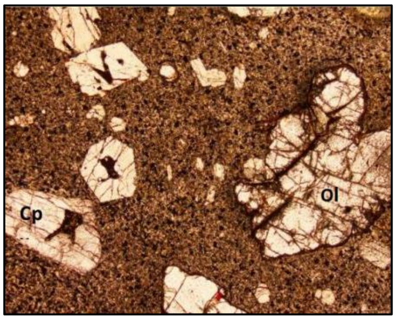
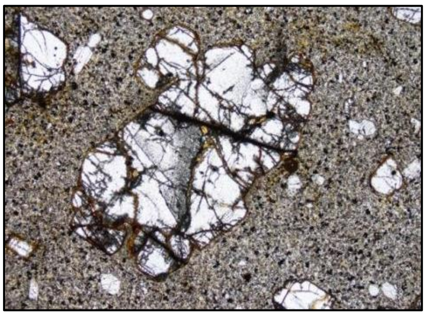
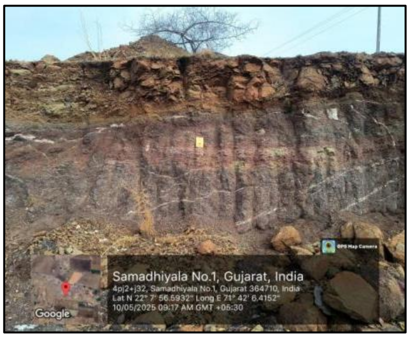
GEOLOGICAL REPORT
RECONNAISSANCE SURVEY (G4) FOR Ni, Co AND PGE
IN BOTAD BLOCK (99.6 Sq km area) - BOTAD DISTRICT
GUJARAT (UNDER NMEDT PROGRAMME)







Critical Mineral Trackers

(NOTIFIED PRIVATE EXPLORATION AGENCY)

March 2026

CERTIFICATION

This is to certify that geological report has been prepared in respect of **"Reconnaissance Survey (G-4) for Ni, Co and PGE in Botad Block, Botad District and Gujarat"** by CRITICAL MINERAL TRACKERS on behalf of National Mineral Exploration and Development Trust (NMEDT). The report has been prepared in accordance with the Minerals (Evidence of Mineral Contents) Rule 2015 specified under Mineral Auction Rule, 2015 and amended up to 2021.

M. Chandu

MEKALA CHANDU
Team Member (TM)

S. RAMA MURTHY
Technical Area Expert (TAE) &
Principal Investigator

Reconnaissance Survey (G4) for Ni, Co and PGE in Botad area, Botad District, Gujarat

Project Code: 23/607/2025-NMET/1009

Under NMDET

By

S. Rama Murthy

M. Chandu

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Critical Mineral Trackers
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Project Title: Reconnaissance Survey (G4) for Ni, Co and PGE in Botad area, Botad District, Gujarat.

Project Code: 23/607/2025-NMET/1009

Project Timeline: 10 Months (From 13.03.2025 to 12.01.2026)

Project Location: Botad, Gujarat

Funding Organisation

National Mineral Exploration and Development Trust (NMEDT), Ministry of Mines

Room No. 325 & 326, Wing-F, Udyog Bhawan, Rafi Ahmed Kidwai Marg,

Rajpath Area, Central Secretariat

New Delhi-110011

Phone: 011 2307 1006

Email Id: nmet-mines@gov.in

Project executed as NPEA:

Critical Minerals Trackers

#Concourse, No 306,7-1-58/CC/306

Opp Lal Bungalow, Greenland's,

Hyderabad-500016 INDIA.

Ph no:7893847742

www.criticalmineraltrackers.co.in

Team Involved:

S. Rama Murthy

Principal Investigator

Mekala Chandu

Team Member (Geologist)

Dr A Ajay Kumar

Team Member (Geologist)

CHAPTER -1

"सारांश"

निकेल–कोबाल्ट–पीजीई (Ni–Co–PGE) की संभाव्यता के आकलन हेतु **बोटाद क्षेत्र, बोटाद जिला, गुजरात** में **पुनर्ज्ञान स्तर (G4)** की खोज कार्यवाही **NMET द्वारा वित्तपोषित** परियोजना के अंतर्गत **M/s Critical Minerals Trackers** (आगे *बोटाद परियोजना* के रूप में संदर्भित) द्वारा निष्पादित की गई। अन्वेषण क्षेत्र का कुल विस्तार **99.6 वर्ग किलोमीटर** है, जो **भारतीय सर्वेक्षण विभाग (Survey of India)** की टोपोशीट संख्या **41N/12 एवं 41N/16** में स्थित है तथा **22°03′45″ उ. से 22°14′30″ उ. अक्षांश** एवं **71°38′15″ पू. से 71°46′15″ पू. देशांतर** के मध्य विस्तृत है।

इस परियोजना का मुख्य उद्देश्य **दक्कन लार्ज इग्नियस प्रांत (DLIP)** में पाई जाने वाली **पिक्राइट-आश्रित महाकाय PGE–Ni–Cu–(Co) निक्षेपों** के अनुरूप **मैग्मैटिक सल्फाइड प्रकार की PGE–Cu–Ni–Co खनिजीकरण संभाव्यता** का आकलन करना था।

कार्य-घटक में **1:25,000 पैमाने पर भूवैज्ञानिक मानचित्रण**, **पेट्रोग्राफिक अध्ययन**, **पिटिंग कार्य**, तथा **बेडरॉक एवं पिट नमूनों का रासायनिक विश्लेषण** सम्मिलित था। अध्ययन क्षेत्र मुख्यतः **दक्कन ट्रैप अनुक्रमों पर विकसित पिक्राइटिक बेसाल्ट** से आच्छादित है। क्षेत्र में दक्कन ट्रैप अनुक्रम का प्रतिनिधित्व **ऊपरी क्रिटेशस से निचले पैलियोसीन आयु** के **पोरफिरिटिक एवं अमिग्डुलर बेसाल्ट प्रवाहों** द्वारा होता है, जिन्हें **पिक्राइट एवं बेसाल्टिक पिक्राइट के सिल एवं डाइक** अंतर्भेदित करते हैं।

अध्ययन क्षेत्र में चार प्रमुख बेसाल्ट प्रवाहों की पहचान की गई है, जिन्हें **रेड बोले परतों** द्वारा अलग किया गया है। ये रेड बोले परतें सतही अनावृत्तियों तथा खुदे हुए कुओं (dug wells) के खंडों में स्थान-स्थान पर देखी गईं:

प्रवाह	**समुद्र तल से ऊँचाई**	**सापेक्ष आयु**
प्रवाह–4	लगभग 90 मीटर	सबसे नवीन
प्रवाह–3	80–90 मीटर	
प्रवाह–2	65–80 मीटर	
प्रवाह–1	65 मीटर से कम	सबसे प्राचीन

इन प्रवाहों को **पिक्राइट एवं बेसाल्टिक पिक्राइट के सिल** असंगत (discordant) संबंध के साथ अंतर्भेदित करते हैं। पिक्राइटिक शैलें लगभग पूरे **99.6 वर्ग किलोमीटर** क्षेत्र में फैली हुई हैं और यही वर्तमान अन्वेषण का मुख्य केंद्र रहीं। विस्तृत मानचित्रण के माध्यम से **पिक्राइट एवं बेसाल्टिक पिक्राइट के ज्ञात अनावृत्त क्षेत्र में उल्लेखनीय विस्तार**

किया गया है। इसके अतिरिक्त, कई खुदे हुए कुओं में बेसाल्ट प्रवाहों के नीचे **पिक्राइट सिलों की उपस्थिति** भी दर्ज की गई है।

कुल **182 नमूनों** का पेट्रोग्राफिक अध्ययन किया गया, जिनमें सतही एवं पिट नमूने सम्मिलित हैं। अध्ययन का उद्देश्य शैल प्रकारों की पहचान, बनावट (texture), संचयी (cumulus) बनावट की उपस्थिति/अनुपस्थिति, सल्फाइड या ऑक्साइड अयस्क खनिजों की उपस्थिति, तथा हाइड्रोथर्मल परिवर्तन का आकलन करना था। क्षेत्र में पहचानी गई प्रमुख शैल इकाइयों में **पिक्राइट, बेसाल्टिक पिक्राइट, एफैनिटिक बेसाल्ट एवं पोरफिरिटिक बेसाल्ट** शामिल हैं। पिक्राइट में **ओलिविन प्रमुख खनिज** है, जो प्रायः **क्लिनोपाइरॉक्सीन एवं अल्प मात्रा में फेल्डस्पार** के साथ सह-अस्तित्व में पाया जाता है। अनेक नमूनों में ओलिविन का **सर्पेन्टाइन एवं/या इडिंग्साइट में परिवर्तन** पाया गया है, जो कुछ क्षेत्रों में **हाइड्रोथर्मल क्रियाओं** की उपस्थिति का संकेत देता है। पिक्राइट एवं बेसाल्टिक पिक्राइट में **मध्यम-दानेदार, होलोक्रिस्टलाइन से पोरफिरिटिक बनावट** पाई जाती है तथा रिक्तिकाएँ (vugs) प्रायः **जिओलाइट** से भरी होती हैं। बेसाल्ट में मुख्यतः **प्लैजियोक्लेज फिनोक्रिस्ट** पाए जाते हैं, जिनके साथ ग्राउंडमास में अल्प मात्रा में ओलिविन एवं क्लिनोपाइरॉक्सीन उपस्थित हैं।

1:25,000 पैमाने पर भूवैज्ञानिक मानचित्र अंतिम रूप से तैयार कर लिया गया है तथा सभी पिट स्थलों को उसमें अंकित किया गया है। **95 पिट नमूनों के रासायनिक विश्लेषण** पूर्ण हो चुके हैं तथा **Ni, Cr, Co एवं Nb के तत्वीय वितरण मानचित्र** तैयार किए गए हैं। इन तत्वों के वितरण पैटर्न के आधार पर यह पाया गया है कि **प्रवाह–3 सर्वाधिक संभावनाशील** है तथा कुछ सीमा तक **प्रवाह–4** भी आशाजनक प्रतीत होता है।

पिट नमूनों में तत्वीय सांद्रण निम्न प्रकार है:

- **Cr:** 122–1280 पीपीएम
- **Co:** 8–90 पीपीएम
- **Ni:** 87–1116 पीपीएम
- **Nb:** 250–1395 पीपीएम; जबकि **प्रवाह–3 के उत्तरी भाग में नमूना संख्या 94** में **39,850 पीपीएम (3.985%) Nb** का असाधारण मान प्राप्त हुआ है।

20 पिट नमूनों के प्रमुख ऑक्साइड आंकड़ों को **TAS एवं R1–R2 आरेखों** पर निरूपित किया गया, जिनके अनुसार शैलें **पिक्राइटिक बेसाल्ट एवं बेसाल्ट** प्रकृति की हैं। **Pearce एवं Mullen त्रिकोणीय आरेख** के अनुसार इन शैलों की उत्पत्ति **महासागरीय रिज/महासागरीय तल परिवेश** से संबंधित है।

इसके अतिरिक्त, **77 बेडरॉक नमूनों (BRS)** का भी रासायनिक विश्लेषण किया गया, जिनमें तत्वीय मान निम्न सीमाओं में पाए गए:

- **Co:** 2.9–80.3 पीपीएम
- **Cr:** 12.4–1411.6 पीपीएम
- **Ni:** 23.6–1105.1 पीपीएम
- **Nb:** 4.4–1214.6 पीपीएम

इस प्रकार, पिट एवं बेडरॉक नमूनों सहित कुल **182 नमूनों** का रासायनिक विश्लेषण किया गया। **10 नमूनों** को **पेट्रोलॉजी डिवीजन, GSI, साउदर्न रीजन** में पेट्रोग्राफिक अध्ययन हेतु भेजा गया, जिनकी रिपोर्ट प्राप्त हो चुकी है तथा संलग्न की गई है। इसके अतिरिक्त, **5 नमूनों का XRD** तथा **4 नमूनों का SEM विश्लेषण** किया गया है।

Summary

A reconnaissance stage (G4) exploration programme for **Ni–Co–PGE** was carried out in the **Botad area, Botad District, Gujarat**, under **NMET funding**, and executed by **M/s Critical Minerals Trackers** (hereafter referred to as the *Botad Project*). The total investigation area covers **99.6 sq. km**, falling within **Survey of India toposheets 41N/12 and 41N/16**, bounded by latitudes **22°03′45″ N to 22°14′30″ N** and longitudes **71°38′15″ E to 71°46′15″ E**.

The principal objective of the project was to assess the **prospectivity of magmatic sulphide–type PGE–Cu–Ni–Co mineralization** within the **Deccan Large Igneous Province (DLIP)**, analogous to picrite-hosted supergiant PGE–Ni–Cu deposits documented elsewhere.

The scope of work included **large scale geological mapping at 1:25,000 scale**, **petrographic studies**, **pitting**, and **chemical analysis of bedrock and pit samples**. The area is dominantly underlain by **picritic basalts** developed over the Deccan Trap sequences. The Deccan Traps in the area comprise **Upper Cretaceous–Lower Paleocene porphyritic and amygdaloidal basalt flows**, intruded by **picrite and olivine basaltic sills and dykes**.

Four basalt flows were delineated, separated by **intermittently developed red bole horizons**, observed both in surface exposures and dug-well sections:

Flow	Elevation above MSL	Relative age
Flow 4	~90 m	Youngest
Flow 3	80–90 m	
Flow 2	65–80 m	
Flow 1	<65 m	Oldest

Picrite and basaltic picrite sills intrude these flows with **discordant relationships**. Olivine rich basalts/Picritic rocks are mostly confined to Flow 3 and Flow 4 in the study area and formed the main focus of investigation. Detailed mapping has **significantly extended the known outcrop distribution of picrite and basaltic picrite**, including their occurrence as sills encountered in dug wells beneath basalt flows.

A total of **182 samples** including surface and pit samples for chemical analysis by ICPMS to identify lithological variations, textural features, presence/absence of sulphides or oxide minerals, and hydrothermal alteration. Lithologies identified include **picrite, olivine basalt, aphanitic basalt, and**

porphyritic basalt. Picrites are characterized by **olivine with frequent clinopyroxene and minor feldspar**, occurring as phenocrysts and groundmass. Olivine alteration to **serpentine and iddingsite** in several samples suggests **localized hydrothermal activity**. Picrite and basaltic picrite exhibit **medium-grained holocrystalline to porphyritic textures**, with vugs commonly filled by **zeolites**. Basalts are dominated by **plagioclase phenocrysts** with minor olivine and clinopyroxene in the groundmass.

A **1:25,000 scale geological map** has been finalized, incorporating all pit locations. **Chemical analysis of 95 pit samples** has been completed, and **elemental distribution maps for Ni, Cr, Co, and Nb** were prepared. Based on geochemical patterns, **Flow 3 appears most promising**, followed by **Flow 4**.

Major oxide data from **20 pit samples**, plotted on **TAS and R1–R2 diagrams**, classify the rocks as **picritic basalt and basalt**. **Pearce and Mullen discrimination diagrams** indicate an **oceanic ridge/oceanic floor tectonic affinity**.

In addition, **77 bedrock samples (BRS)** were analysed, yielding the following ranges:

- **Co:** 2.9–80.3 ppm
- **Cr:** 12.4–1411.6 ppm
- **Ni:** 23.6–1105.1 ppm
- **Nb:** 4.4–1214.6 ppm

Overall, **182 samples** (pit + BRS) were chemically analysed. **Ten samples** were submitted to the **Petrology Division, GSI, Southern Region** for petrographic studies, and the report has been received and appended. Additionally, **five samples were analysed by XRD** and **four samples by SEM**.

CHAPTER-2

INTRODUCTION

M/S Critical Mineral Trackers, Hyderabad, a Ministry of Mines Notified Private Exploration Agency (NPEA) was awarded the NMET funded project, entitled "Reconnaissance Survey (G4) for Ni, Co and PGE Prospect Block in Botad area, Botad District, Gujarat. The majority of the rocks in the research region are from the Tertiary Deccan Trap, which also contains Quaternary Miliolite Formation, sedimentary inter-trappeans, tholeiites, and picritic basalt. Worldwide picritic rocks associated with Large Igneous Provinces (LIP) host many rich Ni, Co and PGE deposits. The Botad Project area covers an area of 99.6 sq.km in the Botad district of Gujarat. This project report outlines all the activities undertaken during the project from 13.03.2025 to 12.01.2026, which includes large-scale geological mapping (1: 25000), Sample collection, pitting, petrographic studies, geochemical analysis (XRF & ICPMS), XRD and SEM analysis.

2.1 Details of the Project:

1	Project name	Reconnaissance Survey (G4) for Ni, Co and PGE Prospect Block in Botad area, Botad District, Gujarat
2	Project code	**23/607/2025-NMET/1009**
3	Commodity	Ni, Co and PGE
4	Tehsil	Botad, Gadhada, Barvala, and Ranpur
5	Nearby villages	Sherthali, Amapar, Samadhiyala No1, Khas Road, Tajpar, Bhambhan
6	State	Gujarat
7	Project area	99.6 sq km (100 sq km)
8	Survey of India Toposheet No	41 N/12 & 16
9	Date of commencement of project	13 March 2025
10	Boundary coordinates of the project area	**Boundary coordinates** / **Latitude (DD)** / **Longitude (DD)** A 22.167 71.574 B 22.282 71.634 C 22.185 71.763 D 22.081 71.701

2.2 Investigating agency:

Name	Critical Minerals Trackers
Postal Address	H.O #Concourse, No 306,7-1-58/cc/306, Opp Lal Bungalow, Greenland, Hyderabad-500016, INDIA
Telephone No (Office)	9666975499
Mobile No	9849574333
E-Mail address	criticalmineraltrackers@gmail.com
Date of accreditation granted by QCI-NABET	May 20,2024
Date of expiry of Accreditation	May 15,2027
Telephone No (Residence)	
Category of the NPEA	Category A Exploration Agency

2.3 Objectives of investigation:

Search and assessment of Nickel, Cobalt & PGE resources in Botad Block, Botad District, Gujarat.

2.4 Basis for taking up Investigation:

About 99.6 sq. km area around Botad- Hadadad-Senthali are known for picrite flows/ sills/ dykes within tholeiitic basalt flows. The area was mapped on scale 1:25,000 about 30% of the area is covered by picritic flows/sills and dykes which are 10 m to 20 m thick. Sulphide related PGE-Ni-Co mineralization is usually localized at the basal part of thick picritic sills and flows. Weathered lateritic areas that developed lover picritic basalts should also be tested for possible Ni rich zones. Some of these picritic hocks are very high in Ni concentration (over 1000 ppm). MgO content of these picritic hocks goes up to 20%. Co and PGE content of these picritic rocks are not analysed. High concentration of thick picritic flows sills and dykes with high MgO content along with isolated high Ni concentration in these rocks make them a good target for Ni-Co-PGE mineralization. Especially the basal parts of thick picritic flows may host Sulphur rich Ni-Co-PGE mineralization However, Ghevariya et al. (1996) analysed 33 basaltic samples (picrite and other basalts) from the area of which nine samples yielded over 500 ppm Ni, highest concentration being 0.1% Ni.

All the above observations of Ghevariya et al., 1996 are positive indicators for presence of sulphide related PGE-Ni mineralization in the area.

In view of the above observations, a G4 exploration program for Ni-PGE in picritic basalts of the area is proposed.

2.5 Table 1: Nature and quantum of work Approved vs Achievement:

S. No.	Nature of work*	*Approved Quantum*	Achieved Quantum	Remarks
1	Aerial Reconnaissance: PGRS studies (1:25/50,000) (sq km)	100 sq km	100 sq km	Using Google imagery and Landsat OLI imagery
2	Geological Survey- (DGPS/Total Station Survey) (sq km)	Nil	Nil	
3	Geological Mapping (LSM on 1:12500) (sq km)	100 sq km	100 sq km	
4	Geophysical Surveys (Gravity, Magnetic Stn), Nos	Nil	Nil	
5	Technological			
	(a) Surface exploration- Pitting (cu m)	100	93	Remaining 7 could not be done because of objection from the local villagers
	(b) Sub Surface exploration- Drilling (m)	300	Nil	Not recommended by the TCC II

6	Geochemical survey			
	(a) Bed Rock Sample (Nos.)	Nil	Nil	
	(b) Stream Sediment Sample (Nos.)	Nil	Nil	
	(c) Core Sample (Nos.)	300	Nil	
	(d) PT sample (Nos)	100	95 (93 pit samples and 2 bed rock samples)	
7	Petrographic/ Mineragraphic/ other studies			
	Pitting sample: 100*1=100 nos) by fire assay (ICPMS Ni-S) for PGE	25	Nil	TCC II recommended not to go of PGE analysis as Ni values are less than 0.2%
	Core drilling samples 3*100=300 Total depth 100m each, samples will be collected at every 1.0m interval by ICPMS method	50	Nil	No drilling was done as per the recommendation of TCC II
	Trace element analysis (Ni, Cu, As, Mo, Re, In, Te & Co) 14 elements by ICPMS	245	182	Remaining samples are earmarked for drilling, hence not done
	Major oxides by XRF technique (whole rock analysis)	40	20	Remaining samples are earmarked for drilling, hence not done
	Complete Petrographic/ Ore Microscopic/Minerographic studies (Nos.)	10	10	Nil
	XRD analysis for identification of minerals (random)	10	5	Since drilling is not recommended by TCC II, only 5 samples have been sent for XRD
	EPMA/SEM	10	4	Since drilling is not recommended by TCC II, only 4 samples

				have been sent for SEM
8	Chemical Analysis			
	(a) Internal Check samples (5% of Primary samples)	0	Nil	Nil
	(c) External Check sample (10 % of Primary samples)	0	Nil	Nil
	(d) Composite samples	Nil	Nil	Nil

2.6 Personnel Involved

Sno	Team Members	Role
1.	Soma Ramamurthy	Principle Investigator
2.	Mekala chandu	Team Member (Geologist)
3.	A. Ajay kumar	Team Member (Geologist)

2.7 Mode of operation of different working components and associated agency

All field components, encompassing geological mapping, Pitting have been conducted using in-house resources of Critical Minerals Trackers. Geochemical analyses were carried out in collaboration with the Lucid Laboratories, Hyderabad. Samples for XRD are analyzed at the Shiva Analytical in Bengaluru, Karnataka. Additional analyses, including SEM (Scanning Electron Microscope) and preparation of thin section and petrographic studies were carried out at Petrology Divn of Geological Survey of India, Southern Region, Hyderabad.

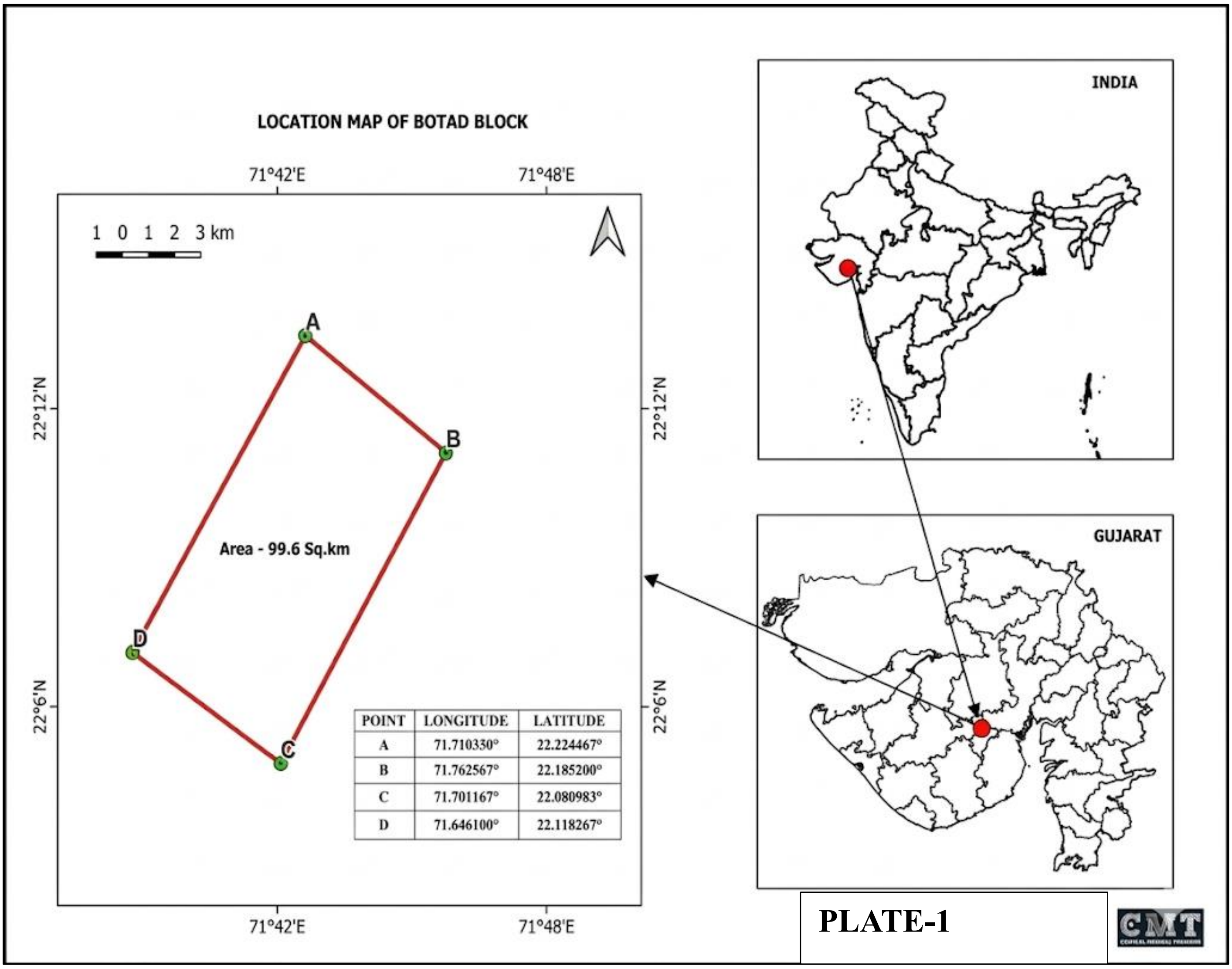
2.8 Acknowledgements:

This project is funded by National Mineral Exploration Trust (NMET), Ministry of Mines, Government of India, New Delhi (vide project sanction File No: **23/607/2025-NMET/1009** dated 13th March, 2025). The project is technically designed and also reviewed time to time by the Technical and Cost Committee (TCC) followed by the Executive Committee (EC) of NMET. We express our sincere gratitude to EC, Chairman and members of TCC and HOD of NMET for awarding this project. Technical and financial review by the CGM and GMRDS (Government of Gujarat) Gandhinagar are sincerely acknowledged. Critical Minerals Trackers (Hyderabad) expresses sincere thanks to all including local administration and villagers of the block area for their invaluable supports in executing the project in and around Botad-Khas-Samadhiyala area, Gujarat.

CHAPTER-3

3.1 Property description

The Botad Block having an area of 99.6 sq. km and nearest villages names include Botad, Samadhiyala no 1, Khas, Tajpar, Senthali. The Botad block comes under Botad district, Gujarat State. The total investigation area covers **99.6 sq. km**, falling within **Survey of India toposheets 41N/12 and 41N/16**, bounded by latitudes **22°03′45″ N to 22°14′30″ N** and longitudes **71°38′15″ E to 71°46′15″ E**.



POINT	LONGITUDE	LATITUDE
A	71.710330°	22.224467°
B	71.762567°	22.185200°
C	71.701167°	22.080983°
D	71.646100°	22.118267°

PLATE-1

3.2 Location and Accessibility

The Area is connected to Ahmedabad and other major cities of Gujarat both by rail and road. Paliyad-Botad and other major villages pass through the area. Botad is well connected to Ahmedabad, Vadodara, Bhavnagar, Rajkot and Surendranagar by road network. There are three major roads passing through Botad town namely NH-51 (Dwarka to Bhavnagar), SH-38 (Sarangpur road) and SH-21(Paliyad road). Botad is the Sub-divisional and Tehsil headquarters. Paliyad and Gadhada are other important towns and pilgrimage centers. Almost all the villages in the area are connected to Botad and Paliyad by roads.

Physiography and Drainage

The northern, eastern and southeastern parts of the area show almost flat ground with few low mounds. Major part of the area is covered by cultivated fields. The area shows a general east to southeast slope. The average elevation of the area is around 120m in northern part, 130m in western part and around 100m in central and northeastern part and around 80m in eastern part. The A171 spot height near Paliyad Jaga forms the highest point in the area. Drainage pattern is mainly dendritic to sub dendritic with major streams flowing towards east. There are two ephemeral streams flowing through the Botad block namely Utavali Nadi in the north, Bhalagama Nadi in the south. The reservoirs generally remain empty due to severe drought conditions.

3.3 Climate

It has the Tropical climate. The average rainfall of the area has 616 mm. The Minimum temperature during January is 17.4 degree Celsius and maximum temperature during May 42.43 degree Celsius.

Topography and Land use and Land cover

The block falling under the Toposheet Number 41N/12, 41N/16. The morphology of the area is undulatory to gently undulating plains, small hillocks, pediment & Pediplains.

3.4 Flora and Fauna

Major parts of the area in east and north are under cultivation except some wastelands, stream courses and low mounds. The hilly parts are mostly barren with scanty bushes along stream courses and along peripheral parts of the reservoir areas. Babul (Acacia indica and Acasia arabica), Cactus, fern are the important vegetation. Shady trees like Pipal, Neem and Banyan are scattered mostly around populated areas and cultivated lands near villages. Groundnut, cotton, bazra, jowar, wheat are the important seasonal crops. Northwestern part of the area has scanty vegetation (Babuls and cactus) with a number of wildlife like deer and neelgai, fox, jackal etc.

3.5 Land use/Landcover:

This is a Land Use and Land Cover Map of Botad Block. It shows how different types of land are distributed in the area using colours. Most of the area is agricultural land (yellow), indicating farming is the dominant activity. Settlements (red) appear in patches, showing villages or built-up areas. Small areas of barren/waste land (purple) and water bodies (blue) are also present, along with some trees/plants (green) in scattered locations. The black boundary line marks the limits of the Botad block.

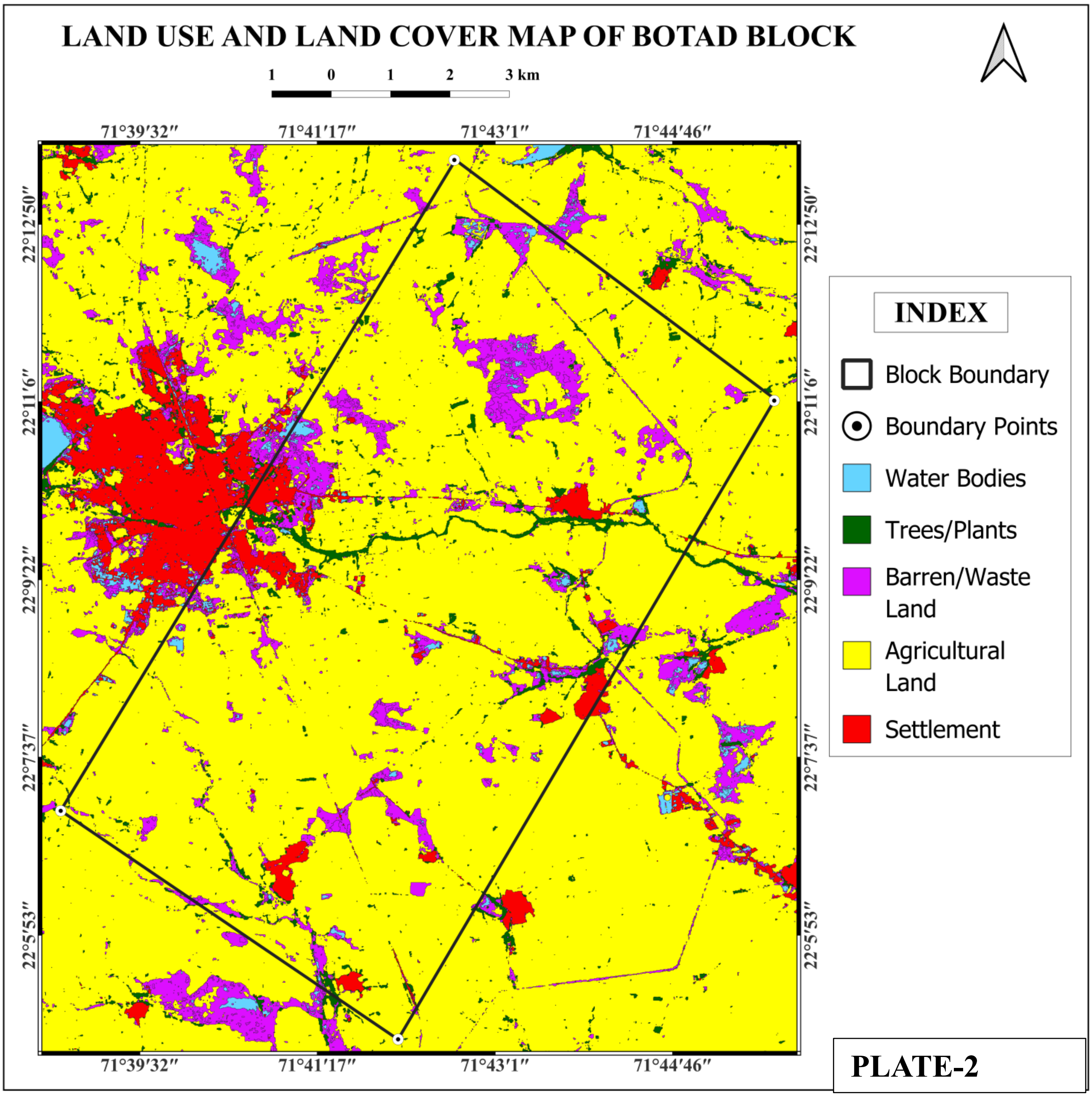

LAND USE AND LAND COVER MAP OF BOTAD BLOCK
1 0 1 2 3 km
71°39′32″
71°41′17″
71°43′1″
71°44′46″
22°12′50″
22°11′6″
22°9′22″
22°7′37″
22°5′53″
INDEX
Block Boundary
Boundary Points
Water Bodies
Trees/Plants
Barren/Waste Land
Agricultural Land
Settlement

PLATE-2

CHAPTER-4

4.Previous Work

- Fedden (1884) first carried out geological mapping of this area as part of his monumental work on Deccan Traps of Saurashtra area. He has described intrusive dykes from this area and from adjacent areas like Chogat Chamardi with acid intrusive. He also suggested that majority of the flows were derived from the fissure eruption. He proposed that the dykes belong to different stages and some of them are post-trappean in age and also are of hypabyssal phase.

- West (1958) studied different lava flows from bore hole logs and gave an account in detail in his work on lava flows from Saurashtra. West also described some picrite basaltic flows from boreholes in Dhanduka and Botad areas. He described 4 picrite basalt flows in Botad area. Gopalan et at (1971) have studied picritic basalt from a quarry near Botad.

- Agrawal and Dey (1985) have mapped these areas and have described porphyritic and fine-grained basalts from Botad, Turkha, and Dhuphamia areas. They have also described iron rich basalt with fine banding 4 km north of Dhakhaniya village. Though they have described olivine in petrographic description, they did not mention about the picritic basalts. There is also no mention about the presence of interstratified, cherty and silty fossiliferous sedimentary/bole beds in their report.

- Mr. Z. G. Ghevariya and Dr B.K. Sahu (1996) representing the Geological Survey of India, conducted extensive mapping of approximately 224 sq. km in the Botad-Hadadad-Senthali region. Their work primarily focused on identifying the unique volcanic sequences within the Deccan Volcanic Province of Saurashtra. He is credited with the significant discovery of thick **picritic basalt** flows and sills, which are rare magnesium-rich volcanic rocks. Ghevariya's mapping revealed that these picritic units make up nearly 30% of the local geology, suggesting a high-temperature mantle source. Through geochemical analysis, they identified high concentrations of **Nickel (Ni)**, with some samples exceeding 500 ppm. His findings provided the first concrete evidence that the Botad region holds high potential for **Platinum Group Element (PGE)** mineralization. They hypothesized that these valuable minerals are likely concentrated at the base of the thick volcanic sills through a process of sulphide settling. Beyond mineralogy, his structural studies highlighted how regional faults and crustal doming controlled the movement of magma in the area. His broader research also connected these volcanic events to the **K-Pg boundary**, helping to date the extinction-era lava flows. Ultimately, Ghevariya's work transformed Botad from a standard volcanic landscape into a high-priority target for strategic mineral exploration in India.

- Naushad Md of Geological Survey of India during field seasons 2014–16 had investigated mafic and picritic lava flows and intrusive of the Deccan Volcanic Province in Kachchh, Saurashtra and East Cambay regions to evaluate their origin and Pt–Pd fertility. The basic plugs of Kachchh are porphyritic with dominant olivine and Ti-augite phenocrysts showing primitive compositions and Cr-spinel inclusions, indicating mantle-derived magma. Globular clinopyroxene textures and quartz xenocrysts suggest low-pressure crystallization and magma–crust interaction. Carbonate inclusions within Ti-augite phenocrysts point to carbonate-rich fluid activity during magma evolution. Picritic basalts of Saurashtra are rich in olivine and clinopyroxene and contain sulphide phases such as pentlandite and chalcopyrite, indicating sulphide immiscibility. Alkaline intrusive of Kanesara and nearby areas show gabbro–pyroxenite compositions with sulphide mineralization. Mantle xenoliths with highly forsteritic olivine confirm a primitive mantle source. A microscopic gold grain in lamprophyre from Kanesara marks the first such report from Gujarat Deccan alkaline rocks. Geochemically, strong Cr–Ni correlation reflects olivine–chromite control, while Pd shows no correlation with MgO, suggesting limited sulphide fractionation control. Although Pt–Pd values are generally low, sulphur saturation and sulphide occurrences indicate localized potential for Ni–Cu–PGE mineralization.

CHAPTER-5

5.0 Geology of the area

5.1 Regional Geology:

The exposed rocks in the region are Miliolite limestone, sedimentary intertrappean, and members of the Deccan Trap suite. The predominant rock type in the region is picrite basalt flows. FGB, or fine-grained basalt, is the primary rock type in the south region of the station on Paliyad Road. Basaltic, doleritic, and gabbroic dykes have penetrated these rocks.

Within the picrite basalt flows at different locations, the intertrappean sedimentary strata are found as thin, interstratified, roughly continuously traceable horizons. These can be easily recognized by their characteristic sub horizontal spread of outcrops in the cultivated fields, at the edges of the low mounds, and in the nalla cuts, as well as their unique hue. Along the higher reaches of the nallahs, the hillslopes, and the communities, the miliolitic limestone is found in thin sheets covering older rocks.

Cultivated fields cover a large portion of the northern and central regions. Road and nalla cuttings, solitary mounds, partially covered wastelands, minor nalla courses, and dam spillways and the faces of Quarry's. Different flows could not be distinguished independently throughout the region because of scanty exposures, the discontinuous nature of partially exposed sedimentary intertrappean/red-bole beds, and a lack of adequate physiographic expressions.

Sections with weathered top and bottom surfaces, zones of highly altered amygdular and vesicular surfaces containing pipe amygdules, red bole/intertrappean beds, and unique mineralogical characteristics like crude banded nature and distinct physical layering were used to identify distinct flows whenever possible. In certain sections, changing coloring was also helpful in differentiating various flows.

5.1.1 Table: Lithostratigraphic succession of the Botad area

(Modified after Ghevariya and Sahu)

Age	**Lithological Units**	**Remarks**	**Thick-ness (m)**
Recent		Top soil and sand cover	-
Quaternary	Miliolitic lime-stone	Dirty white, friable, stratified sandy lime-stone with grit, trap fragments and pebble boulders	1–2
	Limestone	White, compact, well bedded, burrowed limestone with cherty and ashy partings; conglomerate at base	-
……………………………Unconformityy……………………………………			
Deccan Traps	Intrusives	Dolerite, basalt and gabbro dykes	
	Flow 8b	Vesicular picrite basalts with compara-tively fresh olivine and pyroxene pheno-crysts	
	Flow 8a	Weathered picrite basalt with Alternate fine-grained basalt; olivine phenocrysts al-tered	
	Intertrappeans (160 m RL)	Red bole bed-Baked reddish clay	0.3–0.5
	Flow 7	Dark greenish grey porphyritic picrite with Olivine and pyroxene phenocrysts with distinct amygdaloidal and vesicular zones at top and base in two alternations	0.5 -0.8
	Intertrappeans (140 m RL)	Greenish, purple and red cherty fossilifer-ous beds Containing plant fossils, laterally changing to red bole bed in simtalavadi area.	
	Flow 6	Porphyritic olivine basalt with large pheno-crysts of pyroxene and olivine with amyg-daloidal zone at the base	
	Intertrappeans	Black fossiliferous chert, Grey to pink shale, silt stone, red clay with Plant fossils;	2 to 2.5

	(130–132 m RL)	laterally passing into red bole beds	
	Flow 5 (128–130 m RL)	Highly amygdaloidal Grey porphyritic olivine basalt with megaphenocrysts of pyroxene, amphibole and olivine	8 to 10
	Intertrappeans (120 m RL)	Red and chocolate baked fossiliferous mud, chert, volcanoclastic sandy clay, marl with megaplants and micro-invertebrate fossils	3–3.5
	Flow 4	Picrite basalt -coarse porphyritic with large phenocrysts of olivine and pyroxene	10
	Intertrappeans	Pink and grey baked clay (Bhadravadi area)	1 to 1.5
	Flow 3	Coarse porphyritic picrite basalt flows as sub-crop in Bhadravadi area	8 TO 10
	Intertrappeans	Chocolate coloured baked and burrowed sandy clay and mud (sub crop in Bhadravadi area)	0.5 to 0.8
	Flow 2 (90m RL)	Coarse porphyritic olivine basalt (picrite) with crude crystal layering.	20
	Intertrappeans (71-72 m RL)	Red and greenish volcanic clays with baked top lensoid cherty layer exposed near bhambhan and lathidad.	
	Flow 1 (70m RL)	Weathered coarse porphyritic basalt flow in Lathidad and Bhambhan area;Subcrop at Aniyali	

5.2 Block Geology:

The Rock types located in Botad block, covering the villages- Senthali, Samadhiyala, Khas Road, Arto road, Amapar, Tajpar etc. The outcrops are widely exposed and the different basaltic flows and red bole beds are observed in the different villages of the botad block. The Red bole beds in the area are seen as a marker horizon and it is differentiating the basaltic flows.

The below are the Flows delineated:

Flow **Elevation range above MSL**

- Flow 4 90 m above (youngest)
- Flow 3 80 to 90 m
- Flow 2 65 to 80m
- Flow 1 Below 65m (oldest flow)

5.2.2 Table showing Block Geology:

Rock type	**Formation**	**Age**	**Flows**
Olivine Basalt (Picritic basalt)	Junagarh volcanics	Late cretaceous-paleocene	Flow 4
Red bole	Junagarh volcanics	Late cretaceous-paleocene	-
Porphyritic Olivine Basalt(Picritic Basalt)	Junagarh volcanics	Late cretaceous-paleocene	Flow 3
Red bole	Junagarh volcanics	Late cretaceous-paleocene	-
Massive Basalt (Unclassified)	Junagarh volcanics	Late cretaceous-paleocene	Flow 2
Red bole	Junagarh volcanics	Late cretaceous-paleocene	-
Amygdular Basalt, Fine grained olivine basalt	Junagarh volcanics	Late cretaceous-paleocene	Flow 1

CHAPTER-6

6. Activity during the period (Geo-science Investigation)

6.1 Large Scale Mapping (LSM):

Geologically, the area has variants of basalts like Fine-grained olivine basalt, Amygdaloidal basalt, massive basalt, Porphyritic olivine basalt, Picritic basalt. All these basaltic flows belong to Deccan Trap Group and of Saurashtra Supergroup and it belongs to late-cretaceous to Paleocene age. And mostly picritic basalts are vesicular in nature.

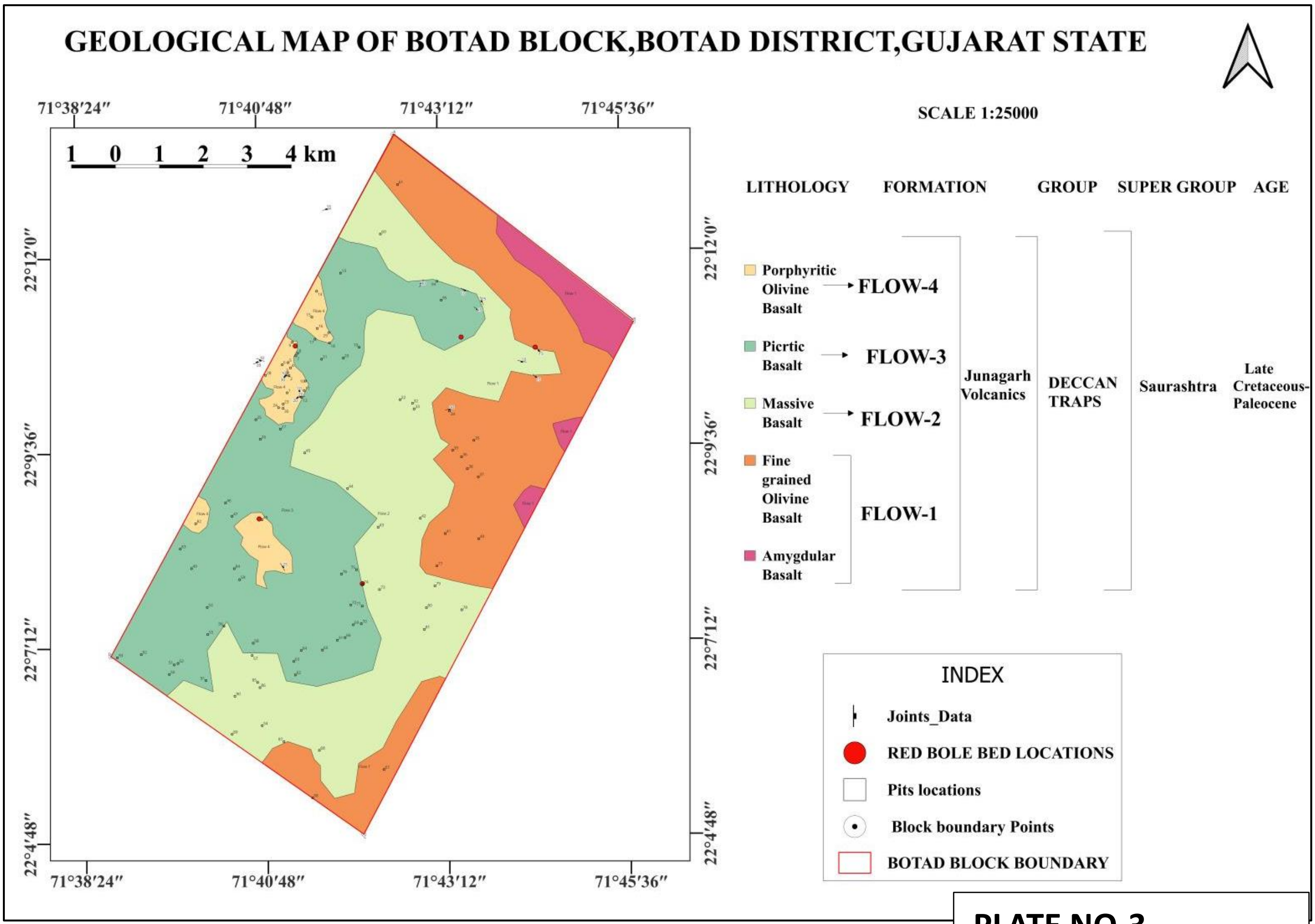


PLATE NO-3

A scale of 1: 25,000 has been used for Large Scale Mapping (LSM). For the working base map of the block, the 1:50,000 scale India toposheet (41N/12&16) was enlarged to a 1:25,000 size. The exposed rocks in the region are sedimentary intertrappean, and Deccan Trap suite. The predominant rock type in the region is made up of picrite basalt flows. FGB or fine-grained basalt, is the primary sort of rock located south of the Paliyad Road station. Doleritic, gabbroic, and basaltic dykes intrude into these rocks.

The thin inter stratified sedimentary strata are found more or less continually differentiable horizons at different locations within the picrite basalt flows. These are primarily distinguished by their unique coloring and a characteristic sub-horizontal outcrop distribution in the cultivated fields, at the edges of the low mounds, and in the nalla cuts.

Identifiable horizons at different locations within the picrite basalt flows. These are primarily distinguished by their unique coloring and a characteristic sub-horizontal outcrop distribution in the cultivated fields, at the edges of the low mounds, and in the nalla cuts.

On the basis of weathered top and bottom surfaces, zones of highly altered amygdular (Fig 3) and vesicular surfaces (Fig 1) with pipe amygdules, red bole/intertrappean beds (Fig 2), and unique mineralogical characters like crude banded nature and distinct physical layering, various flows were identified in section.

Photograph 1: Picritic basalt with vesicular nature near RTO office road, Botad

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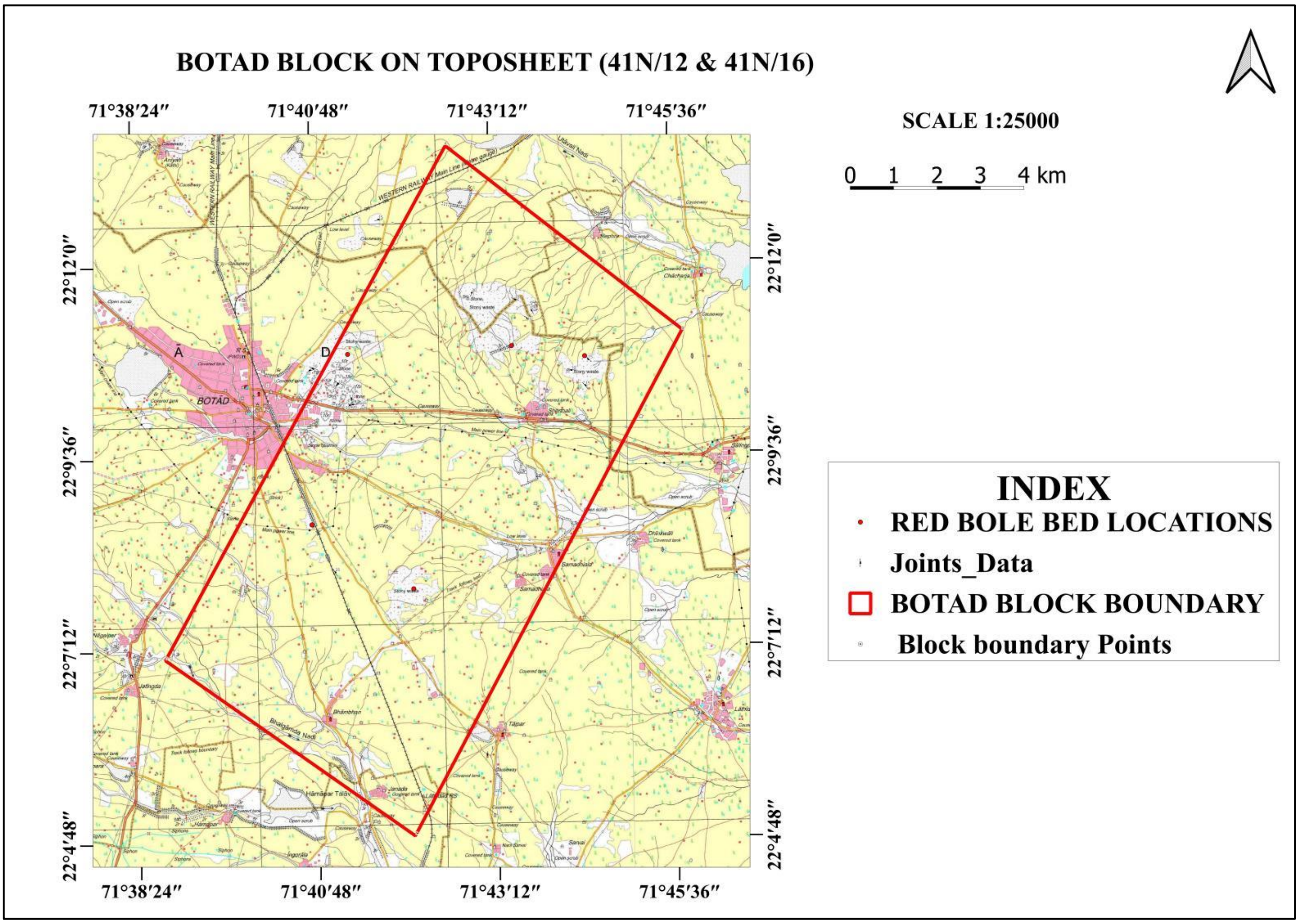

BOTAD BLOCK ON TOPOSHEET (41N/12 & 41N/16)
SCALE 1:25000
0 1 2 3 4 km
71°38′24″
71°40′48″
71°43′12″
71°45′36″
22°12′0″
22°9′36″
22°7′12″
22°4′48″
INDEX
RED BOLE BED LOCATIONS
Joints_Data
BOTAD BLOCK BOUNDARY
Block boundary Points

PLATE NO-4

Photograph 2: Red bole bed in massive olivine basalt

Photograph 3: Amygdaloidal basalt Exposure near Khas Road

Photograph 4: Exposure of Olivine altered to Iddingsite in Khas Road

Photograph 5: Olivine crystals in green and yellow (Fresh to partially altered) near Khas Road

Red bole bed is helpful as guides for demarcation of different lava flows acts as marker horizon (Fig 6)]

Picritic basalt show porphyritic texture with segregations of phenocrysts into layers of olivine, clino-pyroxene, feldspar. In most basaltic rocks, Olivine and pyroxenes are altered to Iddingsite (Fig 4).

Massive, dark grey to greenish black, picritic basalt is dotted with olivine green to bottle green phenocrysts and varying numbers of yellowish aged peanut-sized nodules and the same rock contains both fresh and heavily changed olivine variants (Fig 5)

Photograph 6: Exposure of Red bole bed (Act as Marker horizon)

6.1.1 DELINEATION OF BASALTIC FLOWS:

Basaltic flows:

Supergroup: Saurashtra **Group:**

Deccan Traps

Formation: Junagarh Volcanics

Age: Late cretaceous to Paleocene

Based on Three factors,we have been delineated block area into 4 different basaltic flows:

1. Red bole bed
2. Contour Elevation
3. Characteristics of the rock

1. Red bole beds:

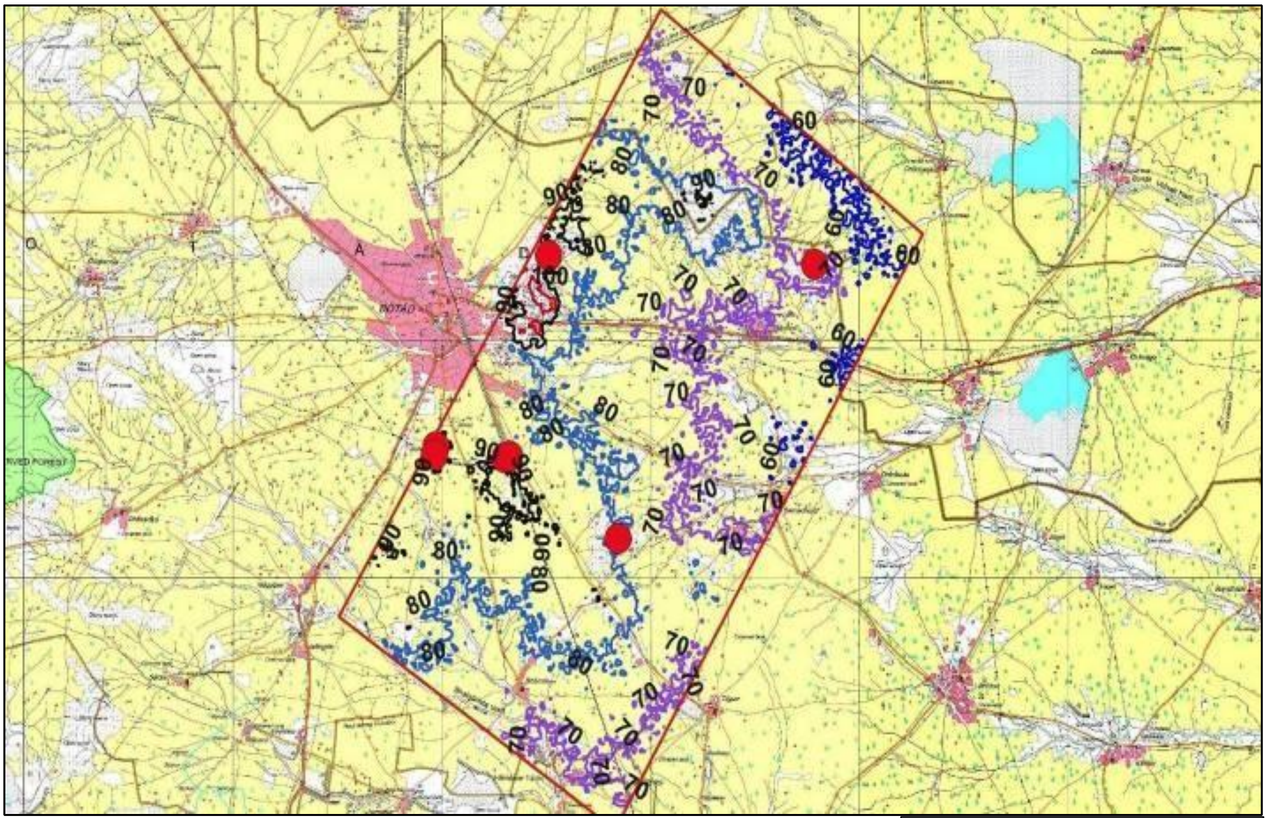


Plate no 5

During our Field Investigation, Red bole beds are identified at different locations.

- **Indicates Flow Boundaries**

Red bole beds form **only at the top of a cooling lava flow**. Their presence marks the **end of one eruptive phase** and the beginning of the next. Therefore, each red bole horizon represents a **distinct flow interface**.

- **Helps in Vertical Flow Classification**

Successive lava flows stack vertically. A red bole bed between two basalts confirms the **separation of two different flow units**.

- **Laterally Continuous Marker**

Red bole layers are often **laterally persistent**, even when basalt textures vary.

They provide a correlation reference across mapping areas.

- **Field Recognition Aid**

Easily recognizable due to: Reddish to purple color, Soft, clayey texture, Presence of hematite and alteration minerals Useful when basalt textures are similar and difficult to differentiate.

Red bole bed contact photographs:

Photograph 7: This red bole bed is located near Samadhiyala no1.Above the red bole, there is a massive olivine basalt. This red bole bed has the thickness of 2m. Excellent lateral continuity; red bole horizon extends continuously with sharp flow contacts.

Photograph 8: This red bole bed is located near Rto road office botad having the elevation of 86m.This red bole bed has good lateral continuity and it is traceable across the exposed section. Above the red bole bed. There is a massive olivine basalt.

Width (Thickness): 40–45 cm thick.

Photograph 9: This red bole is located near the Tajpar road near railway track having the elevation of 89m.Between the red bole, there is massive basalt and the dyke cutting across indicating is a different flow. This red bole bed has moderate lateral continuity but locally disturbed by vegetation and erosion. There is a calcite venations are visible.

Width (Thickness): Around 30–35 cm thick.

Photograph 10: This red bole bed is located near to the Bhambhan road. The lateral continuity of this red bole is clearly traceable. Above there is a vesicular olivine basalt. This red bole bed is located towards the south east of the botad block.

Width (Thickness): Approximately 25–30 cm thick.

Photograph 11: This red bole is located near the Amapar road. The lateral continuity of red bole bed is discontinuous in places due to slope wash and human disturbance, but identifiable in patches. Width (Thickness):

Around 20–25 cm thick.

These Basaltic flows are often **sheet-like and horizontal to sub-horizontal** at the time of emplacement. Successive flows **stack vertically**, so the oldest flow is generally at the lowest elevation, and youngest flows are at the highest levels. Although erosion may modify surfaces, the **relative elevation differences remain fairly uniofrm** across the field. In regions with **uniform dip**, contour spacing also shows gentle tilting of older flows.

