

**RECONNAISSANCE SURVEY (G4) FOR Ni, Co, PGE
AND REE/ ASSOCIATED MINERALS IN JC PURA
MAFIC ULTRAMAFIC SCHIST BELT NEAR
RAMPURA AND GOLLARAHATTI (R-G) BLOCK,
HASSAN DISTRICT, KARNATAKA.**

Name of the Block: Rampura and Gollarahatti Block

Explored Block Area: 2.00 sq. km

Toposheet No. 57C/7

Submitted to



खान मंत्रालय
भारत सरकार

Ministry of Mines
Government of India

**National Mineral Exploration & Development Trust (NMEDT),
Ministry of Mines, Government of India**

Submitted by



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GeoExpOre Private Limited

Bengaluru, Karnataka, 560040

www.geoexpore.com , info@geoexpore.com

July 2026

CONTENTS

1. CONTENTS	ii
2. LIST OF FIGURES	viii
3. LIST OF TABLES	xi
4. LIST OF PLATES	xii
5. LIST OF ANNEXURES	xiii
6. LIST OF ABBREVIATIONS	xiv
EXECUTIVE SUMMARY	1
1. CHAPTER 1: DETAILS OF THE QUALIFIED PERSON(S) / EXPLORATION AGENCY	6
1.1 Details of Investigating agency	6
1.2 Details of qualification and experience of persons associated with various aspects of exploration assessment of resources and reserves	6
2. CHAPTER 2: TITLE AND OWNERSHIP	7
2.1 Name of the explorer/ Mining or prospecting rights holder	8
2.2 Details of period of prospecting/mineral right if any	8
3. CHAPTER 3: DETAILS OF AREA UNDER STUDY	9
3.1 Village, District, State	9

3.2	Survey of India Toposheet No., Differential Global Positioning System (DGPS) coordinates of all corner points of the area and borehole points in latitude and longitude (Degree Minutes Second) format WGS-84 Datum	9
3.3	Cadastral details of the area with land use, area under forest with type of forest. In case the cadastral details are not available an indicative data of breakup of government, private and forest land	10
3.4	Mineral(s) under investigation or granted under license or lease	11
4.	CHAPTER 4: PHYSIOGRAPHY AND ENVIRONMENT	12
4.1	Relief of the area with minimum and maximum elevation, drainage pattern, natural water courses, reservoirs, etc.	12
4.2	Roads, railway track, electric transmission line, telephone line, etc., passing through the area or nearby	14
4.3	Host population (local tribes), Human settlements within and nearby the area	15
4.4	Socio Demographic profile of the area and nearby	16
4.5	Historical sites and archaeological monuments, places of worship, public utilities etc. within or near by	16
4.6	Forests, sanctuaries, national park and wildlife sanctuaries; grazing land and gochar land within or near by the area with distance from periphery of the area explored.	16
4.7	Flora and Fauna within and nearby	16
4.8	Water bodies such as river, nala, stream, reservoir, etc., within or nearby	17
4.9	Climatic conditions	17

4.10	Any other physiographic, social and environmental factor having potential to affect the viability of the project and assessment of resources and reserves.	17
5.	CHAPTER 5: INFRASTRUCTURE	18
5.1	Local infrastructure details	18
6.	CHAPTER 6: GEOLOGY	19
6.1	Brief regional geology of the area outlining the broad geological, stratigraphical and structural framework.	19
6.2	Local geological setting detailing the common rock types, controls of mineralization, details of old workings if any, surface exposures, etc., of the area under study also of adjoining nearby areas, if the information is likely to have an impact on the area under study.	24
7.	CHAPTER 7: PREVIOUS EXPLORATION	36
7.1	Previous studies	36
7.2	Brief details of the exploration carried out (to be given separately for each agency)	41
7.3	Reserves or resources estimated, if any, during the previous exploration campaign with quantity and grade under various categories	45
8.	CHAPTER 8: AERIAL/GROUND GEOPHYSICAL OR GEOCHEMICAL DATA	46
8.1	Details of aerial, ground geophysical and geochemical survey taken up and their results in previous studies.	46
8.2	Detailed drone survey in current study	54
8.3	Geophysical investigation in the current study	59

9. CHAPTER 9: EXPLORATION UNDERTAKEN DURING CURRENT INVESTIGATION	69
9.1 Details of pitting, trenching, drilling, etc., with spacing and distribution of the sample points along with geographical co-ordinates.	69
9.2 Data spacing for reporting of exploration results	69
10. CHAPTER 10: LOCATION OF DATA POINT	70
10.1 Accuracy and quality of surveys used to locate drill holes (collar and down-hole surveys, azimuth, inclination, coordinates of bore holes etc), trenches, mine workings and other locations used in mineral resource estimation.	70
11. CHAPTER 11: SAMPLING TECHNIQUE	75
11.1 Nature and quality of sampling (eg. cut channels, random chips, etc.) and measures taken to ensure sample representation.	75
12. CHAPTER 12: DRILLING TECHNIQUE AND DRILL SAMPLING	77
13. CHAPTER 13: SUB-SAMPLING TECHNIQUES AND SAMPLE PREPARATION	78
13.1 If core, whether cut or sawn and whether quarter, half or all core taken.	78
13.2 If non-core	78
13.3 Quality control procedures adopted for all sub-sampling stages to maximize representation of samples.	78
13.4 Measures taken to ensure that the sampling is representative of the in-situ material collected.	78
14. CHAPTER 14: QUALITY OF ASSAY DATA AND LABORATORY TESTS	79

15. CHAPTER 15: MOISTURE	88
16. CHAPTER 16: BULK DENSITY	89
17. CHAPTER 17: BENEFICIATION STUDIES	90
18. CHAPTER 18: RESOURCE ESTIMATION TECHNIQUES	91
19. CHAPTER 19: REPORTING OF RESOURCES	92
20. CHAPTER 20: SUMMARY AND RECOMMENDATIONS	93
20.1 A discussion on the outcome of the exploration work detailing the nature of the deposit, the dimension of the deposit, general structural trend, depth of occurrence and depth up to which exploration has been done, possibility of continuity of mineralisation beyond the depth of exploration and future exploration requirements, if any.	93
20.2 Discussion on the suggested future or strategy for the deposit for further exploration and mining.	98
21. CHAPTER 21: PLATES	99
22. CHAPTER 22: ANNEXURES	103
22.1 Annexure I: Detailed Description and Field Observations of Bedrock Geochemical Samples.	103
22.2 Annexure II: Analytical Results of Rare Earth Elements (REE) in Bedrock Samples (reported in ppm).	106
22.3 Annexure III: Analytical Results of Base Metals and Other Trace Elements in Bedrock Samples (reported in ppm).	109
22.4 Annexure IV: Analytical Results of Platinum Group Elements (PGE) in Bedrock Samples.	

22.5 Annexure V: Analytical Results of Major and Other Elements in Bedrock Samples (reported in ppm).	111
22.6 Annexure VI: Sanction Order for Exploration of Ni, Co, PGE, REE and Associated Minerals in the Rampura–Gollarahatti Study Block.	115
22.7 Annexure VII: Closure Certificate Issued by the Department of Mines and Geology, Government of Karnataka.	119
22.8 Annexure VIII: Chronology of Exploration Activities and Major Project Events.	121
22.9 Annexure IX: Selected Field Photographs Showing Representative Lithological, Structural and Geological Features of the Investigated Area.	122
23. CHAPTER 23: ANY OTHER INFORMATION	123
23.1 References	123
23.2 Expenditure	125
23.3 Locality Index	128
23.4 Reviewer's Comments	129
24. CHAPTER 24: CERTIFICATE FROM THE QUALIFIED PERSON WITH NAME, DATE AND SIGNATURE	141

LIST OF FIGURES

Figure No. 4.1 - Drainage Map Prepared On The 1:50,000 Toposheet	13
Figure No. 6.1 - A. Spinifex Textured Komatiite Of J.C. Pura Belt. B. Pillowed Komatiite Of J. C. Pura Schist Belt. (<i>Photos By M. Jayananda, Printed In Ramakrishnan And Vaidhyananadan, 2010.</i>)	22
Figure No. 6.2 – Field Photograph Showing An Exposure Of Serpentinite In Block I Near Rampura, Illustrating Its Contact Relationships, Degree Of Serpentinization And Structural Fabric.	31
Figure No. 6.3- Quartzo-Feldspathic Vein Intruding Serpentinite	32
Figure No. 6.4 - Schist Exposed In The Investigated Area Showing The Observed Foliation And Characteristic Schistose Fabric.	34
Figure No. 6.5 - Talc–Tremolite–Chlorite Schist Exposed In The Investigated Area, Showing The Characteristic Mineral Assemblage And Schistose Fabric	35
Figure No. 8.1 - Lineaments Map Of Toposheet No. 57c/7 Over Landsat Oli Data (Source Gsi-2018-19)	47
Figure No. 8.2 - Aero Magnetic Contour Map Of Toposheet No. 57c/7 Over Landsat Oli Data (Source Gsi-2018-19)	49
Figure No. 8.3 - Aster Map Of Chlorite Alteration Of Toposheet No. 57c/7 (Source Gsi-2018-19)	51
Figure No. 8.4 – Aster Map Of Epidote Alteration Of Toposheet Number 57c/7 (Source Gsi-2018-19)	51
Figure No. 8.5 – Aster Map Of Hematitization Of Toposheet No. 57c/7	52
Figure No. 8.6 - Aster Map Of Illite Alteration On Toposheet No. 57c/7	53
Figure No. 8.7 - Digital Terrain Model (Dtm) Of The Rampura–Gollarahatti Study Area Generated From The Drone-Based Photogrammetric Survey.	55
Figure No. 8.8 - Digital Surface Model (Dsm) Of The Rampura–Gollarahatti Study Area Generated From The Drone-Based Photogrammetric Survey.	56
Figure No. 8.9 - Two-Meter Contour Map Generated From The Drone-Based Survey Data Of The Rampura–Gollarahatti Study Area.	57
Figure No. 8.10 - Land Use/Land Cover (Lulc) Map Of The Rampura–Gollarahatti Study Area Derived From The Drone-Based Survey.	58

Figure No. 8.11 - Bouguer Gravity Anomaly Map Of The Rampura–Gollarahatti Study Area Showing The Spatial Distribution Of Gravity Anomalies And Associated Geological Variations.	62
Figure No. 8.12 - Bouguer Gravity Upward-Continued Anomaly Map At 250 M Showing The Regional Gravity Response And Deeper Structural Trends Of The Rampura– Gollarahatti Study Area.	63
Figure No. 8.13 - Bouguer Gravity Residual Anomaly Map Showing Shallow/Residual Gravity Responses, Structural Discontinuities And Lithological Variations In The Rampura– Gollarahatti Study Area.	65
Figure No. 8.14 - Bouguer Gravity Tilt-Derivative Anomaly Map Showing Structural Boundaries, Subsurface Contacts And Associated Geological Features Of The Rampura–Gollarahatti Study Area.	66
Figure No. 8.15 - Integrated Interpretation Map Of The Rampura–Gollarahatti Study Area Showing Interpreted Geological–Geophysical Features And Three Potential Zones Prioritized For Further Detailed Investigation.	67
Figure No. 10.1 - Boundary Coordinates And Spatial Configuration Of The Rampura– Gollarahatti Study Area.	71
Figure No. 10.2 - Ground Control Point (Gcp) Locations Established For The Drone-Based Survey Of The Rampura–Gollarahatti Study Area.	73
Figure No. 10.3 - Ground Gravity Survey Layout Showing The Distribution Of Survey Stations And Traverses Across The Rampura–Gollarahatti Study Area.	74
Figure No. 14.1 - Variation Of Major-Element Concentrations (Ppm) With Mg (Ppm) In Bedrock Samples From The Investigated Area.	81
Figure No. 14.2 - Variation Of Base-Metal Concentrations (Ppm) With Mg (Ppm) In Bedrock Samples From The Investigated Area.	82
Figure No. 14.3 - Variation Of Mg (Ppm) With High-Field-Strength Element Concentrations (Ppm) In Bedrock Samples From The Investigated Area.	82
Figure No. 14.4 - Variation Of Ni (Ppm) With Major-Element Concentrations (Ppm) In Bedrock Samples From The Investigated Area.	84
Figure No. 14.5 - Variation Of Ni (Ppm) With High-Field-Strength Element Concentrations (Ppm) In Bedrock Samples From The Investigated Area.	84
Figure No. 14.6 - Variation Of Ni (Ppm) With Large-Ion-Lithophile Element Concentrations (Ppm) In Bedrock Samples From The Investigated Area.	85

- Figure No. 14.7 - Variation Of Ni (Ppm) With Selected Trace-Element Concentrations (Ppm) In
Bedrock Samples From The Investigated Area. 86
- Figure No. 14.8 - Variation Of Ni (Ppm) With Base-Metal Concentrations (Ppm) In Bedrock
Samples From The Investigated Area. 86



LIST OF TABLES

Table No. 1.1 Personnel involved in the project.	6
Table No. 3.1 - Ground Control Point (GCP) Coordinates Used for the Drone-Based Survey.	9
Table No. 3.2 - Geographic Coordinates of the Corner Points of the Rampura–Gollarahatti Study Block.	10
Table No. 6.1 – Tentative-stratigraphic column for the J C Pura Schist Belt	21
Table No. 6.2 - Nature, Quantum and Target (NQT) of Proposed Exploration Work and Achievements During the Investigation.	25
Table No 10.1 - Geographic Coordinates of the Boundary Points of the Rampura–Gollarahatti Study Area.	70
Table No 10.2 - Ground Control Point (GCP) Coordinates and Elevation Data Used for the Drone-Based Survey.	72
Table No. 14.1 - Summary geochemical results for bedrock samples from the Rampura--Gollarahatti Study Area (Ni, Co, REE and PGE; units as shown).	79

LIST OF PLATES

Plate No. 1	Location Map of Reconnaissance Survey (G4) for Ni, Co, PGE and REE/ Associated Minerals in JC Pura Mafic- Ultramafic Schist Belt Near Rampura and Gollarahatti (R-G) Block, Hassan District, Karnataka on Toposheet No 57 C/7	99
Plate No. 2	Outcrop Map of Reconnaissance Survey (G4) for Ni, Co, PGE and REE/ Associated Minerals in JC Pura Mafic- Ultramafic Schist Belt Near Rampura and Gollarahatti (R-G) Block, Hassan District, Karnataka	100
Plate No. 3	Geological Map of Reconnaissance Survey (G4) for Ni, Co, PGE and REE/ Associated Minerals in JC Pura Mafic- Ultramafic Schist Belt Near Rampura and Gollarahatti (R-G) Block, Hassan District, Karnataka	101
Plate No. 4	Geological Map with Sample Location of Reconnaissance Survey (G4) for Ni, Co, PGE and REE/ Associated Minerals in JC Pura Mafic- Ultramafic Schist Belt Near Rampura and Gollarahatti (R-G) Block, Hassan District, Karnataka	102

LIST OF ANNEXURES

Annexure	Description	Page No.
Annexure No. I	Detailed Description and Field Observations of Bedrock Geochemical Samples.	103
Annexure No. II	Analytical Results of Rare Earth Elements (REE) in Bedrock Samples (reported in ppm).	106
Annexure No. III	Analytical Results of Base Metals and Other Trace Elements in Bedrock Samples (reported in ppm).	109
Annexure No. IV	Analytical Results of Platinum Group Elements (PGE) in Bedrock Samples.	110
Annexure No. V	Analytical Results of Major and Other Elements in Bedrock Samples (reported in ppm).	111
Annexure No. VI	Sanction Order for Exploration of Ni, Co, PGE, REE and Associated Minerals in the Rampura–Gollarahatti Study Block.	115
Annexure No. VII	Closure Certificate Issued by the Department of Mines and Geology, Government of Karnataka.	119
Annexure No. VIII	Chronology of Exploration Activities and Major Project Events.	121
Annexure No. IX	Selected Field Photographs Showing Representative Lithological, Structural and Geological Features of the Investigated Area.	122

LIST OF ABBREVIATIONS

Abbreviation	Description
OGP	Obvious Geological Potential
GSI	Geological Survey of India
NMEDT	National Mineral Exploration and Development Trust
MoM	Ministry of Mines
PGE	Platinum Group Elements
REE	Rare Earth Elements
RM	Rare Metals
LULC	Land Use/ Land Cover
NQT	Nature, Quantum and Target
DMG	Department of Mines and Geology
R-G	Rampur and Gollarahatti
ppm	Parts per million
ppb	Parts per billion
QCI	Quality Council of India
NABET	National Accreditation Board for Education and Training
NPEA	Notified Private Exploration Agencies
NRSA	National Remote Sensing Agency
ASTER	Advanced Space borne Thermal Emission and Reflection Radiometer
DTM	Digital Terrain Model
DSM	Digital Surface Model
DGPS	Differential Global Positioning System

EXECUTIVE SUMMARY

A Reconnaissance Survey (G4) for Ni, Co, PGE and REE/ Associated Minerals in JC Pura Mafic Ultramafic Schist Belt Near Rampura and Gollarahatti (R-G) Block, Hassan District, Karnataka, over an area of 2.00 sq. km. This investigation was taken up as a follow-up to earlier Geological Survey of India (GSI) investigations and was aimed at evaluating the potential for Ni–Co–PGE mineralization associated with altered ultramafic rocks and REE/associated mineral potential associated with intrusive lithologies including gabbro, granite, pegmatite and quartz veins. The G4 investigation comprised detailed geological and structural mapping, bedrock geochemical sampling, drone-based photogrammetric survey and ground gravity investigation, followed by integrated interpretation of geological, geophysical and geochemical datasets.

A detailed drone survey was completed over the entire 2.00 sq. km block to generate high-resolution orthomosaic imagery, Digital Terrain Model (DTM), Digital Surface Model (DSM), contour data and land-use/land-cover information. The detailed investigation of drone survey clearly shows that the entire area is covered with 58% of agricultural land, 40% of forest (Evergreen / scrub forest) and remaining 2% with settlement areas.

Ground gravity investigation was carried out through 202 survey points distributed along 19 traverses over the entire block. Interpretation of Bouguer gravity, upward continuation, residual and tilt-derivative maps delineated structural discontinuities, lithological contrasts and three possible prospective zones for further investigation was completed. The interpreted geophysical response indicates low gravity anomalies associated with serpentinite, medium anomalies over pegmatite, high anomalies over metagabbro and medium to high anomalies associated with talc–tremolite–chlorite schist.

Detailed geological and structural mapping was completed over approximately 0.15 sq. km in Sub-block 1. The principal lithological units identified are serpentinite, talc–tremolite–chlorite schist (TTCS) and pegmatite, with serpentinite forming the dominant lithology. The ultramafic bodies exhibit a predominant NW–SE structural trend, together with schistosity, folding and local shearing. A high-strain structural corridor was also identified in the southern part of the investigated area. The observed geological and structural relationships indicate that the mineralization potential is primarily associated with structurally modified serpentinite and lithological contacts.

A total of 15 bedrock chip samples were collected from the investigated area for geochemical analysis. The analytical results indicate Ni concentrations ranging from 1533 to 1973 ppm, with an average of 1619.73 ppm, and Co concentrations ranging from 73 to 93 ppm with an average of 83.21 ppm. PGE concentrations range from 30 to 70 ppb and represent low-level PGE responses in selected serpentinite and structurally modified ultramafic samples. The PGE results indicate geochemical fertility of the ultramafic host rocks but are not, by themselves, indicative of economic PGE mineralization. The REE dataset was also evaluated, and the variation of Σ REE with Ni indicates a two-phase relationship, suggesting different stages of enrichment within the ultramafic lithologies. The limited number of samples, however, restricts the extent to which definitive geochemical trends and continuity of mineralization can be established.

Integration of geological mapping, gravity anomalies and geochemical signatures indicates that the prospective zones are associated with serpentinite bodies, structural disturbance and lithological contacts. The coincidence of elevated Ni and Co concentrations, low-level PGE enrichment, structurally modified serpentinite and geophysical anomalies provide a basis for prioritizing these zones for systematic follow-up exploration.

Due to local public agitation and law-and-order constraints, detailed geological mapping and geochemical investigation could be completed only over approximately 0.15 sq. km of the 0.85 sq. km block, despite repeated efforts to resume the field programme. Consequently, the continuity, geometry and depth persistence of the mineralization could not be established during the present investigation, and no mineral resource estimation has been undertaken. The geophysical investigation, however, covered the entire block and provides a basis for prioritizing areas for subsequent detailed investigation.

Further exploration is recommended in the remaining unexplored portion of the block through detailed geological and structural mapping, systematic trench/channel sampling and detailed geochemical investigation, particularly across structurally modified serpentinite and lithological contacts. Detailed ground geophysical surveys and scout drilling may subsequently be undertaken over the prioritized zones to evaluate the subsurface continuity and depth persistence of the mineralized system. The available results indicate that the block warrants systematic follow-up exploration for Ni–Co–PGE and associated mineral potential.

कार्यकारी सारांश

कर्नाटक के हासन जिले में रामपुरा और गोल्लरहट्टी के निकट स्थित जे. सी. पुरा मैफिक-अल्ट्रामैफिक शिस्ट पट्टी के आर-जी खंड में **२.०० वर्ग किलोमीटर** क्षेत्रफल में **निकेल, कोबाल्ट, प्लैटिनम समूह के तत्व तथा दुर्लभ मृदा तत्व/सहवर्ती खनिजों** के लिए **अन्वेषण सर्वेक्षण (जी-४ स्तर)** किया गया। यह अन्वेषण भारतीय भूवैज्ञानिक सर्वेक्षण के पूर्ववर्ती अन्वेषण कार्यों के अनुवर्ती रूप में किया गया तथा इसका उद्देश्य परिवर्तित अल्ट्रामैफिक शैलों से संबद्ध निकेल-कोबाल्ट-प्लैटिनम समूह के तत्वों के खनिजीकरण की संभाव्यता तथा गैब्रो, ग्रेनाइट, पेग्माटाइट और क्वार्ट्ज शिराओं सहित अंतःप्रवेशी शैलविन्यासों से संबद्ध दुर्लभ मृदा तत्वों/सहवर्ती खनिजों की संभाव्यता का मूल्यांकन करना था। जी-४ अन्वेषण में विस्तृत भूवैज्ञानिक एवं संरचनात्मक मानचित्रण, आधारशिला भू-रासायनिक नमूना-संग्रहण, ड्रोन आधारित छायाचित्रीय सर्वेक्षण तथा धरातलीय गुरुत्वीय अन्वेषण किया गया, जिसके पश्चात भूवैज्ञानिक, भूभौतिकीय एवं भू-रासायनिक आंकड़ों का एकीकृत विश्लेषण किया गया।

पूरे **२.०० वर्ग किलोमीटर** क्षेत्र में विस्तृत ड्रोन सर्वेक्षण पूरा किया गया, जिससे उच्च-विभेदन वाले समांगीकृत प्रतिबिंब, डिजिटल भू-भाग प्रतिरूप, डिजिटल धरातलीय प्रतिरूप, समोच्च रेखा संबंधी आंकड़े तथा भूमि उपयोग/भूमि आवरण संबंधी जानकारी तैयार की गई। ड्रोन सर्वेक्षण के विस्तृत अध्ययन से स्पष्ट हुआ कि संपूर्ण क्षेत्र का **५८ प्रतिशत** भाग कृषि भूमि, **४० प्रतिशत** भाग वन क्षेत्र (सदाबहार वन/झाड़ीदार वन) तथा शेष **२ प्रतिशत** भाग बस्ती क्षेत्रों से आच्छादित है।

संपूर्ण खंड में **१९ अनुवीक्षण रेखाओं** के साथ वितरित **२०२ सर्वेक्षण बिंदुओं** के माध्यम से धरातलीय गुरुत्वीय अन्वेषण किया गया। बूग्ये गुरुत्व, ऊर्ध्व अध्यारोपण, अवशिष्ट तथा झुकाव-व्युत्पन्न मानचित्रों के विश्लेषण द्वारा संरचनात्मक असांतत्य, शैलविज्ञानिक विषमता तथा आगे के अन्वेषण के लिए **तीन संभावित अनुकूल क्षेत्रों** का निर्धारण किया गया। व्याख्यायित भूभौतिकीय प्रतिक्रिया में सर्पेटिनाइट से संबद्ध निम्न गुरुत्वीय विसंगतियाँ, पेग्माटाइट के ऊपर मध्यम गुरुत्वीय विसंगतियाँ, मेटागैब्रो के ऊपर उच्च गुरुत्वीय विसंगतियाँ तथा टैल्क-ट्रेमोलाइट-क्लोराइट शिस्ट से संबद्ध मध्यम से उच्च गुरुत्वीय विसंगतियाँ परिलक्षित होती हैं।

उपखंड-१ में लगभग **०.१५ वर्ग किलोमीटर** क्षेत्र में विस्तृत भूवैज्ञानिक एवं संरचनात्मक मानचित्रण पूरा किया गया। पहचानी गई प्रमुख शैलविज्ञानिक इकाइयों में सर्पेटिनाइट, टैल्क-ट्रेमोलाइट-क्लोराइट शिस्ट तथा पेग्माटाइट सम्मिलित हैं, जिनमें सर्पेटिनाइट प्रमुख शैलविज्ञानिक इकाई है। अल्ट्रामैफिक पिंडों में

शिस्टोसिटी, वलन तथा स्थानीय कर्तन के साथ मुख्यतः **उत्तर पश्चिम – दक्षिण पूर्व** दिशा में संरचनात्मक प्रवृत्ति प्रदर्शित होती है। अन्वेषित क्षेत्र के दक्षिणी भाग में उच्च-विकृति वाला एक संरचनात्मक गलियारा भी पहचाना गया। देखे गए भूवैज्ञानिक एवं संरचनात्मक संबंधों से संकेत मिलता है कि खनिजीकरण की संभाव्यता मुख्यतः संरचनात्मक रूप से परिवर्तित सर्पेटिनाइट तथा शैलविज्ञानिक संपर्कों से संबद्ध है।

भू-रासायनिक विश्लेषण के लिए अन्वेषित क्षेत्र से आधारशिला के कुल **१५ खंड नमूने** एकत्र किए गए। विश्लेषणात्मक परिणामों के अनुसार निकेल की सांद्रता **१५३३ से १९७३ पीपीएम** के बीच है, जिसकी औसत सांद्रता **१६१९.७३ पीपीएम** है, जबकि कोबाल्ट की सांद्रता **७३ से ९३ पीपीएम** के बीच है, जिसकी औसत सांद्रता **८३.२१ पीपीएम** है। प्लैटिनम समूह के तत्वों की सांद्रता **३० से ७० पीपीबी** के बीच है तथा चयनित सर्पेटिनाइट और संरचनात्मक रूप से परिवर्तित अल्ट्रामैफिक नमूनों में निम्न-स्तरीय प्लैटिनम समूह तत्व प्रतिक्रियाओं को दर्शाती है। प्लैटिनम समूह तत्वों के परिणाम अल्ट्रामैफिक मेजबान शैलों की भू-रासायनिक खनिजीकरण क्षमता का संकेत देते हैं, किंतु ये परिणाम अपने आप में आर्थिक प्लैटिनम समूह तत्व खनिजीकरण के सूचक नहीं हैं। दुर्लभ मृदा तत्वों के आंकड़ों की सीमा **२६.६८ से ४६.३७ पीपीएम** है, जिसकी औसत सांद्रता **३५.५३ पीपीएम** है। कुल दुर्लभ मृदा तत्वों और निकेल के मध्य परिवर्तनशीलता दो-चरणीय संबंध को दर्शाती है, जो अल्ट्रामैफिक शैलविज्ञानिक इकाइयों के भीतर संवर्धन के विभिन्न चरणों का संकेत देती है। तथापि, नमूनों की सीमित संख्या के कारण निश्चित भू-रासायनिक प्रवृत्तियों तथा खनिजीकरण की निरंतरता को स्थापित करने की सीमा सीमित रहती है।

भूवैज्ञानिक मानचित्रण, गुरुत्वीय विसंगतियों तथा भू-रासायनिक संकेतों के एकीकरण से संकेत मिलता है कि संभावित अनुकूल क्षेत्र सर्पेटिनाइट पिंडों, संरचनात्मक विक्षोभ तथा शैलविज्ञानिक संपर्कों से संबद्ध हैं। उच्च निकेल एवं कोबाल्ट सांद्रताओं, निम्न-स्तरीय प्लैटिनम समूह तत्व संवर्धन, संरचनात्मक रूप से परिवर्तित सर्पेटिनाइट तथा भूभौतिकीय विसंगतियों का एक साथ पाया जाना इन क्षेत्रों को व्यवस्थित अनुवर्ती अन्वेषण के लिए प्राथमिकता देने का आधार प्रदान करता है।

स्थानीय जन-विरोध तथा कानून-व्यवस्था संबंधी बाधाओं के कारण, क्षेत्रीय कार्यक्रम को पुनः प्रारंभ करने के बार-बार किए गए प्रयासों के बावजूद, **०.८५ वर्ग किलोमीटर** के खंड में से केवल लगभग **०.१५ वर्ग किलोमीटर** क्षेत्र में ही विस्तृत भूवैज्ञानिक मानचित्रण एवं भू-रासायनिक अन्वेषण पूरा किया जा सका। परिणामस्वरूप, वर्तमान अन्वेषण के दौरान खनिजीकरण की निरंतरता, ज्यामिति तथा गहराई में विस्तार को स्थापित नहीं किया जा सका और खनिज संसाधन का कोई आकलन नहीं किया गया। तथापि, भूभौतिकीय अन्वेषण पूरे खंड में किया गया, जिससे आगे के विस्तृत अन्वेषण के लिए क्षेत्रों को प्राथमिकता देने का आधार प्राप्त होता है।

खंड के शेष अनन्वेषित भाग में विस्तृत भूवैज्ञानिक एवं संरचनात्मक मानचित्रण, व्यवस्थित गर्त/चैनल नमूना-संग्रहण तथा विस्तृत भू-रासायनिक अन्वेषण के माध्यम से आगे के अन्वेषण की अनुशंसा की जाती है, विशेष रूप से संरचनात्मक रूप से परिवर्तित सर्पेटिनाइट तथा शैलविज्ञानिक संपर्कों के पार। इसके पश्चात प्राथमिकता वाले क्षेत्रों में विस्तृत धरातलीय भूभौतिकीय सर्वेक्षण तथा प्रारंभिक परीक्षात्मक वेधन किया जा सकता है, ताकि खनिजीकृत तंत्र की अधस्तलीय निरंतरता एवं गहराई में विस्तार का मूल्यांकन किया जा सके। उपलब्ध परिणामों से संकेत मिलता है कि यह खंड **निकेल-कोबाल्ट-प्लैटिनम समूह के तत्वों तथा सहवर्ती खनिजों** की संभाव्यता के लिए व्यवस्थित अनुवर्ती अन्वेषण का पात्र है।



CHAPTER 1: DETAILS OF THE QUALIFIED PERSON(S) / EXPLORATION AGENCY

1.1 Details of Investigating agency

- (a) Name: GeoExpOre Pvt. Ltd.
- (b) Address: #45(S), 2nd A Main Road, 2nd Cross, Chandra Layout, Bengaluru, 560040
- (c) Contact Mobile No: 9591167745/9980118930
- (d) E-Mail id: info@geoexpore.com
- (e) Qualification: NA
- (f) Experience: Received NABET accreditation, and notified by Ministry of Mines, Govt. of India.
- (g) Affiliation to any organization/ company, if yes, specify the name of the organization or company: NA

1.2 Details of qualification and experience of persons associated with various aspects of exploration assessment of resources and reserves

According to NMEDT work order, the entire Project was sanctioned for a period of 10 months. For this project work, GeoExpOre Private Limited deputed Project coordinator, Senior Geologist, Junior Geologist and Field assistance for completion of this project work.

Table No. 1.1 Personnel involved in the project.

Sr. No.	Name/ Email/Company	Qualification and Experience	Designation	Main Contributions
1	Ms. Mansi Kesarwani* (mansi@geoexpore.com) GeoExpOre Pvt Ltd.	M.Sc., MTech with 1 year of experience	Assistant Manager- Geoscience Strategy	Interpretation of data, map preparation and report writing
2	Mr. Adoni Gopal [#]	M.Sc. with 2 years of	Junior	Geological mapping,

	(info@geoexpore.com) GeoExpOre Pvt. Ltd.	experience	Geologist	topographic survey
3	Mr. Mohammad Muslemeen (mohammad@geoexpore.com) GeoExpOre Pvt Ltd.	M.Sc with 15 years of experience	Senior Geologist	Geological mapping, topographic survey, selection of samples for chemical analysis, interpretation of data, map preparation, and report writing
6	Mr. Sandeep Hamilton (sandeep@geoexpore.com) GeoExpOre Pvt Ltd.	M.Sc Geology (35 years of experience). Formerly Additional Director, Atomic Mineral Directorate (AMD)	Project Coordinator	Guidance throughout the field season, sample processing, analysis and report writing
7	Mr. Channamallikarjun B. Patil (cm@geoexpore.com) GeoExpOre Pvt Ltd.	MTech with 25 years of experience	Project Director	Supervision and guidance in geological mapping, topographic survey, core drilling, selection of samples for chemical analysis, and interpretation of data, map preparation and report writing.
8	Dr. Yerriswamy Pateel (ypateel@geoexpore.com) GeoExpOre Pvt Ltd.	M.Tech, Ph. D with 28years of experience	Project Director	Supervision and guidance in geological mapping, topographic survey, core drilling, selection of samples for chemical analysis, and interpretation of data, map preparation, and report writing.

*yet to be assessed by NABET

no longer part of company

CHAPTER 2: TITLE AND OWNERSHIP

Title of the Report

Reconnaissance Survey (G4) For Ni, Co, PGE And REE/ Associated Minerals In JC Pura Mafic Ultramafic Schist Belt Near Rampura And Gollarahatti (R-G) Block, Hassan District, Karnataka.

2.1 Name of the explorer/ Mining or prospecting rights holder

(a) Name: GeoExpOre Private Limited

(b) Address: # 45 S, 2nd A Main, 2nd Cross, Chandra Layout, Bengaluru- 560040.

(c) Contact Mobile No.: 9591167745 / 9980118930

(d) Email ID: info@geoexpore.com

(e) Qualification: NA

(f) Experience: Received NABET accreditation, and notified by Ministry of Mines, Govt. of India.

(g) Affiliation to any organization/ company, if yes, specify the name of the organization or company: NA

2.2 Details of period of prospecting/mineral right if any

Nil (Exploration carried out under NMEDT sanctioned order; no prospecting/mineral right granted). Chemical analysis of the collected samples was outsourced to Shiva Analytical (India) Pvt. Ltd., an NABL-accredited laboratory, for analysis as per the approved Scope of Work.

In case of a license or lease: NA.

CHAPTER 3: DETAILS OF AREA UNDER STUDY

3.1 Village, District, State

The proposed block is situated in the J C Pura mafic-ultramafic schist belt near Rampura and Gollarahatti block, Hassan district, Karnataka. It falls under the Survey of India Toposheet No. 57C/7. Most of the study area falls within agricultural land and the hilly terrain. The forest area is controlled by Range Forest Office, Arsikere, Hassan District, Karnataka.

3.2 Survey of India Toposheet No., Differential Global Positioning System (DGPS) coordinates of all corner points of the area and borehole points in latitude and longitude (Degree Minutes Second) format WGS-84 Datum

Survey of India Toposheet No.: 57C/7

DGPS Ground Control Points for all corner points of the area only. Since no drilling was undertaken hence no borehole points coordinates exist.

Table No. 3.1 - Ground Control Point (GCP) Coordinates Used for the Drone-Based Survey.

GCP	Latitude /Longitude Decimal Seconds (dd mm ss. ssss)	
	Latitude	Longitude
BASE2A	13°25'50.6269"	076°23'11.9688"
GCP01	13°25'52.9235"	076°23'22.7564"
GCP02	13°25'53.1392"	076°22'56.2432"
GCP03	13°26'04.0527"	076°22'51.0320"

GCP04	13°26'18.6806"	076°22'48.5790"
GCP05	13°26'17.6943"	076°22'37.1022"
GCP06	13°26'27.3289"	076°22'32.8528"
GCP07	13°26'29.4493"	076°22'48.9345"
GCP08	13°26'30.4241"	076°23'00.6341"
GCP09	13°26'19.6378"	076°23'02.5934"
GCP10	13°26'12.3692"	076°23'13.5418"
GCP11	13°26'11.2647"	076°22'58.5342"

3.3 Cadastral details of the area with land use, area under forest with type of forest. In case the cadastral details are not available an indicative data of breakup of government, private and forest land

The entire study area covers 7 corner points (A-G) and each corner coordinates are listed below. The entire Land use pattern was identified by advanced drone survey, and the entire study is falling into two major categories. The major land use patterns are agriculture land (58%), hilly terrain (40%) and followed by villager's settlement (2%). The agricultural land is owned by private village people and has surface rights. Kankatte Revenue office, Arsikere Taluk, Hassan District is maintaining the Hissa numbers and records and reveals that 5 to 10% hilly terrain is coming under the government land. The major water sources in the study are for the agriculture practices are pond and bore wells which are coming under the State Government's control.

Table No. 3.2 - Geographic Coordinates of the Corner Points of the Rampura–Gollarahatti Study Block.

Cardinal Points	Latitude	Longitude
A	N13°26'32.39"	E 76°22'27.95"
B	N13°26'32.21"	E 76°23'05.17"
C	N13°25'50.59"	E 76°23'29.33"

D	N13°25'39.58"	E 76°23'29.33"
E	N13°25'39.58"	E 76°22'42.56"
F	N13°26'13.49"	E 76°22'42.82"
G	N13°26'13.60"	E 76°22'27.84"

3.4 Mineral(s) under investigation or granted under license or lease

Mineral under investigation is Ni, Co, PGE and REE.

CHAPTER 4: PHYSIOGRAPHY AND ENVIRONMENT

4.1 Relief of the area with minimum and maximum elevation, drainage pattern, natural water courses, reservoirs, etc.

The study area comes under the J C Pura schist belt (mostly made of mafic and ultra-mafic rocks) which is equivalent to Sargur Group of rocks. The topography of the terrain is covered with hilly terrain with elevation of 780m to 860m (eastern part) and cultivation land (western part). The highest peak is observed in the Rampura village.

