAILS OF PREVIOUS EXPLORATION CARRIED OUT BY OTHER AGENCIES

8.1.1 Boseworth Smith (1889) was the first worker to mention the extension of hornblende schist bands of Kolar Schist Belt with which gold bearing lodes are associated towards Maharaja-gadai and Adakonta as two arms branching out from Mallappakonda.

8.1.2 M/s John Taylor & Sons (1940) reported that 22 samples of soil collected from old dumps and shafts of Sakalagunta analysed 1.6 to 9.5 g/t gold. 15 out of 32 samples of soil and quartz collected from Bangaragunta analysed 1.5 g/t to 8 g/t gold (GSI, 1990, Records v (123 (5) p 169-183).

8.1.3 Krishnaswamy (1950) described amphibolite, quartzite, banded ferruginous quartzite, granite and champion gneiss in the area.

8.1.4 Iyengar and Gopal Rao (1957) mapped the area and reported charnockite, gneissic granite, amphibolite, hornblende schist and basic dykes.

8.1.5 The Tamil Nadu State Geology branch under the UNDP (Ford et al., 1975) carried out regional geochemical orientation surveys and large-scale mapping of the southern extension of Kolar Schist Belt. Detailed sampling of amphibolite and quartzite for gold was carried out by them in the area north of Varatanapalli and Veppanapalli, but it failed to yield any encouraging result.

8.1.6 Shrivastava (1983) carried out geological mapping in the area and few samples from vein quartz, amphibolite, sheared amphibolite and ferruginous quartzite have shown the incidence of gold values ranging from 0.1 to 0.7 g/t of gold.

8.1.7 Suthanandam and Gopalakrishnan (1983) carried out mapping around Veppanapalli (Toposheet No. 57L/2) area continuation of the Kolar Schist Belt during the Field Season 1981-82. They carried out exploration for gold in the Champion Gneiss and adjoining meta-basalt within the eastern arm of the continuity of Chigargunta block of Kolar Schist belt and demarcated six silicified zones. Their work in the western arms viz. the Veppanapalli arm and the Adakonta arm bifurcating from Mallappakonda also revealed their auriferous nature. The litho units in the area forms a part of the Peninsular Gneissic Complex with lenses and enclaves of ortho and para metamorphic rocks like amphibolites, ferruginous quartzite, meta-ultramafics and calc silicates constituting the locally designated Bargur Group. The Bargur Group of rocks is highly migmatised during different periods and had given rise to a complex assemblage of gneisses, migmatites and granitoids. This assemblage of rocks which is widely exposed in the area is grouped under the Peninsular Gneissic Complex. All these rock types are intruded by basic and ultrabasic dykes of doleritic/gabbroic and pyroxenite composition. A number of quartz and pegmatite veins traverse the area, along the NW-SE trending shear zones. The rocks of the Kolar Schist Group terminate near Maharajagadai and is surrounded by a vast expanse of Peninsular gneiss. The similarity in the litho type and assemblage, viz. amphibolites, magnetite quartzite, meta-chert and ultramafics of Bargur Group with those of Kolar Schist Group often renders the possibility of their correlation, particularly when these litho types occur as detached enclaves within the Peninsular Gneiss.

8.1.8 Suthanandam & Gopalakrishnan (F.S. 1981-82) carried out Large-scale geological mapping over 30 sq.km on 1:12,500 scale in parts of toposheet No.57 L/2 & L/6 at the southern extremity of the Kolar Schist Belt (covering part of Krishnagiri taluk, Dharmapuri district, Tamil Nadu). A total number of 41 surface grab samples were collected and analysed for gold. The mineralised zones are normally silicified and are exposed in the surface as gossan. About a dozen gossan/mineralised zones are identified in Maharajagadai area (outside of Bargur Block). The minerals identified in the mineralised/gossan zones include pyrite, pyrrhotite, chalcopyrite and arsenopyrite (?). A number of old working pits and dumps noticed in the area. Out of the 41 surface grab samples collected, many of them show presence of gold. The gold assay value varies from 0.1 to 1.6 gram per tonne.

8.1.9 Gopalakrishnan (1984) of GSI collected regional groove and chip samples from ferruginous quartzite and the samples have yielded low gold values ranging from 0.2 to 0.4 g/t of gold

8.1.10 Gopalakrishnan (1989) of GSI undertaken large scale geological mapping (1:25,000) over 50 sq.km area and Detailed mapping (plane-table mapping) on 1:2,000 scale, trenching and sampling was carried out over 0.1 sq.km area in the Bargur area. Two old workings namely Sakalagunta & Bangaragunta located in Bargur area. The Sakalagunta pit lies 1.75 km WSW of Karakuppam on the crest of an antiformal fold in amphibolite, with the fold axis trending NNE–SSW and plunging about 40° to the SSW. The pit was roughly 8–12 m across and ~3 m deep, has partly collapsed due to slumping, debris, and fallen amphibolite slabs. A narrow mineralised quartz vein is exposed on the east and south walls, and the old working appears to have followed the plunge of mineralisation. The Bangaragunta working is exposed in a well cut about 500 m west of Karakuppam, showing a south-southwesterly inclined adit about 1 m wide and 1.5 m high, with its full length submerged. A quartz vein fragment from the dump assayed 12 g/t Au, while amphibolite with quartz veinlets assayed 0.2 g/t Au. Nine trenches (112 cu.m) were opened to expose the mineralised zone of the Sakalagunta old working. The trenching work has established a 75 m. long mineralised zone trending in N15°-20°W-S15°-20°E direction. The width of the zone varies from 0.65 m to 4.45 m. and the gold values observed are ranging from 0.2 to 0.96 g/t of (weighted average) gold. The mineralised rock is amphibolite with very thin pegmatite veins. He recommended further detailed work for tracing the strike continuity of the zone.

8.1.11 **NGPM Survey:** GSI carried out NGPM (National Geophysical Mapping Program) survey in parts of Toposheet No. Toposheet No.s 57 H/13, 57H/16, 57L/2, 57 L/6 & 57 L/9 in parts of Chittoor district in Andhra Pradesh, Bangalore & Kolar district in Karnataka, Dharamapuri & Vellore district in Tamil Nadu

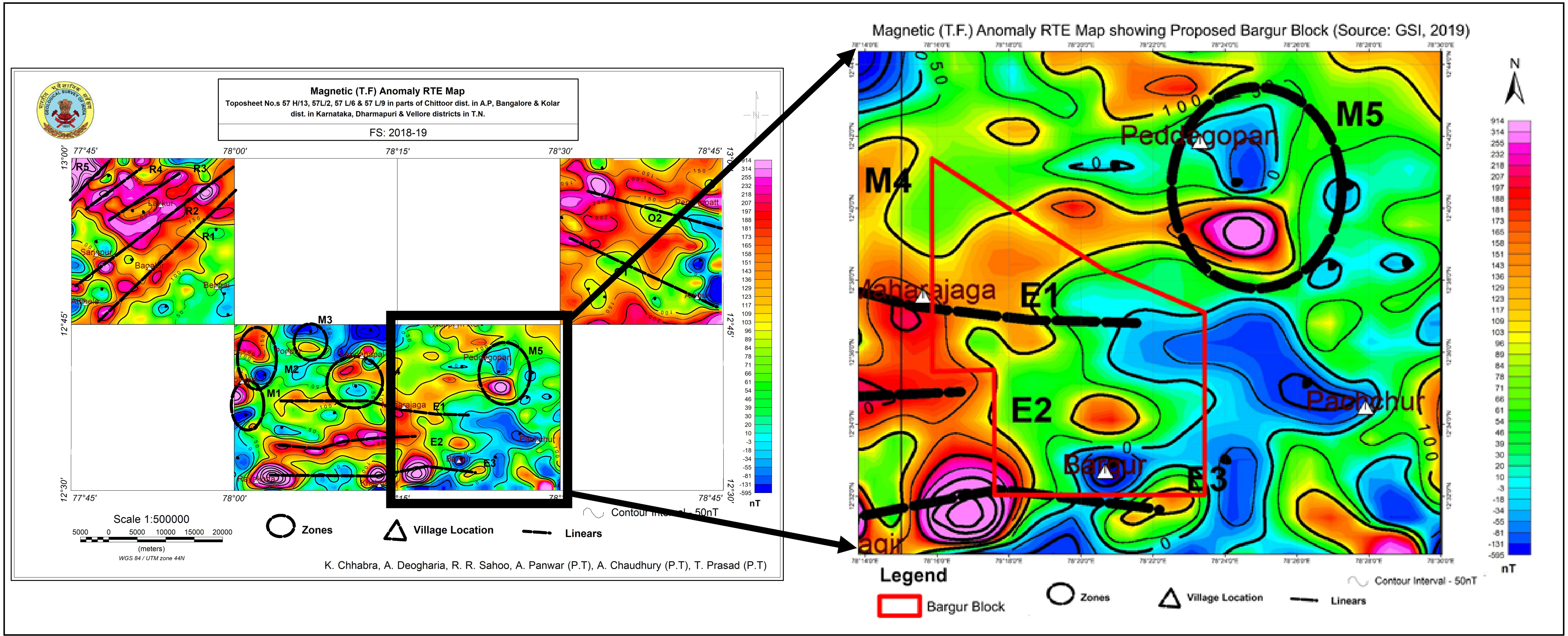
8.1.12 Regional Gravity and Magnetic (Total Field) surveys in Toposheet No.s 57 H/13, 57H/16, 57L/2, 57 L/6 & 57 L/9 are quite diagnostic in mapping the regional geological features. The Bouguer gravity anomaly map brought out a total variation of 43mGal, the anomaly values varying from -106mGal in the southern part to a maximum of -63 mGal in the north-eastern part of the study area. The magnetic (TF) anomaly has brought out an anomaly variation of 1994 nT, the anomaly values ranging from -1216 nT to 778 nT. A clear division of gravity gradients (trending NE-SW) in zone Z1 in N-W part of the study area reflects bulging of contours possibly representing a deep high density mafic intrusive body in the upper crustal levels. Although the high frequency magnetic response in these portions may be attributed to the shallower features of the subsurface but is in collaboration with the bulging of the Bouguer anomaly. Gravity gradients trending E-W can be inferred as the contact of Dharwar and SGT features. Also, Zones Z2 & Z3 in the central part of the study area shows a bulging probably suggesting a weak fractured zone and possibly the conduit for the intrusive bodies. The attitude of magnetic contours in the central & southern portion of the study area respectively may reflect the inferred formational contact of Dharwar Group with PGC basement and SGT (Southern Granulite Terrain). Three zones Z1, Z2 & Z3 are appearing to be very structurally disturbed sectors which may be proposed as target zones of mineralization suggesting further studies in the near future prospects. Gravity and magnetic signatures of mobile belts are mostly controlled by deep geological features possibly associated with older mafic granulite basement.

8.1.13 Quantitative interpretation of Bouguer anomaly suggests the prominent anomaly response at a depth of 8 km probably suggesting the PGC and SGT contact. The shallow Euler depth solutions in the NW-SE trending Dharwar group of the rocks whets the inferred intrusion in the upper crustal levels. Also Euler depth solutions are mostly occurring over the possible conduits where high gravity and magnetic gradient is observed.

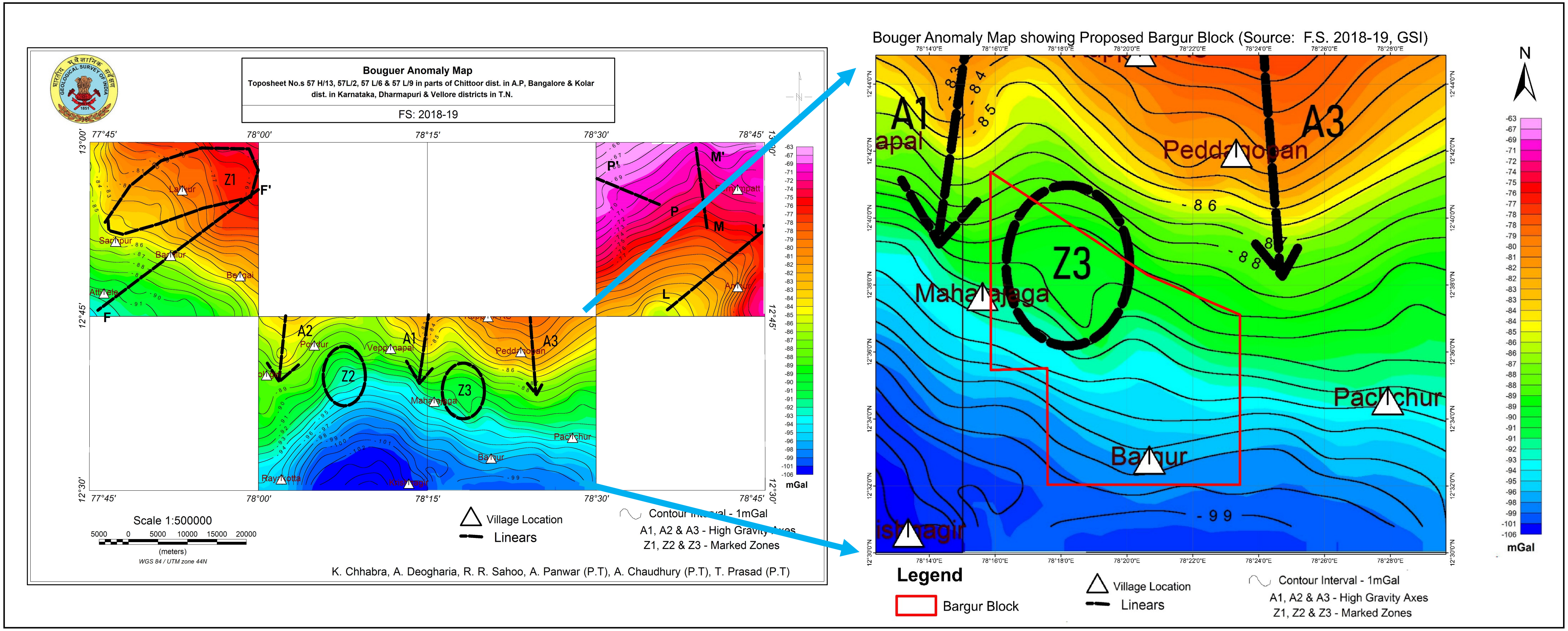
8.1.14 The extension of Kolar Schist Belt has been brought out as Bouguer gravity anomaly nosing (second order feature) in Toposheet no.s 57 L/2 and 57 L/6. Feeble magnetic

(T.F) anomalies, corroborating with this second order feature suggest compositional variation in schist belt rocks.

8.1.15 Based on the available NGPM anomaly maps it is interpreted to identify potential exploration targets and plan ground geophysical survey in Bargur Block. that Magnetic anomaly map represents few bipolar anomalies within the Block area indicating some contact zones/geological structures. Bauger Anomaly map showing marked zone Z3 probably suggesting a weak fracture zone and possibly the conduit for the intrusive body. Both anomalies corroborated well with favourable litho unit i.e.amphibolites.