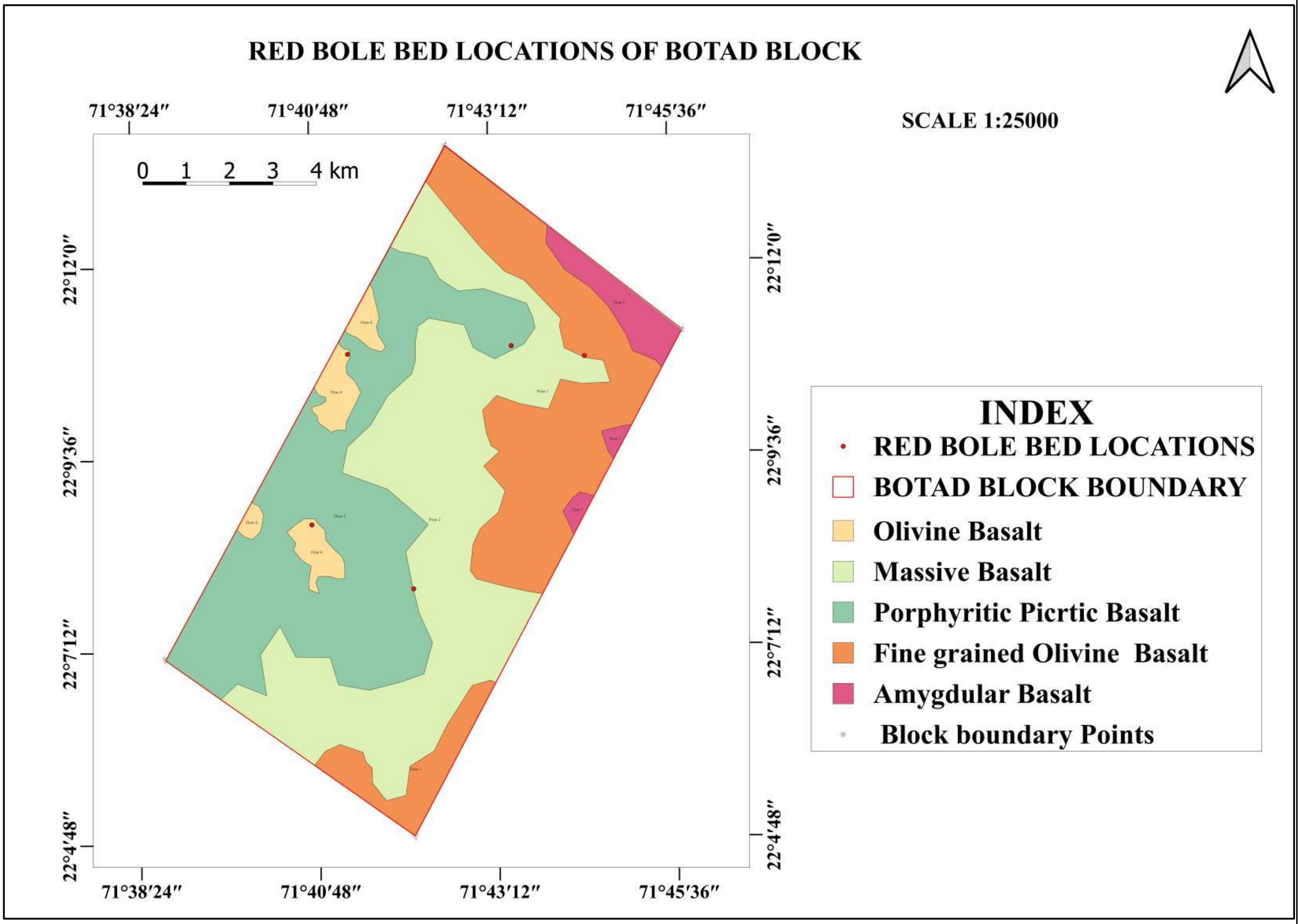

RED BOLE BED LOCATIONS OF BOTAD BLOCK
SCALE 1:25000
0 1 2 3 4 km
71°38′24″
71°40′48″
71°43′12″
71°45′36″
22°12′0″
22°9′36″
22°7′12″
22°4′48″
INDEX
RED BOLE BED LOCATIONS
BOTAD BLOCK BOUNDARY
Olivine Basalt
Massive Basalt
Porphyritic Picrtic Basalt
Fine grained Olivine Basalt
Amygdular Basalt
Block boundary Points

PLATE NO 6

2. Contour Elevation

Below are the Flows delineated: With the help of Handy GPS, took the elevation of the area.

Flow	Elevation range above MSL
Flow 4 →	90 m above (youngest flow)
Flow 3 →	80 to 90 m
Flow 2 →	65 to 80m
Flow 1 →	Below 65m (oldest flow)

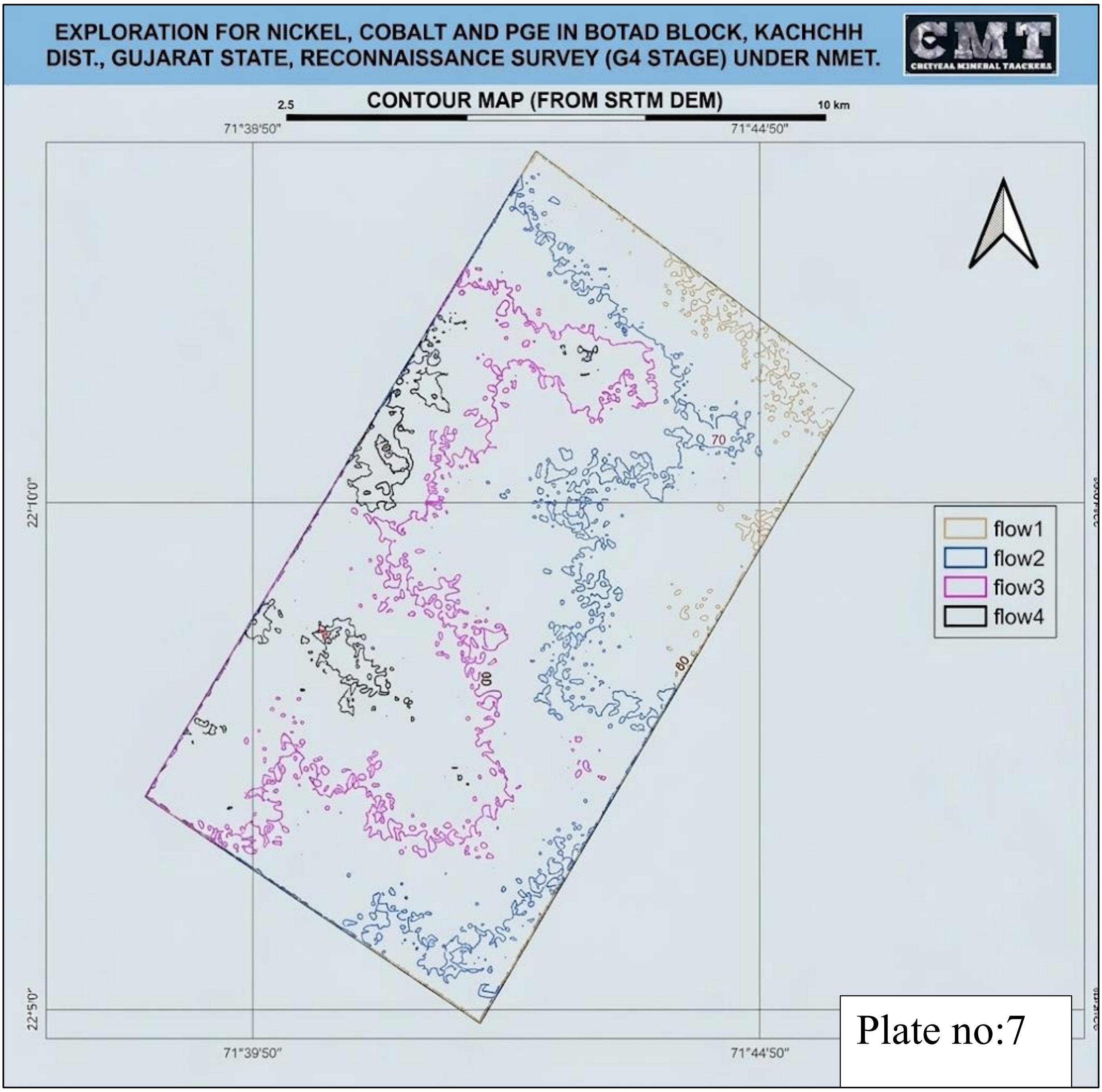


Plate no:7

2. Characteristics of the rock:

During the field investigation, four distinct basaltic flows were identified and differentiated based on macroscopic rock characteristics, including texture, phenocryst content, vesicularity, and mineralogical features. The observed characteristics allowed classification of the flows into **Picritic, Amygdaloidal, Porphyritic, and Unclassified Massive basalt units**.

6.1.2 Geological Cross section of Botad Block:

Basaltic lava flows commonly occur as multiple stacked units formed during successive volcanic eruptions. When these flows have similar lithology and mineral composition, elevation becomes one of the most reliable criteria, besides the occurrence of red bole horizon in between the flows, to distinguish them.

Using the **SRTM elevation data (30m resolution)** topographic profile has been drawn along the section line A-B in the NW-SE direction and also drawn geological cross section across the delineated various flows. Since, most of the areas, the flows are horizontal to sub horizontal in nature and taking the red bole beds as contact between the flows, the following elevation range of flows are deciphered

The contour elevation in the range of -

FLOW 4 ⟷ **80 to 100 m**

FLOW 3 ⟷ **70-80 m**

FLOW 2 ⟷ **60-70 m**

FLOW 1 ⟷ **<60m**

Therefore, based on red bole beds, Contour elevation and megascopic characteristics of the basalts, the flows have been identified. Out of 4 flows, the Flow 4 is much thicker than the other flows.

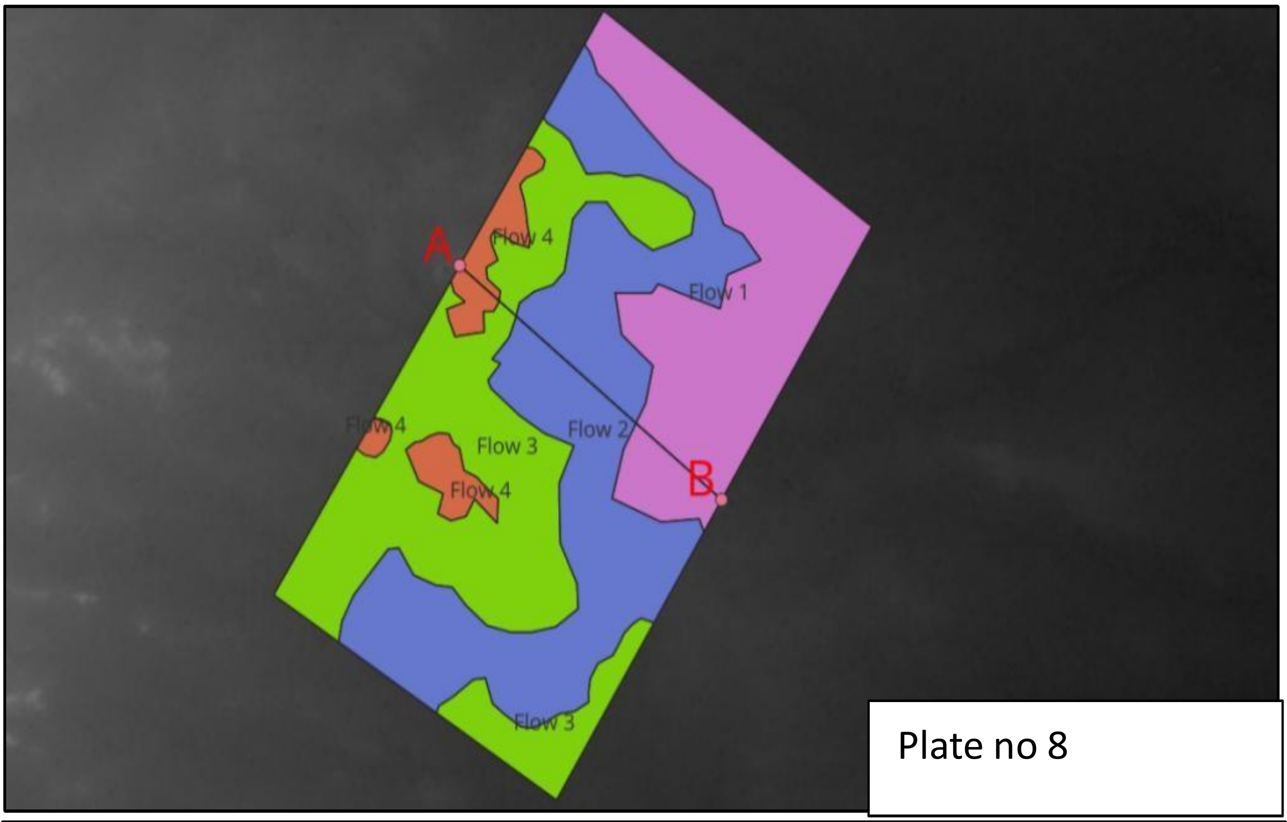
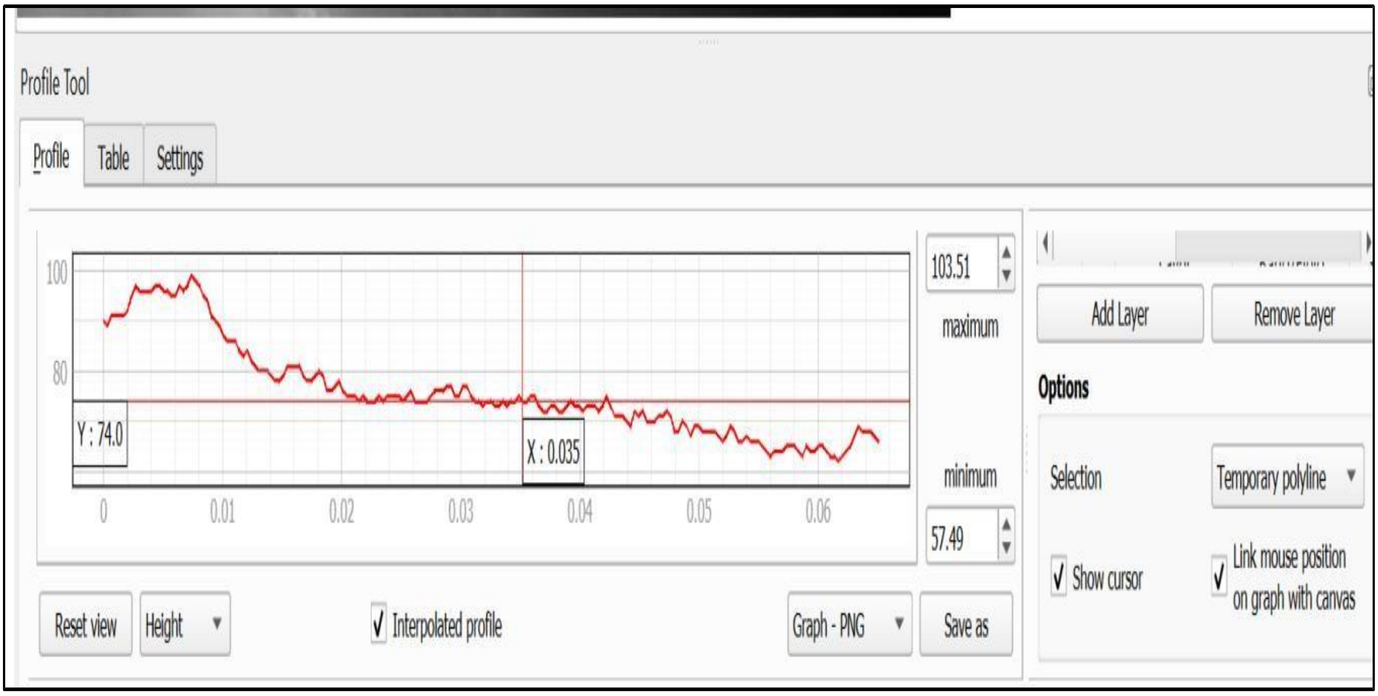
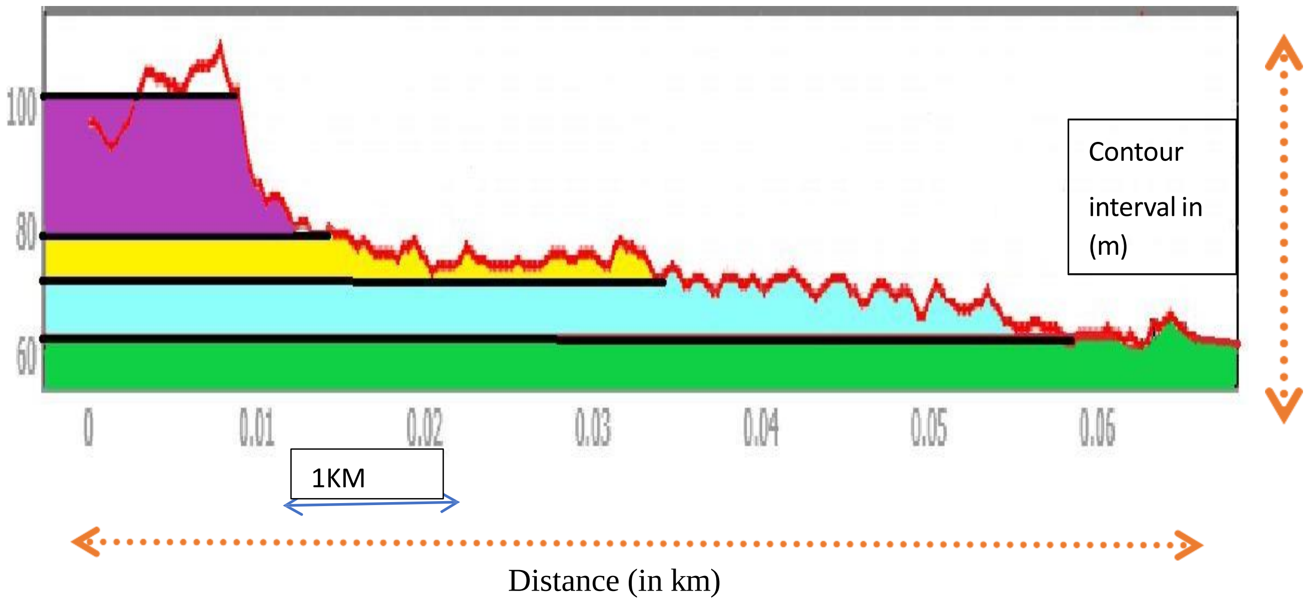


Plate no 8

Fig showing A-B cross section of the block



Basaltic flows Profile:



Index	
	Flow 4
	Flow 3
	Flow 2
	Flow 1

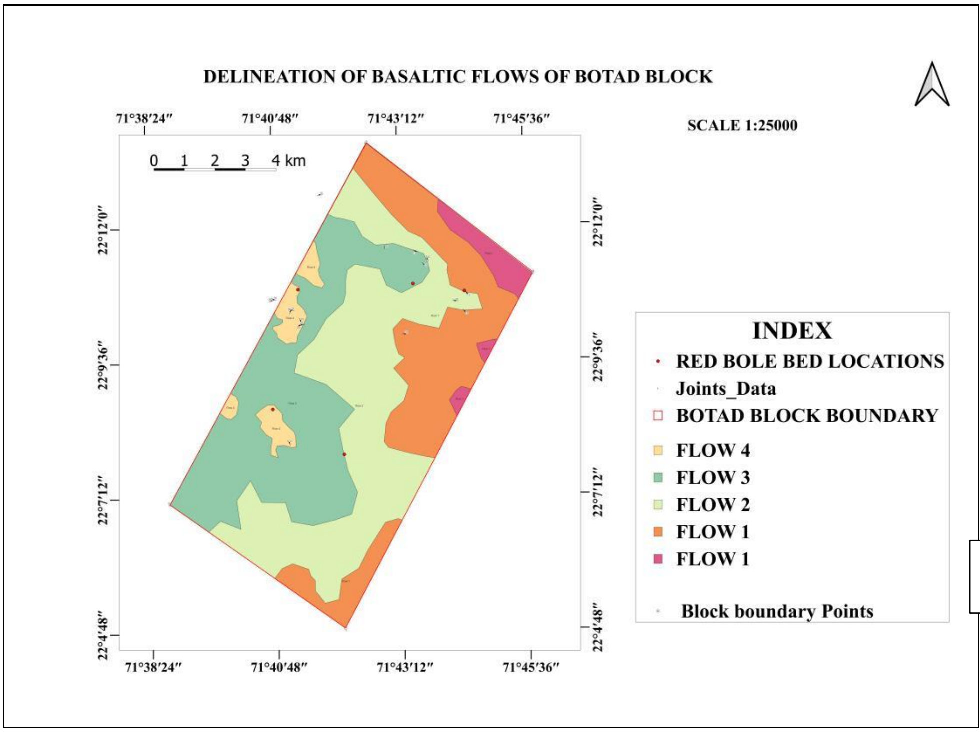


Plate no:19

4 basaltic/picritic basalt flows have been demarcated in the area.

6.1.3 Basaltic Flows:

FLOW 1: (Fine grained olivine basalt & Amygdaloidal basalt)

Photograph 12: Fine-grained olivine basalt in Khas village

- Sub horizontal in nature
- The Flow 1 has the elevation range of < 65m MSL.
- It is fine grained olivine basalts and the amygdular (amygdaloidal) basalts where the vesicles are filled with the secondary minerals such as calcite & zeolites.
- The fine-grained olivine basalts are very fine-grained olivine crystals which are aphanitic in nature.

ANALYTICAL VALUES (PPM) OF BED ROCK AND PIT SAMPLES COLLECTED FROM FLOW 1

S.No	Sample ID	Latitude	Longitude	Ni	Cr	Co	Nb	Sc
1	P41/BT8/2025	22.14236	71.72028	202.9	266.7	45.2	517.7	13.7
2	CMT/011/01/2025	22.16286	71.73026	792.8	427.6	46.2	733.9	30.6
3	P42/BTB/2025	22.14559	71.71484	417.4	474.6	131	771.6	27.9
4	P36/BTB/2025	22.15806	71.72417	150	396.4	34.1	360.5	14.7
5	CMT/011/71/2025	22.14027	71.72448	175.9	292.8	27.2	25.9	22.7
6	CMT/011/08/2025	22.16778	71.72174	490.2	759.2	43	871.4	36.3
7	P37/BTB/2025	22.15389	71.72778	140.9	250.4	24	251.6	10.8
8	P38/BTB/2025	22.15557	71.7254	530.8	546.8	50	386.4	19.1
9	CMT/011/02/2025	22.18014	71.74058	150.7	244.3	22	791.9	24.3
10	P39/BTB/2025	22.15944	71.72222	266.3	604.5	98.9	857.3	31.6
11	P77/BTB/2025	22.13575	71.7183	283.2	369.6	23.3	601.9	16.7
12	CMT/011/60/2025	22.2073	71.7219	502.5	952.5	47.3	30.7	33.8
13	P32/BTB/2025	22.16923	71.71355	164.8	484.1	37	410.1	18.4
14	P33/BTB/2025	22.16806	71.71389	87.2	150.6	20.3	254.8	8.9
15	P34/BTB/2025	22.1675	71.72167	88.1	144.3	20.3	259.3	9
16	CMT/011/59/2025	22.2073	71.7219	668.6	823.5	53.3	26.4	30.6
17	P35/BTB/2025	22.16139	71.72694	93.1	164	65.2	1084.3	27.1
18	P87/BTB/2025	22.10028	71.68389	1025.3	918	81	418.4	19.3
19	P67/BTB/2025	22.09417	71.70583	392.6	759.6	28.4	612.5	21.8
20	CMT/011/03/2025	22.17953	71.74162	481.6	1036.2	48.9	665.2	34.9
21	P61/BTB/2025	22.21417	71.71111	175.1	424.3	46.9	670.8	23.1
22	CMT/011/61/2025	22.2073	71.71899	110.1	309.7	31.1	889.3	33.3
23	CMT/011/41/2025	22.2073	71.7219	665.8	1040.3	53.9	724	31.8
24	CMT/011/07/2025	22.17987	71.7418	88.3	67.7	24.3	1214.6	33
25	P40/BTB/2025	22.14118	71.72764	315.3	406.9	111.2	921.7	27.4

	Ni	Cr	Co	Nb	Sc
Minimum	87.2	67.7	20.3	25.9	8.9
Maximum	1025.3	1040.3	131	1214.6	36.3
Mean	338.38	492.584	48.56	574.088	24.032

15 PIT SAMPLES
10 BED ROCK SAMPLES
TOTAL 25 SAMPLES FROM FLOW 1

FLOW 2: MASSIVE BASALT (Aphanitic nature)

- Occurs in the elevation range of > 65m to 70 m. MSL
- Fine grained and massive in nature with phenocrysts of olivine in it.
- Fine grained basalt having the olivine crystals very small & are in aphanitic in nature, crystals in green color observed through hand lens. This basaltic flow is very hard and massive.
- The flow 2 is overlaying on the flow 1 of the fine-grained and Amygdaloidal basalt. This basaltic flow is well exposed at the Khas village near canal road and located towards and North east - North west of the Botad block.

ANALYTICAL VALUES (PPM) OF BED ROCK AND PIT SAMPLES COLLECTED FROM FLOW 2								
S.No	Sample ID	Latitude	Longi-tude	Ni	Cr	Co	Nb	Sc
1	CMT/011/68/2025	22.09993	71.68057	140.3	253.9	29.6	35.6	32.1
2	CMT/011/24/2025	22.12693	71.72386	23.6	47.2	3.8	4.4	3.4
3	P44/BTB/2025	22.15197	71.69891	667.2	741.2	79.3	542.3	20
4	P45/BTB/2025	22.1594	71.68962	121	130.7	62.6	1186.6	26.3
5	CMT/011/52/2025	22.18248	71.71603	180.5	397.7	36.5	33.1	27.2
6	CMT/011/50/2025	22.12656	71.66904	688.5	986.9	56.1	37.6	30.4
7	PS7/BTB/2025	22.11806	71.67722	641	680.7	64.9	525.2	21.9
8	CMT/011/66/2025	22.1266	71.66917	56.6	826.3	51.8	20	28.2
9	CMT/011/57/2025	22.16211	71.71542	113.6	326.7	31.6	327.6	38.2
10	P60/BTB/2025	22.20407	71.70715	309.5	387	144.7	842.9	26.6
11	P54/BTB/2025	22.10361	71.67917	740.7	576.6	86.9	693.8	29.9
12	PS5/BTB/2025	22.1225	71.6675	660.4	535.9	130.2	634.1	22.1
13	P73/BTB/2025	22.13111	71.70556	563.1	810.4	44.1	883	31.5
14	PS6/BTB/2025	22.12417	71.67111	602.8	557.4	148.4	707.8	23
15	P74/BTB/2025	22.13226	71.70188	417.3	776.6	39.9	674.6	28.6
16	CMT/011/51/2025	22.18248	71.71603	72.3	114.7	19.5	36.5	21.2
17	CMT/011/44/2025	22.11475	71.65999	496.6	590	46.9	40.9	30
18	P68/BTB/2025	22.09833	71.69167	933.4	728.7	76.2	415.2	20.3
19	CMT/011/28/2025	22.12877	71.71457	349.1	482.3	34.6	310.2	26.1
20	CMT/011/05/2025	22.19059	71.7305	520.9	868.2	48.8	835.8	34.4
21	P81/BTB/2025	22.12278	71.71528	501.1	591.3	50.5	787	25.6
22	P78/BTB/2025	22.12667	71.72361	432.1	757.3	39.7	945.6	33.1
23	CMT/011/26/2025	22.12859	71.72004	538.8	514.4	48.5	830.5	28.3
24	P79/BTB/2025	22.13167	71.71778	526.7	787.3	46.7	754.2	29.7
25	CMT/011/69/2025	22.1274	71.71592	723	44.2	4.9	593.3	23.4
26	P80/BTB/2025	22.12722	71.71583	530.3	791.5	45.6	643.1	30.3
27	CMT/011/25/2025	22.12693	71.72386	28.9	971.4	59	479	12.2
28	P90/BTB/2025	22.10974	71.67326	290.2	605.3	27.1	732.3	31.3
29	P91/BTB/2025	22.11306	71.66694	873	804.9	65.5	633.2	20.9
30	CMT/011/31/2025	22.20385	71.7045	889.6	911.5	60.4	576.7	26.6
31	P85/BTB/2025	22.1125	71.67833	776.8	835.6	59.9	856.9	32.7
32	PB6/BTB/2025	22.11142	71.67882	415.3	706.3	29.5	681.7	26.7
33	CMT/011/15/2025	22.11544	71.66057	144.5	886.3	57.3	742.8	20.5
34	P89/BTB/2025	22.10194	71.6725	467.6	640.8	37.7	943	31.3

35	BRS94/BTB/2025	22.19417	71.71944	270.5	431.4	33.4	39850	29.1
36	CMT/011/04/2025	22.12877	71.71457	43.2	144.8	28.4	249.4	6.9
37	CMT/011/05/2025	22.19059	71.7305	894.4	994.5	67.9	645.8	30.3
38	CMT/011/56/2025	22.13442	71.70184	969.3	946.3	80.3	578.3	29.5
39	P22/BTB/2025	22.17	71.71083	383.8	656.5	30.8	771.9	249
40	CMT/011/06/2025	22.19059	71.7305	294.5	719.5	47.7	1085.1	33.3
41	CMT/011/55/2025	22.13442	71.70185	368.1	521.2	39.8	907.6	29.9
42	P43/BTB/2025	22.14391	71.7055	313.5	473.3	120.9	984.5	28.9
43	CMT/011/49/2025	22.09569	71.69467	442.6	685.8	47	878.8	33.6
44	CMT/011/27/2025	22.12877	71.71457	196.4	458.7	38.9	32	25.2

	Ni	**Cr**	**Co**	**Nb**	**Sc**
Min	23.6	44.2	3.8	4.4	3.4
Max	969.3	994.5	148.4	39850	249
Mean	445.7409	606.8	54.63182	1476.589	31.58409

21 PIT SAMPLES
23 BED ROCK SAMPLES
44 TOTAL SAMPLES FROM FLOW 2

FLOW 3: PICRITIC BASALT

- The Flow 3 occurs in the elevation range of 80 to 90 m MSL
- Most of the places it is vesicular basalt which are porphyritic in nature.
- High amount of olivine crystals, which constitute more than 30% and the olivine crystals are in green, red, yellow.
- The olivine crystals which are **partially** to **highly altered. Calcite venations are very prominent in this flow**, besides few secondary minerals like calcite, zeolite is also noticed at several places.
- The olivine which seems to have altered to **Iddingsite which is red in color** at. In this particular flow.

Photograph 13: showing Flow 3 and flow 4 and in between there is a red bole bed

Photograph 14: Zeolite

ANALYTICAL VALUES (PPM) OF BED ROCK AND PIT SAMPLES COLLECTED FROM FLOW 3								
S.No	Sample ID	Latitude	Longitude	Ni	Cr	Co	Nb	Sc
1	P49/BTB/2025	22.13609	71.66419	262.7	506.3	78.3	955.2	32.8
2	P50/BTB/2025	22.11444	71.65889	355.9	522.1	117.7	837	30.2
3	PS1/BTB/2025	22.11639	71.66	320.9	457.1	115.6	834.3	30.1
4	CMT/011/35/2025	22.19193	71.71452	308.6	736.9	45.5	26.4	33.9
5	P46/BTB/2025	22.14944	71.67194	420	500.4	102.3	783.6	22.5
6	P47/BTB/2025	22.14667	71.67333	435.5	823	126.8	878.4	25.4
7	CMT/011/65/2025	22.14014	71.66176	46.5	20.9	29.3	42.4	17.1
8	P58/BTB/2025	22.12056	71.6775	919.6	771.5	99	351	17.7
9	P59/BTB/2025	22.13364	71.67476	732.5	609.1	81.9	553.5	23.2
10	PS2/BTB/2025	22.11667	71.66083	303.7	391.9	103.3	711.8	25.8
11	CMT/011/33/2025	22.19382	71.71593	529.8	816.7	45.7	34.7	35.3
12	P65/BTB/2025	22.1189	71.69273	1025.4	853.4	81.5	437.4	21

13	P66/BTB/2025	22.12139	71.69778	1024.6	966.9	77.6	455.6	20.4
14	P75/BTB/2025	22.13528	71.70056	857.1	968.5	59.9	575.9	25.4
15	P76/BTB/2025	22.13444	71.69722	830.5	842.3	60.5	707.4	27.6
16	P69/BTB/2025	22.12398	71.69963	989.3	1218.7	68.1	573.8	23.8
17	P70/BTB/2025	22.12417	71.70139	1073.5	1162.4	74.8	493.8	27.6
18	P62/BTB/2025	22.11389	71.68667	647.2	645.7	60	602.8	27.9
19	P71/BTB/202	22.12778	71.70167	676.8	1282.1	50.9	794.9	30.6
20	P63/BTB/2025	22.11667	71.68639	645.6	532.9	52.1	667.9	28.2
21	P72/BTB/202	22.12806	71.69917	633	991.9	47.3	738.7	29.5
22	CMT/011/53/2025	22.16424	71.68434	1056.2	1052.3	69.8	544.2	27.2
23	P64/BTB/2025	22.11889	71.68806	989.4	825.8	71.9	444.7	20
24	P83/BTB/2025	22.14015	71.66178	251.7	515.1	43.1	747.3	22.2
25	CMT/011/23/2025	22.13491	71.66442	539.7	638.2	46.8	631	32.7
26	P10/BTB/2025	22.17417	71.69003	543.7	691.5	43.7	840.4	292.3
27	P84/BTB/2025	22.13592	71.67362	179.3	254	34.7	497.7	34.5
28	CMT/011/54/2025	22.13239	71.70182	247.1	515.1	33	1057.7	32.1
29	P17/BTB/2025	22.18272	71.69231	412.9	539.7	33.6	1207.6	273.7
30	P92/BTB/2025	22.11861	71.65278	805.5	758.4	74.3	430.4	25.9
31	P93/BTB/2025	22.11806	71.6475	866.1	936.2	65.7	741.9	18.1
32	P19/BTB/2025	22.18091	71.702	757.1	729.6	51.5	569.9	278
33	CMT/011/39/2025	22.18454	71.70008	800	1028.6	53.2	694.5	30.5
34	CMT/011/73/2025	22.19294	71.71702	550	678.3	51	674.1	34.7
35	P25/BTB/2025	22.16642	71.67894	371.5	564.7	27.7	684.3	217.9
36	P26/BTB/2025	22.16239	71.67985	351.9	530.2	33.3	1164.8	309.3
37	P27/BTB/2025	22.16441	71.68432	179.1	424.8	28.8	1004.9	260.7
38	P20/BTB/2025	22.17875	71.69849	751.8	770.1	52.1	455.9	239.7
39	BRS95/BTB/2025	22.19028	71.72028	244.8	382.6	32.1	905	28.7
40	P21/BTB/2025	22.17863	71.69358	195.1	340.3	24.3	848.5	226
41	CMT/011/37/2025	22.1848	71.71879	246.5	355.7	32	1001.5	33.7
42	CMT/011/11/2025	22.12601	71.69898	446.8	505.1	42	818.5	35.4
43	CMT/011/32/2025	22.19416	71.71169	614.2	483.9	38.3	865.3	36.2
44	CMT/011/09/2025	22.11637	71.70405	542.6	922.3	70.9	843.9	34.9
45	P31/BTB/2025	22.12089	71.69607	746.9	1136.1	51.5	666.1	26.7
46	CMT/011/36/2025	22.19193	71.71452	123.1	159.1	27	1143.8	30.4
47	CMT/011/34/2025	22.19274	71.71526	35.4	12.4	2.9	15.6	1.2
48	CMT/011/38/2025	22.18454	71.72228	194.7	326.8	32.2	33.2	34.2
				Ni	**Cr**	**Co**	**Nb**	**Sc**
			Minimum	35.4	12.4	2.9	15.6	1.2
			Maximum	1073.5	1282.1	126.8	1207.6	309.3
			Mean	543.3708	660.3667	57.19792	658.1083	66.51875
			32 PIT SAMPLES					
			16 BED ROCK SAMPLES					
			TOTAL 48 SAMPLES FROM FLOW 3					

FLOW 4: PORPHYRITIC OLIVINE BASALT

- In this particular flow one can see massive olivine basalt having porphyritic texture, where olivine crystals in green to red, having high picritic nature. Olivine phenocrysts are abundant in volume in comparison to the other three flows in the study area hence it is considered as picritic basalt. The outcrops are located near Arto Road, Amapar village and Senthali. Compared to all the basaltic flows, this flow 4 is very prominent and having higher thickness. Several stone Quarry's for building stones are reported in this flow.

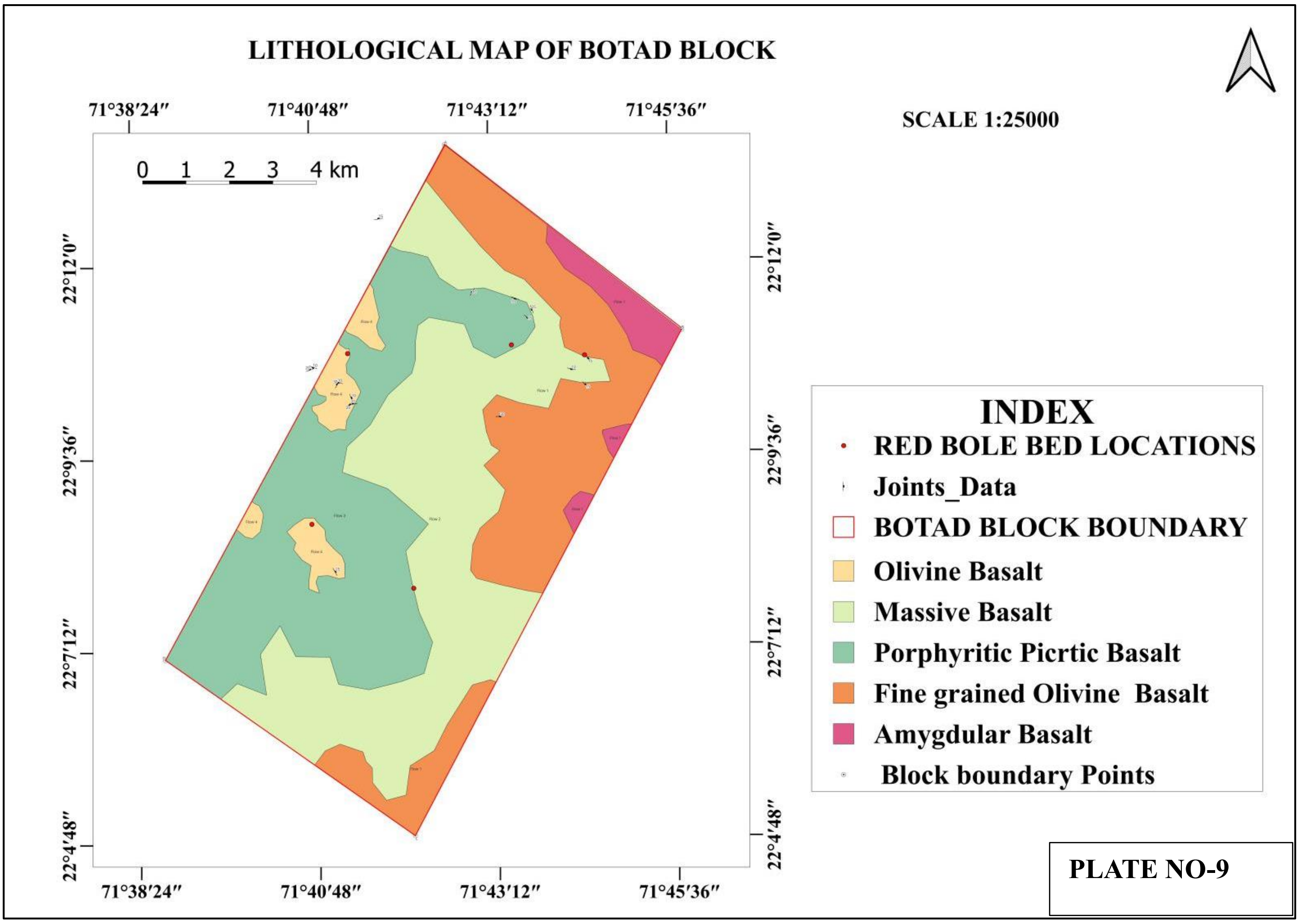
Photograph 15: Red bole bed at ARTO Botad

Photograph 16: Picritic Quarry area along Sherthali village

ANALYTICAL VALUES (PPM) OF BED ROCK AND PIT SAMPLES COLLECTED FROM FLOW 4								
S.No	**Sample ID**	**Latitude**	**Longitude**	**Ni**	**Cr**	**Co**	**Nb**	**Sc**
1	CMT/011/17/2025	22.14825	71.664815	19.9	101.9	9.7	10	2.8
2	P6/BTB/2025	22.17784	71.685027	160	218.4	20.6	933.8	250.1
3	CMT/011/43/2025	22.17936	71.688045	70.6	69.9	9.7	35.6	14.5
4	P7/BTB/2025	22.17939	71.68802	**434.7**	658.2	34.3	1097.1	317.7
5	CMT/011/20/2025	22.14564	71.665273	**429.5**	730.6	46.4	809.9	31
6	P16/BTB/2025	22.18492	71.692865	**653.5**	1156.9	47.9	788.4	329
7	CMT/011/21/2025	22.14564	71.665273	190.5	238	26	761.7	29.5
8	P18/BTB/2025	22.18188	71.695478	260.3	271.2	27.5	1074.9	259.9
9	CMT/011/12/2025	22.14632	71.679646	111.6	163.9	11.6	1023.1	26.7
10	P12/BTB/2025	22.1708	71.689153	**449.8**	446.5	40	796.4	251.4
11	P13/BTB/2025	22.19621	71.6982	**598**	507.7	64.1	661	202.6
12	P48/BTB/2025	22.14589	71.679947	393.2	813.5	86.4	767.9	31.5
13	P14/BTB/2025	22.19256	71.692855	285.8	344.4	17.6	252.3	117
14	P15/BTB/2025	22.18726	71.691693	**404.4**	606.2	37.6	747.6	328
15	CMT/011/19/2025	22.14564	71.66527	**629.6**	1312.3	69.1	21.4	35.4

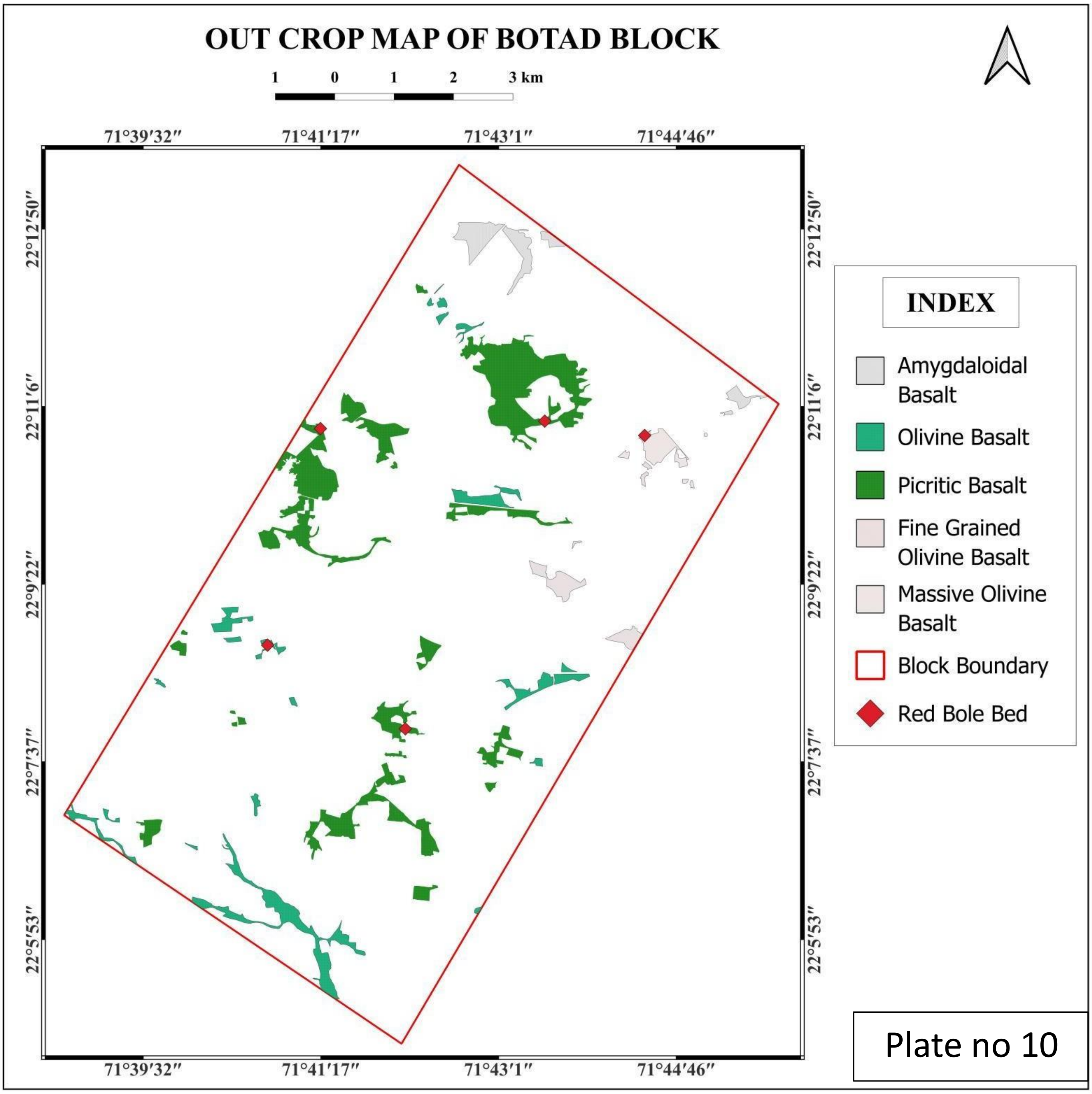
16	P24/BTB/2025	22.1688	71.684002	497.2	715.8	39.3	1104.6	323.8
17	P82/BTB/2025	22.14528	71.665278	300.4	466.4	31.6	1024.3	30.3
18	CMT/011/45/2025	22.18084	71.688229	581.3	903.5	52.4	680.1	31.1
19	CMT/011/77/2025	22.14634	71.680033	158.7	391.9	38.3	40.1	39.5
20	P1/BTB/2025	22.1718	71.68595	297.2	468	31.2	1262.6	291
21	P2/BTB/2025	22.1753	71.686443	405.4	374.3	32	1188.7	287.4
22	P3/BTB/2025	22.17594	71.686137	315.3	433.4	29.9	1219.6	299.6
23	P23/BTB/2025	22.16953	71.685037	468.1	735.5	38.4	1020.4	307.6
24	P28/BTB/2025	22.17548	71.681255	425.2	765.9	36.9	1053.2	312.2
25	P29/BTB/2025	22.18403	71.695361	561.9	0.25	438.6	1000.1	313.2
26	CMT/011/22/2025	22.14564	71.665273	82.2	214.1	65.3	1098.3	32
27	P30/BTB/2025	22.16865	71.685003	468.4	852.7	39.3	1051.4	314.6
28	CMT/011/46/2025	22.17426	71.689048	407	600.3	43.8	965.2	30.5
29	CMT/011/42/2025	22.18504	71.692137	659.7	1015	52.6	726	36.5
30	CMT/011/63/2025	22.17705	71.68412	795.2	404.5	33.7	585.3	25.5
31	P8/BTB/2025	22.17983	71.688527	223.5	452	32.2	838.5	232.5
32	P9/BTB/2025	22.18217	71.687272	511.3	377.8	48.1	536.2	178.8
33	P11/BTB/2025	22.17224	71.689718	346.3	399.1	34.8	1059.3	261.3
34	P4/BTB/2025	22.17693	71.686795	139.5	122.2	23	1395.9	316.9
35	CMT/011/18/2025	22.14825	71.664815	194.7	46.7	3.7	5	2.1
36	P5/BTB/2025	22.17802	71.686268	209.3	269.8	18.2	660.4	178.3
				Ni	**Cr**	**Co**	**Nb**	**Sc**
			MINIMUM	19.9	0.25	3.7	5	2.1
			MAXIMUM	795.2	1312.3	438.6	1395.9	329
			MEAN	114.6	135.025	10.95	332.7	90.2
					23 PIT SAMPLES			
					13 BED ROCK SAMPLES			
					36 TOTAL SAMPLES			

Lithological Map of the Botad Block



6.1.4 Outcrop Map of the Botad Block:

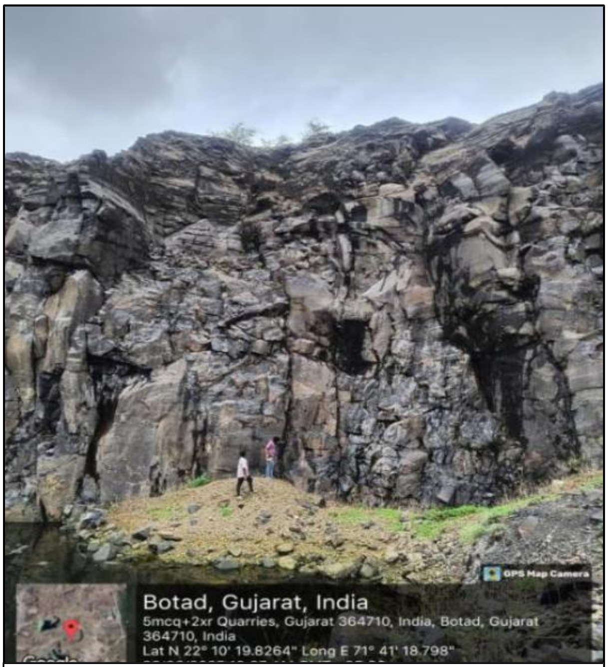
Outcrop map of the botad block showing different variants of basalts- Amygdaloidal basalt, olivine basalt, picritic basalt, fine grained olivine basalt, massive olivine basalt.



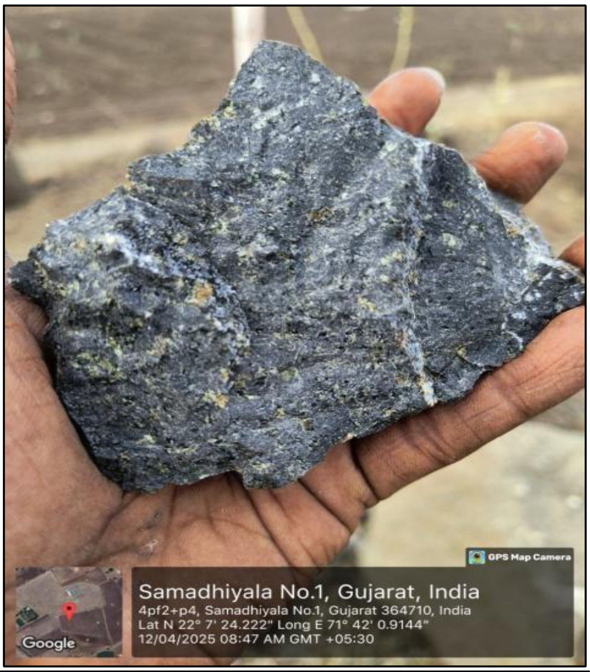
6.1.5 Description of the rock types:

There are different types of basaltic flows found in the botad block. These includes-Porphyritic olivine- bearing picrite basalt, porphyritic basalt, fine-grained basalt, sandstone, tuff, ash, and green, black, and red bole beds (Deccan) are among the significant rock types in the region.

Picritic Basalt:



Photograph 17: Quarrie area showing picritic basalt.



Photograph 18: Picrite sample along khas road

To classify it as a picritic basalt, it should have-

- **12 wt% MgO**
- **52 wt% SiO_2**
- **Alkali content (Na_2O+K_2O): 3%**

The eastern, northern, and central regions of the region are dominated by picrite basalt. Few out crops are also noticed to northeast of Paliyad Road. Other significant locations of well exposures of Picritic basalt include near Botad, Sherthali, Samadhiyala No1, Khas Road, Bhambhan, Amapar road.

Two of the four demarcated flows that are found in the area are picritic in origin. The thickness of these varies. In the Botad area, there is a rise in thickness. Megascopically, the rock

is enormous, dark grey to greenish black, and contains olivine phenocrysts that range in color from olive green to bottle green as well as varying numbers of yellowish aged peanut-sized nodules. Sometimes the same rock contains both fresh and significantly changed forms of olivine.

The rock's worn surface has a faint pitted appearance because some of the olivine phenocrysts have been removed. Large phenocrysts of pyroxenes, measuring one to two and a half centimeters, are found in picrite basalt. Most of these picritic basalts are vesicular in nature and most olivine are in green, yellow, red. The olivine got altered to Iddingsite.

Porphyritic olivine Basalt:

Photograph 19: Olivine basalt along Tajpar near sub station

Photograph 20: showing olivine basalt located near Tajpar

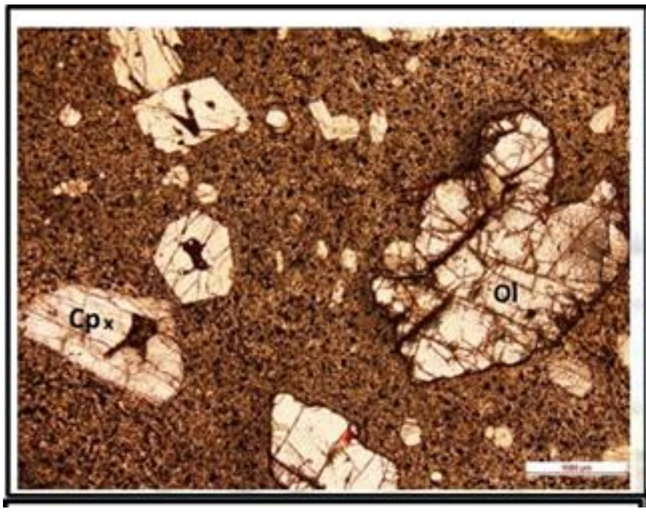
Porphyritic olivine basalt is a mafic volcanic rock distinguished by conspicuous olivine phenocrysts set within a fine-grained to microcrystalline groundmass of plagioclase and clinopyroxene. The porphyritic texture indicates a two-stage cooling history: initial slow cooling at depth allowing olivine crystals to grow, followed by rapid cooling during eruption, producing the fine groundmass. Olivine phenocrysts are typically green to yellow, rounded to subhedral, and may show alteration rims of iddingsite. The rock is dark grey to black, massive, and may contain minor vesicles. Groundmass textures are typically intergranular to intersertal.

Under Microscope, it is observed that-

1. **Sample no: CMT/011/05/2025**

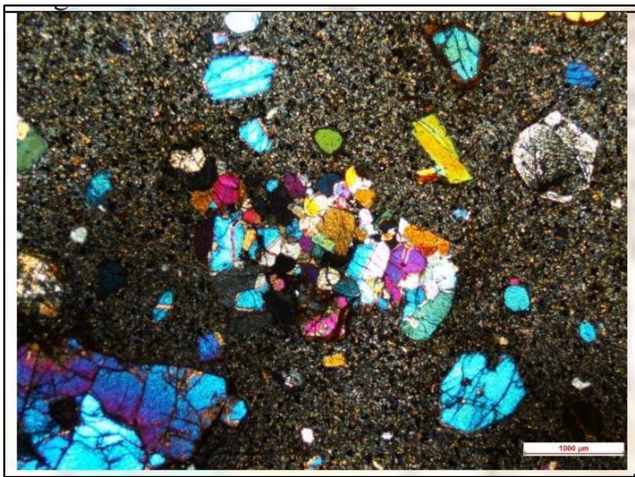
Mineral assemblage: Porphyritic phases: Clinopyroxene + Olivine Matrix phases: Clinopyroxene + Plagioclase + Magnetite + pyrite

Texture: The rock represents fine grained porphyritic basalt having inequigranular texture. Large olivine and clinopyroxene phenocrysts occur within very fine-grained basaltic matrix showing intergranular texture. Phenocrysts are angular to subhedral shaped, often clusters of phenocrysts of olivine define glomeroporphyritic texture. Olivine phenocrysts are identified by their high refractive index, colorless, fractured nature and by high birefringence color. Clinopyroxene phenocrysts are identified by high refractive index (< than olivine), one set of perfect cleavage with inclined extinction. Often basal section with two sets of perfect cleavage at 90 angle is also noted. Exsolution lamellae and zoning are the common features of clinopyroxene phenocrysts. Thin brownish colored rim representing alteration zones were formed over clinopyroxene and olivine. Often fusing of two phenocrysts are also observed representing high temperature crystallization. The matrix consists of very fine-grained lath shaped plagioclase occurring randomly. Very small clinopyroxenes are present in the interstitial spaces of plagioclase laths defining intergranular texture. Very small magnetite and very few pyrite occur as dissemination within the matrix.



Photomicrograph 1: showing large phenocrysts of olivine and clinopyroxene in very fine basaltic matric showing porphyritic texture; under plane polarized light; 2X magnification

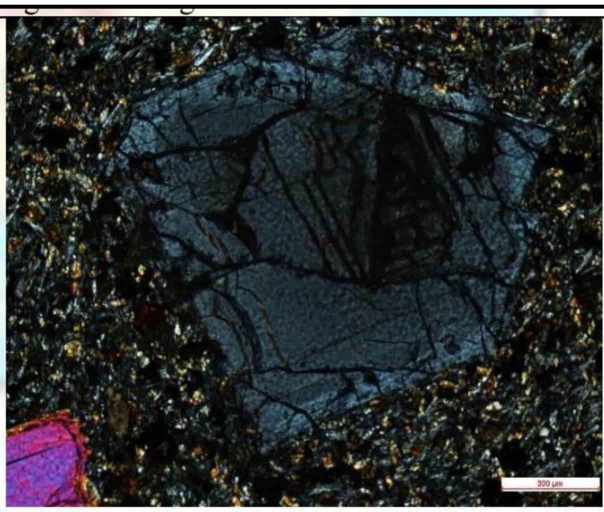
Photomicrograph 2: showing large phenocrysts of olivine and clinopyroxene in very fine basaltic matric showing porphyritic texture; under cross polarized light.



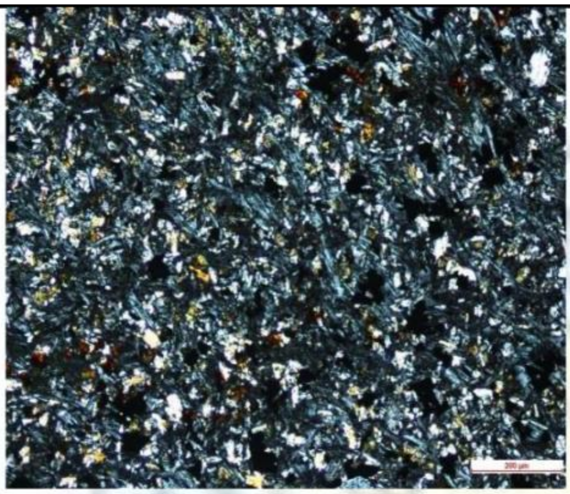
Photomicrograph 3: showing Clusters of phenocrysts within basaltic matrix showing Glomeroporphyritic texture; under cross polarized light at 2X magnification.

Photomicrograph 4: showing A closer view of Clusters of phenocrysts of olivine and Cpx within basaltic matrix showing Glomeroporphyritic texture; under cross polarized light at 5X magnification.

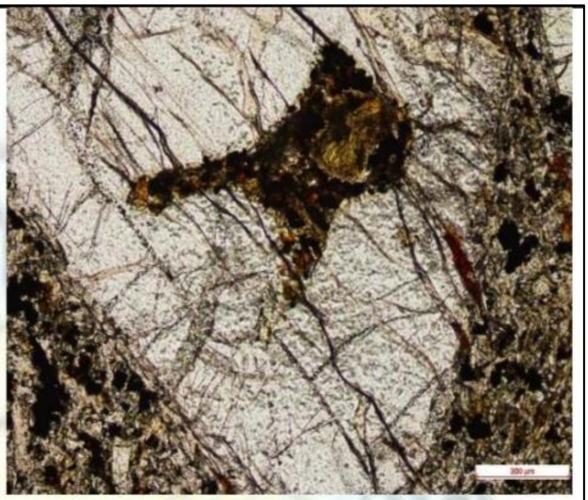
Photomicrograph 5: showing Bimodal distribution of phenocrysts size; very sharp-edged phenocrysts of Olivine in a fine-grained basaltic matrix



Photomicrograph 6: showing Fractured olivine in plagioclase-pyroxene rich matrix; small magnetites and rutiles are present in the matrix; under 10X magnification

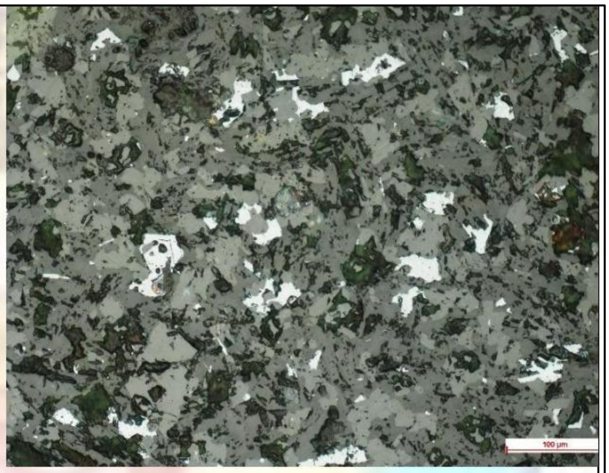


Photomicrograph 7: showing Inter-granular texture defined by plagioclase laths and clinopyroxenes in basalt; magnetites are the only opaques present in the rock; under 10X magnification



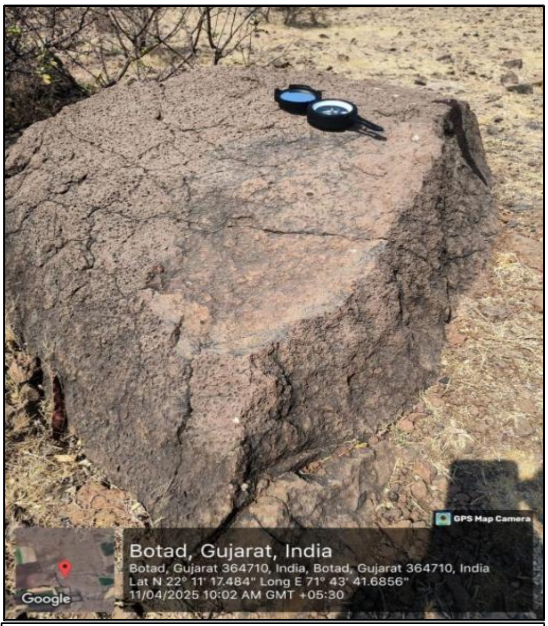
Photomicrograph 8: showing Olivine phenocrysts replaced by late biotite along fractures.