The drainage pattern of the Rampura–Gollarahatti study area and its surroundings was examined using the 1:50,000 scale Survey of India Toposheet No. 57C/7. The drainage network provides an important basis for planning follow-up geochemical exploration, particularly in areas underlain by mafic–ultramafic lithologies and structurally modified serpentinite.

The drainage channels draining the prospective ultramafic and structurally disturbed zones may be considered for systematic stream-sediment and Heavy Mineral Concentrate (HMC) sampling during subsequent exploration. Such sampling may help identify downstream dispersion of PGE-bearing and associated resistant heavy minerals and thereby assist in tracing potential mineralized source areas upstream. The drainage information should be integrated with geological, structural, geochemical and geophysical datasets for prioritization of prospective zones for detailed follow-up investigation.

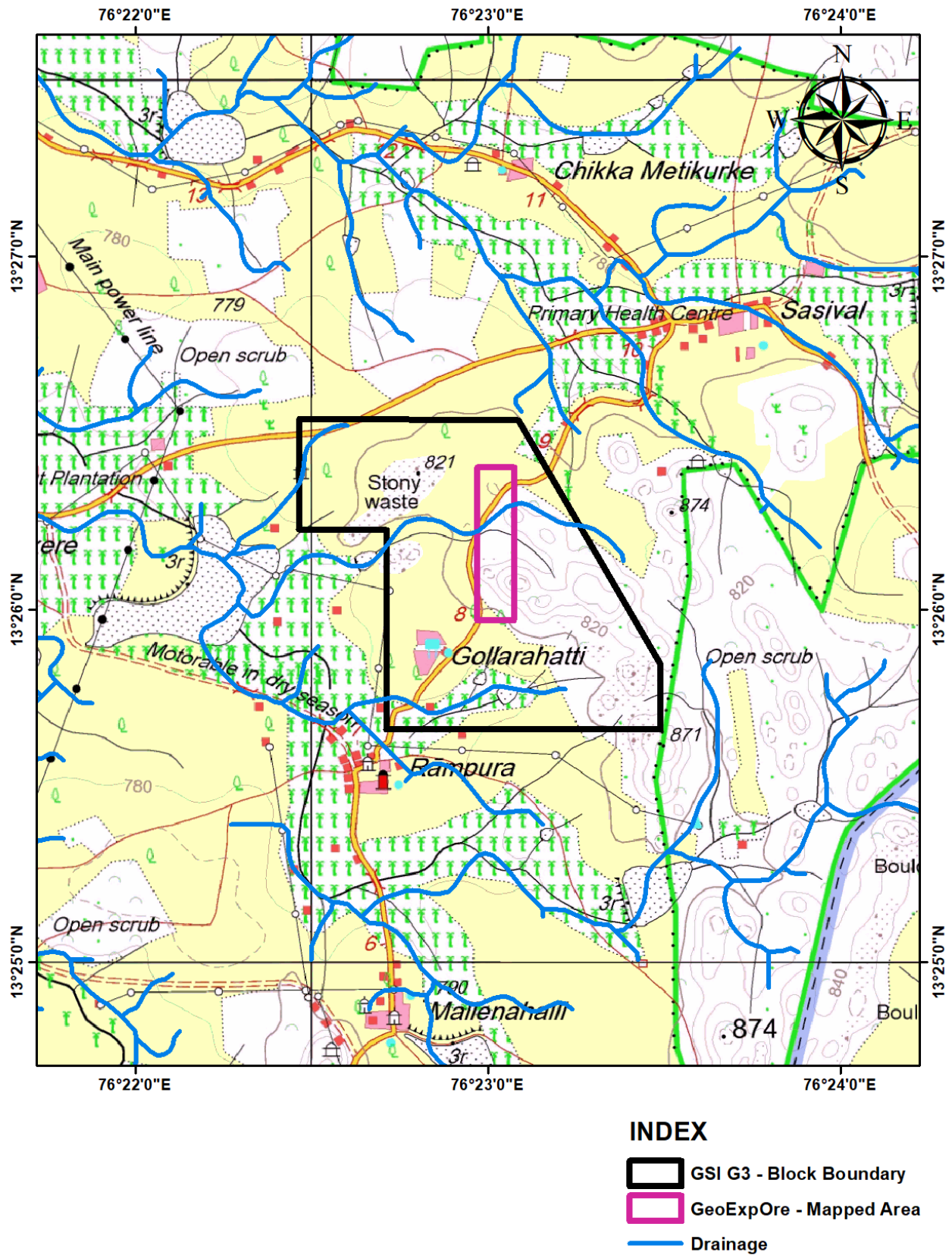


Figure No. 4.1 - Drainage map prepared on the 1:50,000 toposheet

The entire investigation area is covering Rampura and Gollarahatti Village which occurs in Arsikere Taluk of Hassan District, Karnataka and falls under the 57C/7 Survey of India toposheet as seen in Plate 1. The entire study area is located about 23 km Northeast of Arsikere town and 44 km North from its district headquarters Hassan, and 166 km NNW of Bangalore and has good accessible road networks (metalled and non-metalled). The nearest railway station is Arsikere which comes in the main line between Bangalore and Mangalore Railway station. Malekallu Tirupathi hill situated in the Arsikere Town is one of the important tourist sites. Besides, the area is in proximity to world famous tourists' spots of Belur, Halebidu and Shravanabelagola.

The Arsikere Town has administrative (police station, post office, revenue etc.), medical (hospital) and educational amenities whereas the Rampura and Gollarahatti villages have drinking water supply, communication system, power system and primary educational institutions.

The block area falling under 'free hold' category has land use pattern was identified by advanced drone surveys and the entire study is falling into two major categories. The major land use patterns are agriculture land (58%), hilly terrain (40%) and followed by villager's settlement (2%). The cadastral records state that agricultural land is owned by private village people and has surface rights. Kankatte Revenue office, Arsikere Taluk, Hassan District maintains the Hissa numbers. The records reveal that 5 to 10% hilly terrain is coming under the government land.

4.3 Host population (local tribes), Human settlements within and nearby the area

Arsikere town is municipal city of Hassan District which has population of 53,216, among 26,956 are males and remaining 26,260 are females (Census - India, 2011). Arsikere town is exhibiting highest rate of literacy rate (89 %) while comparing with state rate (75.4 %).

4.4 Socio Demographic profile of the area and nearby

The project area lies in a predominantly rural setting of Hassan District, Karnataka. As per Census 2011, Belur Taluk had a population of 184,458, with about 87.8% residing in rural areas. The literacy rate was approximately 76.7%, with a sex ratio of 1,020 females per 1,000 males. The local population is socially diverse, including Scheduled Caste and Scheduled Tribe communities. Agriculture and agricultural labour constitute important livelihood activities in the surrounding area.

4.5 Historical sites and archaeological monuments, places of worship, public utilities etc. within or near by

Malekallu Tirupathi hill is one of the most important tourist sites which is situated in the Arsikere Town and consists of other tourist places such as Belur, Halebidu and Shravanabelagola.

4.6 Forests, sanctuaries, national park and wildlife sanctuaries; grazing land and gochar land within or near by the area with distance from periphery of the area explored.

There is no National Park/Forest around the current area of investigation.

4.7 Flora and Fauna within and nearby

The flora of the area is mainly covered with *Oryza sativa* in the paddy field and thorny bushes and plants on the slopes of the ghat sections. The fauna in the study area is mostly consisting of vertebrate mammals such as *Vulpes vulpes* (foxes) and *Macaca mulatta* (monkeys) and vertebrate Reptiles are *Serpentes* (snakes).

4.8 Water bodies such as river, nala, stream, reservoir, etc., within or nearby

There is no major river in the study area. The major drainage pattern of the study area is controlled by few second order streams (tributary of Hire Halla) which flow in the ENE-WSW directions. The major water supply in the study area is streams and boreholes as there is no canal system.

4.9 Climatic conditions

The weather conditions in the study area are generally hot in summer (19°C and 35°C) and cold in winter seasons (14°C and 26°C). The maximum temperature is expected normally in the month of April. In generally the summer starts from the middle of February and continues up to the end of June. The monsoon starts due to southwest wind circulation pattern and extends up to end of September (average rainfall 517 mm) and followed by winter season.

4.10 Any other physiographic, social and environmental factor having potential to affect the viability of the project and assessment of resources and reserves.

None.

CHAPTER 5: INFRASTRUCTURE

5.1 Local infrastructure details

In the study area, major infrastructures such as police station, post office, hospital, educational institutions are available in the Arsikere town and other infrastructures such as drinking water supply, communication system, power system and primary educational institutions are available in the Rampura and Gollarahatti Village. There is a good road network system available for connection of town and village. The environment around the present investigation area is quite pleasant as no industries and active mines are present nearby.

CHAPTER 6: GEOLOGY

6.1 Brief regional geology of the area outlining the broad geological, stratigraphical and structural framework.

The J.C. Pura Schist Belt represents an Archean ultramafic-dominated greenstone sequence belonging to the Sargur Group and is characterised by komatiitic affinities, extensive serpentinization and multiple phases of deformation. The preservation of spinifex textures, pillow structures and layered ultramafic-mafic associations reported by earlier workers indicates derivation from high-temperature mantle melts and suggests a favourable geological environment for magmatic segregation of Ni-Co-Cr and PGE-bearing sulphides.

The NW-SE structural grain of the belt, together with later cross-cutting lineaments identified from satellite imagery, suggests repeated tectonic reactivation. Such structural corridors may have acted as pathways for hydrothermal remobilisation and local concentration of sulphide mineralization. The coincidence of alteration zones, aeromagnetic signatures and ultramafic lithologies indicates a geologically fertile terrain warranting detailed exploration for strategic and critical minerals.

6.1.1 Jayacharajpura (J.C. Pura) schist belt

Stratigraphic status of J C Pura Schist Belt: In WDC, Sampat Iyengar (1907) showed a narrow NW-SE trending branch of the chlorite schist that gets split from the main Chitradurga schist belt along its western margin, near Dodguni wraps around the gneissic rocks near Chikkanayaknahlli and continues further. This off shoot of the main belt is referred to as the Kibbanahalli arm of the Chitradurga schist belt. The dismembered schistose formations and the mafic-ultramafic rocks occurring to the west of the Kibbanahalli arm, near Sasivala village were considered to represent the basal units of the Chitradurga Group (Drury, 1983). Seshadri et.al (1981), during geological mapping of this area on 1: 50,000 scale, recognized the dismembered supracrustals as to forming

a small spindle shaped belt comprising of serpentinite, meta-ultramafic schists, soapstone, amphibolite and subordinate quartzite. He designated this belt as 'Sasivala belt' and classified under Sargur group. The published geological map of Karnataka and Goa (1:0.5 million scale) of GSI depicts this belt to be composed of ultrabasic rocks of Archaean age, exhibiting a closure towards the south. Venkatadasu and Mahalaxmamma (1986) proposed that this belt can be designated as 'Jayachamarajapura belt' instead of 'Sasivala belt' since village Sasivala is located over the formations of Kibbanahalli arm.

The stratigraphic status of the J.C. Pura belt was controversial as a group of scientists believed it to be part of Dharwar Supergroup and the others considered it represent pre-Dharwarian supracrustals. Venkatadasu and Mahalaxmamma (1986) established an unconformable relationship of the J C Pura Belt with the rocks of the Chitradurga Group exposed in the Kibbanahalli arm. The crucial basement cover relationship was studied by these authors in the trenches and pits where they observed that the foliation direction of the talc-tremolite-chlorite schists of this belt strike in NNE-SSW direction, whereas the basal quartzite band of the Kibbanahalli formation overlies it with a NW-SE strike, indicating an angular unconformity. This relationship is clearly exhibited in the area south of Chikkamettikurke. Thus, it is inferred that the Jayachamarajapura belt is older to the Chitradurga belt rocks of the Kibbanahalli arm.

Tentative stratigraphy, structure and metamorphism of the J.C. Pura Schist Belt: the internal lithologic constituents of the J. C. Pura schist belt comprise:

- i. Ultramafic rocks of J.C. Pura belt consist of peridotite, dunite, pyroxenite, locally gabbro and schistose ultramafic rocks represented by talc-tremolite-chlorite-actinolite schists:
- ii. The ultramafics are closely associated with thin and discontinuous bands of cherty quartzite, carbonate rock, hornblende schist/amphibolite, and banded magnetite quartzite, and
- iii. The above supracrustals are intruded by (a) the Arsikere and Banavara granites(ii) pyroxenites, gabbro, dolerites and (c) pegmatites and quartz reefs.
- iv. Several shear zones have been noticed comprising of sericite quartz schist, talc-quartz schist and mylonite.

- v. Effects of regional low-to medium grade metamorphism of the constituent lithologies and retrogression of the gneisses adjacent to such zones of shearing resulting in the formation of epidote gneiss are observed.

The Geological Survey of India conducted two geological mapping programs one each by Venkatadasu and Mahalaxmamma (1980) on 1:25,000 scale and Tom and Kumar (2015) one 1:12,500 scale. The dismembered, discontinuous (and local nature of the few of the constituent units) pose serious constraints in proposing the true stratigraphic column. In such terrains only tentative-stratigraphic columns are proposed. Each of the above mapping projects proposed tentative-stratigraphic columns. But for minor, local variations both the proposals are similar as shown in the Table No.6.1.

Table No. 6.1 – Tentative-stratigraphic column for the J C Pura Schist Belt

Lithostratigraphic Unit	Venkatadasu and Mahalaxmamma 1980(Based on 180 sq kms of mapping on 1: 25,000 scale)	Tom and Kumar,2015 (Based on 100 sq. kms of mapping on 1:12500 scale)
Dyke activity/ Younger intrusive	Pyroxenite and dolerite	Quartz reef, Pegmatite, Gabbro/dolerite, Pyroxenite
Shear zone rocks	Mylonite, Sericite-quartz schist, Talc-quartz schist and Epidote gneiss (green gneiss)	Cherty quartzite / Quartz–muscovite-sericite / Quartz–talc-chlorite schists (Mylonites)
Intrusive Arsikere Granite	Pegmatite and quartz veins (Granite (Arsikere granite))	Granite
Gneisses	Pink feldspar – hornblende gneiss (pink gneiss); Banded grey biotite gneiss (grey gneiss)	Migmatite gneiss (TTG) / Epidote gneiss with syn-plutonic dykes (Amphibolite)
Archaean (volcanics)	Passive and schistose ultramafic rocks interspersed with bands of cherty quartzite, magnetite-talc-chlorite schist, carbonate rock, hornblende schist / amphibolite and banded magnetite quartzite	Tremolite chlorite schist Hornblende schist (Hornblendite) Serpentinite (Schistose and massive meta-peridotite)
	Base not seen	

The ultramafics show pillow structures and polyhedral jointing in the field and relict spinifex textures under thin sections, indicating that they are possibly peridotitic komatiites. It is further supported by comparison of major element geochemistry with well-established komatiites.



Figure No. 6.1 - A. Spinifex textured komatiite of J.C. Pura Belt. B. Pillow komatiite of J. C. Pura Schist Belt. (Photos by M. Jayananda, printed in Ramakrishnan and Vaidhyananadan, 2010.)

Primary depositional features in the metasediments and primary volcanic features in meta-volcanics (e.g. pillow structures, Figure No. 6.1) though discernible and well documented, could not be used for the structural analysis due to the impersistent and disturbed nature of such structures. The dominant structural fabrics i.e. S1 parallel S2 foliations trend NNW-SSE with steep dips, dipping on either side of the foliations. Venkatadasu and Mahalaxmamma (1980) interpreted the structure of the belt as to represent a doubly plunging anti form (elongated dome) structure bordered by synformal keels along a roughly N-S axis. Biotite gneiss occupies the core of antiform. The northerly closure of this fold is noticed north of Gollarahatti and the southerly closure to the SE of Tumbapura. The dip of the formations on both limbs and closures is from 40° to 50° dipping away from the centre. The above structure has been interpreted as a result upward doming of gneisses or due to interference of folds. These structures are truncated by the Dharwar unconformity (basal units of the Chitradurga Group in Kibbanahalli arm).

The detrital quartzites give SHRIMP U-Pb age of ~3300 Ma which is also corroborated by the Sm-Nd dating of the ultramafics (Ramakrishnan and Vaidyanathan, 2010). Arsikere granite, granite porphyry dykes and basic dykes of dolerite constitute the younger intrusives, while quartz

veins and pegmatite traverse the granite variants associated with PGC. Small bands of desilicated corundum bearing rock occur within the meta-ultramafic.

6.1.2 Surface indication of mineralization, if any, if so nature of host rock for mineralization

6.1.2.1 Base metal mineralization:

Thiagarajan, et al., (1976-78) during their traverses, located two oxidised zones indicated copper mineralization to the north of Kadikengal Betta and southwest of Ramananalli. Palaniappan, (1979-81) further studied the gossans by detailed surveys and drilling for copper and found to be not of economic significance. Further studies by Tom and Kumar (2015) recognised sulphide disseminations in the form of Pyrrhotite- pyrite; pentlandite – millerite assemblages in serpentinite, younger gabbro and pyroxenite dykes near Gollarahatti-Ramananalli and contiguous areas. Chlorite schist bands host secondary pyrite.

6.1.2.2 Ni-Co-PGE-and Cu mineralization:

Tom and Kumar (2015) reported Ni-Co mineralization in the form of greenish tinge in talc serpentinite near Gollarahatti village. Chromite, chromite- sulfide, sulfide and magnetite form the major collectors for magmatic Ni-Co-PGE and Cu mineralization.

6.1.2.3 Exploration significance of local lithologies

The lithological assemblage comprising serpentinite, talc-tremolite-chlorite schist, amphibolite & meta-gabbro represents a typical metamorphosed ultramafic-mafic association. Among these lithologies, serpentinite and its schistose variants constitute the most prospective host rocks owing to their favourable geochemical composition and previously reported Ni-Co-PGE occurrences. Pegmatite occurs as a late-stage, cross-cutting felsic intrusive body/vein within the mafic–ultramafic lithological assemblage of the investigated area. It is lithologically distinct from the

ultramafic rocks and is not considered genetically part of the mafic–ultramafic igneous suite. Its occurrence along fractures and lithological contacts indicates emplacement during a later intrusive and structural phase.

Serpentinisation has extensively modified the primary ultramafic rocks and is expressed by the development of talc-, chlorite- and tremolite-bearing assemblages. Such alteration processes are commonly associated with redistribution and local enrichment of chalcophile elements. The schistose margins of serpentinite bodies are interpreted as structurally weakened zones that may provide favourable sites for sulphide accumulation and remobilisation.

6.2 Local geological setting detailing the common rock types, controls of mineralization, details of old workings if any, surface exposures, etc., of the area under study also of adjoining nearby areas, if the information is likely to have an impact on the area under study.

6.2.1 Exploration Strategy

Considering the occurrence of mafic–ultramafic lithologies, structurally modified serpentinite and the low-level PGE enrichment identified during the present investigation, further exploration for IPGE mineralization should focus on systematic evaluation of both bedrock and drainage-derived material. Detailed geological and structural mapping should be followed by systematic bedrock sampling across serpentinite bodies, lithological contacts, shear zones and other structurally favourable zones, with particular attention to Cr-spinel-bearing ultramafic horizons.

Drainage-based exploration should also be undertaken in the unexplored portions of the block by systematic sampling of active drainage channels and suitable sediment traps. Heavy Mineral Concentrate (HMC) sampling and panning of drainage sediments should be considered to identify and concentrate resistant PGE-bearing minerals and associated indicator minerals derived from the upstream ultramafic source rocks. The distribution of anomalous PGE values and indicator minerals in drainage samples should subsequently be integrated with geological, structural and

geophysical information to delineate prospective source areas.

Based on the integrated results, detailed follow-up geochemical sampling, ground geophysical investigations and scout drilling may be undertaken over prioritized zones to evaluate the subsurface continuity and depth persistence of the mineralized system. The proposed strategy is intended to establish the source, spatial continuity and subsurface extent of any IPGE mineralization before undertaking more detailed resource-oriented exploration.

6.2.2 Details and nature and quantum of work proposed vs achievement

To achieve the objectives as stated above the following studies were planned:

1. Detailed Drone survey for delineation of various Land use / Land cover (LULC) pattern, structural and topographical features in the study area.
2. Geophysical (Gravity) survey to find out the subsurface potential anomalous zones and possible variations in the litho-units with an aim to identify mineral alteration zones.
3. A detailed Geological and structural map (1:2000) for identification and delineation of boundaries of potential mineralized zones.
4. Geochemical exploration via stream sample, Bed rock sample, Pit sample and trench samples. and
5. Sub surface investigation for identifying the depth persistence of the potential mineralized zones

The details of NQT and Achievement for this project work are given below in Table 2.1

Table No. 6.2 - Nature, Quantum and Target (NQT) of Proposed Exploration Work and Achievements During the Investigation.

Sr. No.	Nature of Work	Target Assigned	Achievement
1	GEOLOGICAL EXPLORATION		
a	Geological Mapping (LSM 1:2000 SCALE) AREA 2 SQ.KM.	0.85 Sq. Km.	0.15 Sq. Km.
2	GEOPHYSICAL EXPLORATION		

a	Geophysical Investigation - Gravity Method – 2 profiles, spacing 100 m, 10 stations on each profile (10 x 20 =200)	200 Stations	200 Stations
b	Survey work- boundary survey, surface features	2.00 Sq. Km	2.00 Sq. Km
3	SURFACE AND SUB-SURFACE GEOCHEMICAL		
a	Bedrock sample (Nos.)	150	15
b	Surface Exploration- Pitting/trenching(m ³)	150 (m ³)	*
c	Subsurface Exploration- Drilling (m)	—	*
d	Stream Sediment Sample (Nos.)	—	*
e	Core Sample (Nos.)	—	*
f	PT sample (Nos.)	50	*
4	CHEMICAL ANALYSIS NUMBERS (AS PER APPROVED NQT)		
a	Analyses of Geochemical- BRS, Trench/Pit for Ni (Fire Assay) and associated minerals (Co etc.)	200	15
b	Check samples- Ni, Co, PGE (15%) (Ni Fire Assay)	30	*
c	EPMA Studies	10	*
d	Whole Rock Analyses XRF (Major Oxides and additional trace elements)	10	*
5	PETROGRAPHIC STUDY		
a	Preparation of thin sections	10	*
b	Complete petrographic / ore microscopy study and mineralgraphic studies	10	*
c	Preparation of polished sections	10	*

*The target couldn't be achieved due to strong protest and objection coming from the local villagers. Due to unreceptive, life-threatening environment, all the field-based components of the project study were abandoned since 8th August 2023. The situation was communicated to DMG,

Karnataka and National Mineral Exploration and Development Trust (NMEDT) through email as well as surface mail.

6.2.3 Outcrop mapping

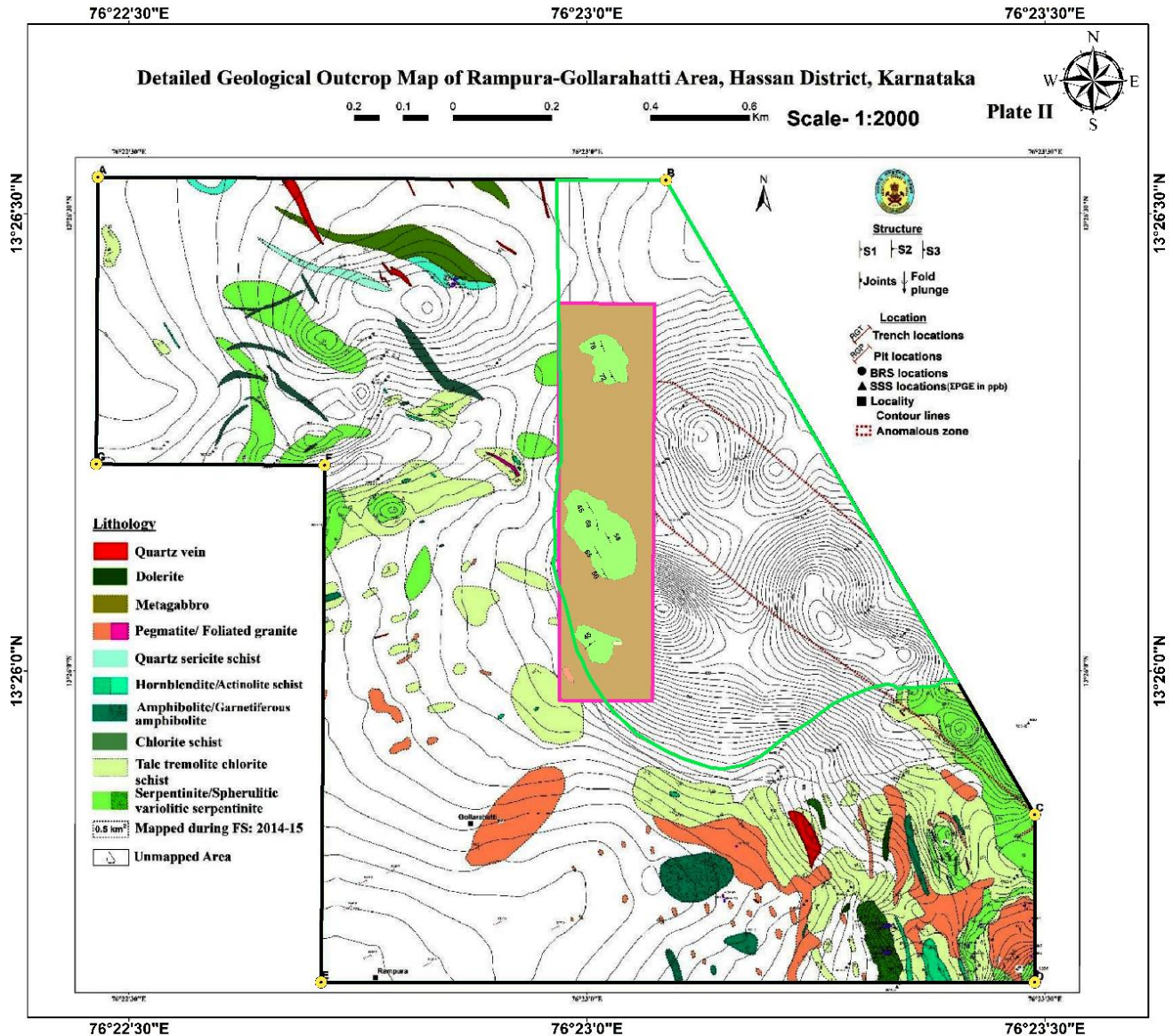
Based on the previous work carried out by GSI, detailed geological and structural mapping at 1:2000 scale was proposed in the remaining unmapped area of 0.85 sq. km to delineate lithological units, structural features and zones of alteration associated with ultramafic rocks.

For systematic execution of the survey, the unmapped area was divided into six sub-blocks, each covering approximately 0.15 sq. km, following the survey principle of “working from whole to part”. Detailed geological and structural mapping commenced in Sub-block 1 on 5th August 2023.



PLATE - 2

**OUTCROP MAP OF RECONNAISSANCE SURVEY FOR Ni, Co, PGE & REE /
ASSOCIATED MINERALS IN J C PURA MAFIC ULTRAMAFIC SCHIST BELT NEAR
RAMPURA AND GOLLARAHATTI (R-G) BLOCK, HASSAN DISTRICT, KARNATAKA**

**INDEX**

- Cleavage/Foliation/Schistosity
- GSI - G3 Cardinal Points
- GSI - G3 Block Boundary
- Unmapped Area - 0.85 Sq.Km
- GeoExpOre Mapped Area - 0.15 Sq. Km

Lithology (0.15 Sq. Km)

- Soil Cover
- Pegmatite
- Talc-Tremolite-Chlorite Schist
- Serpentine

Formation

Younger intrusives

J.C. Pura Schist belt

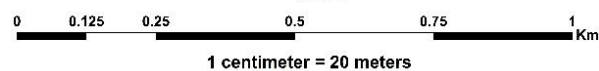
Group

Sargur Group

Age

Late Archean

Palaeoarchean - Mesoarchean

1:2,000

6.2.4 Detailed /geological and structural mapping

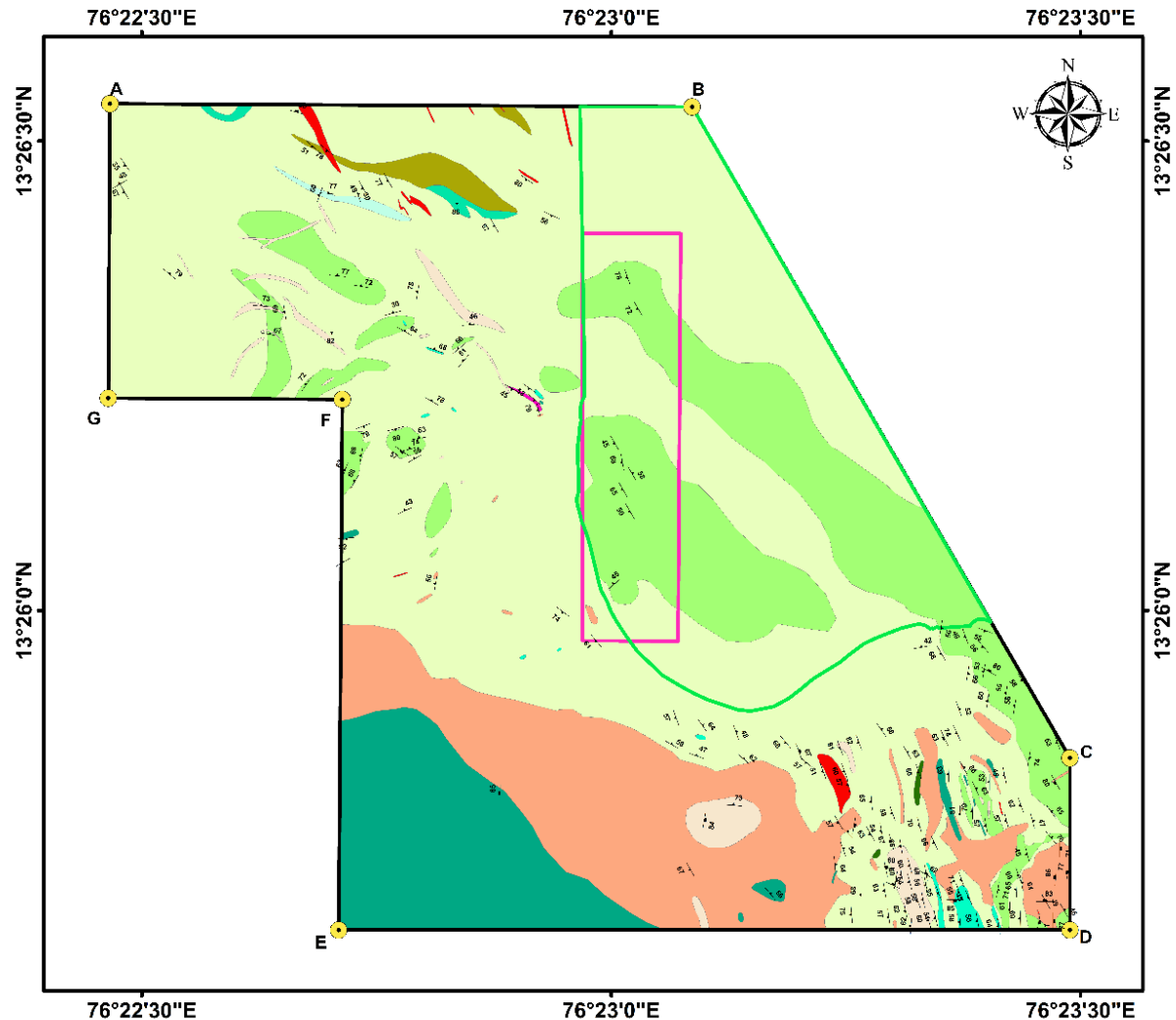
The detailed geological mapping carried out over an area of approximately 0.15 sq. km in Sub-block 1 revealed the occurrence of serpentinite, talc–tremolite–chlorite schist and pegmatite as the principal lithological units (Plate 3). Serpentinite constitutes the dominant lithology and occurs as elongated bodies aligned predominantly in NW-SE direction, conformable with the regional structural trend of the J.C. Pura schist belt.

The serpentinite bodies exhibit varying degrees of deformation and alteration. Schistosity development and talc–chlorite enrichment are observed locally, particularly along lithological contacts. Pegmatite intrusions occur as younger cross-cutting bodies within the ultramafic assemblage.

Structural observations indicate the presence of non-symmetrical plunging folds, schistosity and local sheared zones within serpentinite bodies, suggesting multiple phases of deformation. Structurally disturbed zones are observed particularly in the southern part of the mapped area.

Further geological and structural mapping in Sub-blocks 2 to 6 could not be completed due to local public interference and agitation, resulting in discontinuation of field activities.

PLATE - 3
GEOLOGICAL MAP OF RECONNAISSANCE SURVEY FOR Ni, Co, PGE & REE /
ASSOCIATED MINERALS IN J C PURA MAFIC ULTRAMAFIC SCHIST BELT
NEAR RAMPURA AND GOLLARAHATTI (R-G) BLOCK, HASSAN DISTRICT, KARNATAKA

**INDEX**

-  GSI - G3 Cardinal Points
-  Cleavage/Foliation/Schistosity
-  GSI - G3 Block Boundary - 2 Sq. Km
-  Unmapped Area - 0.85 Sq.Km
-  GeoExpOre Mapped Area - 0.15 Sq. Km

Lithology

-  Quartz vein
-  Dolerite
-  Pegmatite
-  Foliated granite
-  Metagabbro
-  Quartz-sericite schist
-  Hornblende
-  Actinolite schist
-  Amphibolite
-  Chlorite Schist
-  Talc tremolite chlorite schist
-  Serpentine
-  Spherulitic serpentine

Formation

Younger
intrusives

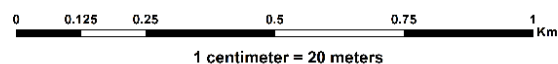
J.C. Pura
Schist belt

Group

Sargur Group

Age
 < Palaeoproterozoic
 Palaeoproterozoic
 Late
 Archean

Palaeoarchaen-
Mesoarchaen

1:2,000

6.2.5 Description of rock types

6.2.5.1 Serpentinite

Serpentinite constitutes the dominant lithological unit in the investigated area and occurs as elongated bodies trending predominantly in NW-SE direction, conformable with the regional structural grain of the J.C. Pura schist belt. The rock is dark green to greenish black in colour, fine- to medium-grained and exhibits varying degrees of deformation, schistosity and weathering. Serpentinite constitutes the principal host lithology for Ni-Co-PGE mineralization in the study area.



Figure No. 6.2 – Field photograph showing an exposure of serpentinite in Block I near Rampura, illustrating its contact relationships, degree of serpentinization and structural fabric.



Figure No. 6.3- Quartzo-feldspathic vein intruding serpentinite in Block-1, illustrating the cross-cutting relationship between the felsic vein and ultramafic host rock.

Megascopically, the serpentinite is massive to schistose in nature and locally exhibits slickensides, fractures and foliation planes. In several locations, talcification and chloritisation are observed along structurally disturbed zones and lithological contacts. Quartz and pegmatitic veining are also noticed locally cutting across serpentinite bodies.

The serpentinite is interpreted to represent altered ultramafic protolith that has undergone extensive serpentinisation during tectono-metamorphic processes. Owing to its ultramafic affinity and favourable geochemical signatures, serpentinite constitutes the principal host lithology for Ni–Co–PGE mineralization in the study area.

6.2.5.2 Pegmatite

Pegmatite occurs as discontinuous intrusive bodies and veins within serpentinite and associated schistose units. The rock is coarse-grained, light coloured and composed predominantly of quartz and feldspar with subordinate mica. Pegmatite was investigated as a potential host for REE and rare metal mineralization, although no significant geochemical enrichment was observed within the investigated area.

Field relationships indicate that pegmatite represents a younger intrusive phase cross-cutting the ultramafic assemblage. The pegmatitic bodies are generally discordant in nature and locally occupy structurally weakened zones such as fractures and joints. No direct evidence of mineralization association with pegmatite was observed during the present investigation; however, quartz veining associated with pegmatitic intrusion may indicate episodes of fluid movement and tectonic reactivation.

6.2.5.3 Talc–chlorite schist

Talc–chlorite schist occurs as schistose and altered zones associated with serpentinite bodies, particularly along lithological contacts and structurally disturbed zones. The rock is soft, foliated

and greenish grey in colour with prominent schistosity. It represents altered ultramafic rocks formed during hydrothermal alteration accompanying serpentinization.



Figure No. 6.4 - Schist exposed in the investigated area showing the observed foliation and characteristic schistose fabric.



Figure No. 6.5 - Talc–tremolite–chlorite schist exposed in the investigated area, showing the characteristic mineral assemblage and schistose fabric

The schist is interpreted to represent metamorphosed and altered ultramafic rock formed through serpentinitisation, talcification and chloritisation processes. In several locations, the rock shows evidence of intense deformation and foliation development indicating tectonic modification.

The close spatial association of talc–chlorite schist with serpentinite suggests its derivation from the ultramafic protolith and indicates favourable conditions for redistribution and localisation of metallic constituents along structurally modified zones.

CHAPTER 7: PREVIOUS EXPLORATION

7.1 Previous studies

7.1.1 Stratigraphy and geo-tectonic developments in the study area

Sampat Iyengar (1907) produced the first geological map of the area on 1:1-mile scale and provided the earliest description of the geology of the area. He was first among the early geologist State Department of Mines and Geology, Karnataka, who recorded the field descriptions of the mafic/ultramafic rocks of this area and assigned its status as to represent greenstone sequences older to the Dharwar System. Later B. Rama Rao (1921) re-examined the area and concurred with the interpretation given earlier. Pichamuthu (1951) studied the ultramafic rocks of this belt enclosed within gneisses (enclaves) and assigned them as the differentiated products of the original ultrabasic magmas that are later undergone low grade metamorphism.