Text Figure-5: Magnetic (T.F.) Anomaly RTE map of T.S. No. 57L/6 with location of Bargur block (Source: GSI, 2019)



Text Figure-6: Bouger Anomaly of T.S. No. 57L/6 with location of Bargur block (Source: GSI, 2019)

8.1.16 **NGCM Survey:** The National geochemical mapping project (NGCM) covering Toposheet No. 57 L/06 during the 2017–18 field season aimed to generate baseline geochemical data for applications in mineral exploration, environmental management, and land-use planning. The terrain is rugged and hilly, reaching up to 1031 m above mean sea level, with undulating plains in between. The major rock types include grey hornblende–biotite gneiss and epidote–hornblende gneiss, along with enclaves of amphibolite, banded iron formation (BIF), basic dykes, quartz, and pegmatite veins. Structural trends are generally north–south to northeast–southwest, with evidence of folding, shearing, and magma mixing observed in the field.

8.1.17 Geochemical results and Geochemical elemental distribution map for Gold (Au) not available in the Report.

8.1.18 Samples of composite cell nos. 152, 13 and 20 show high concentrations with 141.82, 109.48 and 118.78 ppm respectively) against the crustal abundance of 122 ppm and shows positive skewness of 1.10 and threshold value of 95.69. The south east of Rasipalli, West of Mallappadi and north of Maharajagadai of the study area show maximum concentration (Text Figure-7). It shows positive correlation with Fe_2O_3, V and Co. Some high value of Cu is observed in areas where amphibolite (hornblende biotite gneiss) is present and migmatite present in the area.

8.1.19 Zinc varies from 32.83 to 274.45 ppm with mean value of 100.66 ppm (samples 104, 116, 120, 129 and 135 show high concentrations respectively) against the crustal abundance of 76 ppm and shows positive skewness of 1.27. The maximum concentration is in the western and central part of the study area (Text Figure-7). Thus, the concentration of Zn may be attributed to the grey gneiss and basic dykes present in the area. The values are not anomalous and lie well within the normal range for the contributory rock unit. The concentration of zinc in soil is less than the toxic limit in the area and well within the range of agricultural soil.

8.1.20 Lead (Pb) varies from 1 to 63.25 ppm with mean value of 24.89 ppm (samples 50, 73 show high concentrations with values 33.5, 30 ppm respectively) against the crustal abundance of 14 ppm and shows negative skewness of 0.195) and of threshold value 42.91 (Text Figure-7). The study area shows maximum value in composite cell number 20 north east of Rasipalli one isolated peak of high lead value 63.25 (hornblende biotite gneiss). The values of lead are well within the limit of agricultural soil (3-189 ppm) and not in the toxic range (70 ppm for Pb). Its value exceeds crustal abundance value by more than 4 times. In box plot graph cluster of data is showing in lower datum/ first quartile.

8.1.21 Geo-chemical distribution map of Cu, Pb & Zn of Toposheet No. 57L/06 sourced from GSI Report (FS-2017-18) is reproduced along with Bargur block location in **Text Figure No.7.**

8.1.22 Geochemical results revealed significant elemental associations and correlations such as Fe_2O_3–TiO_2–V–Ta–Nb–Cu, Ni–Cr–Co–Mg–CaO, and La–Ce–Pr–Nd–Sm–Gd–Tb–U–Th, indicating distinct lithological and weathering controls. The water chemistry of the area was generally within permissible limits for drinking and irrigation, except for slightly elevated fluoride levels (1.28–1.74 ppm) in a few samples. The environmental evaluation suggests that Cu, Cr, Zr, Ni, and Hf occur in marginally high concentrations, likely of geogenic origin, warranting further study. Overall, the findings indicate that the area remains largely uncontaminated, with a stable natural geochemical background, and holds promise for future mineral exploration, particularly for elements associated with mafic and iron-bearing formations.

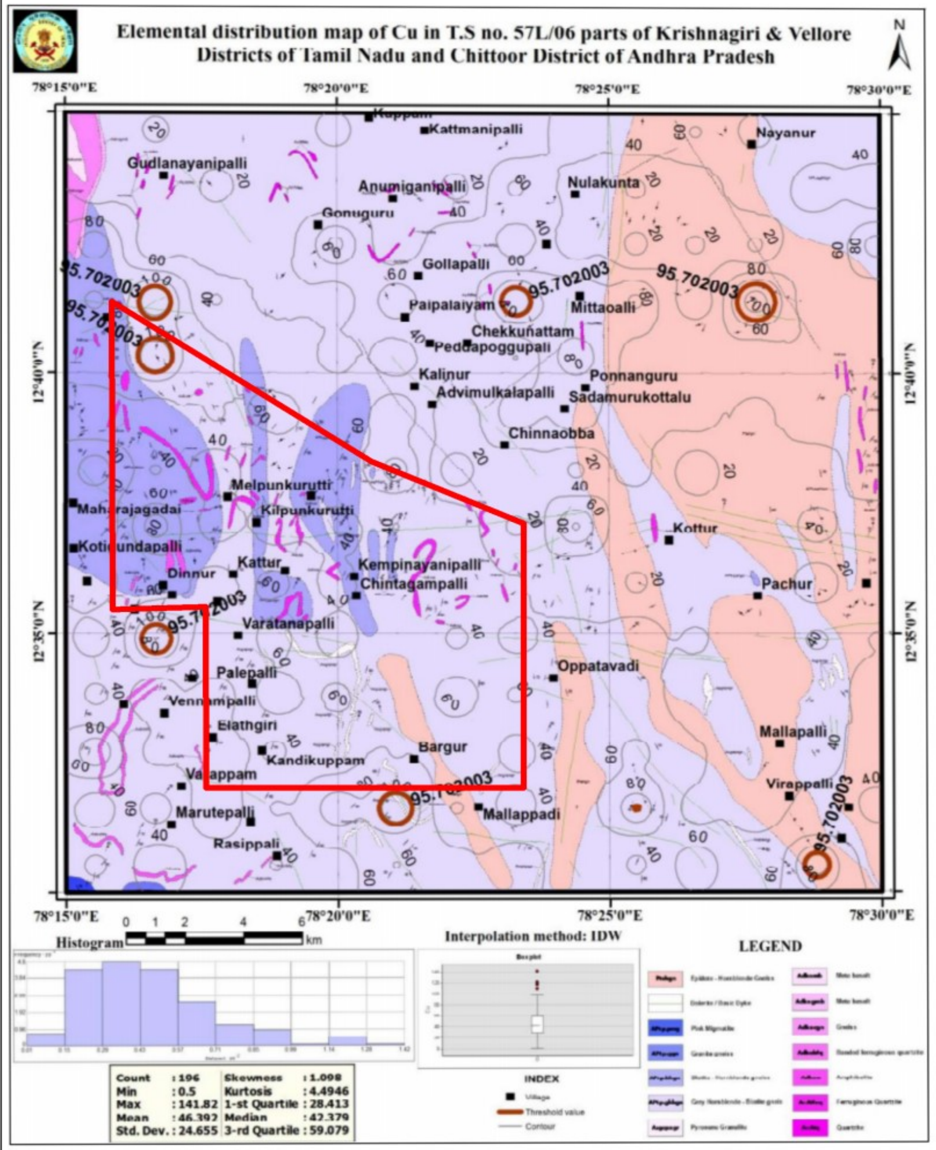


Plate 33: Geochemical distribution map of Cu of Toposheet No. 57L/06

Source: GSI (FS2017-18)

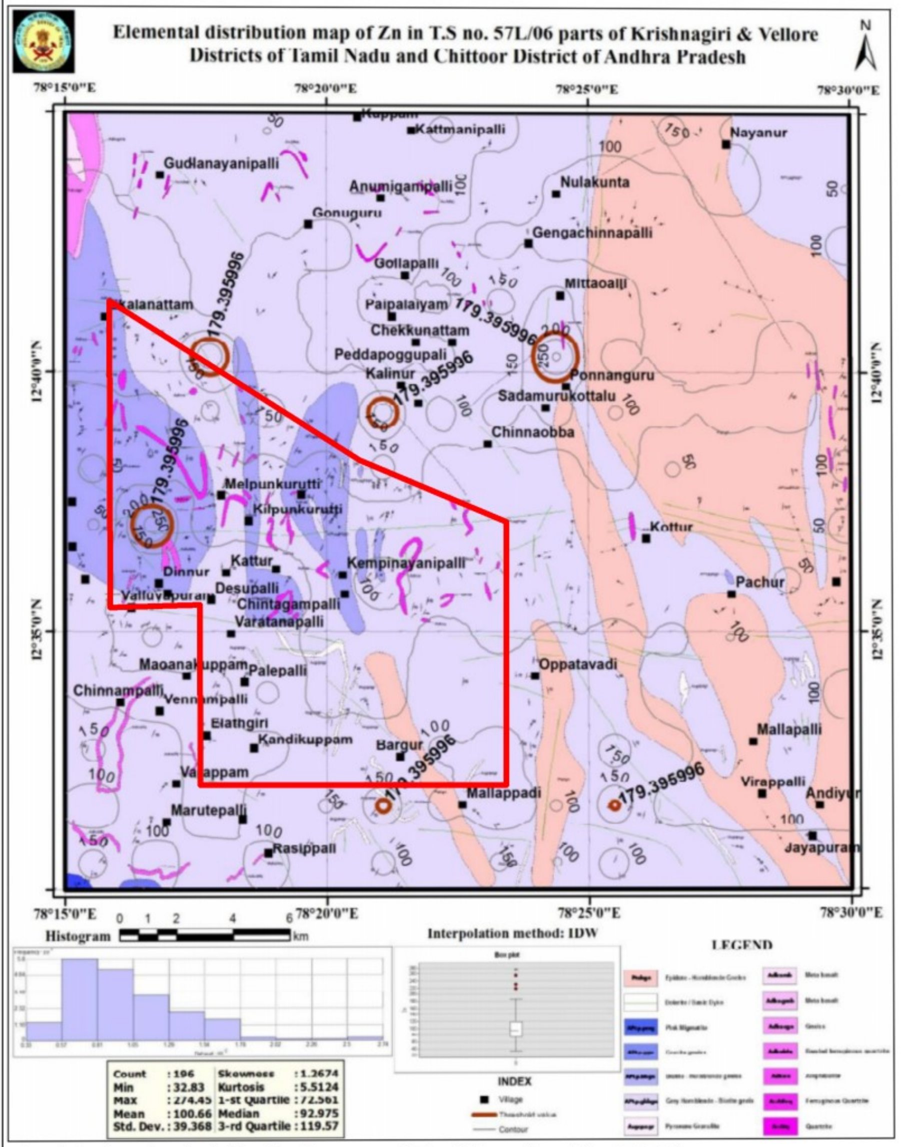


Plate 34: Geochemical distribution map of Zn of Toposheet No. 57L/06

Source: GSI (FS2017-18)

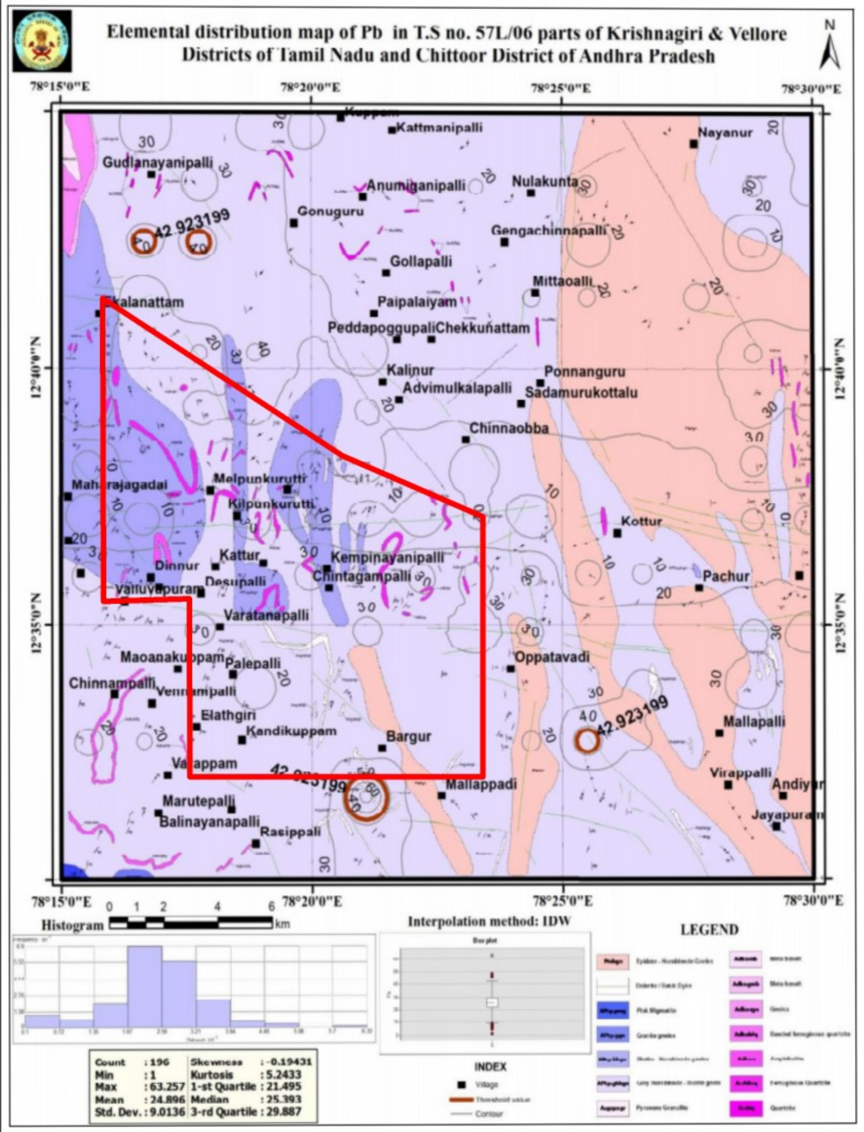


Plate 59: Geochemical distribution map of Pb of Toposheet No. 57L/06

Source: GSI (FS 2017-18)

Text Figure-7: Geochemical distribution Map of Cu, Pb & Zn of Toposheet No. 57L/06 with Bargur block location

CHAPTER-9

9.1.0 AREAL OR GROUND GEOPHYSICAL OR GEOCHEMICAL DATA

Areal/Airborne Geophysical Survey is not the scope of present exploration. As per NGDR portal, the area has not been covered by Airbone Geophysical survey by GSI or any other agency. NGPM data of the area has been reviewed and utlised the same for formulation of ground geophysical survey in Bargur block area. During present exploration Ground geophysical survey has been carried out in Bargur Block.

9.2.0 GROUND GEOPHYSICAL SURVEY

The overall bedrock and channel sample results did not show promising values for Gold and other associated element in Bargur block. However, considering the concealed nature of the area and the presence of two old workings, a ground geophysical survey was planned to identify any subsurface mineralized extensions. Accordingly, two sub-blocks—Bangaragunta (1.3 sq.km) and Sakalagunta (1.76 sq.km) were selected for ground geophysical work as per the approved quantum and finding discussed in subsequent paragraphs.

9.3.0 INTRODUCTION

9.3.1 All available previous geological, ground geophysical survey data of NGPM data has been consulted for the formulation of Ground Geophysical survey proposal at G4 stage for Gold and Associated mineralisation in Bargur Block.

9.3.2 During present investigation, Ground geophysical survey comprising of Magnetic, SP and I.P. Survey planned to demarcate concealed potential mineralisation zones at 100m traverse interval and 10m station interval in Bargur Block.