Photomicrograph 9: showing Small anhedral magnetites disseminated in matrix; under reflected light and 20X magnification



Photomicrograph 10: showing Small anhedral magnetites disseminated in matrix; under reflected light and 20X magnification

Fine Grained Olivine Basalt:



Photograph 21: Fine grained olivine basalt along Khas road

Photograph 22: Fine grained olivine basalt along Khas road

Fine-grained olivine basalt is a mafic volcanic rock composed predominantly of plagioclase and clinopyroxene, with dispersed fresh or altered olivine phenocrysts. The groundmass is fine-grained due to rapid cooling of basaltic lava at or near the surface, producing a compact, dark grey to black matrix. The fine-grained olivine basalt is observed along few villages named Samadhiyala, khas, shenthali, Tajpar road.

The texture is typically massive, though minor vesicles may occur. Weathering commonly results in reddish or brown alteration halos around olivine grains due to iddingsite formation.

Amygdaloidal Basalt:

Amygdaloidal basalt is a fine-grained volcanic rock characterized by the presence of rounded to oval mineral-filled cavities known as amygdales. These cavities originate as gas bubbles (vesicles) trapped within basaltic lava during eruption and cooling. After solidification, circulating hydrothermal fluids deposit secondary minerals into the vesicles, converting them into amygdales. Typical infilling minerals include calcite, zeolites, chlorite.

- This amygdaloidal basalt are found along the northern side of the block and mostly occur along the canal road of Khas village.

Photograph 23: Amygdaloidal basalt along khas canal road

Massive Basalt:

Massive basalt is dark grey to black, fine-grained. Megascopically, it appears dense, compact, and hard, with an aphanitic texture in which individual mineral grains are not visible to the naked eye. The rock shows a massive structure, lacking vesicles, cavities, or layering, which distinguishes it from vesicular or amygdaloidal varieties of basalt. Fresh surfaces are typically dark and compact. The main mineral constituents, include plagioclase feldspar and pyroxene.

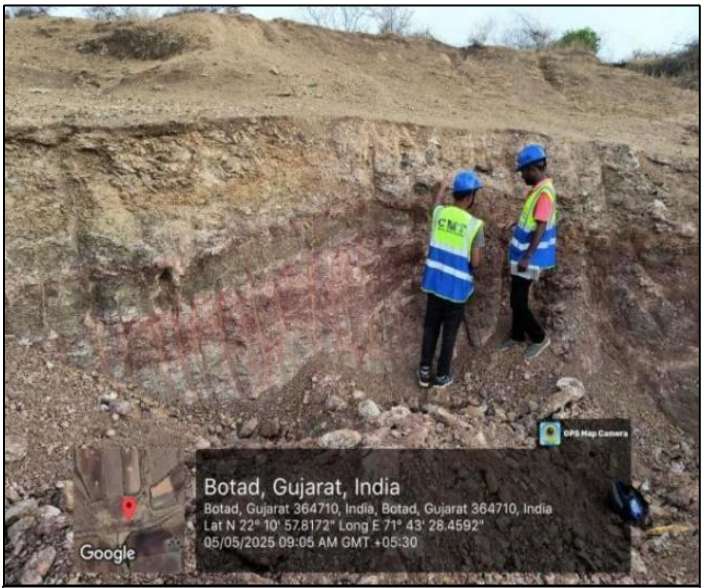
This massive basalt predominantly found in the Flow 2 of the Botad block. Olivine is conspicuously absent in this variant of basalt. Vertical to sub-vertical joints are present.

Photograph 24: Massive basalt along khas road

Photograph 25: Massive basalt along Bhambhan road

Red bole bed:

Red bole beds are thin, reddish to brick-red colored horizons occur between successive lava flows. Megascopically, the rock appears soft, fine-grained, earthy and compact, with a clayey texture. It is usually laminated. The color ranges from red, reddish brown to chocolate brown due to the presence of iron oxides formed during weathering. Red bole beds in the study area composed of clay minerals along with fine volcanic ash (?) and altered underlying basaltic material. The thickness of red bole beds usually varies from a few centimeters to about a meter, Geologically, red bole beds in the Botad area are significant as they indicate pauses in volcanic activity and provide important stratigraphic markers for correlating individual lava flows within the basalt sequence.



Photograph 26: Red bole bed along Bhambhan road

Photograph 27: Red bole bed along ARTO road

The red bole bed locations include RTO road, Samadiyala 1, Khas Road, Amapar road, Tajpar road near substation,

Serpentization:

During the course of mapping, serpentinization in basalt and olivine bearing basalt/picrite is observed as an alteration process affecting the original mafic minerals, particularly olivine and pyroxene. This may be due to the action of hydrothermal fluids emplaced later. The affected rocks usually show a distinct change in colour from the original dark grey or black basalt or picrite to green, dark green, or greenish-black shades. The rock surface looks mottled, patchy, or streaked, indicating partial to intense alteration. In picritic basalts, where olivine is abundant, serpentinization is more prominent and the olivine crystals are often replaced by soft, green serpentine minerals. The rock may become comparatively softer and sometimes displays a smooth or slightly waxy feel on freshly broken surfaces. Serpentinites zones mostly noticed along fractures, joints. At places, thin veinlets and patches of serpentine minerals fill cracks and cavities, and small magnetite grains may also be present as a by-product of the alteration process.

Photograph 28: serpentine along Bhambhan road

Photograph 29: serpentine along Bhambhan road

Serpentization: Hydration of ultramafic rocks (rich in olivine and pyroxenes)

A GREENISH TINT

FIBROUS TEXTURES

VOLUME EXPANSION FRACTURES AND HYDRATION VEINS

- This serpentization is found along the low-lying areas which is located along southwest of the block, near to the streams of the Botad block.

Massive Basaltic Dyke:

A massive basalt dyke occurs at the contact between Flow 3 and Flow 4, both identified as picritic basalts.

The dyke is medium- to fine-grained, dark grey to black, and shows a dense, non-vesicular, sharply bounded intrusive fabric. Its massive character and cross-cutting relation indicate emplacement after the solidification of Flow 3 but before or during the early stage of Flow 4 formation.

Flow 3 exhibits calcite-filled fractures and venations, reflecting post-emplacement hydrothermal circulation and low-temperature alteration. The dyke truncates or offsets these calcite veins, confirming its younger intrusive age relative to the alteration event in Flow 3.

Flow 4, also picritic, lies above the dyke and does not show similar vein development, suggesting either limited fluid access or later sealing by the dyke activity.

Photograph 30: Massive basaltic dyke along Tajpar road

Quarry:

In the western part of the Botad block, different Quarry near Sherthali and ARTO road are observed. Most of these Quarry located in the Flow 4 which is of picritic composition and having the elevation around 95 to 110 m MSL. Two sets of vertical to sub vertical joints and one sub horizontal joint set are very common in these Quarry. The olivine porphyritic crystals are very common these basalts exposed in the quarry faces. Calcite veins are present along the fractured zones. More than 10 Quarry are located in the Flow 4. The thickness of flow 4 is more compared to other flows. The quarry consists of fracture zones where the fractures are filled with calcite minerals.

These are few photographs of Quarrys taken in the field

Few Photographs showing Quarry Area locations:

Quarry-1

Photograph 31: showing Quarrie 1 outcrop location along senthali village, having the elevation of 110m, and having the height of 3m. It is a picritic basalt and there is a calcite venation filling in the outcrop.

Strike → 210^0

Dip amount → 30^0

Dip Direction → 120^0

Quarry-2

Photograph 32: showing Quarry 2 outcrop location along Senthali village, having the elevation of 110m, and having the height of 2.5 m. It is a picritic basalt and there is a calcite venation filling in the outcrop. Vertical to sub-vertical joints can be seen.

Quarrie-3

Photograph 33: showing Quarry 3 outcrop location along senthali village, having the elevation of 97m. It is a picritic basalt and there is a calcite venation filling in the outcrop. There are vertical joints are present.

Joints:

Strike → 260^0

Dip direction → 170^0

Dip amount → 20^0

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Quarry-4

Photograph 34: showing Quarry4 outcrop location along Senthali village, having the elevation of 105m. It is a picritic basalt and there is a calcite venation filling in the out-crop. There are vertical joints are present. Here, there is a water bodies in depression areas.

Quarry-5

Quarry-6

Photograph 35: showing Quarry 5 outcrop location along Senthali village, having the elevation of 93m. It is a picritic basalt and there is a calcite venation filling in the out-crop. There are vertical joints are present. It is having the height of 12m.

Joints:

Strike → 340^0

Dip direction → 250^0

Dip amount → 10^0

Photograph 36: showing Quarry 6 outcrop location along Senthali village, having the elevation of 111m. It is a picritic basalt and there is a calcite venation filling in the out-crop. There are vertical joints are present. Here, there is a water bodies in depression.

6.1.6 PETROGRAPHIC STUDIES:

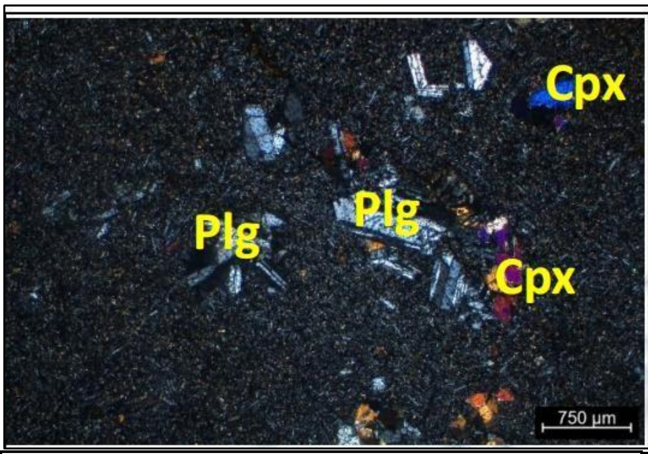
petrographic studies (Thin sections):

- **Sample code: CMT/011/7**

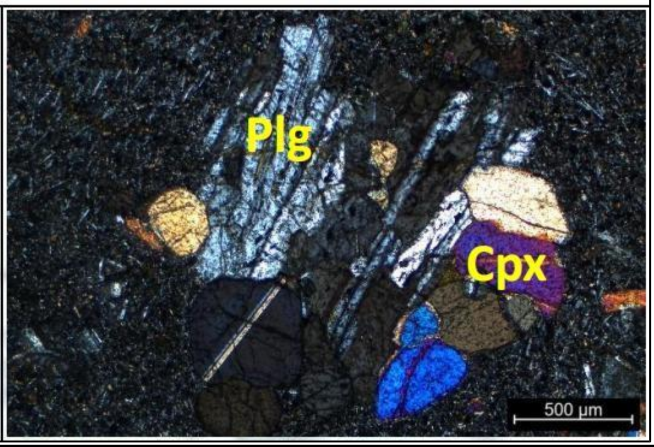
Microscopic study reveals that the rock exhibits a fine- to medium-grained dominated by plagioclase (Plg) and clinopyroxene (Cpx) as major mineral constituents. The overall texture indicates a hypidio-morphic to sub ophitic intergrowth between plagioclase laths and interstitial clinopyroxene, suggesting a crystallization sequence typical of mafic to intermediate igneous rocks.

Plagioclase occurs as lath-shaped to tabular crystals exhibiting polysynthetic twinning under crossed nic-ols. The grains display moderate to high birefringence colors, implying a composition within the labra-dorite to andesine range. Clinopyroxene appears as subhedral to anhedral grains with high interference colors and distinct cleavage traces at nearly 90°, characteristic of augite. Some grains exhibit alteration along cleavage planes and marginal chloritization, indicating incipient secondary alteration. groundmass shows a fine interlocking mosaic of plagioclase microlites and subordinate clinopyroxene, representing rapid crystallization from a melt. In some portions, plagioclase microlites form a trachytic texture, whereas in others, an intergranular to intersertal texture is observed with plagioclase and clinopyroxene forming the main constituents of the matrix. The dominance of plagioclase microlites over clinopy-roxene in parts of the sample reflects variable cooling rates during the final stages of solidification.

The mineral assemblage and textures collectively indicate a magmatic origin, likely from a basaltic magma, crystallized under subvolcanic to shallow intrusive conditions. The fine-grained groundmass and presence of euhedral to subhedral phenocrysts of plagioclase and clinopyroxene suggest that the rock represents a basaltic lava that experienced partial crystallization before eruption.

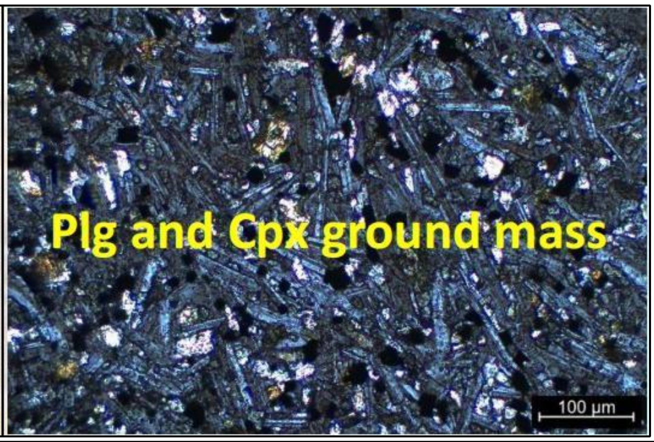


Photomicrograph 11: showing Photomicrograph showing presence of plagioclase (Plg) and Clinopyroxene (Cpx) in fine grained ground mass under transmitted light XPL (5X).



Photomicrograph 12: showing Photomicrograph showing presence of plagioclase (Plg) and Clinopyroxene (Cpx) phenocrysts in fine grained ground mass under transmitted light XPL (5X).

Photomicrograph 13: showing Photomicrograph showing presence of plagioclase (Plg) and Clinopyroxene (Cpx) phenocrysts in fine grained ground mass under transmitted light XPL (2X).



Photomicrograph 14: showing Photomicrograph showing presence of plagioclase (Plg) and Clinopyroxene (Cpx) in fine grained ground mass under transmitted light XPL (20X)

Rock Name: Based on the mineral and textural characteristics, it is a porphyritic basalt.

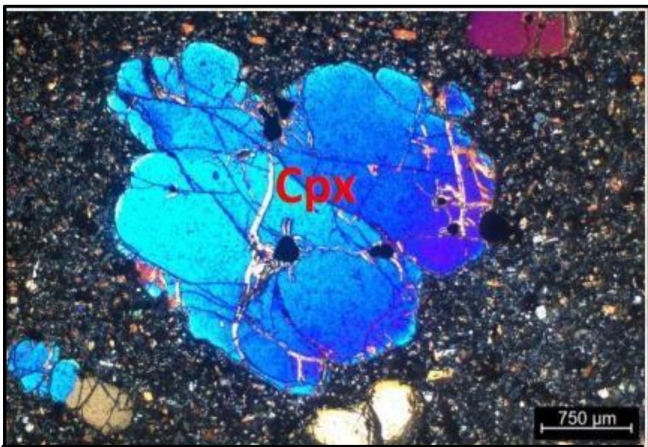
✧ Sample code: CMT/011/64

Microscopic study reveals that the rock exhibits a fine- to medium-grained characterized by the predominance of clinopyroxene (Cpx) and plagioclase (Plg) as the major mineral constituents (Fig. 2A-2D). The overall texture indicates a sub ophitic to intergranular relationship between plagioclase laths and interstitial clinopyroxene.

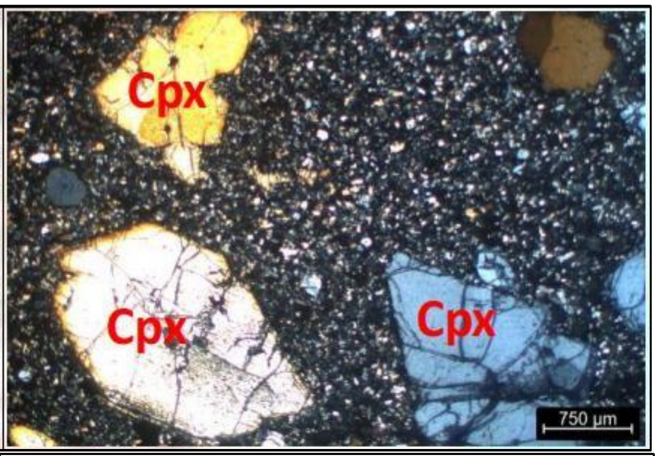
Clinopyroxene occurs as large, subhedral to anhedral grains with high first- to second-order interference colors, showing well-defined cleavages intersecting nearly at 90°. The grains occasionally display faint zoning and marginal alteration to chlorite or opaque minerals along cleavage planes, suggesting minor post-crystallization alteration. Some clinopyroxene crystals exhibit fracturing and inclusions of fine plagioclase microlites, indicating simultaneous growth during early magmatic crystallization.

Plagioclase is abundant in the groundmass, forming lath-shaped microlites and interlocking textures with clinopyroxene. Under crossed nicols, it displays characteristic polysynthetic twinning and low birefringence colors. The plagioclase groundmass is generally fine-grained, reflecting rapid cooling of the residual melt. In some areas, plagioclase and clinopyroxene coexist as an intergranular mosaic, while in others, plagioclase dominates the matrix forming a trachytic texture.

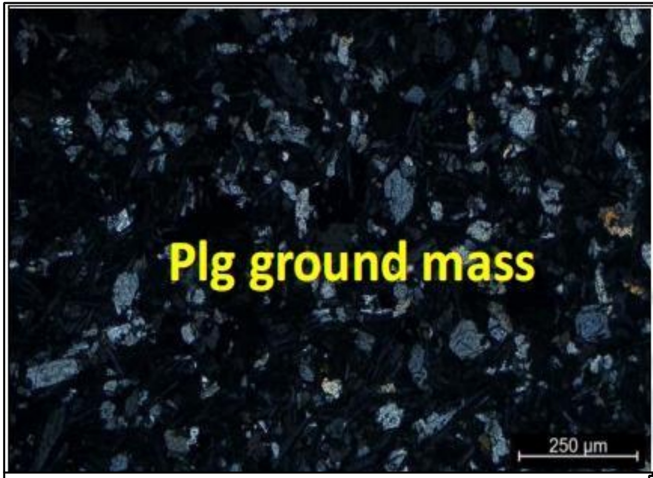
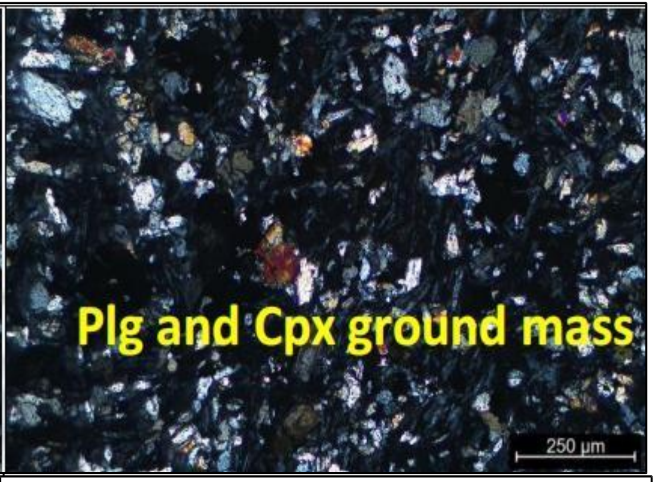
The textural relations suggest crystallization began with clinopyroxene, followed by the growth of plagioclase during the later stages of solidification. The absence of olivine and opaque mineral abundance indicates a moderately evolved basaltic magma.



Photomicrograph 15: showing Photo micro graph showing presence of Clinopyroxene (Cpx) phenocrysts in fine grained ground mass under transmitted light XPL (2X)



Photomicrograph 16: Fig showing Photomicrograph showing presence of Clinopyroxene (Cpx) phenocrysts in fine grained ground mass under transmitted light XPL (2X)

	
Photomicrograph 17: showing Photomicrograph showing presence of plagioclase (Plg) and Clinopyroxene (Cpx) in fine grained ground mass under transmitted light XPL (10X)	**Photomicrograph 18:** showing Photomicrograph showing presence of plagioclase (Plg) and Clinopyroxene (Cpx) in fine grained ground mass under transmitted light XPL (10X)

Rock/Mineral Name: Based on the mineral and textural characteristics, it is a porphyritic basalt.

- **Sample no: CMT/011/10/2025**

Mineral assemblage:

Phenocrystic phases: Olivine + Clinopyroxene

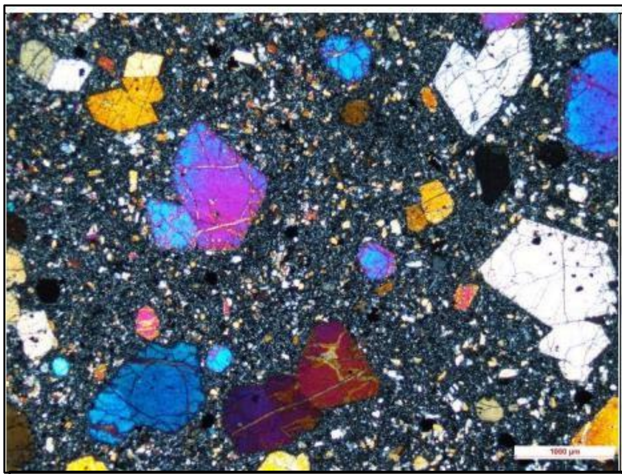
Matrix phases: Clinopyroxene + Plagioclase + Magnetite

Secondary mineral: Serpentine + biotite

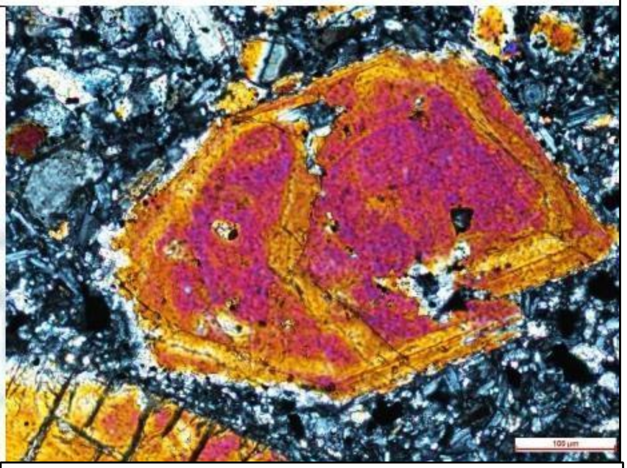
Texture: It is a very fine-grained rock showing inequigranular texture. Large, rounded, euhedral to subhedral phenocrysts of olivine and smaller clinopyroxene phenocrysts occur within very fine-grained basaltic matrix. Oscillatory compositional zoning and large size of the phenocrysts of olivine indicate early and slow magmatic crystallization with. Olivine phenocrysts have thin rim of fractures as well as growth rims containing tiny inclusions of another mineral. Often phenocrysts of olivine form clusters defining glomeroporphyritic texture.

Twin crystals, undulous extinctions are also observed among the phenocrysts. Small olivine phenocrysts developed over larger olivine crystal indicating change in rate of crystallization. Biotite and serpentine replace olivine along the fractures. Clinopyroxene phenocrysts are relatively small in size than olivine representing late crystallization.

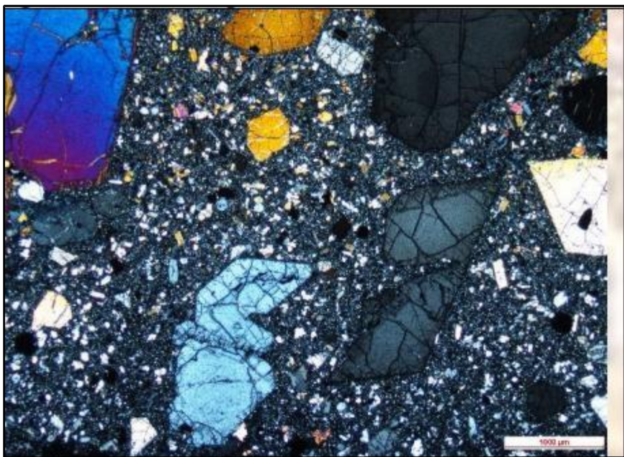
The matrix consists of lath shaped plagioclase and clinopyroxene defining intergranular texture. Presence of microlites of feldspar also define the hyalopilitic texture indicating crystallization from volcanic glass. Often at places, the grain size of the matrix became coarser. Small Magnetite occur as disseminated grains within the matrix but coarser grains are closely associated with olivine phenocrysts indicating synchronous crystallization.



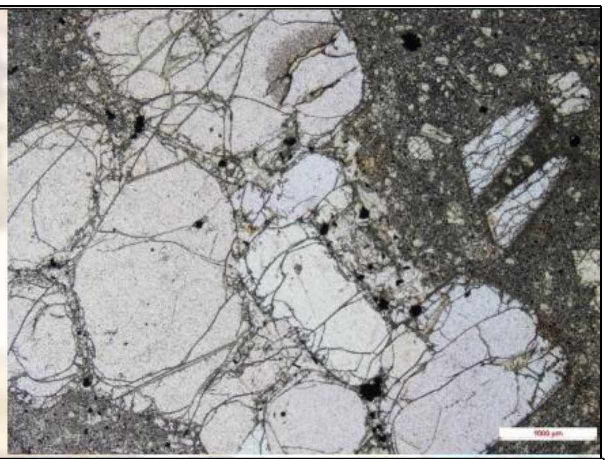
Photomicrograph 19: showing Olivine and clinopyroxene phenocrysts in very fine-grained plagioclase-pyroxene rich basaltic matrix; porphyritic texture; also note the fusion of two phenocrysts; under cross polarized light and at 2X magnification



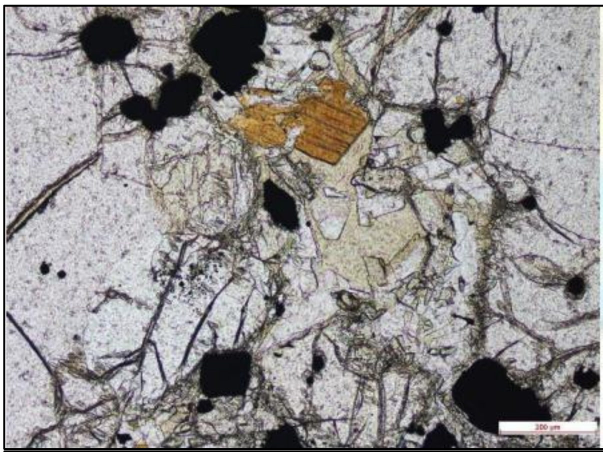
Photomicrograph 20: showing Compositional zoning in olivine phenocrysts; note the plagioclase rich matrix; under 20X magnification



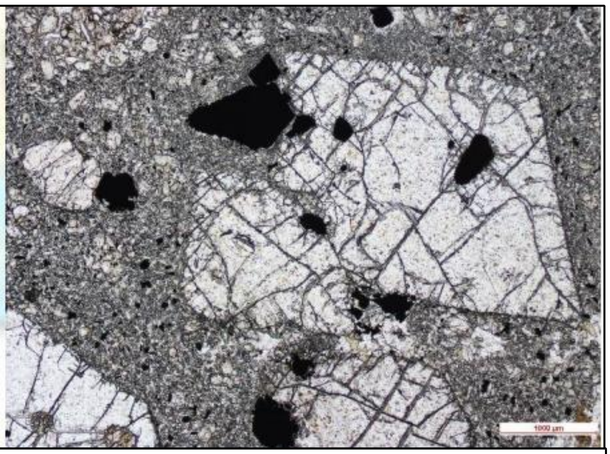
Photomicrograph 21: showing Bimodal distribution of sizes of phenocrysts; euhedral phenocrysts often broken and subsequently filled up by basaltic crystallization; 2X magnification



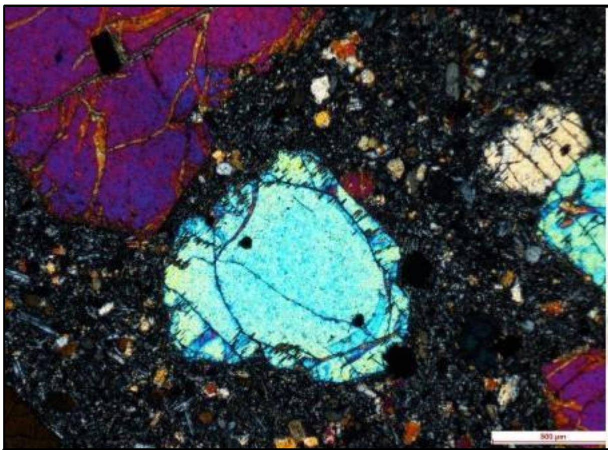
Photomicrograph 22: showing Glomeroporphyritic texture defined by clusters of olivine crystals in a basaltic matrix; 2X magnification



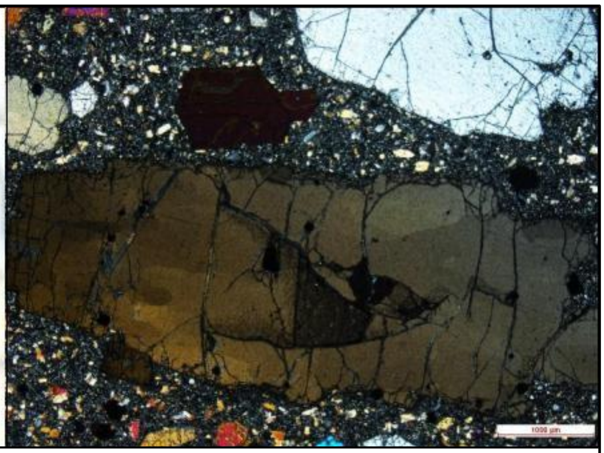
Photomicrograph 23: showing Secondary alteration of olivine and pyroxene by biotite and serpentinite and chlorite; note the close association of olivine and magnetite; under plane polarized light and 10X magnification



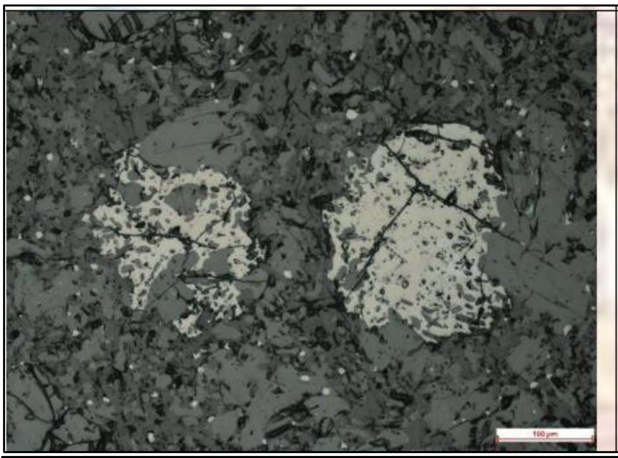
Photomicrograph 24: showing Close association of magnetite and olivine; magnetite also disseminated in matrix; under 2X magnification



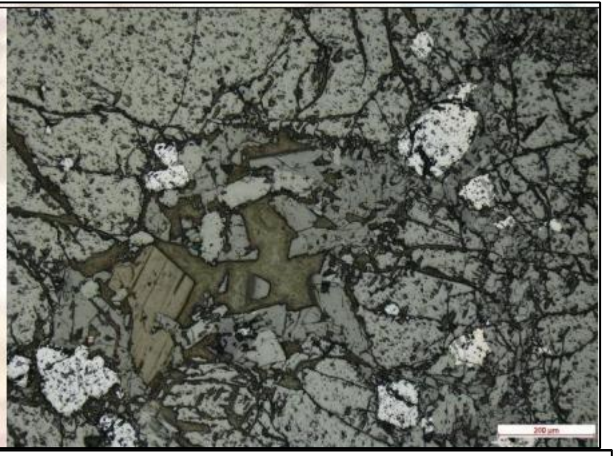
Photomicrograph 25: showing Fractured and altered outer rim of Olivine phenocrysts showing syn crystallization deformation



Photomicrograph 26: showing Undulous extinction in clinopyroxene indicating grain scale ductile deformation.



Photomicrograph 27: showing Anhedral, skeletal shaped large magnetite intergrown with Olivine phenocrysts; small magnetite as dissemination within matrix.



Photomicrograph 28: showing Disseminated magnetite within alteration zones of the basalt.

Rock name: Porphyritic olivine basalt.

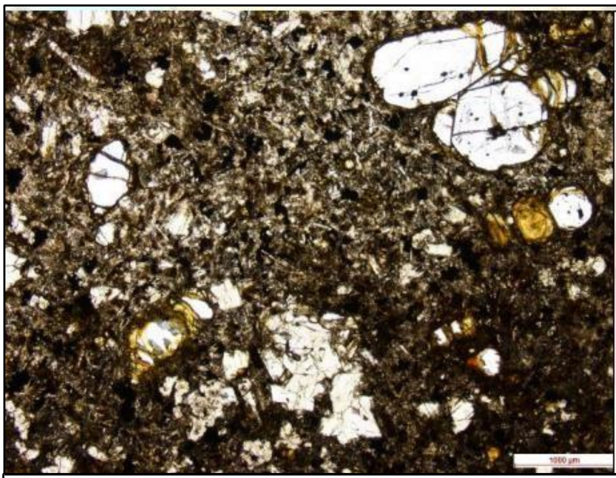
- **Sample no: CMT/011/25/2025**

Mineral assemblage: Phenocrystic phases: Olivine + Clinopyroxene Matrix phases: Plagioclase + Pyroxene + magnetite

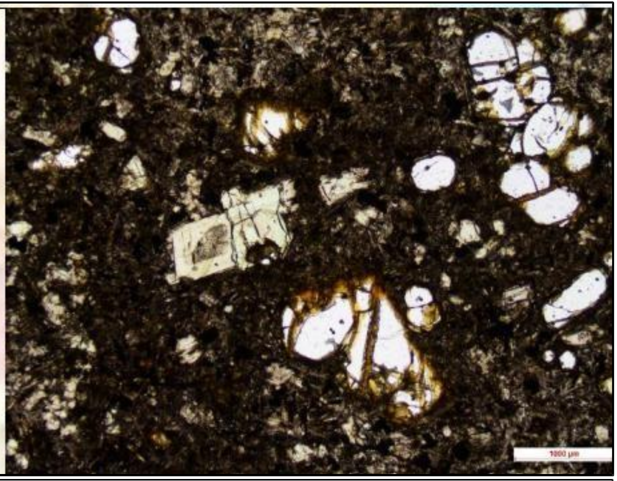
Vesicular phases: Zeolite (quartz)

Texture:

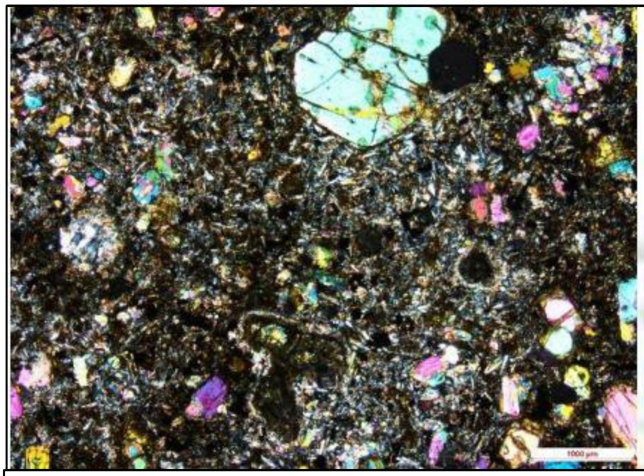
Phenocrysts of olivine and clinopyroxene occurring in very fine-grained basaltic matrix define the porphyritic texture. Olivine phenocrysts are mortly rounded, colorless and fractured. Clinopyroxene phenocrysts are relatively smaller in size and euhedral in shape. The matrix consists of very fine-grained plagioclase microlites and clinopyroxene defining typical basaltic intergranular and hyalopilitic texture. At places volcanic glass is preserved though devitrified. Tiny, anhedral to skeletal shaped magnetites occur as dissemination within the matrix. Small rounded shaped part represents filled up vesicles. Mostly quartz crystals, growing perpendicular to the wall of the vesicles represent the zeolite. Undulous extinction of quartz crystals of vug filling is also noted.



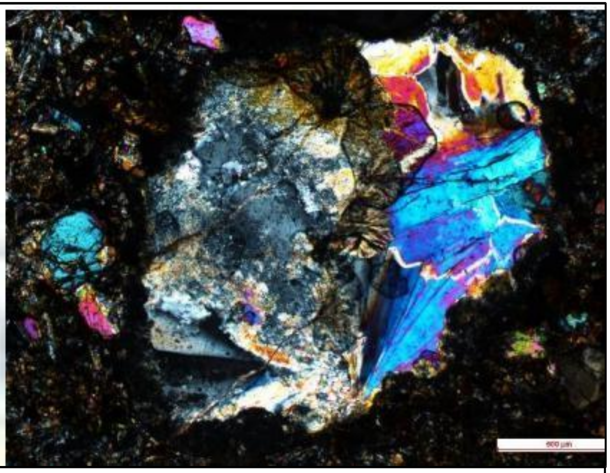
Photomicrograph 29 showing Porphyritic texture with olivine phenocrysts in fine grained plagioclase clinopyroxene rich basaltic matrix; under 2X magnification



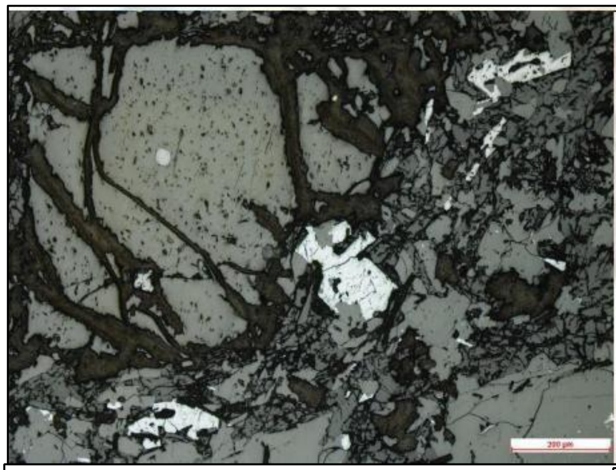
Photomicrograph 30 showing Euhedral phenocrysts of Clinopyroxene and olivine in basaltic matrix; note the cluster of phenocrysts defining glomero-porphyritic texture; under 2X magnification



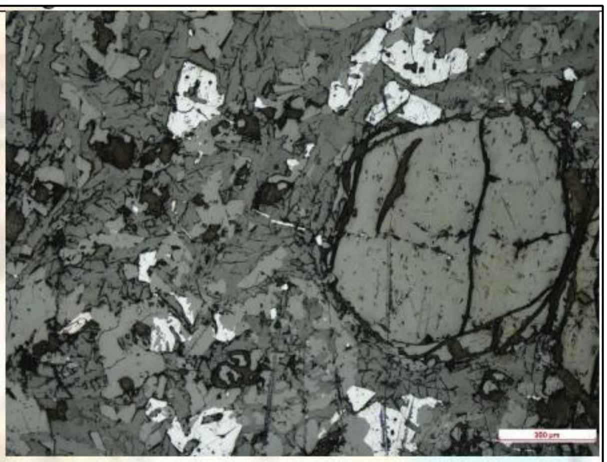
Photomicrograph 31: showing Note the microlites of plagioclase oriented haphazardly and interstitial spaces filled by pyroxene defining intergranular texture; also note the rounded vesicles.



Photomicrograph 32: showing Sub-rounded vesicles within basaltic matrix, filled up by quartz crystals grew perpendicular to the wall of vesicles; under 5X magnification.



Photomicrograph 33: showing Anhedral magnetite occurring within basalt and closely associated with phenocrysts; under reflected light and 10X magnification



Photomicrograph 34: showing Anhedral and small magnetite as dissemination within basalt; under reflected light and 10X magnification

Name of the rock: Porphyritic olivine basalt

✧ **Sample no: CMT/011/31/2025**

Mineral assemblage: Phenocrystic phases: Olivine + Clinopyroxene Matrix phases: Plagioclase + Pyroxene + magnetite

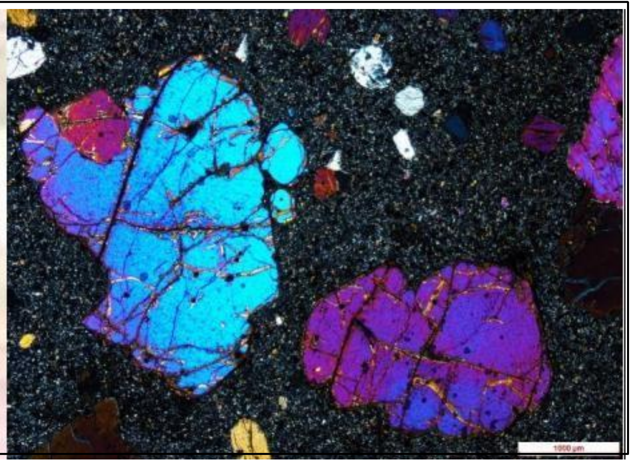
Secondary mineral: Serpentine; Vesicular phases: Quartz

Texture: The rock represents fine grained porphyritic basalt having inequigranular texture. Large olivine and clinopyroxene phenocrysts occur within very fine-grained basaltic matrix showing porphyritic texture. Olivine phenocrysts are identified by their high refractive index, colorless, fractured nature and by high birefringence color.

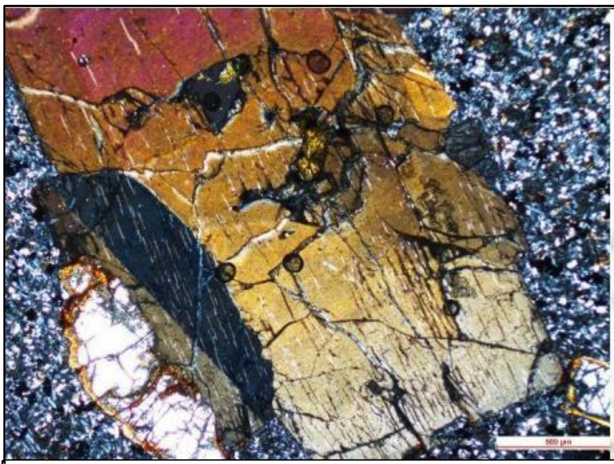
Often, olivine phenocrysts become altered and serpentinite and only pseudomorph of olivine is noted. Clinopyroxene phenocrysts are identified by high refractive index (< than olivine), one set of perfect cleavage with inclined extinction. At places, Clinopyroxene and olivine phenocrysts have fused grain boundaries. Exsolution lamellae and zoning are the common features of clinopyroxene phenocrysts. Two distinct modes of size of phenocrysts is noted. At places large anhedral clinopyroxene show intergrowth with laths of plagioclase feldspar showing eutectic crystallization. The matrix consists of very fine-grained lath shaped plagioclase microlites occurring randomly.

Very small clinopyroxene are present in the interstitial spaces of plagioclase laths defining intergranular texture. Very small magnetite and very few pyrite occur as dissemination within the matrix. Small rounded shaped part represents filled up vesicles. Mostly quartz crystals, growing perpendicular to the wall of the vesicles represent the zeolite.

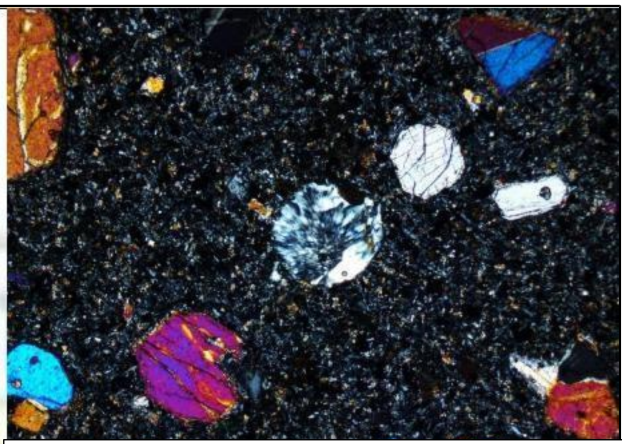
Photomicrograph 35: showing Fractured olivine phenocrysts with alteration along margin and fracture in a fine-grained magnetite rich basaltic matrix



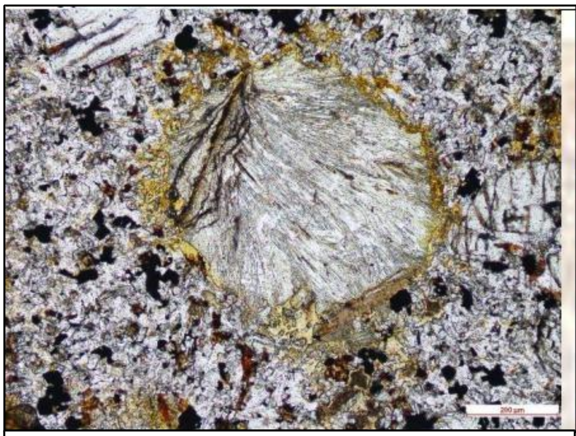
Photomicrograph 36: showing Bimodal distribution of phenocrysts size in basalt; under cross polarized light and 2X magnification



Photomicrograph 37: showing Clinopy-roxene and olivine phenocrysts within basalt; note the exsolution lamellae within clinopyroxene

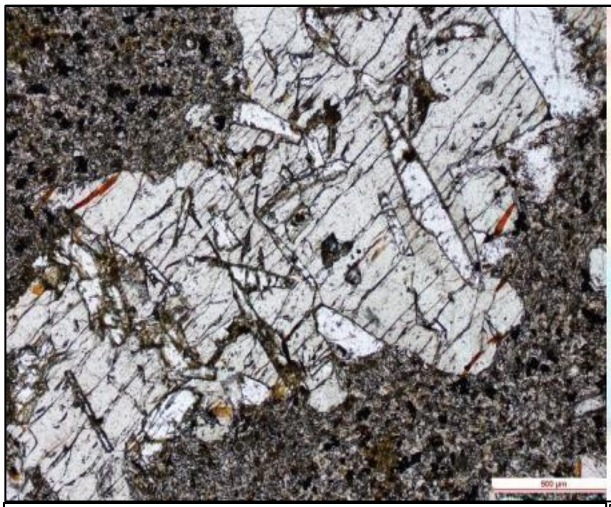


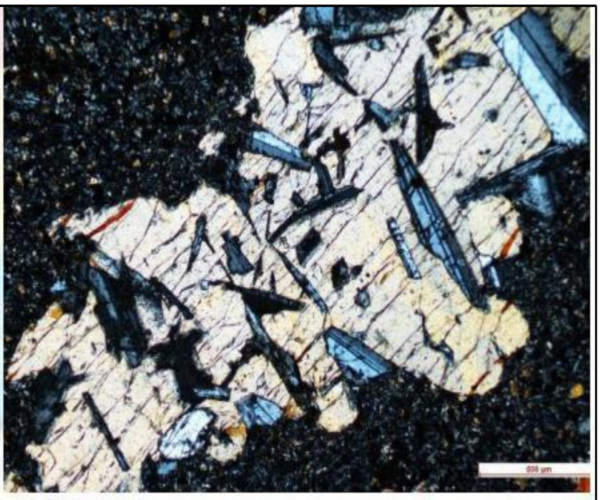
Photomicrograph 38: Small, rounded filled up vesicles within basaltic matrix; quartz crystals have filled up the vesicles; under 5X magnification.



Photomicrograph 39: showing Olivine pseudomorph; secondary serpentine and a very few biotite replace the olivine phenocrysts completely, keeping intact its boundary and shape; also note the matrix rich in small magnetite and rutile.

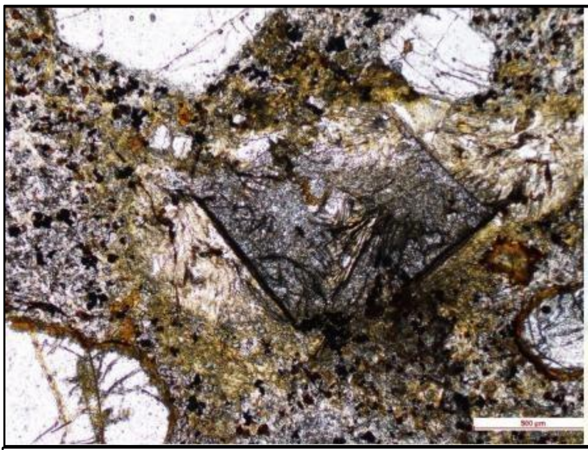
Photomicrograph 40: showing same as left side one under cross polarized light and 10X magnification.

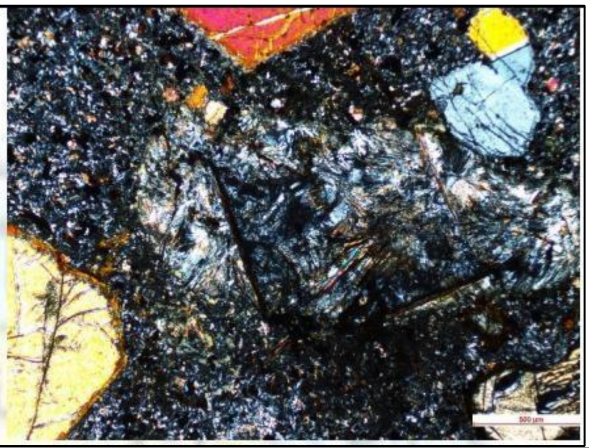




Photomicrograph 41: showing Large anhedral clinopyroxene phenocrysts intergrown with coarse plagioclase laths indicating eutectic crystallization. Under 5X magnification.

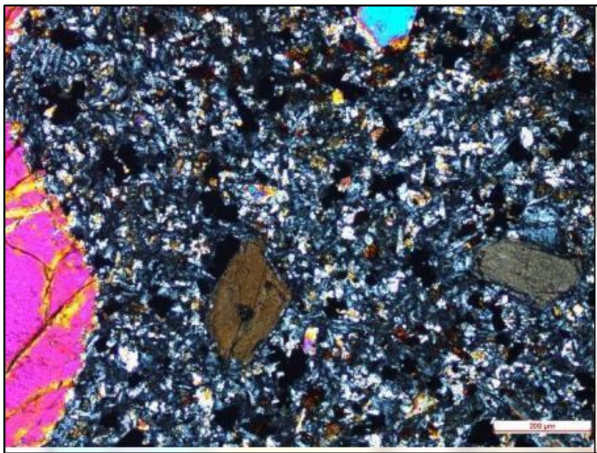
Photomicrograph 42: showing Same as left side one under cross polarized light and at 5X magnification.

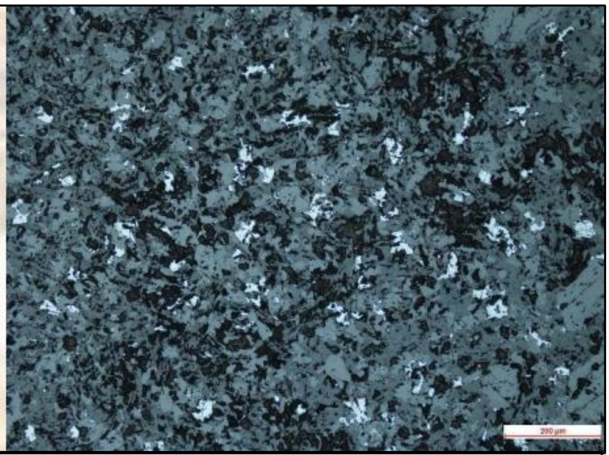




Photomicrograph 43: showing Olivine pseudomorph; secondary serpentine replaces the olivine phenocrysts completely, keeping intact its boundary and shape; also note the magnetite rich matrix.

Photomicrograph 44: showing Olivine pseudomorph; secondary serpentine replaces the olivine phenocrysts completely, keeping intact its boundary and shape; also note the magnetite rich matrix





Photomicrograph 45: Showing Matrix rich in plagioclase laths with interstitial clinopyroxene and magnetite; under 10X magnification

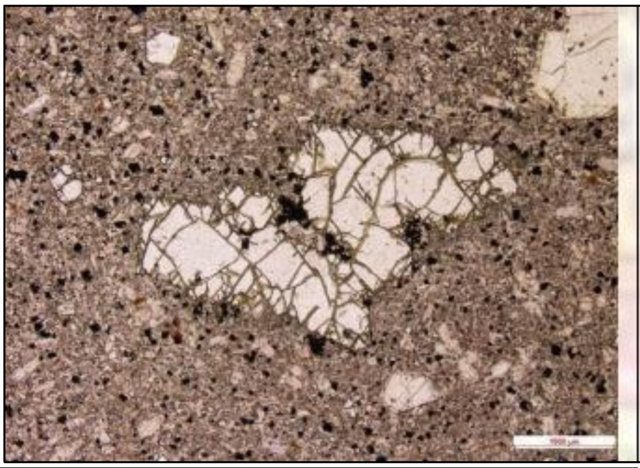
Photomicrograph 46: showing Disseminated and tiny magnetite in basalt; under reflected light

Name of the rock: Porphyritic olivine basalt

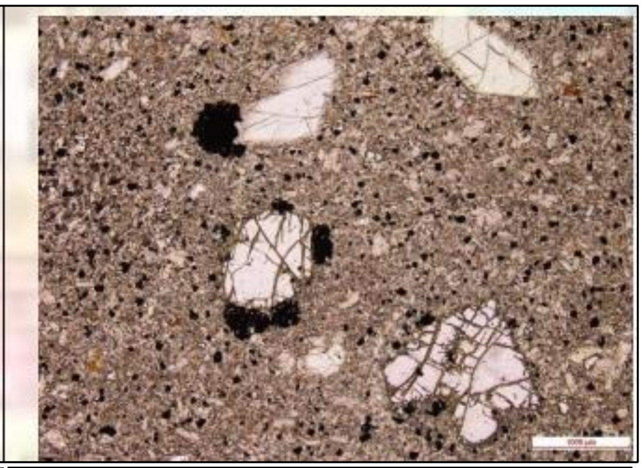
7. Sample no: CMT/011/62/2025

Mineral assemblage: Phenocrystic phases: Olivine + Clinopyroxene + Magnetite Matrix phases: Plagioclase + Pyroxene + magnetite

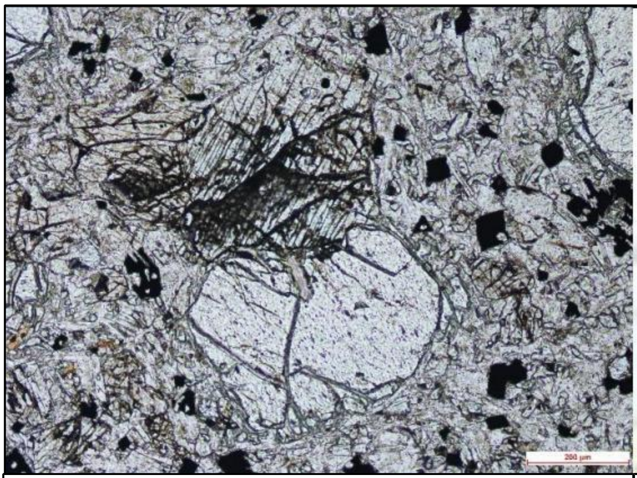
Texture: It is a very fine-grained rock showing inequigranular texture. Large, rounded, euhedral to subhedral phenocrysts of olivine, clinopyroxene and smaller magnetite phenocrysts occur within very fine-grained basaltic matrix. Magnetite and olivine phenocrysts were crystallized simultaneously which is evident from the coexistence of olivine and magnetite all along the rock. Magnetites are associated surrounding the olivine phenocrysts. Oscillatory compositional zoning in clinopyroxene phenocrysts is frequently noted indicating change in magmatic composition. Tiny magnetites occur as dissemination within matrix. Coarse magnetites are anhedral and intergrown silicate phases indicating synchronous crystallization. The matrix consists of very fine-grained lath shaped plagioclase occurring randomly. Very small clinopyroxene grains are present in the interstitial spaces of plagioclase laths defining intergranular texture.



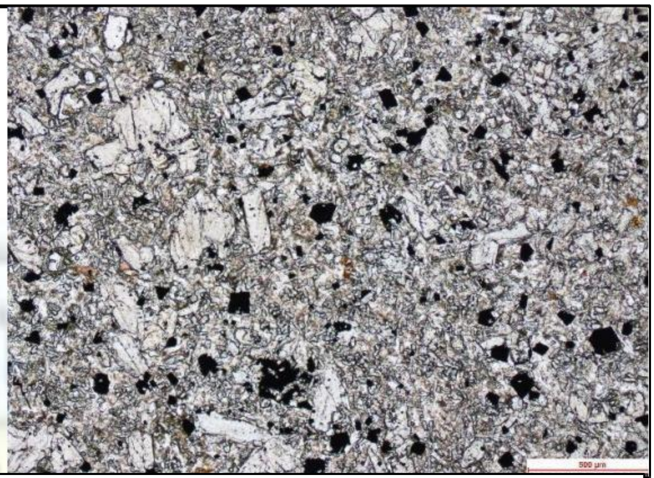
Photomicrograph 47: showing Clinopyroxene and olivine phenocrysts; small magnetite disseminated in matrix



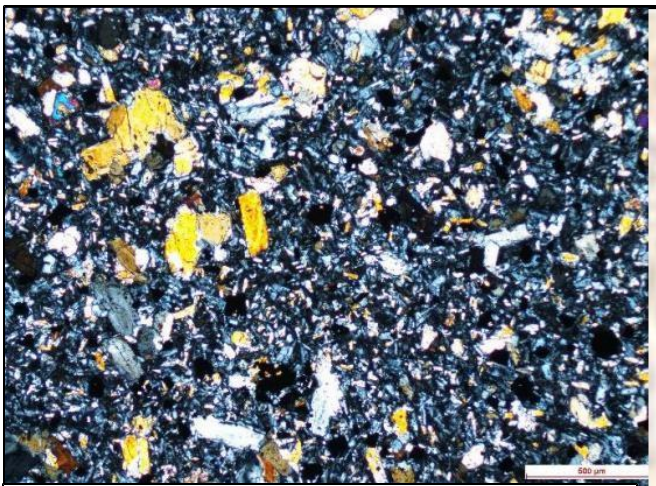
Photomicrograph 48: showing Porphyritic basalt with phenocrysts of olivine associated with large magnetite clusters



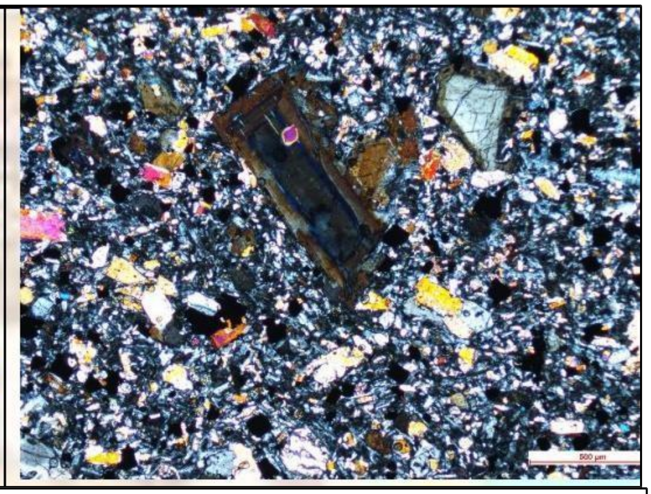
Photomicrograph 49: showing Fractured phenocrysts of olivine in magnetite rich basaltic matrix; note few large magnetite closely associated with olivine phenocrysts.



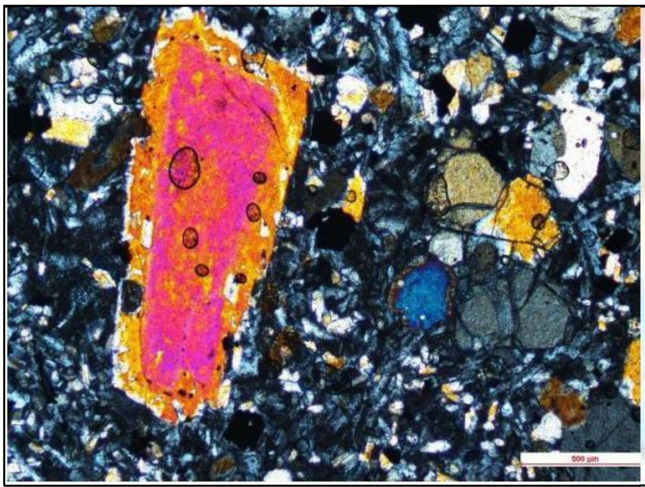
Photomicrograph 50: showing Bimodal distribution of size of phenocrysts; smaller sized phenocrysts of plagioclase and pyroxene in basaltic matrix; under 5X magnification.