The Geological Survey of India carried out first systematic geological mapping of this area on 1:50,000 scale Viswanatha (1976; 1981) and reported a lithostratigraphic column for the area. According to this study the mafic and ultramafic supracrustals that occur as discontinuous narrow skeletal strips and that envelop oval shaped Peninsular Gneissic outcrop (diapiric domes) as to represent the stratigraphically older sequence belonging to the Sargur Group. In view of its unique stratigraphic status, dominant ultramafic assemblages and reported incidences of gold and silver in this terrain, a second-generation geological mapping on 1:25, 000 scale was launched (Venkatadasu and Mahalaxmamma, 1986). This study has brought out several interesting features. This study includes:

- i. This belt forms a major structural dome linking a trail of enclaves to the north and south and thus constitutes part of a much larger geo-tectonic domain than hitherto construed.
- ii. The main lithology of the belt is altered komatiites preserving excellent polyhedral joints, pillows, ocelli and spinifex textures.

- iii. The peridotitic komatiites are closely associated with the basaltic komatiites now represented by dark shiny amphibolites.
- iv. The cherty quartzites and BIF form minor units in the belt and represent their deposition in a shallow continental regime.
- v. The litho-assemblages of the belt are typical of the older greenstones, i.e Sargur Group of Karnataka and that they are overlain unconformably by the basal quartz-pebble conglomerate and associated amygdular metabasalt - crossbedded quartz arenite of the Bababudan Group in the Kibbanahalli arm of Chitradurga schist belt. The Kibbanahalli volcanics are mainly tholeiites as distinct from the dominant komatiites of the JC Pura belt.

Such geo-chemical distinction offers yet a spectacle of Sargur-Dharwar orogenic discrimination in Karnataka.

Ramakrishnan et al (1994) dated euhedral zircons with minor rounding of pyramidal terminations in the metaquartzite of this belt by evaporation technique which yielded a Pb-Pb age of 3230 ± 5 Ma. These authors interpret this date as representing the maximum age of the Sargur metaquartzite and that still older gneisses seen in the neighbourhood (3300 Ma old Gorur gneisses) may constitute a possible basement to the Sargur supracrustals and represent widespread early Archaean granitic crust of the Dharwar craton.

Prabhakara and Namratha (2014) carried out a detailed petrographic study of the komatiitic ultramafic rocks and reported several flow characteristics and sub-volcanic emplacement features typical of well-known komatiitic areas of the world. Despite deformation, metamorphism and alterations the J C Pura komatiites have preserved many of the primary cooling structures like pillows, flow-top polyhedral joints, ocelli, vesicular, flow-top breccia and cumulate segregations and crude layering, which stand testimony for their extrusive volcanic nature. However, massive, undifferentiated nature of komatiitic flows is more predominant. Because of serpentinization, carbonatization and chloritization, the original mineralogy and textures are obliterated and scantily preserved. Still, these observed features provide vital clues to imply the formation of komatiite sequences in a submarine to subaerial conditions when episodic pulses of komatiite lava piled up (about 3.35 Ga ago) to form the ultramafic milieu of J.C. Pura belt.

A detailed structural analysis of J.C. Pura belt by Chardon et. al., 2008, indicates two strain fields compatible with the hypothesis that it is associated with the development of diapiric-type gravitational instabilities and associated with two deformational episodes: D1 and D2. The D1 episode produced dome and basin structures and affected merely the older greenstones and the gneisses. The D2 episode affects only the younger greenstone belt, which has the overall geometry of a complex syncline.

More recently, Santosh et al (2023) have carried out geochemical studies of ultramafic rocks. This study suggests though the komatiite nature of ultramafics is conspicuous in most of the areas of the belt these ultramafics are massive in nature and in some places the ultramafic units show layered nature. But their outcrops of the latter are encompassed within the massive komatiitic bodies. These komatiitic ultramafics are predominantly Mg-rich in nature. The layered rocks are also Mg-rich, and their field setting and geochemistry suggest their intermittent occurrence as sills, during the differentiation of peridotitic magma. The layered rocks, which have been intensely serpentinization show homogenous nature, almost wholly made of serpentinite with occasional relics of pyroxene and secondary carbonate. Their higher MgO content indicates Mg-rich ultramafic magmatism during Archaean orogeny and inferred to have been derived from depleted mantle source.

7.1.2 Mineralization in this area.

From a mineralization perspective, mafic-ultramafic rocks of the older Sargur Group received much attention as commercially exploitable chromite, magnesite deposits, copper-nickel, Ni-PGE and V-Ti- magnetite, asbestos, soapstone, ruby/sapphire mineralization of possible commercial value and gold incidences in many of the old workings have been located with good success in different parts of the craton. Though the above reports in similar geo-tectonic milieu bolstered the possibility of such types of mineralization in the ultramafic rocks of this area, a few attempts made towards finding a substantial mineralization has eluded for various, mainly non-technical reasons. The only current exploitation of economic minerals in this area is related to small-scale mining of serpentinite (talcose) and asbestos (chrysotile/ tremolite) and quarrying for dimension stones and silica (quartz). A brief account of the reports/incidences of economic minerals of in the current- and contiguous areas is described here.

Airborne Mineral Survey Wing of GSI took several mineral investigation projects. This includes:

- i. Ramakrishnan (1971) examined the area in connection with asbestos investigations.
- ii. Thiagarajan, et al., (1976-78) during their traverses, located two oxidized zones indicating copper mineralization to the north of Kadikengal Betta and southwest of Ramananalli.
- iii. These areas further studied by detailed surveys and drilling for copper by the AMSE Wing of the Geological Survey of India and indicated mineralization in the form of pyrite with lean values for Cu and Zn (Palaniappan, 1979-81).
- iv. Ramachandran (1977-78; 1980-81) brought out a photo-geological map for toposheet 57 C/7 and correlated the airborne geophysical and geological data. He applied geo-statistical techniques in interpretation of aeromagnetic data and suggested some more areas for detailed ground examination regarding mineralization.
- v. Paliniappan and Vayangankar (1991) carried out ground evaluation of aeromagnetic data and geological data moderate to high magnetic relief indicating rich ferromagnetic minerals and low relief indicated by gneissic and granitic terrains.
- vi. To understand the significance of the air-borne magnetic anomaly data, the nature of the constituent lithological units, their mutual field relationships, structure, petrography and chemistry. Venkata Dasu and Mahalakshamma (1986) mapped the area on 1:25,000 scale and studied the area in greater detail. These studies have thrown new light on the evolution of the various rock types, their structure, stratigraphy and geological history of the area. These authors did not report any base-metal or Ni-related mineralization though, they recorded occurrence of magnetite, corundum and garnet.

Rashmi et al (2009) carried out geobotanical mineral exploration in this area. These authors collected plant species and soil over high Mg Komatiite-bearing areas and found that out of seven plant species analysed, one species, i.e. *Vicoaindica* has indicated higher Ni values (540-896 ppm), and it is potential as a local indicator for Ni. The soil samples have yielded distinct signatures of Ni (3126 -12406 ppm) and Co (382-1071 ppm). This study warrants a detailed study of this belt for these elements. The EPMA studies of sulphides from the ultramafic rocks by Prabhakar et al., (2014) have brought out cobalt-nickel occurrence followed by pentlandite pyrrhotite-chalcopyrite assemblage.

During last one decade, geologists from Operations Karnataka and Goa, launched two major projects (Tom and Kumar, 2015 and Fayazudeen et al 2019) to evaluate the mineral potentials of the mafic ultramafic rocks of this area. Tom and Kumar (2015) carried out large scale mapping of this area on 1:12,500 scale (100 Sq. Km area) and detailed mapping on 1: 2000 Scale (for 0.50 Sq. Km). These authors reported:

- Incidences of Ni (from 20 to 3515 ppm), Cr (from 15 to 16,100 ppm), Co (35 to 330) and Cu (from 10 to 340 ppm), the maximum copper content is recorded in schistose ultramafics and its variants, clearly suggesting role of structure and metamorphism in base metal mineralization of the area (epigenetic).
- During EPMA studies Pentlandite- pyrrhotite- chalcopyrite assemblages were identified. Two grains of palladium of bismuth – palladium (Kotulskite; 1.0-micron size) were found as inclusions in pentlandite in a spherulitic serpentinite.
- Ni max, Co max and Cr max values are shown in the south-eastern range of Rampura village.
- Also reported PGE concentration from 9.5 to 158 ppm.

Fayazudeen et al (2019) carried out detailed mapping on 1:2000 scale for 1.50 sq. km area and reported massive serpentinite between Gollarahatti and Kamasamudra, their schistose variant near Gollarahatti and east of Doddaghatta and spherulitic serpentinite to southeast of Gollarahatti. These authors recommended further investigation to know the depth persistence of the mineralized zone.

Talukdar et al (2018) carried out petrological studies of the meta-ultramafites (talc-actinolite-chlorite schist) of this area and identified discrete gold and silver grains in idiomorphic magnetite with exsolved anhedral ilmenite and in magnetite veinlets. Besides the above grains smaller grains of monazite are also reported. These authors also conducted X-ray element mapping for individual grain of gold and silver, which demarcates size along with its percentage. Gold grains are of 3-6 μ in size; oval, rounded and flaky in shape and Au percentage ranges from 52.08 to 91.34 wt%. Silver grain is oval. These findings highly warrant an evaluation of mineral potential of J C Pura schist belt with respect to gold and silver.

Petrographic studies by Santosh et al (2023) revealed presence of disseminated sulphide minerals in layered dunite-peridotites rocks. Sulphides are seen as dispersed grains both as independent grains and with oxide phases. Disseminated pyrrhotite and pentlandite grains exist in exsolution form. The exsolved magnetite-ilmenite is the most common phase. Pentlandite, chalcopyrite, and pyrite are multiphase sulphide associations. Oxide mineral aggregates are present in gabbro. These sulphide associations have been considered to reflect as the possible PGE associations.

7.2 Brief details of the exploration carried out (to be given separately for each agency)

Year	Agency / Investigator	Scale / Area	Brief Details of Exploration / Study and Major Findings
1907	Sampat Iyengar	1:1 mile scale	Prepared the first geological map of the area and provided the earliest description of the geology. Recorded the mafic-ultramafic rocks and assigned them to greenstone sequences older than the Dharwar System.
1921	B. Rama Rao	—	Re-examined the area and concurred with the earlier geological interpretation.
1951	Pichamuthu	—	Studied the ultramafic rocks enclosed within gneisses and interpreted them as differentiated products of original ultrabasic magmas that subsequently underwent low-grade metamorphism.
1976 & 1981	Geological Survey of India – Viswanatha	1:50,000 scale	Carried out the first systematic geological mapping of the area and established a lithostratigraphic column. The mafic and ultramafic supracrustals were interpreted as discontinuous narrow skeletal strips enveloping oval-shaped Peninsular Gneissic outcrops and were assigned to the Sargur Group.

Year	Agency / Investigator	Scale / Area	Brief Details of Exploration / Study and Major Findings
1976–1978	Thiagarajan et al., GSI	Regional traverses	During traverses, two oxidized zones indicating copper mineralization were located north of Kadikengal Betta and southwest of Ramananalli.
1977–1978 & 1980–1981	Ramachandran, GSI	Toposheet 57 C/7	Prepared a photo-geological map and correlated airborne geophysical and geological data. Applied geostatistical techniques to aeromagnetic data interpretation and suggested areas for detailed ground examination for mineralization.
1979–1981	Palaniappan, GSI – AMSE Wing	Detailed surveys and drilling	Conducted detailed surveys and drilling for copper in the oxidized zones. Mineralization was indicated in the form of pyrite with low Cu and Zn values.
1986	Venkata Dasu and Mahalakshamma, GSI	1:25,000 scale	Conducted second-generation detailed geological mapping owing to the unique stratigraphic status, dominant ultramafic assemblages and reported gold and silver occurrences. The belt was interpreted as a major structural dome linking enclaves to the north and south. Altered komatiites with polyhedral joints, pillows, ocelli and spinifex textures were identified. Peridotitic komatiites were found associated with basaltic komatiites represented by dark shiny amphibolites. Cherty quartzites and BIF were identified as minor units.
1991	Palaniappan and Vayangankar	Ground evaluation	Conducted ground evaluation of aeromagnetic and geological data. Moderate to high magnetic relief was associated with ferromagnetic minerals, whereas low magnetic relief corresponded to gneissic and granitic terrains.
1994	Ramakrishnan et al.	Metaquartzite	Dated euhedral zircons from metaquartzite using the evaporation technique, yielding a Pb–Pb age of 3230 ± 5

Year	Agency / Investigator	Scale / Area	Brief Details of Exploration / Study and Major Findings
			Ma. The age was interpreted as the maximum age of the Sargur metaquartzite. Older nearby Gorur gneisses, dated at approximately 3300 Ma, were considered possible basement to the Sargur supracrustals.
2008	Chardon et al.	Structural study	Conducted detailed structural analysis and identified two strain fields associated with diapiric-type gravitational instabilities and two deformation episodes, D1 and D2. D1 produced dome-and-basin structures affecting older greenstones and gneisses, while D2 affected the younger greenstone belt, producing a complex synclinal geometry.
2014	Prabhakara and Namratha	Petrographic study	Conducted detailed petrographic studies of komatiitic ultramafic rocks and identified flow characteristics and sub-volcanic emplacement features. Despite deformation, metamorphism and alteration, primary cooling structures including pillows, flow-top polyhedral joints, ocelli, vesicles, flow-top breccia, cumulate segregations and crude layering were preserved.
2014	Prabhakar et al.	EPMA study	Studied sulphides in ultramafic rocks and identified cobalt–nickel occurrence associated with pentlandite–pyrrhotite–chalcopyrite assemblages.
2015	Tom and Kumar, GSI – Operations Karnataka and Goa	1:12,500 scale over 100 sq. km; 1:2,000 scale over 0.50 sq. km	Conducted large-scale and detailed geological mapping to evaluate the mineral potential of the mafic–ultramafic rocks. Reported Ni, Cr, Co and Cu concentrations, with maximum Cu in schistose ultramafics and their variants, indicating structural and metamorphic influence on base-metal mineralization. Pentlandite–pyrrhotite–chalcopyrite assemblages and palladium-bearing minerals were identified.

Year	Agency / Investigator	Scale / Area	Brief Details of Exploration / Study and Major Findings
2018	Talukdar et al.	Petrological study	Studied meta-ultramafites (talc–actinolite–chlorite schist) and identified discrete gold and silver grains associated with idiomorphic magnetite, exsolved anhedral ilmenite and magnetite veinlets. Monazite grains were also reported.
2019	Fayazudeen et al., GSI – Operations Karnataka and Goa	1:2,000 scale over 1.50 sq. km	Conducted detailed geological mapping and reported massive serpentinite between Gollarahatti and Kamasamudra, schistose serpentinite near Gollarahatti and east of Doddaghatta, and spherulitic serpentinite southeast of Gollarahatti. Further investigation was recommended to establish the depth persistence of the mineralized zone.
2023	Santosh et al.	Geochemical and petrographic studies	Conducted geochemical studies of ultramafic rocks and identified predominantly Mg-rich massive komatiitic ultramafics, with locally layered ultramafic units. The layered rocks were interpreted as intermittent sills formed during differentiation of peridotitic magma. Petrographic studies identified disseminated sulphides in layered dunite–peridotites, including pyrrhotite, pentlandite, chalcopyrite and pyrite, with oxide mineral aggregates in gabbro. These sulphide associations were considered possible PGE associations.

7.3 Reserves or resources estimated, if any, during the previous exploration campaign with quantity and grade under various categories

No reserves or resources were estimated during the previous exploration campaign.



CHAPTER 8: AERIAL/GROUND GEOPHYSICAL OR GEOCHEMICAL DATA

8.1 Details of aerial, ground geophysical and geochemical survey taken up and their results in previous studies.

8.1.1 Aerial reconnaissance

Photogeological, aeromagnetic (high altitude NRSA data, taken above the 5000 ft from the surface) and ASTER (Advanced Spaceborne Thermal Emission and Reflection Radiometer, image that covers a wide spectral region with 14 bands from the visible to the thermal infrared region with high spatial spectral and radiometric) data are available for the areas covered toposheet no. 57C/7.

Photogeological Studies: The first regional aerial reconnaissance involving photogeological studies Ramachandran, (1983) suggests a synformal fold of the ultramafic/iron formation bearing rocks of Sargur group to the east of to Jayachamarajapura, Ramananalli and SW of Jayachamarajapura areas. The satellite imagery studies (LISS-III -IRS-1D imagery, processed in ERDAS and ARC-GIS softwares: Fayazudeen et al 2019) helped in identification of four sets of lineaments trending NW-SE, WNW-ESE, NNE-SSW and ENE-WSW in toposheet no. 57C/7. In Rampura-Gollarahatti area, NW-SE trending lineament is identified.

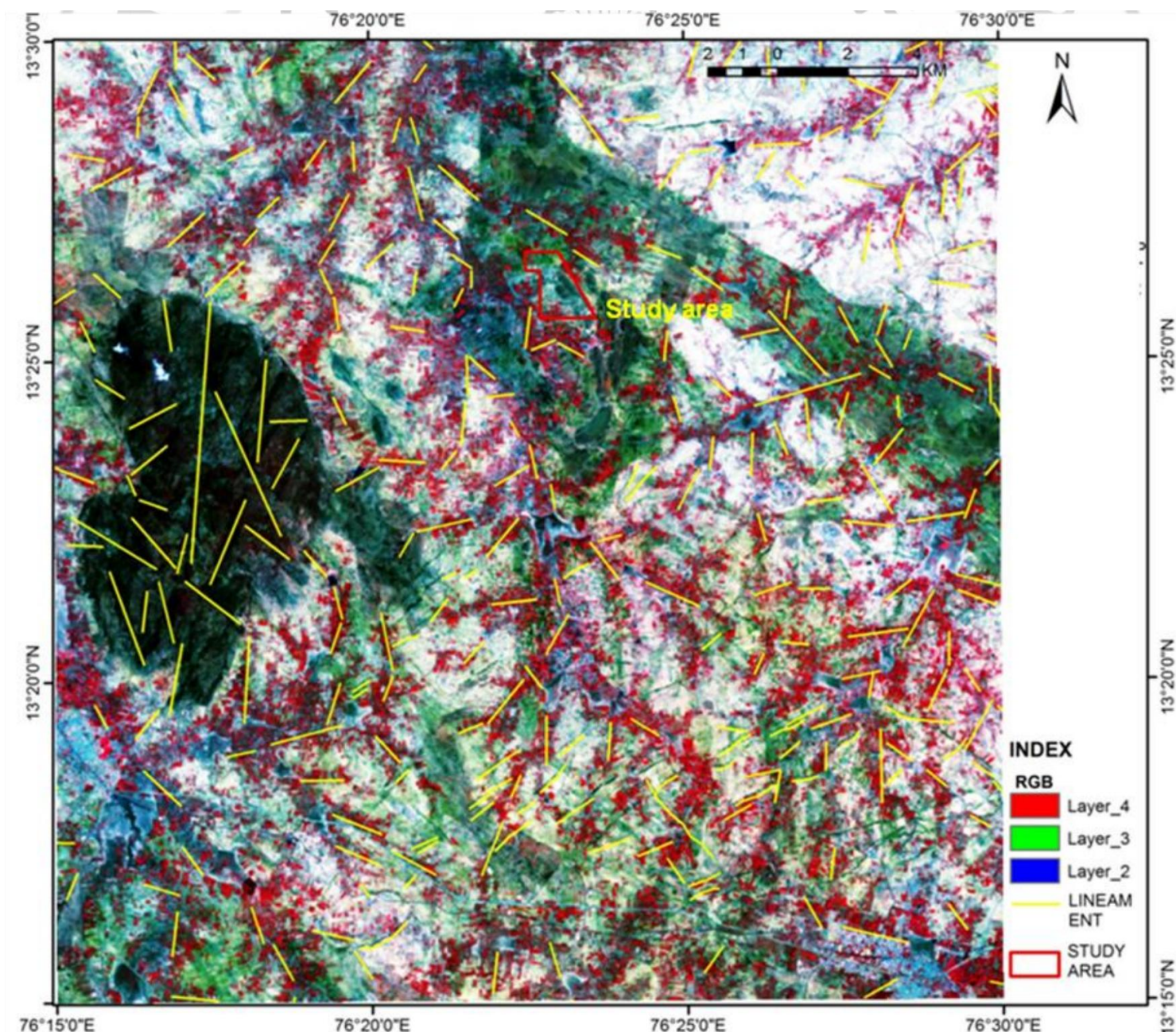


Figure No. 8.1 - Lineaments map of toposheet no. 57C/7 over Landsat OLI data (Source GSI-2018-19)

Aeromagnetic studies: Several prominent magnetic anomalies identified in the region (Ramachandran, 1983) were classified under three zones namely high intensity, low intensity and feeble to low intensity anomalies that broadly correspond to Sargur Group, Dharwar greenstone and Peninsular Gneiss respectively. Long linear zones of high intensity anomalies in an E-W trending pattern in the southern part were found to be caused due to dyke bodies. Further investigations of these anomalies (Thiagarajan et al., 1981) several closed magnetic feature lines

in toposheet no. 57C/7 including in Ramohalli and Gollarahatti areas. Ground evaluation of aeromagnetic data (Paliniappan and Vayangankar, 1991) shows the NW-SE trending anomalies are associated with the schist belts, and moderate to high magnetic intensity group is due to their higher ferro magnetite content compared to the low relief and low intensity group noticed over gneissic and granitic terrains. Another study (Fayazudeen et al, 2019) interprets the positive magnetic anomalies due to the high magnetic property of the rocks. The maximum magnetic anomaly 72 nT recorded over gneissic rocks in the northern side and in the southern side over meta pyroxenite, amphibolites and meta basalt. Negative magnetic anomalies are recorded over Arsikere granite, fuchsite muscovite quartz schist and migmatite gneiss in the geological map of toposheet no 57C/7. The present area of investigation (Rampura-Gollarahatti) falls in the lower positive magnetic anomalies category.



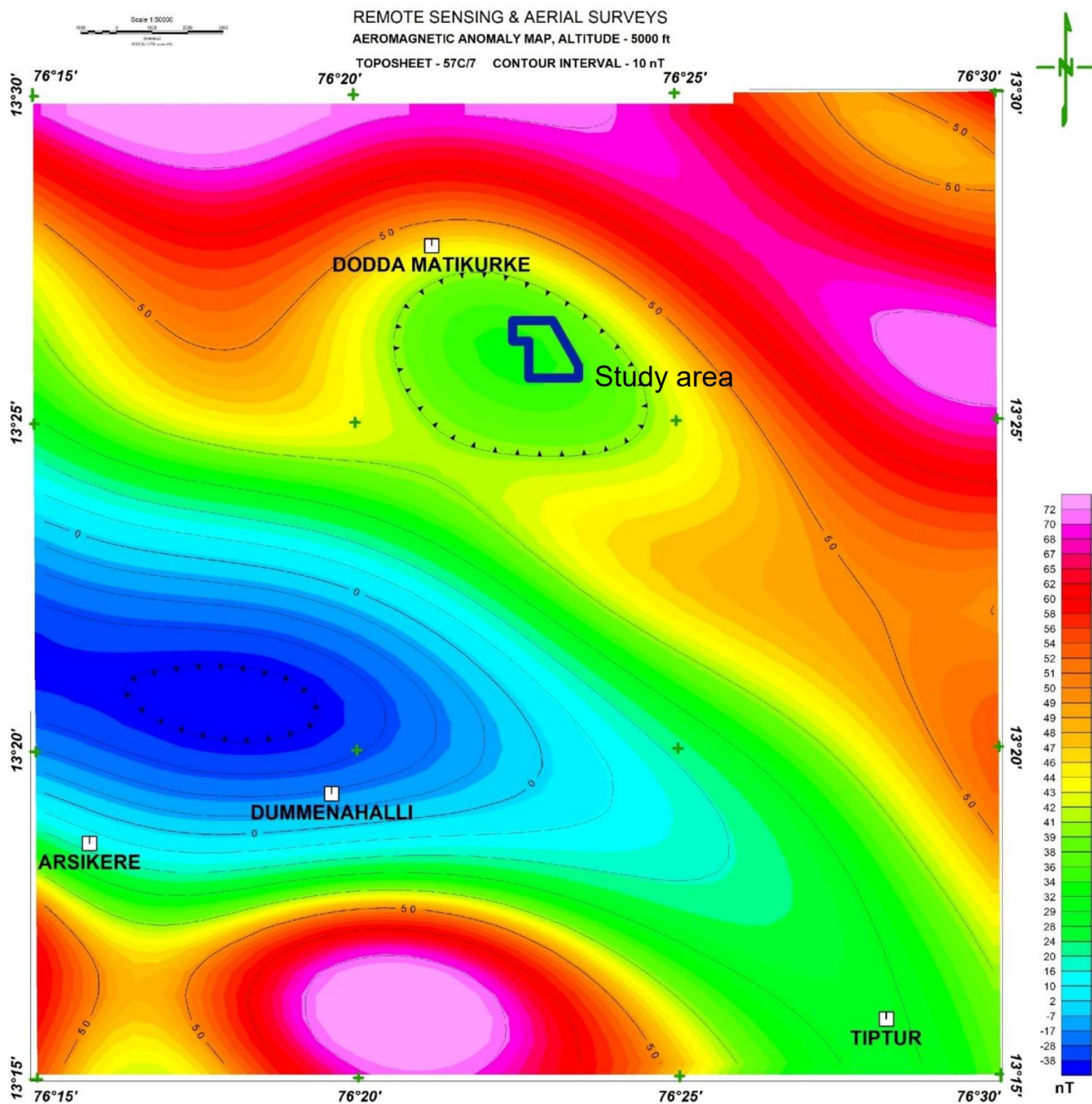


Figure No. 8.2 - Aero magnetic contour map of toposheet no. 57C/7 over Landsat OLI data
(Source GSI-2018-19)

8.1.2 Regional geochemical survey

ASTER Data Studies: The ASTER data (Fayazudeen, 2019) helped in identification of 4 different types of alterations in the block. These are chloritic alterations over talc- tremolite-chlorite schist in the western part, epidote alteration in talc-tremolite-chlorite schist along the serpentinite body in the eastern part, hematitization along the serpentinite body in the eastern part and Illite alteration over talc-tremolite-chlorite schist in the northern part of the block.

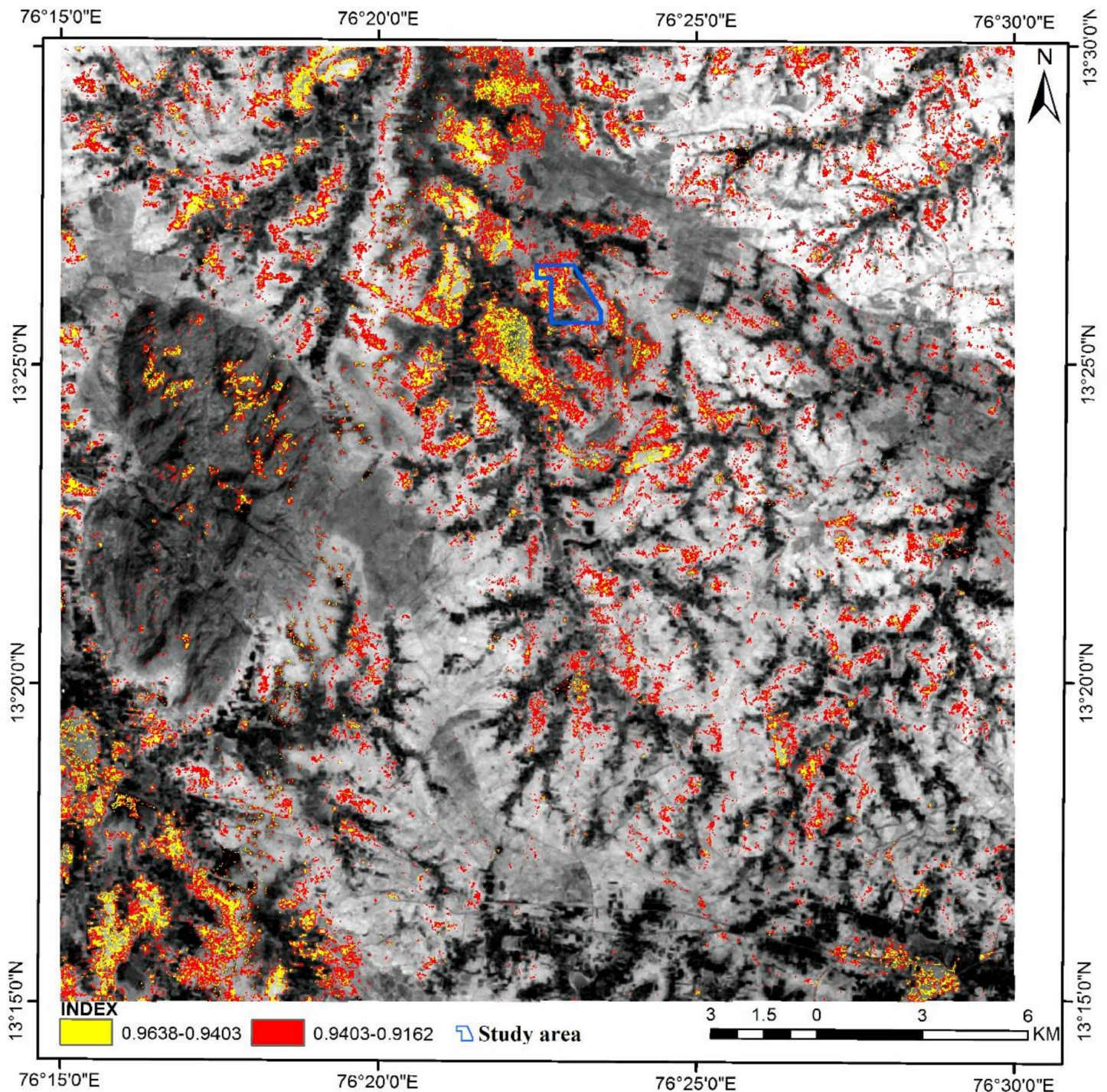


Figure No. 8.3 - ASTER map of chlorite alteration of toposheet no. 57C/7 (Source GSI-2018-19)

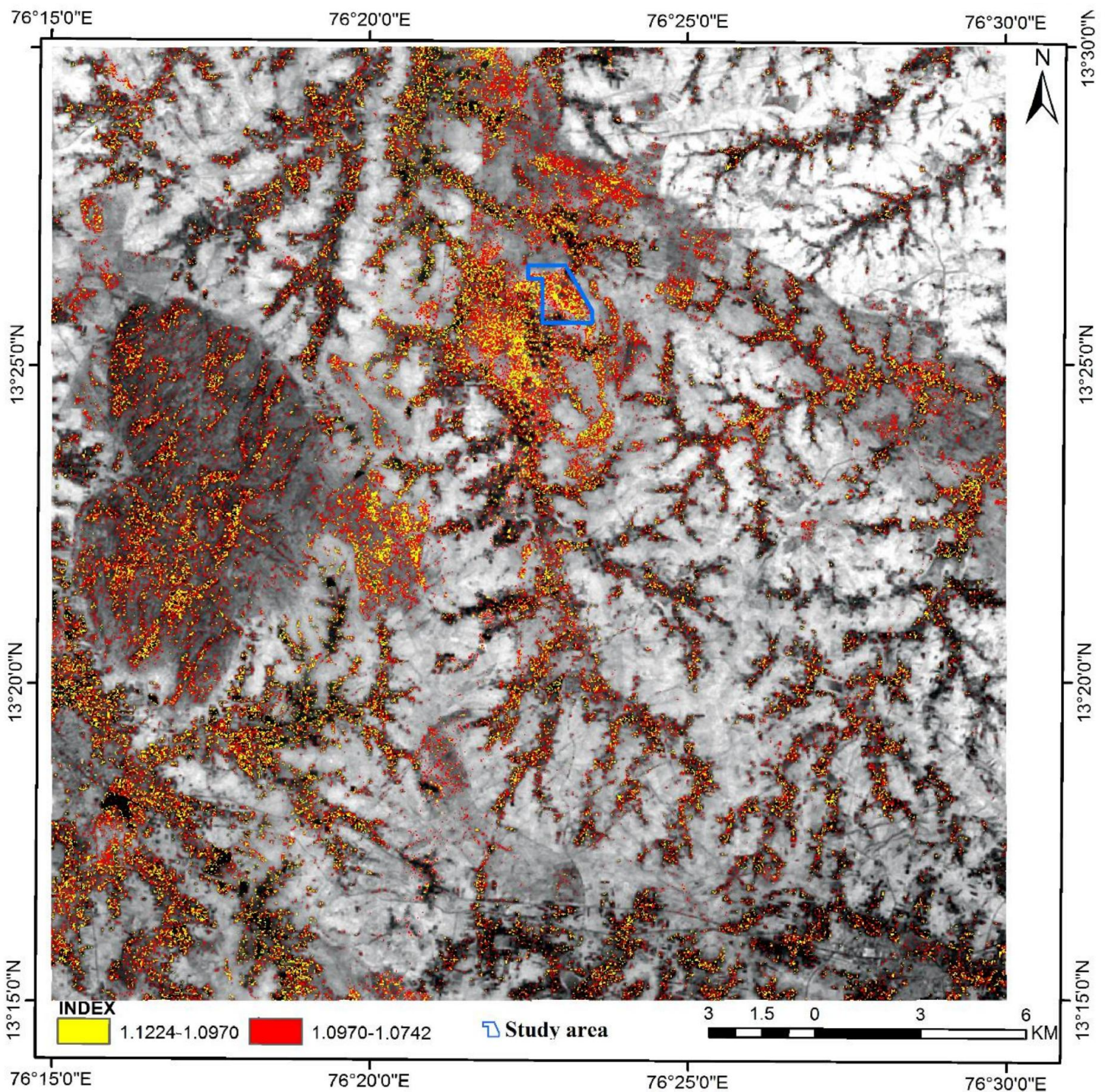


Figure No. 8.4 – ASTER map of Epidote Alteration of Toposheet number 57C/7 (Source GSI-2018-19)