9.3.3 The physical properties for different expected ores & host rocks shown in below **Table 9.1.**

Table -9.1 Physical Properties of different expected ores & host rocks

Ore/ rock	Chemical composition	nsity (g/cc)	Magnetic Intensity
Chalcopyrite	$CuFeS_2$	4.1-4.3	Paramagnetic
Bornite	Cu_5FeS_4	5.06-5.09	Paramagnetic
Chalcocite	Cu_2S	5.5	Diamagnetic
Covellite	CuS	4.68	Diamagnetic
Pyrite	FeS_2	5.02	Paramagnetic
Biotite	$K(Mg,Fe)_3AlSi_3O$	2.92	Medium to low magnetic
Quartz/Quartzite	SiO2	2.6-2.8	Diamagnetic
Galena	PbS	7.6	Diamagnetic
Sphalerite	ZnS	3.9-4.1	Paramagnetic

9.4.0 OBJECTIVE AND SCOPE OF THE WORK

9.4.1 The scope of work consists of acquisition, processing and interpretation of ground geophysical data across a prospective mineralized area spanning 3.55 square kilometers. The Profile lines were designed and aligned in such a way that it lays across the regional geological strike direction of the targeted potential zones and to be covered with 30 lines km (3 Unit) of IP, SP and magnetic Survey Profile as approved by NMET. The Geophysical survey was carried out by using IP, SP and magnetic methods with 30 profile lines in grid pattern comprising 30-line Km. The 30-line kilometers were divided into two blocks: Block-I having area 1.767 square kilometers near Sakalgunta village and the Block-II having area 1.134 square kilometers near Bangaragunta village which are possible associated with gold mineralization covering of 18.0 and 12.0 line-kilometers respectively. The lines were kept at 100 meters spacing with 20 meter as station spacing for recording data. The objective of the Geophysical survey was to delineate gold mineralization and its host rock with other associated mineralized zone in respective blocks.

9.5.0 SURVEY LAYOUT

9.5.1 A base camp was established near Bargur block at Krishnagiri District to facilitate the geophysical survey in both the blocks. The survey team consisted of three to four members equipped with specialized instruments including the ENVI Pro Magnetometer for magnetic measurements, the IRIS Syscal R2 Resistivity Meter for SP data recording, the Syskal pro switch 72 Channels for IP-cum-Resistivity measurements, DGPS for block boundary with Trimble Juno Handheld GPS unit for precise location tracking/marking. The location Map/Block boundary map, along with its coordinates, is presented in **Table 9.2** respectively. To ensure accuracy and minimize disturbances the magnetic base was established outside of the Bargur block boundary area, as specified below.

The field activities consisted of the following:

- Fixing of survey points in 100m x 20m grid for IP cum resistivity survey.
- Fixing of survey points in 100m x 20m grid for Magnetic Survey.
- Acquisition of IP cum Resistivity, SP and magnetic Survey
- Field QC of acquired data on day-to-day basis.

The field activities consisted of the following:

- Fixation of survey points in 20m X 1000m grid with GPS system.
- Magnetic data has been acquired with EnviPro Magnetometer and SP data with IRIS Syscal R2 and the Syscal-Elrec Pro 10 Channels for IP-cum-Resistivity measurements
- Field QC of acquired data on daily basis.

9.5.2 Total quantum of work i.e. area surveyed and Line Km recorded in the blocks are given below.

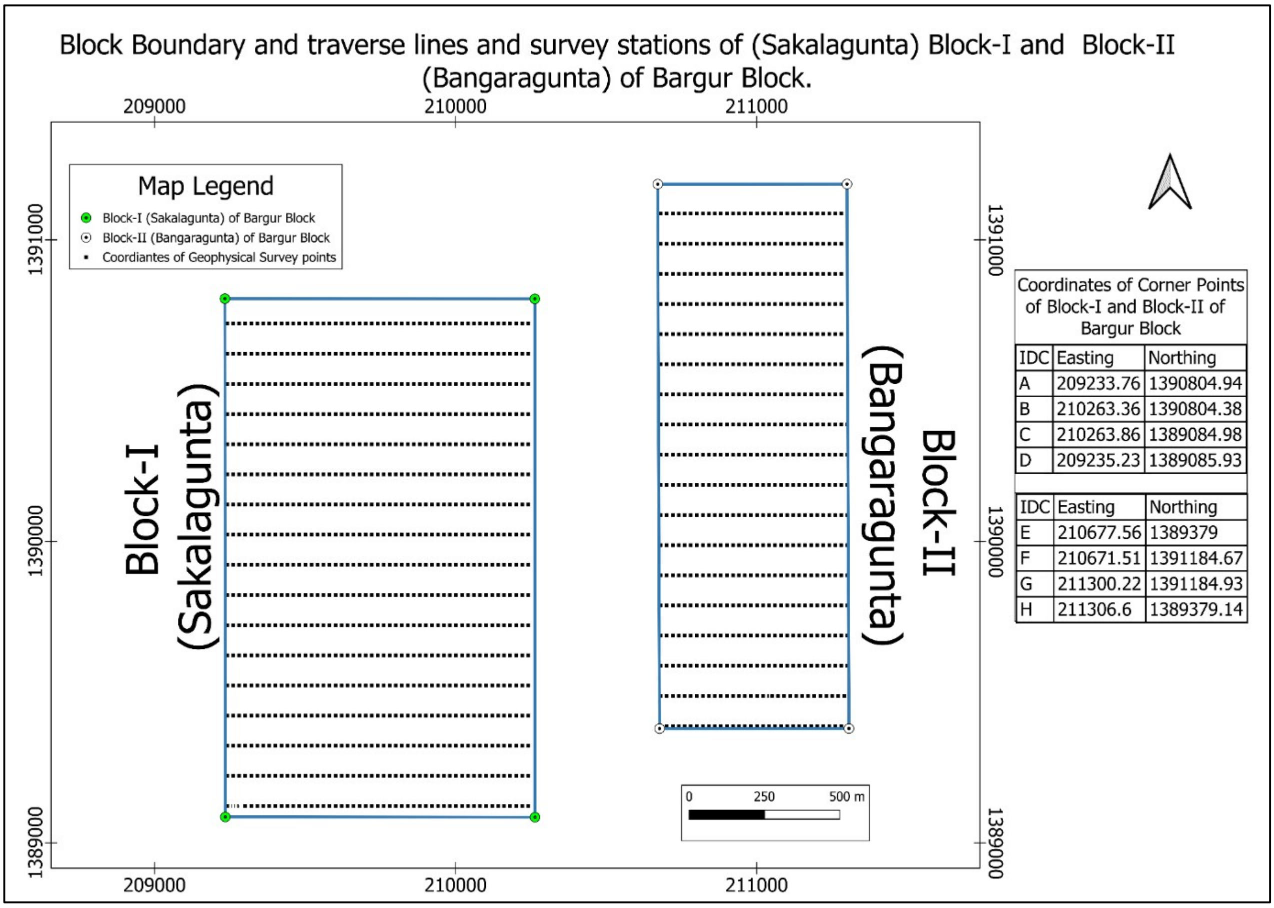
Table -9.2
Quantum of Ground geophysical work carried out in Block-I (Sakalagunta) and Block-II (Bangaragunta) of Bargur Block.

Block-I (Sakalagunta) (1.767 Sq.km) of Bargur Block.							
Cardinal Points	**Easting**	**Northing**	**Parameter**	**Grid**	**Line No**	**Line Km**	**Covered area (Km^2)**
A	Easting	Northing	MAGNETIC SP IP CUM RESISTIVITY	20 x 100	L1 – L16	18	1.767
B	209233.8	1390805					
C	210263.4	1390804					
D	210263.9	1389085					
Magnetic Base	452960	2431498					

Block-II (Bangaragunta) (1.134 Sq.km.) of Bargur Block							
Cardinal Points	**Easting**	**Northing**	**Parameter**	**Grid**	**Line No**	**Line Km**	**Covered area (Km^2)**
A	210677.6	1389379	MAGNETIC SP IP CUM RESISTIVITY	20 x 100	L17 – L35	12	1.134
B	210671.5	1391185					
C	211300.2	1391185					
D	211306.6	1389379					
Magnetic Base	452960	2431498					

9.5.3 The Geophysical survey was completed within 75 days i.e. from 01-02-2025 to 15-04-2025

9.5.4 The Lay-Out map the block is shown in **Text Figure 8** with the location of traverse lines and stations of observations.



TEXT FIGURE. 8: Block boundary of Bargur Block along with Traverse Line

9.6.0 DATA REDUCTION AND PROCESSING

Instrument Details:

Table 9.3: Instrument Details

INDUCED POLARIZATION DATA ACQUISITION UNIT	
Type	Multi -Electrode
Make	IRIS (SYSKAL-PRO)
Maximum No of Channel	72
Minimum Channel Interval	10
Voltage accuracy	0.2%
Automatic compensation of SP	-5V to +5V
RESISTIVITY METER (SP Measuring Unit)	
Type	SYSCAL R2 Resistivity meter with IP & SP measurements
Make	IRIS Instrument
Input impedance	100 MOhm
Voltage resolution	1 µV/0.2%
Voltage accuracy	0.2%
Automatic compensation of SP	-5V to +5V
MAGNETOMETER	
Type	Proton Precision Magnetometer (PPM)
Make	Scintrex (ENVI Pro MAG)
Sensitivity	0.1 nT
Accuracy	+1nT
Range	23000 to 100000 nT
SURVEYING	
Type	Hand-Held-DGPS
Model	Trimble-Juno

9.7.0 FIELD DATA ACQUISITION:

Magnetic Method:

The survey was designed in a grid pattern with a line interval of 100 meters and a station spacing of 20 meters, with positions marked using Hand held DGPS. Survey locations were meticulously demarcated by placing pegs, each indicating the corresponding line and station number. The layout map of the traverse lines and observation stations is shown in **TEXT FIGURE 8.**

The Magnetic data was recorded at every station with starting and ending at the base station on routine basis. The survey was meticulously designed to detect subtle changes in the magnetic field, which could indicate the presence of geological features such as shear zones, faults, and mineralized bodies.

IP Survey Design:

An induced polarization (IP) cum resistivity survey is conducted using various electrode arrangements, typically involving four electrodes two current electrodes (C1 and C2) and two potential electrodes (P1 and P2). The choice of electrode configuration depends on the specific objectives of the survey. Different arrangements can provide different responses based on geological conditions. For instance, to map lateral changes in geological structures, the Dipole-Dipole and Werner arrays are often more effective.

In the current field survey, a total of 36 channels were used for subsurface imaging, with an electrode spacing of 20 meters and a maximum array length of 720 meters. The multi-electrode channel system automatically selects various combinations of current (C1 and C2) and potential (P1 and P2) electrodes from the 36 available electrodes, enhancing the efficiency of subsurface imaging within an optimal timeframe. Throughout the survey block, a cumulative total of 30-line kilometres of profile data were recorded. A graphical representation of the multi-electrode system is provided for better illustration.

SP Survey Design:

The SP survey was carried out using non-polarizing electrodes and a high-impedance voltmeter, along with an SYSCAL R2 system. The recording was done in a grid pattern, with a station spacing of 20 meters and line spacing of 100 meters. A total of 30 LKM was covered in both blocks.

9.8.0 DISCUSSION OF RESULTS

9.8.1 Magnetic Anomaly of Block-I (Sakalagunta) of Bargur Block

Magnetic survey investigates subsurface geology using anomalies in Earth's magnetic field caused by rock properties. Magnetic anomalies arise from induced or remnant magnetism, with shapes and amplitudes influenced by rock size, depth, geometry, susceptibility, and Earth's magnetic field. Corrected data showed a A total variation of ≈ 980 nT is observed in the TMI data, with the maximum value recorded at 41,991.1 nT and the minimum at 41,011.7 nT. The magnetic survey reveals a significant variation (≈ 980 nT) in both the total magnetic field and magnetic anomalies, with a distinct dominance of N-S oriented structural control, especially in the northern portion of the area, accompanied by secondary E-W trends.

9.8.2 Magnetic Anomaly of Block-II (Bangaragunta) of Bargur Block.

A total variation of 1627 nT in the Total Magnetic Intensity (TMI) was observed, with the highest value recorded at 42115.6 nT and the lowest at 40487.7nT. Similarly, the Magnetic Anomaly (MA) showed a total variation of 1627 nT, with a maximum value of 1380.4 nT and a minimum of -247.2 nT, as illustrated in Figures 6.1.2.1 and 6.1.2.2, respectively. The Total Magnetic Intensity (TMI) map of Block-II reveals significant magnetic anomalies that suggest notable variations in the subsurface geology. The TMI values range from approximately **40,487.7 nT to 42,115.6 nT**, indicating zones of high and low magnetic susceptibilities. The central region of the block shows elevated magnetic values which may correspond to magnetite-rich formations or igneous intrusions. These high anomalies are spatially extensive and could be related to structurally controlled features such as dykes or buried basement highs.

9.8.3 Reduced To Pole (RTP) of Block-I (Sakalagunta) of Bargur Block:

The Reduction to the Pole (RTP) transformation of the magnetic anomaly map for Block-I was generated to enhance structural trends and highlight anomalous features.

The Reduction to Pole (RTP) processing has made the magnetic anomalies more symmetric, reducing the asymmetry caused by the oblique geomagnetic field. Despite the RTP correction, a continuous structural trend is not clearly visible in Block-I. The anomalies are patchy, somewhat isolated, and do not form a single coherent linear feature.

9.8.4 **Reduced To Pole (RTP) of Block-II (Bangaragunta) of Bargur Block.**

The Reduced-To-Pole (RTP) magnetic anomaly map of Block-II offers a clearer picture of the magnetic source geometry by repositioning anomalies directly over their causative bodies. The map displays magnetic intensity values ranging from approximately 48.4 to 390.0 nT, with several high-amplitude anomalies concentrated in the central and southern regions.

9.8.5 **Residual Magnetic Anomaly of Block-I (Sakalagunta) of Bargur Block:**

The residual anomaly map for Block I reveals that beneath the regional / deeper magnetic background, there are many local magnetic features of interest. This residual map effectively highlights local geological features and structures by minimizing the influence of broader regional trends These local features suggest significant lithologic variation and shallow magnetic sources. However, the lack of a continuous structural trend even at residual scale suggests that the subsurface geology is complex, with perhaps many small bodies rather than large cohesive ones.

9.8.6 **Residual Magnetic Anomaly of Block-II (Bangaragunta) of Bargur Block.**

In the residual anomaly map Block-II (Bangaragunta) of Bargur Block the magnetic anomaly observed in the northwestern part of the study area has disappeared. This suggests that the anomaly in that region was primarily associated with regional geological influences. In contrast, the anomaly observed in the southeastern part of the block, trending in a N-S direction, remains prominent. This anomaly is likely associated with shear facies in the study area and is more distinctly represented as a residual feature.

9.8.7 **Analytic Signal Analysis Map of Block-I (Sakalagunta) of Bargur Block**

The Analytical Signal Amplitude map of the Sakalagunta area reveals high-intensity signal amplitudes along geological contacts and shallow magnetic bodies, indicating potential lithological boundaries. However, no continuous trend was observed across the block, suggesting that the magnetic sources are more localized and discontinuous in nature.