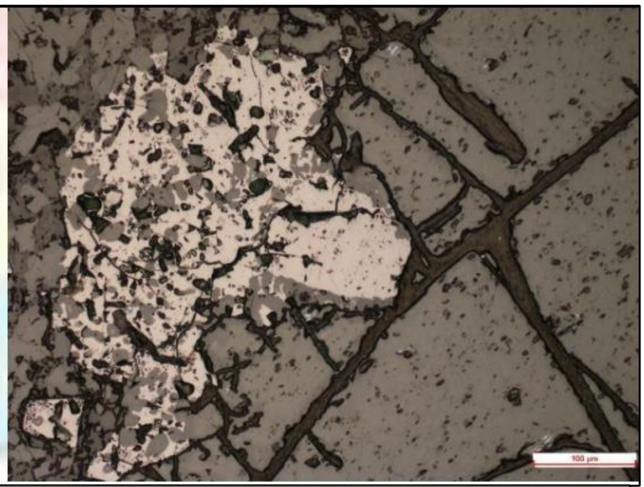


Photomicrograph 51: showing Bimodal distribution of size of phenocrysts; smaller sized phenocrysts of plagioclase and pyroxene in basaltic matrix; under 5X magnification under crossed polar



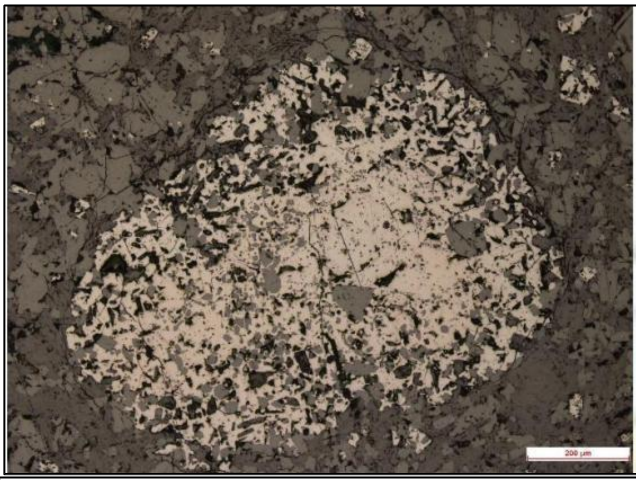
Photomicrograph 52: showing Zoning and exsolution lamellae and twinning in clinopyroxene phenocrysts; under 5X magnification.

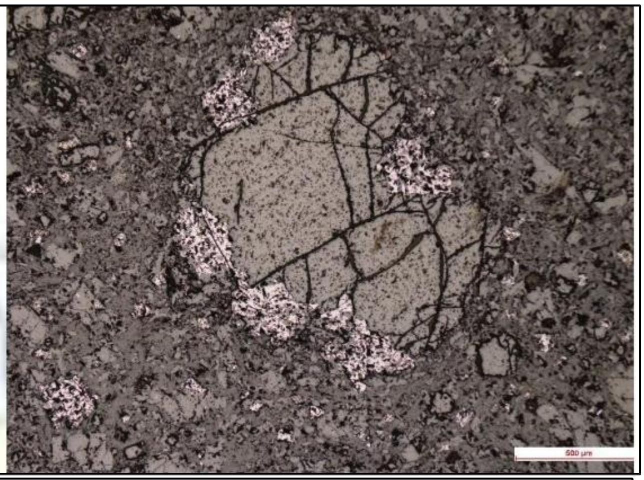




Photomicrograph 53: showing compositional zoning in olivine phenocrysts.

Photomicrograph 54: showing Olivine phenocrysts and anhedral magnetite intergrown with olivine; under reflected light and 20X magnification





Photomicrograph 55: with silicate as intergrown phase; under reflected light and 10X magnification

Photomicrograph 56: showing Olivine phenocrysts surrounded by anhedral magnetite; under reflected light and 5X magnification.

- **Name of the rock: Porphyritic olivine basalt**

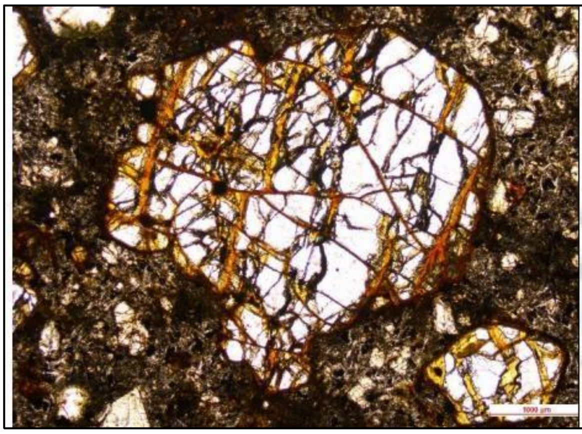
8. Sample no: CMT/011/70/2025

Mineral assemblage: Phenocrystic phases: Olivine + Clinopyroxene Matrix phases: Plagioclase + Pyroxene + magnetite

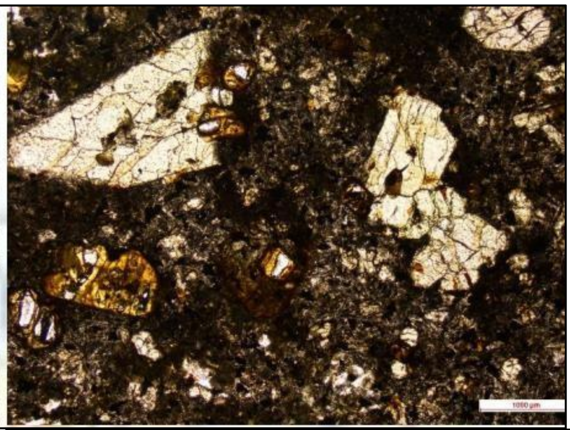
Vesicular phases: Zeolite (quartz)

Texture: Phenocrysts of olivine and clinopyroxene occurring in very fine-grained basaltic matrix define the porphyritic texture. Olivine phenocrysts are sub-rounded and extensively fractured whereas clinopyroxene phenocrysts are anhedral to subhedral in shape and smaller in size.

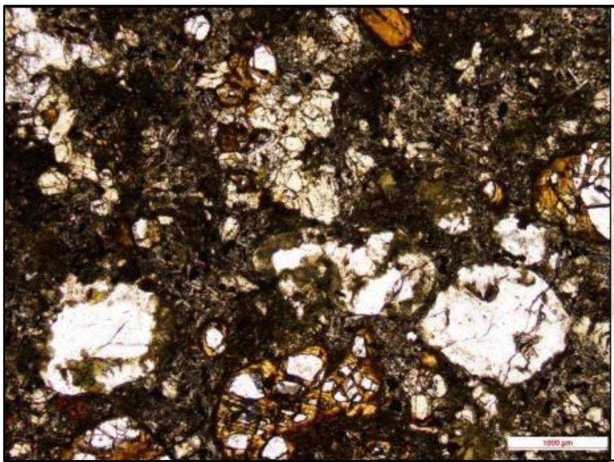
Plagioclase microlites and devitrified glass represent hyalopilitic texture suggesting volcanic origin. Small rounded shaped part represents filled up vesicles. Mostly quartz crystals, growing perpendicular to the wall of the vesicles represent the zeolite. Undulous extinction of quartz crystals is also noted. The matrix consists of very fine-grained plagioclase and clinopyroxene defining typical basaltic texture. Tiny magnetites occur as dissemination within the matrix.



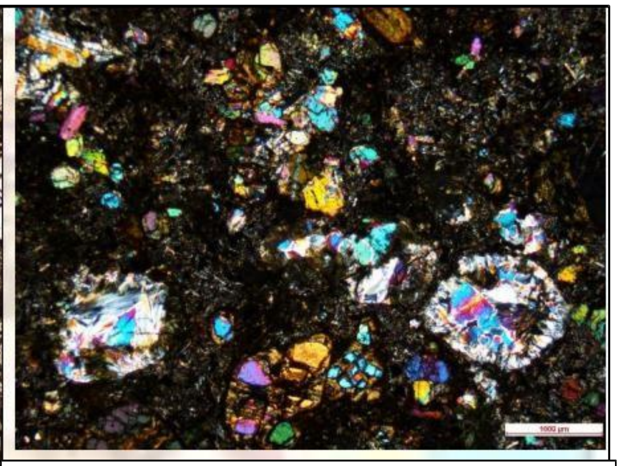
Photomicrograph 57: showing Fractured phenocrysts of large olivine in basaltic matrix; note the bimodal distribution of size of phenocrysts



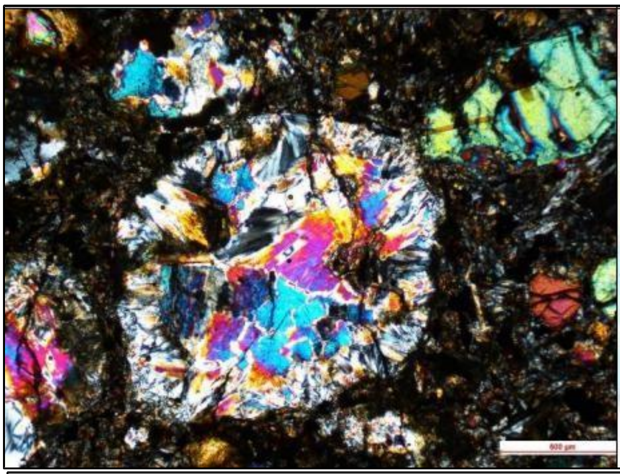
Photomicrograph 58: Angular subhedral phenocrysts of clinopyroxene and relatively small olivine phenocrysts in microlites rich basaltic matrix.



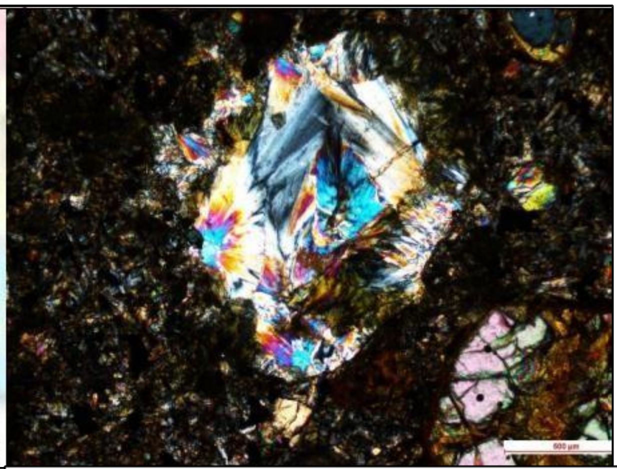
Photomicrograph 59: showing Small rounded vesicles in basalt; also note the fractured olivine phenocrysts.



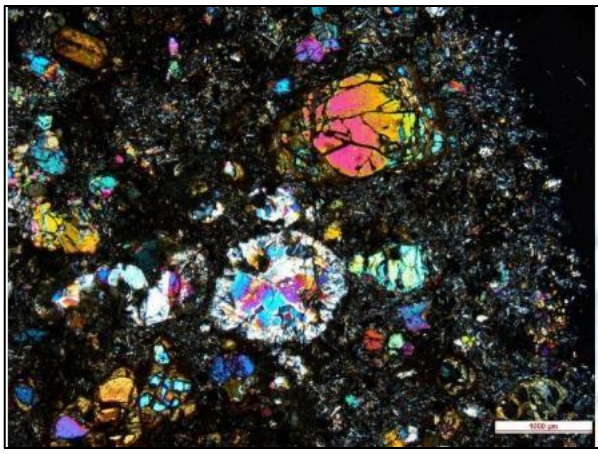
Photomicrograph 60: under cross polarised light; vesicles are filled up with quartz; note the microlites of plagioclase and glass defining the hyalopilitic texture.



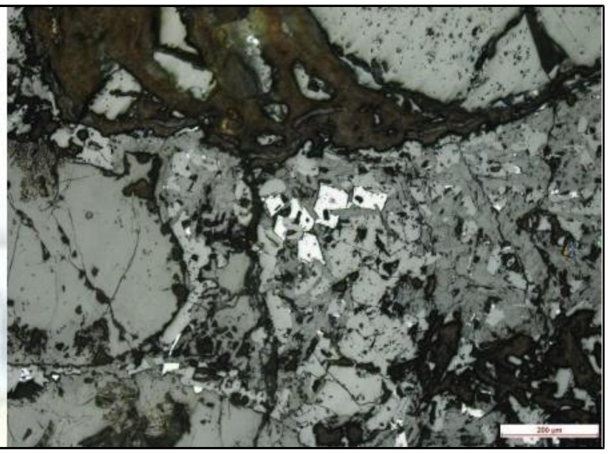
Photomicrograph 61: vesicles filled with quartz



Photomicrograph 62:is Same as upper right at higher magnification and closer look at the vesicles.



Photomicrograph 63: showing Porphyritic and hyalopilitic textures of the rock



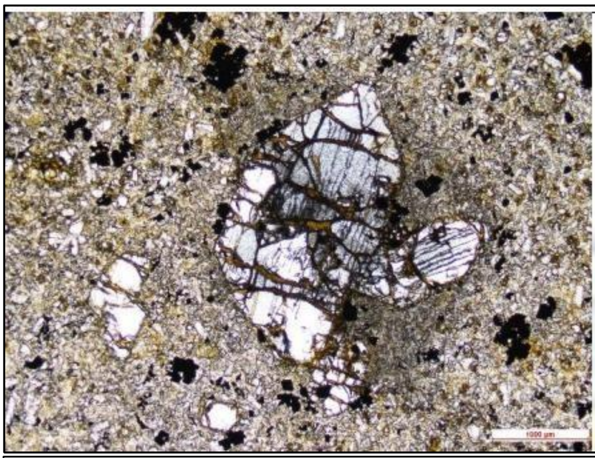
Photomicrograph 64: showing tiny magnetite disseminated in matrix; under reflected light and 10X magnification.

➢ **Name of the rock: Porphyritic olivine basalt**

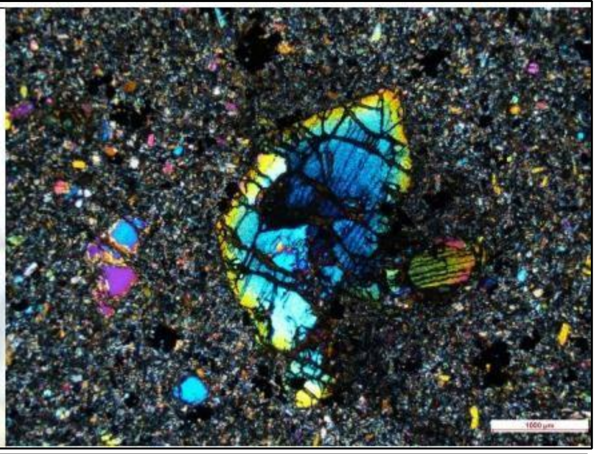
9. Sample no: CMT/011/73/2025

Mineral assemblage: Phenocrystic phases: Olivine Matrix phases: Plagioclase + Pyroxene + magnetite Secondary mineral: Serpentine + Chlorite

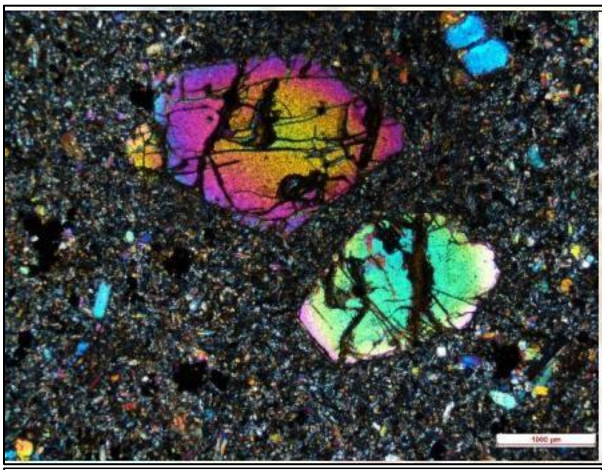
Texture: It is a very fine grained rock showing inequigranular texture. Large, rounded, euhedral to subhedral phenocrysts of olivine occur within very fine-grained basaltic matrix. Olivine phenocrysts are mostly fractured and have high birefringence color under cross polarized light. Compositional zoning in olivine is also noted. Chlorite and serpentine replaced and altered olivine along the fractures as secondary minerals. The matrix consists of lath shaped plagioclase and clinopyroxene defining intergranular texture. Magnetite are mostly small in size and anhedral in shape. They occur as disseminated grains within the matrix.



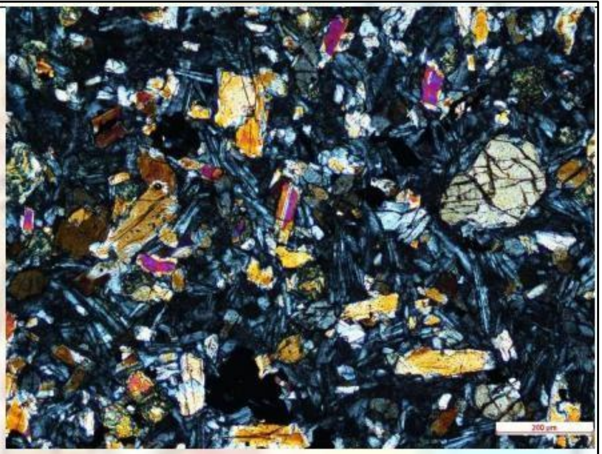
Photomicrograph 65: showing Euhedral and fractured olivine phenocrysts in fine grained basaltic matrix defining porphyritic texture.



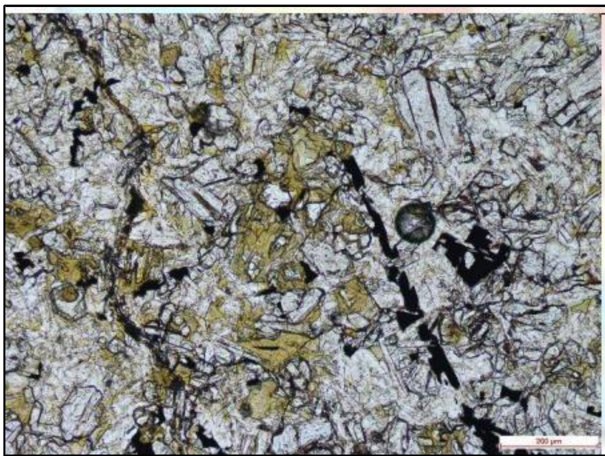
Photomicrograph 66:is Same as left one; under cross polarized light; also note the compositional zoning in olivine.



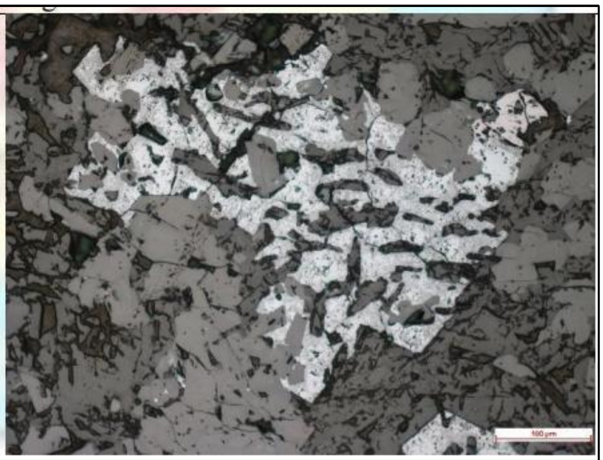
Photomicrograph 67: showing Euhedral, large and fractured olivine phenocrysts with compositional zoning in fine grained basaltic matrix.



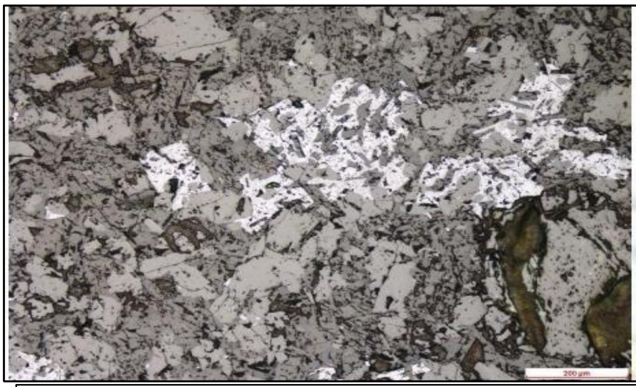
Photomicrograph 68: showing Plagioclase laths and interstitial clinopyroxene define the intergranular texture of basalt; under cross polarized light and at 10X magnification

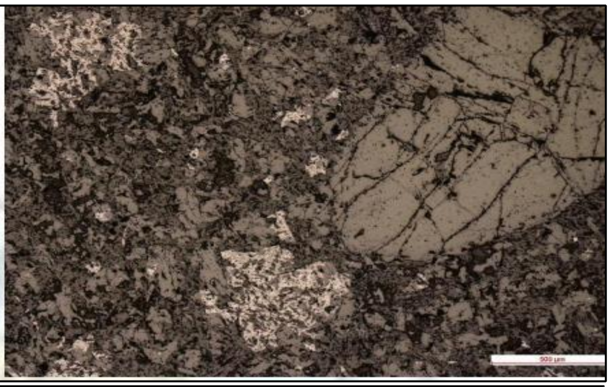


Photomicrograph 69: showing Chloritic alteration of the matrix; note the anhedral magnetite grains disseminated in matrix



Photomicrograph 70: showing Anhedral magnetite intergrown with silicates; under reflected light and at 20X magnification.





Photomicrograph 71: showing Anhedral magnetite intergrown with silicates; under reflected light and at 10X magnification

Photomicrograph 72: showing Anhedral magnetite intergrown with silicates; tiny magnetites disseminated in matrix; under reflected light and at 20X magnification.

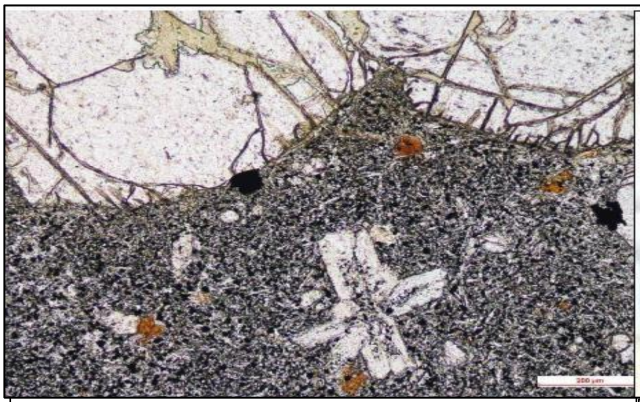
- **Name of the rock: Porphyritic olivine basalt.**

10. Sample no: CMT/011/75/2025

Mineral assemblage: Phenocrystic phases: Olivine + Clinopyroxene + Plagioclase Matrix phases: Plagioclase + Pyroxene + magnetite

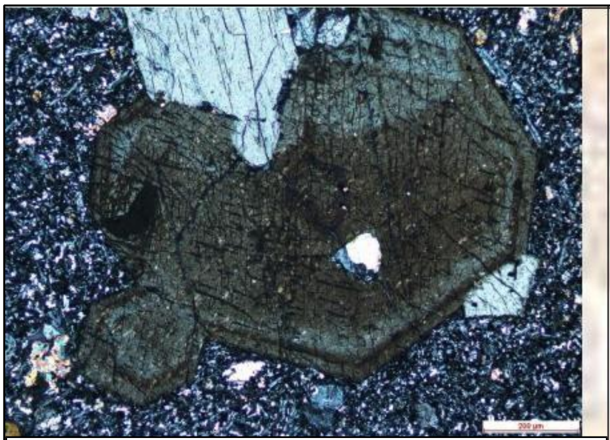
Secondary mineral: Biotite + Chlorite

Texture: This rock is very fine-grained basaltic rock having spectacular porphyritic texture with star shaped twin crystals of clinopyroxene and plagioclase. The volume percentage of olivine phenocrysts is more than that of clinopyroxene. Glomeroporphytic texture is defined by the clusters of olivine phenocrysts within basaltic matrix. Plagioclase phenocrysts are identified by their low refractive index and lamellar twinning. Often clinopyroxene and plagioclase phenocrysts show intergrowth texture. Compositional oscillatory zoning in clinopyroxene basal section is also noted indicating different pulses of magma influx. Bimodal distribution of grain size of phenocrysts indicates different stages of crystallization of mineral phases. At places the basalt became relatively coarser grained and magnetite is completely absent in that part. In rest of the matrix, tiny magnetites occur as disseminations. Small biotite and chlorites occur as secondary minerals within the matrix probably replacing the mafic phases.

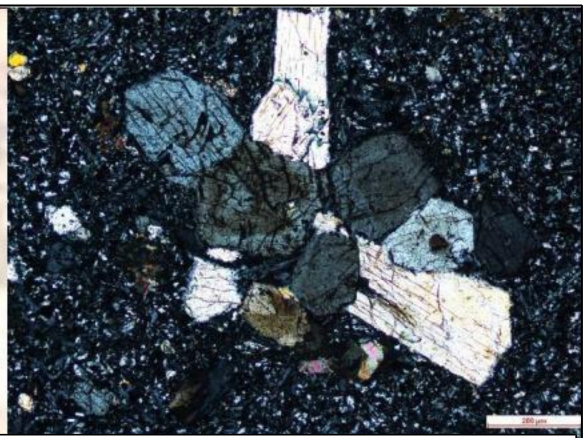


Photomicrograph 73: showing Large euhedral and fractured olivine phenocrysts; note the bimodal phenocrysts size distribution; magnetite rich matrix and phenocrysts of clinopyroxene forming star shaped cluster.

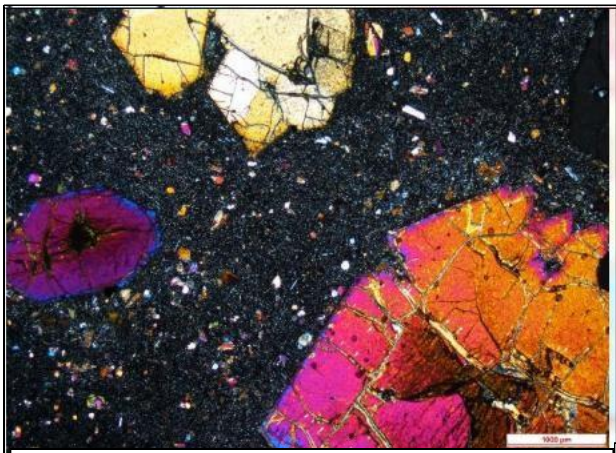
Photomicrograph 74: Large euhedral and fractured olivine phenocrysts; note the bimodal phenocrysts size distribution; magnetite rich matrix and phenocrysts of clinopyroxene forming star shaped cluster under cross polarised light



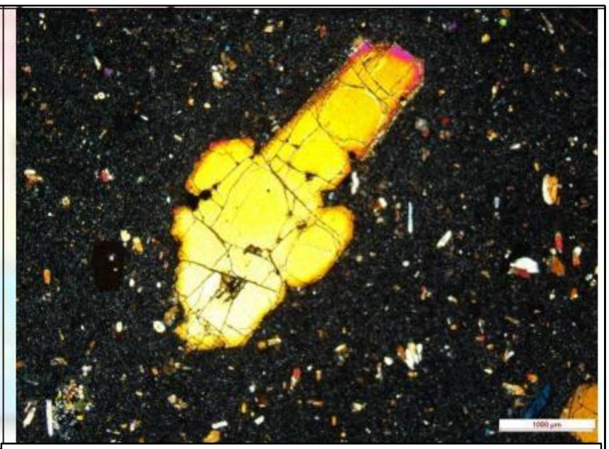
Photomicrograph 75: showing Compositional oscillatory zoning in clinopyroxene basal section indicating different pulses of magma influx



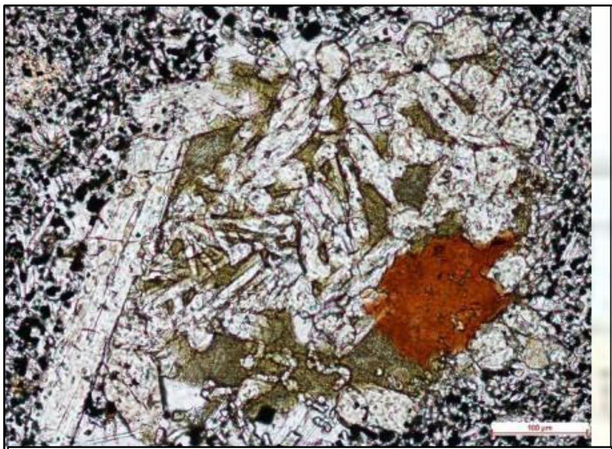
Photomicrograph 76: showing Compositional oscillatory zoning in clinopyroxene basal section indicating different pulses of magma influx



Photomicrograph 77: showing Bi-modal distribution in phenocryst's size; note the large olivine phenocrysts which crystallized early; relatively smaller pyroxene phenocryst disseminated in microlite and glassy matrix of basalt.

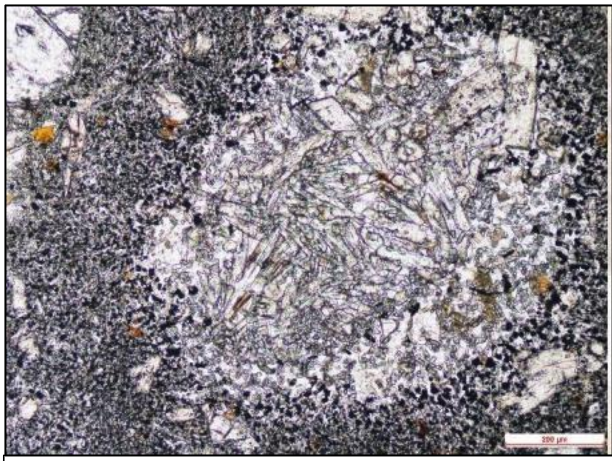


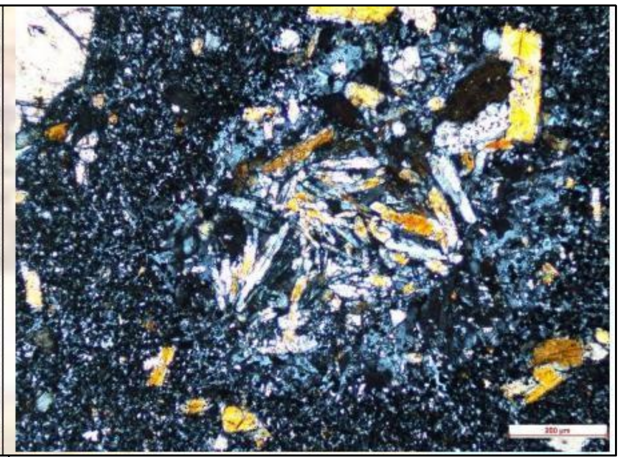
Photomicrograph 78: showing Bi-modal distribution in phenocryst's size; note the large olivine phenocrysts which crystallized early; relatively smaller pyroxene phenocrysts disseminated in microlite and glassy matrix of basalt.



Photomicrograph 79: showing Alteration of clinopyroxene phenocrysts and matrix phases by chlorite and biotite; note the magnetite concentration in matrix.

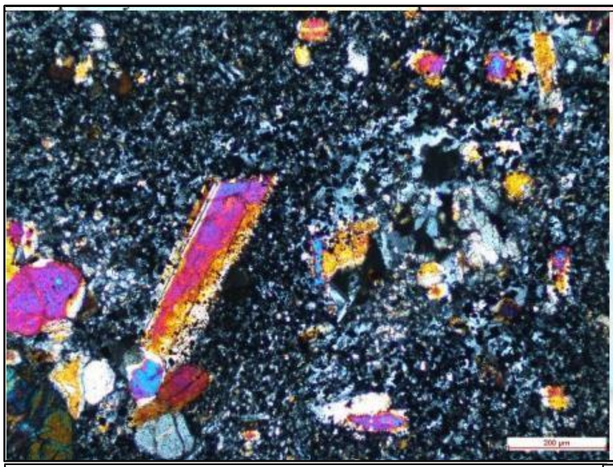
Photomicrograph 80: showing Olivine phenocryst altered along fractures by biotite; biotite also alters the matrix phases.

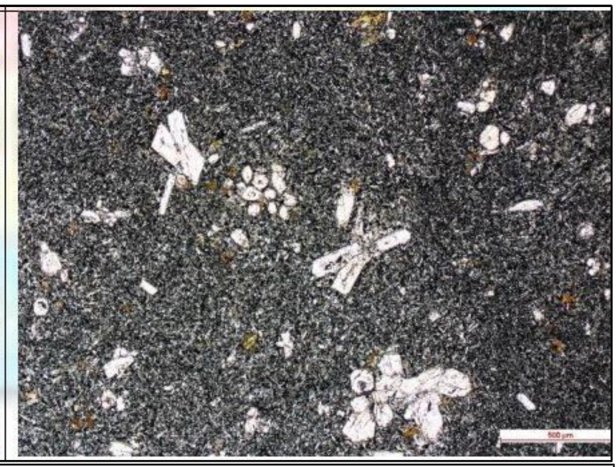




Photomicrograph 81: showing Rounded nodular part with coarser clinopyroxene and plagioclase grains; magnetite is completely absent in this coarser part.

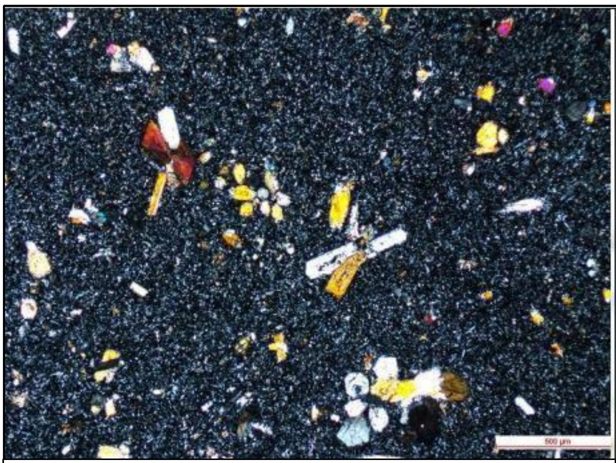
Photomicrograph 82: showing Rounded nodular part with coarser clinopyroxene and plagioclase grains; magnetite is completely absent in this coarser part under cross polarised light.



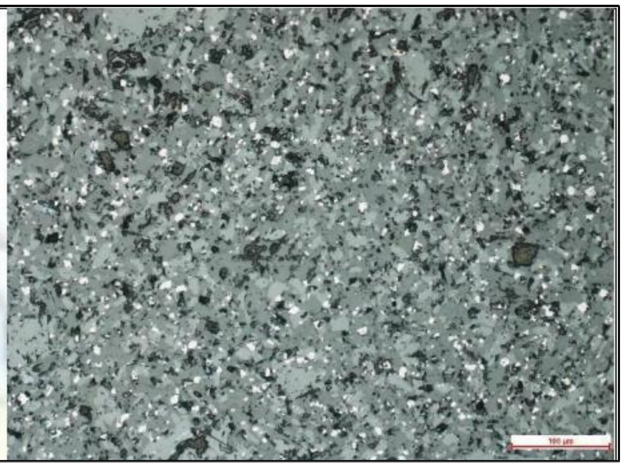


Photomicrograph 83: showing Rounded nodular part with coarser clinopyroxene and plagioclase grains; magnetite is completely absent in this coarser part under cross polarised light.

Photomicrograph 84: showing Clusters of phenocrysts within microlite and glass enriched matrix



Photomicrograph 85: showing Clusters of phenocrysts within microlite and glass en-riched matrix



Photomicrograph 86: showing Small magnetites as disseminate

Name of the rock: Porphyritic olivine basalt.

XRD Analysis:

Five samples were collected from the BRS Samples were subjected to XRD-XRF analysis for mineral characterisation.The analytical results of 5 samples indicate a silicate-rich composition dominated by SiO_2 along with Al_2O_3, Fe_2O_3, CaO, and MgO. XRD mineralogical analysis shows diopside as the dominant crystalline phase (~30–35%) along with plagioclase feldspars like andesine, labradorite and Albite (~15–20%) and minor mica and oxide minerals like aegirine, augite, jadeite, forsterite, aegirine-augite. The high proportion of diopside (pyroxene) indicates a pyroxene-rich mafic mineral assemblage. Overall, the samples represent mafic igneous rocks with basaltic to doleritic affinity showing minor alteration effects.

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Sample Code: G2803-1(CMT/011/10/2025)

Instruments: WDXRF – Bruker S8 Tiger Series 2 (4 kW); XRD – Bruker D8 Advance (1.6 kW).
2θ Scan Range: 5–80° | Crystallinity: 78.50% | Amorphous: 21.50% |

Bulk Oxides by WDXRF:

Oxide	Wt.%
Al2O3	13.62
BaO	<0.05
CaO	9.62
Cr2O3	0.06
Fe2O3	11.37
K2O	1.82
MgO	7.18
MnO	0.12
Na2O	2.35
P2O5	0.31
SiO2	51.01
SO3	<0.05
SrO	<0.05
TiO2	1.98
V2O5	<0.05
ZrO2	<0.05
HfO2	<0.05
CuO	<0.05
NiO	<0.05
PbO	<0.05
ZnO	<0.05
LOI	0.36

Mineral Phases by XRD:

Sl. No.	Mineral	Chemical Formula	XRD Wt.%	XRD Crystalline Wt % (XRD Wt% x 0.785)	Molecular Weight (g/mol)
1	Andesine (An50)	$(Na,Ca)(Al,Si)_4O_8$	23.73	18.63	266.35
2	Labradorite	$(Ca,Na)(Al,Si)_4O_8$	1.99	1.56	271.84
3	Albite	$NaAlSi_3O_8$	2.04	1.60	262.22
4	Diopside	$CaMgSi_2O_6$	42.4	33.28	216.55
5	Aegirine	$NaFeSi_2O_6$	0.46	0.36	235.99
6	Augite	$(Ca,Mg,Fe)Si_2O_6$	0.55	0.43	230.00
7	Jadeite	$NaAlSi_2O_6$	0.67	0.53	202.99
8	Forsterite	Mg_2SiO_4	0.89	0.70	140.69
9	Aegirine-augite	$(Na,Ca)(Fe,Mg)Si_2O_6$	1.39	1.09	235.00

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Sl. No.	Mineral	Chemical Formula	XRD Wt.%	XRD Crystalline Wt % (XRD Wt% x 0.785)	Molecular Weight (g/mol)
10	Magnesioferrite	$MgFe_2O_4$	0.23	0.18	199.94
11	Jacobsite	$MnFe_2O_4$	0.12	0.09	230.60
12	Pyrope	$Mg_3Al_2Si_3O_{12}$	0.33	0.26	403.11
13	Ankerite	$Ca(Fe,Mg)(CO_3)_2$	0.1	0.08	221.97
14	Muscovite-2M1	$KAl_2(AlSi_3O_{10})(OH)_2$	14.46	11.35	398.32
15	Titanite	$CaTiSiO_5$	0.64	0.50	196.99
16	Magnetite	Fe_3O_4	1.2	0.94	231.53
17	Ilmenite	$FeTiO_3$	0.43	0.34	151.71
18	Lizardite-1T	$Mg_3Si_2O_5(OH)_4$	2.34	1.84	277.11
19	Quartz	SiO_2	0.07	0.05	60.08
20	Olivine	$(Mg,Fe)_2SiO_4$	5.96	4.68	154
		Total		**78.50**	

Stoichiometric Comparison Table:

Oxides	XRF wt%	XRD wt%	Amorphous Wt%
SiO_2	51.01	43.09	7.92
Al_2O_3	13.62	12.24	1.38
FeO	11.37	2.85	8.52
MgO	7.18	7.70	-0.52
CaO	9.62	8.59	1.03
Na_2O	2.35	1.49	0.86
K_2O	1.82	1.51	0.31
TiO_2	1.98	0.33	1.65
MnO	0.12	0.05	0.07
CO_2	0.00	0.02	-0.02
H_2O	0.00	0.62	-0.62
Traces	0.93	0.00	0.93

Interpretation

The sample is 78.50% crystalline and 21.50% amorphous, indicating that most of the material is well-ordered minerals with a notable amorphous fraction. Diopside (33.28%) and Andesine (18.63%) are the dominant crystalline phases, with Muscovite (11.35%) and minor feldspars and pyroxenes present. Trace oxides (Magnetite, Ilmenite) and garnet occur in small amounts. The amorphous portion likely consists of glassy silicates or poorly crystalline clays, reflecting partial disorder or rapid cooling. Overall, the assemblage suggests a silicate-rich sample with minor accessory oxides and micas.

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Suggested minor / secondary mineral phases

The sample contains 21.50% amorphous material, primarily composed of SiO_2-rich glassy silicates (7.92%) and Fe-rich poorly crystalline oxides/hydroxides (8.87%), with minor contributions from Al_2O_3 (2.38%), CaO (1.03%), TiO_2 (1.26%), K_2O (0.50%), and MnO (0.11%).

These amorphous phases likely include:

- Glassy silicates or volcanic glass contributing to the silica fraction.
- Nanophase Fe-oxides or ferrihydrite contributing to the Fe fraction.
- Poorly crystalline aluminosilicates or clay minerals (related to Muscovite, Lizardite, or feldspars).
- Minor amorphous titanates or carbonates (from Titanite or Ankerite) contributing to TiO_2 and CaO.

Potential commercial uses

Component	Applications
Silica-rich phases (Quartz, Glass)	Glass, ceramics, silica fillers, cement, construction materials
Feldspars (Andesine, Albite, Labradorite)	Ceramics and porcelain (flux), glass manufacturing, industrial fillers
Mica (Muscovite)	Electrical insulation, heat-resistant materials, decorative fillers
Pyroxenes (Diopside, Augite, Jadeite)	Refractory materials, ceramics, steel slag additives
Olivine / Forsterite	Refractory bricks, slag conditioners, metallurgical applications
Iron & Titanium Oxides (Magnetite, Ilmenite, Titanite, Magnesioferrite)	Pigments, magnetic materials, Fe/Ti extraction, coatings
Amorphous fraction	Pozzolanic cement additive, adsorbents, catalyst supports
Garnet (Pyrope, minor)	Abrasives, waterjet cutting
Carbonates (Ankerite, minor)	Cement additives, soil conditioners
Trace oxides (BaO, SrO, V_2O_5, ZrO_2, NiO, PbO, ZnO)	Specialized industrial applications, pigments, alloy additives

Probable origin assessment

The mineral assemblage and oxide chemistry indicate a primary igneous origin, likely intermediate to mafic volcanic or hypabyssal rock, modified by secondary alteration (hydration, mica formation, and partial amorphization). The combination of crystalline feldspars and pyroxenes with 21.50 wt.% amorphous material is consistent with volcanic rocks that have experienced rapid cooling and minor hydrothermal alteration.

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Final Results:

- **Rock Type / Nature:** Mafic–intermediate silicate rock (likely Diopside–andesine–muscovite)
- **Texture and Alteration:** Partially crystalline with ~21.50wt.% amorphous content, indicating glassy or altered component.
- **Probable Origin:** Igneous (basaltic or doleritic) material subjected to slight metamorphic or metasomatic alteration.

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Stoichiometric Oxide Table

Sl. No.	Mineral	Chemical Formula	XRD Wt.%	SiO_2	Al_2O_3	Fe2O3	MgO	CaO	Na_2O	K_2O	TiO_2	MnO	CO_2	H_2O
1	Andesine (An50)	$(Na,Ca)(Al,Si)_4O_8$	18.63	8.66	6.70	0.00	0.00	2.83	0.44	0.00	0.00	0.00	0.00	0.00
2	Labradorite	$(Ca,Na)(Al,Si)_4O_8$	1.56	0.35	0.33	0.00	0.00	0.49	0.39	0.00	0.00	0.00	0.00	0.00
3	Albite	$NaAlSi_3O_8$	1.60	1.02	0.40	0.00	0.00	0.00	0.18	0.00	0.00	0.00	0.00	0.00
4	Diopside	$CaMgSi_2O_6$	33.28	23.04	0.00	0.00	5.39	4.85	0.00	0.00	0.00	0.00	0.00	0.00
5	Aegirine	$NaFeSi_2O_6$	0.36	0.13	0.00	0.07	0.00	0.00	0.16	0.00	0.00	0.00	0.00	0.00
6	Augite	$(Ca,Mg,Fe)Si_2O_6$	0.43	0.19	0.00	0.07	0.06	0.11	0.00	0.00	0.00	0.00	0.00	0.00
7	Jadeite	$NaAlSi_2O_6$	0.53	0.23	0.13	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00
8	Forsterite	Mg_2SiO_4	0.70	0.34	0.00	0.00	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	Aegirine-Augite	$(Na,Ca)(Fe,Mg)Si_2O_6$	1.09	0.46	0.00	0.22	0.11	0.15	0.15	0.00	0.00	0.00	0.00	0.00
10	Magnesioferrite	$MgFe_2O_4$	0.18	0.00	0.00	0.14	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	Jacobsite	$MnFe_2O_4$	0.09	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00
12	Pyrope	$Mg_3Al_2Si_3O_{12}$	0.26	0.09	0.09	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	Ankerite	$Ca(Fe,Mg)(CO_3)_2$	0.08	0.00	0.00	0.03	0.01	0.02	0.00	0.00	0.00	0.00	0.02	0.00
14	Muscovite-2M1	$KAl_2(AlSi_3O_{10})(OH)_2$	11.35	4.89	4.59	0.00	0.00	0.00	0.00	1.51	0.00	0.00	0.00	0.36
15	Titanite	$CaTiSiO_5$	0.50	0.22	0.00	0.00	0.00	0.14	0.00	0.00	0.14	0.00	0.00	0.00
16	Magnetite	Fe_3O_4	0.94	0.00	0.00	0.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	Ilmenite	$FeTiO_3$	0.34	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.19	0.00	0.00	0.00
18	Lizardite-1T	$Mg_3Si_2O_5(OH)_4$	1.84	0.96	0.00	0.00	0.62	0.00	0.00	0.00	0.00	0.00	0.00	0.26
19	Quartz	SiO_2	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	Olivine	$(Mg,Fe)_2SiO_4$	4.68	2.46	0.00	1.19	1.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total		**78.50**	**43.09**	**12.24**	**2.85**	**7.70**	**8.59**	**1.49**	**1.51**	**0.33**	**0.05**	**0.02**	**0.62**

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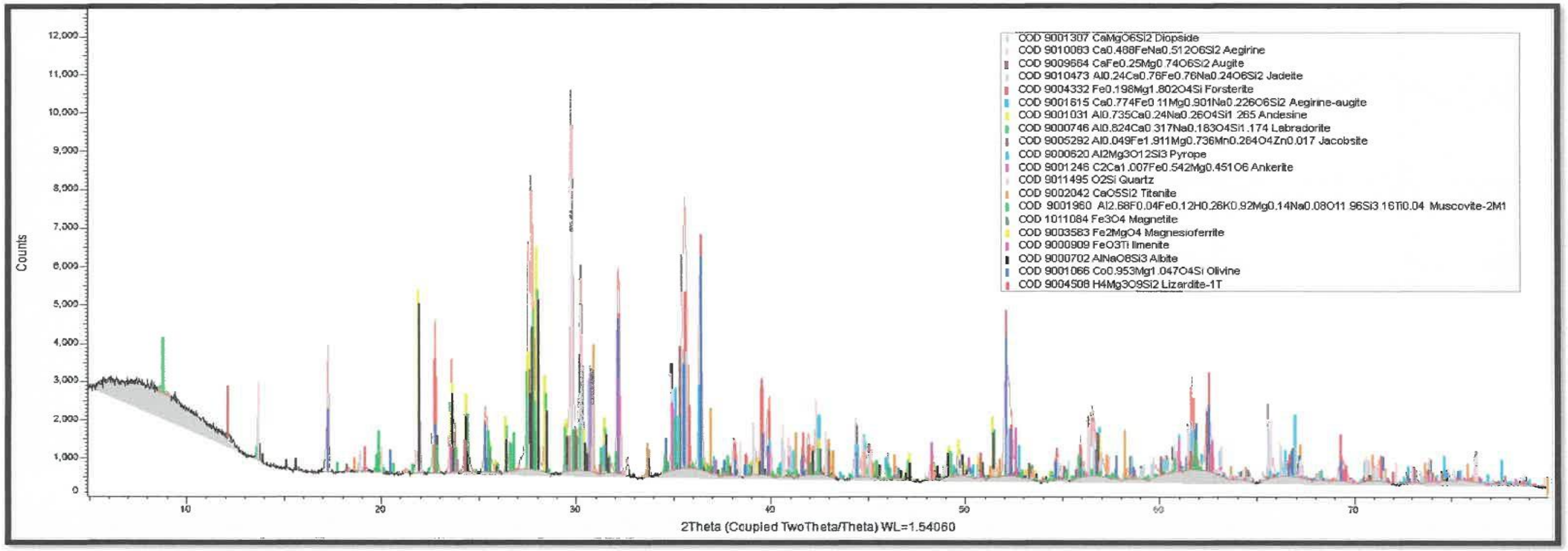
SHIVA ANALYTICALS INDIA PRIVATE LIMITED — BRUKER D8 ADVANCE XRD TEST DATA

G2803-1 — CMT/011/10/2025 — XRD Scan Report_1 of 2



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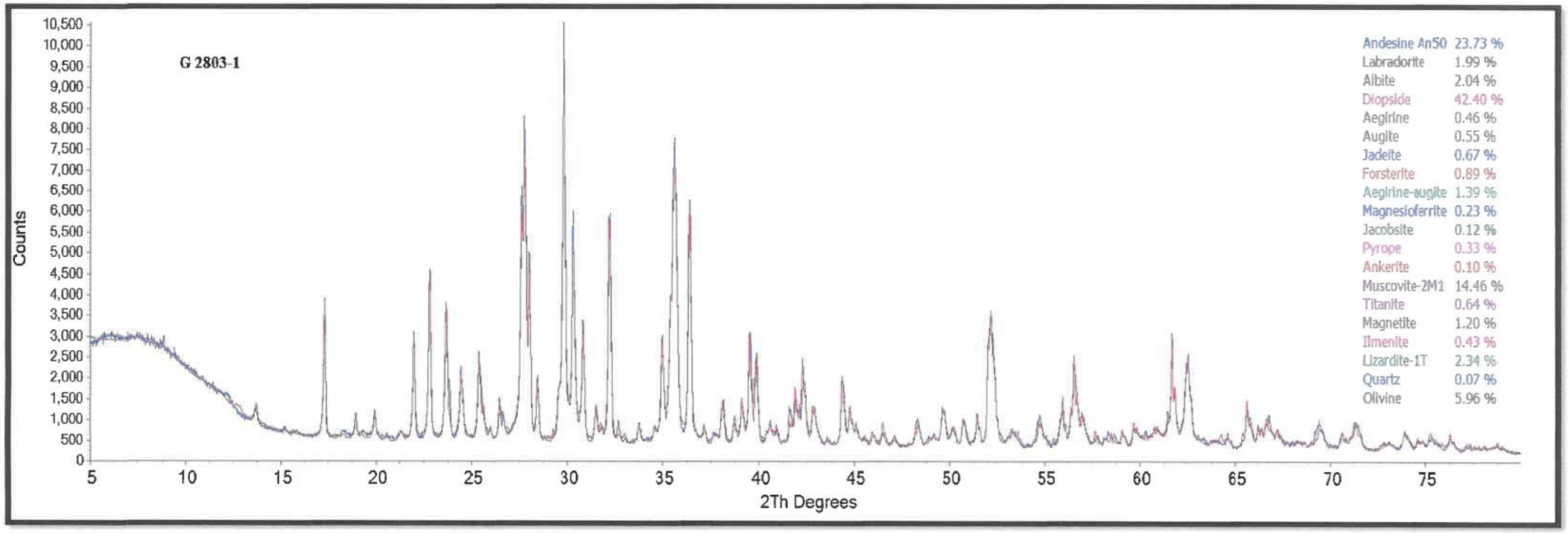
BRUKER D8 ADVANCE XRD TEST DATA

G2803-1	CMT/011/10/2025	XRD Scan Report_2 of 2



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Sample Code: G2803-2 (CMT/011/16/2025)

Instruments: WDXRF – Bruker S8 Tiger Series 2 (4 kW); XRD – Bruker D8 Advance (1.6 kW).
2θ Scan Range: 5–80° | Crystallinity: 63.70% | Amorphous: 36.30% |

Bulk Oxides by WDXRF:

Oxide	Wt.%
Al2O3	9.19
BaO	<0.05
CaO	9.29
Cr2O3	0.32
Fe2O3	12.08
K2O	0.44
MgO	20.36
MnO	0.13
Na2O	1.17
P2O5	0.19
SiO2	43.43
SO3	<0.05
SrO	<0.05
TiO2	1.54
V2O5	<0.05
ZrO2	<0.05
HfO2	<0.05
CuO	<0.05
NiO	0.11
PbO	<0.05
ZnO	<0.05
LOI	1.66

Mineral Phases by XRD:

Sl.no	Mineral Phase	Chemical Formula	XRD Wt.%	XRD Crystalline Wt % (XRD Wt.% ×0.637)	Molecular Weight (g/mol)
1	Andesine An50	$(Na,Ca)Al(Si,Al)_3O_8$	34.3	21.85	268.3
2	Labradorite	$(Ca,Na)(Al,Si)_4O_8$	2.74	1.75	271.8
3	Forsterite	Mg_2SiO_4	6.33	4.03	140.7
4	Olivine	$(Mg,Fe)_2SiO_4$	0.15	0.10	153.3
5	Diopside	$CaMgSi_2O_6$	24.00	15.29	216.6
6	Augite	$(Ca,Na)(Mg,Fe,Al)(Si,Al)_2O_6$	3.63	2.31	236.4
7	Analcime	$NaAlSi_2O_6 \cdot H_2O$	1.89	1.20	220.1

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muscovite, chlorite, antigorite, and hydrogarnet record retrogressive hydration and metamorphic overprint on the primary silicate framework.

Suggested minor/Secondary mineral phases

- Poorly ordered Mg–Fe silicate gels / proto-serpentines (serpentine-type, lizardite/antigorite precursors): Mg-rich and Fe-bearing amorphous material produced by hydration of olivine/pyroxene.
- Ferruginous amorphous oxides/hydroxides (nano-goethite, poorly crystalline ferrihydrite-like phases) resulting from oxidation of Fe^{2+}.
- Amorphous silica/silica gel (opal/cryptocrystalline SiO_2) produced during silica mobilisation and low-temperature alteration.
- Minor amorphous titanate or Ti-bearing glassy residue (accounts for the TiO_2 deficit).
- Small amounts of carbonate/organic/alkali-bearing non-crystalline phases may also be present (consistent with small Ca, Na deficits).

Potential commercial uses

Component	Application
Refractory material	Furnace linings, foundry crucibles, refractory bricks
Ceramic and glass–ceramic production	Advanced ceramics, glass–ceramic composites
Feedstock for Mg/Fe compounds	Catalysts, flame retardants, adsorbents, magnetic materials
Construction aggregate / stone ·	Dimension stone, road metal, construction aggregate
Pozzolanic / geopolymer additive	Supplementary cementitious materials, geopolymer binders
CO_2 sequestration feedstock	Carbon capture and storage (CCUS), mineral carbonation
Industrial mineral recovery	Pigments, ceramics, mineral fillers
Environmental sorbent	Heavy metal removal, wastewater treatment, soil remediation
Low-grade glass precursor	Glass manufacturing, fiber glass raw mix

Probable origin assessment

The sample most likely represents a Mg-rich, mantle-derived mafic–ultramafic protolith (high-Mg basalt to komatiite or an ultramafic cumulate) that has undergone significant post-magmatic hydrothermal/low-grade metamorphic alteration (serpentinization, chloritization, silica mobilization, local carbonation and Fe-oxidation).