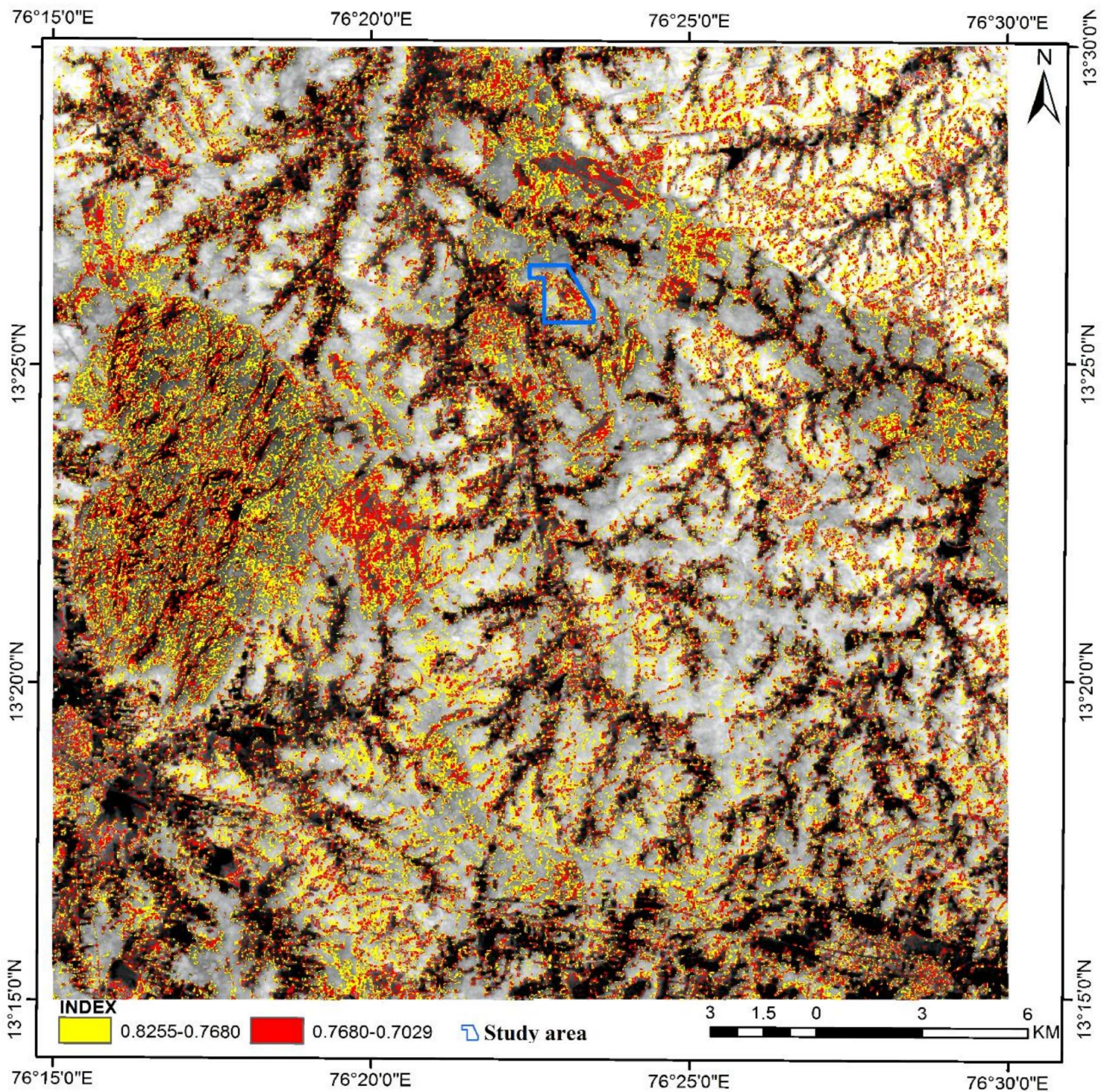


Figure No. 8.5 – ASTER map of Hematitization of toposheet no. 57C/7

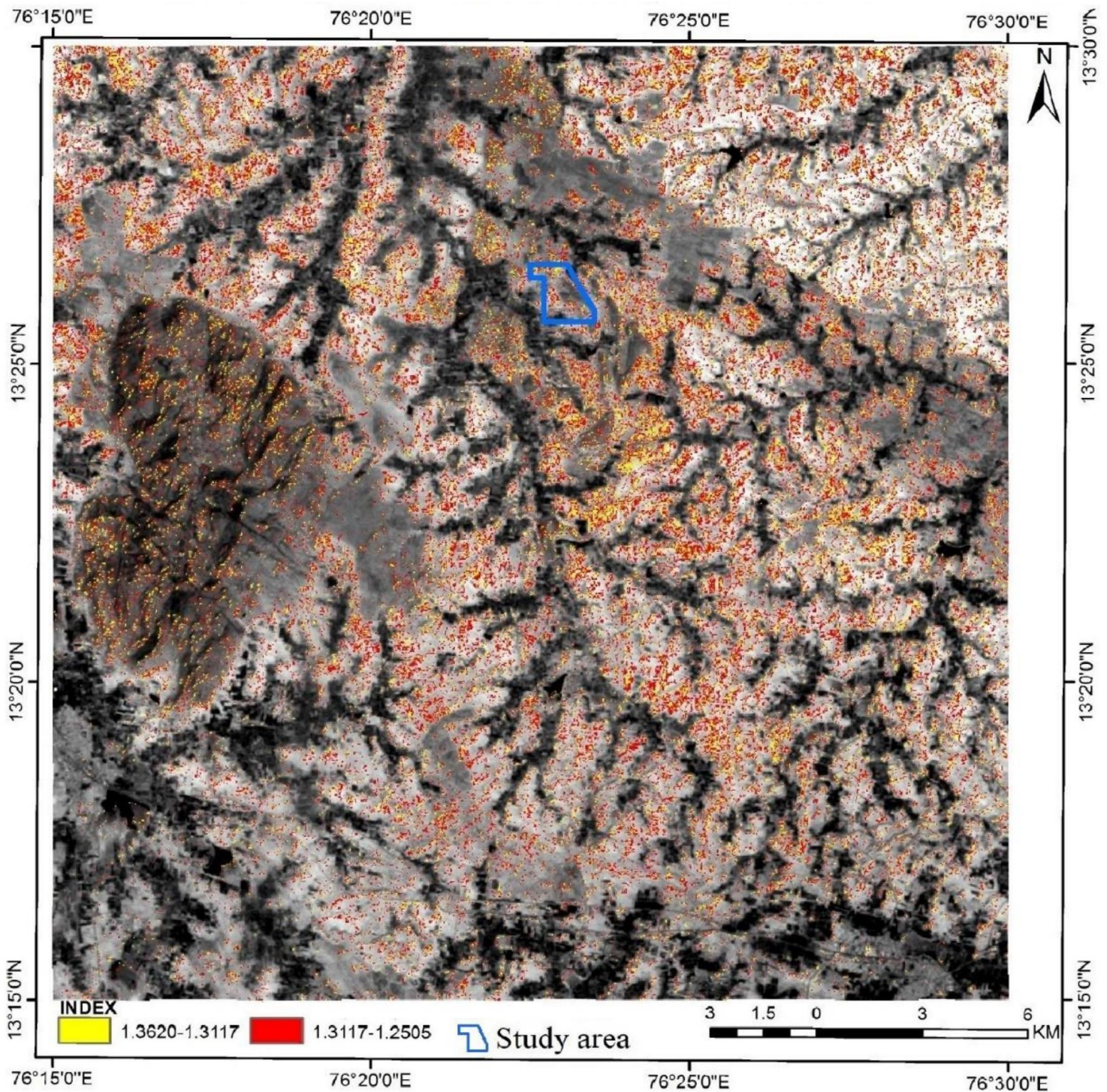


Figure No. 8.6 - ASTER map of Illite Alteration on Toposheet no. 57C/7

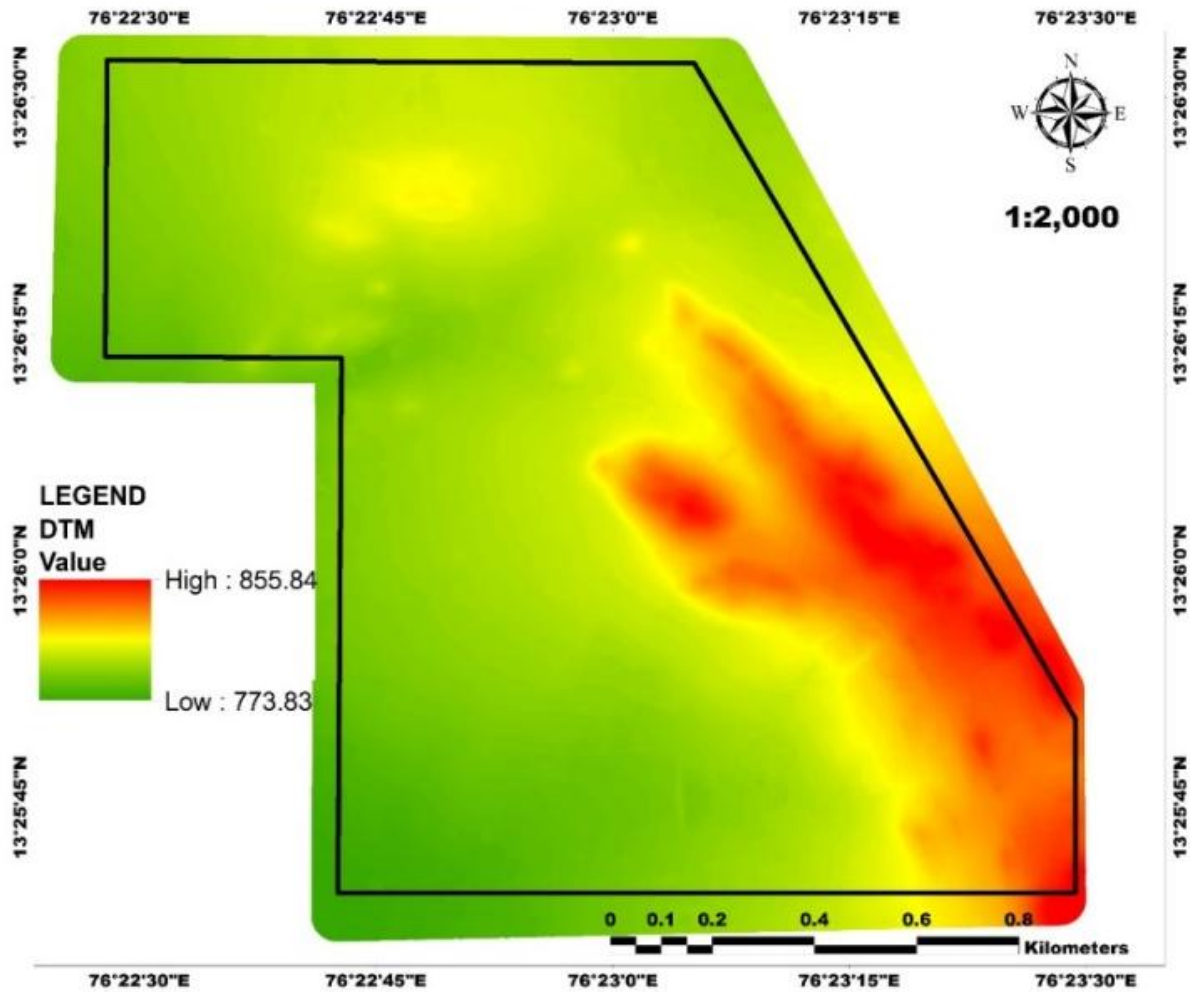
8.2 Detailed drone survey in current study

A detailed drone-based photogrammetric survey was carried out over the entire 2.0 sq. km block to generate high-resolution Ortho mosaic imagery, digital terrain data and surface models for supporting geological and geophysical investigations. The survey was undertaken to delineate terrain morphology, drainage pattern, lineaments, surface exposures, access conditions and land use–land cover characteristics that may influence the occurrence and continuity of ultramafic-hosted mineralization.

The drone survey further aided in generation of high-resolution topographic products including Digital Terrain Model (DTM), Digital Surface Model (DSM) and 2 m interval contour maps for facilitating detailed geological mapping, structural interpretation and future exploration planning.

8.2.1 Construction of Digital Terrain Modelling (DTM):

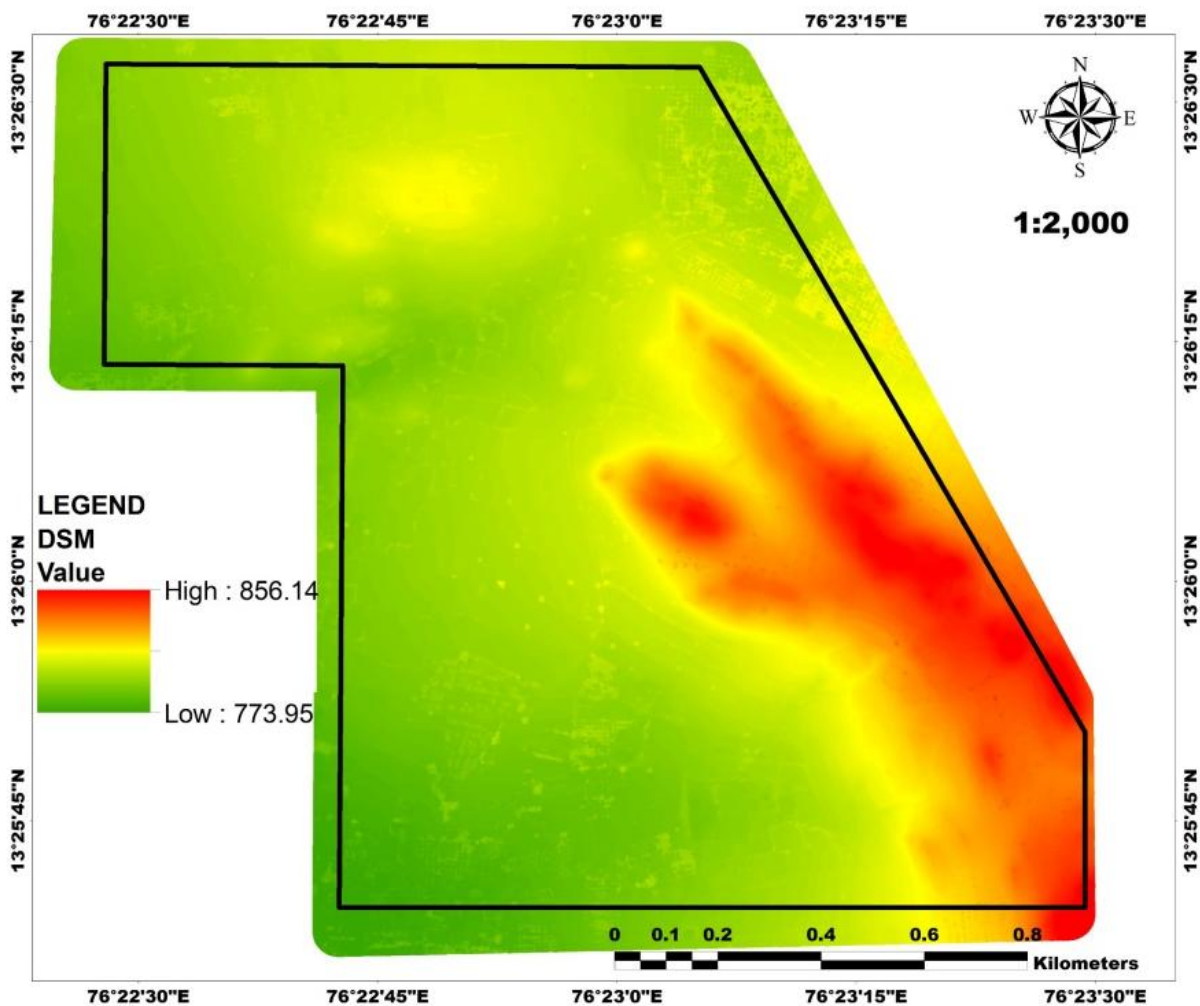
The Digital Terrain Model (DTM) generated from drone-derived elevation data aided in understanding relief variations, slope characteristics and geomorphological controls within the study area. The terrain shows elevated topography in the eastern part corresponding to hilly ultramafic terrain, whereas relatively lower elevations occur towards the south-western agricultural plain. Such elevation contrasts assisted in understanding outcrop disposition, drainage behaviour and accessibility for geological traverses and future trench/drilling planning.



**Figure No. 8.7 - Digital Terrain Model (DTM) of the Rampura–Gollarahatti Study Area
Generated from the Drone-Based Photogrammetric Survey.**

8.2.2 Re-construction of Digital Surface Modelling (DSM):

The Digital Surface Modelling (DSM) facilitated recognition of vegetation cover, surface roughness, drainage channels and anthropogenic features. It also supported identification of exposed ridges and structurally controlled topographic alignments that may influence lithological continuity and mineral prospectivity.



**Figure No. 8.8 - Digital Surface Model (DSM) of the Rampura–Gollarahatti Study Area
Generated from the Drone-Based Photogrammetric Survey.**

8.2.3 Re-construction of contour maps:

The Contour map is obtained by using DTM / DSM and can be used for demarcating various topographical features according to the changes in the gradient. The contour maps are very useful for real terrain conditions as shown in Figure No. 8.9. The 2 m contour interval map proved particularly useful in identifying subtle slope breaks, ridge alignments and structurally controlled

geomorphic features relevant for detailed geological mapping.

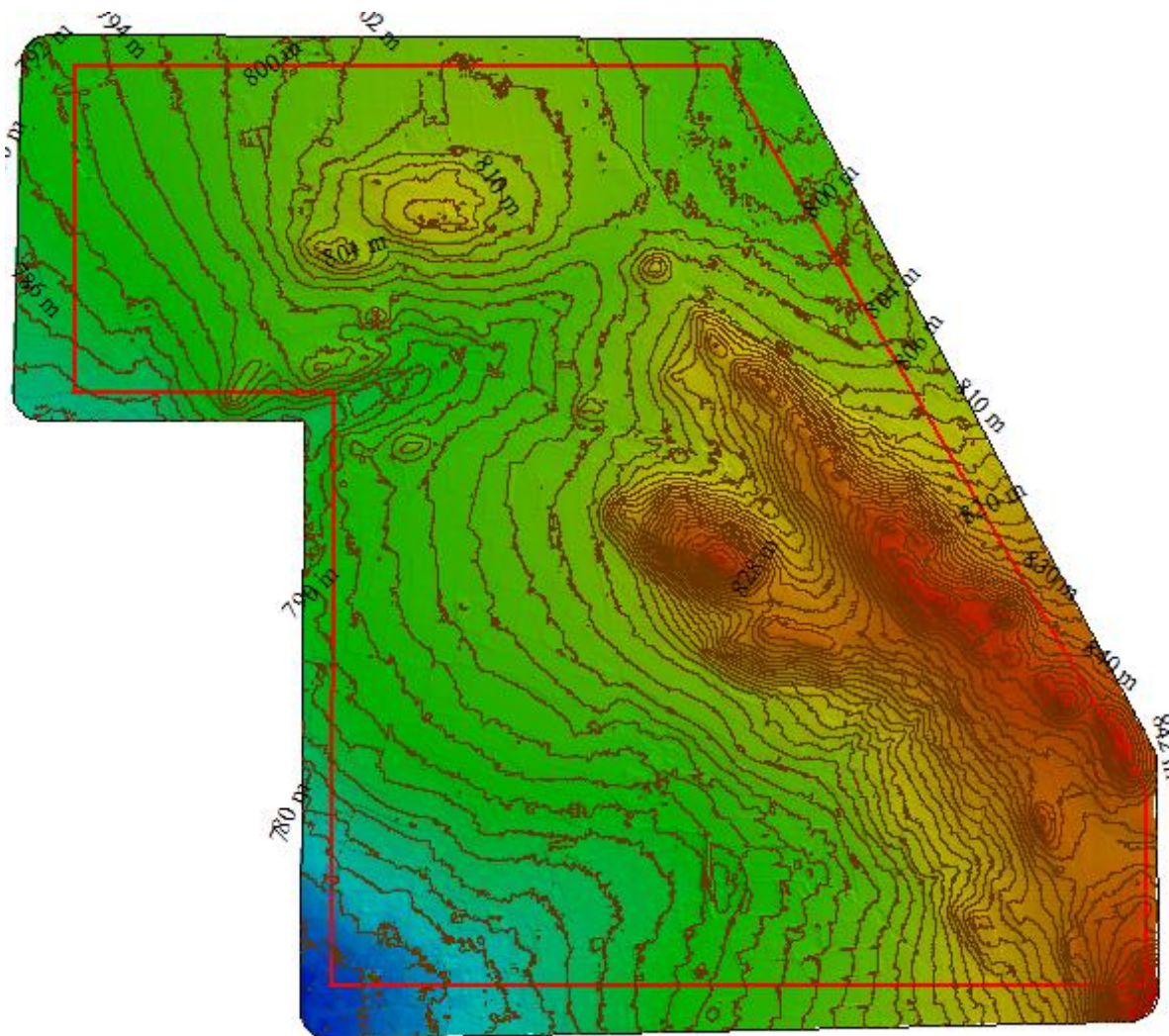


Figure No. 8.9 - Two-Meter Contour Map Generated from the Drone-Based Survey Data of the Rampura–Gollarahatti Study Area.

8.2.4 Construction of Land Use / Land Cover (LULC)

The LULC analysis indicates that approximately 58% of the study area is occupied by agricultural land, 40% by hilly scrub/forest terrain and around 2% by rural settlement. The hilly terrain, particularly in the eastern part, coincides with better rock exposure conditions and was found favorable for geological mapping, whereas agricultural areas exhibit limited outcrop availability due to soil cover.

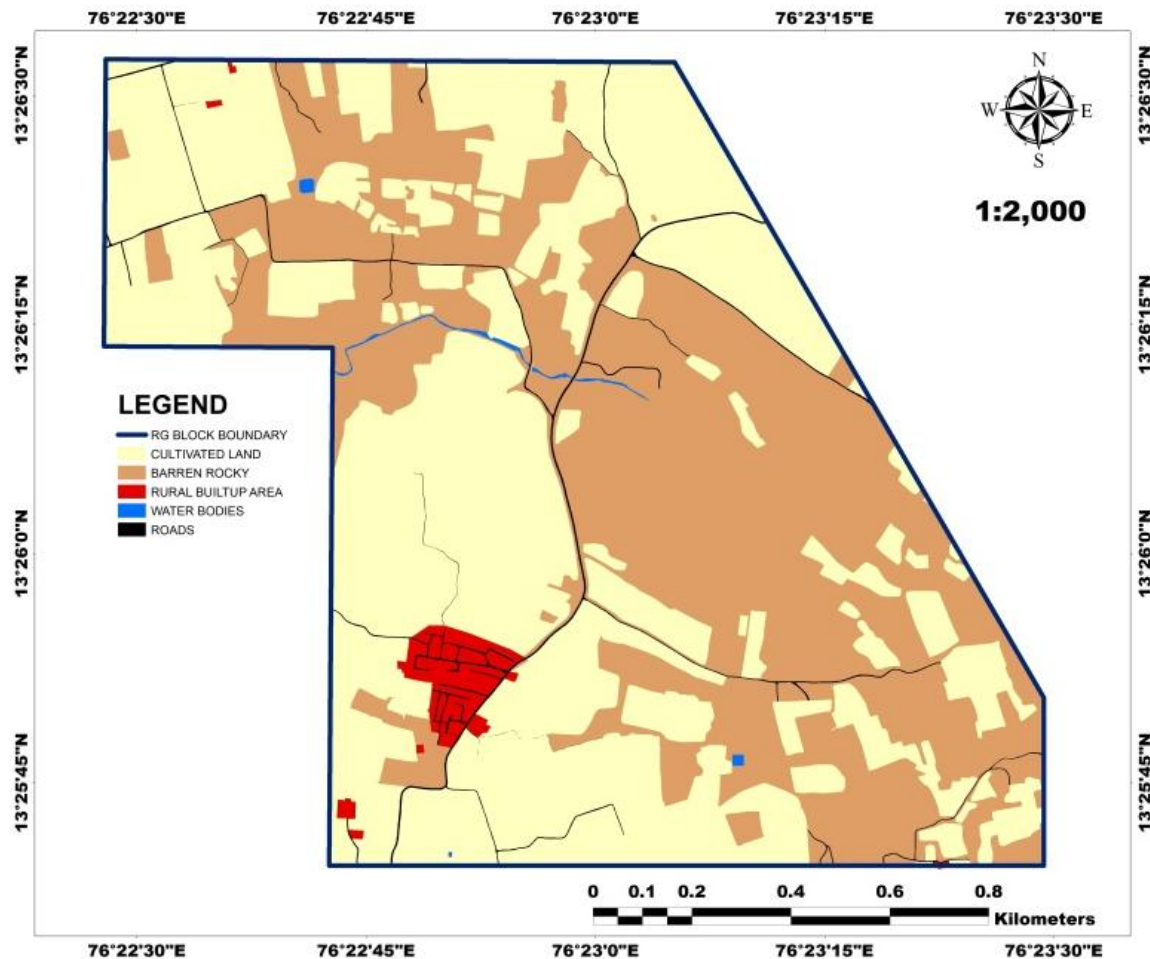


Figure No. 8.10 - Land Use/Land Cover (LULC) Map of the Rampura–Gollarahatti Study Area Derived from the Drone-Based Survey.

8.2.5 Significance of drone survey

Integration of Ortho mosaic imagery, terrain models and contour data aided in identification of lithological contacts, drainage-controlled exposures and structurally controlled geomorphic trends within the study area. The dominant topographic grain observed in the hilly eastern sector broadly corresponds with the NW-SE regional structural trend of the J.C. Pura schist belt.

The drone-derived terrain products provided an important base for detailed geological mapping, gravity survey planning and identification of accessible areas for future trenching and scout drilling. In areas affected by vegetation and soil cover, the drone-generated terrain models were useful in interpreting subtle geomorphic expressions possibly related to lithological boundaries and structural disturbances.

8.3 Geophysical investigation in the current study

The objective of the gravity survey was to delineate subsurface density variations and identify favorable structural zones associated with serpentinite and talc–tremolite–chlorite schist (TTCS), which may host Ni–Co–PGE mineralization within the Rampura and Gollarahatti block. The survey was also intended to identify subsurface lithological variations, structural discontinuities and potential anomalous zones for future detailed investigation.

8.3.1 Principle

Gravity survey is based on measurement of variations in the Earth's gravitational field caused by contrasts in subsurface rock density. High-density lithological units generally produce positive gravity anomalies, whereas low-density materials generate relatively lower gravity responses. The method is useful for delineation of subsurface geological structures, lithological boundaries and density contrasts associated with mineralized zones.

8.3.2 Survey instruments & methods deployed

The gravity method is used to understand subsurface details. For this, the following precise equipment was deployed. The details of the equipment are listed below

8.3.2.1 Gravimeter

The CG-5 gravimeter of Scintrex (Canada) was deployed for conduction of gravity survey in the study area. This gravimeter is very sensitive with least count of 0.001 m. G.

8.3.2.2 Differential Global Positioning System (DGPS)

Trimble R8S and controller TSC3 of Differential Global Positioning System (DGPS) was used to obtain the accurate position and elevation of the gravimeter with an accuracy of 3 mm $\pm$ 0.5 mm and RMS is 5 mm $\pm$ 0.5 mm.

8.3.2.3 Coordinate system

The World Geodetic System 84 (WGS 84) with UTM zone 43N is the reference co-ordinate system that was organized for processing, analysis and interpretation of Gravity data. In general, WGS is Earth-centered and Earth-fixed coordinate system mostly associated with Earth Gravitational Model (EGM) and World Magnetic Model (WMM). Hence this geographic coordinate system was employed for this gravity method.

8.3.3 Gravity data acquisition

For attainment of high-resolution data, gravimeter reading and DGPS data were continuously collected and maintaining higher accuracy, at every 3 stations, the reading was corrected. The gravity data must be corrected for drift due to sensitivity of sensor, tidal corrections, and gravimeter elevation corrections, latitude of the gravity stations and density of bouguer slab. All the corrections were done by using in built software with basic inputs such as elevation from MSL, average crustal density and latitude variations. The details of the corrections were briefly explained below

8.3.3.1 Drift correction

As the gravimeter is sensitive, it is need to corrected drift correction arises due to transportation. The correction was done at the start of survey and end of the survey every day.

8.3.3.2 Combined elevation correction

In general, the gravimeter data varies with elevation; hence it is necessary to correct elevation data at every gravity station by using accurate DGPS. The combined elevation corrections (free air correction + Bouguer correction) were done by using software.

8.3.3.3 Latitude correction

The latitude corrections were done by applying the international gravity formula which is related to Earth's gravity and the station latitude.

8.3.3.4 Terrain correction

In general, terrain correction is important for gravity surveys, but in the present study area, the topography is almost flat, except for certain areas with small hills, the terrain correction was not required.

8.3.3.5 Base correction

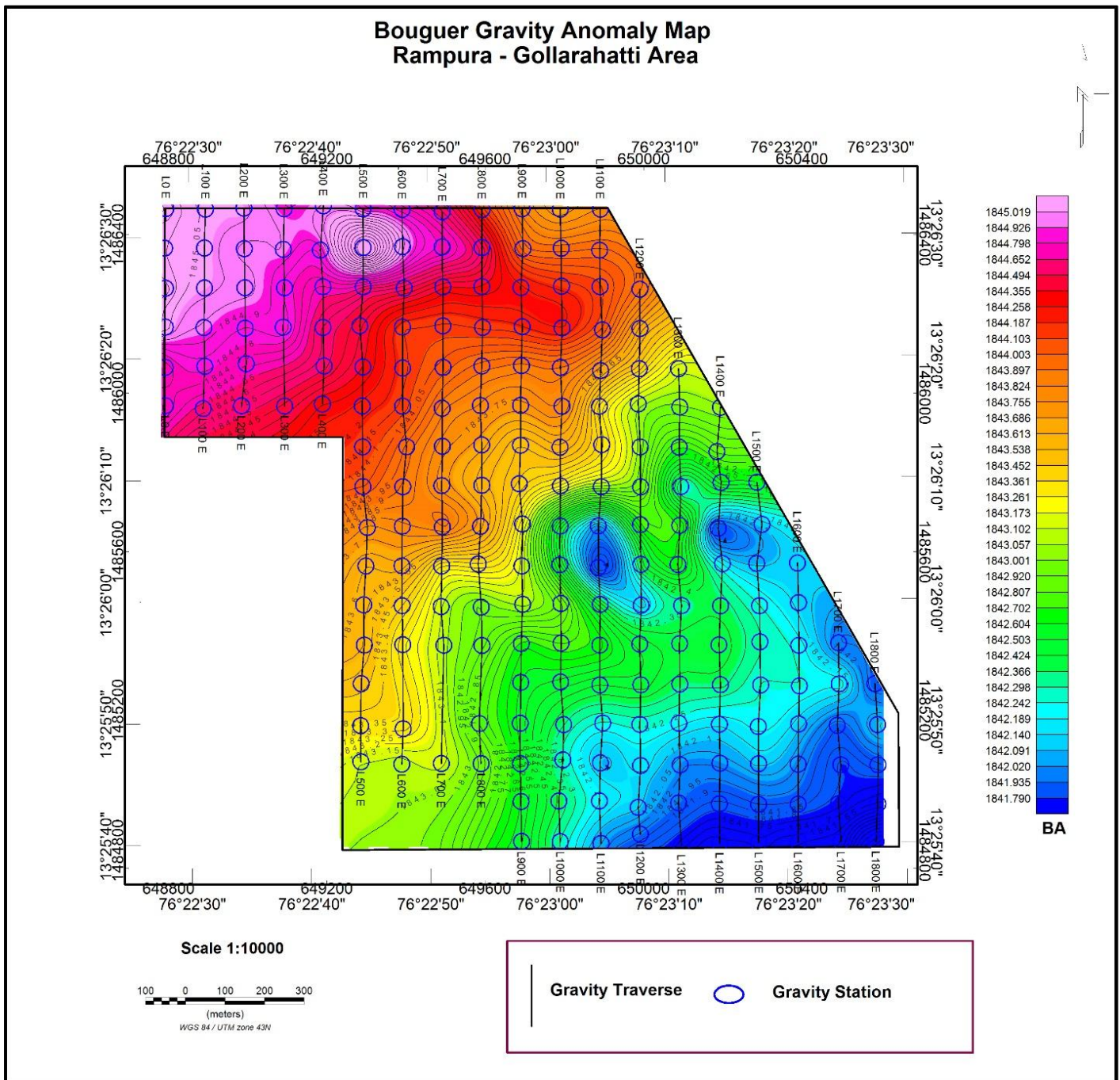
It is necessary to carry out base correction, the Government hospital, Shasivalla village (a local base), was considered and base correction was done. The final bouguer gravity anomalies arrived after the base correction in the entire area.

8.3.4 Seed of various derivative maps

8.3.4.1 The Bouguer anomaly

The Bouguer anomalies' values are shown in figure No. 8.11 and reveal the following inference sub-surface information

1. Southeastern part of the study area exhibited low anomaly value of 1841.2 m. Gal due to encounter of pegmatite
2. The northwestern part of the study area exhibits a high anomaly value of 1845.05 mGal. This response is interpreted as a density contrast associated with mapped talc–tremolite–chlorite schist and metagabbro; gravity response alone does not establish metamorphic grade or mineralization.
3. Based upon the contour values, Low anomaly contour value exhibited in the south central to southeastern part of study area happenstance serpentinite
4. Low to medium anomaly contour values, exhibited due to interference of pegmatite
5. Variations in anomaly contour patterns indicate subsurface density contrasts, which when correlated with geological mapping are interpreted to represent lithological variations involving serpentinite, amphibolite, TTCS, pegmatite and meta-gabbro.



**Figure No. 8.11 - Bouguer Gravity Anomaly Map of the Rampura–Gollarahatti Study Area
Showing the Spatial Distribution of Gravity Anomalies and Associated Geological
Variations.**

8.3.4.2 The Bouguer anomaly gravity grid

Based on the Bouguer anomaly values, a gravity grid was generated to examine the regional response of the study area. Upward continuation filtering at 250 m was applied to suppress shallow

responses and highlight deeper trends. The anomaly contours exhibit a dominant NE–SW trend, while gravity values generally increase from SE towards NW. The Bouguer gravity anomaly map is shown in Figure No. 8.12.

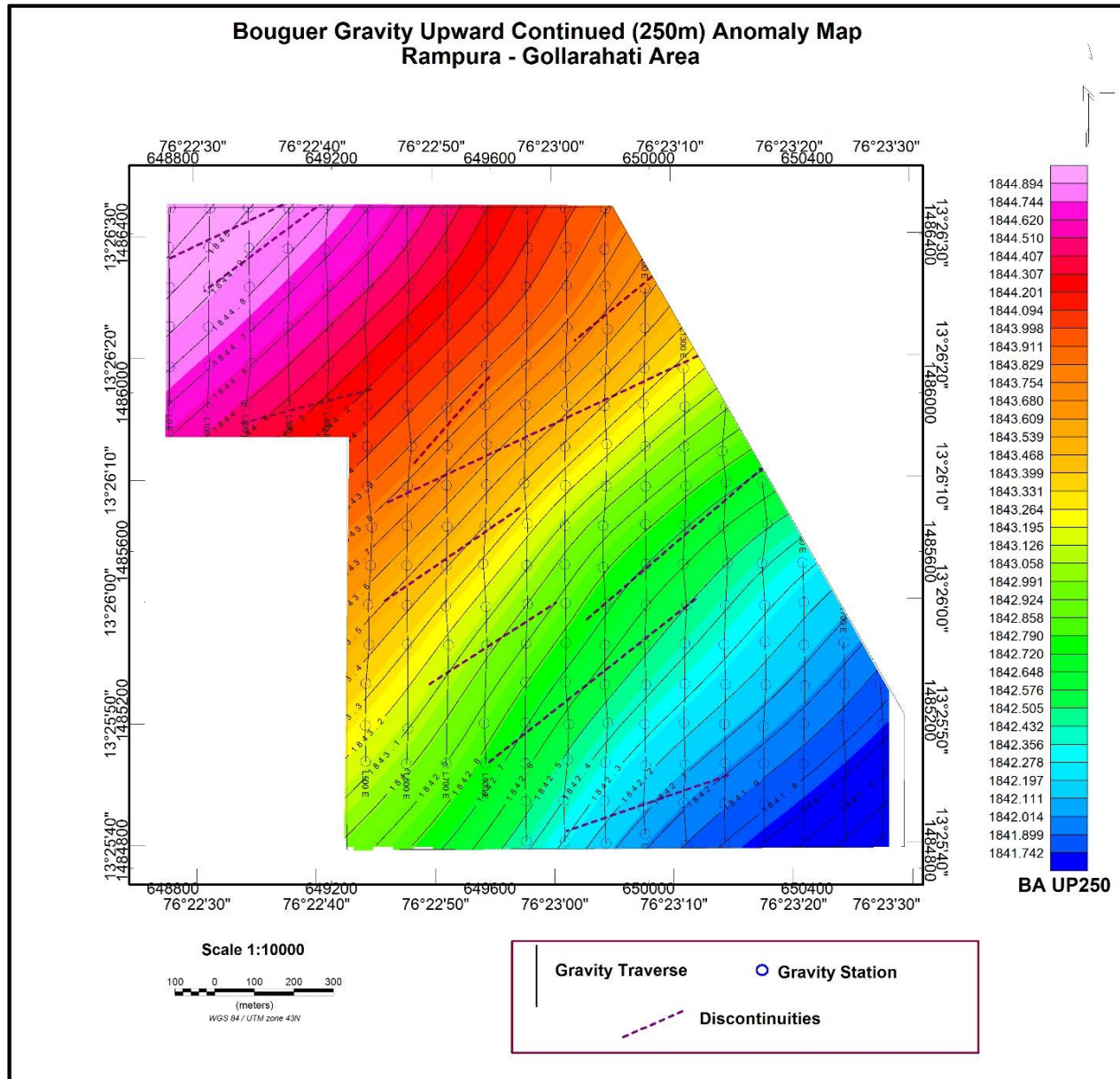


Figure No. 8.12 - Bouguer Gravity Upward-Continued Anomaly Map at 250 m Showing the Regional Gravity Response and Deeper Structural Trends of the Rampura–Gollarahatti Study Area.

8.3.4.3 Bouguer gravity residual anomaly map

Bouguer Residual Anomaly was extracted from the Bouguer anomaly value by the subtraction of deep sources response. It clearly depicts the surface or shallow depth responses. Bouguer gravity

residual maps were depicted the following information.

1. Discontinuous/orthogonal structures inferred
2. Near circular to elliptical, gravity anomaly in NW-SE direction.
3. The gravity low and high trendlines were marked in the map.
4. Amphibolite, pegmatite, metagabbro and serpentinite bodies were delineated and marked on the interpreted residual-anomaly map shown in Figure No. 8.13.
5. Gravity low closures observed near serpentinite–pegmatite contacts are interpreted as zones of structural complexity and were considered favourable targets for further investigation.



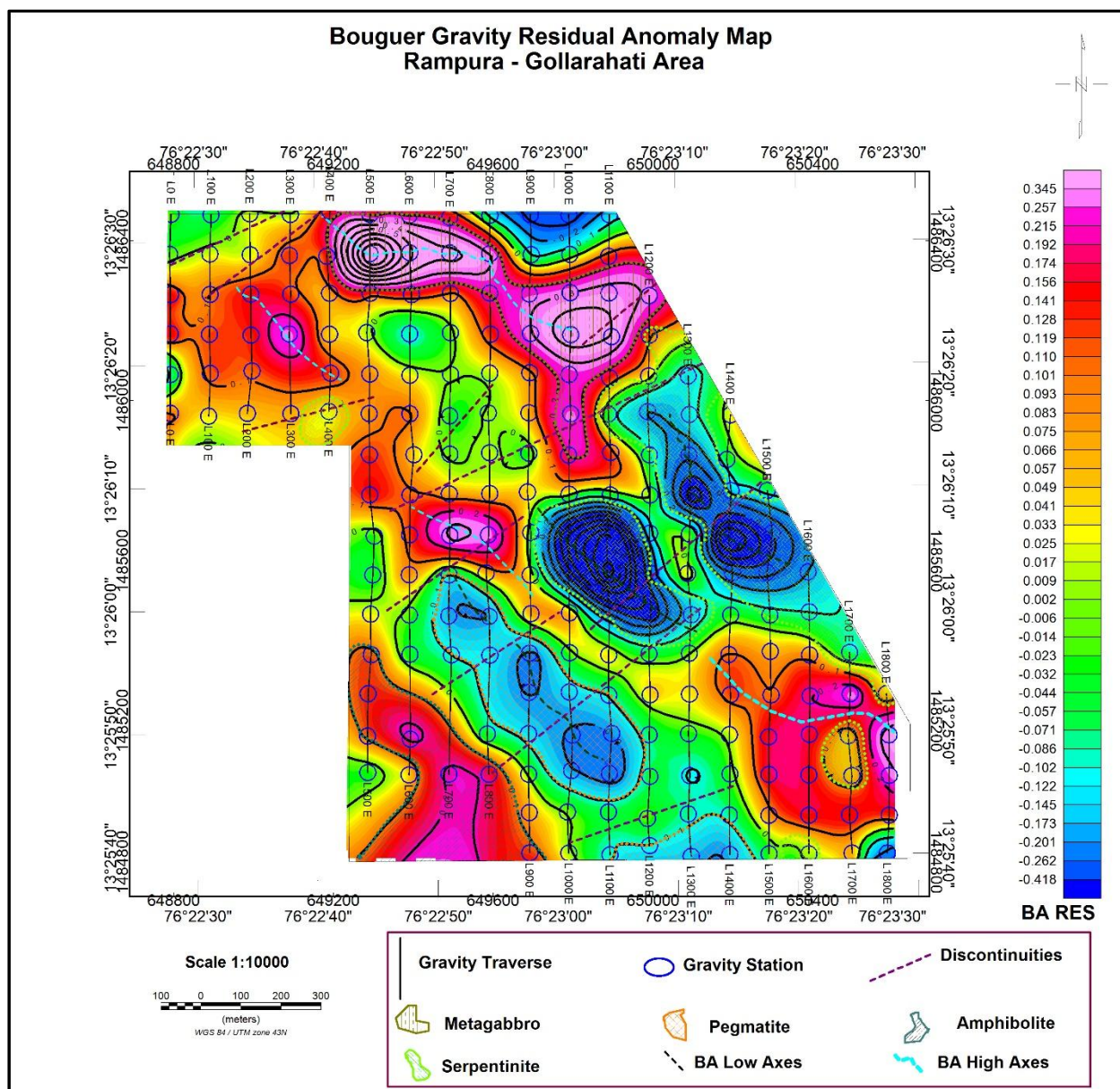


Figure No. 8.13 - Bouguer Gravity Residual Anomaly Map Showing Shallow/Residual Gravity Responses, Structural Discontinuities and Lithological Variations in the Rampura–Gollarahatti Study Area.