9.8.8 **Analytic Signal Analysis Map of Block-II (Bangaragunta) of Bargur Block.:**

The Analytical Signal Amplitude map of the Bangaragunta area displays high-intensity signal amplitudes along geological contacts and over shallow anomalous sources, helping to infer subsurface lithological boundaries. Contour lines, marked in white, clearly delineate the boundaries of the causative magnetic bodies.

9.8.9 **Radially Average Power Spectrum of Block-I (Sakalagunta) and Block-II (Bangaragunta) of Bargur Block.**

The Radially Averaged Power Spectrum (RAPS) plots for Block-I and Block-II, indicate that the majority of the magnetic anomaly features and their causative bodies lie within a depth range of approximately 100 to 500 meters. This depth estimation provides valuable insight into the subsurface geological structures and supports the interpretation of near-surface and intermediate-depth magnetic sources across both blocks.

9.8.10 **Induced Polarization (IP cum Resistivity) Profiles:**

The resistivity and IP data were checked station wise to remove any near surface effect prevailing in the data. The pseudo-depth data were inverted using the RES2DINV software to bring out the subsurface resistivity and chargeability distribution. The inverted sections for Line-1 to Line 17 for Sakalagunta block and Line-18 to Line 35 for Bangaragunta block. A detailed view of the subsurface characteristics, to interpret the underlying geological structures.

9.8.11 **IP Response of Block-I (Sakalagunta) of Bargur Block.**

The Resistivity values along the IP lines are significantly low, while the chargeability values are elevated, exceeding 40 mV/V. This combination of low resistivity and high chargeability suggests the presence of conductive formation zones, which may correspond to gold mineralization within the surveyed area.

Although no consistent trend is observed across all lines, areas showing localized zones of low resistivity and high chargeability may indicate potential mineralization. These zones generally align in a north-south (N-S) direction across the survey area. Notably, the resistivity and chargeability anomalies in the central part of the block suggest continuous mineralization extending to a depth of 120 meters (the full depth of the survey investigation).

9.8.12 IP cum Resistivity Response of Block-II (Bangaragunta) of Bargur Block.

The Resistivity values along the IP lines are significantly low, while the chargeability values are elevated, exceeding 40 mV/V. This combination of low resistivity and high chargeability suggests the presence of conductive formation zones, which may correspond to gold mineralization within the surveyed area.

Although no consistent trend is observed across all lines, areas showing localized zones of low resistivity and high chargeability may indicate potential mineralization. These zones generally align in a north-south (N-S) direction across the survey area.

Areas with closely spaced data points show better-defined geophysical anomalies, enhancing the identification of mineralized zones.

9.8.13 Self-Potential (SP) Profiles of Block-I (Sakalagunta) of Bargur Block.

The total SP anomalies along each traverse have been generated from the SP data. The total variation of the SP anomaly observed was 348 mV, with the highest value recorded at 180 mV and the lowest at -168 mV. The SP data did not provide conclusive results due to structural disturbances in the area. Although it is also well correlate with the IP, Resistivity, and Magnetic data, indicating that the electro-kinetic potential developed at shear zone due to sulphide mineralization.

9.8.14 Self-Potential (SP) Profiles of Block-I (Bangaragunta) of Bargur Block

The Spontaneous Potential (SP) survey results over Block-II reveal a significant variation in natural electric potentials, with values ranging from +59.4 mV to -125.3 mV, amounting to a total variation of 184.7 mV. The SP anomalies display a consistent north-south (N-S) trend, correlating strongly with chargeability and resistivity anomalies from the IP cum resistivity survey as well as with the magnetic highs and structural features delineated in the TMI, RTP, and ASA maps.

9.9.0 CONCLUSIONS AND RECOMMENDATIONS:

9.9.1 The integrated geophysical survey as approved by NMET has been conducted in the Sakalagunta and Bangaragunta block of Bargur Block by adopting IP cum resistivity, SP and Magnetic methods. The effectiveness of these methods along with its limitation depends upon the physical properties contrast of the target and surroundings. To demarcating the zones of interest and their contacts spatial filtering technique like upward continuation, Horizontal derivatives and analytical signal analysis etc. were applied on magnetic data to enhance the outcomes. The area of possible mineralization has also been marked in IP and apparent resistivity sections and has plotted over profile. In order to obtain source depth information, radially averaged power spectrum and analytical signal analysis maps of magnetic anomaly etc. has been generated and depth of the anomalous zones were found ranging from 80m to 140m in different segments of the block.

9.9.2 Block-I (Sakalagunta) of Bargur Block:

Sakalagunta Block exhibit moderate magnetic complexity with several discrete anomalous zones rather than a single, coherent structural body. The Total Magnetic Intensity (TMI) and Magnetic Anomaly (MA) maps show a variation of ~980 nT, with both high positive and negative anomalies, indicating contrasts in both magnetic mineral content and source depth. The Reduction to Pole (RTP) transformation improves symmetry of these anomalies but still not reveal a continuous N–S-oriented structure suggesting that magnetic sources are discontinuous. Based on these integrated geophysical results, three boreholes have been proposed over the Analytical Signal (Magnetic) maps targeting the identified alteration and shear zones.

Table 9.4:
Detailed of Proposed Boreholes Locations for Block-I (Sakalagunta) of Bargur Block

PB ID	Easting	Northing	Depth
PB-1	209761.3	1390122	120
PB-2	209801.3	1389922	98
PB-3	209741.3	1390422	95

9.9.3 Block-II (Bangaragunta) of Bargur Block:

In Block-Bangarugunta, two boreholes have been proposed within a low to moderate magnetic zone. The locations are further supported by IP-resistivity data, which reveal low resistivity and high chargeability—geophysical signatures indicative of sulphide mineralisation. The resistivity and chargeability anomalies in the central part of the block shows mineralization extending upto a depth of 120 meters. However, no continuous trend was observed across the block, suggesting that the magnetic sources are more localized and discontinuous in nature due to structural or lithological discontinuities.

Table-9.5:
Proposed tentative Borehole Locations for Block-II (Bangaragunta) of Bargur Block.

PB ID	Easting	Northing	Depth
PB-1	210921.3	1390787	90
PB-2	210901.3	1390487	90

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.

9.9.4 Report on IP cum RES, SP & Magnetic Survey in Bargur Block, District Krishnagiri, Tamilnadu for Gold Mineralisation is enclosed as **Annexure-X.**

CHAPTER-10

10.0.0 EXPLORATION UNDERTAKEN DURING CURRENT INVESTIGATION

10.1.0 BACKGROUND INFORMATION

10.1.1 The Bargur block area is part of Bargur belt and lies in the southern end of Kolar Schist belt in Krishnagiri District of Tamil Nadu. The Bargur area was known for incidence of gold and two ancient old workings for gold namely Sakalagunta and Bangaragunta were reported by the previous workers in the past. M/s John Taylor & Sons (1940) examined these old workings and followed by GSI (1988-89) reported some gold values in mine dumps and surface samples. Previous workers of GSI opined that the amphibolite enclaves/bands in migmatites are mostly mineralised with gold as their counterparts in the Kolar schist belt and these enclaves should therefore be exclusively prospected for gold.

10.1.2 In view of the above, the present Reconnaissance Survey (G4 stage) for gold in the Bargur block has been undertaken with the objective of identifying gold-bearing host rocks and assessing the potential of the old workings and their possible extensions, covering an area of about 157.50 sq. km. The G4 stage exploration work carried out in two phases. The objectives of present exploration program at G4 stage are as below.

Phase-I

i) To carry out large scale Geological mapping on 1:12,500 scale for demarcation of gold bearing formations (host rock) with the structural features to identify the surface manifestations and lateral disposition of the mineralized zones.

ii) To collect surface samples & analyse for Gold and associated minerals to identify the host rock.

iii) To carry out trenching/pitting work

iv) Based on the outcome of Geological mapping and surface sample/trenching results, carry out ground geophysical survey (IP cum Resistivity, SP and Magnetic) to demarcate potential areas for mineral targeting and giving sub-surface positive details of extension of concealed ore body if any.

Phase-II (Phase-II work shall be carried out after review of Phase-I work),

v) To carryout scout drilling (500m in 5 Bhs) in the identified potential mineral bearing area to confirm the subsurface continuity of mineralisation.

vi) To estimate Reconnaissance resource (334) for Gold along with accessory elements if any as per UNFC norms and Minerals (Evidence of Mineral Content) Rules-2015 at G-4 level.

10.2.0 EXPLORATION METHODOLOGY

10.2.1 The components of G-4 level of exploration for Gold in Bargur 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.

10.2.2 The Reconnaissance Survey (G-4 stage) for Gold in Bargur Block included Large scale Geological mapping (1:12500 scale) over 157.50 sq.km. area collection and analysis of 220 Nos. Bedrock/channel samples for Gold and associated elements, Ground geophysical survey comprising of IP cum Resistivity, SP and Magnetic survey and followed by test drilling (247m in 2 Boreholes) along with associated activities i.e. borehole deviation survey & borehole geophysical logging and associated laboratory studies including petrographic, mineragraphic and specific gravity determination studies.

10.2.3 The details of the nature and quantum of work proposed Vs. an actual achievement is given in **Table-10.1.**

Table – 10.1
Quantum of Work vs. Achievement by MECL in Bargur Block, Bargur Belt of Kolar Schist Belt, District: Krishnagiri, Tamil Nadu

S. No.	Item of Work	Unit	Target	Achieved
A	**Geological Mapping Other Geological Work & Surveying**			
	Geological mapping, (1:12,500 scale) & Trenching , drilling work	sq.km	157.50 sq.km	157.50 sq.km
B	**Ground Geophysical Survey**			
	IP. Induced Polarization (I.P) cum Resistivity S.P and Magnetic	Line Km	30 Lkm	30 Lkm
C	**Survey work for geophysical survey layout & Trenching work**			
	BH fixation & RL determination	Per Point of observation	05	02
D	**Trenching/Pitting**			
	a) Excavation of Trenches	cu.m	200	-
E	**DRILLING**			
	Drilling up to 300m (Hard Rock)	m	500	247
	Borehole deviation Survey by Multishot Camera	m	500	247
	Construction of concrete Pillar (12"x12"x30")	Nos.	5	-
	Drill Core Preservation	per m	160	120
F	**Borehole Geophysical Logging**	m	500	244
G	**LABORATORY STUDIES**			
1	**Chemical Analysis**			
i)	**Geochemical Sampling-Surface samples (Bedrock/Channel (Primary+10% External)**			
	1. Primary			
	a. Au by Fire Assay	Nos	200	200
	b. For Ag, Ni, Co, Cr, Cu, Pb, Zn, V, Ti	Nos	200	200
	c. For PGE	Nos	10	10
	2. External Check (10%)			
	a. Au by Fire Assay	Nos	20	20
	b. For Ag, Ni, Co, Cr, Cu, Pb, Zn, V, Ti	Nos	20	20
	c. For PGE	Nos	1	1
iii)	**Trench Samples**			
	Trench samples (Primary+10% External)			
	a) For Au by Fire Assay	Nos	165	-
	b. For Ag, Ni, Co, Cr, Cu, Pb, Zn, V, Ti	Nos	165	-

S. No.	Item of Work	Unit	Target	Achieved
v)	**BH Core samples (Primary+ 10%External)**			
	1. Primary			
	a) For Au by Fire Assay	Nos	100	39
	b. For Ag, Ni, Co, Cr, Cu, Pb, Zn, V, Ti	Nos	100	39
	2. External Check 10%			
	a) For Au by Fire Assay	Nos	10	04
	b. For Ag, Ni, Co, Cr, Cu, Pb, Zn, V, Ti	Nos	10	**-**
2	**Physical & Petrological Studies**			
i	Petrological studies	Nos	10	09
ii	Mineralogical studies	Nos	10	09
iii	Digital photomicrographs	Nos.	10	08
iv	Whole Rock Analysis	Nos	10	10
v	Sp. Gravity Determination	Nos	5	03
Vi	SEM studies	Per hour	10	-
vii	EPMA studies	Per hour	05	-
H	**Geological Report**	No.	01	01

10.2.4 MECL commenced Phase-I exploration work comprising of Geological mapping, surface sampling and ground geophysical survey in Bargur block in mid of April, 2024 and completed mid of September, 2024. Test drilling activities commenced on 22nd July, 2025 and concluded on 31st Aug, 2025. Total drilling of 247.0m in two boreholes (MBG-01 & 02) in Bangaragunta sub block of Bargur block accomplished. The allied field-works including borehole fixation and determination of co-ordinates & reduced level of boreholes by DGPS, drilling work and associated borehole deviation survey & borehole geophysical logging, core logging, core sampling etc. were completed simultaneously. The laboratory studies including chemical analysis and physical analysis i.e. petrographic, mineragraphic and specific gravity studies were carried out simultaneously in MECL laboratories and other external laboratories. Ground Geophysical survey work and findings have already been disucussed in previous Chapter IX. Component wise Exploration methodology and findings have been described in subsequent paragraphs.

10.2.5 **Large scale Geological Mapping**

Large scale Geological mapping taken up in the total area of 157.50 sq. km on 1:12,500 scale. Availalble toposheet map and Topographical contour map generated from Aster data has been utilised to understand the topography, roads, and drainage of the mapped area and was also used as a base map for geological mapping. For recording precise sample location and to carry out a geological survey, handheld BAP-GPS device has been used. The coordinates had been recorded in UTM coordinate system with WGS 1984 datum. 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 Granitoids (Horblende biotite gneiss/biotite gneiss), Amphibolite, Meta chert, Banded Inform Formation (BIF) have been mapped ignoring minor variations. Plain lands and valley portions of hilly terrains are soil covered. Attitude of structural features of rocks, foliation, were recorded by brunton compass. Variation of lithologies aling 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 on 1:12,500 scale and given as **Plate No. IV**. The description of lithology has already been furnished in **Chapter No VII.**

10.2.6 **Surface Sampling (Bedrock/Channel)**

During the course of geological mapping, total 200 nos. of bedrock chip samples collected from different rock types i.e. Amphibolites, Metachert, basic dykes, old working dumps and Banded Iron Formation (BIF) to know the content of Gold and associated minerals. Bedrock samples were analysed for Au & associated elements viz. Ag, Ni, Co, Cr, Cu, Pb, Zn, V, Ti. Total 10 nos. selected samples analysed for PGE content. 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 10 nos of BRS sample have been collected for whole rock analysis. Moreover, total 6 nos. BRS samples and 3 nos. borehole core samples collected from different lithologies exposed/intersected in the block area for petrographic and mineragraphic studies. The location of bedrock sampels were recorded with handheld BAP-GPS device plotted on the surface Geological map of the block area (**Plate No.III&IV**). The sampling technique has been described in detail in the **Chapter-XII**. The analytical details of bed rock and channel samples for Au, other associated elements (9 elements) and PGE are provided in **Annexure-I-A, I-B and I-C** respectively. The location of samples along with Au value & anomolous Cu, Zn values shown on Geological map of Bargur Block is given in **Plate-III.**

10.2.7 **Discussion on Bedrock/Channel Sample Results:**

Out of 200 samples, total 189 bedrock samples and 11 nos. channel samples collected from varied lithounits. Bedrock (189 nos.) collected from varied litho units viz. Amphibolite with quartz vein, Sheared Amphibolite with quartz viens, Fine grained massive Amphibolites, Meta chert, BIF, basic (dolerite) dykes and old working dumps shown gold values varies from <0.01 ppm to 0.21 ppm Au. Total 91 Bedrock samples shown >0.01 ppm Au to 0.21 ppm Au and 80 bedrock samples analysed <0.01 ppm Au. Only one bedrock sample of Amphibolite with quartz vein collected from Sakalagunta old workings showed 0.19 ppm Au while one dump sample collected from Bangaragunta old workings showed 0.21 ppm Au. Litho unit wise summary of chemical analysis of bedrock samples for Gold is given in below **Table No. 10.2** and chemical analysis of bedrock sample is in **Annexure No.I-A.**

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Table – 10.2

Summary of Analytical results of Bedrock samples, Bargur Block, District: Krishnagiri, Tamil Nadu

SL.No.	Lithology	Qty. Collected & Analysis for Au (Nos.)	Au	
			Min (ppm)	Max (ppm)
1	Amphibolite with Quartz Vein	120	<0.01	0.21
2	Sheared Amphibolite with quartz Vein	46	<0.01	0.08
3	Fine Grained Massive amphibolite	8	<0.01	0.03
4	Meta Chert	5	0.03	0.07
5	Old working dumps	3	0.01	0.03
6	BIF	6	<0.01	0.02
7	Basic Dyke	1	<0.01	<0.01

Channel samples (11 nos.) collected from Amphibolite with quartz veins showed Au values ranging from <0.01 ppm Au to 0.02ppm Au, while channel from Meta chert outcrops shown Au values from 0.03 ppm Au to 0.04 ppm Au.