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Sl.no	Mineral Phase	Chemical Formula	XRD Wt.%	(XRD Wt.% ×0.637)	Molecular Weight (g/mol)
8	Clinoenstatite	$MgSiO_3$	0.46	0.29	100.40
9	Hydrogarnet	$Ca_3Al_2(SiO_4)_{3-x}(OH)_{4x}$	0.47	0.30	377.00
10	Dolomite	$CaMg(CO_3)_2$	1.00	0.64	184.40
11	Lizardite-1T	$Mg_3Si_2O_5(OH)_4$	0.01	0.01	277.10
12	Muscovite 2M1	$KAl_2(AlSi_3O_{10})(OH)_2$	13.33	8.49	398.30
13	Quartz	SiO_2	1.37	0.87	60.10
14	Chlorite	$(Mg,Fe)_3(Si,Al)_4O_{10}(OH)_2\cdot(Mg,Fe)_3(OH)_6$	2.35	1.50	595.20
15	Canadinite	$Na_4Ca_2Si_{16}O_{38}(OH)_2\cdot10H_2O$	2.91	1.85	1407.50
16	Antigorite	$Mg_3Si_2O_5(OH)_4$	1.48	0.94	277.10
17	Fassaite	$Ca(Mg,Fe,Al)(Si,Al)_2O_6$	0.74	0.47	226.70
18	Topaz	$Al_2(SiO_4)(F,OH)_2$	0.22	0.14	182.20
19	Titanite	$CaTiSiO_5$	0.71	0.45	196.00
20	Magnetite	Fe_3O_4	1.37	0.87	231.50
21	Kaolinite	$Al_2Si_2O_5(OH)_4$	0.54	0.34	258.20
		Total	**100**	**63.70**	

Stoichiometric Comparison Table:

Oxides	XRF (wt%)	XRD crystallinity (wt%)	Amorphous (wt%)
SiO2	43.43	35.31	8.12
Al2O3	9.19	9.24	-0.05
Fe2O3	12.08	1.11	10.97
MgO	20.36	6.66	13.70
CaO	9.29	8.48	0.81
Na2O	1.17	0.82	0.35
K2O	0.44	0.40	0.04
TiO2	1.54	0.18	1.36
CO2	0.00	0.31	-0.31
F	0.00	0.02	-0.02
H2O	0.00	1.16	-1.16
Traces	2.50	0.00	2.50

Interpretation

Integrated bulk-rock chemistry and XRD data indicate a mafic–ultramafic lithology, characterized by high MgO and Fe_2O_3 contents with moderate CaO and low alkalis. The crystalline assemblage comprises plagioclase (andesine–labradorite), clinopyroxene (diopside–augite–fassaite), and forsteritic olivine, consistent with a pyroxenitic to komatiitic composition. Subordinate phases such as

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Final Results:

- The integrated WDXRF and XRD datasets indicate a compositionally Mg- and Fe-rich mafic–ultramafic rock that has undergone significant low-grade alteration.
- The bulk oxide chemistry (SiO_2 = 43.43 wt%, MgO = 20.36 wt%, Fe_2O_3 = 12.08 wt%, CaO = 9.29 wt%, Al_2O_3 = 9.19 wt%) reflects a dominantly mafic to ultramafic character with subordinate alkalis (Na_2O = 1.17 wt%, K_2O = 0.44 wt%).
- XRD mineralogical quantification reveals that the crystalline fraction (63.70 wt%) is dominated by plagioclase (andesine–labradorite; 37%), clinopyroxenes (diopside–augite–fassaite; 28%), and forsteritic olivine (6%), along with muscovite (13%), chlorite, analcime, and minor quartz and magnetite.
- These assemblages define a mineralogically evolved but compositionally primitive system, with alteration signatures evident in the presence of muscovite, chlorite, antigorite, and hydrogarnet.
- The stoichiometric balance between XRF and XRD data indicates an amorphous component of 36.31 wt%,

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Stoichiometric Oxide Table

Sl. No.	Mineral Name	Simplified Mineral Formula	XRD Wt%	SiO2	Al2O3	Fe2 O3	MgO	CaO	Na2O	K2O	TiO2	CO2	F	H2O
1	Andesine (An50)	$(Na,Ca)Al(Si,Al)_3O_8$	21.85	12.99	5.34	0.00	0.00	3.12	0.40	0.00	0.00	0.00	0.00	0.00
2	Labradorite	$(Ca,Na)(Al,Si)_4O_8$	1.75	0.92	0.52	0.00	0.00	0.21	0.10	0.00	0.00	0.00	0.00	0.00
3	Forsterite	Mg_2SiO_4	4.03	1.72	0.00	0.00	2.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Olivine	$(Mg,Fe)_2SiO_4$	0.10	0.04	0.00	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Diopside	$CaMgSi_2O_6$	15.29	8.49	0.00	0.00	2.85	3.95	0.00	0.00	0.00	0.00	0.00	0.00
6	Augite	$(Ca,Na)(Mg,Fe,Al)(Si,Al)_2O_6$	2.31	1.15	0.22	0.15	0.26	0.48	0.05	0.00	0.00	0.00	0.00	0.00
7	Analcime	$NaAlSi_2O_6{\cdot}H_2O$	1.20	0.66	0.28	0.00	0.00	0.00	0.16	0.00	0.00	0.00	0.00	0.10
8	Clinoenstatite	$MgSiO_3$	0.29	0.17	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	Hydrogarnet	$Ca_3Al_2(SiO_4)_{3-x}(OH)_{4x}$	0.30	0.08	0.07	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.03
10	Dolomite	$CaMg(CO_3)_2$	0.64	0.00	0.00	0.00	0.14	0.19	0.00	0.00	0.00	0.31	0.00	0.00
11	Lizardite01T	$Mg_3Si_2O_5(OH)_4$	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
12	Muscovite02M1	$KAl_2(AlSi_3O_{10})(OH)_2$	8.49	5.36	2.35	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.38
13	Quartz	SiO_2	0.87	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	Chlorite	$(Mg,Fe)_3(Si,Al)_4O_{10}(OH)_2{\cdot}(Mg,Fe)_3(OH)_6$	1.50	0.64	0.10	0.08	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.18
15	Canadinite	$Na_4Ca_2Si_{16}O_{38}(OH)_2{\cdot}10H_2O$	1.85	1.32	0.00	0.00	0.00	0.15	0.11	0.00	0.00	0.00	0.00	0.27
16	Antigorite	$Mg_3Si_2O_5(OH)_4$	0.94	0.41	0.00	0.00	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.12
17	Fassaite	$Ca(Mg,Fe,Al)(Si,Al)_2O_6$	0.47	0.13	0.19	0.00	0.02	0.13	0.00	0.00	0.00	0.00	0.00	0.00
18	Topaz	$Al_2(SiO_4)(F,OH)_2$	0.14	0.06	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02
19	Titanite	$CaTiSiO_5$	0.45	0.14	0.00	0.00	0.00	0.13	0.00	0.00	0.18	0.00	0.00	0.00
20	Magnetite	Fe_3O_4	0.87	0.00	0.00	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	Kaolinite	$Al_2Si_2O_5(OH)_4$	0.34	0.16	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
			63.70	**35.31**	**9.24**	**1.11**	**6.66**	**8.48**	**0.82**	**0.40**	**0.18**	**0.31**	**0.02**	**1.16**

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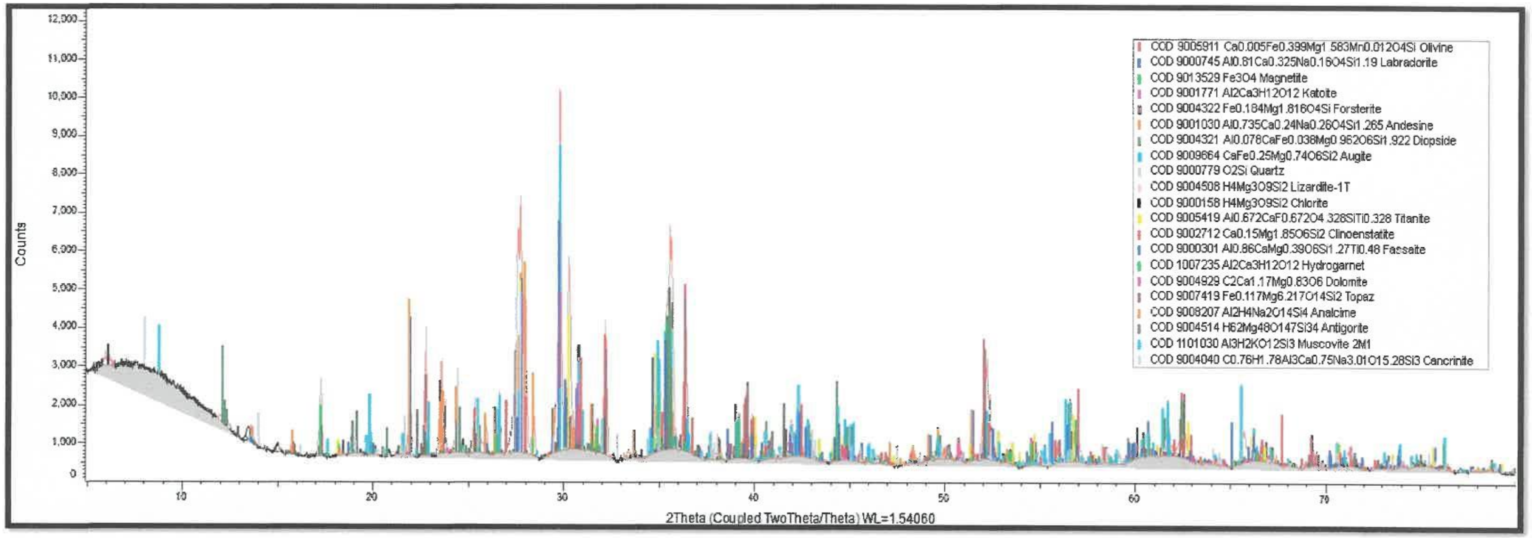
BRUKER D8 ADVANCE XRD TEST DATA

G2803-2	CMT/011/16/2025	XRD Scan Report_1 of 2



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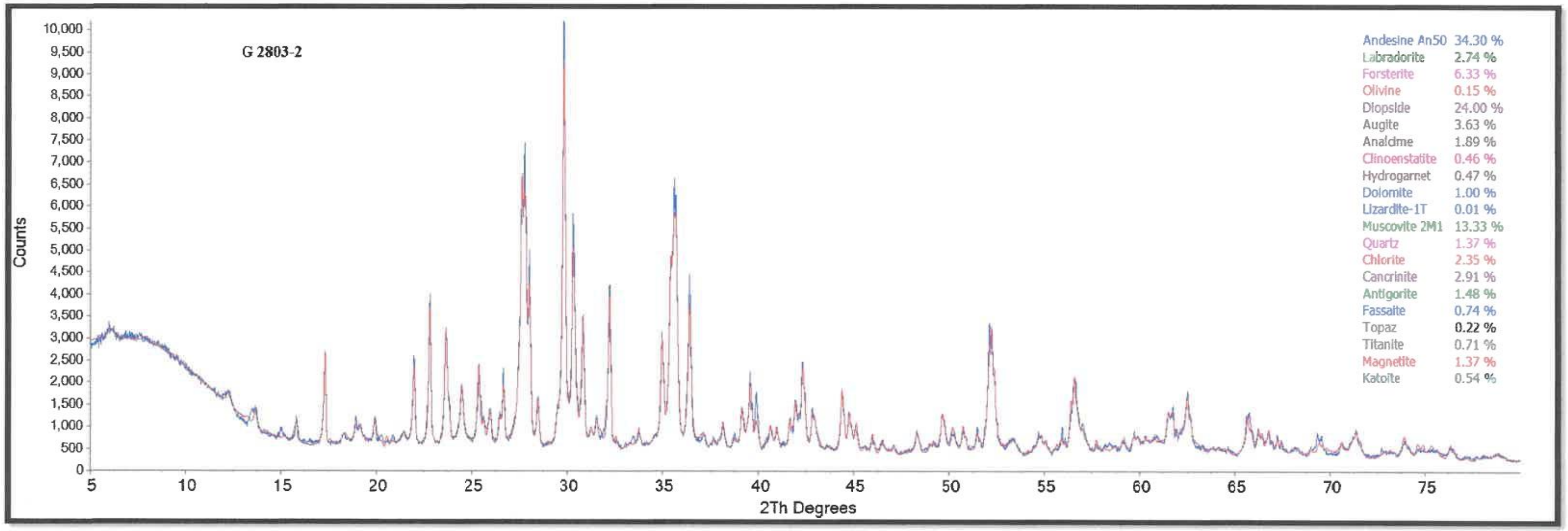
BRUKER D8 ADVANCE XRD TEST DATA

G2803-2	CMT/011/16/2025	XRD Scan Report_2 of 2



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Sample Code: G2803-3(CMT/011/29/2025)

Instruments: WDXRF – Bruker S8 Tiger Series 2 (4 kW); XRD – Bruker D8 Advance (1.6 kW).
2θ Scan Range: 5–80° | Crystallinity: 64.20% | Amorphous: 35.80% |

Bulk Oxides by WDXRF:

Oxide	Wt.%
Al2O3	10.34
BaO	<0.05
CaO	10.24
Cr2O3	0.24
Fe2O3	11.83
K2O	0.62
MgO	16.07
MnO	0.12
Na2O	1.49
P2O5	0.21
SiO2	43.92
SO3	<0.05
SrO	<0.05
TiO2	1.61
V2O5	<0.05
ZrO2	<0.05
HfO2	<0.05
CuO	<0.05
NiO	0.09
PbO	<0.05
ZnO	<0.05
LOI	3.04

Mineral Phases by XRD:

Sl.no	Mineral Phase	Chemical Formula	XRD Wt.%	XRD Crystalline Wt % (XRD Wt.% ×0.642)	Molecular Weight (g/mol)
1	Diopside	$CaMgSi_2O_6$	4.96	3.18	216.55
2	Hedenbergite	$CaFeSi_2O_6$	1.78	1.14	248.09
3	Aegirine	$NaFeSi_2O_6$	0.64	0.41	231.00
4	Augite	$(Ca,Na)(Mg,Fe)Si_2O_6$	10.87	6.98	236.35
5	Olivine	$(Mg,Fe)_2SiO_4$	0.8	0.51	153.31
6	Enstatite	$MgSiO_3$	3.06	1.96	100.39
7	Pigeonite	$(Ca,Mg,Fe)Si_2O_6$	2.7	1.73	226.50

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Sl.no	Mineral Phase	Chemical Formula	XRD Wt.%	(XRD Wt.% ×0.642)	Molecular Weight (g/mol)
8	Labradorite	$(Ca,Na)(Al,Si)_4O_8$	19.86	12.75	271.81
9	Andesine An50	$(Na,Ca)(Al,Si)_4O_8$	11.89	7.63	268.62
10	Forsterite	Mg_2SiO_4	2.84	1.82	140.69
11	Chayesite	$K(Mg,Fe)_4Fe^{3+}Si_{12}O_{30}$	3.66	2.35	1040.72
12	Chlorite	$(Mg,Fe)_3(Si,Al)_4O_{10}(OH)_8$	4.84	3.11	595.22
13	Analcime	$NaAlSi_2O_6{\cdot}H_2O$	2.57	1.65	220.15
14	Magnetite	Fe_3O_4	0.72	0.46	231.53
15	Magnesioferrite	$MgFe_2O_4$	0.68	0.44	200.00
16	Titanite	$CaTiSiO_5$	2.89	1.86	197.76
17	Hydrogarnet	$Ca_3Al_2(SiO_4)_{3-x}(OH)_{4x}$	1.85	1.19	414.37
18	Lizardite	$Mg_3Si_2O_5(OH)_4$	0.6	0.39	277.11
19	Antigorite	$Mg_3Si_2O_5(OH)_4$	4.13	2.65	300.77
20	Phillipsite-Ca	$Ca_3(Si_{10}Al_6)O_{32}{\cdot}12H_2O$	2.15	1.38	1043.9
21	Illite	$KAl_2(Si_3Al)O_{10}(OH)_2$	12.46	8.00	398.31
22	Quartz	SiO_2	4.05	2.60	60.08
Total			**100**	**64.20**	

Stoichiometric Comparison Table:

Oxides	XRF (wt%)	XRD crystallinity (wt%)	Amorphous (wt%)
SiO2	43.92	30.63	13.29
Al2O3	10.34	8.89	1.45
Fe_2O_3	11.83	3.38	8.45
MgO	16.07	9.17	6.90
CaO	10.24	6.35	3.89
Na2O	1.49	1.18	0.31
K2O	0.62	1.04	-0.42
TiO2	1.61	0.72	0.89
H2O	0.00	2.83	-2.83
Traces	3.88	0.00	3.88

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Interpretation

- Bulk geochemistry reveals dominance of SiO_2 (43.92 wt%), MgO (16.07 wt%), Fe_2O_3 (11.83 wt%), and CaO (10.24 wt%), with minor alkalis (Na_2O 1.49 wt%, K_2O 0.62 wt%) and trace oxides.
- XRD identifies primary crystalline phases dominated by plagioclase (Labradorite 19.86 wt%, Andesine 11.89 wt%) and clinopyroxenes (Augite 10.87 wt%, Diopside 4.96 wt%), alongside olivine, enstatite, and minor titanite.
- Secondary hydrous minerals, including serpentine-group phases (Antigorite, Lizardite), chlorite, chayesite, phillipsite, and illite, account for alteration features.
- Stoichiometric comparison between XRF and XRD indicates 35.80 wt% of the sample is amorphous or poorly crystalline, particularly enriched in Fe and Mg, reflecting post-magmatic hydration and minor oxidation.
- The data suggest a mafic-ultramafic protolith that has undergone low-grade metamorphic alteration, with primary igneous minerals partially preserved. These findings provide insights into the mineralogical evolution, alteration processes, and potential secondary mineral formation in Mg- and Fe-rich silicate rocks.

Suggested minor/Secondary mineral phases

- The sample contains a significant amorphous fraction (35.80 wt%), representing non-crystalline or poorly crystalline material.
- This fraction is enriched in SiO_2, Fe_2O_3, MgO, and CaO, reflecting contributions from glassy silicates, secondary Fe-oxides, and hydrous Mg-Ca silicates such as serpentine and chlorite.
- The presence of these amorphous phases indicates post-magmatic alteration and low-grade hydration, consistent with the observed LOI of 3.04 wt%.

Potential commercial uses

Mineral / Oxide	Potential Commercial Uses
MgO / Olivine / Serpentine / Chlorite	Refractories, Mg metal and MgO production, CO_2 sequestration, ceramics
CaO / Plagioclase / Diopside / Titanite	Cement and lime production, glass and ceramic raw materials
SiO_2 / Quartz / Amorphous silica	Glass manufacture, fillers in polymers and paints, and catalyst supports
Fe_2O_3 / Magnetite / Magnesioferrite	Iron pigments, minor iron extraction, and catalysts
Na_2O / K_2O / Feldspars (Andesine, Labradorite)	Ceramics, glass, industrial fillers
Hydrous / Clay minerals (Illite, Phillipsite, Hydrogarnet)	Ceramics, soil conditioners, zeolite applications, and lightweight aggregates
Trace / Minor oxides (TiO_2, ZrO_2, etc.)	Pigments, catalyst supports, specialty ceramics

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Probable origin assessment

The sample is derived from a mafic-ultramafic igneous protolith, dominated by plagioclase and pyroxenes. Subsequent low-grade hydrothermal alteration produced hydrous minerals (serpentine, chlorite, phillipsite, illite) and a significant amorphous fraction (35.80 wt%), reflecting hydration and partial oxidation. Overall, it represents a magmatic rock modified by secondary alteration processes.

Final Results:

- Bulk Geochemistry: The sample is mafic-ultramafic, dominated by SiO_2 (43.92 wt%), MgO (16.07 wt%), Fe_2O_3 (11.83 wt%), and CaO (10.24 wt%), with minor Na_2O, K_2O, and trace elements. LOI (3.04 wt%) indicates water in hydrous phases
- Primary Mineralogy (XRD): Dominated by plagioclase feldspars (Labradorite, Andesine) and clinopyroxenes (Augite, Diopside, Hedenbergite), along with olivine, enstatite, and minor titanite, confirming a magmatic origin.
- Secondary Minerals and Hydrous Phases: Presence of serpentine-group minerals (Antigorite, Lizardite), chlorite, chayesite, phillipsite, illite, and hydrogarnet reflects post-magmatic alteration, including hydration and low-grade metamorphism.
- Amorphous Fraction: Approximately 37.6 wt% of the sample is amorphous, enriched in Si, Fe, Mg, and Ca, likely comprising glassy silicates, secondary Fe-oxides, and hydrous Mg-Ca silicates, indicating element mobility during alteration.
- The rock is a primary mafic-ultramafic igneous protolith modified by serpentinization, chloritization, and clay formation.

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Stoichiometric Oxide Table

Mineral Name	Chemical Formula	XRD wt%	SiO2	Al2O3	Fe_2O_3	MgO	CaO	Na2O	K2O	TiO2	H2O
Diopside	$CaMgSi_2O_6$	3.18	1.76	0.00	0.00	0.59	0.83	0.00	0.00	0.00	0.00
Hedenbergite	$CaFeSi_2O_6$	1.14	0.51	0.00	0.32	0.00	0.31	0.00	0.00	0.00	0.00
Aegirine	$NaFeSi_2O_6$	0.41	0.22	0.00	0.13	0.00	0.00	0.06	0.00	0.00	0.00
Augite	$(Ca,Na)(Mg,Fe)Si_2O_6$	6.98	0.49	0.00	0.58	3.65	2.16	0.10	0.00	0.00	0.00
Olivine	$(Mg,Fe)_2SiO_4$	0.51	0.21	0.00	0.05	0.25	0.00	0.00	0.00	0.00	0.00
Enstatite	$MgSiO_3$	1.96	1.18	0.00	0.00	0.78	0.00	0.00	0.00	0.00	0.00
Pigeonite	$(Ca,Mg,Fe)Si_2O_6$	1.73	0.94	0.00	0.22	0.31	0.26	0.00	0.00	0.00	0.00
Labradorite	$(Ca,Na)(Al,Si)_4O_8$	12.75	7.88	3.76	0.00	0.00	0.76	0.35	0.00	0.00	0.00
Andesine An50	$(Na,Ca)(Al,Si)_4O_8$	7.63	4.24	2.15	0.00	0.00	0.81	0.43	0.00	0.00	0.00
Forsterite	Mg_2SiO_4	1.82	0.74	0.00	0.00	1.08	0.00	0.00	0.00	0.00	0.00
Chayesite	$K(Mg,Fe)_4Fe^{3+}Si_{12}O_{30}$	2.35	1.05	0.00	0.92	0.15	0.00	0.00	0.23	0.00	0.00
Chlorite	$(Mg,Fe)_3(Si,Al)_4O_{10}(OH)_8$	3.11	0.98	0.56	0.35	0.94	0.00	0.00	0.00	0.00	0.28
Analcime	$NaAlSi_2O_6 \cdot H_2O$	1.65	0.90	0.39	0.00	0.00	0.00	0.24	0.00	0.00	0.12
Magnetite	Fe_3O_4	0.46	0.00	0.00	0.46	0.00	0.00	0.00	0.00	0.00	0.00
Magnesioferrite	$MgFe_2O_4$	0.44	0.00	0.00	0.35	0.09	0.00	0.00	0.00	0.00	0.00
Titanite	$CaTiSiO_5$	1.86	0.58	0.00	0.00	0.00	0.56	0.00	0.00	0.72	0.00
Hydrogarnet	$Ca_3Al_2(SiO_4)_{3-x}(OH)_{4x}$	1.19	0.31	0.28	0.00	0.00	0.47	0.00	0.00	0.00	0.13
Lizardite	$Mg_3Si_2O_5(OH)_4$	0.39	0.17	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.05
Antigorite	$Mg_3Si_2O_5(OH)_4$	2.65	1.16	0.00	0.00	1.16	0.00	0.00	0.00	0.00	0.33
Phillipsite-Ca	$Ca_3(Si_{10}Al_6)O_{32} \cdot 12H_2O$	1.38	0.61	0.18	0.00	0.00	0.19	0.00	0.00	0.00	0.40
Illite	$KAl_2(Si_3Al)O_{10}(OH)_2$	8.00	4.10	1.57	0.00	0.00	0.00	0.00	0.81	0.00	1.52
Quartz	SiO_2	2.60	2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		**64.20**	**30.63**	**8.89**	**3.38**	**9.17**	**6.35**	**1.18**	**1.04**	**0.72**	**2.83**

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Verified by: Satyanarayana

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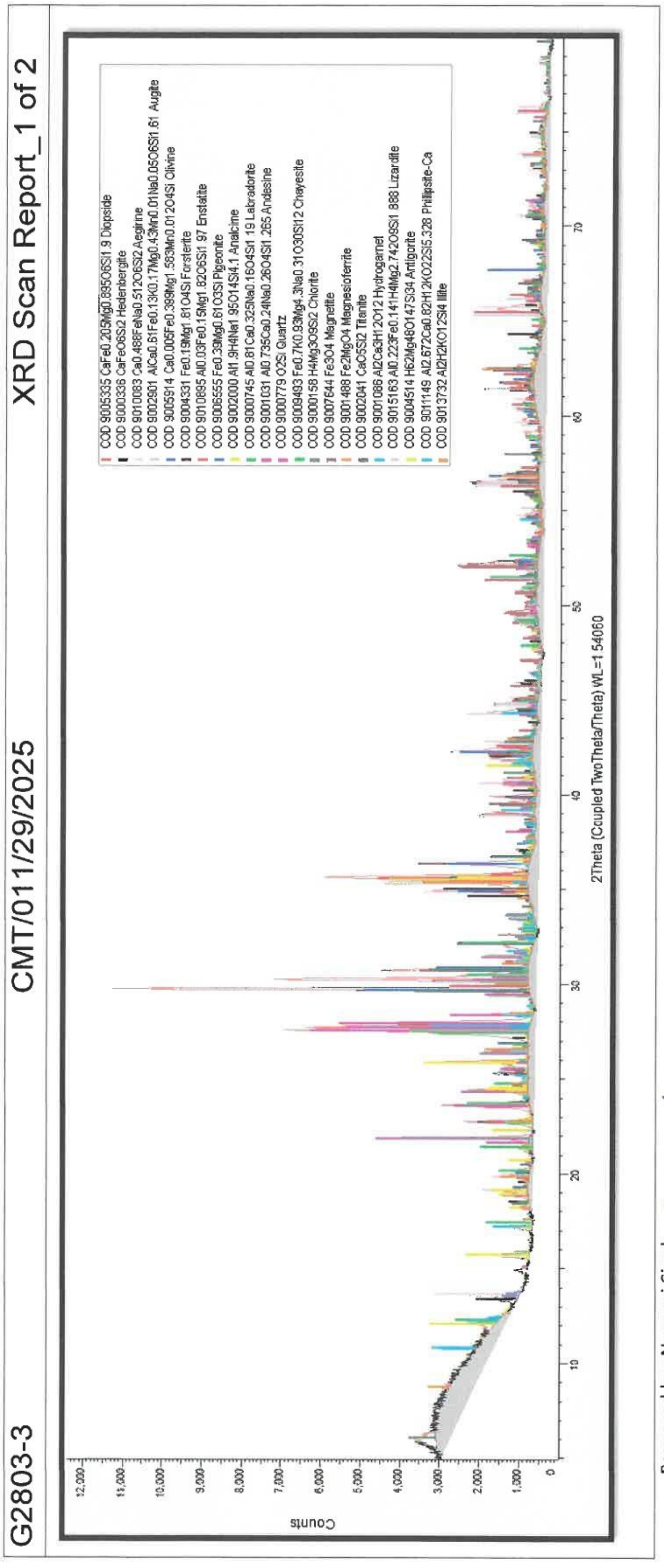

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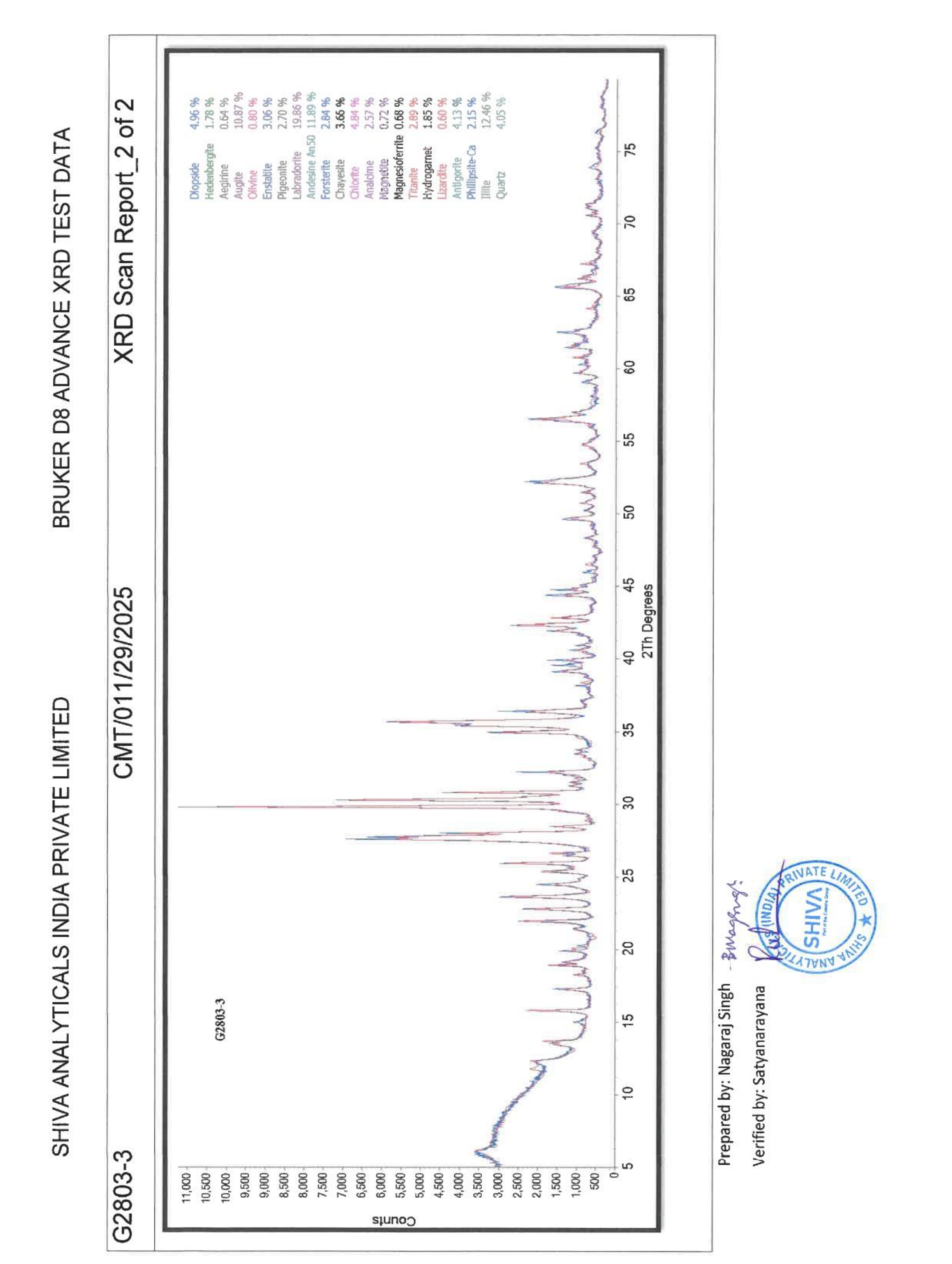
SHIVA ANALYTICALS INDIA PRIVATE LIMITED
BRUKER D8 ADVANCE XRD TEST DATA
G2803-3
CMT/011/29/2025
XRD Scan Report_2 of 2
G2803-3
Diopside 4.96 %
Hedenbergite 1.78 %
Aegirine 0.64 %
Augite 10.87 %
Olivine 0.80 %
Enstatite 3.06 %
Pigeonite 2.70 %
Labradorite 19.86 %
Andesine An50 11.89 %
Forsterite 2.84 %
Chayesite 3.66 %
Chlorite 4.84 %
Analcime 2.57 %
Magnetite 0.72 %
Magnesioferrite 0.68 %
Titanite 2.89 %
Hydrogarnet 1.85 %
Lizardite 0.60 %
Antigorite 4.13 %
Phillipsite-Ca 2.15 %
Illite 12.46 %
Quartz 4.05 %
Counts
2Th Degrees
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Sample Code: G2803-4 (CMT/011/75/2025)

Instruments: WDXRF – Bruker S8 Tiger Series 2 (4 kW); XRD – Bruker D8 Advance (1.6 kW).
2θ Scan Range: 5–80° | Crystallinity: 68.40% | Amorphous: 31.60% |

Bulk Oxides by WDXRF:

Oxide	Wt.%
Al2O3	12.05
BaO	<0.05
CaO	11.41
Cr2O3	0.16
Fe2O3	12.11
K2O	0.77
MgO	13.03
MnO	0.10
Na2O	1.89
P2O5	0.27
SiO2	45.26
SO3	<0.05
SrO	<0.05
TiO2	2.00
V2O5	<0.05
ZrO2	<0.05
HfO2	<0.05
CuO	<0.05
NiO	0.06
PbO	<0.05
ZnO	<0.05
LOI	0.74

Mineral Phases by XRD:

Sl.no	Mineral Phase	Chemical Formula	XRD Wt.%	XRD Crystalline Wt % (XRD Wt.% ×0.684)	Molecular Weight (g/mol)
1	Diopside	$CaMgSi_2O_6$	0.73	0.50	216.55
2	Hedenbergite	$CaFeSi_2O_6$	24.67	16.87	248.09
3	Augite	$(Ca,Mg,Fe)Si_2O_6$	0.38	0.26	236.35
4	Forsterite	Mg_2SiO_4	6.54	4.47	140.69
5	Qandilite	Mg_2TiO_4	0.55	0.38	179.98
6	Hydrogarnet	$Ca_3Al_2(OH)_{12}$	1.04	0.71	358.30
7	Aegirine augite	$(Na,Ca)(Fe,Mg)Si_2O_6$	0.27	0.18	239.50
9	Anorthite	$CaAl_2Si_2O_8$	3.6	2.46	278.21

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Sl.no	Mineral Phase	Chemical Formula	XRD Wt.%	(XRD Wt.% ×0.684)	Molecular Weight (g/mol)
10	Chromite	$FeCr_2O_4$	0.46	0.31	223.84
11	Quartz	SiO_2	2.24	1.53	60.08
12	Ankerite	$Ca(Fe,Mg)(CO_3)_2$	0.48	0.33	206.39
13	Muscovite 2M1	$KAl_2(AlSi_3O_{10})(OH)_2$	1.9	1.30	398.30
14	Clinochlore	$(Mg,Fe)_5Al(Si_3Al)O_{10}(OH)_8$	6.63	4.53	595.22
15	Lizardite-1T	$Mg_3Si_2O_5(OH)_4$	8.54	5.84	277.11
16	Periclase	MgO	0.72	0.49	40.30
17	Fassaite	$(Ca,Mg,Al)(Si,Al)_2O_6$	0.71	0.49	236.35
18	Labradorite An65	$(Ca,Na)(Al,Si)_4O_8$	10.29	7.04	271.81
19	Magnetite	Fe_3O_4	5.14	3.52	231.53
20	Aegirine	$NaFeSi_2O_6$	0.87	0.60	231.00
21	Jadeite	$NaAlSi_2O_6$	0.19	0.13	201.20
22	Phlogopite	$KMg_3(AlSi_3O_{10})(OH)_2$	1.08	0.74	419.25
23	Andesine An50	$(Na,Ca)(Al,Si)_4O_8$	22.97	15.71	268.62
Total			**100**	**68.40**	

Stoichiometric Comparison Table:

Oxides	XRF (wt%)	XRD crystallinity (wt%)	Amorphous (wt%)
SiO2	45.26	30.26	15.00
Al2O3	12.05	9.16	2.89
Fe2O3	12.11	9.33	2.78
MgO	13.03	7.49	5.54
CaO	11.41	8.59	2.82
Na2O	1.89	1.34	0.55
K2O	0.77	0.18	0.59
TiO2	2.00	0.25	1.75
Cr2O3	0.16	0.11	0.05
CO2	0.00	0.15	-0.15
H2O	0.00	1.53	-1.53
Traces	1.32	0.00	1.32

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Interpretation

- The analyzed sample is a mafic-ultramafic rock characterized by high SiO_2 (45.26%), MgO (13.03%), Fe_2O_3 (12.11%), CaO (11.41%), and Al_2O_3 (12.05%), with minor alkalis and trace elements indicating a plagioclase and Ca-pyroxene-rich composition.
- XRD analysis reveals dominant Hedenbergite, Diopside, Forsterite, Labradorite, and Andesine, along with secondary hydrous and alteration phases such as Clinochlore, Lizardite, Phlogopite, Hydrogarnet, and Ankerite, reflecting low-grade hydrothermal or metamorphic overprint.
- The rock exhibits partial crystallinity with a significant amorphous fraction particularly in SiO_2, MgO, TiO_2, and Fe_2O_3, suggesting the presence of fine-grained or glassy silicates from rapid cooling or alteration. Minor accessory phases, including magnetite, chromite, and Ti-bearing minerals, host trace metals like Cr, V, and Ni.
- Overall, the sample represents a partially crystalline, plagioclase- and pyroxene-dominated mafic-ultramafic rock with evidence of secondary alteration and significant amorphous material

Suggested minor/Secondary mineral phases

The amorphous fraction is primarily glassy interstitial silicates with secondary alteration products (serpentine, chlorite, hydrogarnet) and minor Ti/Fe-bearing phases.

Potential commercial uses

Component	Application
High MgO	Forsterite and pyroxenes provide high-temperature stability for furnace linings and refractory bricks
High CaO	Calcium-rich phases like plagioclase and ankerite can react with CO_2 for mineral carbonation
High SiO_2 and Al_2O_3	Suitable for ceramic tiles, porcelain, and specialty glass production
Pyroxene, Olivine, Diopside	Hard silicate minerals can be ground for abrasive powders or fillers in construction and polymers
Forsterite, Clinochlore	Mg-bearing minerals can be processed to obtain magnesium oxide or other Mg-based products

Probable origin assessment

The sample likely represents a mafic-ultramafic cumulate formed from a mantle-derived, Mg- and Ca-rich magma, as indicated by dominant Ca-pyroxenes, plagioclase, and forsterite. The significant amorphous fraction (31.60%) suggests rapid cooling or partial devitrification, while the presence of clinochlore, lizardite, hydrogarnet, and ankerite points to low-grade hydrothermal or metamorphic alteration. Minor spinel and Fe-Ti oxides hosting Cr, Ni, and Ti indicate crystallization from a metal-bearing mafic melt.

Final Results

- Rock Type and Composition: The sample is a mafic-ultramafic rock, rich in SiO_2 (45.26%), MgO (13.03%), Fe_2O_3 (12.11%), CaO (11.41%), and Al_2O_3 (12.05%), dominated by Ca-pyroxenes, plagioclase, and forsterite.

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- Crystallinity and Amorphous Content: XRD shows partial crystallinity (68.40%) with a significant amorphous fraction (31.60%), mainly consisting of glassy silicates and poorly crystalline Mg-, Fe-, and Ti-bearing phases.
- Secondary/Alteration Phases: Presence of clinochlore, lizardite, hydrogarnet, and ankerite indicates low-grade hydrothermal or metamorphic alteration.
- Accessory Minerals: Minor spinel, magnetite, and Fe-Ti oxides host trace metals like Cr, Ni, Ti, and V, reflecting a metal-bearing mafic melt origin.
- The rock likely formed as a mantle-derived mafic-ultramafic cumulate with subsequent alteration

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Stoichiometric Oxide Table

Mineral Name	Mineral Formula	XRD	SiO2	Al2O3	Fe2O3	MgO	CaO	Na2O	K2O	TiO2	Cr2O3	CO2	H2O
Diopside	$CaMgSi_2O_6$	0.50	0.28	0.00	0.00	0.09	0.13	0.00	0.00	0.00	0.00	0.00	0.00
Hedenbergite	$CaFeSi_2O_6$	16.87	7.54	0.00	4.77	0.00	4.56	0.00	0.00	0.00	0.00	0.00	0.00
Augite	$(Ca,Mg,Fe)Si_2O_6$	0.26	0.10	0.00	0.06	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00
Forsterite	Mg_2SiO_4	4.47	1.91	0.00	0.00	2.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Qandilite	Mg_2TiO_4	0.38	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.25	0.00	0.00	0.00
Hydrogarnet	$Ca_3Al_2(OH)_{12}$	0.71	0.00	0.24	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.07
Aegirine augite	$(Na,Ca)(Fe,Mg)Si_2O_6$	0.18	0.11	0.00	0.04	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00
Anorthite	$CaAl_2Si_2O_8$	2.46	1.07	0.81	0.00	0.00	0.58	0.00	0.00	0.00	0.00	0.00	0.00
Chromite	$FeCr_2O_4$	0.31	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00
Quartz	SiO_2	1.53	1.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ankerite	$Ca(Fe,Mg)(CO_3)_2$	0.33	0.00	0.00	0.05	0.07	0.06	0.00	0.00	0.00	0.00	0.15	0.00
Muscovite 2M1	$KAl_2(AlSi_3O_{10})(OH)_2$	1.30	0.60	0.45	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.15
Clinochlore	$(Mg,Fe)_5Al(Si_3Al)O_{10}(OH)_8$	4.53	1.35	0.78	0.50	1.37	0.00	0.00	0.00	0.00	0.00	0.00	0.53
Lizardite01T	$Mg_3Si_2O_5(OH)_4$	5.84	2.55	0.00	0.00	2.55	0.00	0.00	0.00	0.00	0.00	0.00	0.74
Periclase	MgO	0.49	0.00	0.00	0.00	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fassaite	$(Ca,Mg,Al)(Si,Al)_2O_6$	0.49	0.14	0.20	0.00	0.02	0.13	0.00	0.00	0.00	0.00	0.00	0.00
Labradorite An65	$(Ca,Na)(Al,Si)_4O_8$	7.04	3.65	2.05	0.00	0.00	1.04	0.30	0.00	0.00	0.00	0.00	0.00
Magnetite	Fe_3O_4	3.52	0.00	0.00	3.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aegirine	$NaFeSi_2O_6$	0.60	0.31	0.00	0.19	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00
Jadeite	$NaAlSi_2O_6$	0.13	0.05	0.03	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00
Phlogopite	$KMg_3(AlSi_3O_{10})(OH)_2$	0.74	0.33	0.14	0.00	0.15	0.00	0.00	0.08	0.00	0.00	0.00	0.04
Andesine An50	$(Na,Ca)(Al,Si)_4O_8$	15.71	8.74	4.46	0.00	0.00	1.63	0.88	0.00	0.00	0.00	0.00	0.00
	Total	**68.40**	**30.26**	**9.16**	**9.33**	**7.49**	**8.59**	**1.34**	**0.18**	**0.25**	**0.11**	**0.15**	**1.53**

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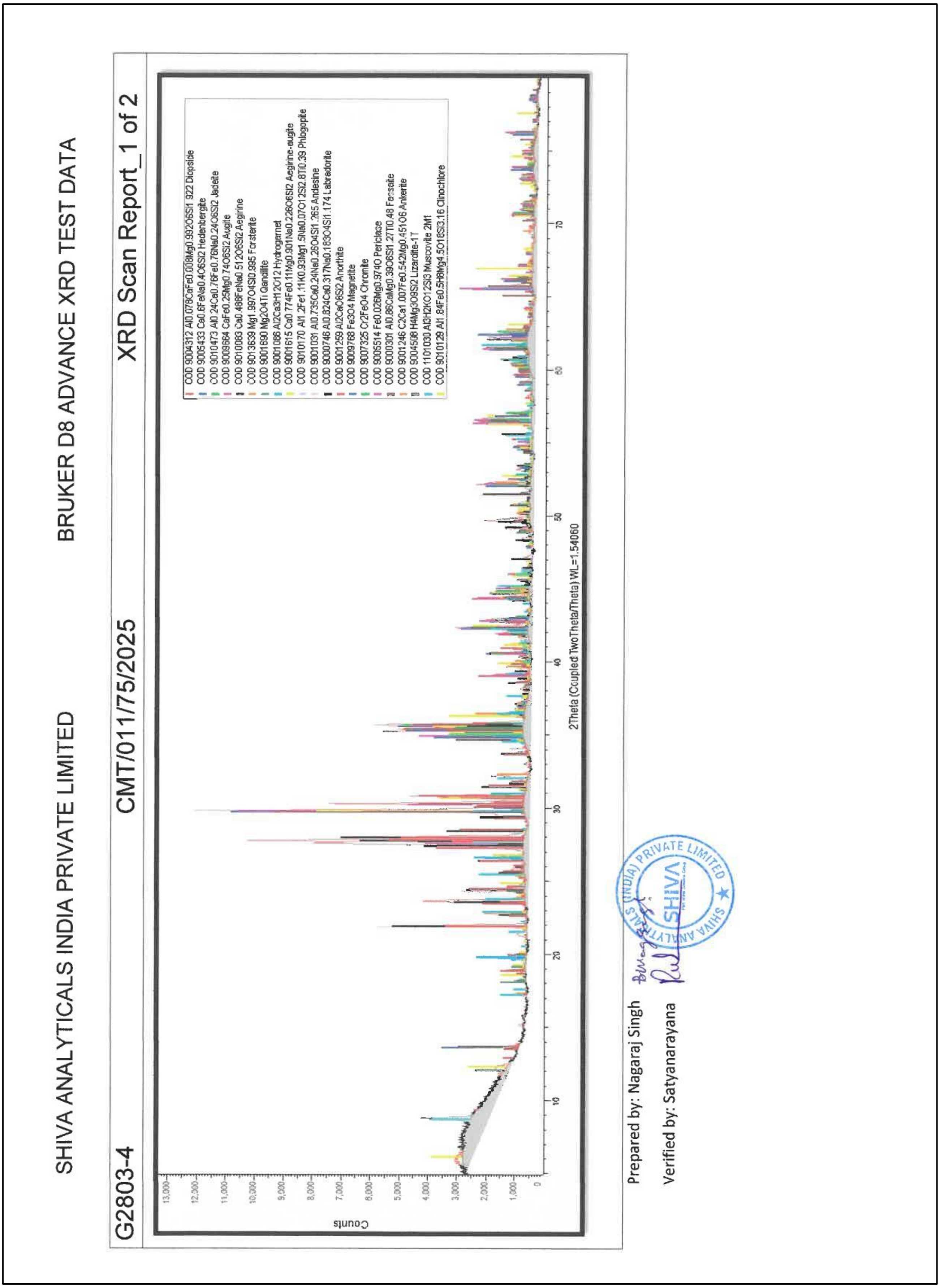
SHIVA ANALYTICALS INDIA PRIVATE LIMITED
BRUKER D8 ADVANCE XRD TEST DATA
G2803-4
CMT/011/75/2025
XRD Scan Report_1 of 2
COD 9004312 Al0.078CaFe0.008Mg0.992O6Si1.922 Diopside
COD 9005433 Ca0.6FeNa0.4O6Si2 Hedenbergite
COD 9010473 Al0.24Ca0.76Fe0.76Na0.24O6Si2 Jadeite
COD 9009564 CaFe0.25Mg0.74O6Si2 Augite
COD 9010083 Ca0.488FeNa0.512O6Si2 Aegirine
COD 9013639 Mg1.997O4Si0.995 Forsterite
COD 9001690 Mg2O4Ti Qandilite
COD 9001066 Al2Ca3H12O12 Hydrogarnet
COD 9001615 Ca0.774Fe0.11Mg0.901Na0.226O6Si2 Aegirine-augite
COD 9010170 Al1.2Fe1.11K0.93Mg1.5Na0.07O12Si2.8Ti0.39 Phlogopite
COD 9001031 Al0.735Ca0.24Na0.26O4Si1.265 Andesine
COD 9000746 Al0.824Ca0.317Na0.183O4Si1.174 Labradorite
COD 9001259 Al2CaO8Si2 Anorthite
COD 9009768 Fe3O4 Magnetite
COD 9007325 Cr2FeO4 Chromite
COD 9005514 Fe0.026Mg0.974O Periclase
COD 9000301 Al0.86CaMg0.39O6Si1.27Ti0.48 Fassaite
COD 9001246 C2Ca1.007Fe0.542Mg0.451O6 Ankerite
COD 9004508 H4Mg3O9Si2 Lizardite-1T
COD 1101030 Al3H2KO12Si3 Muscovite 2M1
COD 9010129 Al1.84Fe0.5H8Mg4.5O18Si3.16 Clinochlore
Counts
2Theta (Coupled TwoTheta/Theta) WL=1.54060
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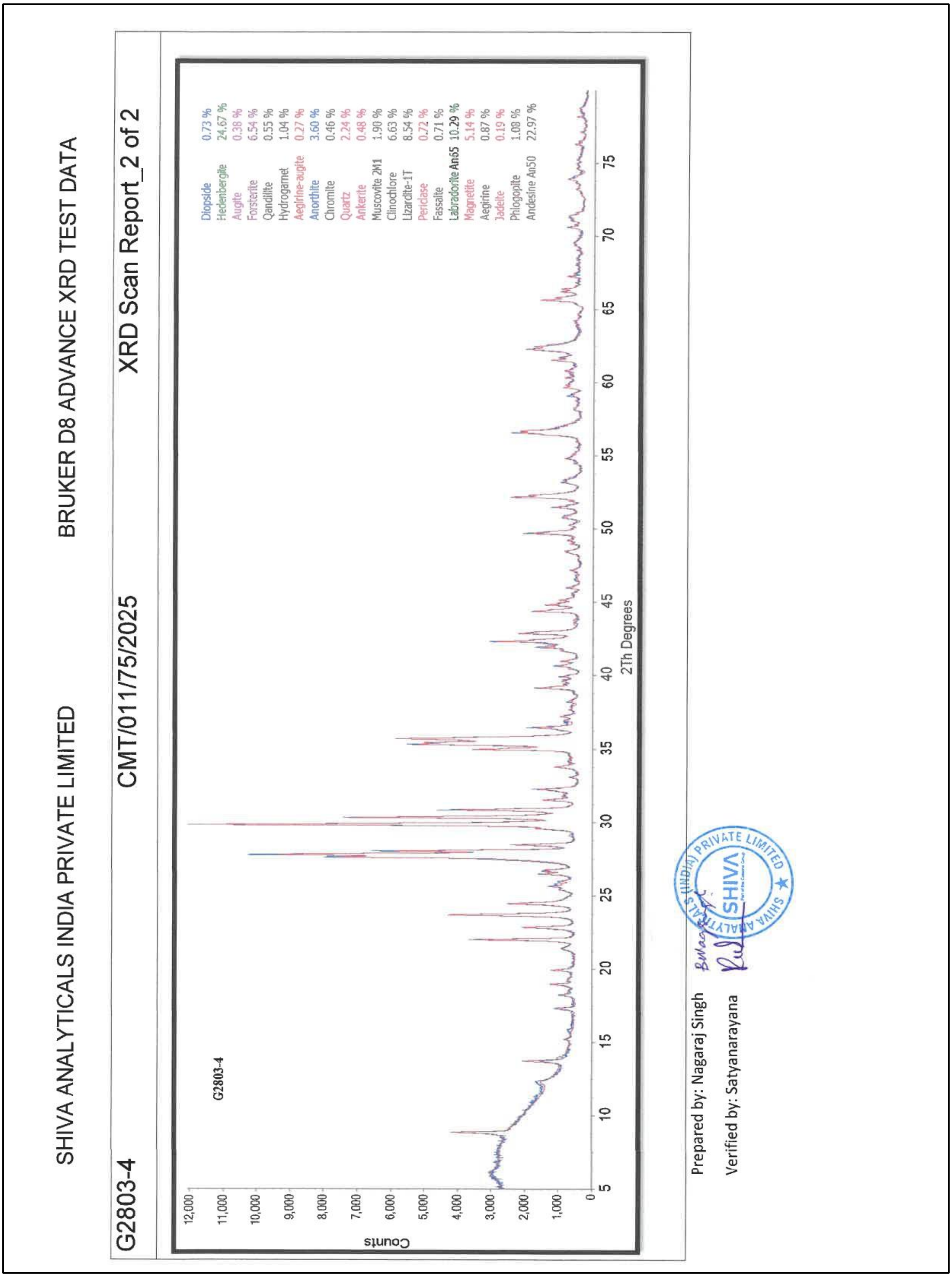
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BRUKER D8 ADVANCE XRD TEST DATA
G2803-4
CMT/011/75/2025
XRD Scan Report_2 of 2
G2803-4
Counts
2Th Degrees
Diopside 0.73 %
Hedenbergite 24.67 %
Augite 0.38 %
Forsterite 6.54 %
Qandilite 0.55 %
Hydrogarnet 1.04 %
Aegirine-augite 0.27 %
Anorthite 3.60 %
Chromite 0.46 %
Quartz 2.24 %
Ankerite 0.48 %
Muscovite 2M1 1.90 %
Clinochlore 6.63 %
Lizardite-1T 8.54 %
Periclase 0.72 %
Fassaite 0.71 %
Labradorite An65 10.29 %
Magnetite 5.14 %
Aegirine 0.87 %
Jadeite 0.19 %
Phlogopite 1.08 %
Andesine An50 22.97 %
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Sample Code: G2803-5 (BRS94/BTB/2025)

Instruments: WDXRF – Bruker S8 Tiger Series 2 (4 kW); XRD – Bruker D8 Advance (1.6 kW).
2θ Scan Range: 5–80° | Crystallinity: 74.90% | Amorphous: 25.10% |

Bulk Oxides by WDXRF:

Oxide	Wt.%
Al2O3	12.97
BaO	<0.05
CaO	11.54
Cr2O3	0.10
Fe2O3	12.60
K2O	1.08
MgO	9.39
MnO	0.14
Na2O	2.32
P2O5	0.36
SiO2	45.45
SO3	<0.05
SrO	<0.05
TiO2	2.45
V2O5	<0.05
ZrO2	<0.05
HfO2	<0.05
CuO	<0.05
NiO	<0.05
PbO	<0.05
ZnO	<0.05
LOI	1.38

Mineral Phases by XRD:

Sl.no	Mineral Phase	Chemical Formula	XRD Wt.%	XRD Crystalline Wt % (XRD Wt.% ×0.749)	Molecular Weight (g/mol)
1	Augite	$(Ca,Mg,Fe)Si_2O_6$	0.31	0.23	236.35
2	Enstatite	$MgSiO_3$	1.88	1.41	100.39
3	Pigeonite	$(Ca,Mg,Fe)Si_2O_6$	0.71	0.53	219.70
4	Aegirine	$NaFeSi_2O_6$	10.98	8.22	231.00
5	Diopside	$CaMgSi_2O_6$	14.36	10.76	216.55
6	Labradorite	$(Ca,Na)(Al,Si)_4O_8$	12.1	9.06	271.81
7	Andesine An50	$(Na,Ca)(Al,Si)_4O_8$	25.59	19.17	521.21

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Sl.no	Mineral Phase	Chemical Formula	XRD Wt.%	(XRD Wt.% ×0.749)	Molecular Weight (g/mol)
8	Bytownite	$(Ca,Na)(Al,Si)_4O_8$	19.17	14.36	275.01
9	Magnetite	Fe_3O_4	3.18	2.38	231.53
10	Jacobsite	$MnFe_2O_4$	0.06	0.04	227.38
11	Chromite	$FeCr_2O_4$	0.27	0.20	171.84
12	Quartz	SiO_2	1.32	0.99	60.08
13	Dolomite	$CaMg(CO_3)_2$	1.5	1.12	184.4
14	Clintonite-1M	$Ca(Mg,Al)_3(Al_3Si)O_{10}(OH)_2$	0.75	0.56	415.81
15	Hydroxyclino-humite	$(Mg,Fe)_9(SiO_4)_4(OH,F)_2$	1.16	0.87	621.49
16	Cancrinite	$Na_6Ca_2Al_6Si_6O_{24}(CO_3)_2$	0.93	0.70	1052.5
17	Titanite	$CaTiSiO_5$	0.94	0.70	196.04
18	Clinochlore	$(Mg,Fe)_5Al(Si_3Al)O_{10}(OH)_8$	2.11	1.58	595.22
19	Laumontite	$CaAl_2Si_4O_{12}\cdot 4H_2O$	2.4	1.80	470.44
Total			100	74.90	

Stoichiometric Comparison Table:

Oxides	XRF (wt%)	XRD crystallinity (wt%)	Amorphous (wt%)
SiO2	45.45	38.76	6.69
Al2O3	12.97	12.72	0.25
Fe2O3	12.60	6.47	6.13
MgO	9.39	3.91	5.48
CaO	11.54	9.20	2.34
Na2O	2.32	2.28	0.04
K2O	1.08	0.00	1.08
TiO2	2.45	0.23	2.22
Cr2O3	0.10	0.07	0.03
MnO	0.14	0.01	0.13
F	0.00	0.05	-0.05
CO2	0.00	0.60	-0.60
H2O	0.00	0.59	-0.59
Traces	1.96	0.00	1.96

Interpretation

- The WDXRF analysis shows the sample is dominated by SiO_2 (45.45 wt%), Fe_2O_3 (12.60 wt%), Al_2O_3 (12.97 wt%), CaO (11.54 wt%), and MgO (9.39 wt%), with minor alkali oxides (Na_2O 2.32 wt%, K_2O 1.08 wt%) and trace elements. This composition suggests a silicate-rich matrix with

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significant mafic (Fe-Mg-Ca) components, consistent with plagioclase-pyroxene dominated lithologies.

- The XRD data identifies 19 crystalline phases, predominantly plagioclase feldspars (Andesine, Bytownite, Labradorite, pyroxenes (Diopside, Enstatite, Augite, Pigeonite, and minor amphiboles/chlorites (Clinochlore, Clintonite, Hydroxyclinohumite), along with accessory magnetite, chromite, titanite, quartz, and dolomite. Notably, aegirine indicates some Na-rich clinopyroxene crystallization.

Suggested minor/Secondary mineral phases

- Silica-rich glass: The largest contributor to the amorphous fraction , likely forming from rapid cooling of silicate melts or fine-grained volcanic glass.
- Fe-rich amorphous oxides: Non-crystalline Fe_2O_3 may occur as nano-magnetite, ferrihydrite, or poorly crystalline iron silicates.
- Mg-silicate glass or amorphous chlorites: MgO could be associated with poorly crystalline Mg-silicates or fine-grained alteration products.
- Ti-bearing amorphous phases: TiO_2 may exist as amorphous Ti-silicates or nanocrystalline titanium oxides.
- K-rich amorphous silicates: K_2O likely occurs in glassy or secondary alteration phases, as no crystalline K-feldspar is observed.
- Minor amorphous Ca- and Na-bearing phases: Small contributions from CaO and Na_2O may arise from partially amorphous plagioclase, calcium silicates, or carbonate glasses.

Potential commercial uses

Component	Applications
SiO_2 (amorphous + crystalline)	Glass and ceramics production, refractory materials, silica fillers
Al_2O_3 (plagioclase, minor amorphous)	Refractories, ceramics, abrasives
Fe_2O_3 (magnetite, amorphous Fe oxides)	Pigments, magnetic materials, iron source in steelmaking
MgO (pyroxenes, chlorites, amorphous Mg-silicates)	Refractory bricks, cement additive, lightweight aggregates
CaO (plagioclase, dolomite, amorphous Ca-silicates)	Cement and lime production, soil amendment
K_2O (amorphous K-rich phases)	Potash fertilizers, specialty glass
TiO_2 (titanite, amorphous Ti-phases)	White pigments, ceramics, catalysts
Minor trace elements (Cr, Mn, Ni)	Alloying, pigments, corrosion-resistant coatings

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Probable origin assessment

The sample likely originates from a mafic to intermediate volcanic or shallow intrusive source, dominated by plagioclase and pyroxene crystallization. The presence of aegirine, Ti-bearing phases, and significant amorphous content (~25 wt%) indicates rapid cooling or quenching, while minor hydrous silicates suggest low-grade hydrothermal alteration.

Final Results

- Bulk Composition: The sample is silicate-rich, dominated by SiO_2 (45.45 wt%), Fe_2O_3 (12.60 wt%), Al_2O_3 (12.97 wt%), CaO (11.54 wt%), and MgO (9.39 wt%), with minor alkali and trace elements, indicating a mafic to intermediate composition.
- Mineralogy (XRD): Major crystalline phases include plagioclase feldspars (Andesine, Bytownite, Labradorite), pyroxenes (Diopside, Enstatite, Augite), and aegirine, with minor hydrous silicates (Clinochlore, Clintonite, Laumontite), oxides (Magnetite, Chromite, Titanite), carbonates (Dolomite), and quartz.
- Amorphous Phases: Approximately 25 wt% of the sample is amorphous, dominated by SiO_2, Fe_2O_3, MgO, TiO_2, and K_2O, likely representing volcanic glass, poorly crystalline silicates, and secondary alteration products.
- Probable Origin: The rock likely formed from a mafic–intermediate volcanic or shallow intrusive source, with rapid cooling/quenching and minor low-grade hydrothermal alteration, reflecting a combination of magmatic crystallization and secondary processes.