8.3.4.4 Bouguer gravity anomaly tilt derivative map

In general, the deep, shallow structures and boundaries are identified by tilt angle method. In the present study, the tilt derivative method was used to delineate structural boundaries and subsurface contacts, which no correlation with geological mapping is interpreted to correspond to serpentinite, pegmatite, amphibolite and TTCS units.

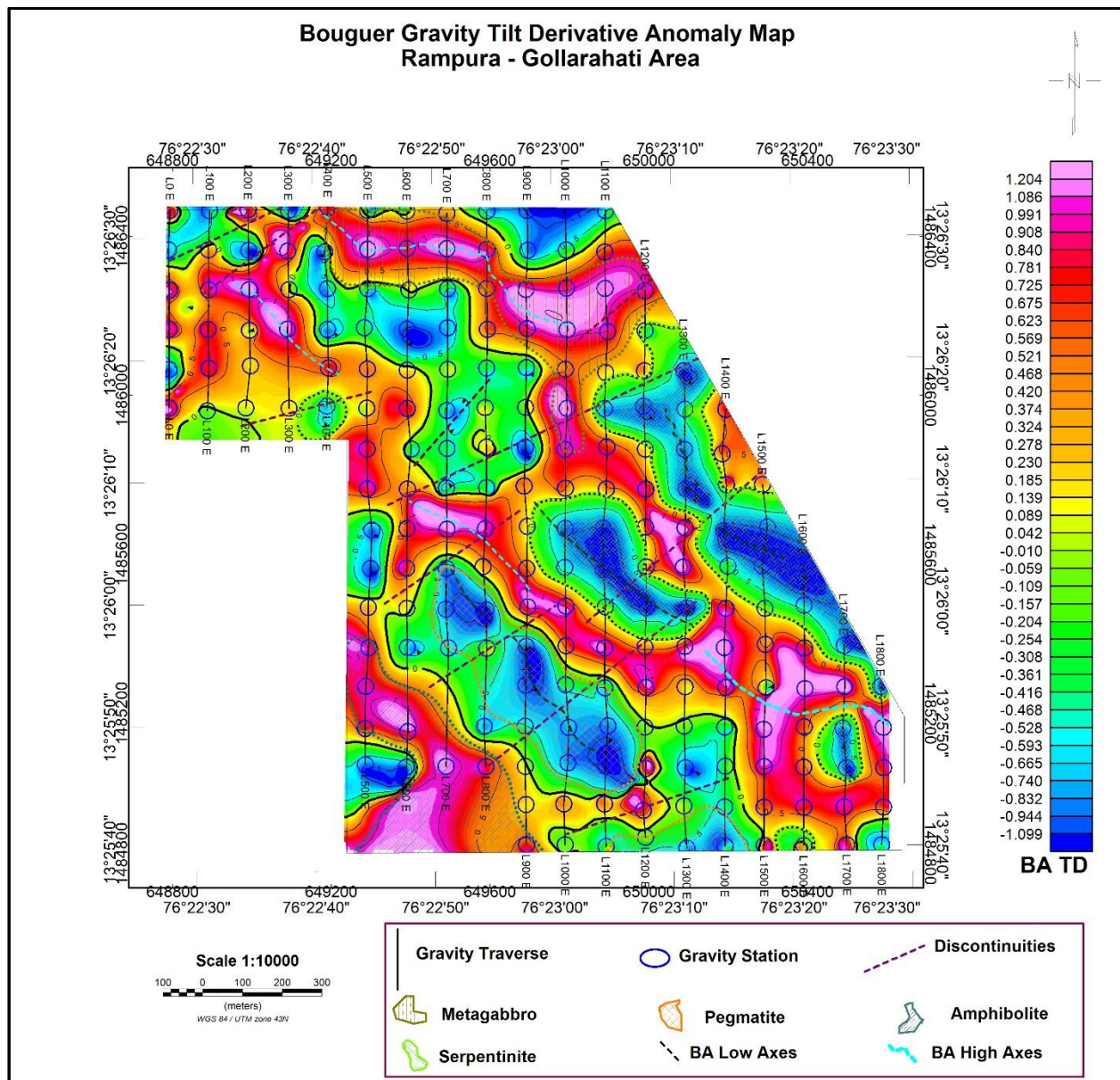


Figure No. 8.14 - Bouguer Gravity Tilt-Derivative Anomaly Map Showing Structural Boundaries, Subsurface Contacts and Associated Geological Features of the Rampura–Gollarahatti Study Area.

8.3.5 Interpretation Map

The gravity and derivative products, including the upward-continued, residual and tilt-derivative maps, were integrated with the mapped geology in Figure 8.15. A gravity low broadly coincides with serpentinite, while pegmatite, metagabbro, amphibolite and TTCS produce contrasting responses. Orthogonal ENE-WSW discontinuities are interpreted as structural features. Together

with the available GSI magnetic and IP/resistivity information, these observations define three preliminary target envelopes for follow-up; the anomalies are not diagnostic of mineralization and require ground truthing.

1. Zone 1: 260m X 220m

2. Zone 2: 450m X 260m

3. Zone 3: 540m X 470m

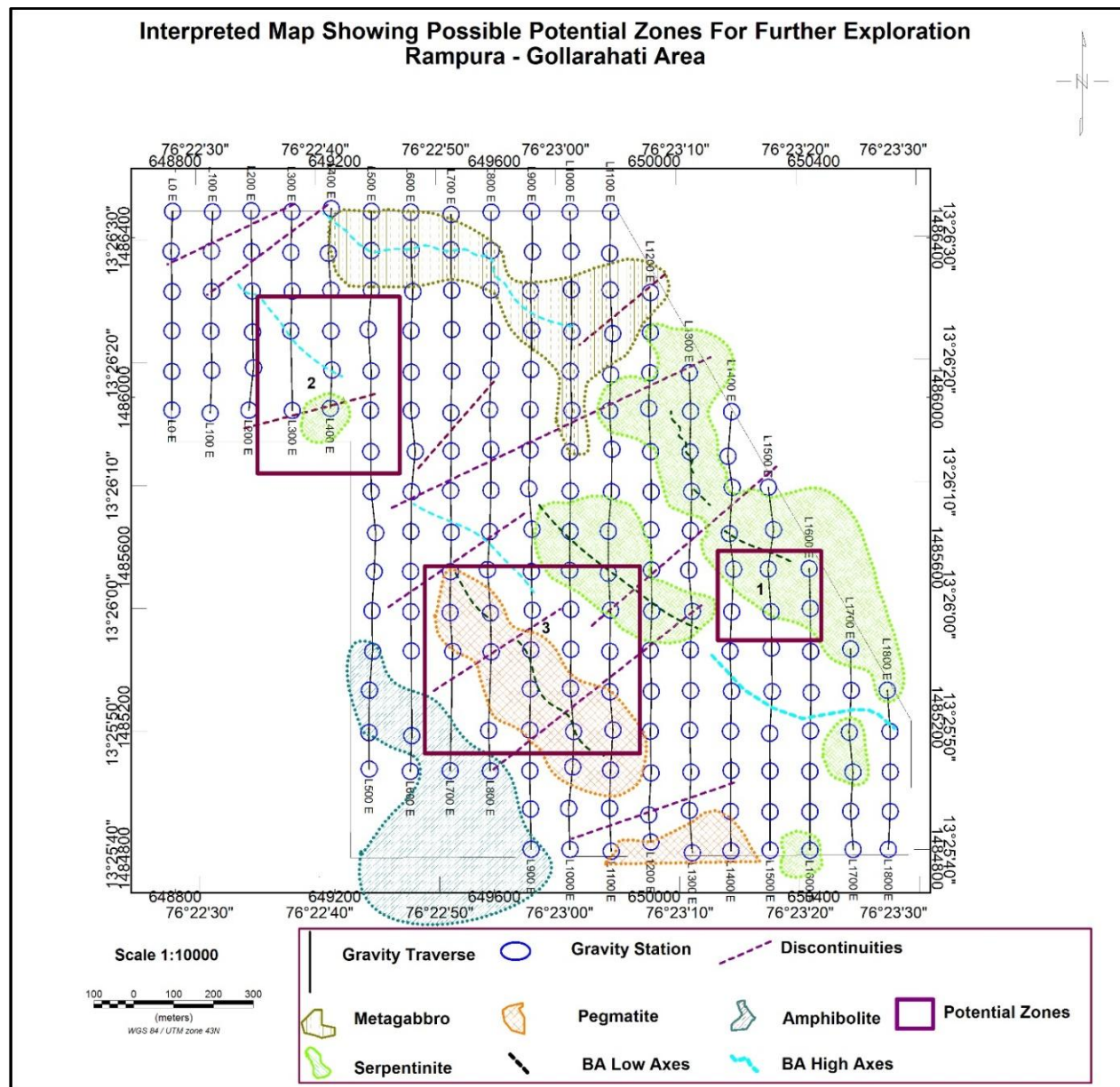


Figure No. 8.15 - Integrated Interpretation Map of the Rampura–Gollarahatti Study Area Showing Interpreted Geological–Geophysical Features and Three Potential Zones Prioritized for Further Detailed Investigation.

8.3.6 Geophysical conclusion

The gravity survey was conducted across the Rampura--Gollarahatti area to map subsurface density contrasts and structures associated with serpentinite and talc--tremolite--chlorite schist (TTCS), with quartz and pegmatite veins, that may warrant follow-up for Ni--Co--PGE and associated mineral potential in the J.C. Pura mafic--ultramafic belt.

The Bouguer anomaly, residual and derivative maps, together with the available GSI magnetic and IP/resistivity results, were used to delineate three possible target zones for follow-up and detailed study. Their interpreted dimensions are as follows.

Zone 1 measures approximately 260 m by 220 m, Zone 2 approximately 450 m by 260 m and Zone 3 approximately 540 m by 470 m. These are interpreted target dimensions, not mineralized widths or resource boundaries.

Because the nominal station and traverse interval was 100 m, the survey cannot resolve narrow mineralized bodies or define precise anomaly boundaries. The orthogonal ENE--WSW structures identified on the upward-continued, residual and tilt-derivative products should therefore be treated as exploration targets requiring higher-resolution work. The observed low, medium and high Bouguer responses over serpentinite, pegmatite and metagabbro, respectively, and the medium-to-high response over TTCS, are interpreted as density contrasts and are not diagnostic of mineralization without ground truthing.

CHAPTER 9: EXPLORATION UNDERTAKEN DURING CURRENT INVESTIGATION

9.1 Details of pitting, trenching, drilling, etc., with spacing and distribution of the sample points along with geographical co-ordinates.

No Pitting, Trenching, Drilling work was undertaken.

9.2 Data spacing for reporting of exploration results

Not applicable since no such work was undertaken,

CHAPTER 10: LOCATION OF DATA POINT

10.1 Accuracy and quality of surveys used to locate drill holes (collar and down-hole surveys, azimuth, inclination, coordinates of bore holes etc), trenches, mine workings and other locations used in mineral resource estimation.

10.1.1 Drone survey boundary and GCP coordinates

10.1.1.1 Construction of ortho mosaic by using boundary coordinates:

Drone survey was carried out using a Phantom 4 Pro UAV equipped with a high-resolution camera for acquisition of aerial imagery over the entire block area. The survey boundary was established using block corner coordinates and subsequently validated through Differential Global Positioning System (DGPS) measurements (Table No 6.2).

Table No 10.1 - Geographic Coordinates of the Boundary Points of the Rampura–Gollarahatti Study Area.

Boundary Coordinates / Point id	Latitude /Longitude Decimal Seconds (dd mm ss. ss)	
	Latitude	Longitude
A	N 13° 26' 32.39"	E 76° 22' 27.96"
B	N 13° 26' 32.19"	E 76° 23' 05.17"
C	N 13° 25' 50.58"	E 76° 23' 29.33"
D	N 13° 25' 39.59"	E 76° 23' 29.33"
E	N 13° 25' 39.59"	E 76° 22' 42.58"
F	N 13° 26' 13.50"	E 76° 22' 42.81"
G	N 13° 26' 13.58"	E 76° 22' 27.85"

For improving positional accuracy and geospatial correction of aerial data, 11 Ground Control Points (GCPs) were established across the study area using Leica Viva GS16 DGPS. The spatial distribution of GCPs ensured reliable georeferencing and generation of high-resolution Ortho mosaic imagery for subsequent terrain and geological interpretation (Table 10.1 and Figure 10.1).

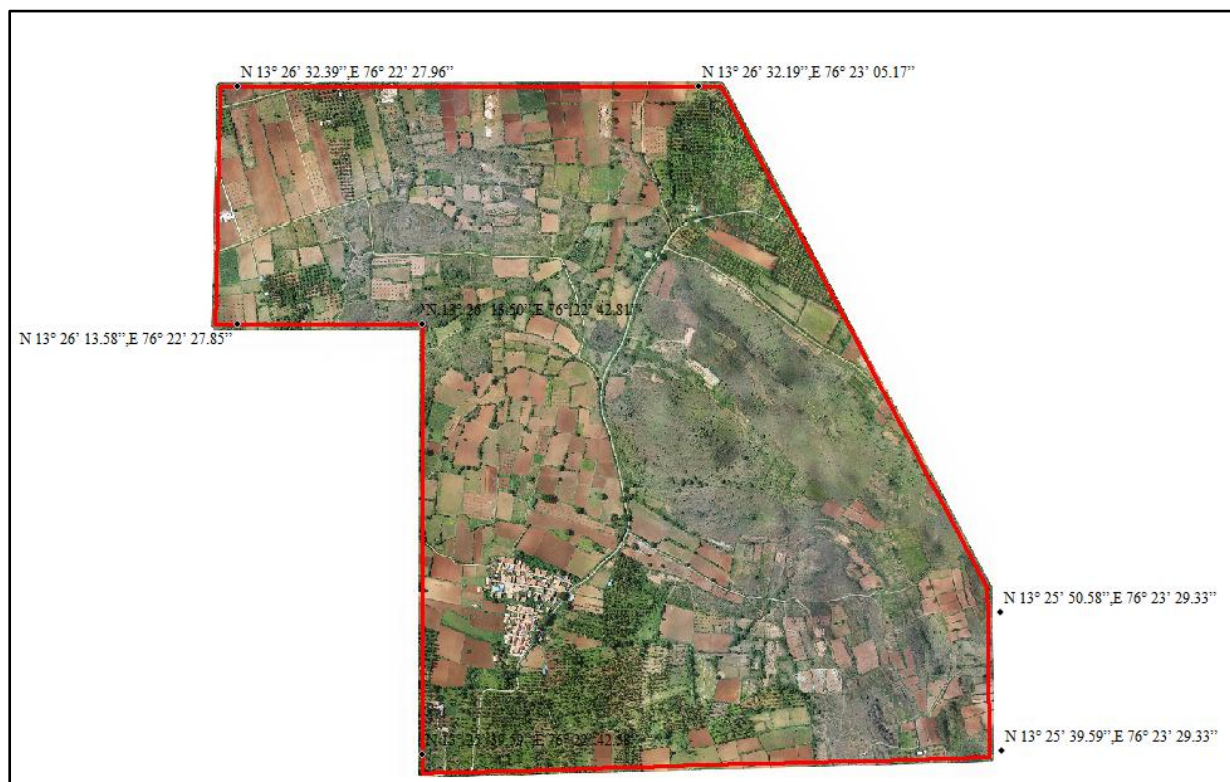


Figure No. 10.1 - Boundary Coordinates and Spatial Configuration of the Rampura–Gollarahatti Study Area.

For obtaining detailed drone surveying, The Leica Viva GS16 DGPS was used in the study area (a detail of DGPS is attached as Annexure 2). A total of 11 Ground Control Points (GCP) were selected for investigation. The details of GCP points were listed in Table 10.1 and Figure 10.1 represents Ground Control Points (GCP) projected over the ortho-imagery

Table No 10.2 - Ground Control Point (GCP) Coordinates and Elevation Data Used for the Drone-Based Survey.

GCP	Latitude /Longitude Decimal Seconds (dd mm ss. ssss)	
	Latitude	Longitude
BASE2A	13°25'50.6269"	076°23'11.9688"
GCP01	13°25'52.9235"	076°23'22.7564"
GCP02	13°25'53.1392"	076°22'56.2432"
GCP03	13°26'04.0527"	076°22'51.0320"
GCP04	13°26'18.6806"	076°22'48.5790"
GCP05	13°26'17.6943"	076°22'37.1022"
GCP06	13°26'27.3289"	076°22'32.8528"
GCP07	13°26'29.4493"	076°22'48.9345"
GCP08	13°26'30.4241"	076°23'00.6341"
GCP09	13°26'19.6378"	076°23'02.5934"
GCP10	13°26'12.3692"	076°23'13.5418"
GCP11	13°26'11.2647"	076°22'58.5342"



Figure No. 10.2 - Ground Control Point (GCP) Locations Established for the Drone-Based Survey of the Rampura–Gollarahatti Study Area.

10.1.2 Gravity station layout

10.1.2.1 Gravity survey layout - description

Gravity survey observations were acquired over the entire 2.0 sq. km block on a nominal grid pattern of 100 m × 100 m using Differential Global Positioning System (DGPS) for precise station positioning and elevation control. A total of 202 gravity stations distributed along 19 traverses were established and measured. The detailed survey layout and traverse plan are presented in Figure No. 10.3.

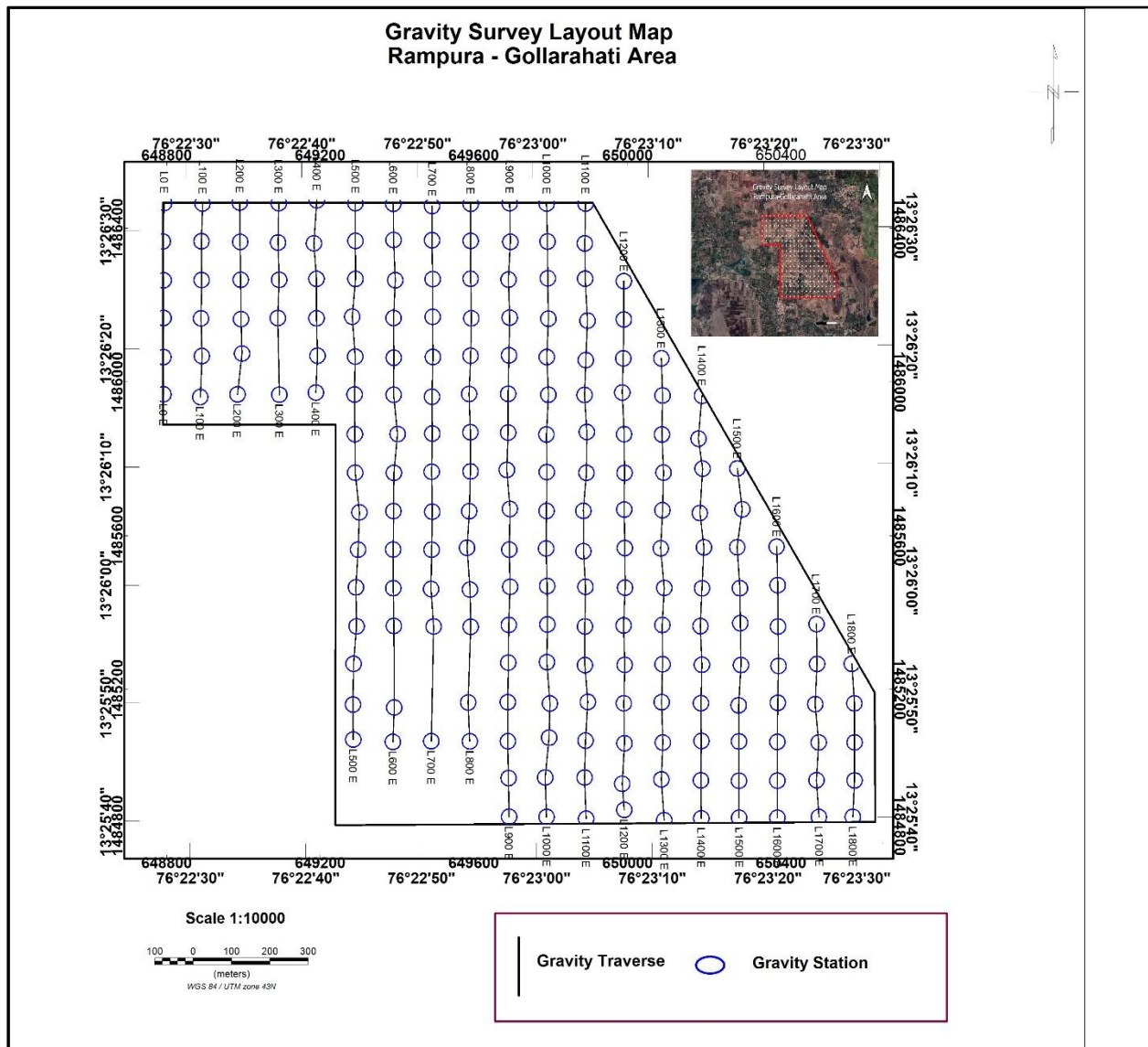


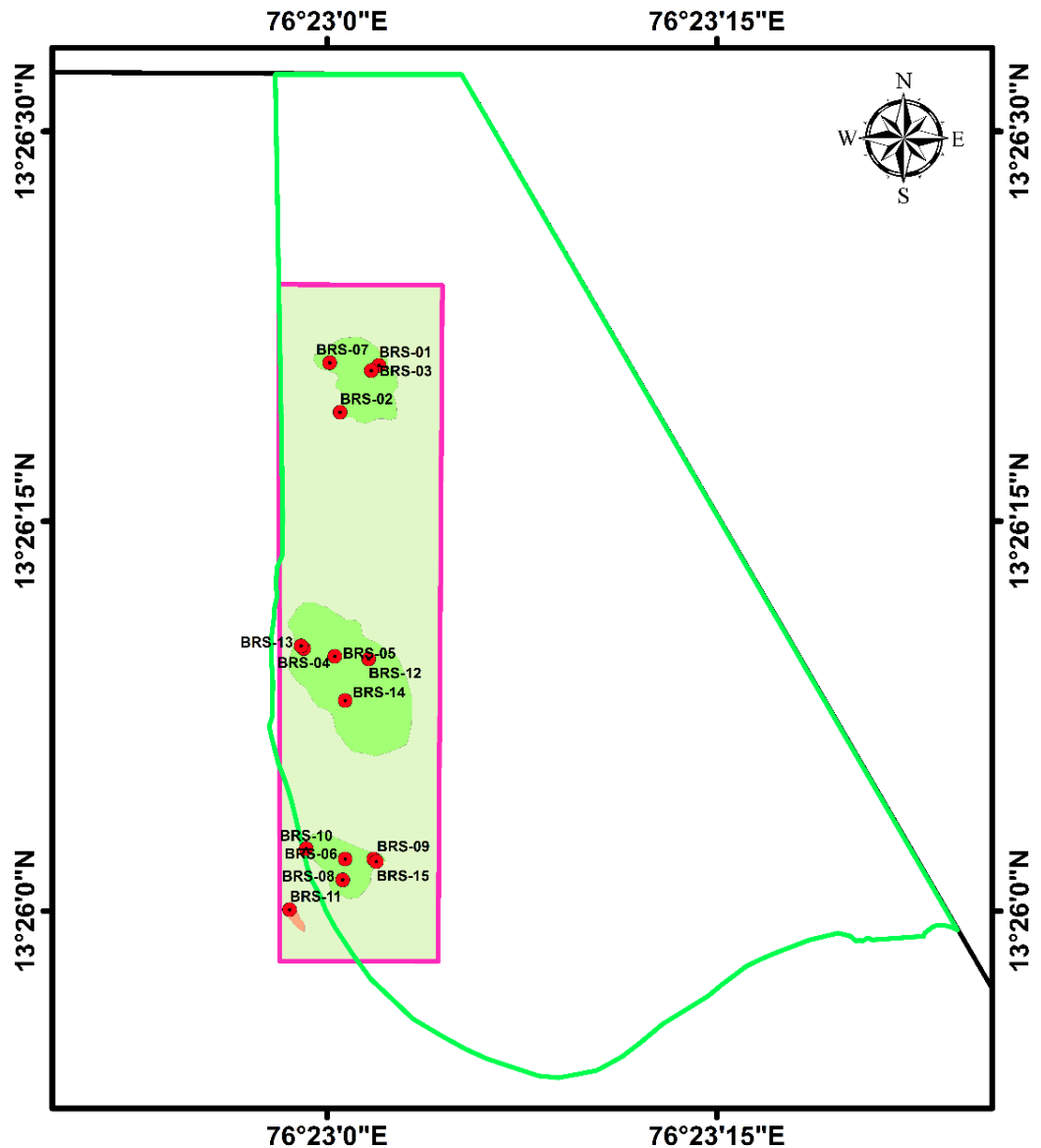
Figure No. 10.3 - Ground Gravity Survey Layout Showing the Distribution of Survey Stations and Traverses Across the Rampura–Gollarahatti Study Area.

CHAPTER 11: SAMPLING TECHNIQUE

11.1 Nature and quality of sampling (eg. cut channels, random chips, etc.) and measures taken to ensure sample representation.

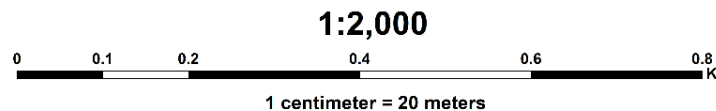
During the geological and structural mapping in the sub block 1, 15 samples were collected in various locations based on the exposure as shown in the Plate 4. The sampling work comprised bedrock chip sampling in the mapped Sub-block 1. Analytical procedures and the resulting dataset are presented under Section 14.

PLATE - 4
GEOLOGICAL MAP WITH SAMPLE LOCATION OF RECONNAISSANCE SURVEY FOR Ni, Co, PG
& REE / ASSOCIATED MINERALS IN J C PURA MAFIC-ULTRAMAFIC SCHIST BELT NEAR
RAMPURA AND GOLLARAHATTI (RG) BLOCK, HASSAN DISTRICT, KARNATAKA



INDEX

- BRS Location
- GeoExpOre Mapped Area - 0.15 Sq. Km
- Unmapped Area - 0.85 Sq.Km



Lithology

- Pegmatite
- Talc-Tremolite-Chlorite Schist
- Serpentinite

Formation

- Younger intrusives
- J.C. Pura Schist belt

Group

Sargur Group

Age

- Late Archean
- Palaeoarchean-Mesoarchean

CHAPTER 12: DRILLING TECHNIQUE AND DRILL SAMPLING

Drilling and drill sampling were not undertaken during this G4 investigation. Subsurface investigation could not be completed because of local public agitation and access constraints.



CHAPTER 13: SUB-SAMPLING TECHNIQUES AND SAMPLE PREPARATION

13.1 If core, whether cut or sawn and whether quarter, half or all core taken.

No drilling was done

13.2 If non-core

13.2.1 (a) If non-core, whether riffled, tube sampled, rotary split, etc., and whether sampled

Not applicable

13.2.2 For all sample types, the nature, quality and appropriateness of the sample preparation technique.

Bedrock samples were collected in the mineralized zones maintaining proper

13.3 Quality control procedures adopted for all sub-sampling stages to maximize representation of samples.

A formal sub-sampling and sample preparation protocol is not documented in this G4 report. No additional preparation work is claimed beyond the laboratory analysis reported in Section 14.

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

All primary Bedrock samples (BRS) were collected from fresh, in-situ and representative bedrock exposures.

CHAPTER 14: QUALITY OF ASSAY DATA AND LABORATORY TESTS

A total of 15 bedrock samples were analyzed: one pegmatite (KARG/BRS-11/2023-24), one talc-tremolite-chlorite schist (KARG/BRS-15/2023-24) and 13 serpentinite samples. A total of 47 elements were analyzed by ICP-MS/OES at Shiva Analytical Laboratory, with the Ni, Co, REE and associated-element results reported in ppm. The PGE values in Table No. 14.1 represent the sum of Pt, Pd, Ru, Rh, Ir and Os (6E), converted to ppb from a nickel-sulphide fire assay with ICP-MS finish (SOP/OM/055). Analytical procedures, standards and detection limits are provided in Annexures II, III, IV and V, and the summary results are presented in Table No. 14.1.

Table No. 14.1 - Summary geochemical results for bedrock samples from the Rampura-Gollarahatti Study Area (Ni, Co, REE and PGE; units as shown).

SAMPLE NO	Ni (ppm)	Σ REE (ppm)	PGE sum (6E, ppb)	Co (ppm)
KARG/BRS-1/2023-24	1670.00	40.20	41.00	85.00
KARG/BRS-2/2023-24	1618.00	33.73	38.00	88.00
KARG/BRS-3/2023-24	1842.00	46.37	44.00	86.00
KARG/BRS-4/2023-24	1973.00	41.88	70.00	90.00
KARG/BRS-5/2023-24	1939.00	30.54	41.00	80.00
KARG/BRS-6/2023-24	1750.00	41.21	36.00	91.00
KARG/BRS-7/2023-24	1546.00	27.53	50.00	81.00
KARG/BRS-8/2023-24	1769.00	39.10	50.00	85.00
KARG/BRS-9/2023-24	1599.00	31.97	30.00	80.00
KARG/BRS-10/2023-24	1866.00	33.68	44.00	93.00
KARG/BRS-11/2023-24	42.00	45.97	30.00	<5
KARG/BRS-12/2023-24	1613.00	34.25	46.00	80.00

KARG/BRS-13/2023-24	1924.00	27.89	51.00	74.00
KARG/BRS-14/2023-24	1533.00	31.95	32.00	79.00
KARG/BRS-15/2023-24	1612.00	26.68	41.00	73.00

The analytical results indicate that Ni, Co, PGE and REE occur at variable concentrations within the investigated lithologies. Across the 15 samples summarized in Table No. 14.1, Ni ranges from 42 to 1973 ppm and Co ranges from <5 to 93 ppm. The reported six-element PGE sum ranges from 30.00 to 70.00 ppb, while the Σ REE values, calculated from the 16 REE elements using the reported detection-limit values for below-detection results, range from 26.68 to 46.37 ppm. The higher Σ REE value in this summary occurs in KARG/BRS-3/2023-24, whereas the higher Ni and Co values are concentrated in serpentinite and altered ultramafic lithologies. Because most individual PGE analytes are at or below the 0.005 ppm detection limit, totals near 30 ppb are reporting-limit responses rather than evidence of comparable enrichment in felsic and ultramafic rocks. The results therefore support follow-up exploration but do not establish economic PGE mineralization.

The PGE certificate includes AMIS0874 certified reference material at the beginning and end of the batch and reports accuracy and precision as method- and instrument-dependent. Correlation plots in this section are consequently treated as exploratory, particularly where values approach analytical reporting limits.

The serpentinite samples analyzed were fresh, medium grain light green to greyish colored serpentinites show spherulitic textures and composed of olivine, serpentinite and Chlorite. Yellowish brown and coffee brown color limonitic stains are ubiquitous. Most of the serpentinites are feebly magnetic. Occasional incidences of silicification (stringers and veinlets of quartz) are recorded. The Serpentinites are either in contact with talc-chlorite schist or with gabbroic rocks.

The available geochemical data was interpreted for two purposes (i) to understand the elemental variations during magmatic differentiation of the ultramafic body and (ii) to understand variations in Ni and associated elements during magmatic- and post-magmatic processes.

14.1.1 Statistical results of geochemical investigation

Elemental variations during magmatic differentiation processes: Magnesium was used as a differentiation index to examine the distribution of major and trace elements in the ultramafic samples (Figure 14.1). The plotted concentrations are reported in ppm, as indicated by the figure axes. Fe, Ca and Al, together with Ti, show broadly decreasing trends with increasing Mg. These relationships are consistent with fractional-crystallization effects involving Fe-, Ca-, Al- and Ti-bearing phases, but the small sample population and limited lithological coverage do not permit a definitive petrogenetic interpretation.

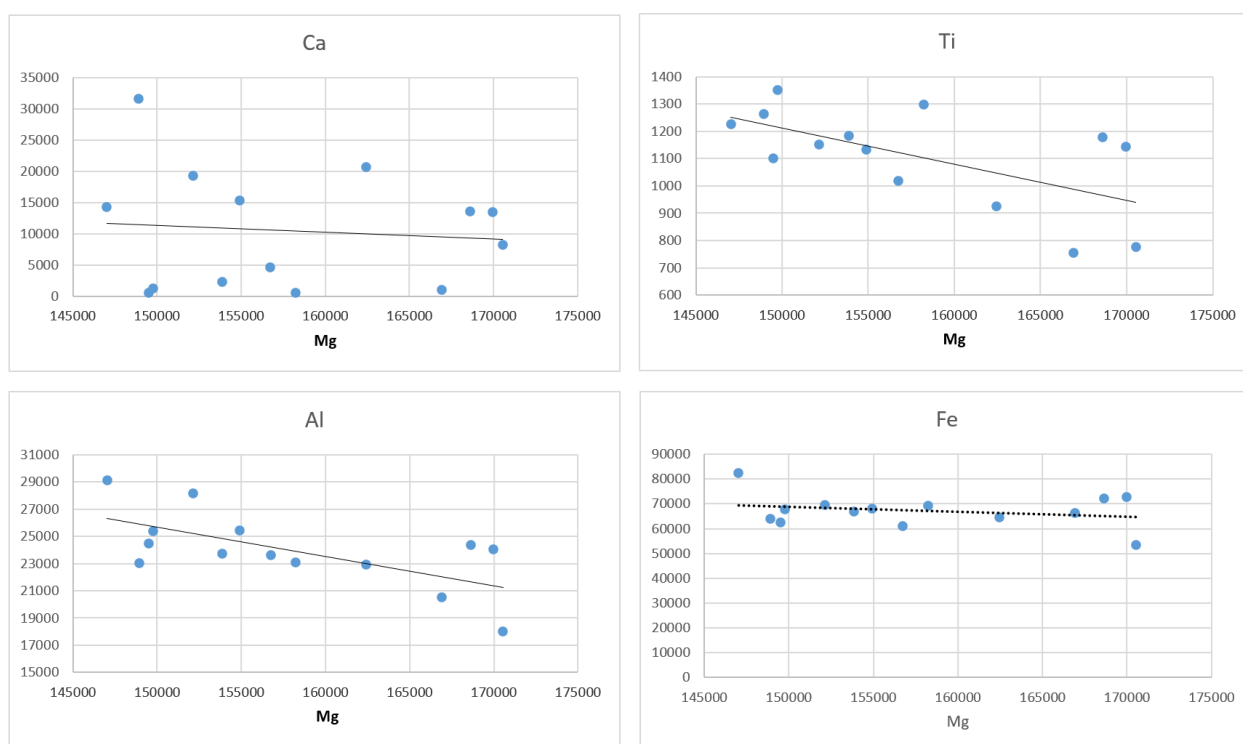


Figure No. 14.1 - Variation of major-element concentrations (ppm) with Mg (ppm) in bedrock samples from the investigated area.

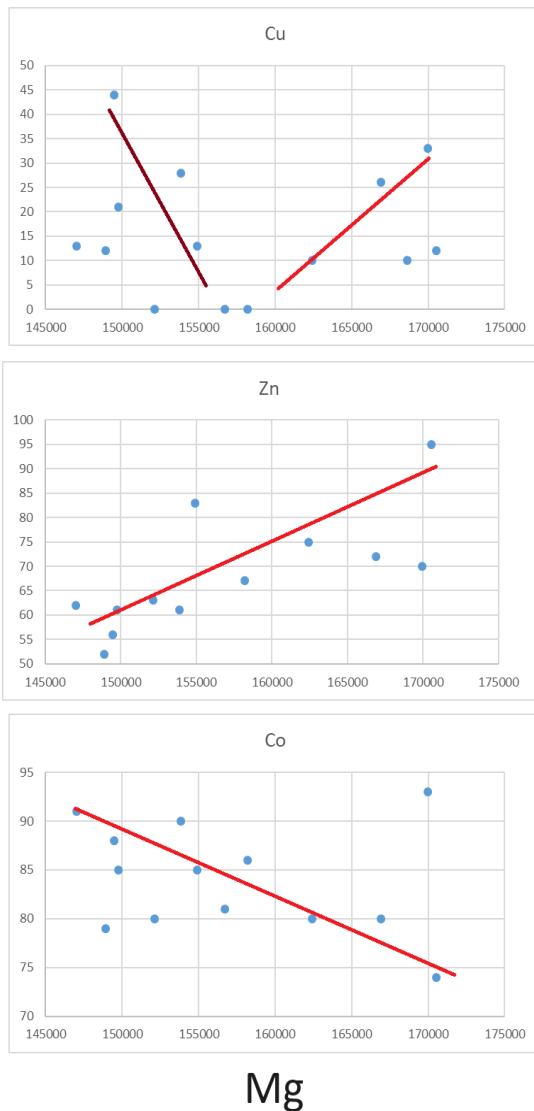


Figure No. 14.2 - Variation of base-metal concentrations (ppm) with Mg (ppm) in bedrock samples from the investigated area.