Table – 10.3
Summary of Analytical results of Channel samples, Bargur Block, District: Krishnagiri, Tamil Nadu

S.No.	Sample Number	Width (m)	Au (PPM)	Channel No./Location	Avg. Au (ppm)	Rocktype
1	MBBR-094/CH-1	0.5	0.02	C1/Chinnamattarepalli	0.01 @ 1m	Amphibolite with quartz veins
2	MBBR-095/CH-2	0.5	<0.01			Amphibolite with quartz veins
3	MBBR-144/CH-5	0.5	0.02	C2/Chinnamattarepalli	0.02 ppm @0.5m	Amphibolite with quartz veins
4	MBBR-003/CH-3	0.5	0.02	C3/Vartanapalli	0.01 ppm @1m	Amphibolite with quartz veins
5	MBBR-141/CH-4	0.5	0.01			Amphibolite with quartz veins
6	MBBR-187/CH-11	1	<0.01	C4/Vartanapalli	<0.01 ppm @ 1m	Amphibolite with quartz veins
7	MBBR-148/CH-6	0.5	<0.01	C5/Sakalagunta	<0.01 ppm @ 0.5m	Amphibolite with quartz veins
8	MBBR-181/CH-7	0.5	0.03	C6/North of Vartanapalli	0.03 ppm @ 1m	Metachert with sulphides

S.No.	Sample Number	Width (m)	Au (PPM)	Channel No./Location	Avg. Au (ppm)	Rocktype
9	MBBR-182/CH-8	0.5	0.03			Metachert with sulphides
10	MBBR-183/CH-9	0.5	0.03	C7/North of Vartanapalli	0.035 ppm @ 1m	Metachert with sulphides
11	MBBR-184/CH-10	0.5	0.04			Metachert with sulphides

Bedrock and channel samples analytical results for gold and associated minerals are poor and not encouraging. Only two samples shown spot values for gold in old working areas.

10.2.8 A total of 200 nos. surface bedrock/channel samples were analysed for associated elements like Ag, Ni, Co, Cr, Cu, Pb, Zn V and Ti. Out of 200 samples, 53 surface Bedrock/Channel samples shown Cu values ranging from >200ppm to 1700ppm Cu. Five number bedrock samples shown Copper values ranging from 536.15ppm to 785.19ppm Cu. One sample shown highiest value of 1700 ppm Cu in Bangaragunta area. Six number bedrock samples shown 215.96ppm Zn to 371.53 ppm Zn values. Elevated values for Cu, Zn recorded from Amphibolites, metacherts in the area are sporadic in nature and do not indicate any consistent mineralized trends. Except these sporadic values for Cu & Zn, chemical analysis for other associated elements for Ag, Ni, Co, Cr, Pb, and V are not encouraging.

10.2.9 Ten number of selected samples collected from Amphibolites and Meta chert were analysed for PGE content. Analytical results of ten number samples indicated total PGE content varying from 62.30 ppb to 484.24 ppb. Out of 10 samples, 8 nos. Amphbilite samples showed Pd values ranging from 62.30 ppb to 342.37 ppb Pd, Ru values below detection limit (5 ppb) to 31.31 ppb and other elements Rh, Os, Ir & Pt values analysed below detection limit (5ppb). Two number Meta chert samples shown Pd values of 434.93 ppb & 451.32 ppb and one sample shown Ru value of 31.31 ppb while another sample analysed below detection limit (5 ppb). Values for Rh, Os, Ir & Pt analysed below detection limit (<5 ppb) in metachert. It is likely that localised Pd enrichment is hydrothermally remobalised from nearby mafic-ultramafic units and trapped in metacherts. Overall, PGE values in amphibolites were poor and not encouraging except the localised anomalous pd concentration in two metachert samples.

10.2.10 **Wholerock analysis:**

Total 10 nos. of bedrock samples from varied litho units subjected to whole rock analysis. The SiO_2 versus major oxide variation trends of the analyzed samples from the Bargur Block reflect compositional diversity ranging from mafic to felsic and siliceous lithologies. The SiO_2 content in the analyzed samples varies widely from about 42 to 62%, showing contrasting silica enrichment among lithounits. Samples with higher SiO_2 (e.g., meta chert and granodiorite/granitoids) show relatively lower Fe_2O_3, CaO, and MgO, indicating more siliceous and acidic character. In contrast, samples with lower SiO_2 (amphibolite and mafic varieties) exhibit higher Fe_2O_3 (up to 16–27%), CaO (~11–17%), and MgO (5–6%), suggesting a more basic composition. Al_2O_3 shows a weak positive relation with SiO_2 in felsic rocks, while Na_2O and K_2O are moderate (1–4%) in granodioritic types but very low in iron formations. Overall, the inverse correlation between SiO_2 and Fe–Mg–Ca oxides reflects compositional variation from felsic to mafic–iron-rich lithologies within the study area. Whole rock analysis of samples is given in **Annexure No-I-D.**

10.2.11 Exploratory Drilling:

10.2.11.1 Out of the 5 approved boreholes only 2 boreholes were taken up for drilling in non-forest Bangaragunta sub block based on TCC recommendations. Two test incline boreholes i.e. Borehole MBG-01 & MBG-02 totalling 247.0 m drilled to test the ground geophysical anomalies and to confirm the gold mineralised zones in depth at specified locations in Bangaragunta sub block of Bargur block. The details of test boreholes drilled during present exploration by MECL in Bangaragunta sub block of Bargur Block are summerised in below given **Table No. 10.4** and also given in **Annexure No. III-A**.

Table-10.4

Details of scout boreholes drilled by MECL in Bangaragunta sub block of Bargur Block, District: Krishnagiri, Tamil Nadu

Sl. No.	Section	BHID	Easting (m)	Northing (m)	Elevation (m)	Azimuth (°)	Dip	Total Depth (m)
1	S-2-S-2'	MBG-01	210990.236	1390785.896	507.579	270°	55°	114.00
2	S-1-S-1'	MBG-02	210961.507	1390487.431	503.959	270°	50°	133.00
	Total							**247.00**

10.2.11.2 The location of test boreholes drilled in Bangargunta sub block is shown in the Large scale Geological map of Bargur Block (Plate No. III). Also, a separate geologic map showing loation of Sakalagunta & Bangaragunta sub block with surface sample locations and borehole locations is given as **Plate No. IV.** Geological cross sections drawn along borehole profile S1-S1 & S2-S2 is given in **Plate No. V.**

10.2.11.3 Two test boreholes (MBG-01 & 02) were drilled targeting low to moderate magnetic zone, supported by IP–resistivity data showing low resistivity and high chargeability signatures indicative of sulphide mineralization in Bangaragunta sub block. Borehole No. MBG-02 drilled on profile S2-S2’ to trace the sub surface continuity of mineralisation below the old working (Bangaragunta) upto to 90m vertical depth from surface

10.2.12 Discussion on Drilling Results:

10.2.12.1 During the course of borehole core logging, sulphide bearing zones intersected in the boreholes were subjected to analysis. A total of 39 nos. of primary core samples have been generated from two test boreholes drilled and samples analysed for gold by fire assay method and 34 element analysis by ICP-MS method. Out of 39 samples, 15 samples show gold values ranging from 10.15 ppb to 55.54 ppb and rest of the samples analysed <10 ppb Au. Gold values are poor and not encouraging. Borehole primary sample analysis details for Gold by fire assay method are given in **Annexure-V-A**

10.2.12.2 Borehole core samples also analysed for 34 element analysis by ICP-MS method. Out of 39 samples, 37 nos. sample results shown Total REE+ Y+Sc values range from minimum 121.06 ppm to maximum 708.75 ppm total REE content while 2 samples analyed below 100 ppm of Total REE. Analytical results for Li, Ti, V, Cr, Co, Ni, Cu, Zn, Ga, As, Mo, Ag, Cd, Sb, Pb, Bi, Th and U are poor and not encouraging. Analytical results of 34 element analysis have not shown any significant values for REE and other associated elements. Borehole primary Sample analysis details for for 34 element analysis by ICP-MS method are given in in **Annexure-V-B.**

10.2.12.3 Although sulphide bearing zone (pyrite, pyrrhotite and minor chalcopyrite) within Amphibolite with quartz veins intersected in the borehole but this did not yield any gold values indicating that the surface mineralization was likely limited and localised. The lack of gold at explored depth suggests that the mineralization is discontinuous and confined to shallow, structurally controlled zones, with the rocks below representing barren extensions of the host formation.

10.2.13 Outcome of Present Work:

10.2.13.1 Surface bedrock/channel sample results for gold not encouraging. Only one bedrock sample from Sakalagunta and one dump sample from Bangaragunta yielded 0.19 ppm and 0.21 ppm Au. Overall, analytical results indicate poor and non-promising gold content in the area.

10.2.13.2 Out of 200 samples, 53 surface Bedrock/Channel samples shown Cu values ranging from >200ppm to 1700ppm Cu. Five number bedrock samples shown Copper values ranging from 536.15ppm to 785.19ppm Cu. One sample shown highiest value of 1700 ppm Cu in Bangaragunta area. Six number bedrock samples shown 215.96ppm Zn to 371.53 ppm Zn values. Elevated values for Cu, Zn recorded from Amphibolites, metacherts in the area are sporadic in nature and do not indicate any consistent mineralized trends. Except these sporadic values for Cu & Zn, chemical analysis for other associated elements for Ag, Ni, Co, Cr, Pb, and V are not encouraging.

10.2.13.3 Analytical results of ten samples show total PGE values ranging from 62.30 ppb to 484.24 ppb. Eight amphibolite samples yielded low PGE values with Pd between

62.30–342.37 ppb, Ru <5–31.31 ppb, and Rh, Os, Ir, and Pt below detection limits (<5 ppb). Two metachert samples recorded higher Pd values of 434.93 ppb and 451.32 ppb, with Ru detected in one sample (31.31 ppb) and other PGE elements below detection limits. The elevated Pd in metacherts may represent localized hydrothermal remobilization from nearby mafic–ultramafic rocks and entrapment along fractures with sulphides. Overall, PGE values in amphibolites are low and not encouraging, except for the localized anomalous Pd concentration in metacherts.

10.2.13.4 Surface bedrock and channel sample analyses from the Bargur area did not yield encouraging values for gold or associated minerals. A few elevated copper and zinc values observed in amphibolite and metachert samples are sporadic and do not indicate any consistent mineralized trend.

10.2.13.5 Considering the concealed nature of outcrops and existance of old workings, ground geophysical surveys were conducted in two sub blocks Sakalagunta (1.76 sq.km.) and Bangaragunta (1.3 sq.km.) to delineate possible concealed mineralised extensions.

10.2.13.6 Ground geophysical survey indicated that, Sakalagunta Block (Block-I) exhibit moderate magnetic complexity with several discrete anomalous zones rather than a single, coherent structural body. The Total Magnetic Intensity (TMI) and Magnetic Anomaly (MA) maps show a variation of ~980 nT, with both high positive and negative anomalies, indicating contrasts in both magnetic mineral content and source depth. The Reduction to Pole (RTP) transformation improves symmetry of these anomalies but still not reveal a continuous N–S-oriented structure suggesting that magnetic sources are discontinuous. Based on these integrated geophysical results, three boreholes were proposed over the Analytical Signal (Magnetic) maps targeting the identified alteration and shear zones.

10.2.13.7 In Bangaragunta (Block-II) block, two boreholes have been proposed within a low to moderate magnetic zone. The locations are further supported by IP-resistivity data, which reveal low resistivity and high chargeability geophysical signatures indicative of sulphide mineralisation. The resistivity and chargeability anomalies in the central part of the block shows mineralization extending upto a depth of 120 meters. However, no continuous trend was observed across the block, suggesting that the magnetic sources are more localized and discontinuous in nature.

10.2.13.8 Based on the outcome of ground geophysical anomalies, two test boreholes drilled to in Bangaragunta sub block area. Two test boreholes intersected sulphide bearing zones (pyrite, pyrrhotite and chalcopyrite) in Amphibolite but gold values were poor ranging from <10 ppb to 55.54 ppb Au.

10.2.13.9 ICP-MS analysis of 36 nos. of borehole core samples for 34 elements indicated Total REE + Y + Sc content between 121.06 and 708.75 ppm. Other elements such as Li, Ti, V, Cr, Co, Ni, Cu, Zn, Ga, As, Mo, Ag, Cd, Sb, Pb, Bi, Th, and U showed low concentrations, suggesting no significant enrichment.

10.2.13.10 The boreholes were drilled within a low to moderate magnetic zone supported by IP–resistivity data showing low resistivity and high chargeability signatures, reflecting sulphide mineralization extending up to the explored depth. The intersected zones consist of pyrrhotite, pyrite, minor chalcopyrite, and magnetite, which account for the observed geophysical responses. However, the lack of significant shearing, weak alteration features, and absence of auriferous indicator minerals (arsenopyrite), along with ore microscopic studies confirming no visible or included gold, indicate that these anomalies represent sulphide–oxide concentration zones devoid of gold. Hence, any gold mineralization, if present, is likely weak, discontinuous, or not spatially associated with the sulphide-bearing horizons within the explored depth.

10.3.0 DATA SPACING FOR REPORTING OF EXPLORATION RESULTS

10.3.1 During present G-4 stage exploration, total 2 nos. test boreholes were drilled at specified locations to test the geophysical anomalies at depth range between 55m to 90m vertical depth from surface. As this being G4 stage, the boreholes are of test boreholes category adhering to approved norms. Exploratory test drilling did not intersected any mineralised zones for Gold and other associated mienrals. Hence, resources not estimated in Bargur Block.