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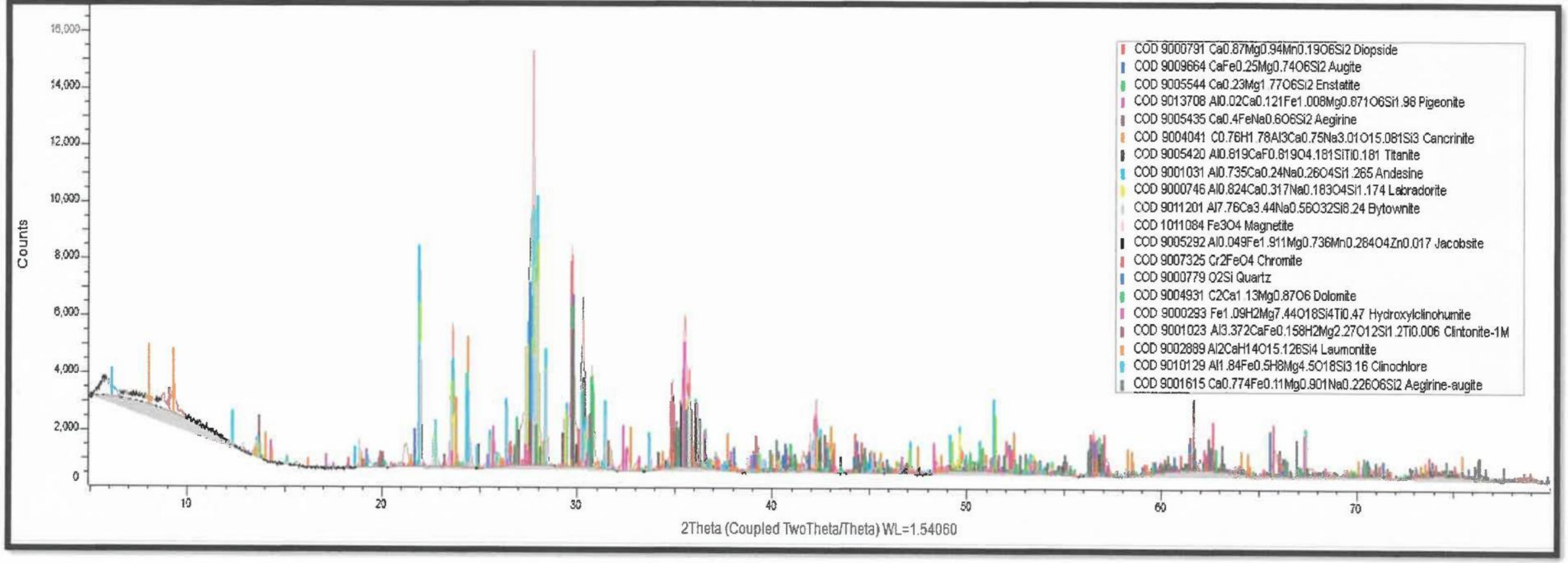
BRUKER D8 ADVANCE XRD TEST DATA

G2803-5 | BRS94/BTB/2025 | XRD Scan Report_1 of 2



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Stoichiometric Oxide Table

Mineral Name	Chemical Formula	XRD wt%	SiO2	Al2O3	Fe2O3	MgO	CaO	Na2O	K2O	TiO2	Cr2O3	MnO	F	CO2	H2O
Augite	$(Ca,Mg,Fe)Si_2O_6$	0.23	0.13	0.00	0.02	0.02	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Enstatite	$MgSiO_3$	1.41	0.85	0.00	0.00	0.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pigeonite	$(Ca,Mg,Fe)Si_2O_6$	0.53	0.29	0.00	0.07	0.09	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aegirine	$NaFeSi_2O_6$	8.22	4.35	0.00	3.56	0.00	0.00	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Diopside	$CaMgSi_2O_6$	10.76	5.97	0.00	0.00	2.01	2.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Labradorite	$(Ca,Na)(Al,Si)_4O_8$	9.06	5.43	2.65	0.00	0.00	0.54	0.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Andesine An50	$(Na,Ca)(Al,Si)_4O_8$	19.17	11.19	4.90	0.00	0.00	2.03	1.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bytownite	$(Ca,Na)(Al,Si)_4O_8$	14.36	6.84	4.39	0.00	0.00	2.75	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Magnetite	Fe_3O_4	2.38	0.00	0.00	2.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jacobsite	$MnFe_2O_4$	0.04	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Chromite	$FeCr_2O_4$	0.20	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00
Quartz	SiO_2	0.99	0.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dolomite	$CaMg(CO_3)_2$	1.12	0.00	0.00	0.00	0.24	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.57	0.00
Clintonite 1M	$Ca(Mg,Al)_3(Al_3Si)O_{10}(OH)_2$	0.56	0.29	0.05	0.00	0.11	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
Hydroxyclinohumite	$(Mg,Fe)_9(SiO_4)_4(OH,F)_2$	0.87	0.31	0.00	0.05	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.07
Cancrinite	$Na_6Ca_2Al_6Si_6O_{24}(CO_3)_2$	0.70	0.31	0.14	0.00	0.00	0.08	0.09	0.00	0.00	0.00	0.00	0.00	0.03	0.05
Titanite	$CaTiSiO_5$	0.70	0.27	0.00	0.00	0.00	0.20	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00
Clinochlore	$(Mg,Fe)_5Al(Si_3Al)O_{10}(OH)_8$	1.58	0.49	0.28	0.18	0.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15
Laumontite	$CaAl_2Si_4O_{12}\cdot 4H_2O$	1.80	0.95	0.31	0.00	0.00	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27
Aegirine-augite	$(Na,Ca)(Fe,Mg)Si_2O_6$	0.21	0.10	0.00	0.05	0.01	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	**74.9**	**38.76**	**12.72**	**6.47**	**3.91**	**9.20**	**2.28**	**0.00**	**0.23**	**0.07**	**0.01**	**0.05**	**0.60**	**0.59**

Prepared by: Nagaraj Singh
Verified by: Satyanarayana

SHIVA ANALYTICALS (INDIA) PRIVATE LIMITED

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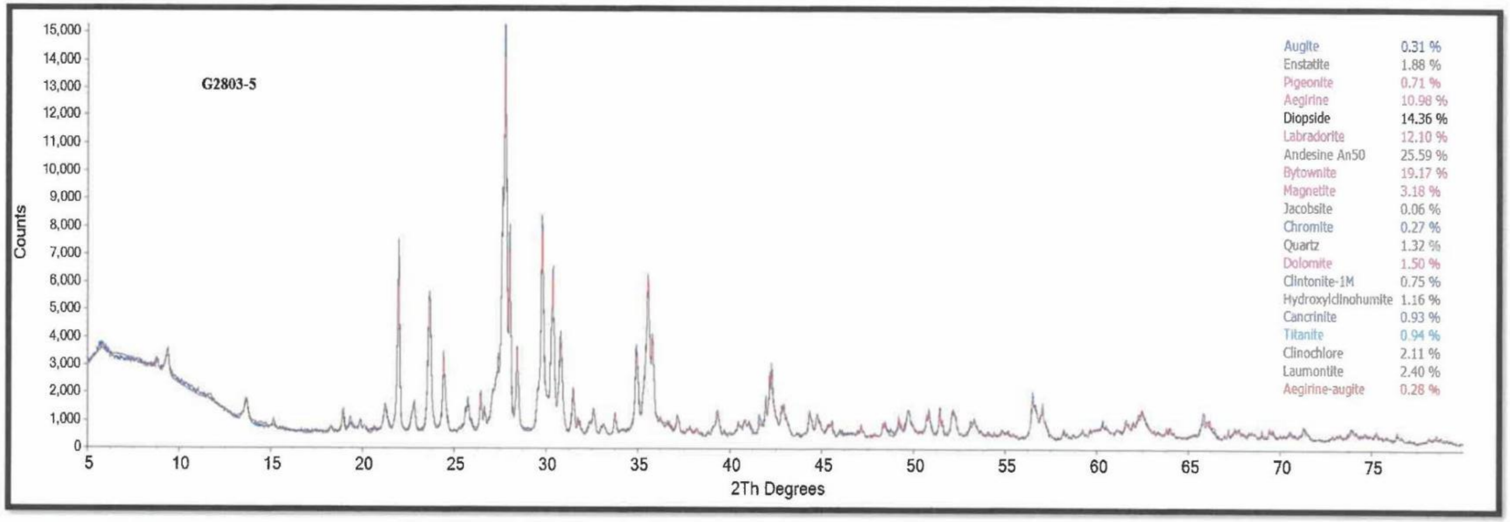
SHIVA ANALYTICALS INDIA PRIVATE LIMITED

BRUKER D8 ADVANCE XRD TEST DATA

G2803-5 BRS94/BTB/2025 XRD Scan Report_2 of 2



Prepared by: Nagaraj Singh

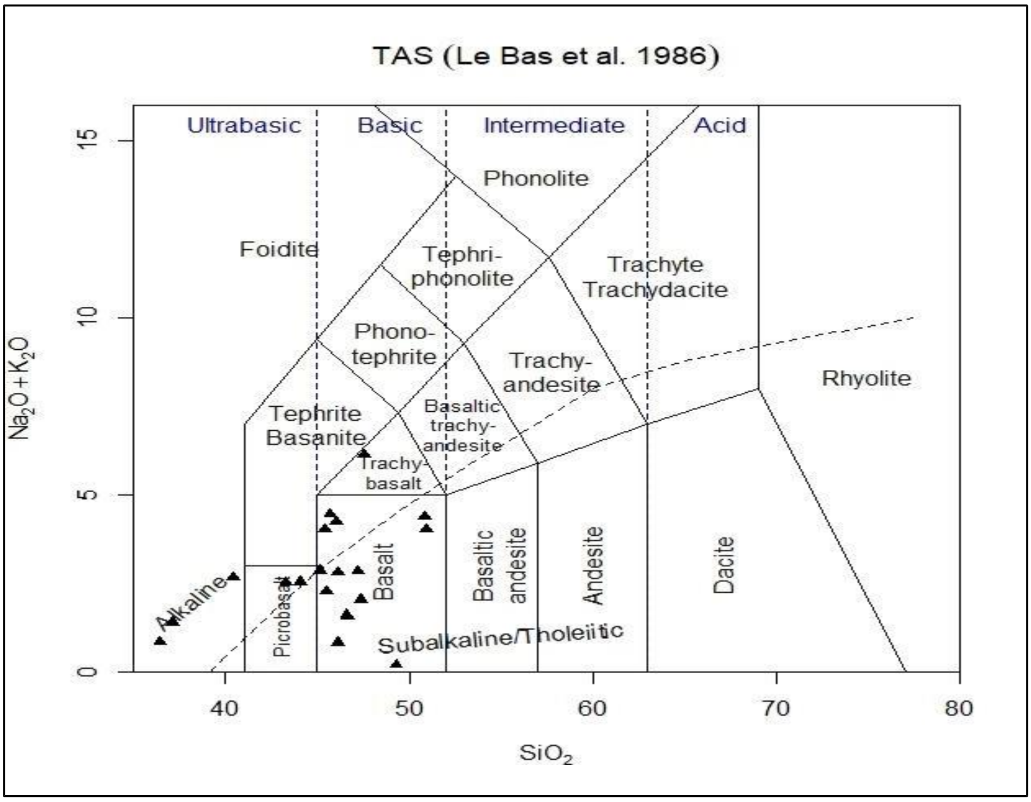
Verified by: Satyanarayana

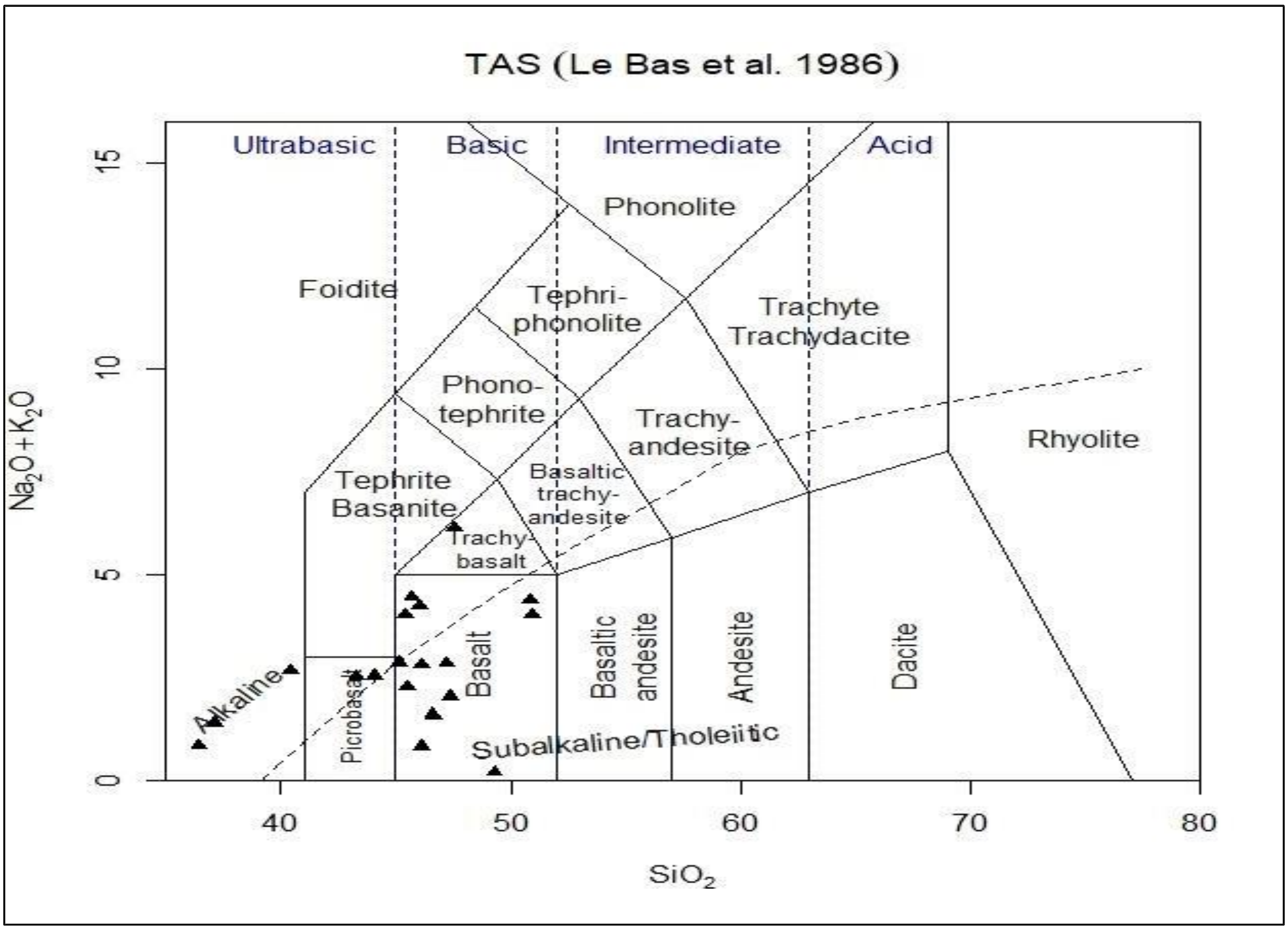
Whole rock analysis (Major oxides):

Several geochemical plots are created using GCD Kit software to understand the chemical variation patterns within the cogenetic volcanic rock series. These diagrams aided in identifying the systematic changes in the chemical data, which, in turn, provide significant insights into the causes regulating the chemical variation. Major oxide analysis of twenty pit samples shows the compositional diversity of the variants of basalts in the area. Major Oxides resulted are attached in annexures.

TAS Diagram:

The Total Alkali-Silica (TAS) diagram analysis demonstrates that all volcanic rocks plotted within the basaltic field. Petrographic study of the picrite to basaltic picrite samples demonstrated widespread alteration of olivine to iddingsite, an iron-rich alteration product. This modification likely impacted the bulk chemistry of picrite-basaltic picrite, causing them to be categorized as basalts on the TAS diagram instead of appearing in the anticipated basaltic picrite field.





R1-R2 Plot:

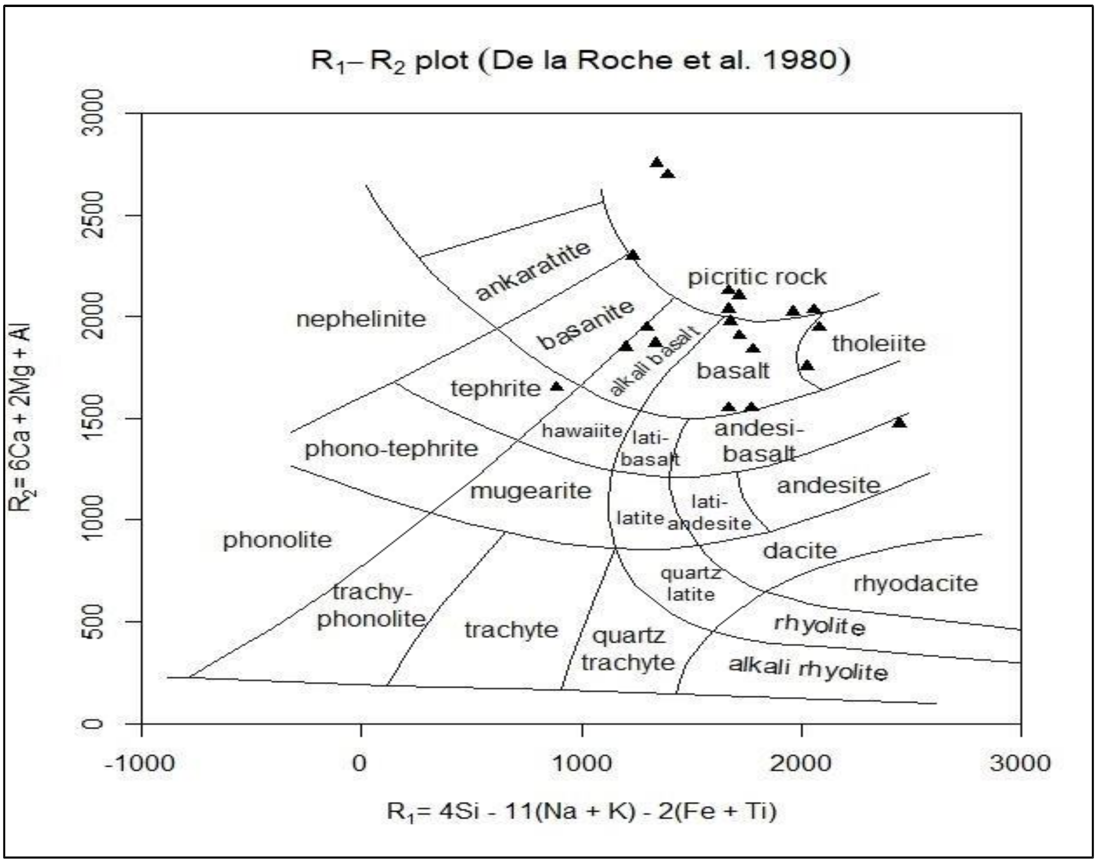
The R_1–R_2 discrimination diagram is a geochemical classification tool used to identify and group volcanic and plutonic rocks based on their major oxide chemistry. The plot transforms major elements (Si, Al, Fe, Mg, Ca, Na, K, Ti) into two linear indices (R_1 and R_2), which effectively separate rock types even when mineralogical information is limited.

The diagram shown helps in:

1. Classifying Igneous Rocks
2. Distinguishing Alkaline vs. Subalkaline Trends
3. Understanding Magmatic Evolution
4. Identifying Special Rock Types

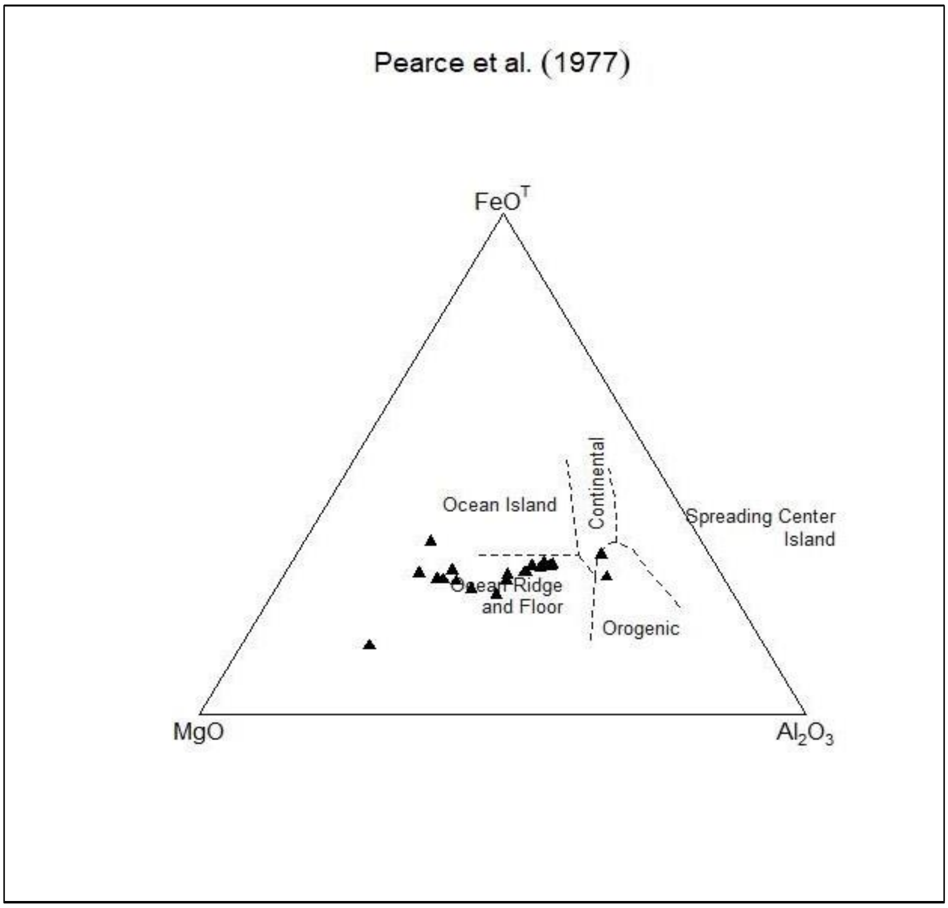
Fields like picritic rock, ankaratrite, hawaiite, mugearite help classify transitional or uncommon mafic compositions.

- The plotted samples classify mainly as basalt, andesite, and dacite, forming a sub alkaline, tholeiitic to calc-alkaline trend, reflecting typical fractional crystallization in a volcanic arc or subduction-related tectonic environment. No alkaline or highly evolved silicic rocks are present.



Feo-Mgo-Al2o3 plot:

According to pearce et al, the samples plot mainly between the Ocean Island, Mid-Ocean Ridge, and Orogenic fields, showing a transitional geochemical signature. This reflects a mantle-derived basaltic magma with both enriched (OIB-type) and depleted (MORB-type) components, consistent with a rifted, back-arc, or transitional arc tectonic environment rather than a single pure tectonic setting.



$10MnO–TiO_2–10P_2O_5$ (Mullen 1983) plot:

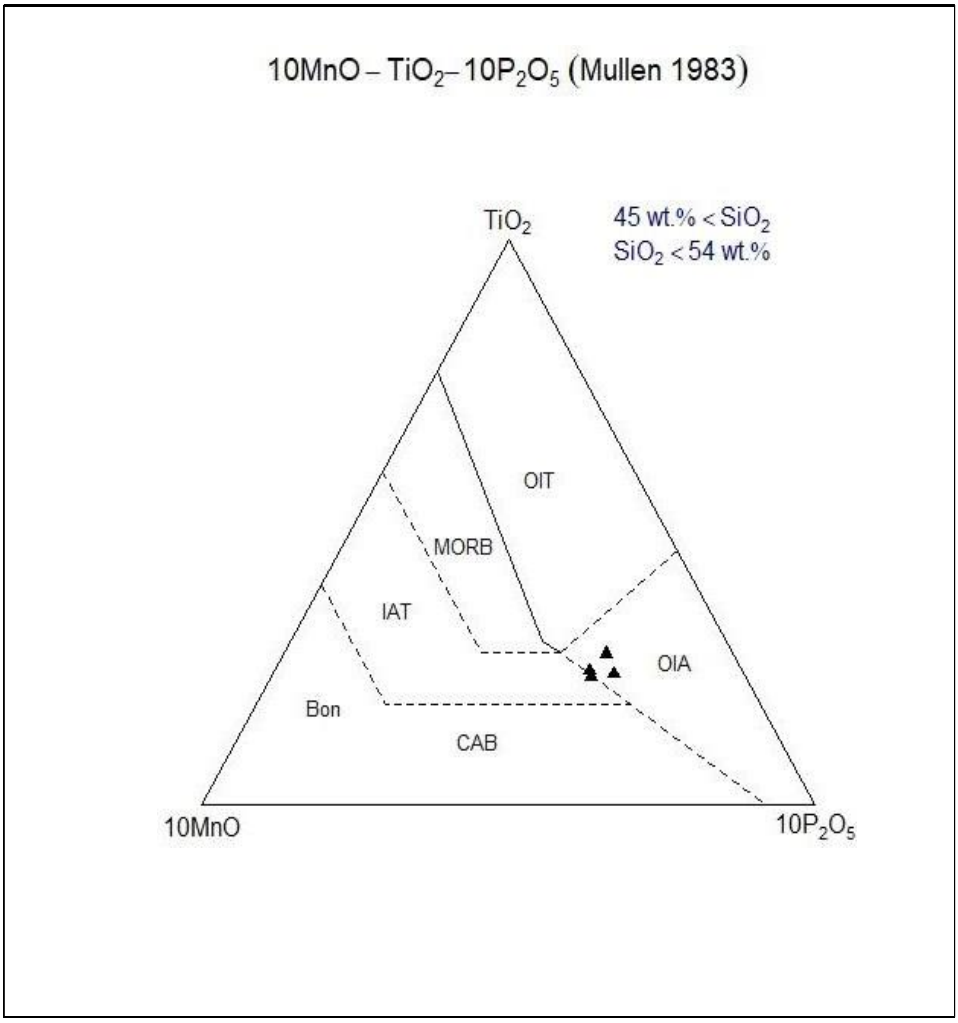
The $10MnO – TiO_2 – 10P_2O_5$ ternary diagram, proposed by Mullen (1983), is a geochemical discrimination tool used to identify the tectonic setting of basaltic rocks using three oxides:

TiO_2 – indicates mantle enrichment vs depletion

MnO – related to melting depth and source properties

P_2O_5 – sensitive to enriched mantle (OIB) signatures

- Samples plot mainly in the Ocean Island Alkali Basalt (OIA) field, indicating an enriched mantle source and intraplate/alkaline affinity, with a minor tendency toward calc-alkaline signature. This suggests a transitional tectonic setting influenced by mantle plume-type magmatism and mild subduction-related overprints.


10MnO – TiO2– 10P2O5 (Mullen 1983)
TiO2
45 wt.% < SiO2
SiO2 < 54 wt.%
OIT
MORB
IAT
OIA
Bon
CAB
10MnO
10P2O5

Gist of the above plots:

Whole-rock major oxide data of twenty pit samples were analysed using GCD Kit software to understand chemical variation within the volcanic rock suite. The results indicate compositional diversity among the basaltic variants present in the study area.

The TAS (Total Alkali–Silica) diagram shows that all samples plot within the basalt field. Petrographic observations reveal that olivine in picrite and basaltic picrite samples is widely altered to iddingsite, which likely modified the bulk chemistry and caused these rocks to plot as basalts instead of their expected picritic compositions.

The R_1–R_2 discrimination diagram classifies the samples mainly as basalt, andesite, and dacite, forming a sub-alkaline tholeiitic to calc-alkaline trend. This pattern reflects magmatic differentiation through fractional crystallization, with no strong evidence of highly alkaline or evolved silicic rocks.

In the FeO–MgO–Al_2O_3 plot, the samples fall between Ocean Island Basalt (OIB), Mid-Ocean Ridge Basalt (MORB), and orogenic fields, suggesting a transitional geochemical signature derived from mantle magma containing both enriched and depleted components.

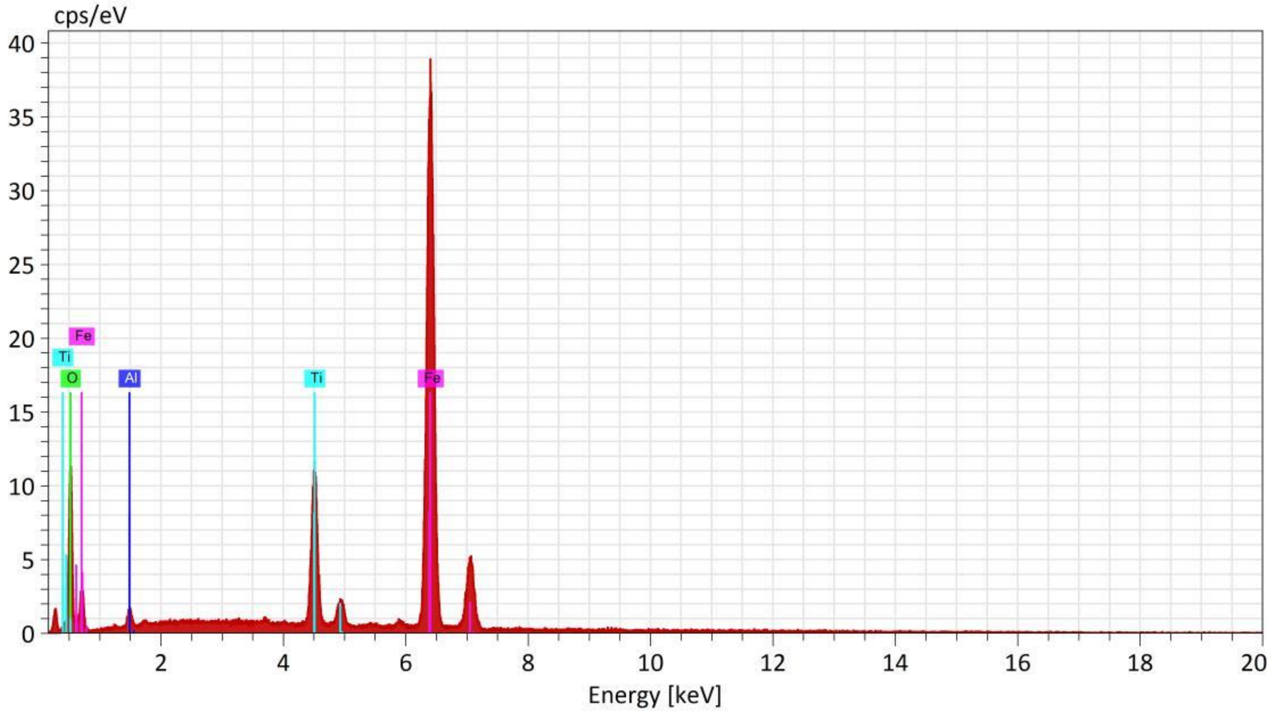
The 10MnO–TiO_2–10P_2O_5 ternary diagram indicates that most samples plot in the Ocean Island Alkali Basalt field, pointing to an enriched mantle source and intraplate affinity, with minor calc-alkaline influence. This suggests mantle plume-related magmatism possibly modified by mild subduction-related processes.

In nutshell the studied volcanic rocks are predominantly basaltic, showing sub-alkaline to mildly alkaline characteristics and a transitional tectonic setting, likely derived from mantle-sourced magma influenced by both plume-type enrichment and minor arc-related processes.

Scanning Electorn Microscope (SEM) report

SEM-EDS Lab, Palaeontology Division, Geological Survey of India (SR) Hyderabad

The following images and photographs represent four basalt/picritic basalt samples that were submitted to the **Geological Survey of India (GSI), Southern Region** for **Scanning Electron Microscope (SEM)** studies. The detailed analytical report and interpretation of the SEM study given below:

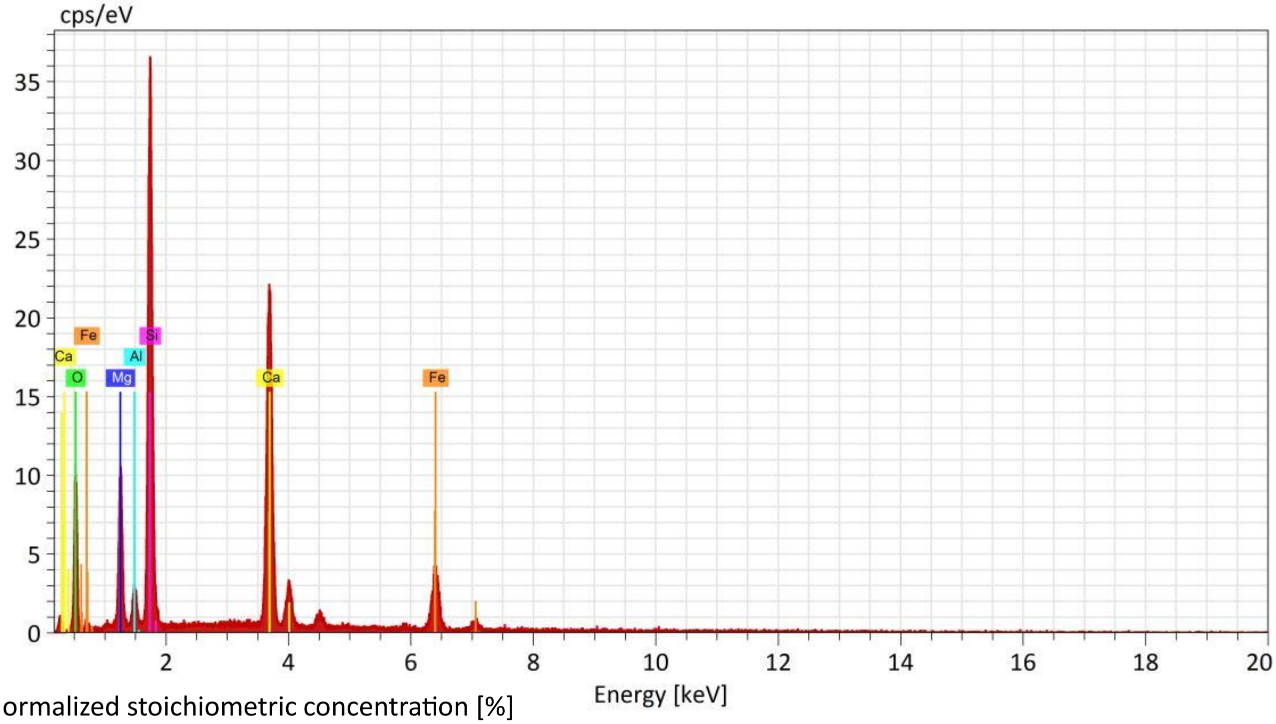


Normalized stoichiometric concentration [%]

Spectrum	Oxygen	Al2O3	TiO2	FeO
CMT/011/07	0.00	2.85	17.06	80.09

SEM-EDS Lab, Palaeontology Division, Geological Survey of India (SR)

Hyderabad

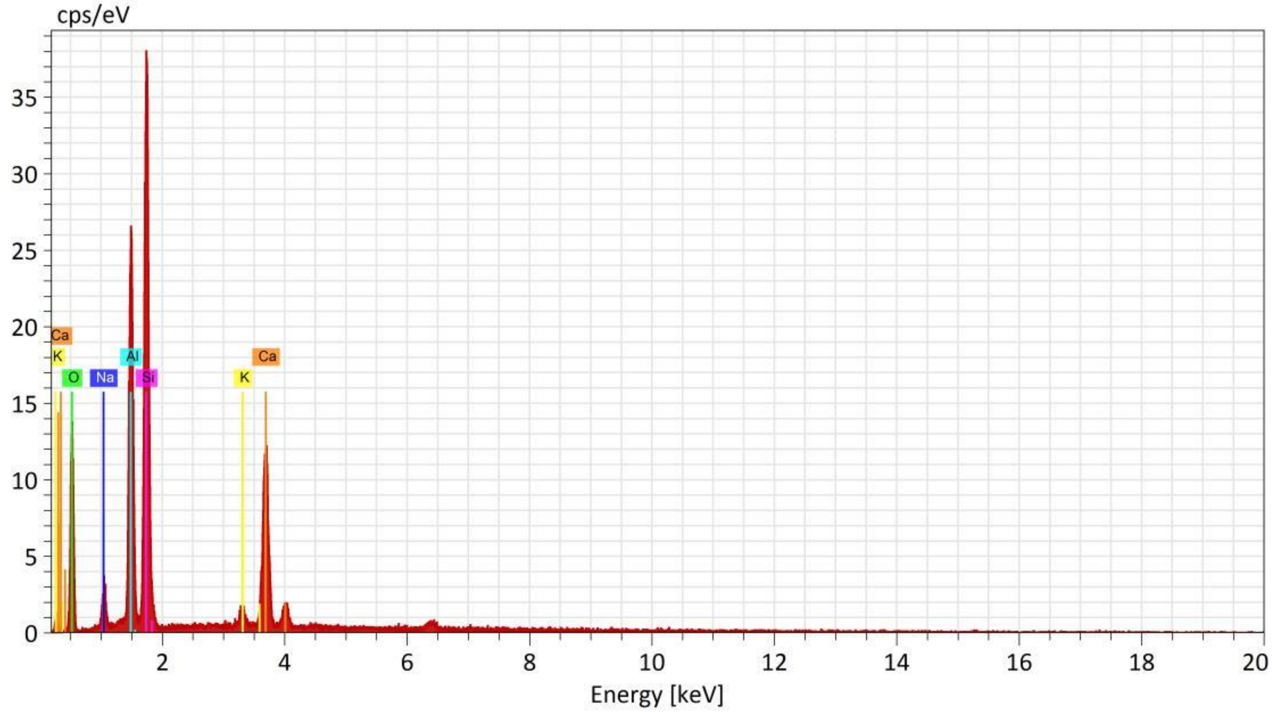


Normalized stoichiometric concentration [%]

Spectrum	Oxygen	MgO	Al2O3	SiO2	CaO	FeO
CMT/011/07	0.00	12.66	3.47	50.56	25.34	7.97

<u>SEM-EDS Lab, Palaeontology Division, Geological Survey of India (SR)</u>

<u>Hyderabad</u>

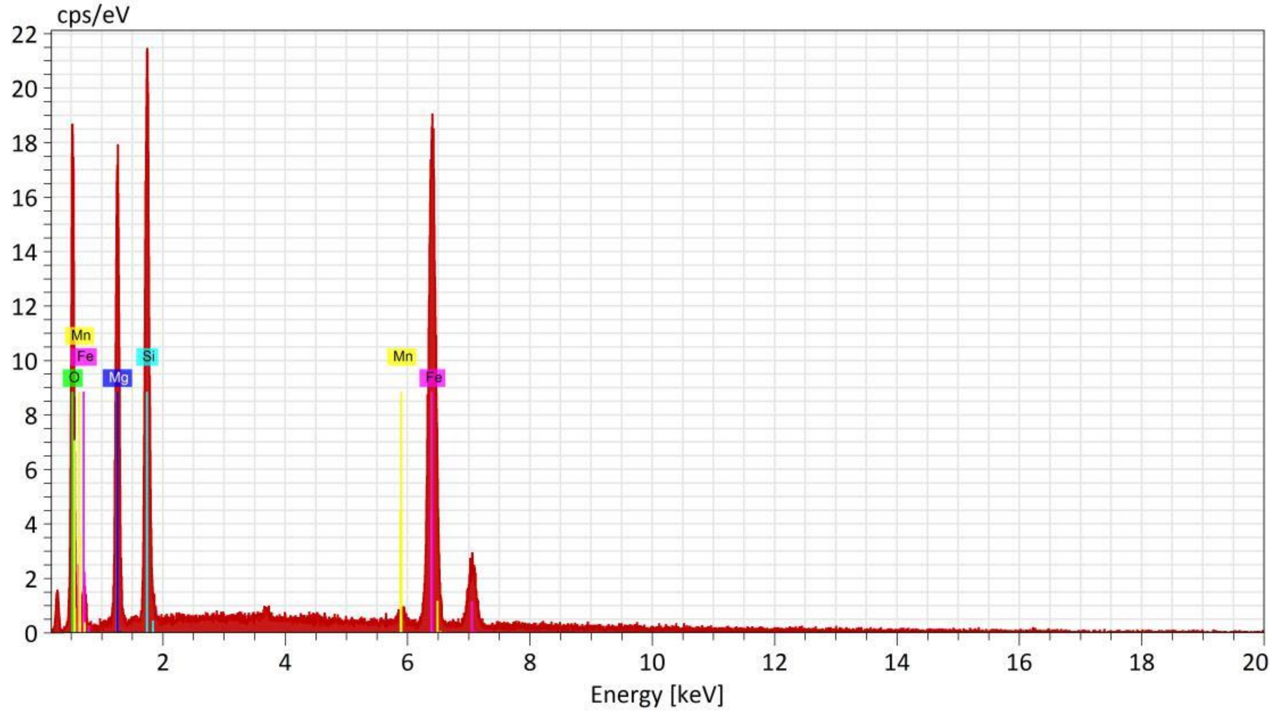


Normalized stoichiometric concentration [%]

Spectrum	Oxygen	Na_2O	Al_2O_3	SiO_2	K_2O	CaO
CMT/011/07	0.00	4.79	24.82	54.62	1.09	14.69

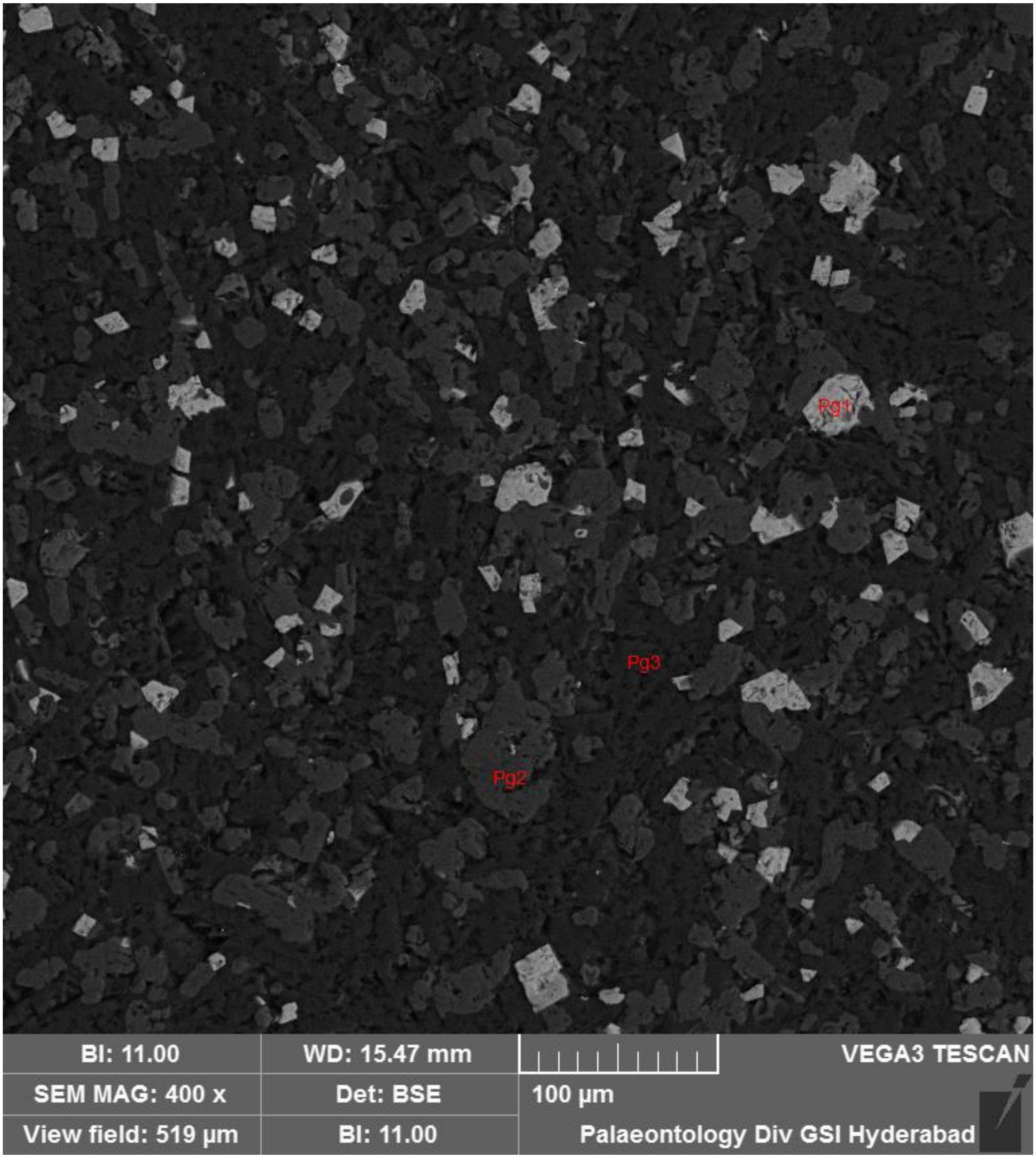
SEM-EDS Lab, Palaeontology Division, Geological Survey of India (SR)

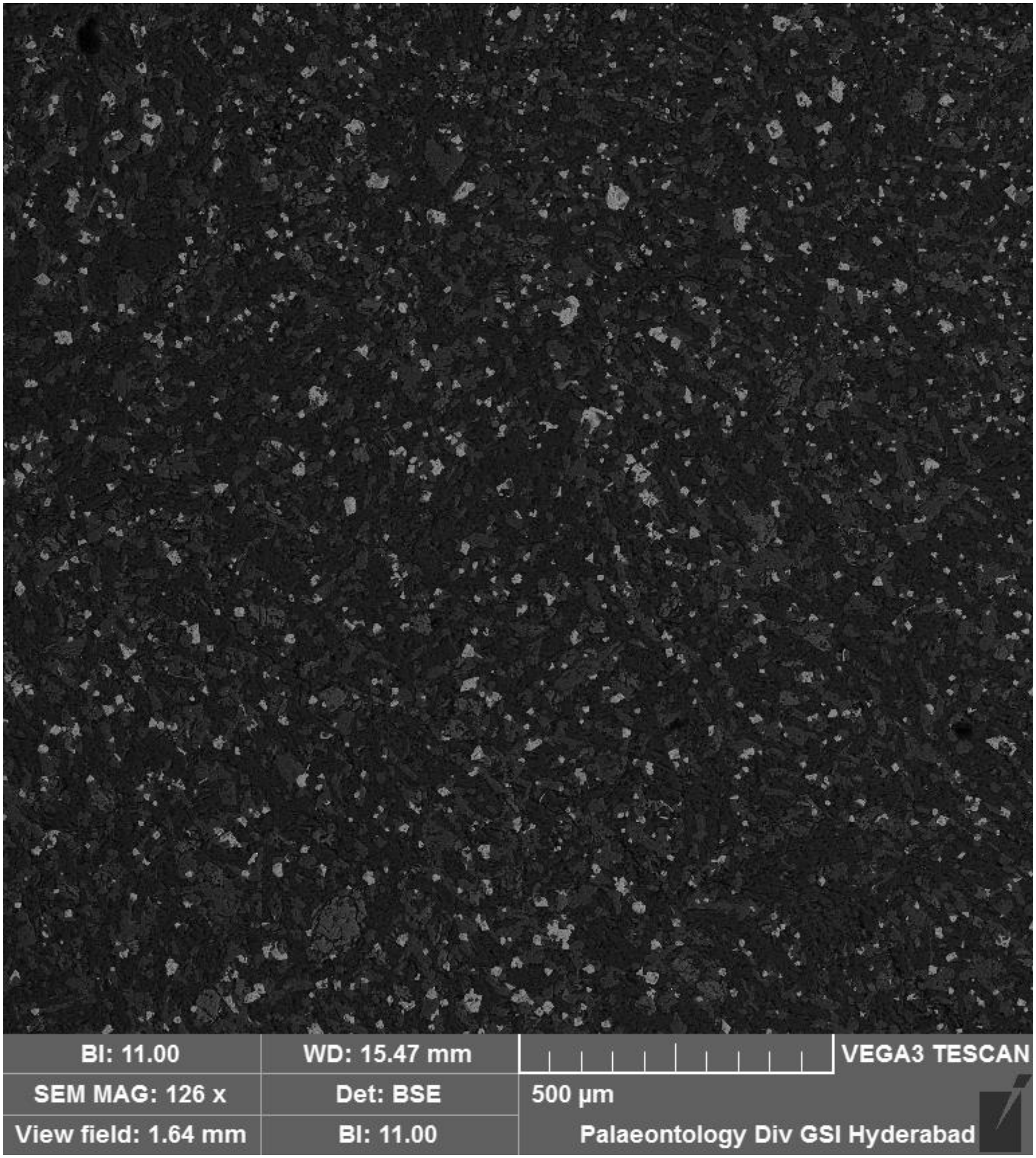
Hyderabad



Normalized stoichiometric concentration [%]

Spectrum	Oxygen	MgO	SiO2	FeO	MnO
CMT/011/07	0.00	28.63	33.20	37.41	0.76


Pg1
Pg3
Pg2
BI: 11.00
WD: 15.47 mm
VEGA3 TESCAN
SEM MAG: 400 x
Det: BSE
100 µm
View field: 519 µm
BI: 11.00
Palaeontology Div GSI Hyderabad


BI: 11.00
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VEGA3 TESCAN
SEM MAG: 126 x
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500 µm
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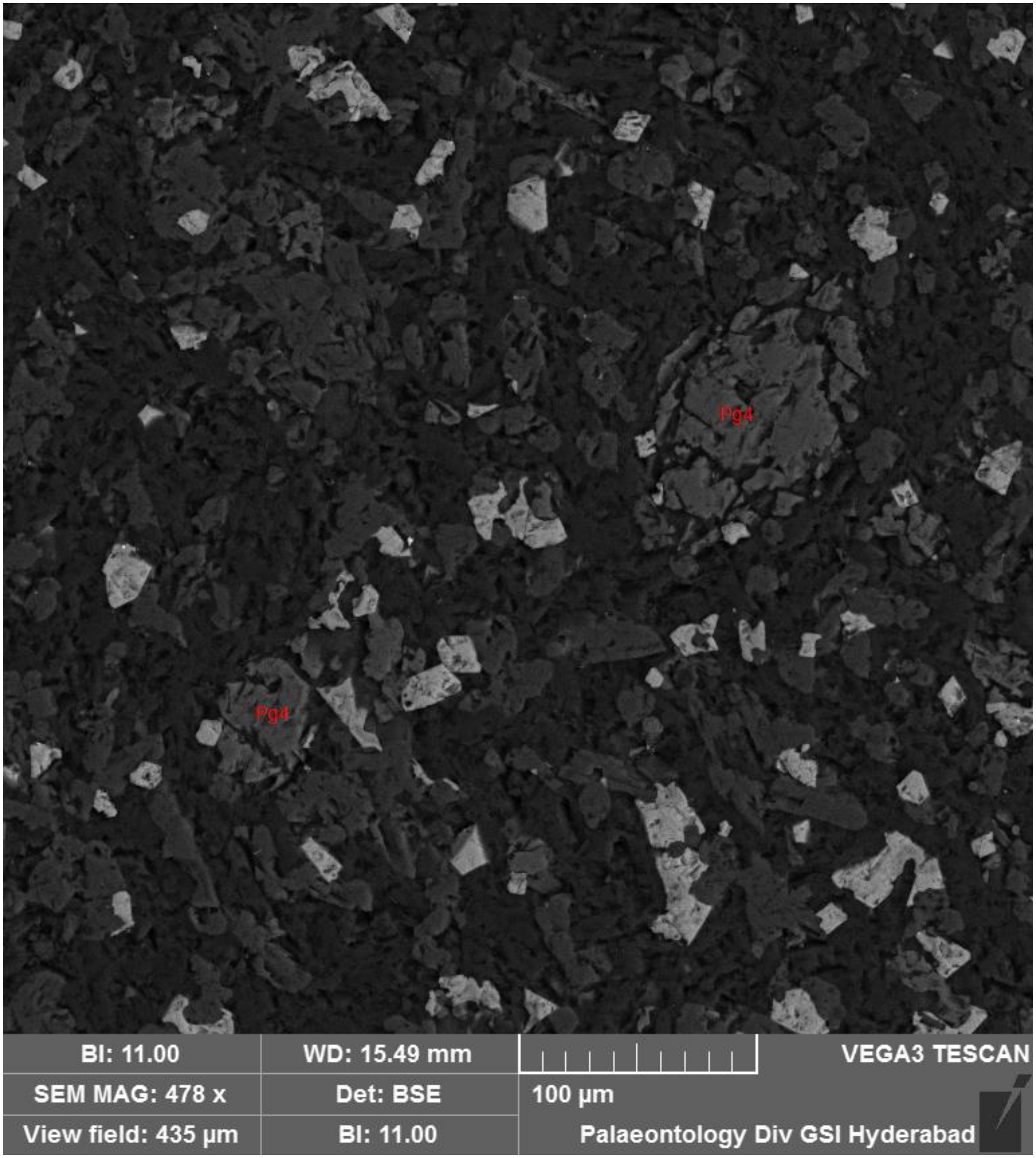
BI: 11.00
Palaeontology Div GSI Hyderabad


Pg4
Pg4
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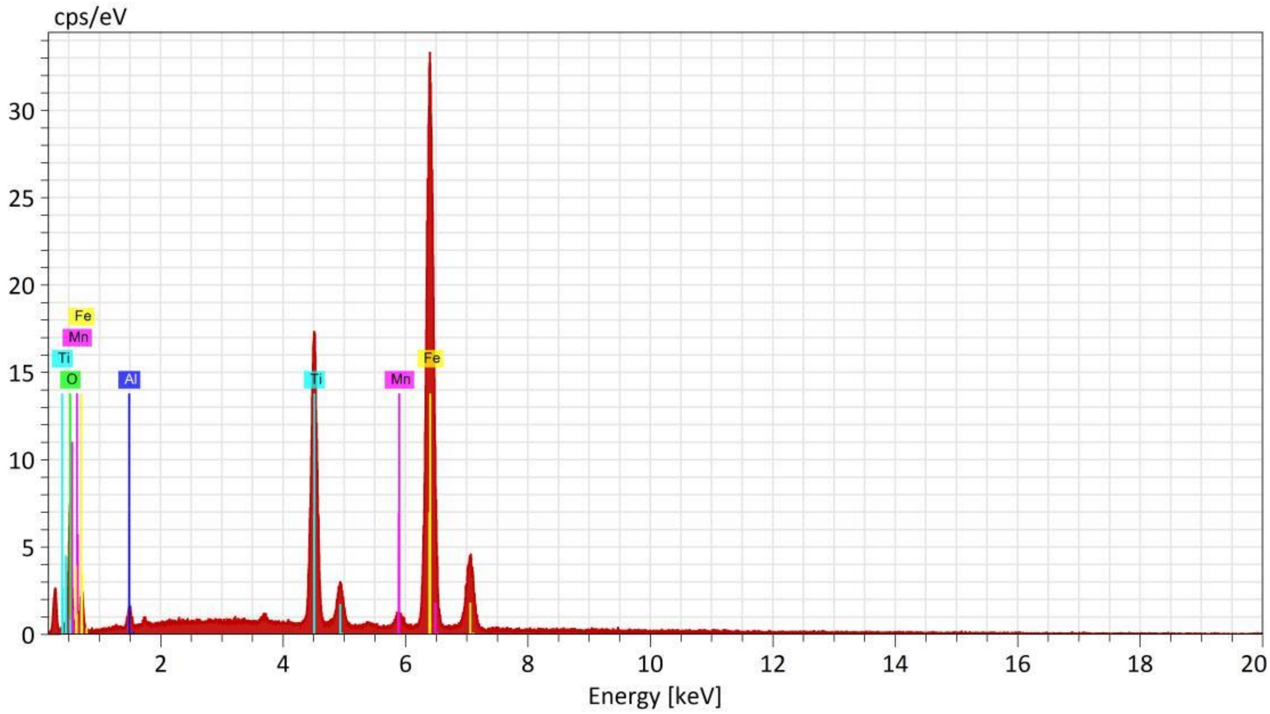
WD: 15.49 mm
VEGA3 TESCAN
SEM MAG: 478 x
Det: BSE
100 μm
View field: 435 μm
BI: 11.00
Palaeontology Div GSI Hyderabad

SEM-EDS Lab, Palaeontology Division, Geological Survey of India (SR) Hyderabad

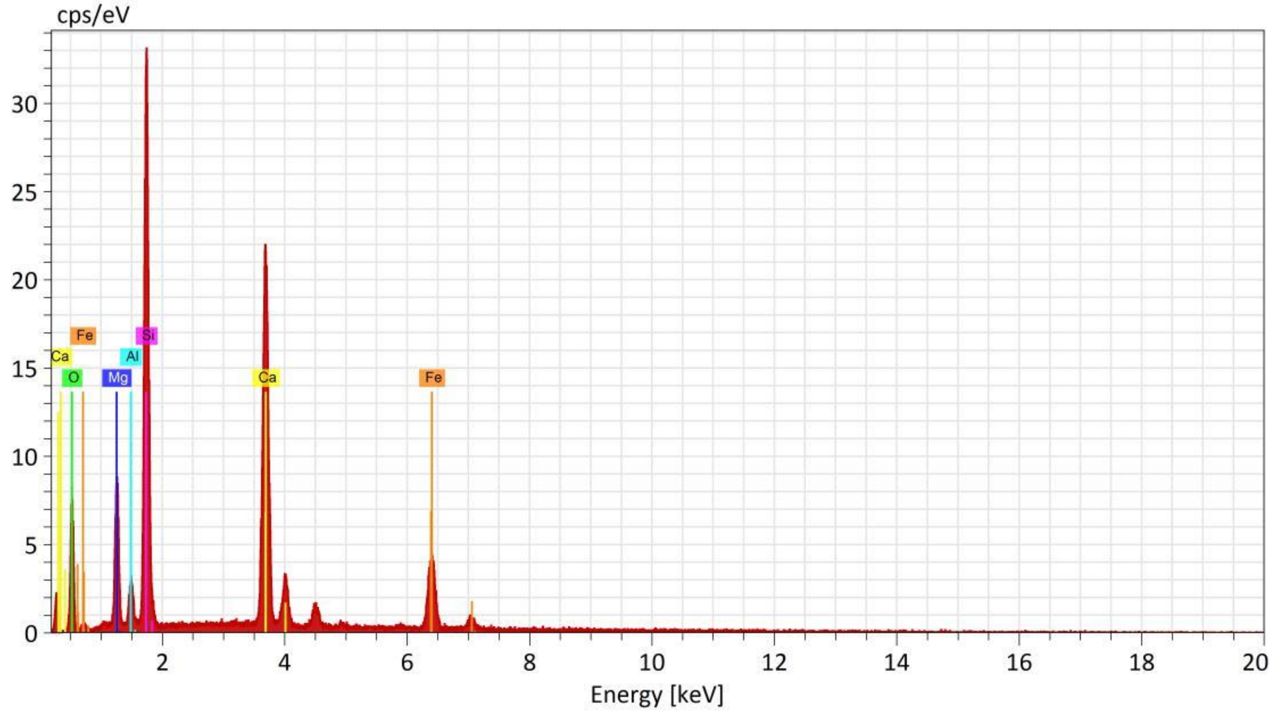


Normalized stoichiometric concentration [%]

Spectrum	Oxygen	Al2O3	TiO2	MnO	FeO
CMT/011/62	0.00	2.32	25.9	21.54	70.22

SEM-EDS Lab, Palaeontology Division, Geological Survey of India (SR)

Hyderabad



Normalized stoichiometric concentration [%]

Spectrum	Oxygen	MgO	Al2O3	SiO2	CaO	FeO
CMT/011/62	0.00	11.99	4.01	49.62	25.99	8.39

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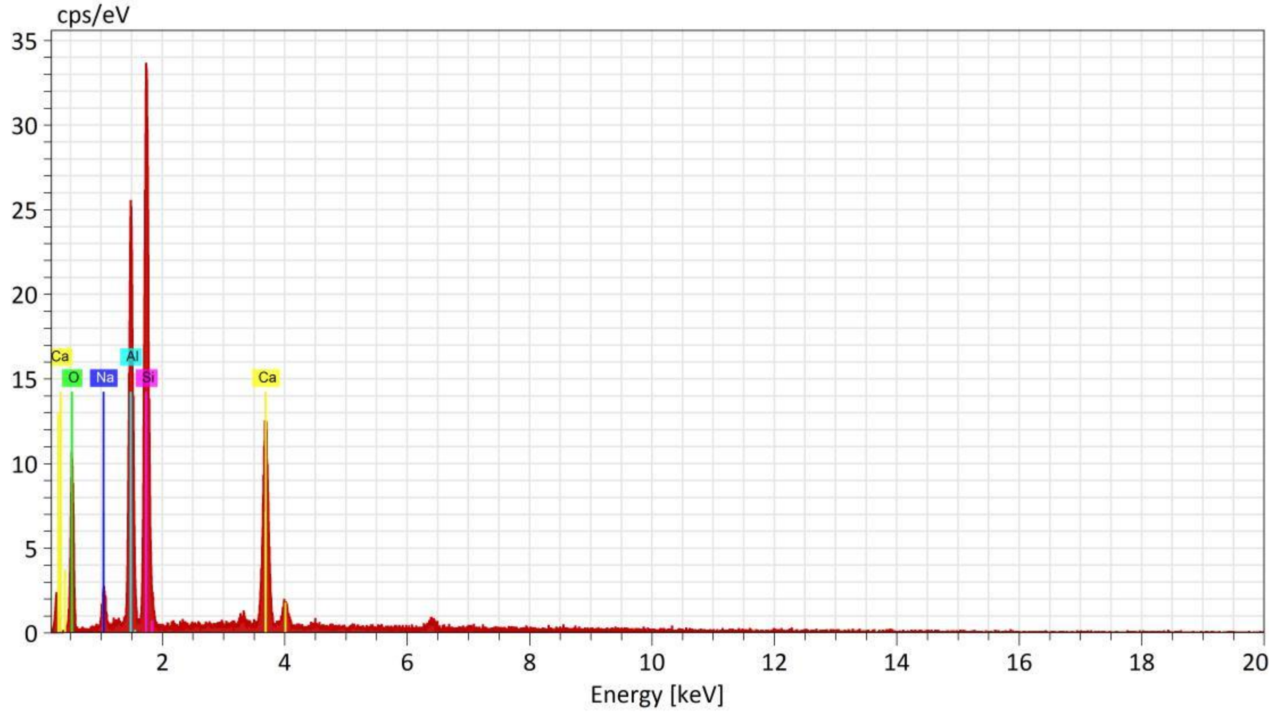
Hyderabad



Normalized stoichiometric concentration [%]

Spectrum	Oxygen	Na2O	Al2O3	SiO2	CaO
CMT/011/62	0.00	3.69	27.56	52.82	15.93

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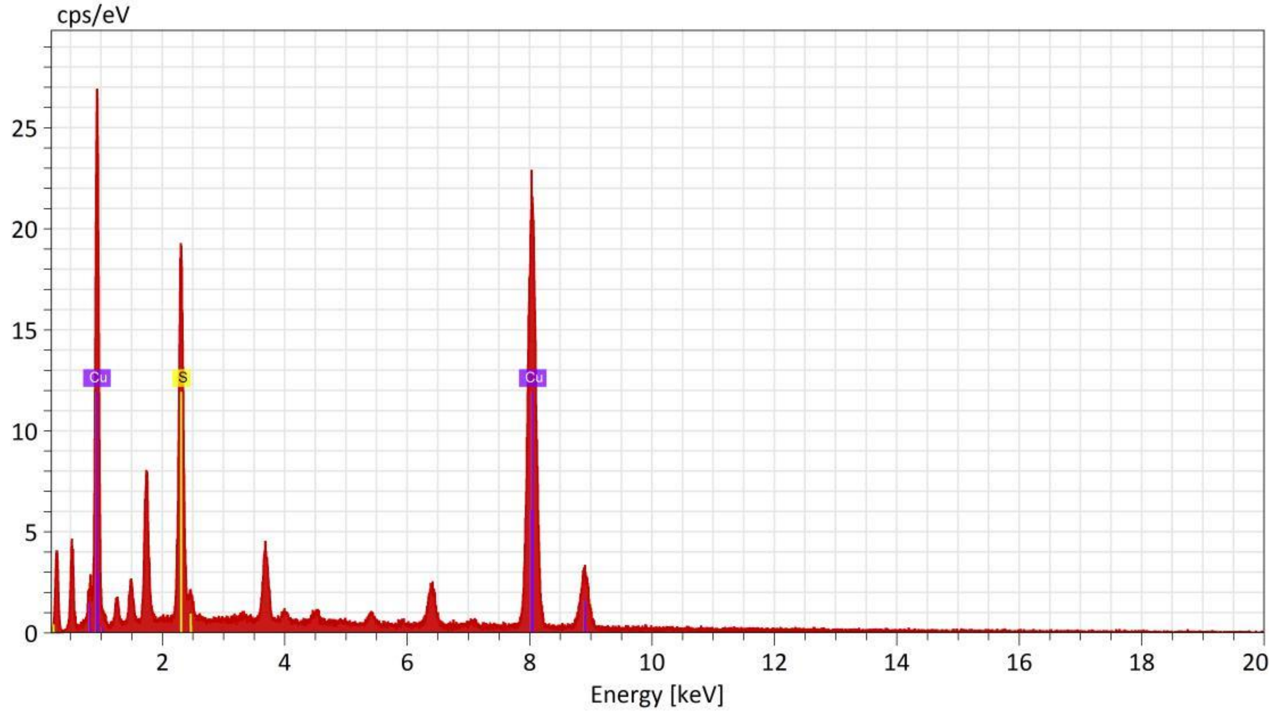

Normalized stoichiometric concentration [%]