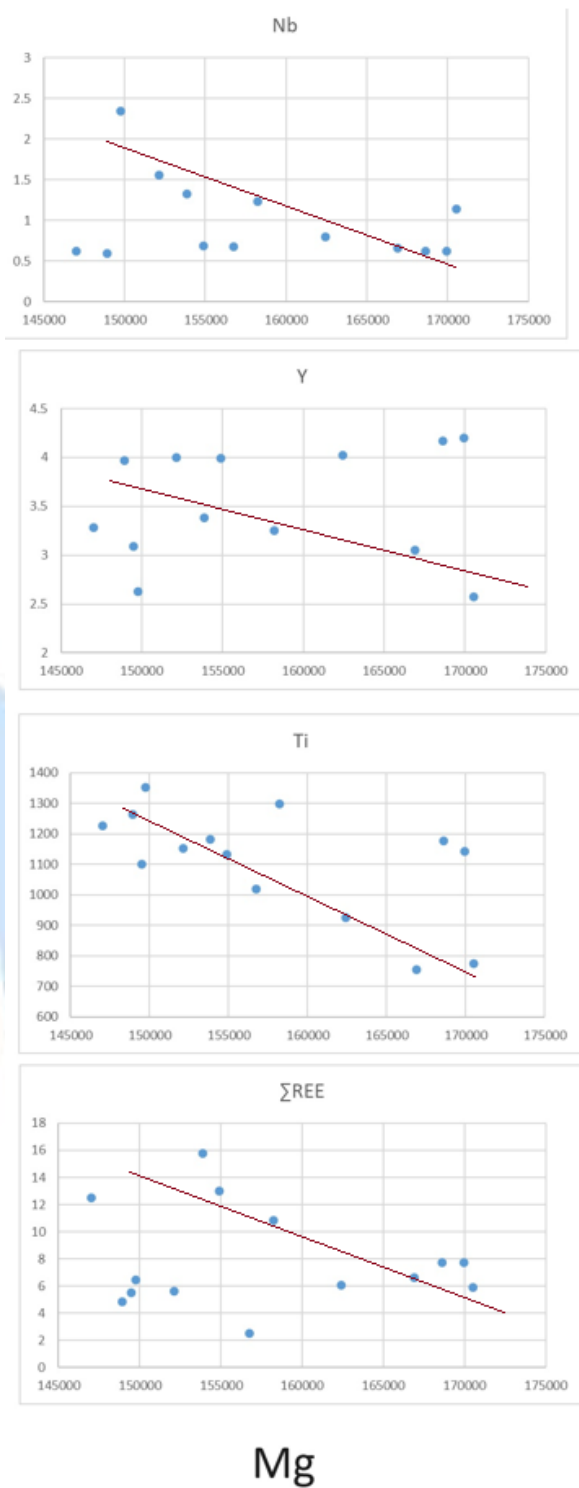


Figure No. 14.3 - Variation of Mg (ppm) with high-field-strength element concentrations (ppm) in bedrock samples from the investigated area.

Copper ranges from 0 to 44 ppm, zinc from 49 to 95 ppm and cobalt from 73 to 94 ppm in the plotted bedrock dataset. These ranges describe the measured samples; they should not be interpreted as proof of primary magmatic control or later enrichment without additional sampling and petrographic confirmation.

Plots of Mg against the base metals show scattered and locally opposing trends for Zn, Co and Cu. These patterns may reflect differences in lithology, alteration and analytical scatter, but the present dataset is too small to distinguish magmatic partitioning from secondary redistribution. The observations are therefore treated as working hypotheses for follow-up investigation rather than as established enrichment processes.

Nickel vs other elements: Nickel concentrations were compared with major elements (Figure 14.4), high-field-strength elements (HFSE; Figure 14.5), large-ion-lithophile elements (LILE; Figure 14.6), selected trace elements (Figure 14.7) and base metals (Figure 14.8). The axes represent concentrations in ppm. The small number of samples, inclusion of different lithologies and values near reporting limits mean that these plots are exploratory and do not establish distinct enrichment stages.

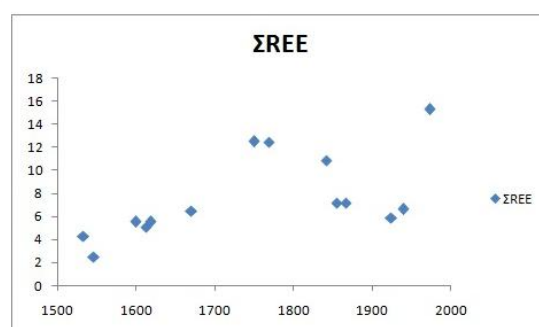
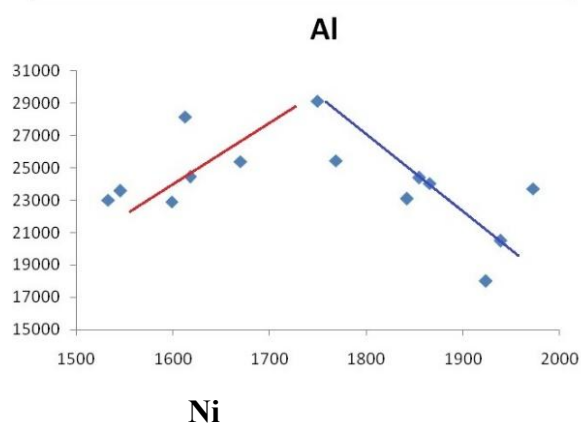
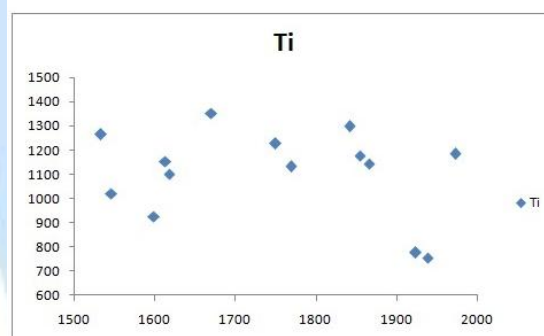
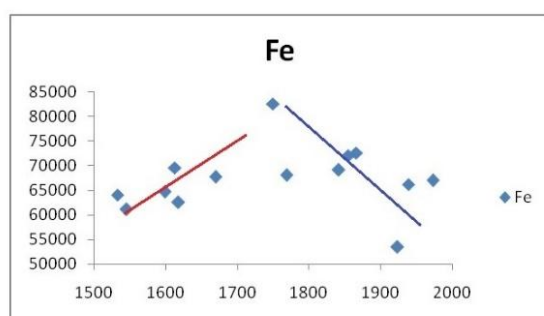
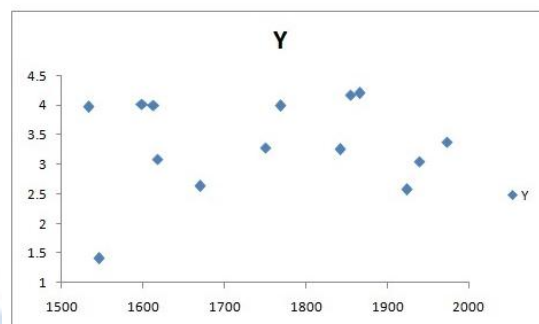
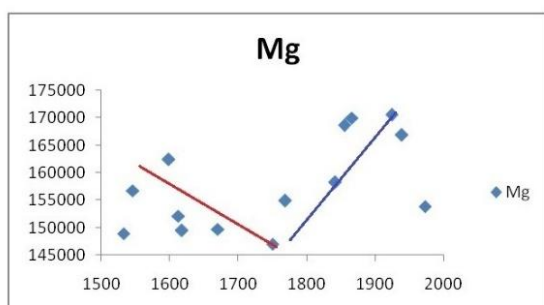
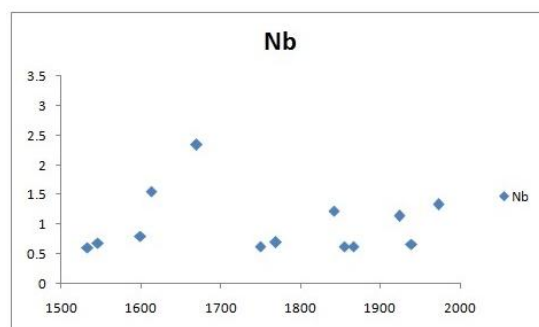
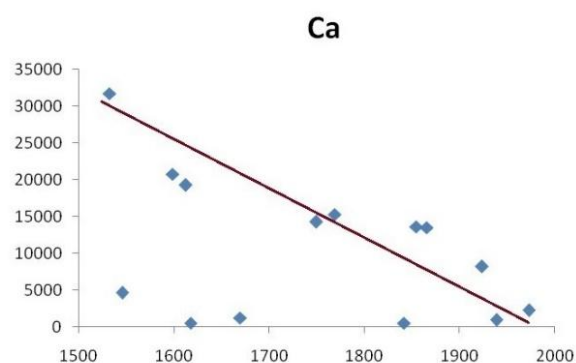


Figure No. 14.4 - Variation of Ni (ppm) with major-element concentrations (ppm) in bedrock samples from the investigated area.

Ni

Figure No. 14.5 - Variation of Ni (ppm) with high-field-strength element concentrations (ppm) in bedrock samples from the investigated area.

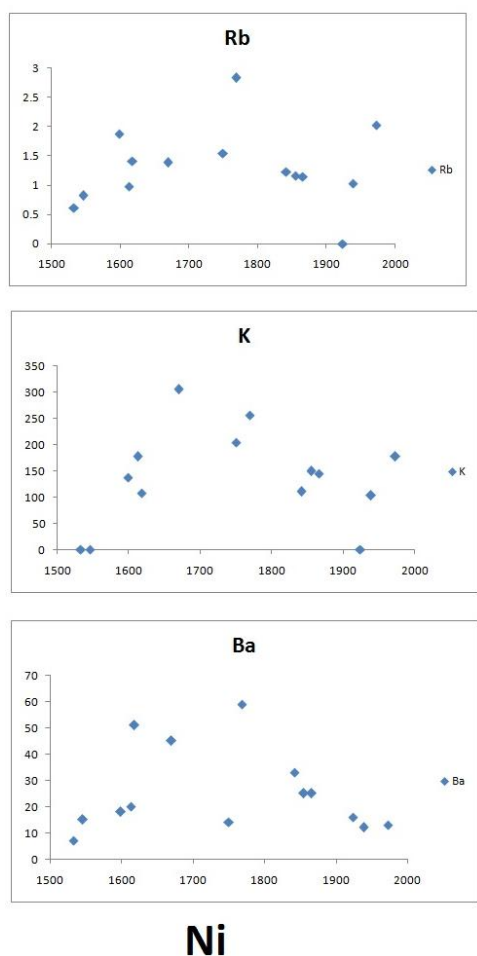
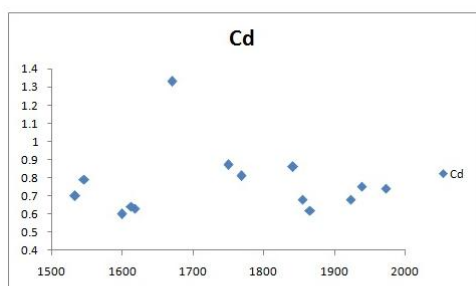
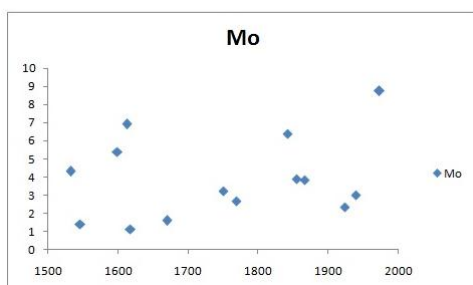
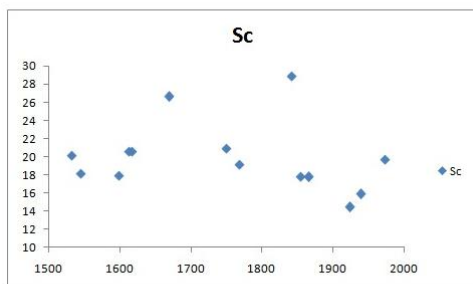
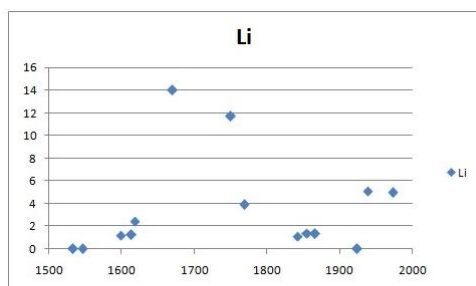


Figure No. 14.6 - Variation of Ni (ppm) with large-ion-lithophile element concentrations (ppm) in bedrock samples from the investigated area.

The available binary plots show several correlations and groupings, but the following observations are descriptive only because the dataset contains 15 samples from more than one lithology and includes values near reporting limits:

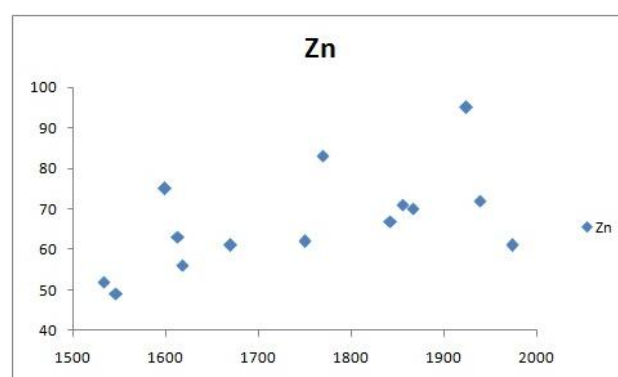
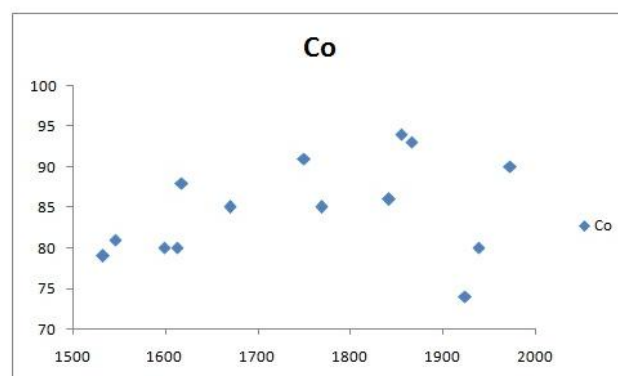
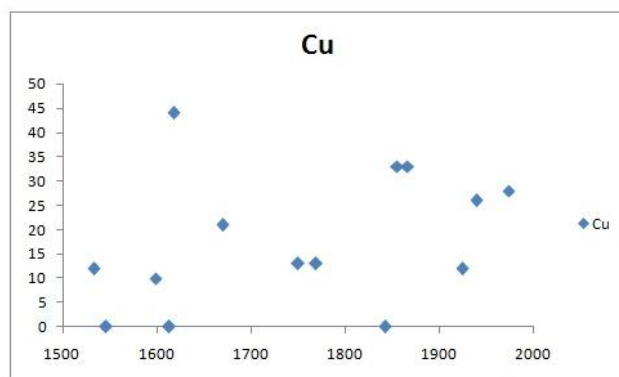
1. Most major-element plots show scattered or segmented relationships with Ni; Ca is comparatively less structured in the present sample set.
2. Among the HFSE and REE variables, Nb and Ti show apparent groupings, whereas Y and total REE are more scattered.
3. Li, Sc, Mo and Cd also show variable, partly grouped distributions that require confirmation with additional samples.
4. Cu, Zn and Co show scattered relationships with Ni; no individual trend is considered conclusive.

The observed groupings may reflect differences between serpentinite, pegmatite and talc-tremolite-chlorite schist, as well as alteration or sulphide-related redistribution. They do not by themselves demonstrate two discrete stages of Ni enrichment or confirm sulphide mineralization. Published reports of pyrrhotite and pentlandite in the wider Rampura-Gollarahatti ultramafic belt (Santosh et al., 2023; Talukdar et al., 2018) provide a rationale for follow-up petrography and mineralogical work.



Ni

Figure No. 14.7 - Variation of Ni (ppm) with selected trace-element concentrations (ppm) in bedrock samples from the investigated area.



Ni

Figure No. 14.8 - Variation of Ni (ppm) with base-metal concentrations (ppm) in bedrock samples from the investigated area.

The geochemical investigation carried out in Sub-block 1 indicates elevated nickel concentrations within serpentinite and associated altered ultramafic lithologies. Nickel concentration varies from 1533 ppm to 1973 ppm, while cobalt ranges from 73 ppm to 93 ppm. Platinum Group Elements

(PGE) values range from 30 ppb to 70 ppb and represent low-level responses, with the highest values occurring in selected structurally modified ultramafic samples.

Compared with the GSI ranges cited in this report, the present dataset overlaps the reported Ni and Co ranges and includes selected serpentinite samples with higher Ni values within the local sample set. The present six-element PGE sum is reported in ppb, whereas the cited GSI PGE result is reported in ppm or has an unconfirmed source unit; direct PGE comparison is therefore withheld pending verification. The results support follow-up sampling but do not establish superior geochemical fertility.

The occurrence of elevated nickel and PGE values in serpentinite, particularly near structurally disturbed and schistose zones, suggests that both lithological composition and structural modification have contributed to localization of mineralization. Serpentinization and quartz veining observed in the field are interpreted to have influenced redistribution of metallic constituents.

Although the present dataset is limited due to curtailed field activities, the geochemical signatures obtained from the investigated area indicate favorable conditions for Ni–Co–PGE mineralization and justify further detailed exploration in the remaining parts of the block.

CHAPTER 15: MOISTURE

Moisture determination was not undertaken or reported because the present investigation comprised surface reconnaissance sampling and did not involve resource estimation.



CHAPTER 16: BULK DENSITY

Bulk-density measurements were not undertaken or reported at the G4 stage. No density data are used for resource estimation.



CHAPTER 17: BENEFICIATION STUDIES

Beneficiation or mineral-processing studies were not undertaken because the investigation did not establish a mineral resource or a defined orebody.



CHAPTER 18: RESOURCE ESTIMATION TECHNIQUES

No mineral resource estimation was undertaken. The work remained at G4 reconnaissance stage, with limited detailed mapping and geochemical coverage and no drilling or subsurface continuity data.



CHAPTER 19: REPORTING OF RESOURCES

No mineral resource or reserve is reported in this document. The interpreted target envelopes are exploration targets only and are not resource boundaries or mineralized widths.



CHAPTER 20: SUMMARY AND RECOMMENDATIONS

20.1 A discussion on the outcome of the exploration work detailing the nature of the deposit, the dimension of the deposit, general structural trend, depth of occurrence and depth up to which exploration has been done, possibility of continuity of mineralisation beyond the depth of exploration and future exploration requirements, if any.

20.1.1 Integrated geological interpretation

The integrated interpretation of geological mapping, gravity survey and geochemical investigation indicates favorable geological conditions for Ni–Co–PGE mineralization within the investigated part of the Rampura–Gollarahatti block.

Detailed geological mapping carried out in Sub-block 1 revealed serpentinite as the dominant lithological unit associated with talc–tremolite–chlorite schist and pegmatite. The ultramafic assemblage follows a dominant NW-SE structural trend consistent with the regional tectonic grain of the J.C. Pura schist belt. Field observations indicate schistosity development, folding and local structural disturbance within serpentinite bodies.

The gravity survey conducted over the entire 2.0 sq. km block delineated distinct density contrasts, structural discontinuities and anomalous zones. Residual anomaly and derivative maps indicate the presence of structurally disturbed domains and subsurface lithological variability interpreted to correspond with serpentinite, TTCS, pegmatite and associated lithological units.

Geochemical investigation of 15 bedrock samples recorded Ni values of 42–1973 ppm and Co

values of <5–93 ppm, with a six-element PGE sum of 30.00–70.00 ppb. Higher Ni and PGE sums occur in selected serpentinite and altered ultramafic samples, but the PGE reporting limit and small multi-lithology dataset require cautious interpretation and do not establish economic enrichment.

The coincidence of serpentinite bodies, structural disturbance, higher Ni values and gravity anomalies supports a working hypothesis of lithological and deformation-related control on geochemical targeting. The anomaly interpretation remains preliminary because detailed mapping and sampling covered only approximately 0.15 sq. km.

20.1.2 Delineation of prospective zones

Based on integrated interpretation of geological, geophysical and geochemical datasets, structurally modified serpentinite bodies occurring along lithological contacts and gravity anomaly zones are interpreted as favorable target areas for further detailed investigation.

Emphasis may be given to structurally disturbed serpentinite zones showing schistosity, folding and quartz veining, where elevated Ni and PGE values have been recorded. The geophysical anomalies identified through gravity interpretation may represent priority target areas for future trenching and scout drilling.

20.1.3 Limitation of investigation

Although geophysical survey was completed over the entire block area, detailed geological mapping and geochemical sampling could only be completed over a limited area due to local public interference and operational constraints. Consequently, interpretation of mineral prospectivity is based on the available datasets generated from the investigated portion of the block.

Nevertheless, the integrated geoscientific datasets generated during the present G4 investigation provide a basis for prioritizing target zones and planning follow-up exploration, subject to confirmation by detailed work.

20.1.4 Surface indication

Field investigations carried out in Sub-block 1 revealed serpentinite, talc–tremolite–chlorite schist (TTCS) and pegmatite with schistosity, folding and quartz veining. Structurally modified

serpentinite is the principal unit associated with the higher measured values, including Ni up to 1973 ppm and a six-element PGE sum of 30.00–70.00 ppb in selected samples. These results identify geochemical targets but do not establish economic mineralization.

No visible sulphide mineralization was observed during field investigation. However, alteration features, structural disturbance and favourable ultramafic host lithology indicate potential for concealed mineralization.

20.1.5 Mode of occurrence

The mineralization potential in the study area is associated with serpentinite and altered ultramafic lithologies within the J.C. Pura schist belt. The measured Ni range of 42–1973 ppm, Co range of <5–93 ppm and six-element PGE sum of 30.00–70.00 ppb is treated as geochemical indicators whose distribution may be influenced by lithology, alteration and structure, particularly along sheared, schistose and folded zones.

Quartz/pegmatite veining observed within serpentinite bodies indicates multiple phases of tectonic activity and fluid movement, which may have contributed to redistribution of metallic constituents.

20.1.6 Strike length and width of anomalous zones

Due to limited accessibility and discontinuation of field activities arising from local public agitation, systematic delineation of strike continuity and width of anomalous zones could not be established during the present investigation.

However, integrated interpretation of geological mapping, gravity anomalies and geochemical signatures indicates localized target zones associated with structurally modified serpentinite bodies. The three gravity-supported target envelopes measure approximately 260 m × 220 m, 450 m × 260 m and 540 m × 470 m; these dimensions require confirmation by detailed mapping, infill geophysics and channel or trench sampling.

20.1.7 Alteration zone

The study area exhibits extensive serpentinization, talcification and chloritization of ultramafic rocks, particularly along lithological contacts and structurally disturbed zones. Quartz veining and

local ferruginization observed in surface exposures suggest fluid activity and tectonic reworking of the ultramafic assemblage. These alteration zones are exploration indicators for possible Ni–Co–PGE redistribution, but their mineralogical significance requires petrographic and mineral-chemical confirmation.

20.1.8 Genesis of mineralization

The observed geochemical signatures are consistent with an ultramafic-hosted system that may have been modified by tectono-metamorphic activity, serpentinization and later fluid movement. The association of serpentinite, TTCS, deformation and quartz/pegmatite veining provides a working model for redistribution and possible local concentration of metallic constituents, but the present data are insufficient to distinguish primary magmatic enrichment from secondary alteration-related concentration.

The association of higher Ni values and reported PGE sums with structurally modified serpentinite supports a combined lithological and structural control hypothesis. Confirmation requires petrography, mineral chemistry, repeat or infill sampling and additional geophysical investigation.

20.1.9 Conclusion

The present G4 investigation in the Rampura–Gollarahatti block established serpentinite as the dominant lithological unit associated with talc–tremolite–chlorite schist (TTCS) and pegmatite within the investigated area.

- Detailed geological mapping in Sub-block 1 indicates a dominant NW-SE structural trend with evidence of folding, schistosity and local shearing within serpentinite bodies.
- Geochemical investigation comprising 15 bedrock samples recorded Ni values of 42–1973 ppm, Co values of <5–93 ppm and a six-element PGE sum ranging from 30.00–70.00 ppb, with the higher Ni and PGE results concentrated in selected serpentinite and altered ultramafic samples. The PGE sum is reported in ppb and should not be compared directly with GSI values reported in ppm unless the source units are verified.
- Gravity survey completed over the entire 2.0 sq. km block delineated density contrasts, structural discontinuities and anomalous zones interpreted to correspond with ultramafic and associated lithological units.

- Integrated interpretation of geological, geophysical and geochemical datasets indicates that structurally modified serpentinite bodies and associated lithological contacts constitute favourable target zones for Ni–Co–PGE mineralization.
- Due to local public agitation and operational constraints, detailed geological mapping and geochemical investigation could only be completed over approximately 0.15 sq. km of the block area.

The 202-station gravity survey, acquired at a nominal 100 m grid spacing over the 2.0 sq. km block, delineated density contrasts and structural discontinuities that broadly correlate with mapped lithological contacts. The geochemical dataset records Ni of 42–1973 ppm, Co of <5–93 ppm and a six-element PGE sum of 30.00–70.00 ppb. The Ni and Co ranges overlap the GSI ranges reported in this document (Ni 20–3515 ppm; Co 35–330 ppm); the PGE comparison requires confirmation of the GSI units because the present results are reported in ppb. The integrated evidence supports prioritization of the three interpreted target zones, but not a conclusion of higher-than-GSI enrichment or an established mineral resource.

Because Ni, Co and PGE are critical or associated commodities, the identified targets should be assessed through staged follow-up exploration rather than treated as confirmed resources. Field activities should proceed only with documented access permissions, local stakeholder engagement and support from the competent administrative and regulatory authorities.

20.1.10 The resources estimated under various classes with grade.

No resources were estimated

20.1.11 The possibility of economic extraction based on present technological, environmental, social and market conditions.

Since the exploration was halted midsession hence such possibilities cannot be made without proper and full investigation.

20.1.12 Hindrances, if any, anticipated in the economic extraction of the deposit.

Local agitation is expected in the field, proper talk channels and support from the local administration need to be obtained before proceeding with work in this area.

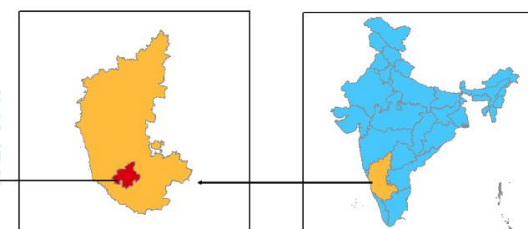
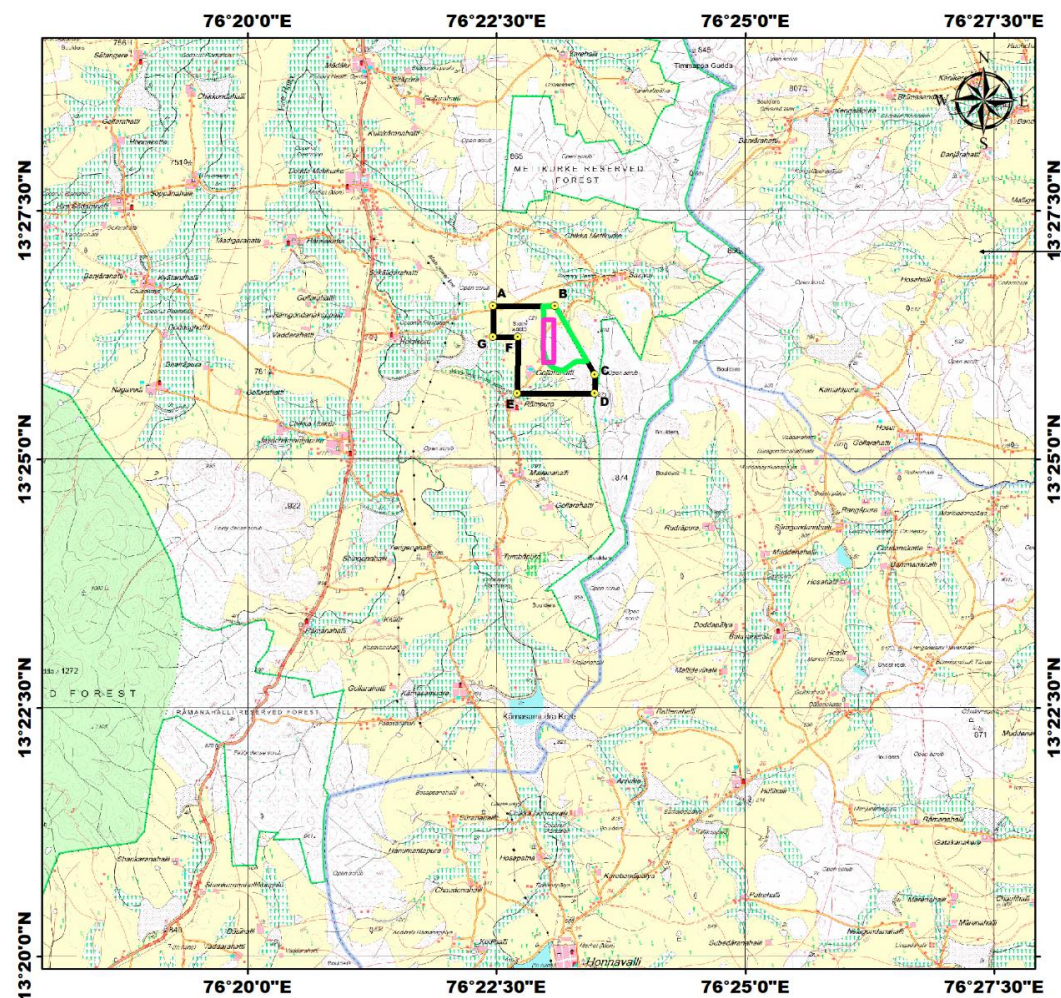
20.2 Discussion on the suggested future or strategy for the deposit for further exploration and mining.

1. The remaining unexplored portion of the block may be taken up for detailed geological and structural mapping to establish continuity of ultramafic bodies and associated structural features.
2. Systematic trench/channel sampling and detailed geochemical investigation should be undertaken across structurally modified serpentinite zones and lithological contacts, with blanks, duplicates, certified reference materials and repeat assays used to document analytical quality. Representative samples should also be examined by petrography, polished-section ore microscopy and suitable mineral-chemical methods to identify Ni-, Co- and PGE-bearing phases.
3. Detailed magnetic surveying at approximately 20 m traverse spacing and IP/resistivity surveying at approximately 50 m traverse spacing are recommended over the three interpreted target zones to refine lithological boundaries, structures and chargeability/resistivity responses. Survey parameters should be finalized after a site-specific design and checked against the resolution required by the target widths.
4. Scout drilling may be considered in integrated anomalous zones after completion of detailed surface investigation to assess subsurface continuity and mineralization potential.
5. Further exploration activities may be planned after resolution of local public issues and improvement in field accessibility.

CHAPTER 21: PLATES

PLATE 1

LOCATION MAP OF PRELIMINARY EXPLORATION FOR NICKEL, COBALT, PGE & REE / ASSOCIATED MINERALS IN J C PURA MAFIC-ULTRAMAFIC SCHIST BELT NEAR RAMPURA AND GOLLARAHATTI (RG) BLOCK, HASSAN DISTRICT, KARNATAKA ON TOPOSHEET NO. 57 C/7



LEGEND

- GSI Block Cardinal Point
- GSI Block Boundary - 2 Sq. Km
- GSI - Unmapped area - 0.85 Sq. Km
- GeoExpOre Mapped Area - 0.15 Sq. Km

GSI - G3 BLOCK (2 Sq. Km)		
CARDINAL POINT	LATITUDE	LONGITUDE
A	13°26'32.39"N	76°22'27.96"E
B	13°26'32.19"N	76°23'5.17"E
C	13°25'50.58"N	76°23'29.33"E
D	13°25'39.59"N	76°23'29.33"E
E	13°25'39.59"N	76°22'42.58"E
F	13°26'13.50"N	76°22'42.81"E
G	13°26'13.58"N	76°22'27.85"E

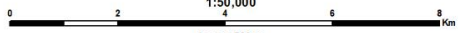
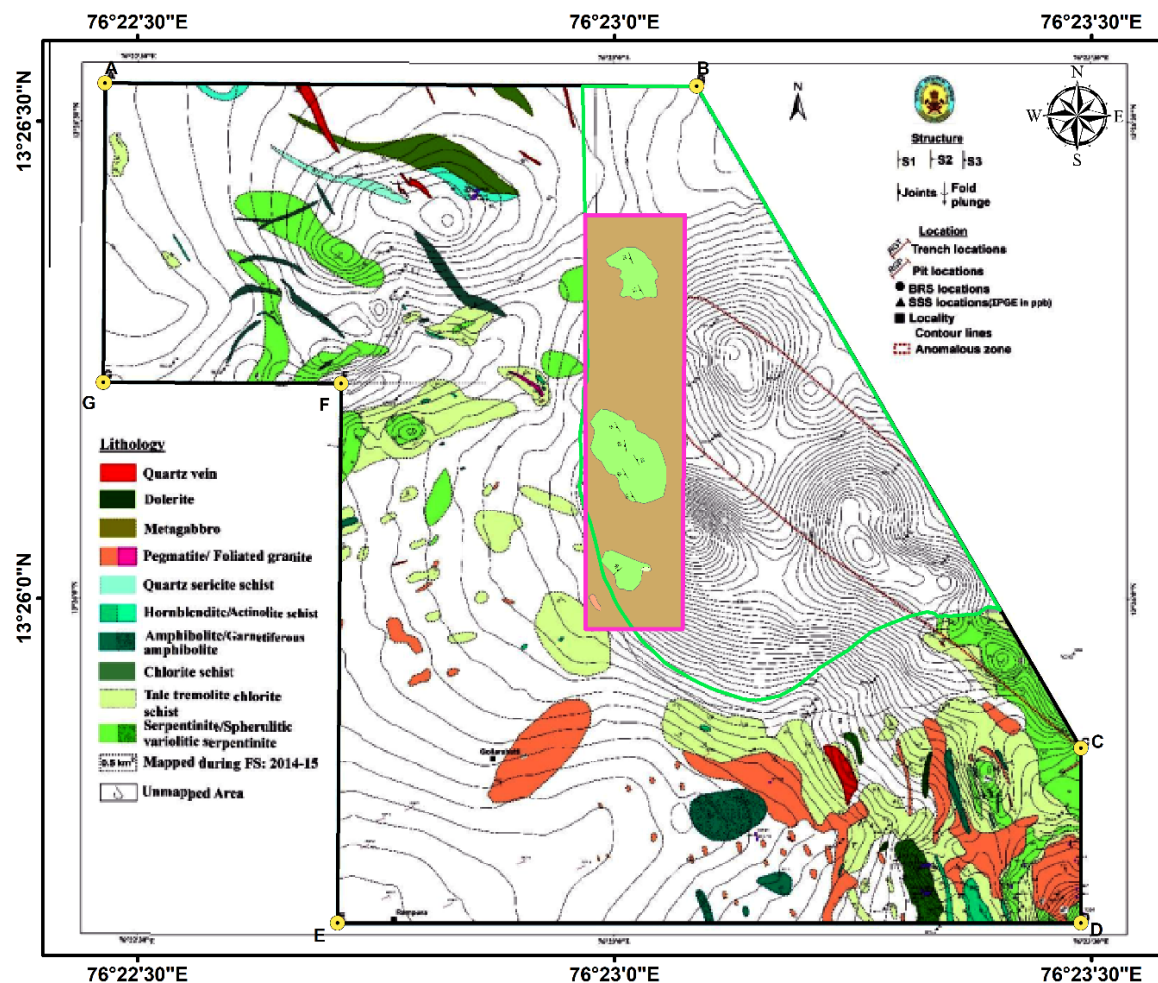
 GeoExpOre Pvt. Ltd.		
PLATE - 1 LOCATION MAP OF PRELIMINARY EXPLORATION FOR NICKEL, COBALT, PGE & REE / ASSOCIATED MINERALS IN J C PURA MAFIC-ULTRAMAFIC SCHIST BELT NEAR RAMPURA AND GOLLARAHATTI (RG) BLOCK, HASSAN DISTRICT, KARNATAKA ON TOPOSHEET NO. 57 C/7		
1:50,000  1 cm = 500 m		
SOURCE: SURVEY OF INDIA (SOI)		
DOC NO: GEO/NMET/KA/TM-01/2023-2024		
PREPARED BY	Mr. UVARAJ M (Junior Geologist)	
VERIFIED BY	Mr. MOHAMMAD MUSLEMEEN (Senior Geologist)	

PLATE - 2

OUTCROP MAP OF PRELIMINARY EXPLORATION FOR NICKEL, COBALT, PGE & REE / ASSOCIATED MINERALS IN J C PURA MAFIC-ULTRAMAFIC SCHIST BELT NEAR RAMPURA AND GOLLARAHATTI (RG) BLOCK, HASSAN DISTRICT, KARNATAKA



Legend

- Cleavage/Foliation/Schistosity
- GSI - G3 Cardinal Points
- GSI - G3 Block Boundary
- Unmapped Area - 0.85 Sq.Km
- GeoExpOre Mapped Area - 0.15 Sq. Km

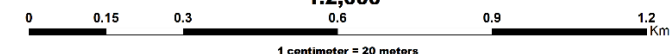
Lithology	Formation	Group	Age
Soil Cover	Younger intrusives		Late Archean
Pegmatite	J.C. Pura Schist belt	Sargur Group	Palaeoarchean - Mesoarchean
Talc-Tremolite-Chlorite Schist			
Serpentinite			



GeoExpOre Pvt. Ltd.