10.4.0 PETROGRAPHIC STUDY

Petrographic study was carried out on 10 Nos. (6 Nos. Bedrock + 3 nos of borehole core samples) collected from different litho units exposed in the area as well as intersected in the drilled boreholes. The petrographic study results have been discussed along with the description of rock types in **Chapter-VII** and petrographic study report has been attached as **Annexure No-VII.**

10.5.0 MINERAGRAPHIC STUDY

Total 10 nos including bedrock and borehole core samples collected from mineralized zones intersected in the drilled boreholes and subjected to mineragraphic study by preparing polished section. Mineragraphic study results have been disucussed in **Chapter-VII** and mineragraphic study report has been attached as **Annexure No-VIII.**

10.6.0 PREPARATION OF GEOLOGICAL REPORT:

Geological Report has been prepared in Corporate Office, MECL, Nagpur by integration of geological, geochemical and sub-surface drilling data. Geosoft Oasis Montaz, AutoCAD, ArcGIS & GDM softwares have been used for preparation of various maps. The report has been written using Microsoft word and excel 2021 version.

CHAPTER-11

11.0.0 LOCATION OF DATA POINTS

11.1.0 ACCURACY AND QUALITY OF SURVEY TO LOCATE DRILL HOLES

11.1.1 During present investigation, boreholes locational coordinates fixed and RL determination carried out. The survey of boreholes has been carried out by the DGPS DA2 Catalyst Instrument.

11.1.2 Topographical contour survey is not the scope of present exploration work. However, for drawing borehole profiles along the sections, DEM was generated at 2.0m contour interval from Aster Data.

11.1.2 The survey work has been carried out with the help of DGPS (Make-Trimble GNSS, Model-DA-2 Catalysst). The **Survey of India (SOI)** base station was utilized for fixing the borehole positions on the ground as well as for obtaining the reduced levels of the boreholes. The base stations used from the Survey of India CORS (Continuously operating Reference Station) network named ‘***HARU’*** &***‘NATR’*** through online GNSS Post processing method.

The coordinates of the SOI base station are provided in ***Table-11.1***.

Table-11.1

The R.L & Coordinates of the SOI CORS Base Point for DGPS Survey of Bargur block, Krishnagiri District, Tamilnadu.

Base Station	Latitude	Longitude	Easting (m)	Northing (m)	RL (m)
SURVEY OF INDIA BASE STATION – *HARU*	12° 03' 31.0095"	78°28'43.8501"	225527.648	1334297.208	364.436
SURVEY OF INDIA BASE STATION – *NATR*	12°35'45.3795"N	78°30'57.7816"E	230131.003	1393729.083	433.51

TABLE -11.2.

TECHNICAL SPECIFICATIONS OF DGPS 11.2.0

- **Make:** Trimble GNSS
- **Model:** DA-2 Catalyst
- **Year:** 2025

a) Measurement Accuracy:

- Static Mode
  - Horizontal: 10 mm + 0.1 ppm or better
  - Vertical: 20 mm + 0.4 ppm or better

11.1.3 **Baseline Processing Results:**

Total 2 boreholes (MBG-01 & MBG-02) drilled in Bangaragunta sub block, Bargur block by MECL as part of present G4 stage exploration have been fixed by DGPS survey instrument. Borehole locational co-ordinates & Reduced level (RL) of the borehole are given in **Annexure-III-A** and also shown in **Plate-III.**

11.2.0 ACCURACY AND QUALITY OF SURVEY TO LOCATE DRILL HOLES

DGPS survey was conducted using a Trimble GNSS DA-2 Catalyst system. Borehole locations and reduced levels were established using Survey of India CORS base stations 'HARU' and 'NATR' through online GNSS post-processing. Survey work carried out by the experienced qualified surveyor as per the prevailing standard procedures.

CHAPTER-12

12.0.0 SAMPLING TECHNIQUES AND SAMPLE PREPARATION

12.1.0 SAMPLING

12.1.1 Sampling inludes Surface sampling (Bedrock/Channel), and drill core sampling. All surface samples (200 nos.) subjected to analysis for Gold by fire assay method and other associated elements Ag, Ni, Co, Cr, Cu, Pb, Zn, V, Ti by AAS method. Few selected samples (10nos.) analysed for PGE content. Drill core samples (39 nos.) analysed for Gold by fire assay method and other associated 34 elements analysis by ICP-MS method.

12.2.0 NATURE, QUALITY AND APPROPRIATENESS OF SAMPLE PREPARATION TECHNIQUE

12.2.1 Sampling methodology adopted for bedrock, channel and borehole core sample is different from each other. The detailed description of sampling techniques discussed in subsequent paragraphs.

12.2.2 **Sampling techniques:**

A.Bedrock Samples: A total of 189 nos. of bed rock samples (BRS) were collected systematically from varied litho units (mostly Amphibolites, Metachert, BIF, basic dykes) 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-III**). All samples collected from field sent to MECL Sampling unit & MECL Chemical Laboratory, Nagpur for sample preparation and analysis. 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. This representative samples were powdered and completely passed through (-) 120 mesh size for Gold analysis and (-) 200 mesh size sieves from which 100 gm sample packed in polythene sample pouch and sent to MECL Chemical Laboratory, Nagpur for chemical analysis for Au and other other associated minerals.

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 samples were collected with an interval of 0.5m and at plaes with an interval of 1.0m 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-III**). A total of 11 Nos. channel samples were collected from Bargur Block area. All samples collected from field sent to MECL Sampling unit, Nagpur & MECL Chemical Laboratory, Nagpur for sample preparation and analysis. Channel 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. This representative samples were powdered and completely passed through (-) 120 mesh size sieves for Gold analysis and (-) 200 mesh size sieves for other elements from which 100 gm sample packed in polythene sample pouch and sent to MECL Chemical Laboratory, Nagpur for chemical analysis for Au and other other associated minerals.

C. Drill Core Samples: The sampling and analysis have been carried out for entire mineralized zones/length intersected in the boreholes drilled on visual basis. The primary samples have been marked in the suspected mineralized zones (sulphide bearing zone) intersected in the borehole based on type and concentration of mineralization /lithology. In general, the sample length has been kept as 0.50 m which varied in some instances because of variation in lithology and type and concentration of mineralisation. Mineralised core has been split longitudinally into two equal halves in such a way that the concentrations of ore minerals are uniform in both the equal halves. One half of the core sample has been crushed to (–) 200 mesh size and another half kept in the core box for future reference. By progressive coning and quartering and repeatedly mixing the sample has been reduced to 600 grams. The representative sample completely passed through (-) 120 mesh size for Gold analysis and (-) 200 mesh size sieves for other elements from which 100 gm sample packed in polythene sample pouch. All samples prepared at MECL Sampling unit facility at Nagpur and sent to MECL Chemical Laboratory, Nagpur for chemical analysis for Gold by fire assay method and for other associated minerals by ICP-MS method.

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. 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.

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. The prepared/processed samples sent to MECL chemical laboratory, Nagpur. All measures taken for packing and transportation of samples. It has been thoroughly checked that none of the sample bags were damaged during transportation.

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 analysis. Bed rock/channel and drill core samples quantity has been reduced 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 Samples were pulverized to an appropriate grain size to ensure representative and accurate analytical results. For gold, the samples were ground to –120 mesh size, which is suitable for achieving uniform particle distribution while minimizing loss of coarse free gold present if any during pulverization. For multi-elemental analysis, the samples were further pulverized to –200 mesh size, ensuring sufficient fineness for complete digestion and homogenous mixing during instrumental analysis. Thus, the adopted grain sizes are considered appropriate and conform to standard analytical protocols for reliable geochemical results.

CHAPTER-13

13.0.0 DRILLING TECHNIQUE AND DRILL SAMPLING EMPLOYED

13.1.0 DRILLING TYPES AND DETAILS

13.1.1 During the present investigation, MECL drilled total two test boreholes involving total 247m diamond core drilling along with associated borehole deviation survey and borehole core logging, sampling and laboratory studies in the block area. The details of boreholes drilled in Bangaragunta sub block of Bargur block by MECL are given in **Annexure-III-A** and summary of borehole is given in **Table-10.4**. of **Chapter-X.**

13.1.2 Drilling operation was carried out by deploying two rigs. One hydrostatic drill rigs KDR-600 (MEC-391) and one conventional wireline drill rig RD-100 (MEC-345). Rotary wash type of wireline drilling method was undertaken. Diamond impregnated NQ bit (outer diameter 75.7 mm and inner diameter 47.6 mm) had been used during drilling operation. At the starting few meters, all the boreholes have been used with HX and NX casing to cover soil cover and loose friable weathered formation. All the precautions had been taken to maintain quality of drilling and achieve maximum core recovery. The core recovery varies from minimum 83.27% (MBG-01) and maximum 97.17% (MBG-02) with an average core recovery is about 90.223%. The average core recovery in the sulphide bearing suspected mineralised zones is about 93.43% which is satisfactory. The quality of drilling was ensured during the operation. After closure, all the boreholes have been properly plugged and sealed with cement pillars.

13.1.3 All the inclined exploratory boreholes drilled by MECL in the block area have been surveyed to ascertain deviation in azimuth and in the borehole path, if any, with the help of multi shot deviation camera (**Photo-20**). The specifications of the deviation survey instrument are given in **Table-13.1.**

Table-13.1
The specifications of the Deviation Survey Instrument

1	Name of instrument	Borehole deviation survey instrument
2	Name of manufacturer (model and make)	Eastman Company Private Ltd (Germany)
3	Parameters	Inclination and azimuth angle
4	Inclination range	0 to 90 degrees
5	Azimuth range	0 to 360 degrees from north
6	Inclination resolution	NA
7	Azimuth resolution	NA

13.1.4 The boreholes have been washed properly after closing and before pull down the deviation camera and after that drill strings have been pulled out from the borehole.

13.1.5 Deviation survey instrument is based on the concept of continuous recording of azimuth and inclination when it is lowered into the borehole. After assembling the deviation survey instrument, it is lowered into the borehole so that its top coincides with the ground level. The instrument is lowered to desired depth i.e., 6.00m interval and keep it stationary for half a minute in order to record stabilized readings required. Several readings have been obtained in this way at regular depth interval i.e., 6.00m till the closure depth of the bore hole. Once the survey instrument reaches the closure depth, it is pulled out of borehole and transfer the recording in a system.

13.1.6 The initial readings are generally erratic due to magnetism on account of casing lowered in the borehole and hence not considered for deviation data plotting. The borehole deviation data is plotted on the geological cross section with the help of GDM software.

13.1.7 The deviation survey indicates gradual and consistent borehole deflection with increasing depth. Azimuth values show a minor rightward deviation from the initial 270° orientation, increasing up to ~286°. Inclination reduces progressively from the planned 55°, reaching a minimum of ~44°, indicating upward deviation with depth. Overall, the borehole maintains acceptable control with no abrupt changes, and the deviation trend is gradual and predictable. The borehole wise deviation data of the boreholes is presented as **Annexure-III- B.**

Photo-20: Borehole deviation survey instrument

13.2.0 WHETHER CORE AND CHIP SAMPLE RECOVERIES HAVE BEEN PROPERLY RECORDED AND RESULTS ASSAYED

13.2.1 The core samples have been recorded properly and the details run wise litholog and summarized litholog for boreholes drilled by MECL are given in **Annexure- IV- A** and **Annexure- IV- B** respectively. The logging of run wise core as well as the cuttings from boreholes have helped in discerning the physical characters like colour, shape, size and nature of mineralisation as well as texture, structural features such as joints, fractures, foliations etc. and their attitude with respect to core axis and identification of different litho units.

13.2.2 The mineralised zones/length recorded during the geological core logging has been subjected for sampling and analyses for gold and associated elements. The primary sample had been marked in the mineralized zones intersected in the borehole based on ore type and concentration of mineralisation/lithology. In general, the sample length has been kept at 0.50 m interval which varied in some instances because of variation in lithology and type and concentration of mineralisation. The details of analysis of primary borehole core samples for Gold (Au) by fire assay method is given in **Annexure-V-A** and for other associated 34 elements analysis by ICPMS method are given in **Annexure-V-B.**

13.3.0 MEASURES TAKEN TO MAXIMIZE SAMPLE RECOVERY AND ENSURE REPRESENTATIVE NATURE OF THE SAMPLES.

13.3.1 The short runs were drilled as per necessity so that optimum core recovery is maintained. The core recovery in the sulphide bearing suspected mineralized zones is about 93.43% which is satisfactory. Whenever core recovery is less, the grade of the recovered portion has been extrapolated over the non-recovered section. The quality of drilling was ensured during the operation.

13.4.0 WHETHER THE RELATIONSHIP EXISTS BETWEEN SAMPLE RECOVERY AND GRADE

13.4.1 The core recovery in the mineralized zones is about 93% approximately which is satisfactory. The entire mineralized zones / length recorded during the geological logging on visual basis have been analysed for Gold (Au) and associated elements. As the recovery in mineralized zones is consistently high, it is unlikely to have any significant impact on the grade estimation.

13.5.0 CORE LOGGING

13.5.1 The drilled core recovered from the boreholes has been logged systematically to demarcate various litho-units. The core recovery varies from minimum 83.27% (MBG-01) and maximum 97.17% (MBG-02) with an average core recovery is about 90.223%. The logging of run wise core as well as the cuttings from boreholes have helped in discerning the physical characters like colour, shape, size and nature of copper mineralisation as well as texture, structural features such as joints, fractures, foliations etc. and their attitude with respect to core axis and identification of different litho units. Besides, the qualitative analytical data have helped in delineating the ore and non-ore litho units.

13.5.2 The borehole logging was carried out run-wise for boreholes drilled by MECL. Since the variation of litho units in schistose rock in down-hole direction and run lengths were short, thus consolidated / summarized litholog for all the boreholes were prepared with all details to show the litho units as graphic representation. The grouping of litho units intersected in the boreholes was done as Top Soil, Biotite hornblede gneiss, Quartz vein, Altered Biotite hornblede gneiss, Amphibolites, Silicified Amphibolites. Detailed borehole core logging is given as **Annexure-IV-A** and summerised borehole logs given as **Annexure-IV-B** respectively.

13.5.3 Borehole core samples preserved in GI sheet core boxes with proper labelling. Total 120m borehole core has been preserved for future rererence.

13.6.0 ROCK QUALITY DESIGNATION (RQD %)

13.6.1 During the detailed geological logging of the core samples, RQD have been measured over entire column of the overburden/core, mineralized zone and footwall. RQD data is incorporated in the run-wise litholog, given as Annexure-IVA. Rock Quality Designation (RQD) is a modified measure of the degree of jointing and the fracture in a rock mass, measured as a percentage of drill core in lengths of 10cm or more. High quality rock has RQD more than 75%, Low quality rock has RQD of less than 50%. D.U. Deere (1963) defines the RQD as the ratio of the sum of the total length of the cores of the length 10cm and longer recovered from drilling of one run (3.0 m) drilling. RQD (%) = (Total length of the core in pieces of 10cm or more) / Length of the run) X 100.

13.6.2 RQD with reference to the lithologies are given in borehole log in the enclosed **Annexure IIA.** The average RQD of Hornblende/Epidote/Biotite gneissic rock is 37.04%, Altered Hornblende/Biotite gneiss is 72%. Amphibolite is 86.74% is above 75% and may be classified as **Good** as per the RQD rock mass classification.

13.7.0 BOREHOLE GEOPHYSICAL LOGGING

13.7.1 Introduction:

Borehole geophysical logging has been carried out as a part of present exploration in Bargur Block. The borehole geophysical logging technique is primarily based on measurements of a series of petro-physical parameters made within a borehole and displayed for study on a continuous depth synchronized chart. The measurements made for variation in physical properties of the formation.