Spectrum	Sulfur	Copper
CMT/011/62	21.48	78.52

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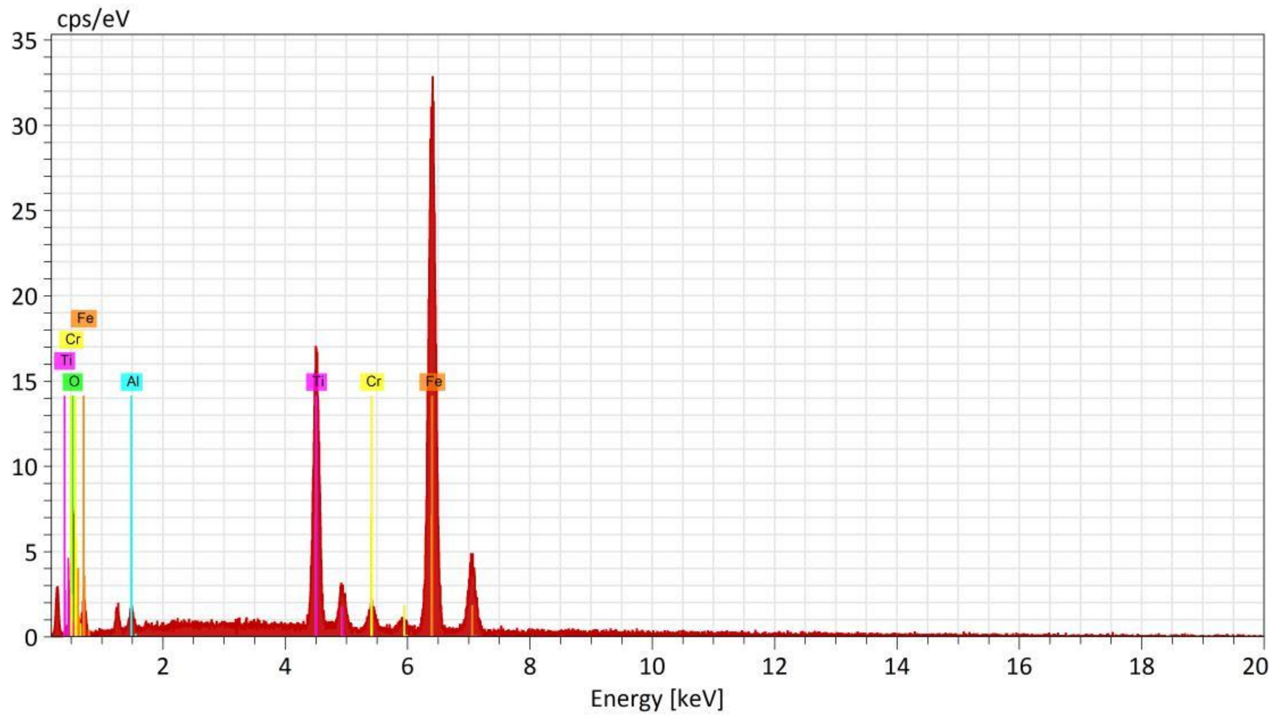
Hyderabad



Normalized stoichiometric concentration [%]

Spectrum	Oxygen	Al2O3	TiO2	Cr2O3	FeO
CMT/011/62	0.00	2.42	25.89	2.44	69.25

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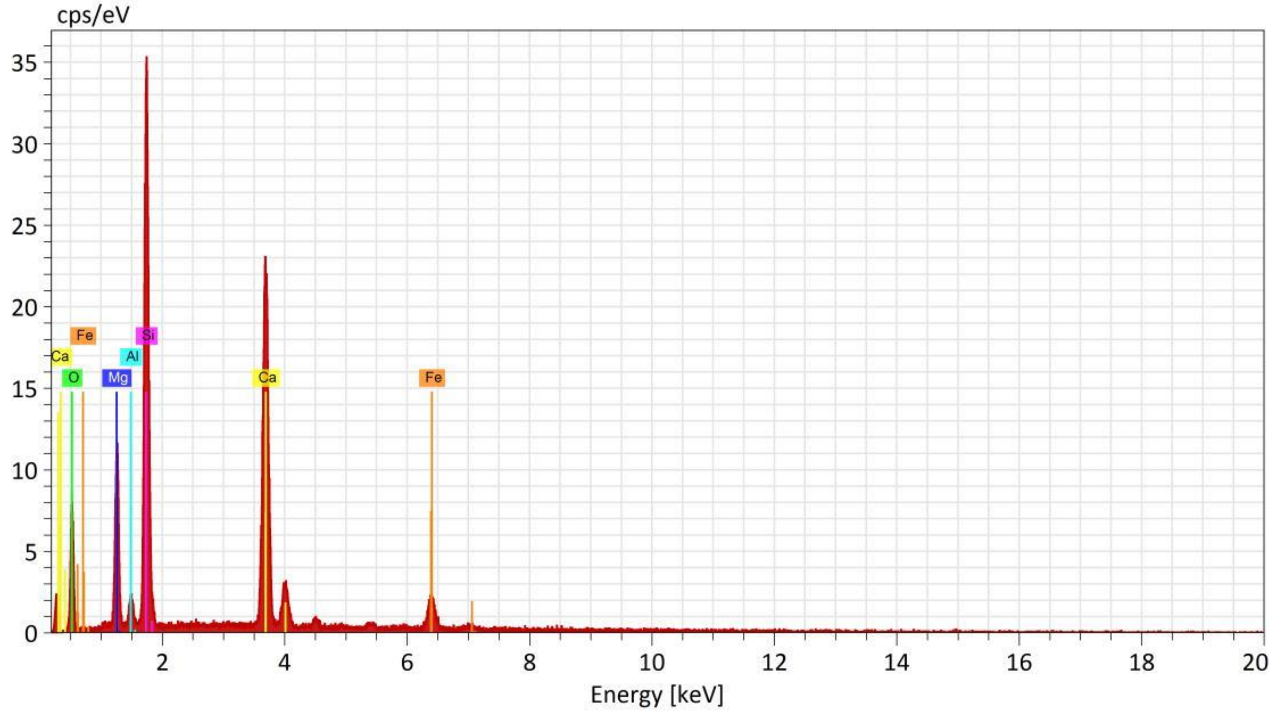
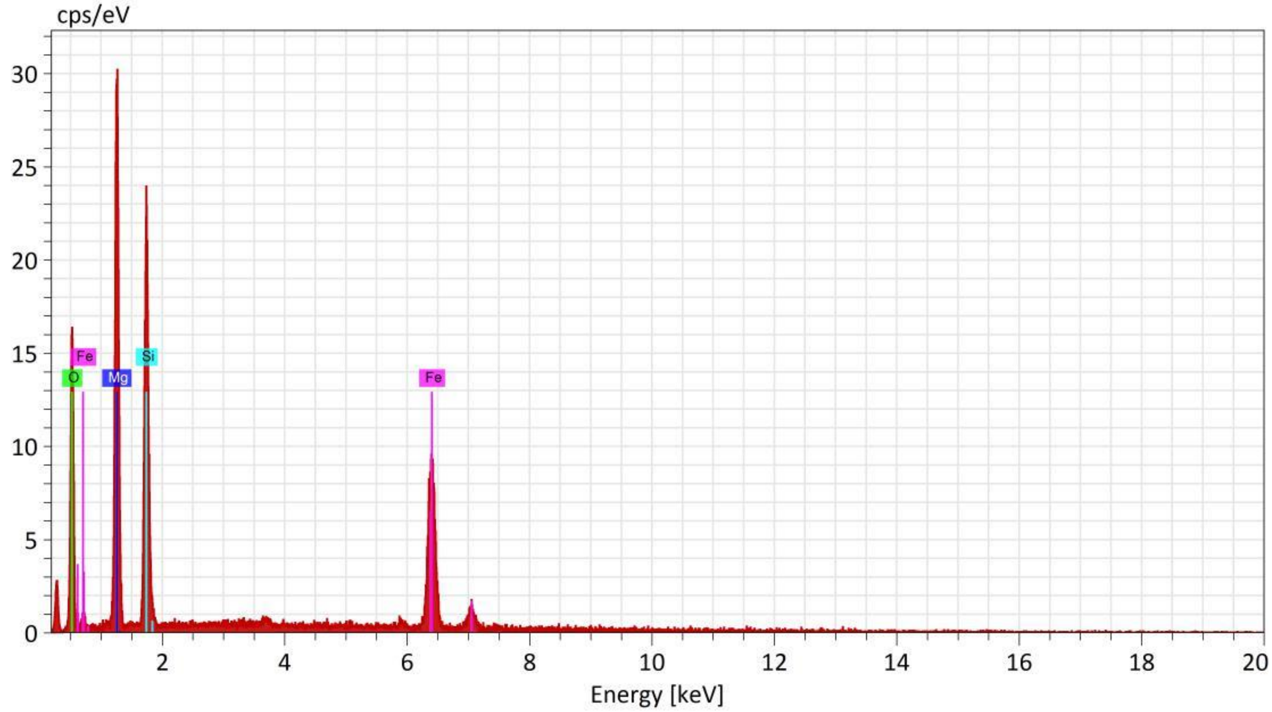


Normalized stoichiometric concentration [%]

Spectrum	Oxygen	MgO	Al2O3	SiO2	CaO	FeO
CMT/011/6	20.00	13.5	32.52	50.81	28.6	44.50

SEM-EDS Lab, Palaeontology Division, Geological Survey of India (SR)

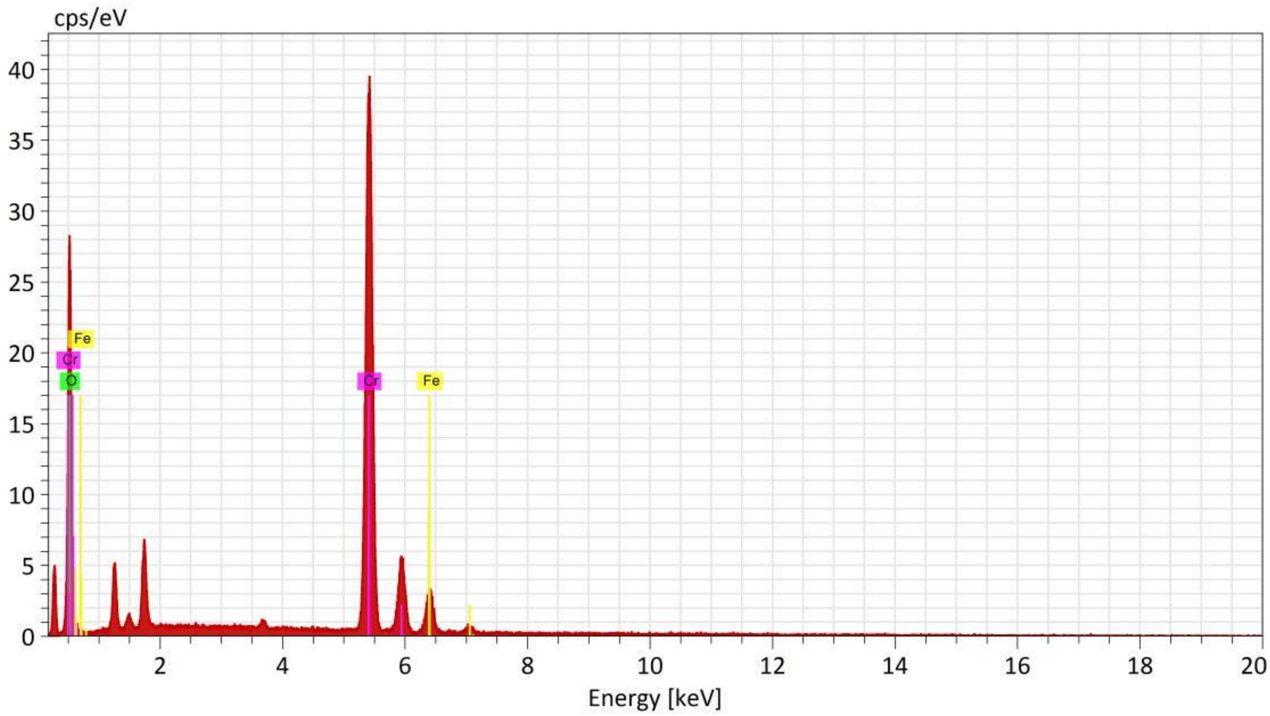
Hyderabad



Normalized stoichiometric concentration [%]

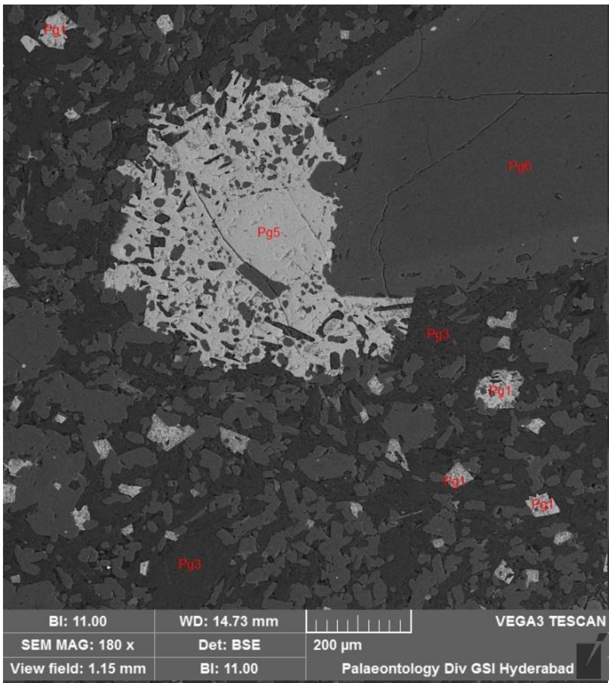
Spectrum	Oxygen	MgO	SiO2	FeO
CMT/011/62	0.00	36.39	44.11	19.51

SEM-EDS Lab, Palaeontology Division, Geological Survey of India (SR) Hyderabad



Normalized stoichiometric concentration [%]

Spectrum	Oxygen	Cr2O3	FeO
CMT/011/620.00		89.64	10.36


Pg1
Pg6
Pg5
Pg3
Pg1
Pg1
Pg1
Pg3
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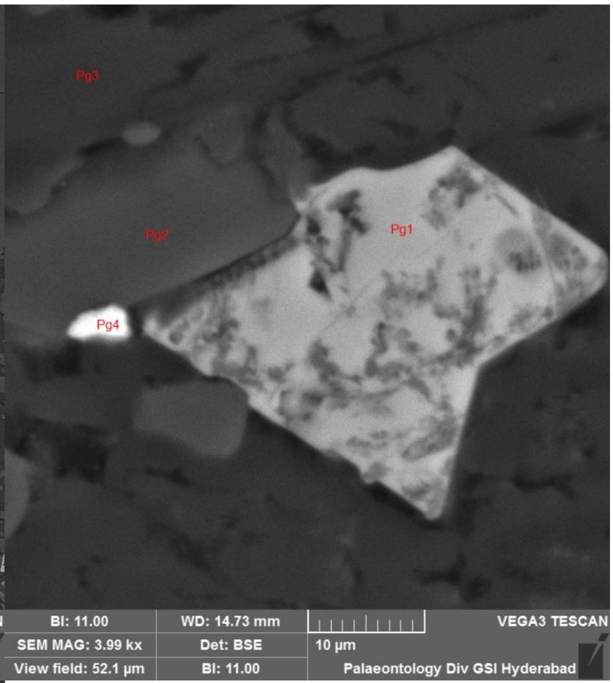
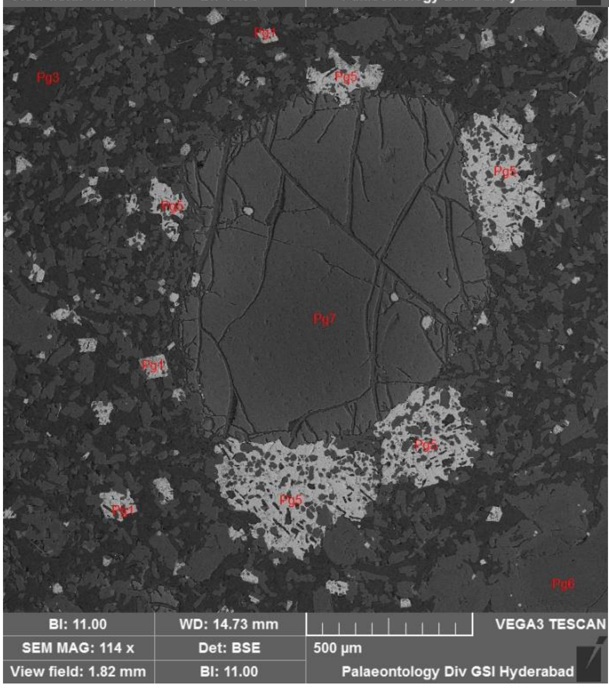
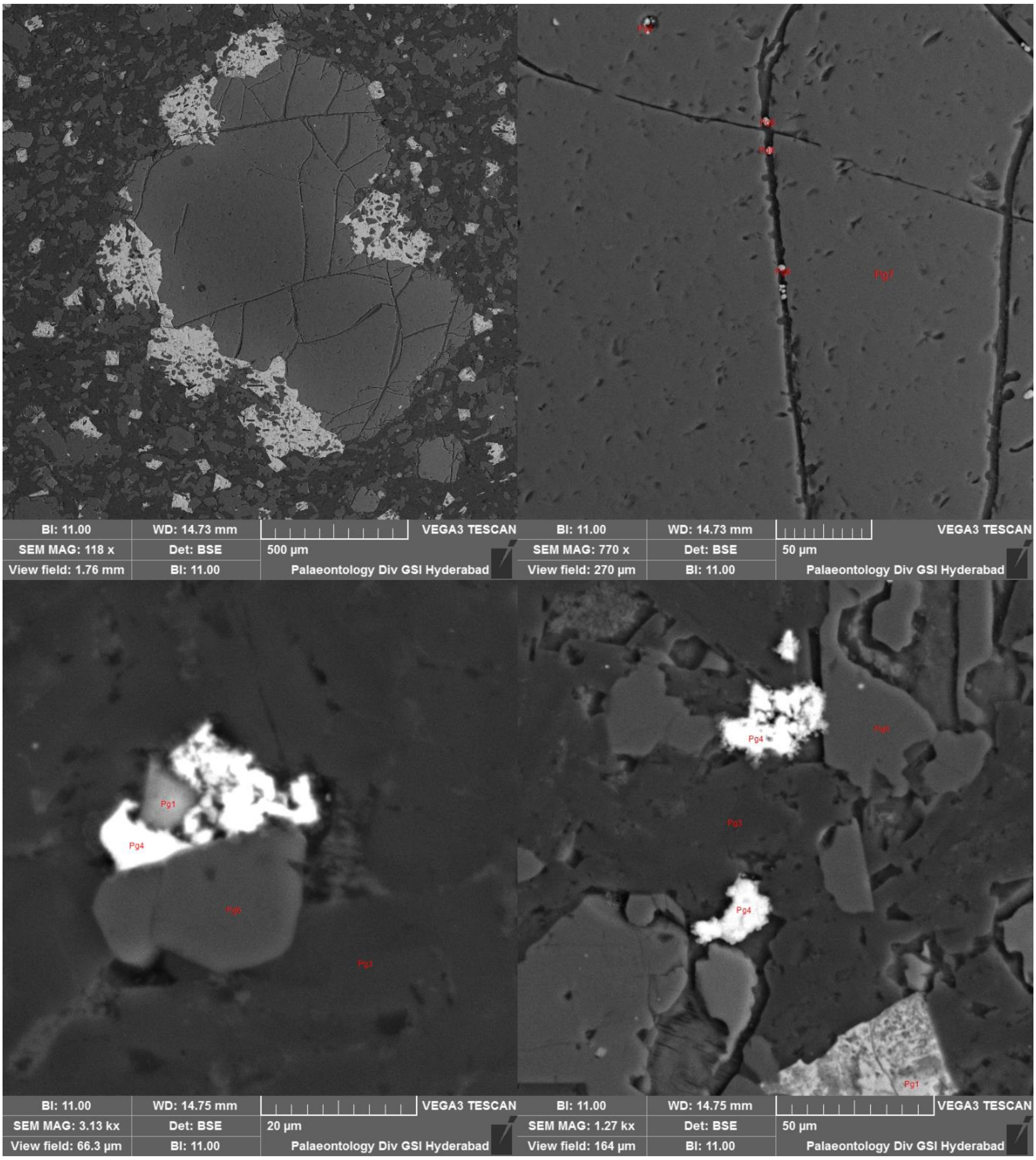
VEGA3 TESCAN
SEM MAG: 180 x
Det: BSE
200 µm
View field: 1.15 mm
BI: 11.00
Palaeontology Div GSI Hyderabad

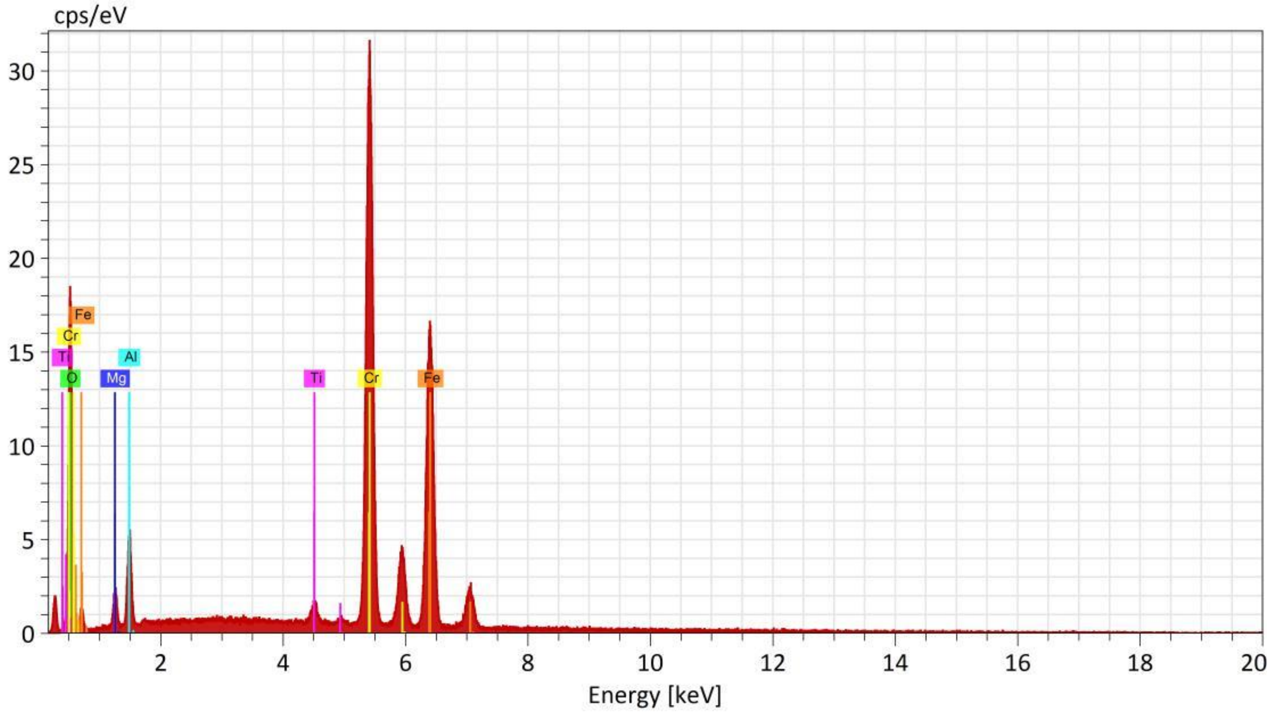

Pg3
Pg2
Pg1
Pg4
BI: 11.00
WD: 14.73 mm
VEGA3 TESCAN
SEM MAG: 3.99 kx
Det: BSE
10 µm
View field: 52.1 µm
BI: 11.00
Palaeontology Div GSI Hyderabad


Pg1
Pg3
Pg5
Pg5
Pg5
Pg7
Pg1
Pg5
Pg5
Pg1
Pg6
BI: 11.00
WD: 14.73 mm
VEGA3 TESCAN
SEM MAG: 114 x
Det: BSE
500 µm
View field: 1.82 mm
BI: 11.00
Palaeontology Div GSI Hyderabad


BI: 11.00
WD: 14.73 mm
VEGA3 TESCAN
SEM MAG: 118 x
Det: BSE
500 µm
View field: 1.76 mm
BI: 11.00
Palaeontology Div GSI Hyderabad
BI: 11.00
WD: 14.73 mm
VEGA3 TESCAN
SEM MAG: 770 x
Det: BSE
50 µm
View field: 270 µm
BI: 11.00
Palaeontology Div GSI Hyderabad
Pg1
Pg4
BI: 11.00
WD: 14.75 mm
VEGA3 TESCAN
SEM MAG: 3.13 kx
Det: BSE
20 µm
View field: 66.3 µm
BI: 11.00
Palaeontology Div GSI Hyderabad
Pg4
Pg4
Pg1
BI: 11.00
WD: 14.75 mm
VEGA3 TESCAN
SEM MAG: 1.27 kx
Det: BSE
50 µm
View field: 164 µm
BI: 11.00
Palaeontology Div GSI Hyderabad

SEM-EDS Lab, Palaeontology Division, Geological Survey of India (SR)

Hyderabad



Normalized stoichiometric concentration [%]

Spectrum	Oxygen	MgO	Al2O3	TiO2	Cr2O3	FeO
CMT/011/64	0.00	3.81	8.99	1.50	48.96	36.74

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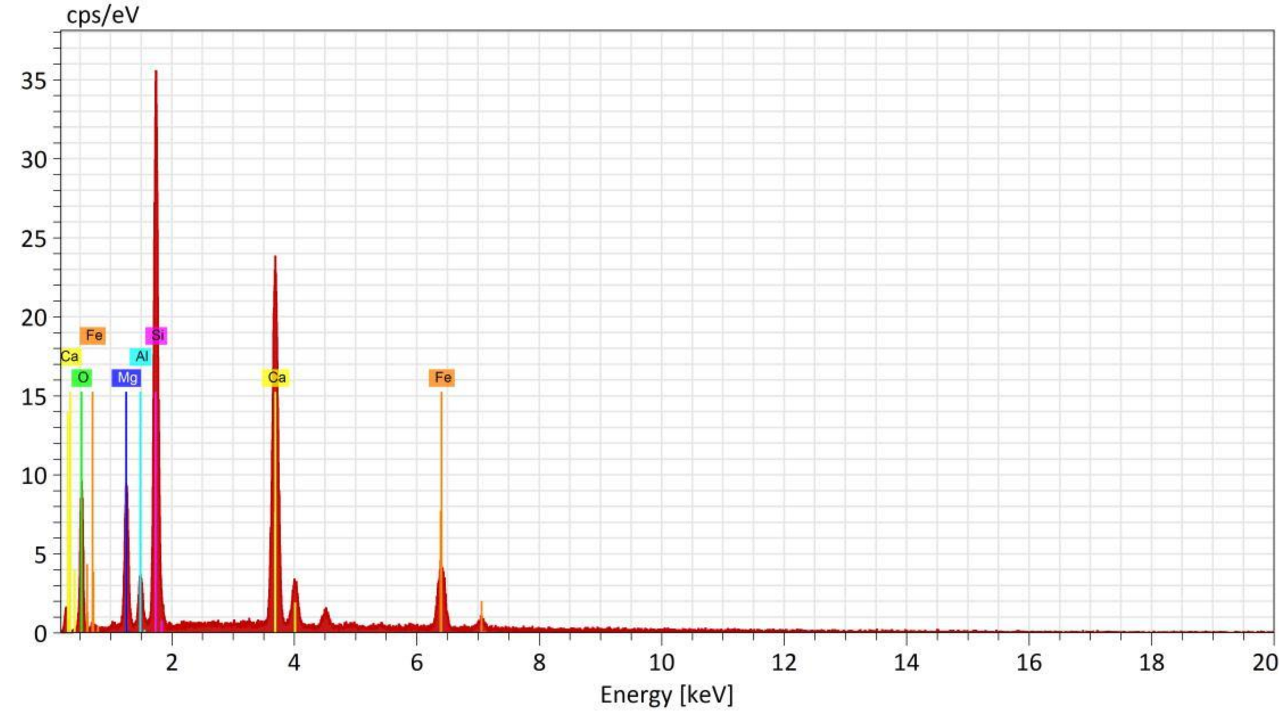

normalized stoichiometric concentration [%]

Spectrum	Oxygen	MgO	Al2O3	SiO2	CaO	FeO
CMT/011/64	0.00	13.48	5.04	50.36	24.11	7.01

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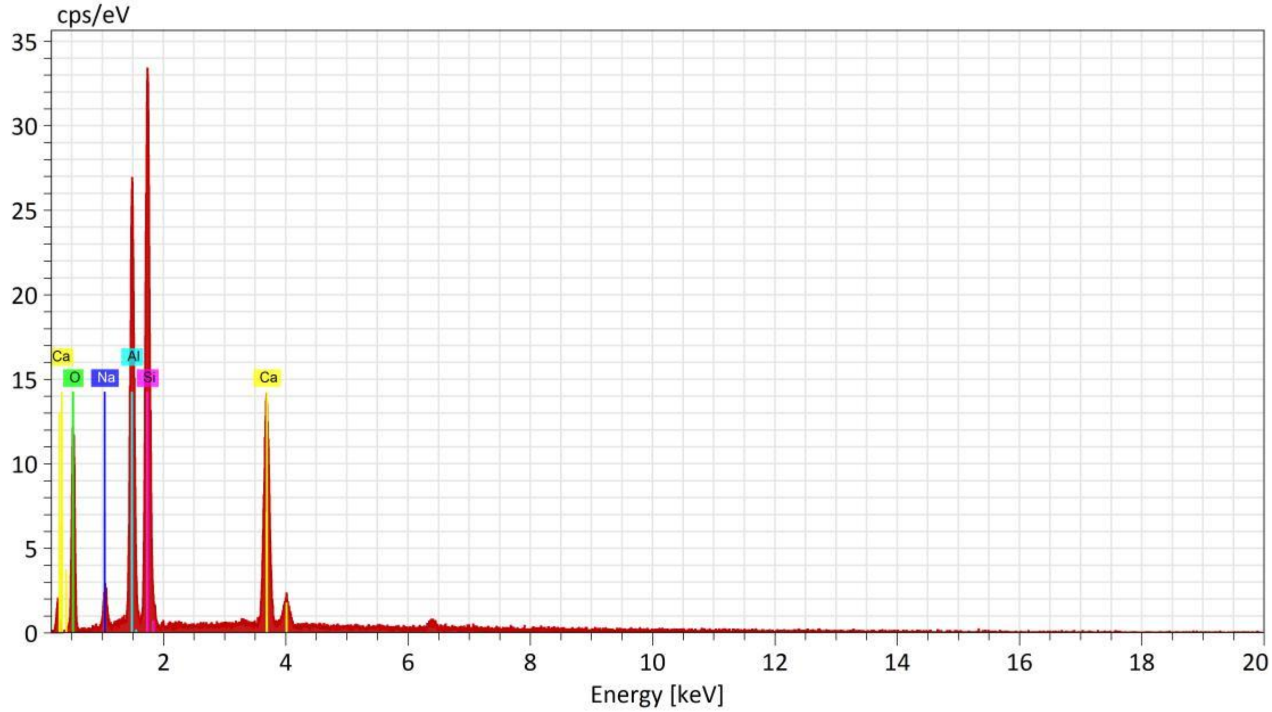
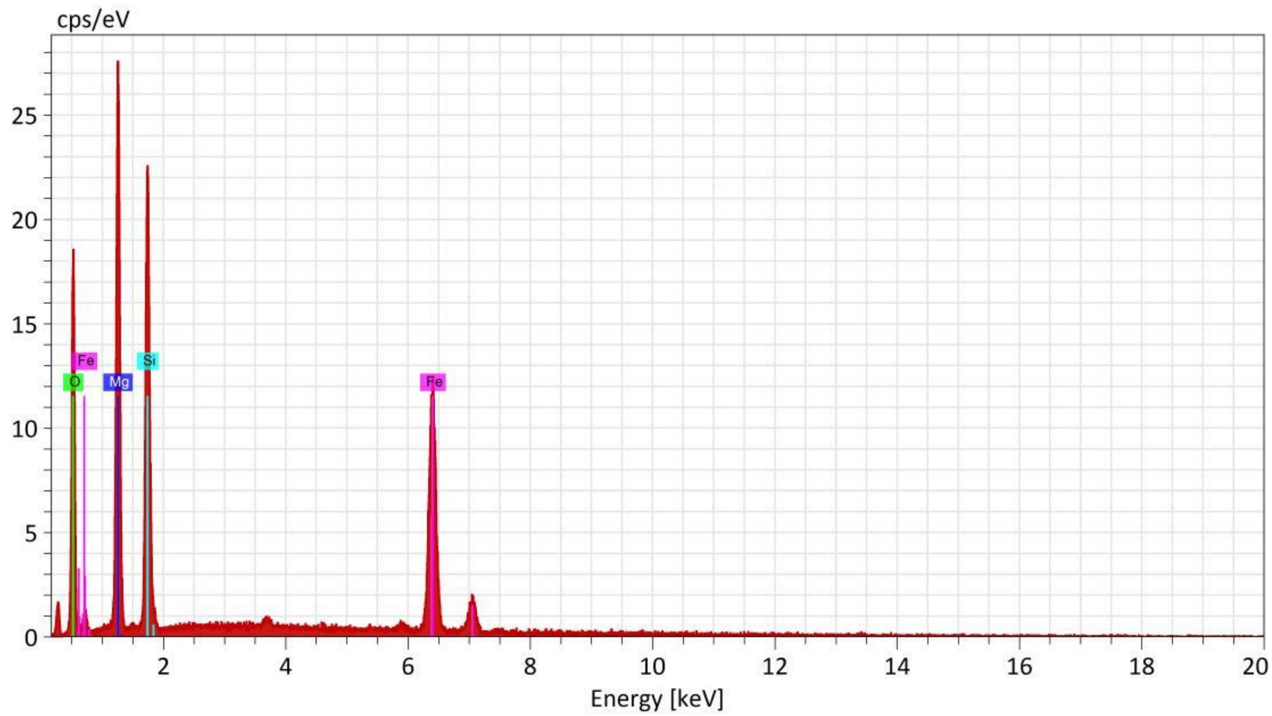


Normalized stoichiometric concentration [%]

Spectrum	Oxygen	Na2O	Al2O3	SiO2	CaO
CMT/011/64	0.00	4.34	27.69	51.72	16.26

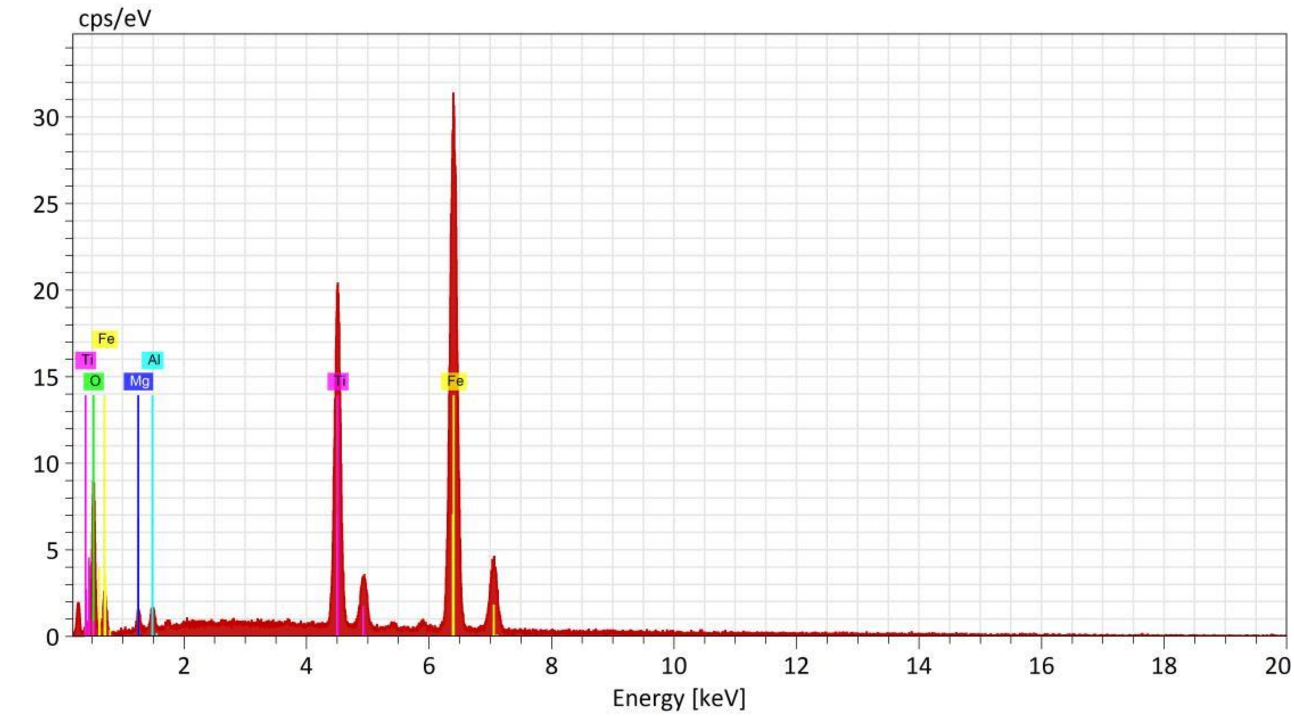
SEM-EDS Lab, Palaeontology Division, Geological Survey of India (SR) Hyderabad



Normalized stoichiometric concentration [%]

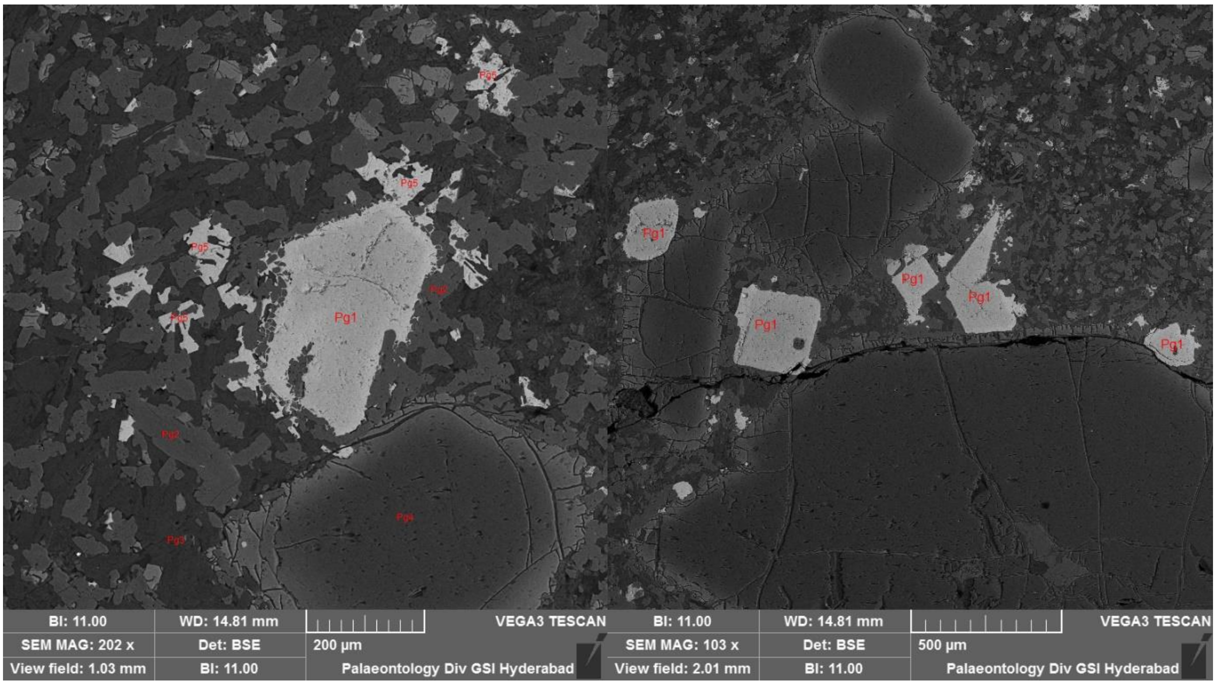
Spectrum	Oxygen	MgO	SiO2	FeO
CMT/011/64	0.00	33.40	41.87	24.72

SEM-EDS Lab, Palaeontology Division, Geological Survey of India (SR) Hyderabad



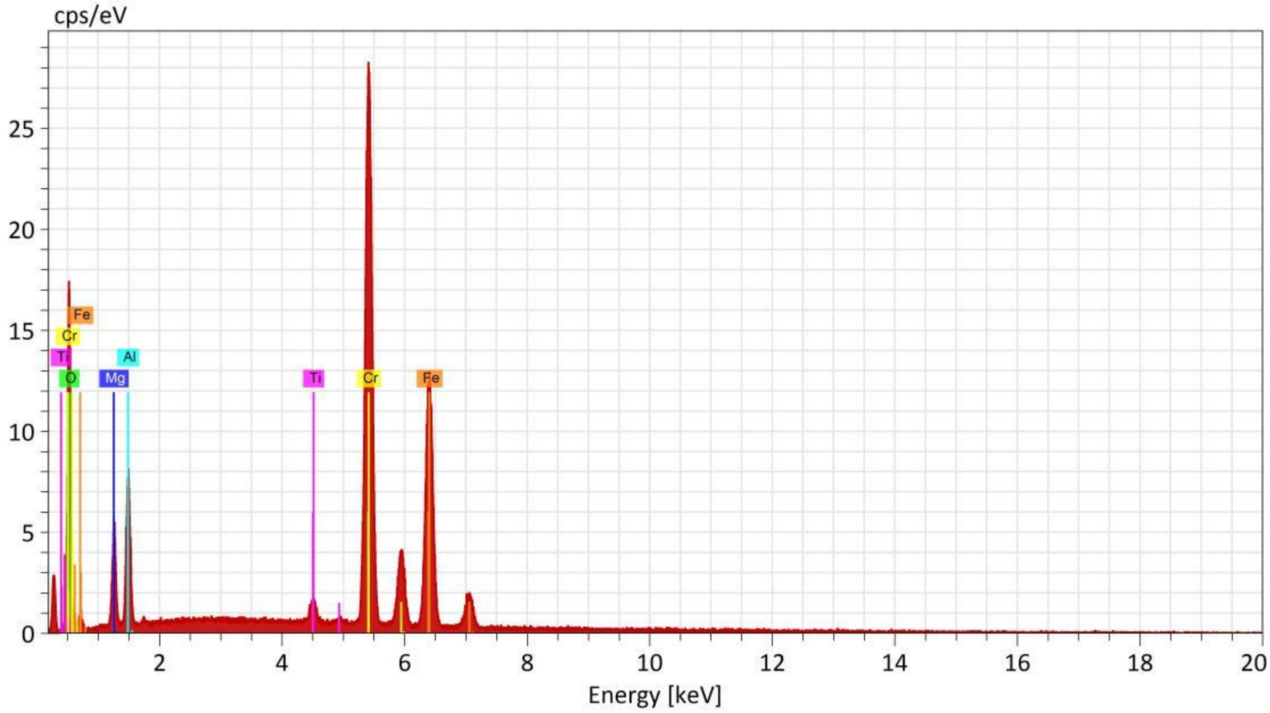
Normalized stoichiometric concentration [%]

Spectrum	Oxygen	MgO	Al2O3	TiO2	FeO
CMT/011/64	0.00	2.41	2.40	31.41	63.78


Pg5
Pg5
Pg5
Pg5
Pg1
Pg2
Pg4
Pg3
BI: 11.00
WD: 14.81 mm
VEGA3 TESCAN
SEM MAG: 202 x
Det: BSE
200 µm
View field: 1.03 mm
BI: 11.00
Palaeontology Div GSI Hyderabad
Pg1
Pg1
Pg1
Pg1
Pg1
BI: 11.00
WD: 14.81 mm
VEGA3 TESCAN
SEM MAG: 103 x
Det: BSE
500 µm
View field: 2.01 mm
BI: 11.00
Palaeontology Div GSI Hyderabad

SEM-EDS Lab, Palaeontology Division, Geological Survey of India (SR)

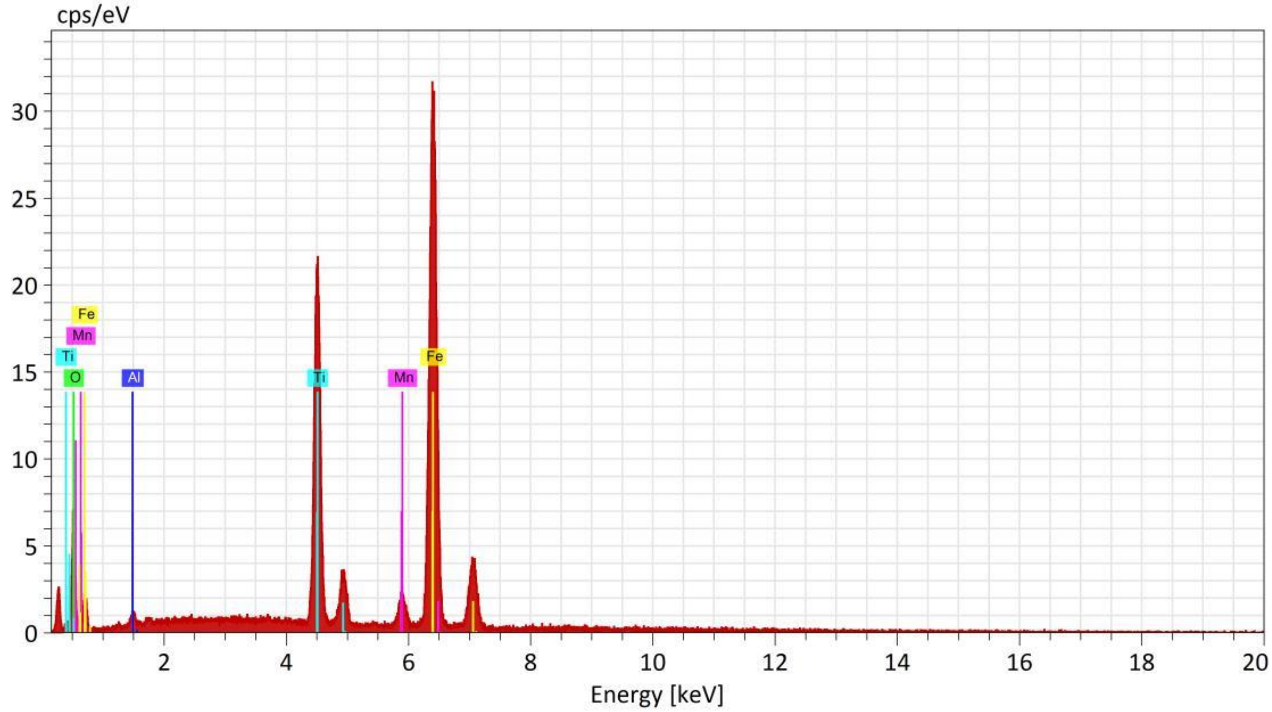
Hyderabad



Normalized stoichiometric concentration [%]

Spectrum	Oxygen	MgO	Al_2O_3	TiO_2	Cr_2O_3	FeO
CMT/011/700.00		8.26	13.09	1.71	47.36	29.57

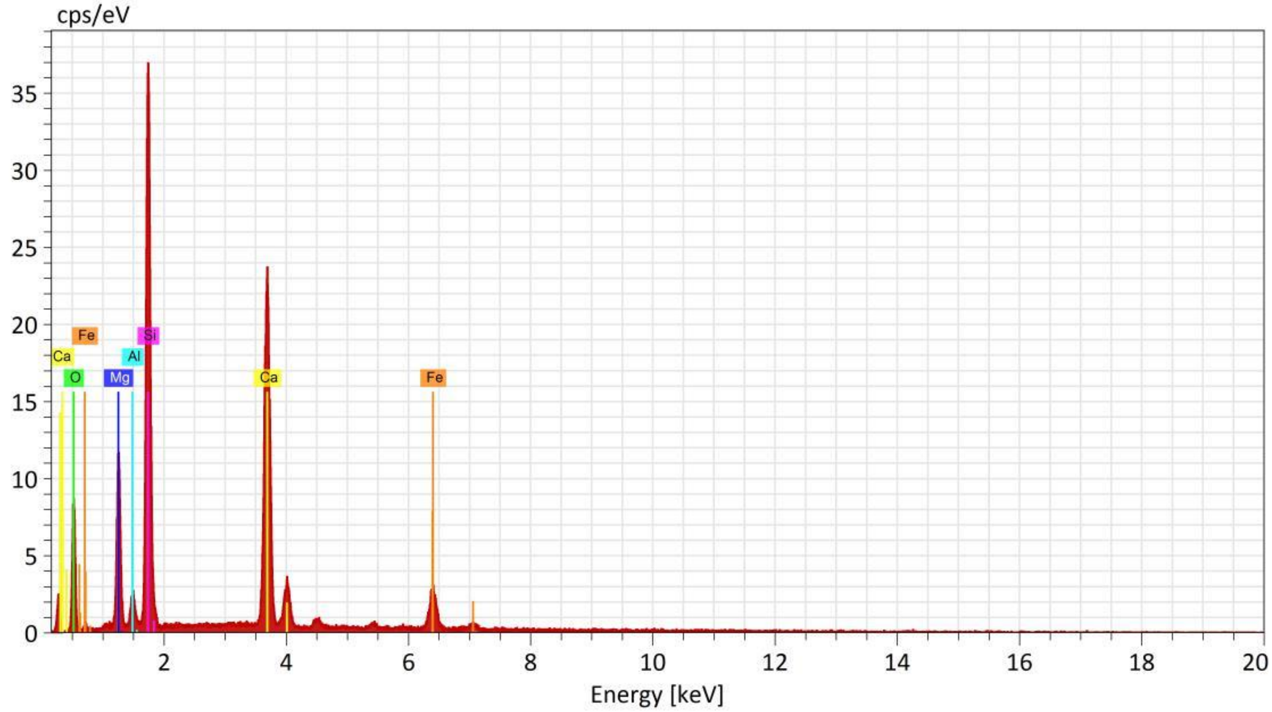
SEM-EDS Lab, Palaeontology Division, Geological Survey of India (SR) Hyderabad



Normalized stoichiometric concentration [%]

Spectrum	Oxygen	Al2O3	TiO2	MnO	FeO
CMT/011/70	0.00	1.61	32.06	3.13	63.20

SEM-EDS Lab, Palaeontology Division, Geological Survey of India (SR) Hyderabad



Normalized stoichiometric concentration [%]

Spectrum	Oxygen	MgO	Al2O3	SiO2	CaO	FeO
CMT/011/70	0.00	14.74	3.27	51.08	25.80	5.10

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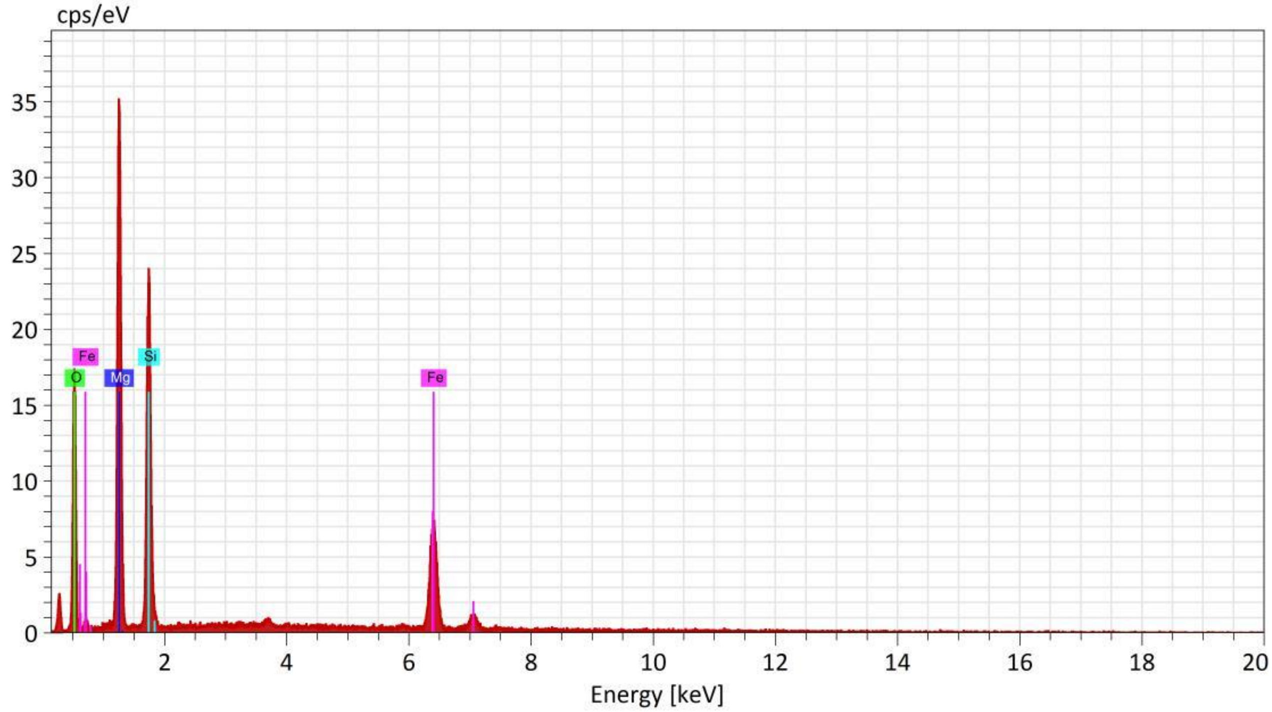
Hyderabad



Normalized stoichiometric concentration [%]

Spectrum	Oxygen	MgO	SiO2	FeO
CMT/011/70	0.00	38.24	48.37	13.39

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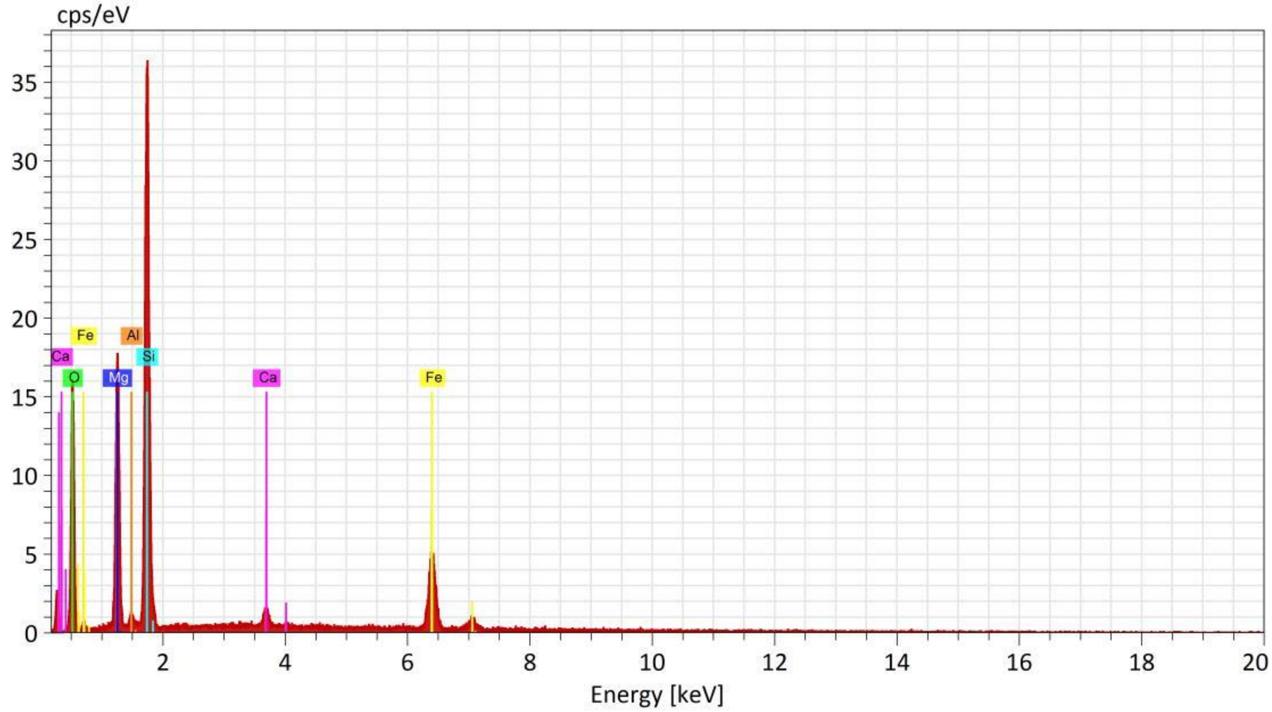
Hyderabad

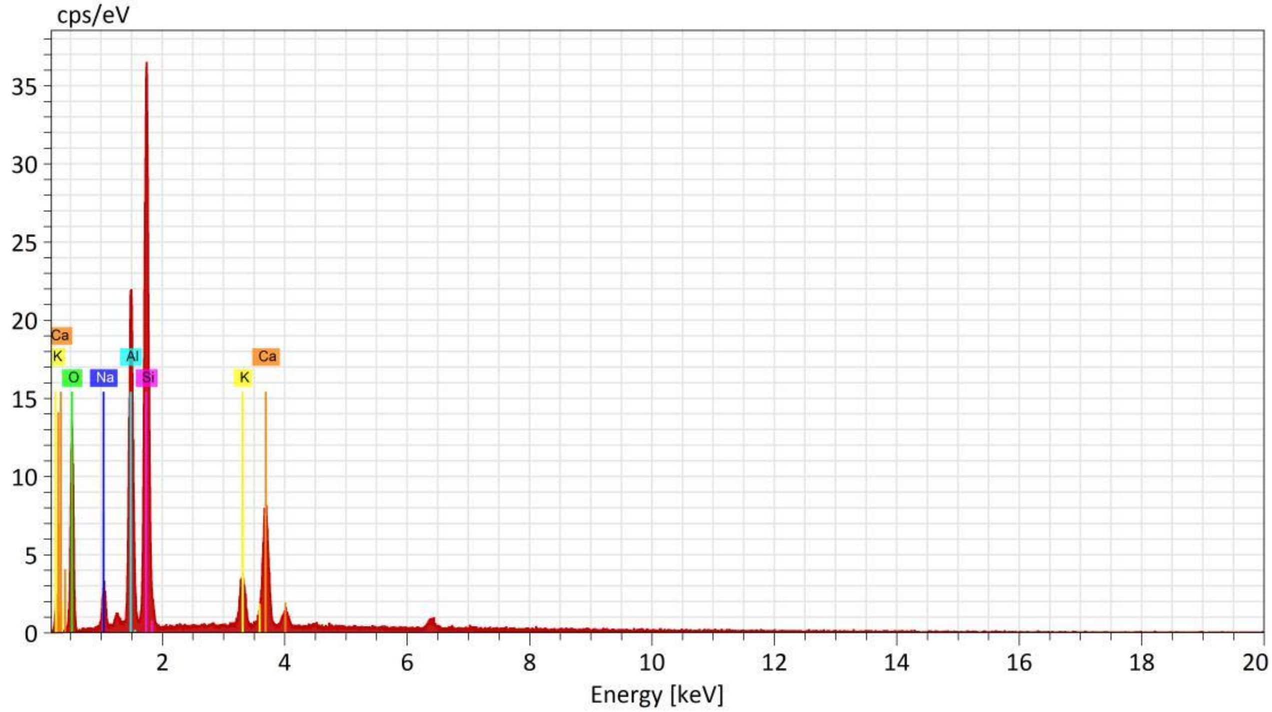


Normalized stoichiometric concentration [%]

Spectrum	Oxygen	MgO	SiO2	CaO	FeO	Al2O3

CMT/011/700.00 25.2562.481.359.141.77

SEM-EDS Lab, Palaeontology Division, Geological Survey of India (SR) Hyderabad



Normalized stoichiometric concentration [%]

Spectrum	Oxygen	Na2O	Al2O3	SiO2	K2O	CaO
CMT/011/70	0.00	4.53	26.88	56.42	2.78	9.40

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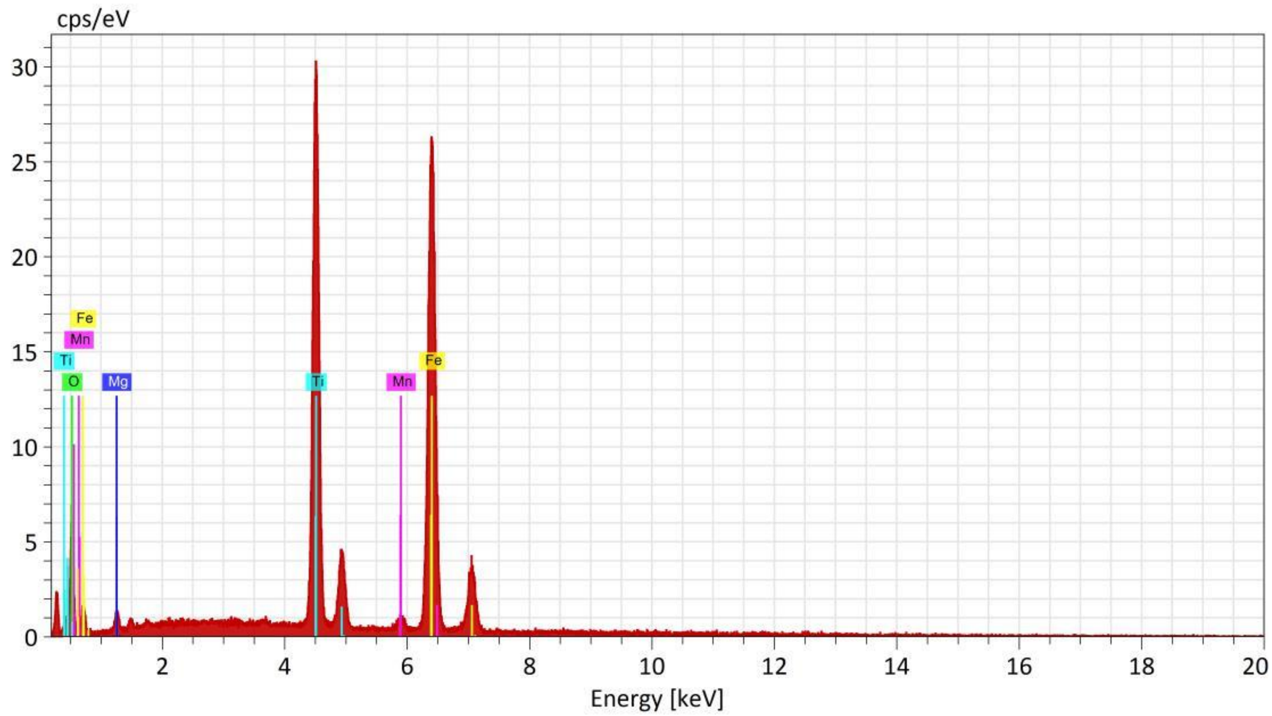
Hyderabad

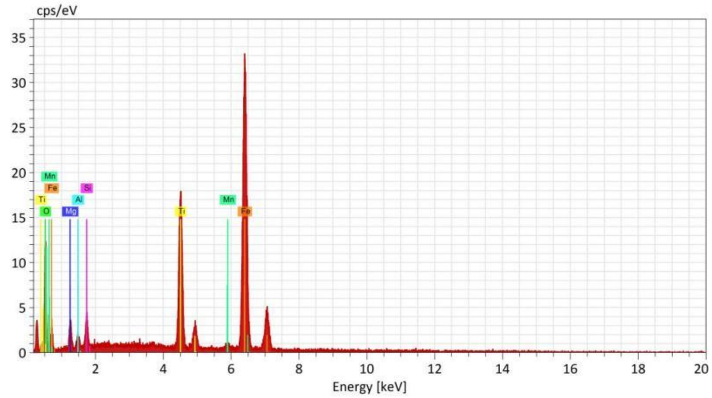


Normalized stoichiometric concentration [%]

Spectrum	Oxygen	MgO	TiO2	MnO	FeO

CMT/011/700.00 2.83 43.770.96 52.43

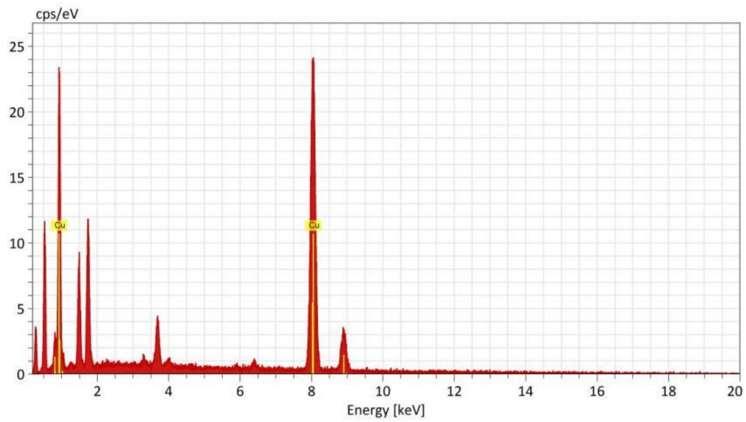
SEM-EDS Lab, Palaeontology Division, Geological Survey of India (SR) Hyderabad



Normalized stoichiometric concentration [%]

Spectrum	Oxygen	MgO	Al2O3	SiO2	TiO2	FeO	MnO

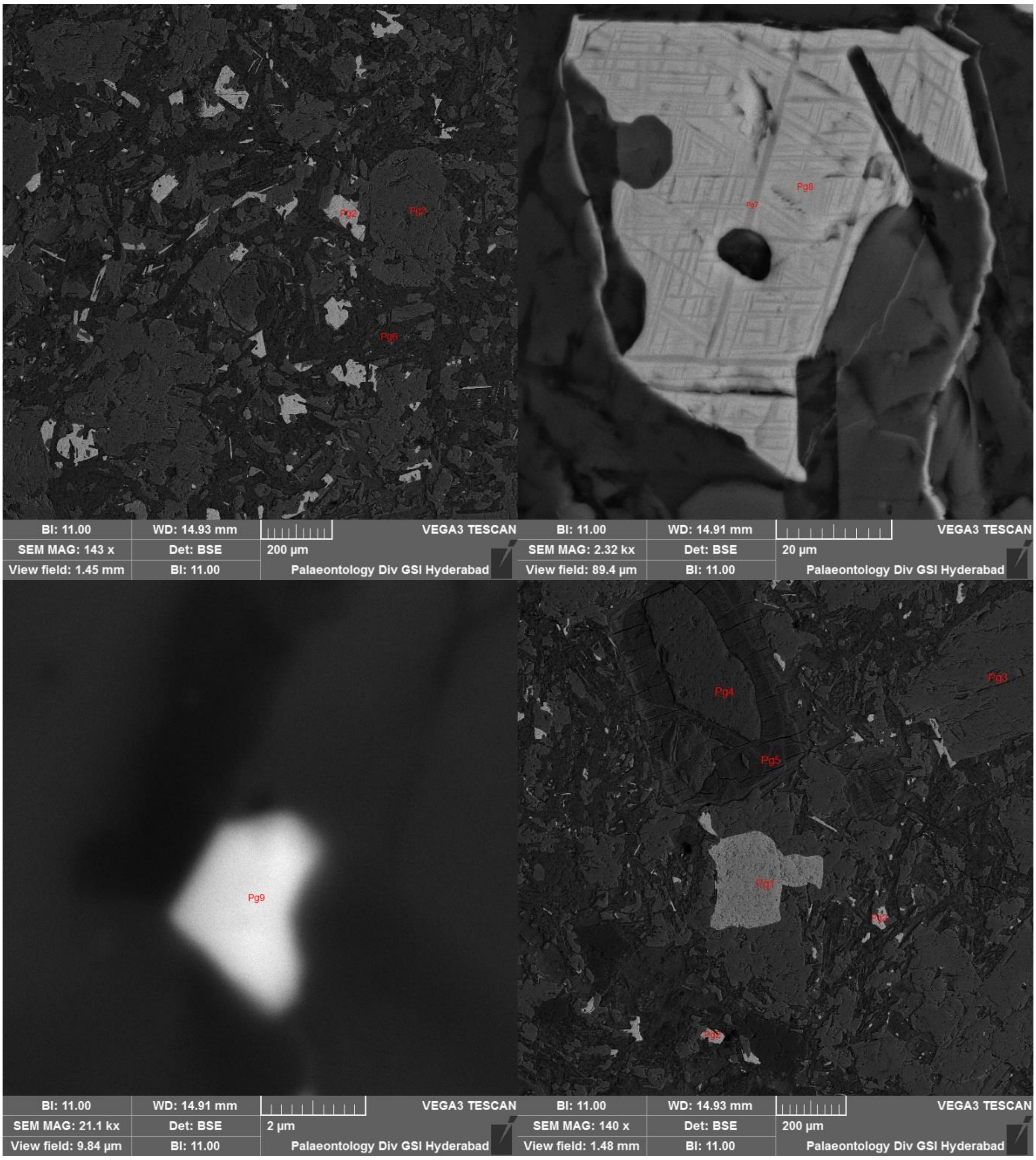
CMT/011/700.00 4.73 2.08 4.6926.0261.770.