PLATE - 2
OUTCROP MAP OF PRELIMINARY EXPLORATION FOR NICKEL, COBALT, PGE & REE / ASSOCIATED MINERALS IN J C PURA MAFIC-ULTRAMAFIC SCHIST BELT NEAR RAMPURA AND GOLLARAHATTI (RG) BLOCK, HASSAN DISTRICT, KARNATAKA

1:2,000



SOURCE: GSI - Item no.: M2APMM-MEP/NC/SR/SU-KG/2018/18837

DOC NO.: GEO/NMET/KA/OM-01/2023-24

PREPARED BY

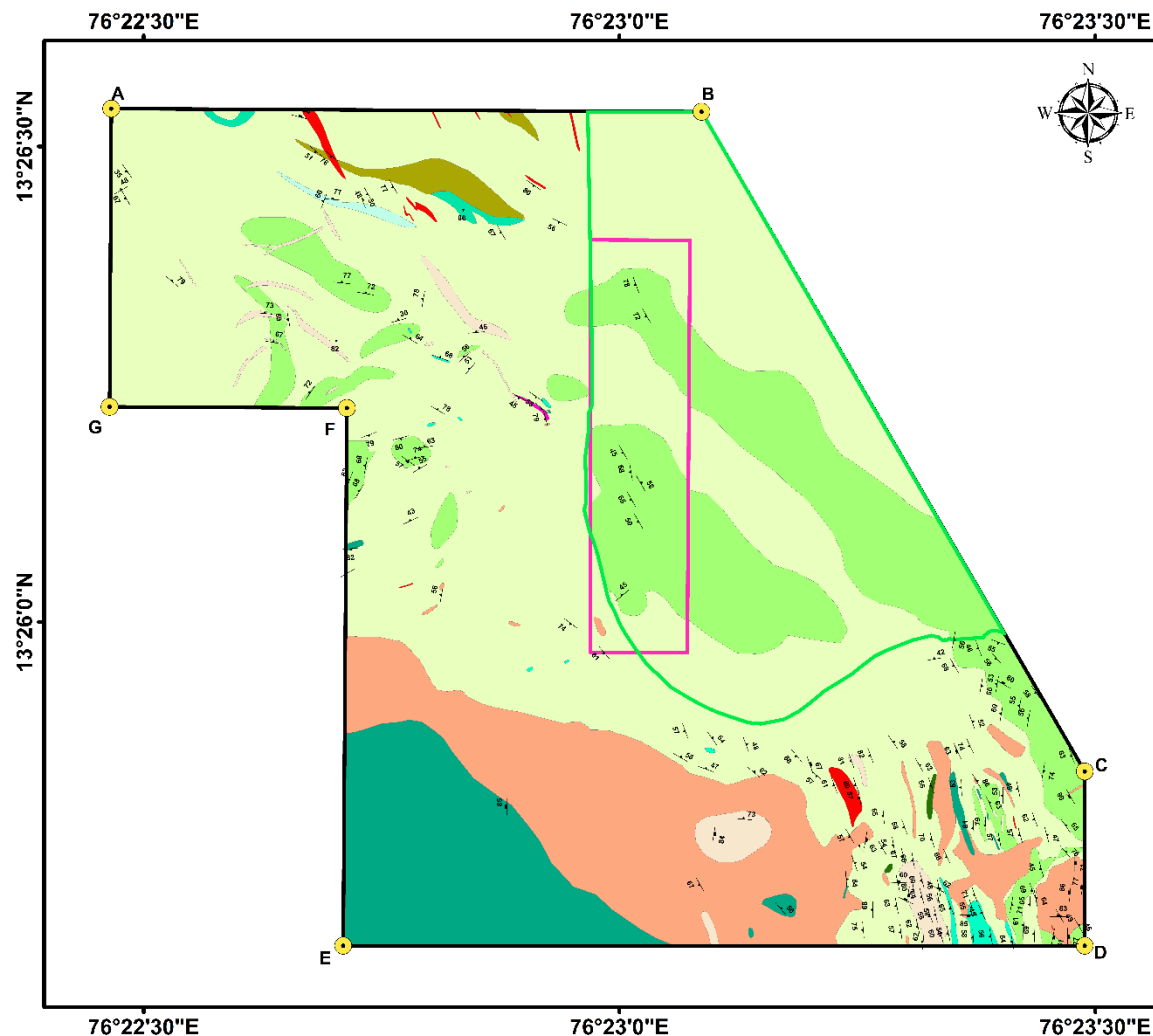
Mr. UVARAJ M
(Junior Geologist)

VERIFIED BY

Mr. MOHAMMAD MUSLEMEEN
(Senior Geologist)



PLATE - 3

**GEOLOGICAL MAP OF RECONNAISSANCE SURVEY FOR Ni, Co, PGE & REE / ASSOCIATED MINERALS IN J C PURA
MAFIC ULTRAMAFIC SCHIST BELT NEAR RAMPURA AND GOLLARAHATTI (R-G) BLOCK, HASSAN DISTRICT, KARNATAKA**


INDEX

-  GSI - G3 Cardinal Points
-  Cleavage/Foliation/Schistosity
-  GSI - G3 Block Boundary - 2 Sq. Km
-  Unmapped Area - 0.85 Sq.Km
-  GeoExpOre Mapped Area - 0.15 Sq. Km

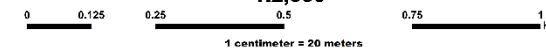
Lithology	Formation	Group	Age
 Quartz vein  Dolerite  Pegmatite  Foliated granite  Metagabbro  Quartz-sericite schist  Hornblende  Actinolite schist  Amphibolite  Chlorite Schist  Talc tremolite chlorite schist  Serpentinite  Spherulitic serpentinite	- Younger intrusives - J.C. Pura Schist belt	Sargur Group	< Palaeoproterozoic - Palaeoproterozoic - Late Archean - Palaeoarchaen-Mesoarchaen



GeoExpOre Pvt. Ltd.

PLATE - 3
GEOLOGICAL MAP OF RECONNAISSANCE SURVEY FOR Ni, Co, PGE & REE /
ASSOCIATED MINERALS IN J C PURA MAFIC ULTRAMAFIC SCHIST BELT NEAR
RAMPURA AND GOLLARAHATTI (R-G) BLOCK, HASSAN DISTRICT, KARNATAKA

1:2,000



SOURCE: GSI - Item no.: M2APMM-MEP/NC/SR/SU-KG/2018/18837

DOC NO.: GEO/NMET/KA/GM-01/2023-24

PREPARED BY

 Mr. UVARAJ M
(Junior Geologist)

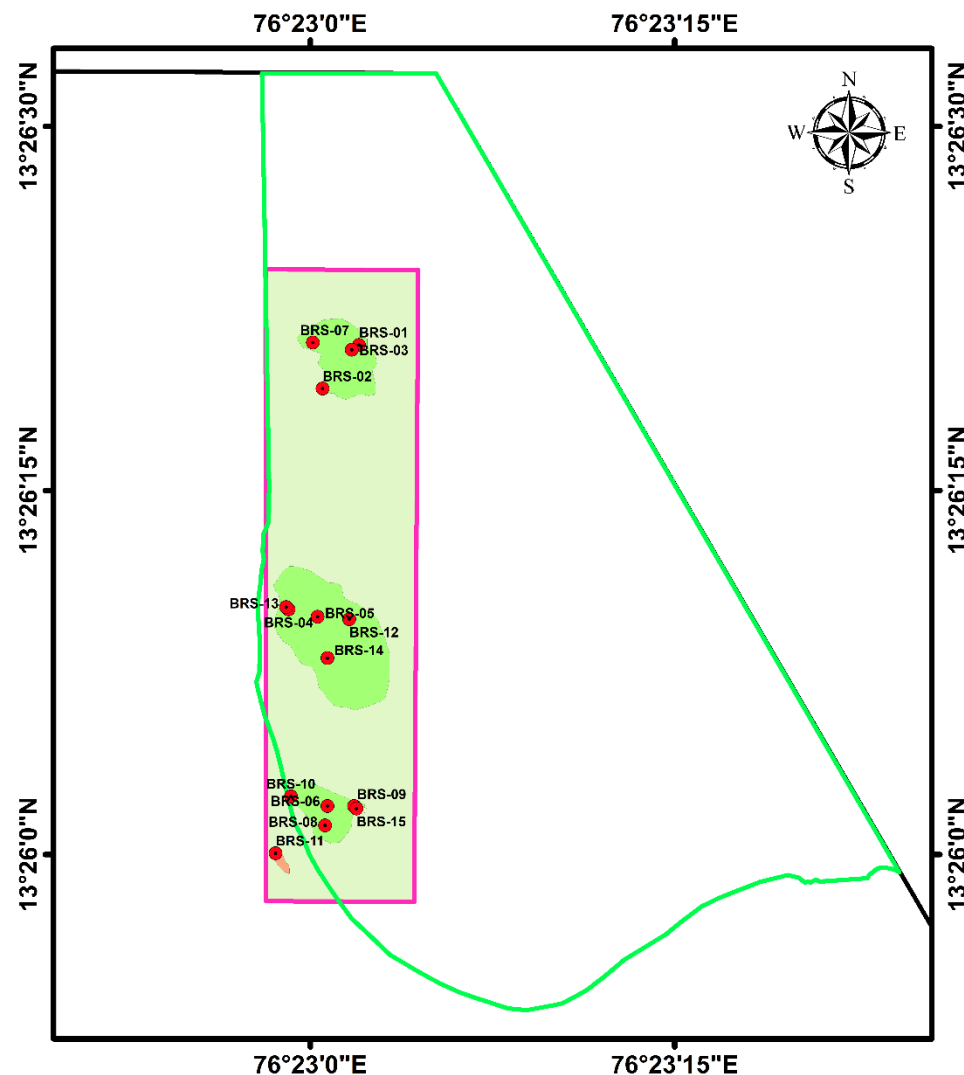
VERIFIED BY

 Mr. MOHAMMAD MUSLEMEEN
(Senior Geologist)




PLATE - 4

**GEOLOGICAL MAP WITH SAMPLE LOCATION OF RECONNAISSANCE SURVEY FOR Ni, Co, PGE & REE / ASSOCIATED MINERALS
IN J C PURA MAFIC ULTRAMAFIC SCHIST BELT NEAR RAMPURA AND GOLLARAHATTI (R-G) BLOCK, HASSAN DISTRICT, KARNATAKA**



INDEX

- BRS Location
- GeoExpOre Mapped Area - 0.15 Sq. Km
- Unmapped Area - 0.85 Sq.Km

Lithology

- Pegmatite
- Talc-Tremolite-Chlorite Schist
- Serpentinite

Formation

Younger intrusives

J.C. Pura Schist belt

Group

Sargur Group

Age

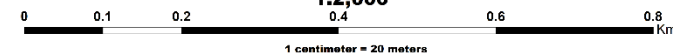
Late Archean

Palaeoarchean-
Mesoarchean

GeoExpOre Pvt. Ltd.

PLATE - 4
GEOLOGICAL MAP WITH SAMPLE LOCATION OF RECONNAISSANCE SURVEY FOR Ni, Co, PGE
& REE / ASSOCIATED MINERALS IN J C PURA MAFIC ULTRAMAFIC SCHIST BELT NEAR
RAMPURA AND GOLLARAHATTI (R-G) BLOCK, HASSAN DISTRICT, KARNATAKA

1:2,000



DOC NO.: GEO/NMET/KA/GM-02/2023-24

PREPARED BY

Mr. UVARAJ M
(Junior Geologist)

VERIFIED BY

Mr. MOHAMMAD MUSLEMEEN
(Senior Geologist)





CHAPTER 22: ANNEXURES

22.1 Annexure I: Detailed Description and Field Observations of Bedrock Geochemical Samples.

Geological Observation-Reconnaissance Survey (G4, Phase-1) For Ni, Co, PGE & Associated Minerals In J C Pura Mafic-Ultramafic Schist Belt Near Rampura and Gollarahatti Block, District Hassan, Karnataka

Sr No.	Waypoint No. /Sample No.	Latitude (N)	Longitude (E)	Lithology	Description	Structural Reading	Sample Reference No
1	RGGBRS001	13 26 21.0	76 23 02.0	SERPENTINITE	Spherulitic serpentinite composed of olivine, serpentine Chlorite and serpentine. Rich in limonitization cause yellowish brown colour and feebly magnetic	Strike N30°W & Dip 78° towards Southwest	KARG/BRS-1/2023-24
2	RGGBRS002	13 26 19.2	76 23 00.5	SERPENTINITE	Medium grained light green colour serpentinite composed mainly of olivine, serpentine and occasional talc material. Serpentine in contact with Talc schist	Strike N35°W & Dip 72° towards Southwest	KARG/BRS-2/2023-24
3	RGGBRS003	13 26 20.8	76 23 01.7	SERPENTINITE	Greenish coloured Spherulitic Serpentine shows talc on outer surface. Limonised outer surface with coffee brown colour	Strike N33°W & Dip 75° Due Southwest	KARG/BRS-3/2023-24
4	RGGBRS004	13 26 10.1	76 22 59.1	SERPENTINITE	The serpentinite contains trace amount of olivine, talc, chlorite and serpentine minerals. Spotty outer surface	Strike=N35°W & Dip 45° Due West	KARG/BRS-4/2023-24

5	RGGBRS005	13 26 09.8	76 23 00.3	SERPENTINITE	Greenish greyish serpentinite silicified composed of olivine, chlorite & mica. Outer surface is limonitized (yellowish brown colour)	Strike N25°W & Dip 68° Due West	KARG/BRS-5/2023-24
6	RGGBRS006	13 26 02.0	76 23 00.7	SERPENTINITE	Light green - green colour serpentinite composed mainly of serpentinite, chlorite, mica. the rock is feebly magnetic	Strike N30° W & Dip 50° towards West	KARG/BRS-6/2023-24
7	RGGBRS007	13 26 21.1	76 23 00.1	SERPENTINITE	Dark grey colour serpentinite comprised of talc, serpentine, chlorite, mica. limonitized with yellowish surface with feebly magnetic	Strike N25°W & Dip 55° towards West	KARG/BRS-7/2023-24
8	RGGBRS008	13 26 01.2	76 23 00.6	SERPENTINITE	Dark greenish grey colour silica rich serpentinite comprised of talc, serpentine, chlorite, mica. limonitized with yellowish brown surface with feebly magnetic. Serpentinite in contact with Talc schist.	Strike N32°W & Dip 65° Due West	KARG/BRS-8/2023-24
9	RGGBRS009	13 26 13.10	76 22 57.37	SERPENTINITE	Dark green colour spherulitic serpentinite comprised of serpentine, chlorite, mica. limonitized with yellowish brown surface with feebly magnetic	Strike N28°W & Dip 55° towards West	KARG/BRS-9/2023-24
10	RGGBRS010	13 26 02.4	76 22 59.2	SERPENTINITE	Dark greenish grey colour silica rich spherulitic serpentinite, massive comprised of serpentine, chlorite, mica. limonitized with yellowish brown surface with feebly magnetic. Serpentinite is in contact with Meta Gabbro and talc schist	Strike N30°W & Dip 60° towards Southwest	KARG/BRS-10/2023-24

11	RGGBRS011	13 25 59.2	76 22 59.0	QUARTZ PEGMATITE	Coarse grained Quartz rich Pegmatite body (around 2m x 5) with few muscovite mica flakes.	Trending N20°W	KARG/BRS-11/2023-24
12	RGGBRS012	13 26 09.7	76 23 01.6	SERPENTINITE	Dark greenish brown colour, ferruginous spherulitic serpentinite comprised of talc, serpentine, chlorite, limonitized with yellowish brown surface with feebly magnetic. The rock is in contact with chlorite schist.	Strike N26°W & Dip 65° towards West	KARG/BRS-12/2023-24
13	RGGBRS013	13 26 10.8	76 23 00.4	SERPENTINITE	Dark greenish colour spherulitic serpentinite comprised of serpentine, chlorite, outer surface is limonitized with yellowish brown surface with feebly magnetic.	Strike N25°W & Dip 60° towards West	KARG/BRS-13/2023-24
14	RGGBRS014	13 26 08.1	76 23 00.7	SERPENTINITE	Dark green to grey colour serpentinite comprised of talc, serpentine, chlorite, mica. limonitized with yellowish surface with feebly magnetic.	Strike N23°W & Dip 58° Due West	KARG/BRS-14/2023-24
15	RGGBRS015	13 26 00.05	76 22 58.56	TALC CHLORITE SCHIST	Light green coloured Talc Tremolite Actinolite Chlorite schist composed of Actinolite, tremolite and chlorite. The rock is in contact with Meta Gabbro	Strike N22°W & Dip 48° towards West	KARG/BRS-15/2023-24

22.2 Annexure II: Analytical Results of Rare Earth Elements (REE) in Bedrock Samples (reported in ppm).

Sl. No.	Customer Code	Customer Description	Lab ID	Method	Units	Sc	Y	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb
1	KARG/BRS-1/2023-24	Rock Chip	G7139-1	SOP/OM/052	ppm(mg/kg)	26.60	2.63	1.20	2.84	<0.5	1.34	<0.5	<0.5	0.53	<0.5
2	KARG/BRS-2/2023-24	Rock Chip	G7139-2	SOP/OM/052	ppm(mg/kg)	20.61	3.09	0.90	2.14	<0.5	1.29	<0.5	<0.5	0.58	<0.5
3	KARG/BRS-3/2023-24	Rock Chip	G7139-3	SOP/OM/052	ppm(mg/kg)	28.85	3.25	2.02	3.88	0.50	2.20	<0.5	<0.5	0.76	<0.5
4	KARG/BRS-4/2023-24	Rock Chip	G7139-4	SOP/OM/052	ppm(mg/kg)	19.70	3.38	2.53	7.02	0.70	2.91	0.64	<0.5	0.78	<0.5
5	KARG/BRS-5/2023-24	Rock Chip	G7139-5	SOP/OM/052	ppm(mg/kg)	15.86	3.05	0.93	3.51	<0.5	1.52	<0.5	<0.5	<0.5	<0.5
6	KARG/BRS-6/2023-24	Rock Chip	G7139-6	SOP/OM/052	ppm(mg/kg)	20.93	3.28	1.49	7.98	<0.5	1.73	<0.5	<0.5	0.63	<0.5
7	KARG/BRS-7/2023-24	Rock Chip	G7139-7	SOP/OM/052	ppm(mg/kg)	18.12	1.41	0.55	1.41	<0.5	0.54	<0.5	<0.5	<0.5	<0.5
8	KARG/BRS-8/2023-24	Rock Chip	G7139-8	SOP/OM/052	ppm(mg/kg)	19.13	3.99	2.38	5.02	0.58	2.46	0.58	<0.5	0.73	<0.5
9	KARG/BRS-9/2023-24	Rock Chip	G7139-9	SOP/OM/052	ppm(mg/kg)	17.89	4.02	0.94	2.23	<0.5	1.10	<0.5	<0.5	0.61	<0.5
10	KARG/BRS-10/2023-24	Rock Chip	G7139-10	SOP/OM/052	ppm(mg/kg)	17.78	4.17	1.21	3.13	<0.5	1.49	<0.5	<0.5	0.64	<0.5
11	KARG/BRS-11/2023-24	Rock Chip	G7139-11	SOP/OM/052	ppm(mg/kg)	3.59	12.40	4.13	9.22	1.17	4.61	1.52	<0.5	1.93	<0.5
12	KARG/BRS-12/2023-24	Rock Chip	G7139-12	SOP/OM/052	ppm(mg/kg)	20.61	4.00	0.53	2.32	<0.5	0.91	<0.5	<0.5	0.53	<0.5

Sl. No.	Customer Code	Customer Description	Lab ID	Method	Units	Sc	Y	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb
13	KARG/BRS-13/2023-24	Rock Chip	G7139-13	SOP/OM/052	ppm(mg/kg)	14.42	2.57	1.09	2.67	<0.5	1.56	<0.5	<0.5	<0.5	<0.5
14	KARG/BRS-14/2023-24	Rock Chip	G7139-14	SOP/OM/052	ppm(mg/kg)	20.17	3.97	0.53	<0.5	<0.5	0.91	<0.5	<0.5	0.53	<0.5
15	KARG/BRS-15/2023-24	Rock Chip	G7139-15	SOP/OM/052	ppm(mg/kg)	14.45	3.52	0.59	1.51	<0.5	0.95	<0.5	<0.5	<0.5	<0.5

Sl. No.	Customer Code	Customer Description	Lab ID	Method	Units	Dy	Ho	Er	Tm	Yb	Lu
1	KARG/BRS-1/2023-24	Rock Chip	G7139-1	SOP/OM/052	ppm(mg/kg)	0.56	<0.5	<0.5	<0.5	<0.5	<0.5
2	KARG/BRS-2/2023-24	Rock Chip	G7139-2	SOP/OM/052	ppm(mg/kg)	0.62	<0.5	<0.5	<0.5	<0.5	<0.5
3	KARG/BRS-3/2023-24	Rock Chip	G7139-3	SOP/OM/052	ppm(mg/kg)	0.91	<0.5	<0.5	<0.5	<0.5	<0.5
4	KARG/BRS-4/2023-24	Rock Chip	G7139-4	SOP/OM/052	ppm(mg/kg)	0.72	<0.5	<0.5	<0.5	0.50	<0.5
5	KARG/BRS-5/2023-24	Rock Chip	G7139-5	SOP/OM/052	ppm(mg/kg)	0.67	<0.5	<0.5	<0.5	<0.5	<0.5
6	KARG/BRS-6/2023-24	Rock Chip	G7139-6	SOP/OM/052	ppm(mg/kg)	0.67	<0.5	<0.5	<0.5	<0.5	<0.5
7	KARG/BRS-7/2023-24	Rock Chip	G7139-7	SOP/OM/052	ppm(mg/kg)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
8	KARG/BRS-8/2023-24	Rock Chip	G7139-8	SOP/OM/052	ppm(mg/kg)	0.72	<0.5	<0.5	<0.5	0.51	<0.5
9	KARG/BRS-9/2023-24	Rock Chip	G7139-9	SOP/OM/052	ppm(mg/kg)	0.67	<0.5	<0.5	<0.5	0.51	<0.5
10	KARG/BRS-10/2023-24	Rock Chip	G7139-10	SOP/OM/052	ppm(mg/kg)	0.74	<0.5	<0.5	<0.5	0.50	<0.5

Sl. No.	Customer Code	Customer Description	Lab ID	Method	Units	Dy	Ho	Er	Tm	Yb	Lu
11	KARG/BRS-11/2023-24	Rock Chip	G7139-11	SOP/OM/052	ppm(mg/kg)	2.24	<0.5	1.30	<0.5	1.36	<0.5
12	KARG/BRS-12/2023-24	Rock Chip	G7139-12	SOP/OM/052	ppm(mg/kg)	0.77	<0.5	<0.5	<0.5	0.58	<0.5
13	KARG/BRS-13/2023-24	Rock Chip	G7139-13	SOP/OM/052	ppm(mg/kg)	0.58	<0.5	<0.5	<0.5	<0.5	<0.5
14	KARG/BRS-14/2023-24	Rock Chip	G7139-14	SOP/OM/052	ppm(mg/kg)	0.79	<0.5	0.52	<0.5	0.53	<0.5
15	KARG/BRS-15/2023-24	Rock Chip	G7139-15	SOP/OM/052	ppm(mg/kg)	0.66	<0.5	<0.5	<0.5	<0.5	<0.5

22.3 Annexure III: Analytical Results of Base Metals and Other Trace Elements in Bedrock Samples (reported in ppm).

Sl. No.	Customer Code	Customer Description	Lab ID	Method	Units	Al	Ni	Cu	Zn	Sn	Pb
1	KARG/BRS-1/2023-24	Rock Chip	G7139-1	SOP/OM/052	ppm(mg/kg)	2539 1	1670	21	61	<0.5	<5
2	KARG/BRS-2/2023-24	Rock Chip	G7139-2	SOP/OM/052	ppm(mg/kg)	2445 5	1618	44	56	<0.5	<5
3	KARG/BRS-3/2023-24	Rock Chip	G7139-3	SOP/OM/052	ppm(mg/kg)	2308 1	1842	<5	67	<0.5	<5
4	KARG/BRS-4/2023-24	Rock Chip	G7139-4	SOP/OM/052	ppm(mg/kg)	2372 7	1973	28	61	<0.5	<5
5	KARG/BRS-5/2023-24	Rock Chip	G7139-5	SOP/OM/052	ppm(mg/kg)	2050 8	1939	26	72	<0.5	<5
6	KARG/BRS-6/2023-24	Rock Chip	G7139-6	SOP/OM/052	ppm(mg/kg)	2913 5	1750	13	62	<0.5	<5
7	KARG/BRS-7/2023-24	Rock Chip	G7139-7	SOP/OM/052	ppm(mg/kg)	2359 3	1546	<5	49	<0.5	<5
8	KARG/BRS-8/2023-24	Rock Chip	G7139-8	SOP/OM/052	ppm(mg/kg)	2545 4	1769	13	83	<0.5	<5
9	KARG/BRS-9/2023-24	Rock Chip	G7139-9	SOP/OM/052	ppm(mg/kg)	2290 3	1599	10	75	<0.5	<5
10	KARG/BRS-10/2023-24	Rock Chip	G7139-10	SOP/OM/052	ppm(mg/kg)	2438 4	1855	33	71	<0.5	<5
11	KARG/BRS-11/2023-24	Rock Chip	G7139-11	SOP/OM/052	ppm(mg/kg)	7526 6	42	10	17	<0.5	7
12	KARG/BRS-12/2023-24	Rock Chip	G7139-12	SOP/OM/052	ppm(mg/kg)	2816 6	1613	<5	63	<0.5	<5
13	KARG/BRS-13/2023-24	Rock Chip	G7139-13	SOP/OM/052	ppm(mg/kg)	1800 8	1924	12	95	<0.5	<5
14	KARG/BRS-14/2023-24	Rock Chip	G7139-14	SOP/OM/052	ppm(mg/kg)	2301 0	1533	12	52	<0.5	<5
15	KARG/BRS-15/2023-24	Rock Chip	G7139-15	SOP/OM/052	ppm(mg/kg)	1906 7	1612	<5	80	<0.5	<5

22.4 Annexure IV: Analytical Results of Platinum Group Elements (PGE) in Bedrock Samples.

Sl. No.	Customer Code	Customer Description	Lab ID	Method	Units	Pt	Pd	Ru	Rh	Ir	Os
1	KARG/BRS-1/2023-24	Rock Chip	G7139-1	SOP/OM/055	PPM (mg/kg)	<0.0 05	<0.0 05	0.01 6	<0.0 05	<0.0 05	<0.0 05
2	KARG/BRS-2/2023-24	Rock Chip	G7139-2	SOP/OM/055	PPM (mg/kg)	<0.0 05	<0.0 05	0.01 3	<0.0 05	<0.0 05	<0.0 05
3	KARG/BRS-3/2023-24	Rock Chip	G7139-3	SOP/OM/055	PPM (mg/kg)	<0.0 05	0.01 9	<0.0 05	<0.0 05	<0.0 05	<0.0 05
4	KARG/BRS-4/2023-24	Rock Chip	G7139-4	SOP/OM/055	PPM (mg/kg)	0.03 2	<0.0 05	0.01 8	<0.0 05	<0.0 05	<0.0 05
5	KARG/BRS-5/2023-24	Rock Chip	G7139-5	SOP/OM/055	PPM (mg/kg)	<0.0 05	<0.0 05	0.01 6	<0.0 05	<0.0 05	<0.0 05
6	KARG/BRS-6/2023-24	Rock Chip	G7139-6	SOP/OM/055	PPM (mg/kg)	<0.0 05	<0.0 05	0.01 1	<0.0 05	<0.0 05	<0.0 05
7	KARG/BRS-7/2023-24	Rock Chip	G7139-7	SOP/OM/055	PPM (mg/kg)	<0.0 05	<0.0 05	0.02 5	<0.0 05	<0.0 05	<0.0 05
8	KARG/BRS-8/2023-24	Rock Chip	G7139-8	SOP/OM/055	PPM (mg/kg)	<0.0 05	<0.0 05	0.02 5	<0.0 05	<0.0 05	<0.0 05
9	KARG/BRS-9/2023-24	Rock Chip	G7139-9	SOP/OM/055	PPM (mg/kg)	<0.0 05	<0.0 05	0.00 5	<0.0 05	<0.0 05	<0.0 05
10	KARG/BRS-10/2023-24	Rock Chip	G7139-10	SOP/OM/055	PPM (mg/kg)	0.02 0	<0.0 05	0.00 5	<0.0 05	<0.0 05	<0.0 05
11	KARG/BRS-11/2023-24	Rock Chip	G7139-11	SOP/OM/055	PPM (mg/kg)	<0.0 05	<0.0 05	<0.0 05	<0.0 05	<0.0 05	<0.0 05
12	KARG/BRS-12/2023-24	Rock Chip	G7139-12	SOP/OM/055	PPM (mg/kg)	<0.0 05	<0.0 05	0.02 1	<0.0 05	<0.0 05	<0.0 05
13	KARG/BRS-13/2023-24	Rock Chip	G7139-13	SOP/OM/055	PPM (mg/kg)	<0.0 05	<0.0 05	0.02 6	<0.0 05	<0.0 05	<0.0 05
14	KARG/BRS-14/2023-24	Rock Chip	G7139-14	SOP/OM/055	PPM (mg/kg)	0.00 7	<0.0 05	<0.0 05	<0.0 05	<0.0 05	<0.0 05
15	KARG/BRS-15/2023-24	Rock Chip	G7139-15	SOP/OM/055	PPM (mg/kg)	<0.0 05	<0.0 05	0.01 6	<0.0 05	<0.0 05	<0.0 05

22.5 Annexure V: Analytical Results of Major and Other Elements in Bedrock Samples (reported in ppm).

Sl. No.	Customer Code	Customer Description	Lab ID	Method	Units	Li	Be	Na	Mg	P	S	K	Ca	Ti	V	Cr	Mn
1	KARG/BRS-1/2023-24	Rock Chip	G7139-1	SOP/OM/052	ppm(mg/k g)	13.99	<0.5	542	149759	61	<100	305	1253	1351	99	2372	1161
2	KARG/BRS-2/2023-24	Rock Chip	G7139-2	SOP/OM/052	ppm(mg/k g)	2.43	<0.5	163	149492	<50	<100	108	544	1101	86	2025	902
3	KARG/BRS-3/2023-24	Rock Chip	G7139-3	SOP/OM/052	ppm(mg/k g)	1.13	<0.5	<100	158219	61	<100	110	528	1297	108	2463	1515
4	KARG/BRS-4/2023-24	Rock Chip	G7139-4	SOP/OM/052	ppm(mg/k g)	4.95	<0.5	142	153863	60	<100	177	2272	1183	99	2343	1087
5	KARG/BRS-5/2023-24	Rock Chip	G7139-5	SOP/OM/052	ppm(mg/k g)	5.07	<0.5	<100	166905	64	<100	103	957	754	81	1780	988
6	KARG/BRS-6/2023-24	Rock Chip	G7139-6	SOP/OM/052	ppm(mg/k g)	11.70	<0.5	269	147020	57	<100	204	14263	1226	114	2920	1371
7	KARG/BRS-7/2023-24	Rock Chip	G7139-7	SOP/OM/052	ppm(mg/k g)	<0.5	<0.5	<100	156736	<50	<100	<100	4647	1019	81	2305	734
8	KARG/BRS-8/2023-24	Rock Chip	G7139-8	SOP/OM/052	ppm(mg/k g)	3.89	<0.5	323	154905	83	<100	256	15300	1132	95	2281	1496
9	KARG/BRS-9/2023-24	Rock Chip	G7139-9	SOP/OM/052	ppm(mg/k g)	1.20	<0.5	351	162432	318	<100	137	20747	925	94	2176	1133
10	KARG/BRS-10/2023-24	Rock Chip	G7139-10	SOP/OM/052	ppm(mg/k g)	1.35	<0.5	300	168622	103	<100	149	13617	1177	112	2374	1327
11	KARG/BRS-11/2023-24	Rock Chip	G7139-11	SOP/OM/052	ppm(mg/k g)	15.82	3.76	45898	4461	99	<100	9670	3367	121	<10	146	382
12	KARG/BRS-12/2023-24	Rock Chip	G7139-12	SOP/OM/052	ppm(mg/k g)	1.24	<0.5	653	152138	<50	<100	177	19271	1152	105	2247	1317
13	KARG/BRS-13/2023-24	Rock Chip	G7139-13	SOP/OM/052	ppm(mg/k g)	<0.5	<0.5	104	170539	149	<100	<100	8232	776	72	1317	1134

Sl. No.	Customer Code	Customer Description	Lab ID	Method	Units	Li	Be	Na	Mg	P	S	K	Ca	Ti	V	Cr	Mn
14	KARG/BRS-14/2023-24	Rock Chip	G7139-14	SOP/OM/052	ppm(mg/k g)	<0.5	<0.5	367	148921	<50	<100	<100	31698	1264	86	2175	1122
15	KARG/BRS-15/2023-24	Rock Chip	G7139-15	SOP/OM/052	ppm(mg/k g)	11.92	<0.5	396	145857	57	<100	276	18993	249	55	1304	718

Sl. No.	Customer Code	Customer Description	Lab ID	Method	Units	Fe	Co	Ga	Ge	As	Se	Rb	Sr	Zr	Nb	Mo	Ag
1	KARG/BRS-1/2023-24	Rock Chip	G7139-1	SOP/OM/052	ppm(mg/k g)	67764	85	10	<0.5	<5	<0.5	1.38	<5	<20	2.34	1.59	<1
2	KARG/BRS-2/2023-24	Rock Chip	G7139-2	SOP/OM/052	ppm(mg/k g)	62509	88	<10	<0.5	<5	0.76	1.41	<5	<20	6.41	1.14	<1
3	KARG/BRS-3/2023-24	Rock Chip	G7139-3	SOP/OM/052	ppm(mg/k g)	69131	86	<10	<0.5	<5	0.51	1.22	<5	<20	1.23	6.37	<1
4	KARG/BRS-4/2023-24	Rock Chip	G7139-4	SOP/OM/052	ppm(mg/k g)	66965	90	<10	<0.5	<5	<0.5	2.02	<5	<20	1.33	8.74	<1
5	KARG/BRS-5/2023-24	Rock Chip	G7139-5	SOP/OM/052	ppm(mg/k g)	66229	80	<10	<0.5	<5	<0.5	1.03	<5	<20	0.66	3.00	<1
6	KARG/BRS-6/2023-24	Rock Chip	G7139-6	SOP/OM/052	ppm(mg/k g)	82583	91	12	<0.5	<5	<0.5	1.54	13	<20	0.62	3.23	<1
7	KARG/BRS-7/2023-24	Rock Chip	G7139-7	SOP/OM/052	ppm(mg/k g)	61128	81	<10	<0.5	<5	<0.5	0.82	7	<20	0.68	1.41	<1
8	KARG/BRS-8/2023-24	Rock Chip	G7139-8	SOP/OM/052	ppm(mg/k g)	68099	85	<10	<0.5	<5	<0.5	2.83	12	<20	0.69	2.68	<1
9	KARG/BRS-9/2023-24	Rock Chip	G7139-9	SOP/OM/052	ppm(mg/k g)	64636	80	<10	<0.5	<5	<0.5	1.87	16	<20	0.80	5.39	<1
10	KARG/BRS-10/2023-24	Rock Chip	G7139-10	SOP/OM/052	ppm(mg/k g)	72113	94	<10	<0.5	<5	<0.5	1.16	16	<20	0.62	3.88	<1
11	KARG/BRS-11/2023-24	Rock Chip	G7139-11	SOP/OM/052	ppm(mg/k g)	6226	<5	19	<0.5	<5	<0.5	59.66	88	27	24.28	1.25	<1
12	KARG/BRS-12/2023-24	Rock Chip	G7139-12	SOP/OM/052	ppm(mg/k g)	69590	80	11	<0.5	<5	<0.5	0.98	12	<20	1.56	6.92	<1

Sl. No.	Customer Code	Customer Description	Lab ID	Method	Units	Fe	Co	Ga	Ge	As	Se	Rb	Sr	Zr	Nb	Mo	Ag
13	KARG/BRS-13/2023-24	Rock Chip	G7139-13	SOP/OM/052	ppm(mg/k g)	53508	74	<10	<0.5	<5	<0.5	<0.5	27	<20	1.14	2.35	<1
14	KARG/BRS-14/2023-24	Rock Chip	G7139-14	SOP/OM/052	ppm(mg/k g)	64077	79	<10	<0.5	<5	<0.5	0.61	17	<20	0.60	4.32	<1
15	KARG/BRS-15/2023-24	Rock Chip	G7139-15	SOP/OM/052	ppm(mg/k g)	44109	73	<10	<0.5	<5	<0.5	2.26	8	<20	<0.5	2.63	<1

Sl. No.	Customer Code	Customer Description	Lab ID	Method	Units	Cd	In	Sb	Te	Cs	Ba	Hf	Ta	W	Tl	Bi	Th	U
1	KARG/BRS-1/2023-24	Rock Chip	G7139-1	SOP/OM/052	ppm(mg/k g)	1.33	<0.5	<0.5	<0.5	<0.5	45	2.50	0.56	1.29	<0.5	<10	4.69	<0.5
2	KARG/BRS-2/2023-24	Rock Chip	G7139-2	SOP/OM/052	ppm(mg/k g)	0.63	<0.5	<0.5	<0.5	<0.5	51	<0.5	<0.5	<0.5	<0.5	<10	0.52	<0.5
3	KARG/BRS-3/2023-24	Rock Chip	G7139-3	SOP/OM/052	ppm(mg/k g)	0.86	<0.5	<0.5	<0.5	<0.5	33	<0.5	<0.5	3.03	<0.5	<10	0.53	<0.5
4	KARG/BRS-4/2023-24	Rock Chip	G7139-4	SOP/OM/052	ppm(mg/k g)	0.74	<0.5	<0.5	<0.5	<0.5	13	<0.5	<0.5	4.11	<0.5	<10	0.68	<0.5
5	KARG/BRS-5/2023-24	Rock Chip	G7139-5	SOP/OM/052	ppm(mg/k g)	0.75	<0.5	<0.5	<0.5	<0.5	12	<0.5	<0.5	1.05	0.77	<10	<0.5	<0.5
6	KARG/BRS-6/2023-24	Rock Chip	G7139-6	SOP/OM/052	ppm(mg/k g)	0.87	<0.5	<0.5	<0.5	<0.5	14	<0.5	<0.5	2.53	0.51	<10	<0.5	<0.5
7	KARG/BRS-7/2023-24	Rock Chip	G7139-7	SOP/OM/052	ppm(mg/k g)	0.79	<0.5	<0.5	<0.5	<0.5	15	<0.5	<0.5	0.67	<0.5	<10	<0.5	<0.5
8	KARG/BRS-8/2023-24	Rock Chip	G7139-8	SOP/OM/052	ppm(mg/k g)	0.81	<0.5	<0.5	<0.5	<0.5	59	<0.5	<0.5	0.67	<0.5	<10	<0.5	<0.5
9	KARG/BRS-9/2023-24	Rock Chip	G7139-9	SOP/OM/052	ppm(mg/k g)	0.60	<0.5	<0.5	<0.5	<0.5	18	<0.5	<0.5	1.18	<0.5	<10	<0.5	<0.5
10	KARG/BRS-10/2023-24	Rock Chip	G7139-10	SOP/OM/052	ppm(mg/k g)	0.68	<0.5	<0.5	<0.5	<0.5	25	<0.5	<0.5	-	<0.5	<10	<0.5	<0.5
11	KARG/BRS-11/2023-24	Rock Chip	G7139-11	SOP/OM/052	ppm(mg/k g)	0.64	<0.5	<0.5	<0.5	1.50	104	1.88	6.59	0.83	<0.5	<10	4.57	1.82

Sl. No.	Customer Code	Customer Description	Lab ID	Method	Units	Cd	In	Sb	Te	Cs	Ba	Hf	Ta	W	Tl	Bi	Th	U
12	KARG/BRS-12/2023-24	Rock Chip	G7139-12	SOP/OM/052	ppm(mg/k g)	0.64	<0.5	<0.5	<0.5	<0.5	20	<0.5	0.55	<0.5	<0.5	<10	<0.5	<0.5
13	KARG/BRS-13/2023-24	Rock Chip	G7139-13	SOP/OM/052	ppm(mg/k g)	0.68	<0.5	<0.5	<0.5	<0.5	16	<0.5	<0.5	0.53	<0.5	<10	<0.5	<0.5
14	KARG/BRS-14/2023-24	Rock Chip	G7139-14	SOP/OM/052	ppm(mg/k g)	0.70	<0.5	<0.5	1.00	<0.5	7	<0.5	<0.5	<0.5	<0.5	<10	<0.5	<0.5
15	KARG/BRS-15/2023-24	Rock Chip	G7139-15	SOP/OM/052	ppm(mg/k g)	0.78	<0.5	<0.5	<0.5	<0.5	17	<0.5	<0.5	<0.5	<0.5	<10	<0.5	<0.5

22.6 Annexure VI: Sanction Order for Exploration of Ni, Co, PGE, REE and Associated Minerals in the Rampura–Gollarahatti Study Block.