13.7.2 Objectives:

The main objective of borehole geophysical logging in precious metal exploration was to delineate the minaralised zones along with their depths and thicknesses encountered in the boreholes. The parameters recorded are variations in magnetic susceptibility, resistivity, chargeability, conductivity, self potential, density, borehole diameter (caliper) and spectral gamma.

13.7.3 Quantum of work:

The multi parametric borehole geophysical logging was undertaken during present investigation by MECL in Bangaragunta sub block of Bargur Block. Total 244 m. of Borehole Geophysical logging was carried out in 2 nos. boreholes for magnetic susceptibility, resistivity, chargeability, conductivity, self potential, density, borehole diameter (caliper) and spectral gamma. Statement showing the details of borehole geophysical logging carried out by MECL is given below given in **Table 13.1.**

Table No. 13.2
Details of Geophysical Logging Parameters of boreholes drilled by MECL in Bangaragunta Sub Block of Bargur Block Block, Krishnagiri District, Tamil Nadu

Sl. No.	BH NAME	Date of Logging	Drilling Depth	GPL Depth	RS	SP	IP	SG	BD	CL	MS
1	MBG-01	27.08.2025	114.00	112.00	N	N	Y	Y	Y	Y	Y
2	MBG-02	23.08.2025	133.00	132.00	Y	Y	Y	Y	Y	Y	Y
			247.00	**244.00**							

NOTE: **RS-** Short Normal Resistivity, **SP-** Self Potential Suceptability **IP-** Induced Polarisation/ Chargeability, **SG-** Spectral Gamma, BD- Dual Density, **CL**-Caliper, **MS** – Magnetic susceptibility

13.7.4 Log Data Acquisition

13.7.4.1 The borehole geophysical logging by MECL has been carried out using RG (Robertson Geologger) Logger in 2 nos. boreholes. The recording system of Robertson Geologger (R.G.) unit is digital and a printer is attached with a high speed integral thermal plotter. RG-Win logger software is installed in the system for data acquisition, calibration of the tools and replay of logs.

13.7.4.2 The probes used are i) ELTG (Electrical, Temperature, Gamma Probe, (ii) INPS (Induced Polarisation) Probe (iii) SGAM (Spectral Gamma) Probe and Dual Inducation Sonde, Dual density and Magnetic susceptibility probe.

13.7.4.3 For recording geophysical logs, each probe is lowered carefully into the borehole and the data recorded while hoisting the probe. Uniform speed of 6 m per minute or less maintained for recording depending on the requirement of specific probe/sonde and vertical scale of 1:200 was maintained for replay/ print of geophysical logs.

13.7.5 Data Processing and Interpretation

13.7.5.1 Well CAD software is used for processing the log data. A composite record of logs was prepared during processing stage. Different litho-units have different characteristic log responses and by combining the same it could be possible to categorize the litho-units as encountered in the boreholes.

13.7.5.2 The identification of lithology from the geophysical logs is based on the response of physical properties i.e., natural radioactivity (spectral gamma), electrical resistivity, magnetic sucesptibility, conductivity, density, self potential and chargeability (IP) of various formations.

13.7.6 Discussion of Results

13.7.6.1 Multi-parametric borehole geophysical logging was carried out using dual density, caliper, magnetic susceptibility, resistivity, spectral gamma, and dual induction sondes. The recorded log responses were interpreted in terms of the lithological units responsible for the observed variations. The density log helps in distinguishing mineralized zones, showing higher density values where mineral concentration is high. However, in the case of disseminated mineralization, only a weak response is obtained. The caliper log assists in identifying caved or washed-out zones. Formation conductivity is measured by the dual induction sonde, where sulphide-rich zones (mainly pyrite) are indicated by high conductivity. Magnetic susceptibility logging detects alteration zones, such as those affected by serpentinization, which exhibit high magnetic response due to their magnetic nature, while paramagnetic sulphide zones (chalcopyrite/pyrite) generally show poor response. The induced polarization (IP) sonde records high chargeability in sulphide-bearing zones. Spectral gamma logs show high counts over feldspathic zones enriched in feldspar and thorium. Sulphide-bearing zones containing pyrrhotite/pyrite/chalcopyrite etc are characterized by low resistivity, whereas quartz, mica-schist, granite, and gneiss show high resistivity, low conductivity, negligible magnetic susceptibility, low gamma response, and nil chargeability. The sulphide zones corresponding to pyrite/pyrrhotite/chalcopyrite are reflected by high chageability and low resistivity values. The high magnetic susceiptibility zones having low chargeability and and high resistivity rerosponds to alteration zones. The borehole geophysical logs are presented in **Plate-VI.**

13.7.7 Conclusion

The borehole geophysical logging helped to delineate sulphide zones along with their depths and thickness. The geophysical logging also enhanced the value of information collected from the boreholes.

CHAPTER-14

14.0.0 SUB-SAMPLING TECHNIQUES AND SAMPLE PREPARATION

14.1.0 WHETHER CUT OR DRAWN AND WHETHER QUARTER, HALF OR ALL CORE TAKEN

14.1.1 The details of sampling procedure described in previous Chapters No. **X & XII.** During the sample preparation the borehole core sample has been split longitudinally into two equal halves with the help of hydraulic core splitter. One half has been preserved and the other has been crushed for the preparation of primary samples at -120 mesh for Gold analysis by fire assay method and 200 mesh size for other elements by ICP-MS method. Sample has been homogenized by proper mixing and coning quartering as per the standard sampling procedure.

14.2.0 NATURE, QUALITY AND APPROPRIATENESS OF THE SAMPLE PREPARATION TECHNIQUE

14.2.1 The details of sampling procedure and techniques for bedrock, channel and borehole core primary samples described in previous chapters No**. X & XII.**

14.3.0 QUALITY CONTROL PROCEDURES ADOPTED

14.3.1 Samples have been prepared under the supervision of geologist and qualified and experienced sampling technician. Samples were collected in separate plastic bags for bedrock/channel samples and borehole core samples. After collecting each sample, all the instruments were properly cleaned before proceeding for next sample collection to maintain quality and to avoid contamination. All samples packed in the polythene sample bag with proper tag. Then the entire samples were transported to central sample processing unit located in Nagpur. It has been thoroughly checked that none of the sample bags were damaged during transportation. Standard sampling procedure under the supervision of qualified sampling technician. All samples processed at MECL Sampling Unit, Nagpur. 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. Prepared powedered samples packed in sample polythene bags and sent to MECL Chemical Laboratory, Nagpur for analysis. All primary bedrock/channel and borehole core samples analysed at MECL Chemical laborarory, Nagpur. Surface bedrock/channel samples (200 nos.) analysed for Au by fire assay method, for Ti, V, Cr, Ni, Co, Cu, Zn, Ag and Pb by AAS method and selected 10 nos. samples for PGE analysis. Total 39 nos. of borehole core samples analysed for Au by fire assay method and 34 element analysis by ICP-MS method. All qualtity control procedures adopted while sample preparation and analysis as per the standard operationg procedures. To check the sampling and analytical bias if any, a total of 20 Nos. of bedrock/channel samples analysed as external check samples (10% of primary samples) for analysis of Gold in JNARDDC Laboratory, Nagpur and 20 Nos. eternal check samples analysed for Ti, V Cr, Ni, Co, Cu, Zn, Ag & Pb and one external check sample for PGE analysis in Shiva laboratory, Bangalore. The analysis of internal and external laboratory compared and found no major differences between two laboratories.

14.4.0 MEASURES TAKEN TO ENSURE THAT THE SAMPLING IS REPRESENTATIVE OF THE IN-SITU MATERIAL COLLECTED

14.4.1 It is very important to submit the representative sample of collected material for geochemical analyses. Sampling is done of the in-situ exposures representing the mineralised rock/zones. Bed rock/channel samples and drill core samples quantity has been reduced 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.

14.5.0 WHETHER SAMPLE SIZES ARE APPROPRIATE TO THE GRAIN

14.5.1 The primary samples have been prepared (–) 120 mesh size for analysis of Gold by fire assay method and -200 mesh for analysis of other elements by AAS method and ICP-MS method. As per the previous studies in and surroung the area, the (–) 120 mesh size is appropriate for the liberation of mineral grains and analysis for Gold (Cu) while -200 mesh is appropriate for other associated elements.

CHAPTER-15

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 chemical analysis of primary samples for gold (Au) and associated elements has been carried out in MECL Chemical Laboratory, Nagpur. The analysis for Gold has been carried out by fire assay mthod and for analysis of Ti, V, Cr, Ni, Co, Cu, Zn, Ag and Pb by Atomic Absorption Spectroscopy (AAS) method by Analytical Jena ZEEnit model instrument. Analysis of other associated elements (34 elements) carried out by ICP-MS method. The Standard Operating Procedure (SOP) for analysis of Gold, and other associated elements using AAS and ICP-MS method is given below.

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 Analysis of other associated element by AAS method.

<u>For Copper</u>

<u>Reagents and Standards</u>

- Aqua Regia – 50-60 ml (Prepared using AR Grade Acids)
- Stock standards for copper – 1 ml of solution = 1 mg of copper (1000 ppm).

<u>Procedure</u>

1. Weigh 0.3 – 1.0 gm of the sample in a 250 ml beaker and add 50-60 ml aqua regia.

2. Cover the beaker with watch glass, and digest on hot plate for 5-6 hrs till syrup like solution is formed.
3. After digestion, add 10-20 ml water and heat for 5-10 minutes and filter by Whatman grade – 40 filter paper, in 250 ml volumetric flask.
4. Wash the residue with hot distilled water for four to five times.
5. Add the washings to the filtrate and makeup the volume up to 250ml.
6. Aspirate the sample solution in AAS using Air-Acetylene flame mode with following settings-

   (AAS to be calibrated before testing samples with at least 10 calibration points)

   - Wavelength - 324.7 nm,
   - Slit width - 0.5 nm,
   - Lamp current - 4.0 mA
   - Instrument mode - Absorbance

7. Read the absorbance and concentration on atomic absorption spectrophotometer (Analytical Jena ZEEnit model).

   (Run CRM and repeat samples after every 20 samples)

Calculation

$$\text{copper in \%} = \frac{\text{Cu ppm reading x volume (ml) x 100 x Dilution factor}}{\text{1000000 x weight of sample (gm)}}$$

15.1.3 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%).

15.1.4 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

15.2.2 For Gold analysis, NIST traceable liquid CRMs were used for instrument calibration to ensure accurate response across the full analytical range. Additionally, a solid geological CRM (BND 3401.01) was inserted after every five routine samples to verify digestion efficiency, matrix effects, and overall analytical accuracy. Method blanks (acid/matrix blanks) were also included at a frequency of one per five samples to monitor any contamination or carry-over. All CRM and blank results were within acceptable limits, confirming the reliability and validity of the reported data.

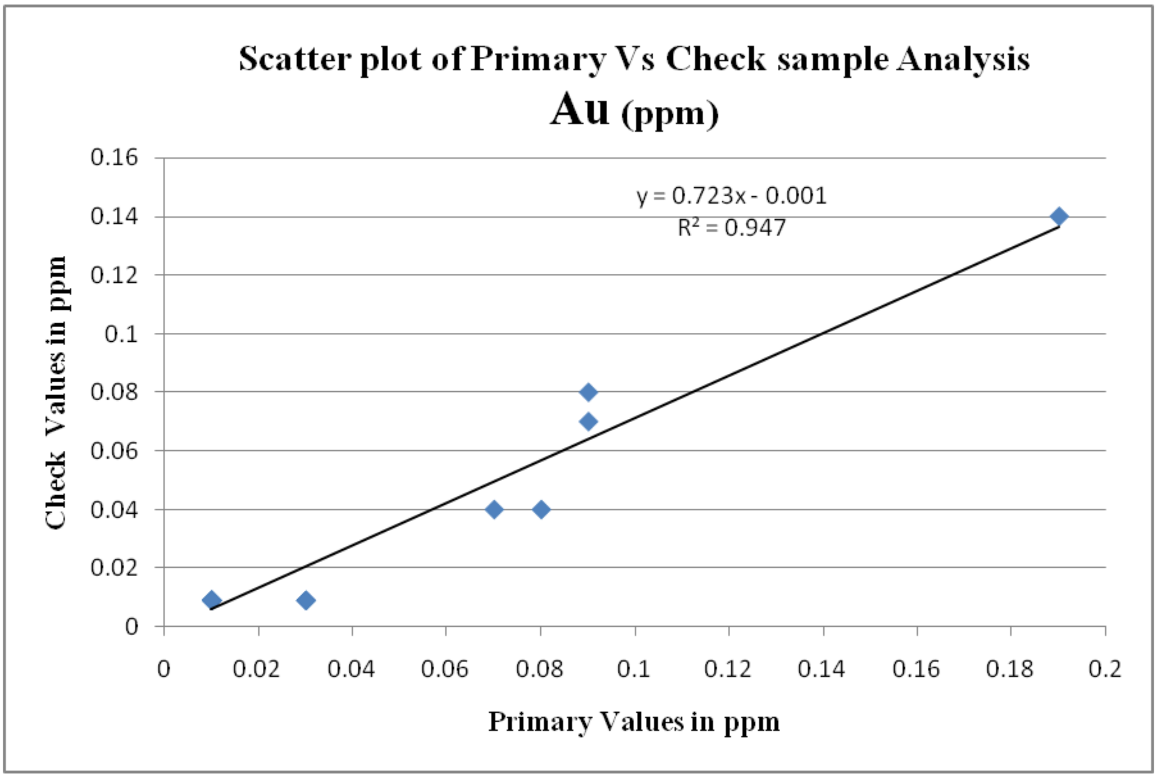
15.3.0 CHECK ANALYSIS FROM THIRD PARTY NABL ACCREDITED LABORATORY

15.3.1 In accordance to the standard practice of quality assurance and quality control, total 20 nos. of bedrock/channel primary samples (10% of primary), have been analysed as external check samples for Au in external laboratory i.e. M/s JNARDDC Laboratory, Nagpur. Moreover, 20 nos. of primary samples have been analysed as external check samples for other associated elements viz. Ti, V, Cr, Ni, Co, Cu, Zn, Ag & Pb and one sample for PGE analysis in M/s Shiva Laboratory, Bangalore. 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 JNARDDC Laboratory have been compared with primary sample results for Au and other associated elements found no major or significant difference between the results. The analytical details and comparative statement of Primary and External Check samples bedrock/channel samples for Gold (Au) are given in **Annexure-IIA,** for Ti, V, Cr, Ni, Co, Cu, Zn, Ag & Pb given in **Annexure-IIB** and for PGE analysis given in **Annexure-IIC** respectively.

15.3.2 The comparative studies of primary Vs External check analysis of bedrock/channel samples for Gold is given in **Table-15.1** and scatter plots is represented as **Text Figure- 9.**

Table-15.1: Comparison of Primary vs External Check Bedrock/channel samples for Gold

SL. NO.	Comparision Index	Primary Analysis for Au	External Check Analysis for Au
1	No. of Samples	20	
2	Arithmetic Mean	0.036	0.025
3	Standard Deviation	0.045	0.034
4	Standard Error of Mean	0.01	0.008
5	Variance	0.002	0.001
6	Mean of Deviation	0.011	
7	Correlation coefficient	0.973	
8	Paired T value	3.43	
9	F test value	1.811	



Text Figure-9: Scatter Plot of Primary Vs Check (External) Analysis of Au

15.3.3 The data set for primary Vs. External check analysis comprises 20 pairs of bedrock/channel samples. **Table-15.1** shows that the difference in arithmetic mean, standard deviation, of primary and exterrnal check samples is not high. The value of R^2 given in scatter plot (Text Figure – 8) is 0.947, 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 exterrnal check analysis, which support the reliability of sampling procedure.