Government of India
Ministry of Mines
National Mineral Exploration Trust

F.No.23/353/2023-NMET/46

New Delhi, 17th April, 2023

Subject: Approval of mineral exploration project and release of 1st Advance of Grant-in-Aid (General) for Preliminary Exploration (G3) For Ni, Co, PGE and Associated Minerals in J C Pura Mafic-Ultramafic Schist Belt Near Rampura And Gollarahatti Block, Hassan District, Karnataka.

On the recommendation of Technical-cum-Cost Committee (TCC) of NMET, the Executive Committee (EC) in its 29th EC meeting held on 31st March, 2023 approved mineral exploration project to be executed by M/s GeoExpore Private Limited, a Notified Private Exploration Agency (NPEA), through Department of Mines and Geology, State Government of Karnataka. The details of the block are given below:

S. No.	Project/Block Name	Commodity	Stage	Duration (Months)	Approved Cost (Including GST).
1	Preliminary Exploration (G3) For Ni, Co, PGE And REE / Associated Minerals in J C Pura Mafic-Ultramafic Schist Belt Near Rampura And Gollarahatti Block, Hassan District, Karnataka	Ni, Co, PGE and Associated Minerals	G3	10	₹ 82,87,108/-

2. The mineral exploration project will be funded by NMET as per the cost recommended by the TCC and approved by the EC. The Implementing Agency shall complete the same as per the approved cost estimates and time schedule, enclosed in **Annexure**.

3. The Para 3 of the "Scheme for engagement of Notified Private Exploration Agencies in Mineral Exploration" issued by NMET vide letter no.6/3/2015-NMET/28 dated 10th May, 2022 stipulates that mineral exploration agencies including private agencies, notified under sub-section 1 of Section 4 of the Mines and Mineral (Development and Regulation) Act, 1957 (the Act) shall be eligible for funding from National Mineral Exploration Trust as per provision under sub-section 5 of section 9C of the Act.

4. Point No.(vii) of Para 3.2.1 is regarding "Mode A: Mineral Exploration Projects formulated by Private Exploration agency (PEA) and funding by NMET". This para states that NMET shall issue the sanction order to State government and all advances and payments shall be made by NMET to the State Government directly. The State Government, in turn, will get the work executed through the notified PEA for such purpose. The State Government shall submit the utilization certificate to NMET periodically in the manner as specified by NMET.

5. The Implementing Agency shall submit progress on monthly basis to State Government with copy to NMET Secretariat. The TCC, NMET shall review the progress of project and provide update to the Executive Committee.

6. Sanction is also hereby conveyed for release of the 1st installment of 40% of the approved project cost i.e. ₹ 33,14,843/- (₹ Thirty Three Lakh Fourteen Thousand Eight Hundred and Forty Three Only) as an advance in terms of conditions stipulated in this office letter no. 42/1/2017-NMET/176 dated 16th December 2021 and letter no. 42/1/2017-NMET/217 dated 19th January 2022 regarding "Release of funds to State Government / NEAs for mineral exploration".

7. The expenditure will be debited to '2853' Non-Ferrous Mining and Metallurgical Industries (Major Head) 02-Regulation and Development of Mines (Sub-Major head) 102-Mineral Exploration (Minor Head) 05-National Mineral Exploration Trust Fund Activities (Sub-Head) 00- National Mineral Exploration Trust Fund Activities (Detailed-Head) 05.00. 31- Grant-in-aid (General) under Demand No. 69, Ministry of Mines during the financial year 2023-24.

8. Certified that the pattern of assistance, under which the Grants-in-Aid (General) has been sanctioned, has the prior approval of Ministry of Finance.

9. Department of Mines and Geology, Karnataka is a registered agency on EAT module of PFMS. In terms of Rule 230, 235, 236 and 238 of GFR, Department of Mines and Geology, Karnataka, should maintain subsidiary accounts of the Government Grants and furnish the same to the Principal Accounts Office of the Ministry. The account shall be open to inspection by the Sanctioning Authority and audit, both by the Comptroller and Auditor General of India and internal audit by the Principal Accounts Office of the Ministry of Mines, whenever the Organization is called upon to do so.

10. The exploration agency has to furnish the utilization certificate in respect of amount disbursed as Grant-in-aid for the project on utilization of disbursed amount or after completion of one year from the date of disbursement of advance, whichever is earlier. The next instalment of advance will be released after submission of utilization certificate and progress report in respect of the 1st installment.

11. Shri Arun Kumar Chail, Section Officer in the Ministry will be the Drawing and Disbursing Officer for this purpose. It is requested that the payment of hereby conveyed for release of the 1st installment of 40% of the approved project cost i.e ₹ 33,14,843/- (₹ Thirty Three Lakh Fourteen Thousand Eight Hundred and Forty Three Only) may kindly be made to the Department of Mines and Geology, Karnataka through RTGS in State Bank of India, Madhavanagar (IFSC Code – SBIN0040196 Account No. 40677949267)

12. This has concurrence of JS &FA, Mines vide Note# 8 dated 17.04.2023 (E file No. 3067852).

Yours faithfully,


(Vivek Kumar Sharma)
Director & HoD, NMET

Copy for information and further necessary action:

1. The Director, Directorate of Mines and Geology, Karnataka.
2. Shri Janardan Prasad, Additional Director General and Chairman, TCC-NMET, Southern Region, GSI Complex, Bandlaguda, Hyderabad- 500068.
3. M/s GeoExpore Private Limited
4. I.F. Division, Ministry of Mines, Shastri Bhawan, New Delhi.
5. Executive Committee (EC) Meeting file (F.No.6/2/2015-NMET)
6. Grant-in aid Sanction order file.

File No. 23/353/2023-NMET (Computer No. 3067852)
1654756/2023/NMET Cell

ANNEXURE 5A

Cost Estimation for Exploration (G3, Phase-I) for Ni-Co,PGE and associated minerals In J.C. Pura Mafic-Ultramafic Sschist Belt near Rampura Gollarahatti Block, Hasan District - Karnataka						
Total Area 2.00 sq.km. (Mapping for 0.85 sq.km. on 1:2000 Scale)						
S.No	Item of work	Unit	NMET SoC-Item -Sl No	NMET Rates (2020)	Qty	Amount INR
A	GEOLOGICAL WORK					
i	Geologist Party days H Q	Days	1.3	9000	60	540000
ii	Geologist Party days (2) -Field	Days	1.3	11000	120	1320000
iii	Labourers (Rs 477/day/labour)	Days	5.7	477	240	114480
iv	Sampler Party days (1party)	Days	1.5.2	5100	20	102000
v	Labour for Sampling	Days	5.7	477	80	38160
B	GEOPHYSICAL INVESTIGATION					
i	Gravity Method-2- profiles, spacing 100 mts- 10 stations on each profile(10X20 =200)	Per station	3.1a	3800	200	760000
C	SURVEY					
i	Survey Party Days (1 party)	Days	1.6.1a	8300	15	124500
ii	Labourers (Rs 477/day/labour) for Survey Party (4 Nos)	Days	5.7	477	60	28620
	SubTotal A+B+C					3027760
D	PITTING & TRENCHING					
i	Pitting/Trenching	Per Cu.M	2.1.2	3800	150	570000
	SubTotal C					570000
E	LABORATORY STUDIES					
i	a.Chemical analyses	Nos				
ii	Analyses of Geochemical -BRS, Trench/Pit Samples (Ni-Fire Assay)	Per sample	4.1.5d	11800	200	2360000
iii	Primary + Check Sample					
	(a)Check Samples- Ni,Co, PGE (15%) NABL Lab (Ni-Fire Assay)	Per sample	4.1.5d	11800	30	354000
	b.Petrography studies					
	(a) Preparation of thin sections	Per sample	4.3.1	2353	10	23530
	(b)Complete petrographic/Ore microscopic study/Mineragraphic studies	Per sample	4.3.4	4232	10	42320
	(c)Preparation of Polished Sections	Per sample	4.3.2	1549	10	15490
	c) EPMA Studies	Per hour	4.4.1	8540	10	85400
	d) Whole Rock Analysis (Major oxide and additional trace elements)	Nos	4.1.15a & b	7568	10	75680
	SubTotal E					2956420
	Total A+B+C+D+E					6554180
F	PREPARATION OF EXPLORATION PROPOSAL (5+1 Softcopy)	Per Project	5.1		1	131084
G	PEER REVIEW	As per EC decision				10000
H	GEOLOGICAL REPORT PREPARATION (@5%)	Per Project			1	327709
	TOTAL A to H					7022973
	GST 18%					1264135
	Total project cost inclusive of GST 18%					8287108

File No. 23/353/2023-NMET (Computer No. 3067852)

54756/2023/NMET Cell

ANNEXURE 5B

Estimated cost for Exploration (G3, Phase-I) for Ni-Co-PGE and associated minerals in J.C. Pura Mafic-Ultramafic Schist Belt near Rampura Gollarahatti Block, Hasan District - Karnataka

[Block area- 2 sq.km., Schedule timeline- 10 months]

S. No.	Activities	Months/ Days	1	2	3	4	5	6	Review				7	8	9	10
1	Geological Mapping	months														
2	Trenching	cu.m														
3	Geologist days	days														
4	Sampling days, Core	days														
5	Sampling	days														
6	Laboratory Studies	months														
7	Geologist days, HQ	days														
	Report Writing with	months														
	Peer Review	months														

2

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22.7 Annexure VII: Closure Certificate Issued by the Department of Mines and Geology, Government of Karnataka.



GOVERNMENT OF KARNATAKA

No: DMG/Plan/914462/2025-26

1019-1023

Office of the Director,
Department of Mines and Geology,
No.49, KhanijaBhavan, R.C. Road,
Bengaluru-01. Dated: 27.04.2026.

To,

M/s GeoExpOre pvt.Ltd,
(45) S 2nd A main,
2nd Cross, Chandra layout,
Bengaluru-56040.

ರವಾನಿಸಲಾಗಿದೆ
ದಿನಾಂಕ 28 APR 2026

Sub: Issuing of closure certificate for the NMET-sponsored project, "Preliminary Exploration (G3) for Ni, Co, PGE and REE/Associated Minerals in JC Pura Mafic-Ultramafic Schist Belt Near Rampura and Gollarahatti (RG) Block, Hassan District, Karnataka."

Ref: 1. NMEDT letter No: F.No.23/354/2023-NMET/48, Dated: 17.04.2023.
2. NMEDT letter No: F.No.117/1/2025-NMET/655, Dated: 19.12.2025 and Minutes of 03rd PSC meeting held on 15th Dec 2025.

With reference to the above subject, NMET-sponsored project, "Preliminary Exploration (G3) for Ni, Co, PGE and REE/Associated Minerals in JC Pura Mafic-Ultramafic Schist Belt Near Rampura and Gollarahatti (RG) Block, Hassan District, vide letter at a reference (1). Accordingly, M/s GeoExpOre Pvt. started the exploration work and continued for 10 months. Later on due to resistance by the local public the project was kept under abeyance.

Despite repeated attempts to convince the local public and even the district administration holding meetings with local representatives, villagers, and police and revenue department officials, exploration activities could not be complete due to strong resistance from the local people.

As recommended by the NMET-PSC committee at vide reference (2), Department of Mines & Geology, Karnataka is Issuing a formal closure certificate for surrender of the project of Preliminary Exploration (G3) for Ni, Co, PGE and REE/Associated Minerals in JC Pura Mafic-Ultramafic Schist Belt Near Rampura and Gollarahatti (RG) Block, Hassan District, Karnataka.

Director

Department of Mines & Geology
Bengaluru.

Copy to:

1. Director & HOD, NMET, Room No.114, F wing, 1st floor, Ministry of Mines, ShastriBhavan, Dr.Rajendra Prasad Road, New Delhi-110001 for information.

2. Accounts Officer, Head Office, Department of Mines & Geology, Bengaluru.
3. The Deputy Director General, Geological Survey of India, Operation Karnataka and Goa Unit, VasudhaBhavan, Kumaraswamy Layout, Bengaluru-560078.
4. Regional Controller of Mines, India Bureau of Mines, No.29, Industrial Suburb, 2nd stage, Tumkur Road, Yeshwanthpur, Bengaluru-560022.
5. Office copy.

22.8 Annexure VIII: Chronology of Exploration Activities and Major Project Events.

- Approval from NMET TCC and 29th EC received on 31st March 2023.
- Sanction Order received on 17th April. 2023.
- DMG Karnataka Approval received on 5th July 2023, Delay due to elections in Karnataka.
- Project Commenced on 1st August 2023.
- Project halted due to Local agitation on 8th August 2023.
- Timeline Extension was requested on 25th March 2024.
- The project was reviewed in 64th TCC meeting for surrendering of the project on 25th April 2024
- The project was reviewed in 35th EC Committee meeting held on 16th May 2024 during which we were advised to re-initiate the project with support from the Director, DMG, Bangalore and Regional DMG Office, Directorate of Mines and Geology, Hassan, the Hassan District administration and SP office.
- Multiple re—initiation efforts undertaken from June to November 2024, but no action taken.
- The project was reviewed in 81st TCC I meeting for surrendering of the project on 25th Sept 2025.
- The project was reviewed in 82nd TCC I meeting for surrendering of the project post re-notification on 14th October 2025.
- The project was reviewed in 84th TCC I meeting for surrendering of the project post re-notification on 13th November 2025.
- The project was reviewed in 3rd PSC meeting for the same on 15th December 2025 and were asked to obtain closure certificate from DMG KA.
- The project was reviewed in 93rd TCC I meeting held on 30th March 2026 to provide closure certificate by DMG KA.
- Closure Certificate received on 28th April 2026 from DMG KA.
- The project was reviewed in 8th PSC meeting for timeline extension till 30/04/2026.
- The project was reviewed in 96th TCC I for timeline extension till 30/06/2026.
- The project was reviewed in 99th TCC I for timeline extension till 31/07/2026.

22.9 Annexure IX: Selected Field Photographs Showing Representative Lithological, Structural and Geological Features of the Investigated Area.



Geological Mapping



Gravity Survey



Field Inspection



Protest during Mapping

CHAPTER 23: ANY OTHER INFORMATION

23.1 References

1. Chardon, D., Jayananda, M., Chetty, T.R. and Peucat, J.J., 2008. Precambrian continental strain and shear zone patterns: South Indian case. *Journal of Geophysical Research: Solid Earth*, 113(B8).
2. Palaniappan, K, (1984) A report on the test drilling in Kadikengal betta and Ramanahalli areas, Hassan district, Karnataka, GSI Un, Pub, Pro, report.
3. Paliniappan and Vayangankar (1991) A Report on the Ground Evaluation of Aeromagnetic Data in Parts of Chikmagalur, Hassan and Tumkur Districts, Karnataka State. FS:1988-89 & 1991-92
4. Pichamuthu, C.S., 1951. Some observations on the structure and classification of the Dharwars of Mysore State. *Current Science*, 20(5), pp.117-119.
5. Prabhakar, B.C. and Namratha, R. 2014. Morphology and textures of komatiite flow of J.C. Pura schist belt, Dharwar craton. *Jour. Geol. Soc. India*. vol.83, pp.13-20.
6. Prabhakar, B.C. and Namratha, R. 2015. A note on the layered dunite-peridotite-pyroxenite sill in the komatiitic milieu of J.C.Pura belt, Dharwar craton. *Journal of Geol. Soc. India*, vol.85, pp.120-121.
7. Ramachandran, T.V. (1983) A note on the correlation of the photointerpretation of airborne geophysical and geological data for the toposheet 57 C/7, GSI, Un publ, Pro, Report.
8. Ramakrishnan M (1971) Preliminary appraisal of the known asbestos occurrences in Hassan and Chikmagalur districts, Mysore state, GSI Unpublish. Pro. Report.
9. Ramarao, B, (1921) Notes on the work done in the Arsikere taluk, Hassan district, and Koratagere sub-taluk, Tumkur district. *Rec. M.G.O. Vol.21*. p.p.205-219.
10. Ramkrishnan, M., Venkata Dasu, S.P. and Kroener, A., 1994: Middle Archaean Age of Sargur Group by single grain zircon dating and geochemical evidence for the clastic origin of metaquartzite from J. C. Pura Greenstone Belt, Karnataka. *Jour. Geol. Soc. of India*, 44(6): 605-616
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12. Sampat Iyengar (1907) Reports on parts of Hassan and Tumkur SRO_GSI_10656 26 districts. Rec. M.G.O, vol.7. PP. 27-32.
13. Santhosh S, B. G. Dayanand, B. C. Prabhakar (2023) Geochemistry of Layered Ultramafic Rocks in J.C. Pura Schist Belt, Dharwar Craton, Karnataka, India.
14. Talukdar, Debojit, Ajit Sing, Mohanty, M and Korkoppa M.M, (2018) Occurrence of precious metals in Ultramafic hosted magnetite of J. C. Pura belt, Western Dharwar Craton, Karnataka. Indian Journal of Geosciences, Volume 72, No. 2 April - June 2018; pp. 175-184
15. Thiagarajan, T.A. Palaniappan, K and Ramanamurthy, D.R.V (1980) A report on studies of-closed and linear magnetic features and ground evaluation of E.M. anomaly intercepts in parts of Chikmagalur, Chitradurga, Hassan, Mysore and Tumkur districts, Karnataka State. AMSE Wing, GSI, Bangalore.
16. Venkata Dasu S.P., Mahalakshamma A.P. and Sugavanam E.B., 1984-85: Geology of the area around Jaychamarajapura, Arskere Taluk, Hassan District, Karnataka. Unpublished GSI report.
17. Viswanatha, M.N (1981) J.C. Pura Schist Belt. Memoir, 112, Geological Survey of India.

23.2 Expenditure

Revised cost-sheet for "Preliminary Exploration (G3) for Ni,Co, PGE and REE /Associated Minerals in J.C. Pura Schist Belt Near Rampura Gollarahatti Block, Hassan District, Karnataka (2 Sq.Km)"									Annexure-1
S. No.	Item of Work	Unit	Rates as per NMET SoC 2020-21		Approved Cost of the Proposal		Amount to be claimed		Remarks
			SoC-Item -SI No.	Rates as per SoC					
					Qty.	Amount (Rs)	Qty	Revised cost	
A	GEOLOGICAL WORK								
i	Geologist Party Days (HQ)	Days	1.3	9000	60	5,40,000	12	1,08,000	
ii	Geologist Party Days (2) (Field)	Days	1.3	11000	120	13,20,000	20	2,20,000	
iii	Labour Days (2) Field	Days	5.7	477	240	1,14,480	40	19,080	
iv	Sampler Party Days	Days	1.5.2	5100	20	1,02,000	2	10,200	
v	Labour Sampling	Days	5.7	477	80	38,160	8	3,816	
vi	Survey Party Days (1 Party)	Days	1.6.1a	8300	15	1,24,500	10	83,000	
vii	Labour for Survey party	Days	5.7	477	60	28,620	40	19,080	
	Sub Total- A					22,67,760		4,63,176	
B	GEOPHYSICAL INVESTIGATION								
i	Geophysical Investigation- Gravity 2 Profiles Spacing 100 meters -10 stations on each profile (10X20=200)	Per Station	3.1a	3800	200	7,60,000	200	7,60,000	
	Sub Total- B					7,60,000		7,60,000	
C	PITTING / TRENCHING								
	Pitting/Trenching	Per Cu.m	2.1.2	3800	150	5,70,000	-	-	
	Sub Total- C					5,70,000	-	-	
D	CHEMICAL ANALYSIS								

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i	Chemicals Analysis - Geochemicals, BRS, Trench /Pit for Ni, Cr,Cu, PGE (Ni-Fire Assay)	Per Sample	4.1.5d	11800	200	23,60,000	15	1,77,000	
ii	Check Samples- Ni,Cr, Cu,PGE, Au(15%) Ni-Fire assay	Per Sample	4.1.5d	11800	30	3,54,000	-	-	
iii	Preparation of thin sections	Per Sample	4.3.1	2353	10	23,530	-	-	
iv	Complete petrographic /ore microscopic study/Mineragraphic studies	Per Sample	4.3.4	4232	10	42,320	-	-	
v	Preparation of Polished Sections	Per Sample	4.4.1	1549	10	15,490	-	-	
vi	EPMA Studies	Per Hour	4.3.2	8540	10	85,400	-	-	
vii	Whole Rock Analysis	Nos	4.1.15a & b	7568	10	75,680	-	-	
	Sub Total- D					29,56,420		1,77,000	
	Sub Total (A+B+C+D)							14,00,176	
E	PREPARATION OF EXPLORATION PROPOSAL	Per Project	5.1	131084	1	1,31,084	1	28,004	
	Sub Total- E					1,31,084		28,004	2% of Approved cost or 5 lakhs, whichever is lower
F	PEER REVIEW	As per EC	-	10000	1	10,000		30,000	
	Sub Total- F					10,000		30,000	*
G	GEOLOGICAL REPORT PREPARATION 5 HARD COPIES + 2 SOFTCOPY (@5%)	Per Project	5.2	327709	1	3,27,709		1,50,000	For project with cost up to 50 lakhs, minimum of Rs. 1.5 lakhs or 5% of work, whichever is more
	Sub Total- G					3,27,709		1,50,000	
H	Total Estimated Cost without GST(A+B+C+D+E+F+G)					70,22,973		16,08,180	
I	Provision for GST (18%)					12,64,135		2,89,472	

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J	Total Estimated Cost with GST	82,87,108		18,97,652	De- escalation amount is Rs. 63,89,456/-
	Rs. (in lakhs)	82.87		18.98	De- escalation amount: Rs. 63.89 Lakhs (~ - 77.10%)
Note:					
1	Strict adherence to the Ministry of Finance's and GFR guidelines is mandatory. Every transaction must adhere to GFR rule 21.				
2	In case of delay/non- performance, the appropriate action will be taken by competent authority against delinquent agency as per prevailing govt. of India rules/guidelines on procurement.				
3	If any part of the project is outsourced, the amount will be reimbursed as per the Paragraph 3 of NMEDT SoC and Item no. 6 of NMEDT SoC. In case of execution of the project by NEA on its own, a Certificate regarding non outsourcing of any component/project is required.				
4	Necessary efforts should be made to minimize any adverse impact on the environment during exploration activities.				
5	Any item of work not mentioned above shall be added as per SoC.				
6	All the Geological Reports and data are to be uploaded on NGDR as per MERT template by the agency				

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23.3 Locality Index

Sr. No.	Villages	Latitude	Longitude
1	Gollarahatti	13° 25' 51.50" N	76° 22' 51.26" E
2	Rampura	13° 25' 32.55" N	76° 22' 43.20" E

23.4 Reviewer's Comments

Sr. No.	Report Section No.	Reviewer's Comments	GeoExpOre's Action
1	Cover Page	Replace the existing Ministry of Mines logo and align it correctly on the cover page.	The Ministry of Mines logo has been replaced with the approved version and repositioned on the cover page to improve alignment and presentation.
2	Cover Page	Check whether the bilingual title and other details on the cover page are required.	The cover page has been reviewed and revised in accordance with the prescribed NMEDT report format. Unnecessary details have been removed, and the bilingual title has been retained/revised as applicable.
3	Contents	Revise chapter numbering consistently (Chapter I, II, III... instead of simple numbering).	Chapter numbering has been revised throughout the report. All major sections are now presented as Chapter I to Chapter IX, and the Table of Contents has been updated accordingly.
4	Executive Summary	Present Executive Summary as a separate section before the report, followed by bilingual version. Improve it by including objectives, methodology, findings, Co and REE analyses.	The Executive Summary has been separated from the main chapters and placed before the report. The summary has been expanded to include objectives, methodology, key findings, and Ni, Co, PGE and REE analytical results.

5	Figures (General)	Revise all figure captions to be complete and descriptive instead of only mentioning rock names.	Figure captions throughout the report have been rewritten to include photograph type, location, lithology, geological significance and relevant observations instead of only rock names.
6	List of Tables	Make all table titles more descriptive and informative.	Table titles throughout the report have been thoroughly revised into detailed, self-explanatory phrases specifying parameters, locations, and lithologies presented (e.g., Table 6.1 now explicitly details summary analytical results across specific rock types).
7	Plates	Enlarge all plates for readability. Consider including A3 plates as A4 figures within relevant chapters.	All plates have been enlarged to full-page scale to improve clarity and readability. Additionally, reduced A4-sized versions of the main geological and sample maps have been integrated directly within the text of relevant chapters to improve text flow and cross-referencing
8	Annexures	Revise captions of all eight annexures to be more descriptive.	The titles and headers for all eight annexures have been revised to clearly reflect their specific scope, analytical methodologies, and

			contents (e.g., specifying ICP-MS/OES base metals, REE, and PGE analysis).
9	Summary (Page 1, Para 2)	Recast OGP paragraph for better clarity and readability.	The OGP framework paragraph in the Executive Summary has been reworded to improve sentence structure, flow, and technical clarity regarding the initiative of private agency participation.
10	Summary	Strengthen scientific discussion, moderate PGE prospectivity statements, discuss gravity survey, Co & REE analyses, and align report title with analytical findings.	The Executive Summary and main Summary sections have been comprehensively upgraded. PGE prospectivity statements have been moderated to acknowledge the low concentration levels observed (<50 ppb). Detailed interpretations of the Bouguer gravity survey, Co, and REE data have been integrated, and the report title/text now reflects realistic analytical findings.
11	Section 2.3	Recast the first sentence under Objectives for clarity.	The opening sentence under Section 2.3 (Objectives) has been recast for syntactic clarity, explicitly stating the primary objective of G4-stage evaluation for critical/strategic mineral potential.

12	Section 2.4	Revise exploration strategy for IPGE mineralization; consider heavy mineral concentrate sampling and drainage-based sampling.	The exploration strategy in Section 2.4 has been updated to specifically address IPGE-type mineralization. Recommendations for heavy mineral concentrate (HMC) panning in drainage channels and bedrock sampling near Cr-spinel bearing zones have been incorporated.
13	Plate 1 (Page 13)	Enlarge Plate 1 and include coordinates, block boundaries, and key localities.	Plate 1 has been re-rendered to full-page size with enhanced digital clarity, including clear boundary coordinates (latitude/longitude), demarcated block boundaries, and major surrounding geographical localities.
14	Section 3.11	Include a drainage map from 1:50,000 SOI toposheet to support exploration rationale.	A drainage map derived from the 1:50,000 SOI toposheet (57C/7) has been added to Section 3.11/2.11 to illustrate stream networks, structural controls, and the rationale behind stream-sediment PGE targeting
15	Section 4.1.1	Cite relevant published literature in Previous Studies.	Section 4.1.1 has been updated with formal citations of key published geological literature (e.g., Viswanatha, 1981; Ramakrishnan et al., 1994; Chardon et al.,

			2008) to reinforce the regional geological framework.
16	Chapter 5	Enlarge Lineament Map for better visibility of scale and details.	Figure 5.1 (Lineament Map) has been formatted to a full-page layout with a legible scale bar, directional compass, and clear lineament annotations for improved visual analysis.
17	Aeromagnetic Map	Enlarge map; improve visibility of scale and geological features.	Figure 5.2 (Aeromagnetic Contour Map) has been enlarged to fill an A4 page, with higher-contrast contouring, visible map scales, and legible coordinate labels.
18	ASTER Map	Enlarge map for improved readability.	Figure 5.3 (ASTER Alteration Map) has been enlarged to full-page size to ensure high resolution, clear visibility of alteration indices (chlorite/epidote), and legible map elements.
19	Geology	Expand discussion on geology and rock types with quality field photographs.	The discussion on local geology and lithological units has been expanded with detailed macro/micro-structural descriptions and supplemented with high-resolution field photographs showing lithological contacts and structural features.

20	Page 27, Para 2	Replace "internal stratigraphy" with an appropriate geological term.	The ambiguous term "internal stratigraphy" has been replaced with standard geological terminology ("internal lithological variation" / "stratigraphic succession").
21	Stratigraphy	Use "Tentative Stratigraphy" or "Generalized Stratigraphic Succession" instead of "Pseudo Stratigraphy."	The heading and text references for "Pseudo-Stratigraphy" (Table 5.1) have been changed throughout the report to "Tentative Stratigraphy" as per IUGS norms.
22	Figure 5.4	Figure is good in all aspects.	Noted with thanks. The figure and its descriptive caption have been retained in their original high-quality format.
23	Section 5.3.2	Include geochemical analytical values for all commodities (Ni, Co, PGE, REE, associated minerals).	Section 5.3.2 has been expanded to explicitly incorporate and discuss complete geochemical analytical values for all target commodities, including Ni, Co, PGE, and REE.
24	Section 5.3.3	Revise Pegmatite discussion to correctly reflect geological association.	The text has been revised to clarify that pegmatite represents a late-stage, cross-cutting felsic intrusive and is not genetically part of the mafic-ultramafic igneous suite.
25	Chapter 6	Enlarge geological plate map; improve legend and scale visibility.	The geological map in Chapter 6 has been re-scaled to a full A4 page, significantly

			improving the visibility of lithological units, legend symbology, structural symbols, and the scale bar.
26	Plate 3	Increase font size of labels and legend; add scale bar.	Plate 3 has been enlarged to A4 format with increased font size for all text labels, coordinate annotations, and map legends. A clear linear scale bar has also been added
27	Section 6.4, Fig. 6.1	Revise figure captions to include location, geological features and significance.	Figure 6.1 caption has been rewritten to explicitly specify location coordinates/block, outcrop nature, structural features (foliation/shearing), and geological significance.
28	Fig. 6.2	Mention photograph location in caption.	The caption for Figure 6.2 has been updated to include exact location details (Block-1, near Rampura) and structural context.
29	Section 6.4.2	Clarify terminology "Quartz Pegmatite"; adopt standard IUGS nomenclature.	The terminology "Quartz Pegmatite" has been corrected to "Pegmatite / Quartz-rich Pegmatitic Vein" in compliance with standard IUGS classification guidelines.
30	Figures 6.3 & 6.4	Replace simple rock-name captions with detailed geological captions.	Captions for Figures 6.3 and 6.4 have been updated from simple rock names to descriptive captions detailing lithology,

			fabric, location, alteration, and observed mineralogy.
31	Plate 4	Enlarge plate for better readability.	Plate 4 (Geological Map with Sample Locations) has been enlarged to full-page scale, ensuring clear legibility of sample numbers, legend details, and coordinates.
32	Table 6.1	Clarify whether PGE represents 2E or 5E; specify fire assay method; limit decimal places.	Table 6.1 and its text now specify the reported PGE sum as six-element (Pt, Pd, Ru, Rh, Ir and Os), with the method, units, detection limit and consistent rounding stated. The source certificate identifies nickel-sulphide fire assay with ICP-MS finish (SOP/OM/055), not a Pb/Ni collection method.
33	Table 6.1	Clarify analytical methodology and justify similar PGE values in felsic and ultramafic rocks.	The analytical methodology and reporting limit have been stated. Similar PGE totals near 30 ppb are treated cautiously because individual analytes approach the 0.005 ppm detection limit; no lithology-independent enrichment is claimed.
34	Section 6.5.2	Improve geochemical correlation discussion; include instrument details, QA/QC, SRMs, axis units and figure captions.	Section 6.5.2 has been revised to use cautious, descriptive correlation language and to state

			ppm axis units and complete captions for Figures 6.5–6.12. The supplied report does not provide instrument models or complete blank, duplicate and SRM statistics; these remain author-confirmation items.
35	Page 44	Show actual analytical values when comparing with GSI instead of stating "better than GSI values."	Qualitative claims of being better than GSI values have been removed. The text now reports the present Ni (42–1973 ppm) and Co (<5–93 ppm) ranges against the cited GSI ranges (Ni 20–3515 ppm; Co 35–330 ppm) and flags the unresolved PGE unit mismatch.
36	Geophysical Investigation	Improve interpretation and integration of geophysical data with geology.	The geophysical section now integrates Bouguer, residual, upward-continued and tilt-derivative responses with mapped lithological boundaries and structural lineaments, while stating the resolution and interpretation limitations.
37	Geochemical Investigation	Moderate conclusions on PGE; recommend further systematic exploration for Ni-Co-PGE.	PGE prospectivity conclusions have been moderated based on low absolute concentrations. Systematic follow-up exploration (detailed geophysics, trenching,

			scout drilling) is recommended to assess Ni-Co potential and verify PGE continuity.
38	Figures 6.7.1 & 6.7.5.1	Correct figure numbering errors (6.17→6.19; 6.18→6.20).	Sequential figure numbering errors throughout Section 6.7 and Chapter 5/6 have been corrected to maintain strict sequential alignment.
39	Section 6.7.5.1	Correct statement that Talc-tremolite chlorite schist is a high-grade package.	The text in Section 6.7.5.1 and Page 57 has been rectified to accurately describe Talc-Tremolite-Chlorite Schist as a low-to-medium grade metamorphic unit rather than a high-grade package.
40	Figure 6.24	Improve interpreted map and revise figure/table captions.	Figure 6.24 (Interpreted Map) has been enhanced with overlay structural lineaments, demarcated prospective target zones (Zones 1–3), and complete descriptive figure/table captions.
41	Section 6.7.7	Improve geophysical conclusions; remove bullet points.	Section 6.7.7 (Geophysical Conclusions) has been rewritten in structured, continuous prose, removing bulleted lists and strengthening the integration of gravity anomaly patterns with subsurface structures.

42	Chapter 7	Include geochemical and geophysical results in discussion.	Chapter 7 (Mineral Prospects) has been updated to integrate specific geochemical threshold values (Ni, Co, PGE) and gravity anomaly signatures into the discussion of target prospective zones.
43	Chapter 8 – Mineral Prospects	Reduce speculation; support interpretations with field photographs.	Speculative assertions regarding mineralization genesis have been moderated. Text interpretations are now substantiated using annotated field photographs showing hydrothermal alteration, veining, and structural fabrics.
44	Conclusion Chapter	Correct chapter numbering; separate Summary and Conclusion; include Ni, Co, PGE & REE values.	The chapter numbering has been corrected (Chapter VIII: Conclusion and Recommendation). The conclusion now states Ni, Co and six-element PGE ranges, gravity coverage and target-zone dimensions; REE context is retained in the geochemical discussion.
45	Recommendation	Improve recommendation section by including petrography and geophysical aspects.	The Recommendation section now includes petrography, polished-section ore microscopy, QA/QC-supported follow-up sampling, ground magnetic surveying at

			approximately 20 m spacing and IP/resistivity surveying at approximately 50 m spacing across prioritized zones.
46	Sections 14.2 & 14.3	Rearrange analytical tables; include rock names and proper units; classify elements into major, minor, trace and REE.	Annexure headings and the main analytical-method text now identify the table units and the six-element PGE suite. Existing source tables retain their original layout and should be reformatted into clearly labelled major-, trace-, REE- and PGE groups before final submission.
47	Section 14.8	Correct typographical errors in Project Chronology dates.	Project Chronology wording has been reviewed for obvious typographical issues; dates and activity descriptions that depend on the project record should receive a final author verification.
48	Entire Report	Correct typographical and grammatical errors; comprehensively revise the report before NGDR submission.	The requested analytical, interpretation and recommendation revisions have been applied. Final author proofreading, pagination review and confirmation of unresolved source-data items remain necessary before NGDR submission.

CHAPTER 24: CERTIFICATE FROM THE QUALIFIED PERSON WITH NAME, DATE AND SIGNATURE

This is to certify that geological report has been prepared in respect of Reconnaissance Survey (G4) For Ni, Co, PGE And REE/ Associated Minerals In JC Pura Mafic Ultramafic Schist Belt Near Rampura And Gollarahatti (R-G) Block, Hassan District, Karnataka. The report was prepared by GeoExpOre Private Limited on behalf of the National Mineral Exploration and Development Trust (NMEDT). The report adheres to the Minerals (Evidence of Mineral Contents) Rules, 2015, as specified under the Mineral Auction Rules, 2015 and amended up to 2021.

NAME: Mr. Sandeep Hamilton

DATE: 31/07/2026

SIGNATURE:



DESIGNATION: Project Coordinator