15.3.5 The comparative statement of primary Vs. external check analysis of borehole core samples for gold is provided in **Annexure-VI**. A total of four check samples (10% of primary samples) were analysed at the external laboratory, M/s Lucid Laboratory Pvt. Ltd., Hyderabad. Comparative statistical analysis (including scatter plot) has not been carried out due to the limited number of check samples (<10), as such analysis would not provide a true representation or reliable interpretation.

15.4.0 SECURITY AND CHAIN OF CONTROL OF SAMPLES SHOULD BE CLEARLY MENTIONED

15.4.1 The samples have been processed at centralised MECL Sampling unit, Nagpur with proper lebeling and tag and samples sent to chemical laboratory, Nagpur. At the sampling unit, standard procedures have been followed and all the precautionary measures have been taken to avoid the contamination. All samples prepared under the supervision of qualified sampling technician and geologist. The samples have been transported from project site to Chemical laboratory, Nagpur with proper sealing of sampling bags and the same has been verified in Sampling unit and Chemical laboratory. Further the remaining half spilt core samples preserved with sample tags for any future reference under the custody of the company.

CHAPTER-16

16.0.0 MOISTURE

16.1.0 METHOD OF DETERMINIATIONOF MOISTURE CONTENT

16.1.1 Mositure content not determined.

MECL

<u>**CHAPTER-17**</u>

17.0.0 BULK DENSITY

17.1.0 METHOD OF DETERMINIATION AND RESULT

17.1.1 During present exploration, total 3 nos. samples collected from sulphide bearing suspected mineralised portions intersected in the boreholes subjected to specific gravity determination. Specific gravity determinations have done by Walker's Steel Yard Balance method. The average specific gravity of suspected mineralised sulphide bearing zone determined as 2.94 and details are given in **Annexure-XI.** However, resource estimation in the area has not been done due to poor gold values.

CHAPTER-18

18.0.0 BENEFICIATION STUDIES AS MAY BE REQUIRED

18.1.0 DETAILS OF BENEFICIATION STUDIES

18.1.1 Beneficiation studies have not been carried out during present exploration as it was not the scope of present work.

CHAPTER-19

19.0.0 RESOURCE ESTIMATION TECHNIQUES

19.1.1 The present exploratory test drilling has not intersected any mineralized zones for Gold and other associated minerals. Hence, resource estimation has not been undertaken for the Bargur Block.

CHAPTER-20

20.0.0 REPORTING OF RESOURCES

20.1.0 Resources not estimated in Bargur Block.

CHAPTER-21

21.0.0 SUMMARY AND RECOMMENDATIONS

21.1.0 DISCUSSION ON THE OUTCOME OF THE EXPLORATION WORK DETAILING THE NATURE OF THE DEPOSIT

21.1.1 The Bargur Block forms part of the Bargur Belt and lies at the southern end of the Kolar Schist Belt in Krishnagiri District, Tamil Nadu. The area is historically known for occurrences of gold, with two old workings at Sakalagunta and Bangaragunta reported by earlier workers. M/s John Taylor & Sons examined these workings in 1940, followed by the Geological Survey of India (1988–89), who recorded few encouraging gold values in mine dumps and surface samples. GSI opined that amphibolite enclaves within migmatites could host gold mineralization similar to those in the Kolar Schist Belt, warranting focused prospecting in such zones.

21.1.2 In view of the above, the present Reconnaissance Survey (G4 stage) for gold in the Bargur block in parts of Survey of India Toposheet No. 57 L/6, Krishnagiri District of Tamil Nadu has been undertaken with the objective of identifying gold-bearing host rocks and assessing the potential of the old workings and their possible extensions, covering an area of about 157.50 sq. km.

21.1.3 The G-4 stage survey involved large-scale geological mapping at 1:12500 scale over 157.50 sq.km, collection and analysis of 200 bedrock/channel samples for gold and associated elements (Ag, Ni, Co, Cr, Cu, Pb, Zn, V, Ti), and ten selected samples for PGE analysis. A ground geophysical survey consisting of IP–Resistivity, SP, and Magnetic methods (total 30 line km) was carried out over the Sakalagunta and Bangaragunta sub-areas. Based on the Phase-I results and review by the TCC of NMET, Phase-II test drilling of 247 m in two boreholes was executed in the Bangaragunta area, along with borehole deviation, geophysical logging, laboratory analysis of 39 core samples for Au and 34 elements by ICP-MS, petrography (9 nos.), mineragraphy (9 nos.), and specific gravity studies (3 nos.).

21.1.4 The litho-units in the Bargur Block belong to the Peninsular Gneissic Complex (PGC), containing enclaves and lenses of amphibolite, banded iron formation (as magnetite quartzite), and a single metachert enclave within granitic gneiss. The PGC is represented by hornblende–biotite gneiss, biotite/epidote gneiss, granodiorite, and migmatite, all intruded by basic dykes. Several quartz and pegmatite veins traverse the area, and the plains and valleys are covered by soil, most of which are under cultivation.

21.1.5 During geological mapping, emphasis was placed on delineation of amphibolite, BIF, and metachert units to identify mineralized zones. Two old gold workings, Sakalagunta and Bangaragunta, are located west of Karakuppam village. These old workings are associated with thin quartz/pegmatite veins within hornblende gneiss/migmatite and amphibolite enclaves. However, no visible mineralised quartz veins could be identified due to land modification and soil cover. Outcrop indications of mineralisation are limited, and amphibolites, BIF, and metachert exposures show sulphide dissemination and ferruginisation in places.

21.1.6 Mineragraphic examination of sulphide-bearing samples, including amphibolite, amphibolite with quartz vein, magnetite quartzite, and metachert, revealed magnetite, sphene, pyrrhotite, and pyrite as major mineral phases. Ilmenite, hematite, goethite, and chalcopyrite occur as minor minerals, whereas digenite, covellite, sphalerite, pentlandite, and limonite appear only in trace or accessory quantities.

21.1.7 Surface bedrock and channel samples were collected to assess gold and associated mineral content. Out of 200 collected samples, 189 bedrock samples from various lithologies including amphibolite, metachert, BIF, sheared amphibolite, and basic dykes recorded gold values between <0.01 ppm and 0.21 ppm. A single bedrock sample from Sakalagunta showed 0.19 ppm Au, and one dump sample from Bangaragunta recorded 0.21 ppm Au. Channel samples from amphibolite with quartz veins showed <0.01 to 0.02 ppm Au, whereas metachert channel samples showed 0.03–0.04 ppm Au. Overall assay values were not encouraging.

21.1.8 Associated element analysis of 200 surface samples indicated that 53 samples contained copper values between >200 ppm and 1700 ppm, including five samples with 536.15–785.19 ppm Cu and one with 1700 ppm. Six samples reported zinc values of 215.96–371.53 ppm. While elevated Cu and Zn were observed mainly from amphibolite and metachert, other associated elements such as Ag, Ni, Co, Cr, Pb, and V did not yield encouraging results.

21.1.9 Ten selected samples from amphibolite and metachert units were analysed for PGE. Total PGE values ranged from 62.30 to 484.24 ppb. Amphibolite samples recorded Pd values ranging from 62.30 to 342.37 ppb and Ru from <5 ppb to 31.31 ppb, while Rh, Os, Ir, and Pt remained below detection limits. Two metachert samples recorded 434.93 ppb and 451.32 ppb Pd, with one showing 31.31 ppb Ru and the other below detection limits. Rh, Os, Ir, and Pt remained below 5 ppb. Overall, PGE values in amphibolite were low, except for the anomalous Pd results in metachert samples

21.1.10 Since surface analytical results were poor but historical workings were present, detailed ground geophysical surveys were undertaken to explore possible subsurface mineralised trends in two sub-blocks: Bangaragunta (1.3 sq.km) and Sakalagunta (1.76 sq.km).

21.1.11 Results from the Sakalagunta geophysical survey indicate moderate magnetic complexity with several discrete anomalies. Magnetic variation of approximately 980 nT was observed, and after RTP correction, the anomalies remained discontinuous with no clearly defined north–south structural trend.

21.1.12 In the Bangaragunta block, two proposed borehole locations were supported by magnetic and IP–resistivity anomalies. These included low resistivity and moderate–high chargeability zones extending to around 120 meters depth, although no consistent structural trend was identified.

21.1.13 Based on geophysical results and TCC review, only the non-forest Bangaragunta sub-block was taken up for test drilling. test boreholes drilled in Bangaragunta intersected sulphide-bearing zones of pyrite, pyrrhotite, and chalcopyrite within amphibolite but no gold mineralization was recorded. Out of 39 borehole samples, 15 samples showed gold values between 10.15 ppb and 55.54 ppb, while remaining samples recorded <10 ppb.

21.1.14 Analysis of borehole core samples showed copper values of 32.39–393.18 ppm and zinc values of 27.98–205.24 ppm. Total REE + Y + Sc values ranged from 121.06 to

708.75 ppm in 37 samples. Other trace elements including Li, Ti, V, Cr, Co, Ni, Ga, As, Mo, Ag, Cd, Sb, Pb, Bi, Th, and U did not show encouraging values.

21.1.15 The borehole geophysical logging helped to delineate sulphide zones along with their depths and thickness. The geophysical logging also enhanced the value of information collected from the boreholes.

21.1.16 The test drilling confirmed that the identified anomalies correspond to sulphide and magnetite enrichment without associated gold mineralisation. The drilling, laboratory analysis, and petrographic and mineragraphic studies did not indicate significant gold, copper, zinc, or other associated minerals in the Bangaragunta sub-block.

21.2.0 RECOMMENDATION:

21.2.1 Surface bedrock and channel sample analyses from the Bargur area did not yield encouraging values for gold or associated minerals. A few elevated copper and zinc values observed in amphibolite and metachert samples are sporadic and do not indicate any consistent mineralized trend. Similarly, the two test boreholes drilled to investigate ground geophysical anomalies did not reveal any mineralized zones for gold or associated metals up to the explored depth of 90 m (vertical depth) in the Bangargunta sub-block of the Bargur block. However, the possibility of deeper mineralization cannot be ruled out, as the ore shoot geometry and structural controls could not be conclusively established based on the limited geophysical surveys and shallow exploratory drilling undertaken so far.

At present, no further immediate exploration work is recommended. However, advanced deep-earth imaging techniques such as Magnetotelluric (MT), Time-Domain Electromagnetic (TDEM), and high-resolution deep Induced Polarization (IP) surveys may be considered in the future to delineate favourable structural corridors that may host deeper-seated mineralization, if any.

CHAPTER-22

PLATES AND MAPS

22.1.0 List of Plates

22.1.1 The report includes all the relevant plates maps, plans, sections etc. List of plates are provided in the Geological Report.

CHAPTER-23

23.0.0 ANNEXURE / ENCLOSURES TO THE REPORT

23.1.0 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-24

24.0.0 ANY OTHER INFORMATION

24.1.0 GEO-TECHNICAL STUDIES

24.1.1 No specific geotechnical studies have been undertaken as there is no scope of work in present exploration at G4 stage. However, as part of geological logging, the following geo-tech parameters have been collected.

1. Core recovery
2. RQD%

24.2.0 PEER-REVIEW

24.2.1 Draft Geological Report was peer reviwed by Shri K. Shashidharan, Dy Director (Retd.) and suggested comments were attended and incorporated in the report (Annexure-XI).

24.3.0 REFERENCES

i. Boseworth Smith, P., (1889) Report on the Kolar Gold Field and its south extension. Govt. Press, Madras.

ii. Krishnaswamy, S. (1950), Geology of the Southern extension of Kolar Gold Fields (Unpublished report of G.S.I. for the field season 1949-50).

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v. Gopalakrishnan R (1990) Preliminary Investigation for primary gold in Bargur Area, Krishnagiri Taluk, Dharmapuri District, Tamil Nadu. Progress Report for the filed season 1988-89.

vi. Kapil Chhabbra et.al (2019), A Report on Regional Gravity and Magnetic TF Surveys in Topos heet Nos. 57H/13, H/16, 57L/2, 57L/6 & 57L/ 9 in parts of Chittoor district in Andhra Pradesh, Bangalore & Kolar district in Karnataka, Dharamapuri & Vellore district in Tamil Nadu. Under The Project: National Geophysical Mapping (NGPM).

vii. Nishant kumar and Suman Saha (Field season 2017-18), Interim Report on Geochemical Mapping in Toposheet No. 57 L/6 parts of Krishnagiri & Vellore Districts Of Tamil Nadu & Chittoor District of Andhra Pradesh.

CHAPTER-25

25.0.0 CERTIFICATION

25.1.0 CERTIFICATION

This is to certify that geological report has been prepared in respect of Geological Report on Reconnaissance Survey (G-4 Stage) for Gold in Bargur Block (157.50 Sq.Km.) Bargur Belt of Kolar Schist Belt, District: Krishnagiri, State: Tamil Nadu by Mineral Exploration and Consultancy Limited (MECL) on behalf of National Mineral Exploration and Development Trust (NMEDT). 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: **SRIKANTH SHARMA**
DESIGNATION: **HoD (Exploration)**

DATE:

LOCALITY INDEX

Locality	Latitude	Longitude
Bangaragunta	12°33’ 50”	78° 20’30”
Bargur	12°32’30”	78° 21’30”
Vartanapalli	12°34’50”	78° 18’10”
Sakalagunta	12°33’40”	78° 19’50”

ABBREVIATIONS USED

SL. No.	Abbreviation	Full form
1	M / m	Meter
2	Cu m	Cubic Meter
4	RL	Reduced Level
5	mRL	Reduced Level in metre
6	M.S.L.	Mean sea level
7	IBM	Indian Bureau of Mines
8	GSI	Geological Survey of India
9	NMET	National Mineral Exploration Trust
10	NMEDT	National Mineral Exploration and Development Trust
11	TCC	Technical cum Cost Committee
12	EC	Executive Committee
13	MMDR	Mines and Minerals (Development and Regulation)
14	MEMC	Minerals (Evidence of Mineral Contents)
15	MECL	Mineral Exploration and Consultancy Limited
16	NABL	National Accreditation Board for Testing and Calibration Laboratories
17	JNARDDC	Jawaharlal Nehru Aluminium Research Development and Design Centre
18	QA/QC	Quality Assessment/ Quality Checks
19	WGS-84	World Geodetic System-84
20	DMS	Degree Minute Second
21	UTM	Universal Transverse Mercator
22	Bhs	Boreholes
23	DGPS	Differential Global Positioning System
24	XRF	X-ray Fluorescence
25	ICP-MS	Inductively Coupled Plasma Mass Spectrometry
26	AAS	Atomic Absorption Spectroscopy
27	XRF	X-Ray Fluorescence Spectroscopy
28	BDL	Below Detection Limit
29	MT	Million Tonnes
30	RF	Reserve Forest
31	Sq.km.	Square kilometer
32	ppm	Parts per million
33	ppb	Parts per billion