Normalized stoichiometric concentration [%]

Spectrum Copper

CMT/011/70100.00


Pg2
Pg2
Pg6
BI: 11.00
WD: 14.93 mm
VEGA3 TESCAN
SEM MAG: 143 x
Det: BSE
200 µm
View field: 1.45 mm
BI: 11.00
Palaeontology Div GSI Hyderabad
Pg7
Pg8
BI: 11.00
WD: 14.91 mm
VEGA3 TESCAN
SEM MAG: 2.32 kx
Det: BSE
20 µm
View field: 89.4 µm
BI: 11.00
Palaeontology Div GSI Hyderabad
Pg9
BI: 11.00
WD: 14.91 mm
VEGA3 TESCAN
SEM MAG: 21.1 kx
Det: BSE
2 µm
View field: 9.84 µm
BI: 11.00
Palaeontology Div GSI Hyderabad
Pg4
Pg3
Pg5
BI: 11.00
WD: 14.93 mm
VEGA3 TESCAN
SEM MAG: 140 x
Det: BSE
200 µm
View field: 1.48 mm
BI: 11.00
Palaeontology Div GSI Hyderabad

Conclusion:

The mineralogical suite identified across all samples is characteristic of a **layered mafic to ultramafic igneous assemblage** (likely Gabbroic or Peridotitic).

Primary Silicates: The rock is dominated by high-magnesium/calcium phases, specifically **Diopside** (clinopyroxene), **Olivine**, and calcic **Plagioclase** (Labradorite-Bytownite).

Oxide Mineralization: There is significant enrichment of **Chromite** (up to 89% Cr2o3) **Ilmenite/Titaniferous Magnetite**. This suggests potential for chromium and iron-titanium ore deposits.

Metallic/Sulfide Phases: The detection of **Copper sulfides** (Chalcocite) and **Native Copper** indicates a late-stage hydrothermal or magmatic sulfide mineralizing event.

The samples represent a high-temperature magmatic environment with strong evidence of **Cr-Fe-Ti oxide crystallization** and localized **copper mineralization**. The presence of fresh pyroxene and olivine alongside these metallic phases suggests the samples originate from an economically promising mafic-ultramafic complex

Summary: (AI interpreted)

A reconnaissance-level (G4) mineral investigation was carried out on basalt/picritic basalt samples from the Botad area using **SEM–EDS analysis** at GSI, Hyderabad to evaluate their mineralogical composition and assess potential for Ni–Co–PGE and associated mineralization.

The SEM–EDS results indicate that the samples belong to a **mafic to ultramafic igneous assemblage**, characterized by a primary mineral suite of **olivine, clinopyroxene (diopside/augite), and calcic plagioclase (labradorite–bytownite)**. The high MgO and FeO contents suggest a **primitive, mantle-derived magma**, indicative of high-temperature crystallization conditions.

Significant **oxide mineralization** has been identified in the form of:

- **Chromite** with Cr_2O_3 values up to ~89%
- **Fe–Ti oxides** such as ilmenite and titaniferous magnetite

These features indicate **oxide segregation during magmatic differentiation**, suggesting potential for **chromium and Fe–Ti mineralization**.

Importantly, **sulfide and metallic phases** have also been detected, including:

- **Chalcocite (Cu_2S)**
- **Native copper**

This points to **late-stage magmatic sulfide segregation and/or hydrothermal activity**, which is a key indicator for **Ni–Cu–PGE mineral systems**.

Overall, the mineral assemblage, geochemical signatures, and presence of oxide and sulfide phases suggest that the study area represents a **fertile mafic–ultramafic magmatic system**, possibly related to a **layered intrusion or cumulate zone**.

The following favourable indicators for Ni–Co–PGE mineralization are observed:

- Ultramafic affinity (olivine-rich system)
- Strong chromite association
- Presence of sulfide mineralization (Cu phase)
- High MgO magma (primitive nature)

The Botad block area exhibits **promising geological conditions for magmatic sulfide and oxide mineralization**, with potential for:

- **Chromite (Cr)**
- **Fe–Ti oxides**
- **Cu–Ni–Co sulfides**
- **PGE mineralization**

6.1.7 Structure:

The following are the common structures noticed in the mapped area include:

Joints, including vertical, horizontal, and irregular joints that divide the basalt into blocks and facilitate weathering and groundwater movement. These joints trend N-S (vertical), E-W, and NE-SW (vertical to subvertical), along with horizontal sheet joints.

Vesicular and amygdaloidal structures are also widely present in the upper parts of lava flows, where gas bubbles formed cavities (vesicles) that were later filled by secondary minerals such as calcite, quartz, or zeolites to form amygdales.

Sheet joints and spheroidal weathering are also commonly observed in exposed basalt, producing rounded blocks due to chemical weathering along joint planes. These structural features are significant as they control groundwater movement, mineralisation, and the geomorphology of basaltic terrains.

Dyke intrusions are another important structural feature, where vertical or steeply inclined sheets of basaltic magma intruded along fractures and served as feeders for the lava flows.

6.1.8 Pitting

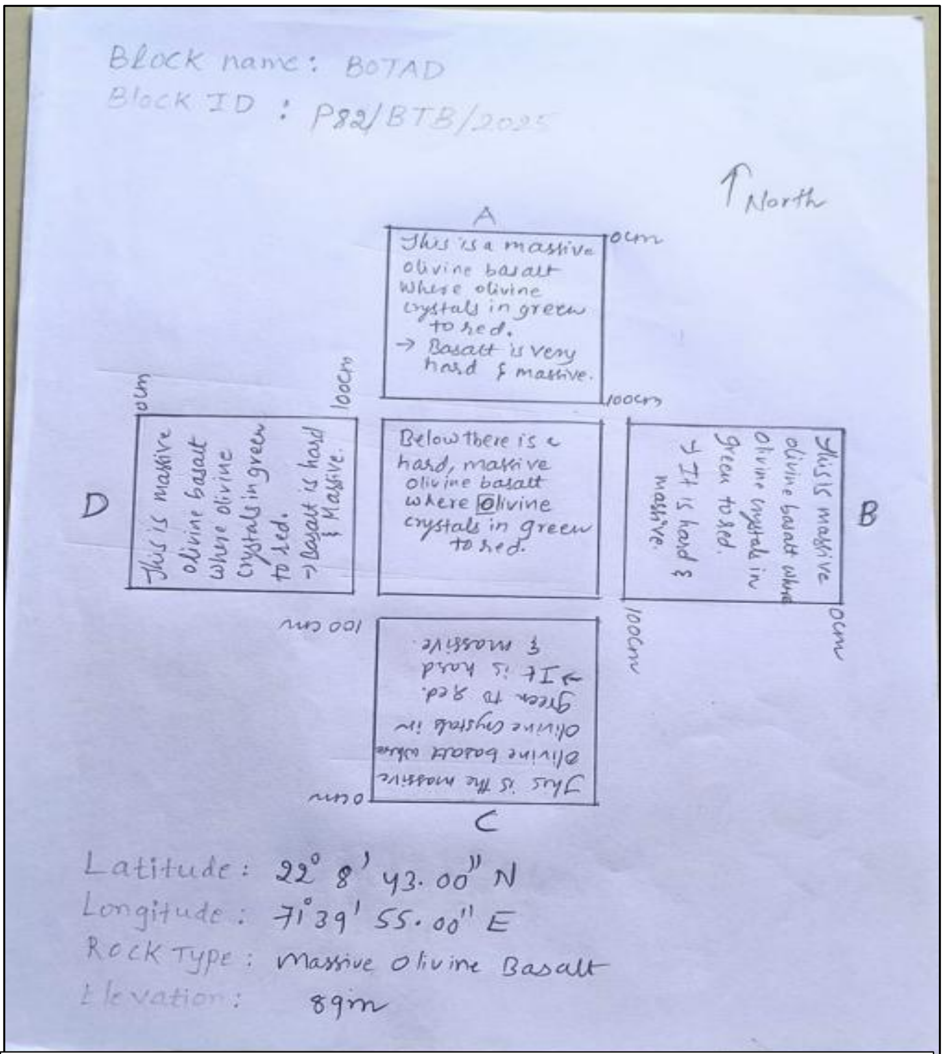
Pitting is an early-stage exploration method used to expose soil and weathered bedrock by excavating shallow pits. It is important because it provides direct access to subsurface materials, enabling geologists to observe lithology, alteration more accurately than by surface mapping alone. Pitting also facilitates reliable geochemical sampling from relatively undisturbed soil horizons and helps in understanding the local weathering profile and subsurface continuity of lithological units.

Initially, pits were planned along **Flow 3 and Flow 4**, as these represent picritic basalt flows. Preliminary **BRS samples** from these zones yielded encouraging values, with **Nickel (Ni) concentrations exceeding 1200 ppm**. Based on these results, exploration efforts were initially focused on these flows and subsequently extended to the other flows in the area. Eventually, all the flows were investigated and the entire block was systematically covered.93 pits and 2BRS samples have been excavated in the mapped zone, each measuring 1 x 1 x 1 cubic meters (approx.) in dimension.

A total of 95 samples were systematically collected from the pits, representing each of the distinct layers observed in the pit sections. These include the duri-crust layer, red bole bed layer, and the olivine basaltic layer containing calcareous material.

However, seven pits could not be excavated due to obstruction from local villagers. Subsequently, 20 pit samples were analysed using XRF, while all 95 samples were subjected to ICP–MS chemical analysis. The subsurface observations from the pits have been documented and demarcated as A (along the north direction), B, C, D, E, and so on for systematic representation and interpretation.

Pitting revealed the continuation of picritic basalt in the subsurface layers. Within these layers, olivine crystals were observed, displaying colors ranging from green to reddish. In several instances, the olivine shows alteration to iddingsite, indicating secondary alteration processes within the basalt.



Photograph 37: showing worksheet of pit details

Few Photographs related to Pitting:

Photograph 38A: Showing pitting

Photograph 38B: Showing pitting

Photograph 38C: Showing pitting

Photograph 38D: Showing pitting

Table: Details of Pitting

S. No	Sample Id	Latitude	Longitude	Dimension (in m)	Pit Volume (cu m)
1	P1/BTB/2025	22.171803	71.68595	1*1*1	1
2	P2/BTB/2025	22.1753	71.686443	1*1*1	1
3	P3/BTB/2025	22.175935	71.686137	1*1*1	1
4	P4/BTB/2025	22.17693	71.686795	1*1*1	1
5	P5/BTB/2025	22.178015	71.686268	1*1*1	1
6	P6/BTB/2025	22.177838	71.685027	1*1*1	1
7	P7/BTB/2025	22.179392	71.68802	1*1*1	1
8	P8/BTB/2025	22.17983	71.688527	1*1*1	1
9	P9/BTB/2025	22.182173	71.687272	1*1*1	1
10	P10/BTB/2025	22.174173	71.690027	1*1*1	1
11	P11/BTB/2025	22.1722445	71.689718	1*1*1	1
12	P12/BTB/2025	22.1708	71.689153	1*1*1	1
13	P13/BTB/2025	22.196212	71.6982	1*1*1	1
14	P14/BTB/2025	22.192557	71.692855	1*1*1	1
15	P15/BTB/2025	22.187255	71.691693	1*1*1	1
16	P16/BTB/2025	22.184922	71.692865	1*1*1	1
17	P17/BTB/2025	22.182715	71.692312	1*1*1	1
18	P18/BTB/2025	22.181883	71.695478	1*1*1	1
19	P19/BTB/2025	22.180908	71.701997	1*1*1	1
20	P20/BTB/2025	22.178752	71.698485	1*1*1	1
21	P21/BTB/2025	22.178628	71.693582	1*1*1	1
22	P22/BTB/2025	22.17	71.710833	1*1*1	1
23	P23/BTB/2025	22.169528	71.685037	1*1*1	1

24	P24/BTB/2025	22.1688	71.684002	1*1*1	1
25	P25/BTB/2025	22.166423	71.678943	1*1*1	1
26	P26/BTB/2025	22.162388	71.679848	1*1*1	1
27	P27/BTB/2025	22.164405	71.684322	1*1*1	1
28	P28/BTB/2025	22.175482	71.681255	1*1*1	1
29	P29/BTB/2025	22.184031	71.695361	1*1*1	1
30	P30/BTB/2025	22.16865	71.685003	1*1*1	1
31	P31/BTB/2025	22.120888	71.696067	1*1*1	1
32	P32/BTB/2025	22.169232	71.713553	1*1*1	1
33	P33/BTB/2025	22.168056	71.713889	1*1*1	1
34	P34/BTB/2025	22.1675	71.721667	1*1*1	1
35	P35/BTB/2025	22.161389	71.726944	1*1*1	1
36	P36/BTB/2025	22.158056	71.724167	1*1*1	1
37	P37/BTB/2025	22.153889	71.727778	1*1*1	1
38	P38/BTB/2025	22.15557	71.725395	1*1*1	1
39	P39/BTB/2025	22.159444	71.722222	1*1*1	1
40	P40/BTB/2025	22.141183	71.727643	1*1*1	1
41	P41/BT8/2025	22.142363	71.720277	1*1*1	1
42	P42/BTB/2025	22.145588	71.71484	1*1*1	1
43	P43/BTB/2025	22.143911	71.705497	1*1*1	1
44	P44/BTB/2025	22.151969	71.698906	1*1*1	1
45	P45/BTB/2025	22.159397	71.689622	1*1*1	1
46	P46/BTB/2025	22.149444	71.671944	1*1*1	1
47	P47/BTB/2025	22.146667	71.673333	1*1*1	1
48	P48/BTB/2025	22.145886	71.679947	1*1*1	1
49	P49/BTB/2025	22.136086	71.664194	1*1*1	1
50	P50/BTB/2025	22.114444	71.658889	1*1*1	1
51	PS1/BTB/2025	22.116389	71.66	1*1*1	1

52	PS2/BTB/2025	22.116667	71.660833	1*1*1	1
53	P53/BTB/2025	22.128056	781.6675	1*1*1	1
54	P54/BTB/2025	22.103611	71.679167	1*1*1	1
55	PS5/BTB/2025	22.1225	71.6675	1*1*1	1
56	PS6/BTB/2025	22.124167	71.671111	1*1*1	1
57	PS7/BTB/2025	22.118056	71.677222	1*1*1	1
58	P58/BTB/2025	22.120556	71.6775	1*1*1	1
59	P59/BTB/2025	22.133644	71.674756	1*1*1	1
60	P60/BTB/2025	22.204069	71.707147	1*1*1	1
61	P61/BTB/2025	22.214167	71.711111	1*1*1	1
62	P62/BTB/2025	22.113889	71.686667	1*1*1	1
63	P63/BTB/2025	22.116667	71.686389	1*1*1	1
64	P64/BTB/2025	22.118889	71.688056	1*1*1	1
65	P65/BTB/2025	22.118903	71.692731	1*1*1	1
66	P66/BTB/2025	22.121389	71.697778	1*1*1	1
67	P67/BTB/2025	22.094167	71.705833	1*1*1	1
68	P68/BTB/2025	22.098333	71.691667	1*1*1	1
69	P69/BTB/2025	22.12398	71.69963	1*1*1	1
70	P70/BTB/2025	22.124167	71.701389	1*1*1	1
71	P71/BTB/202	22.127778	71.701667	1*1*1	1
72	P72/BTB/202	22.128056	71.699167	1*1*1	1
73	P73/BTB/2025	22.131111	71.705556	1*1*1	1
74	P74/BTB/2025	22.132264	71.701878	1*1*1	1
75	P75/BTB/2025	22.135278	71.700556	1*1*1	1
76	P76/BTB/2025	22.134444	71.697222	1*1*1	1
77	P77/BTB/2025	22.13575	71.7183	1*1*1	1
78	P78/BTB/2025	22.126667	71.723611	1*1*1	1
79	P79/BTB/2025	22.131667	71.717778	1*1*1	1

80	P80/BTB/2025	22.127222	71.715833	1*1*1	1
81	P81/BTB/2025	22.122778	71.715278	1*1*1	1
82	P82/BTB/2025	22.145278	71.665278	1*1*1	1
83	P83/BTB/2025	22.140148	71.66178	1*1*1	1
84	P84/BTB/2025	22.135923	71.673618	1*1*1	1
85	P85/BTB/2025	22.1125	71.678333	1*1*1	1
86	PB6/BTB/2025	22.111418	71.678823	1*1*1	1
87	P87/BTB/2025	22.100278	71.683889	1*1*1	1
88	P88/BTB/2025	22.088611	71.69	1*1*1	1
89	P89/BTB/2025	22.101944	71.6725	1*1*1	1
90	P90/BTB/2025	22.10974	71.673258	1*1*1	1
91	P91/BTB/2025	22.113056	71.666944	1*1*1	1
92	P92/BTB/2025	22.118611	71.652778	1*1*1	1
93	P93/BTB/2025	22.118056	71.6475	1*1*1	1
				Total Vol-ume	**93 cubic meter**

MAP SHOWING BASALTIC FLOWS ALONG WITH PIT LOCATIONS:

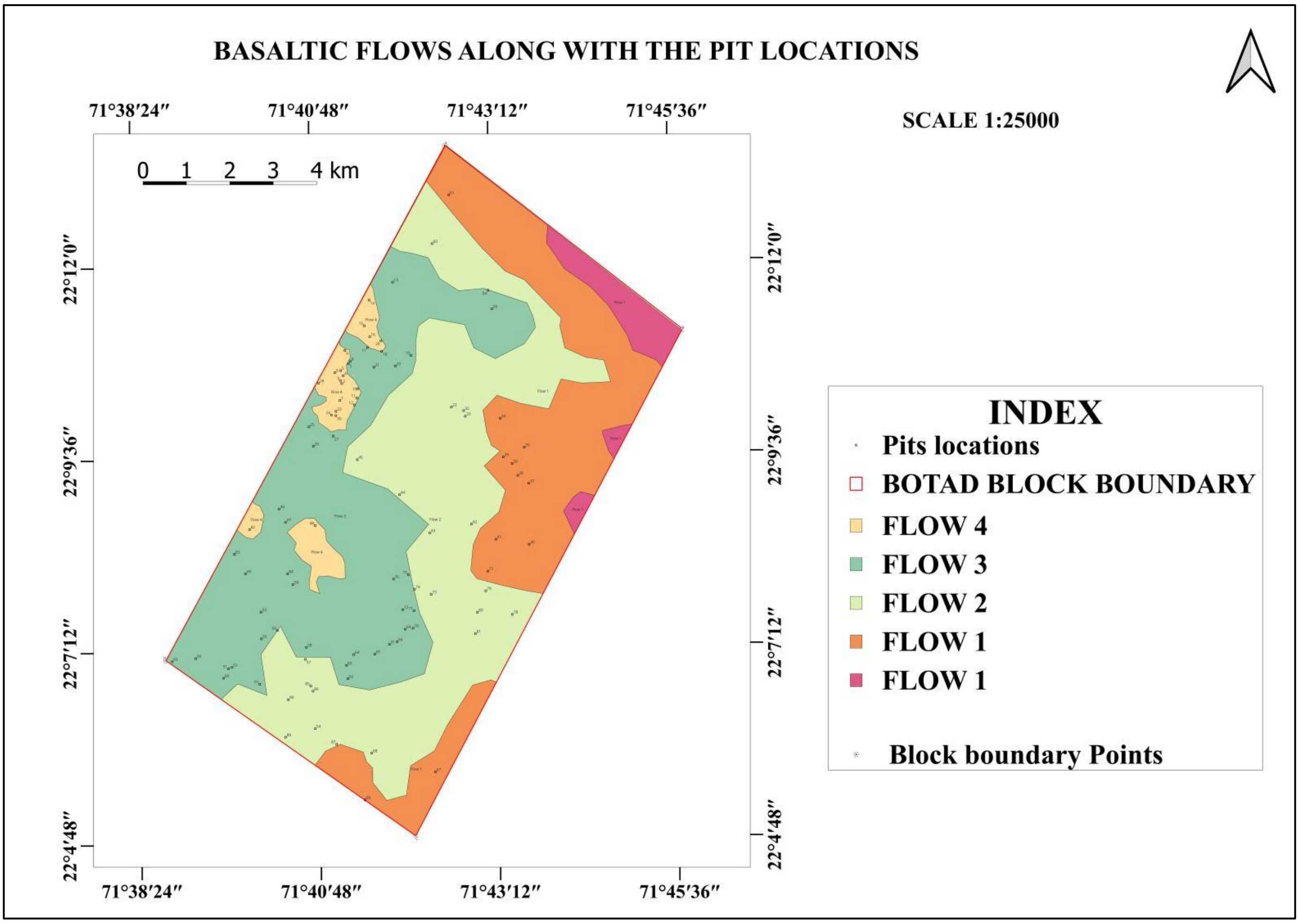
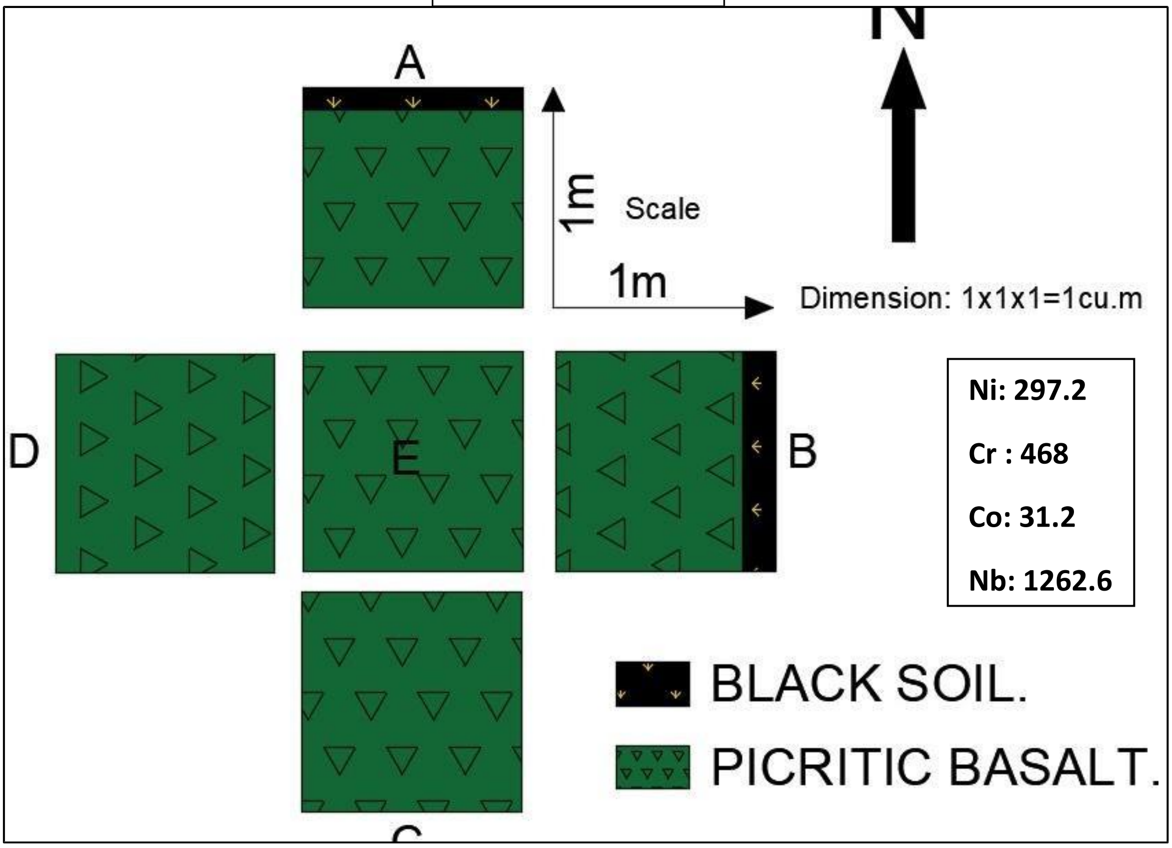


PLATE NO:11

Pit Profiles:

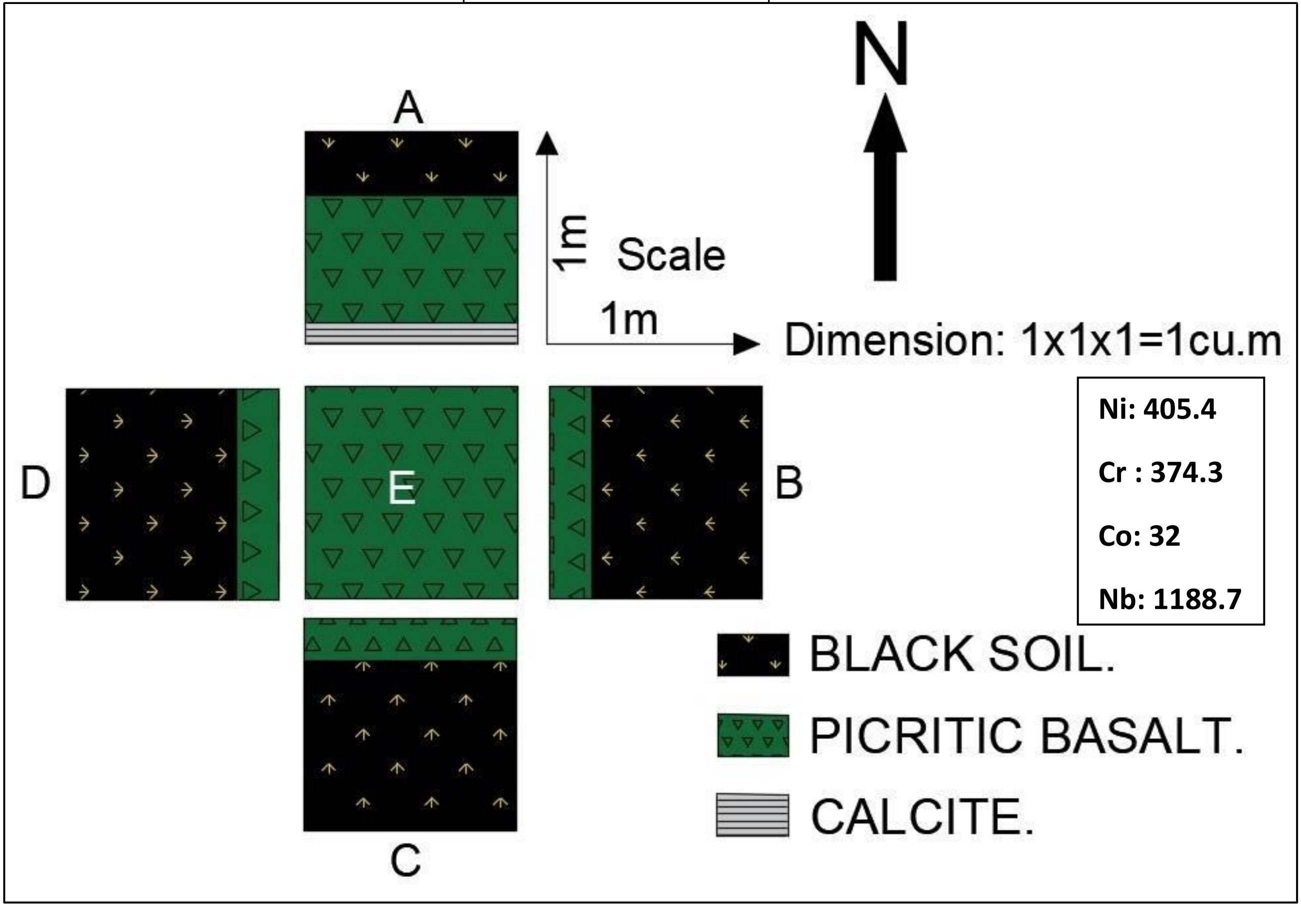
On the basis of pit worksheet (eg: Photograph 37), we have created the pit profiles showing the subsurface rock types and described about each wall and made pit profiles where each wall of the pit is 1m.

Pit 1 profile:



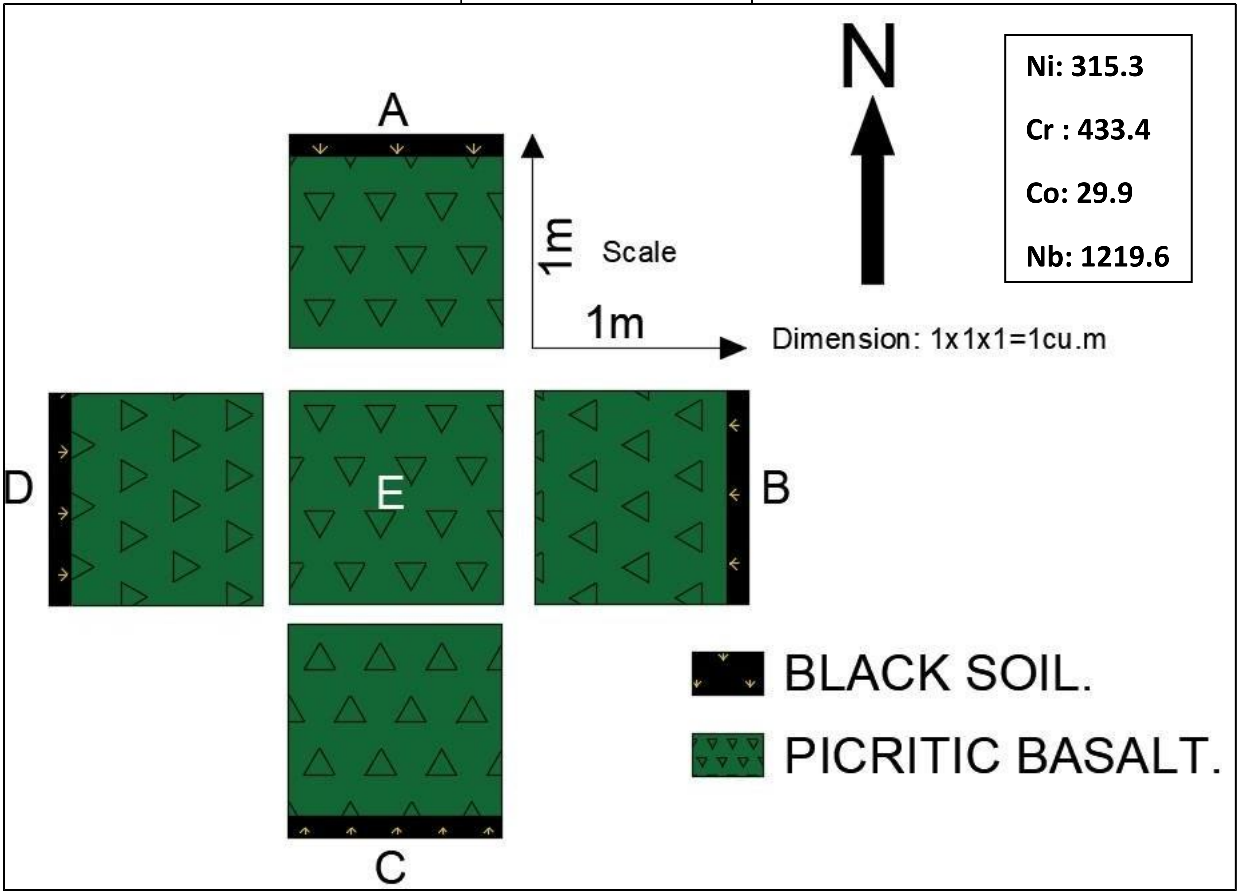
Name of the investigation: Ni, Co and PGE	Pit no: P1/BTB/2025
Location: 22.171803,71.68595	Elevation: 100m
Pit top measurement: a. Length: 1m b.Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 2 profile:



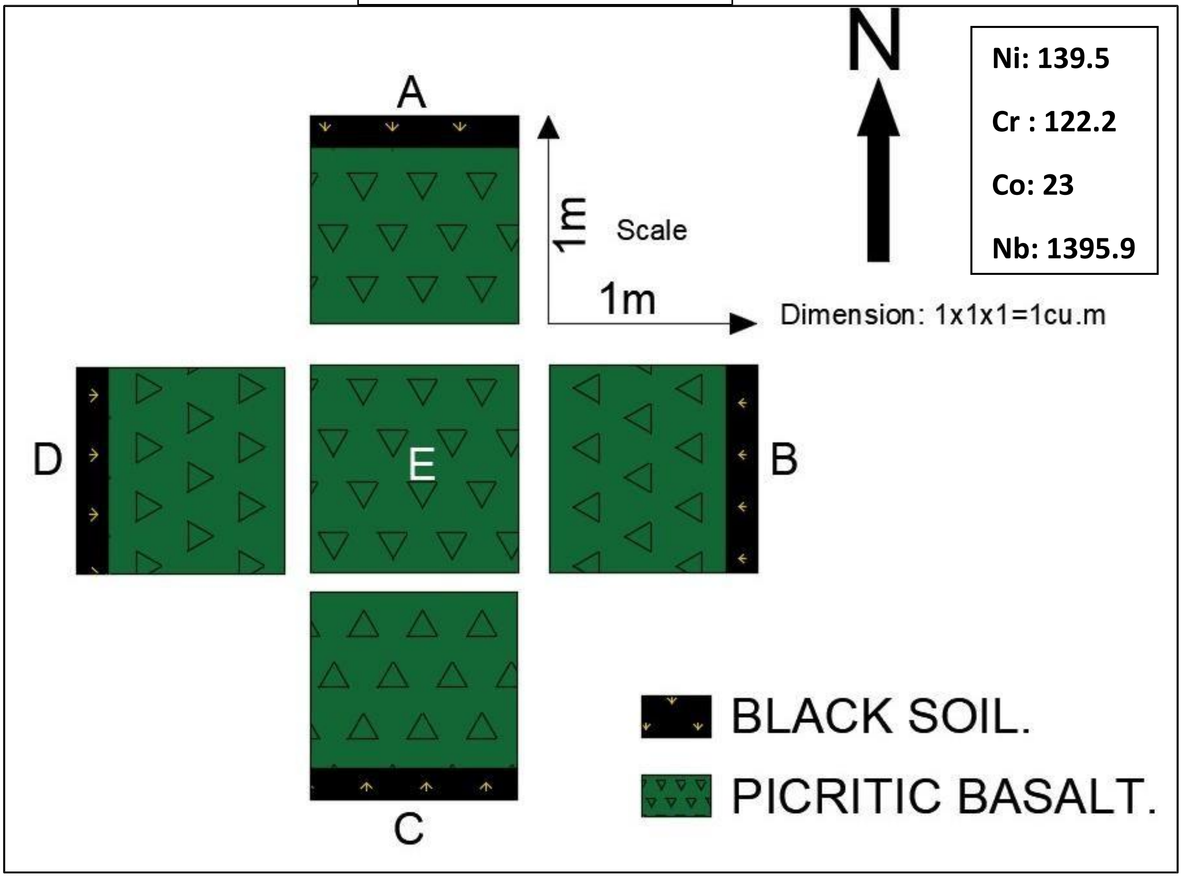
Name of the investigation: Ni, Co and PGE	Pit no: P2/BTB/2025
Location:22.175300,71.686	Elevation:92m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 3 profile:



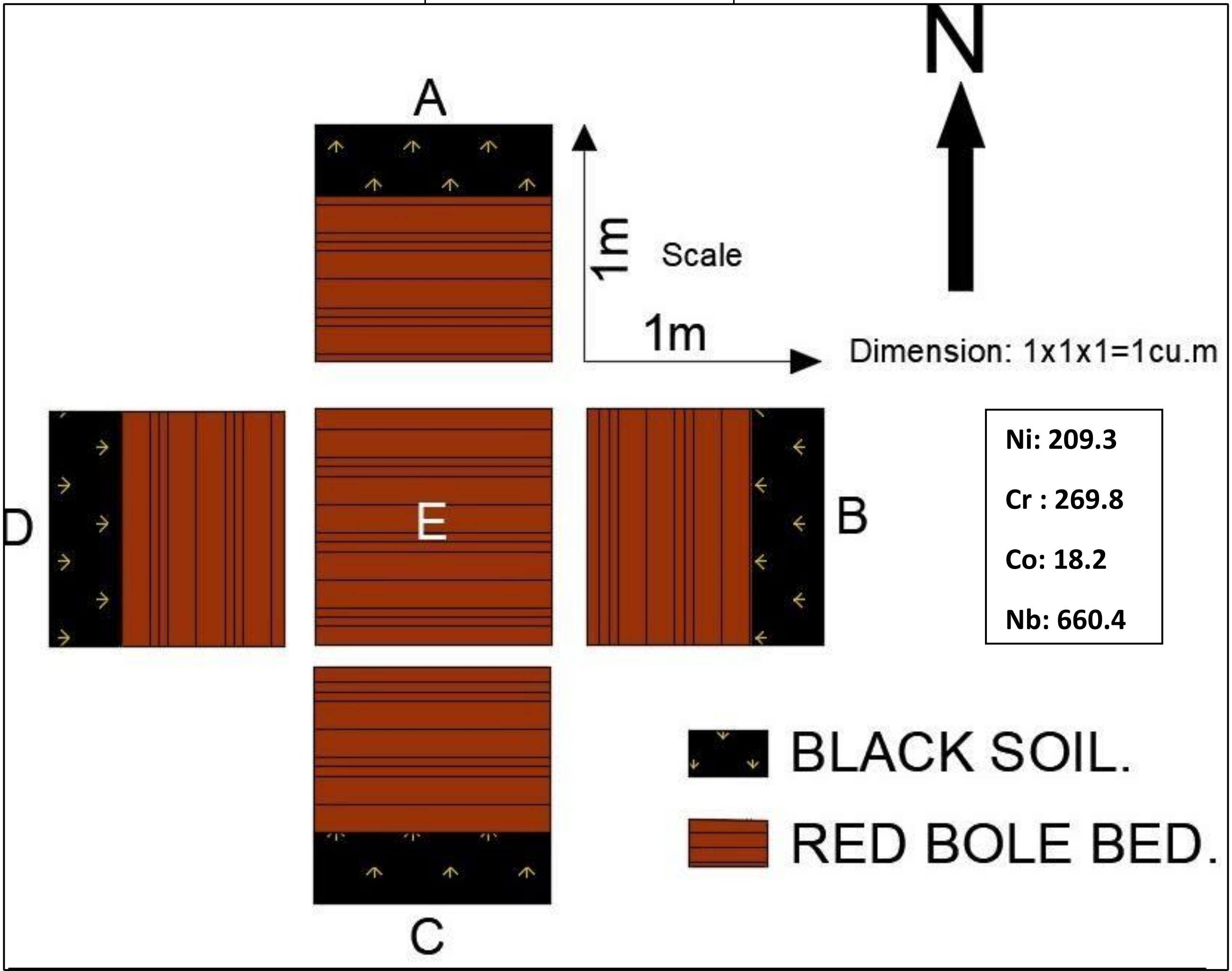
Name of the investigation: Ni, Co and PGE	Pit no: P3/BTB/2025
Location: 22.175935,71.686137	Elevation: 98m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 4 profile:



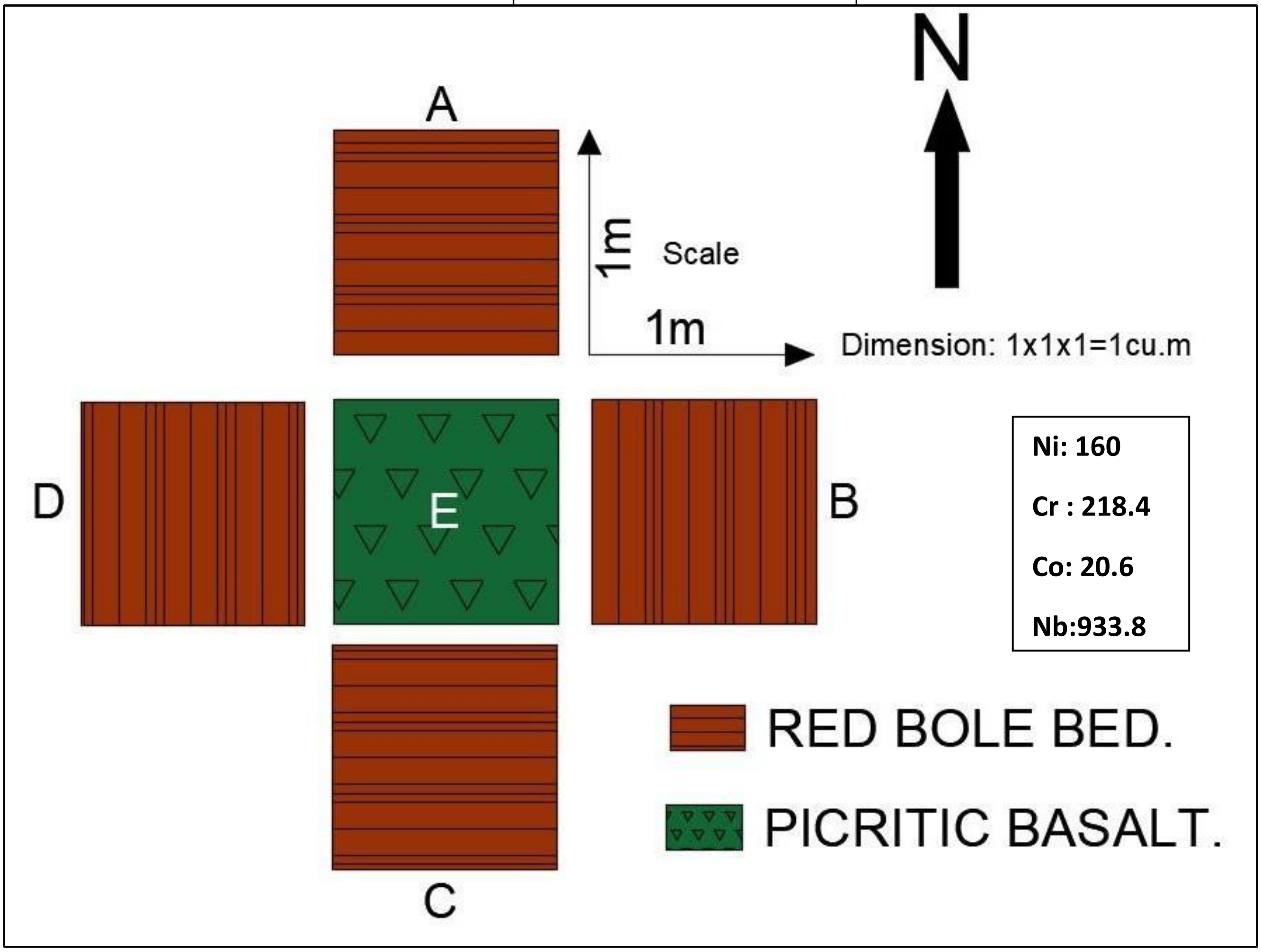
Name of the investigation: Ni, Co and PGE	Pit no: P4/BTB/2025
Location: 22.176930,71.686795	Elevation: 95 m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 5 profile:



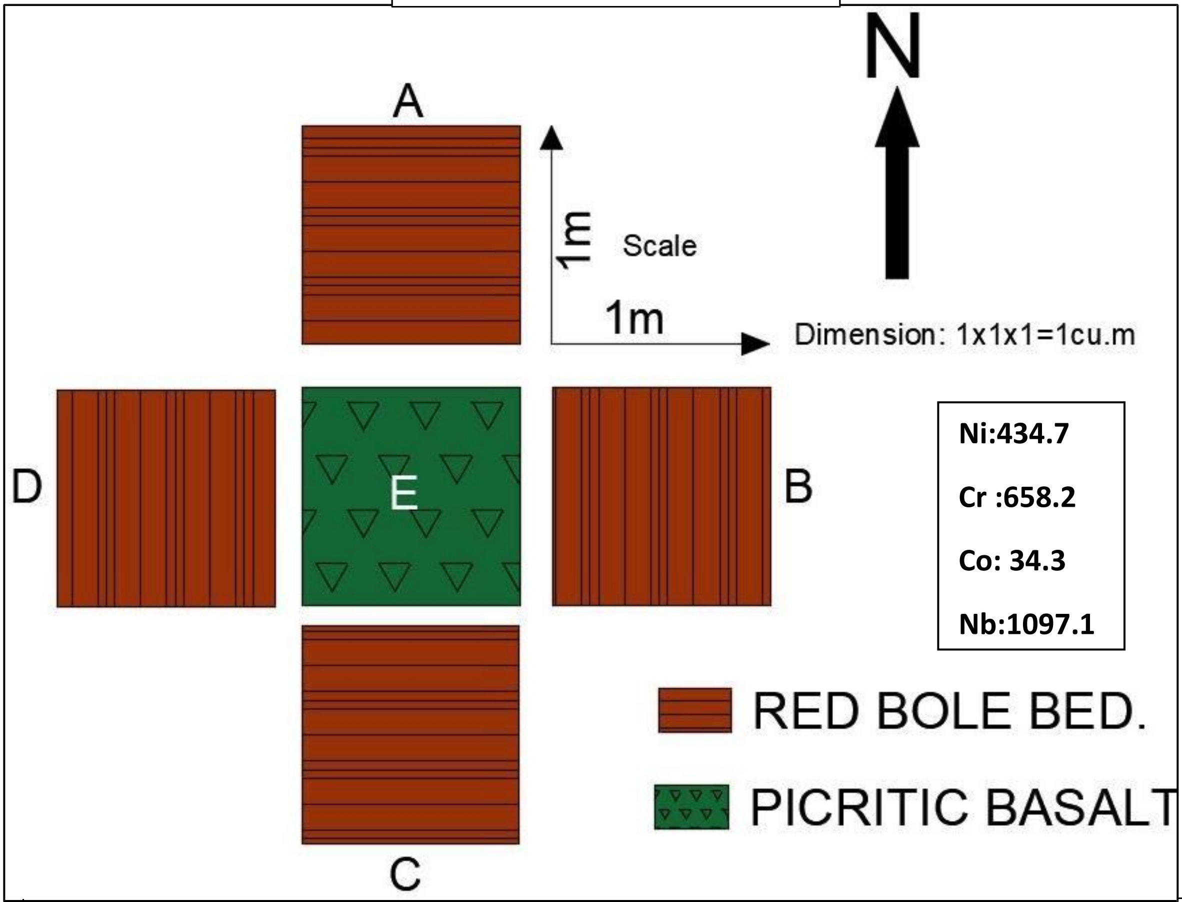
Name of the investigation: Ni, Co and PGE	Pit no: P5/BTB/2025
Location: 22.178015,71.686268	Elevation: 88m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay Kumar, Geologists	
Lithology details: RED BOLE BED	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 6 profile:



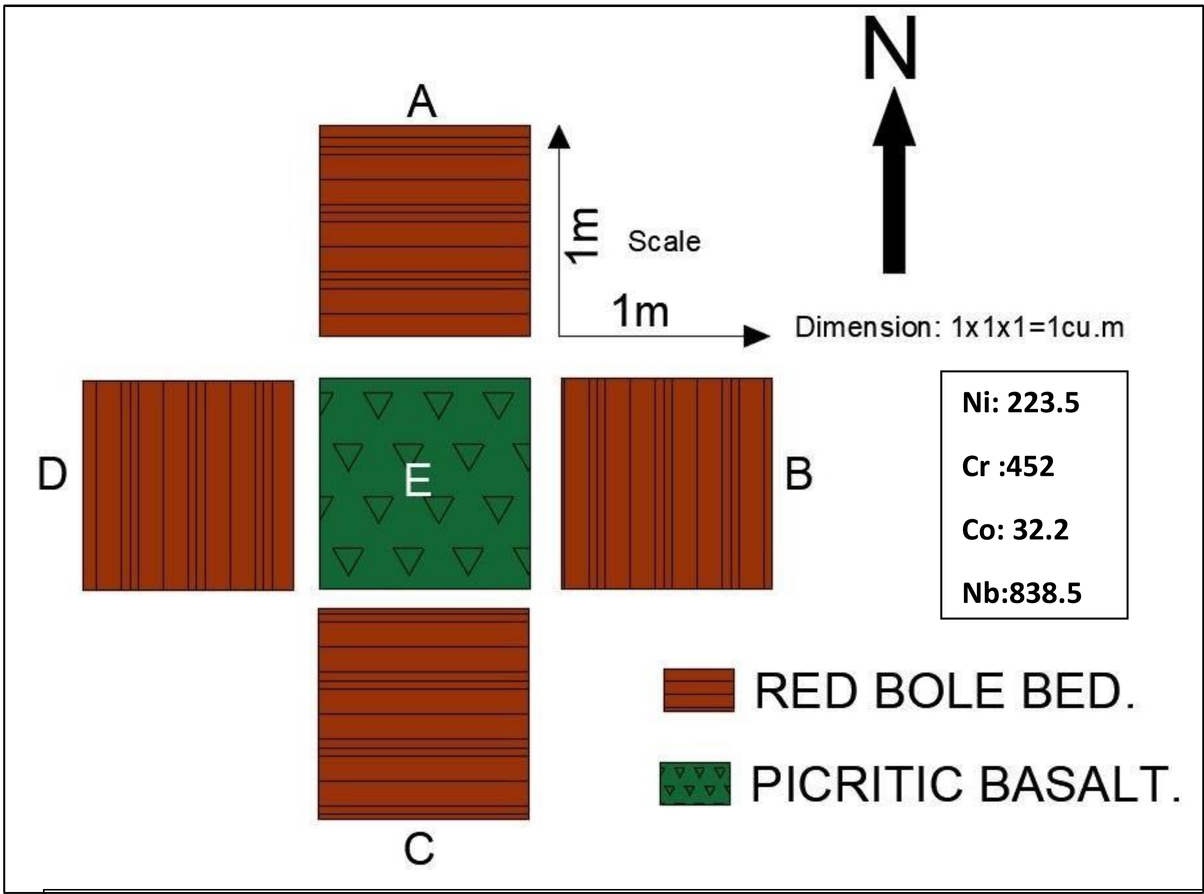
Name of the investigation: Ni, Co and PGE	Pit no: P6/BTB/2025
Location: 22.177838,71.685027	Elevation: 100m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay Kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 7 profile:



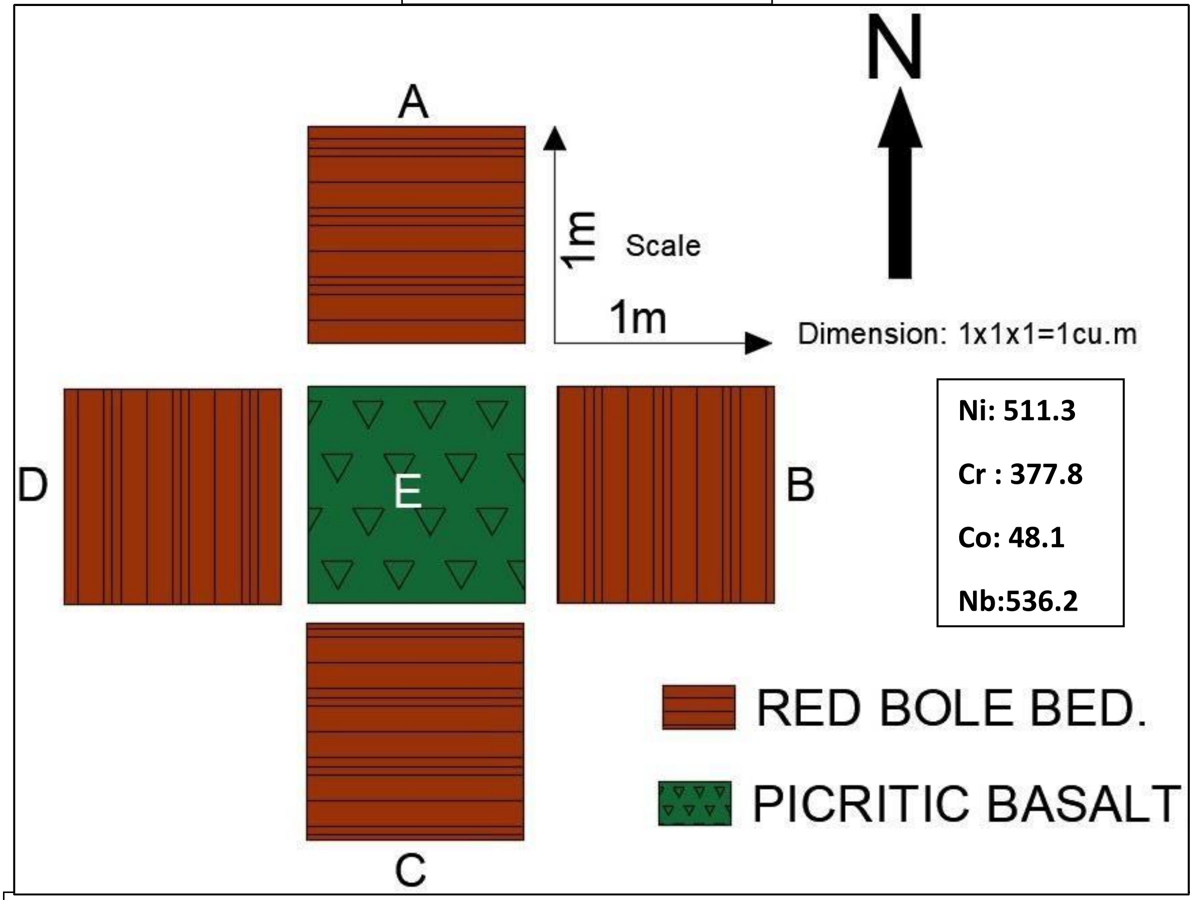
Name of the investigation: Ni, Co and PGE	Pit no: P7/BTB/2025
Location: 22.179392,71.688020	Elevation: 88m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 8 profile:



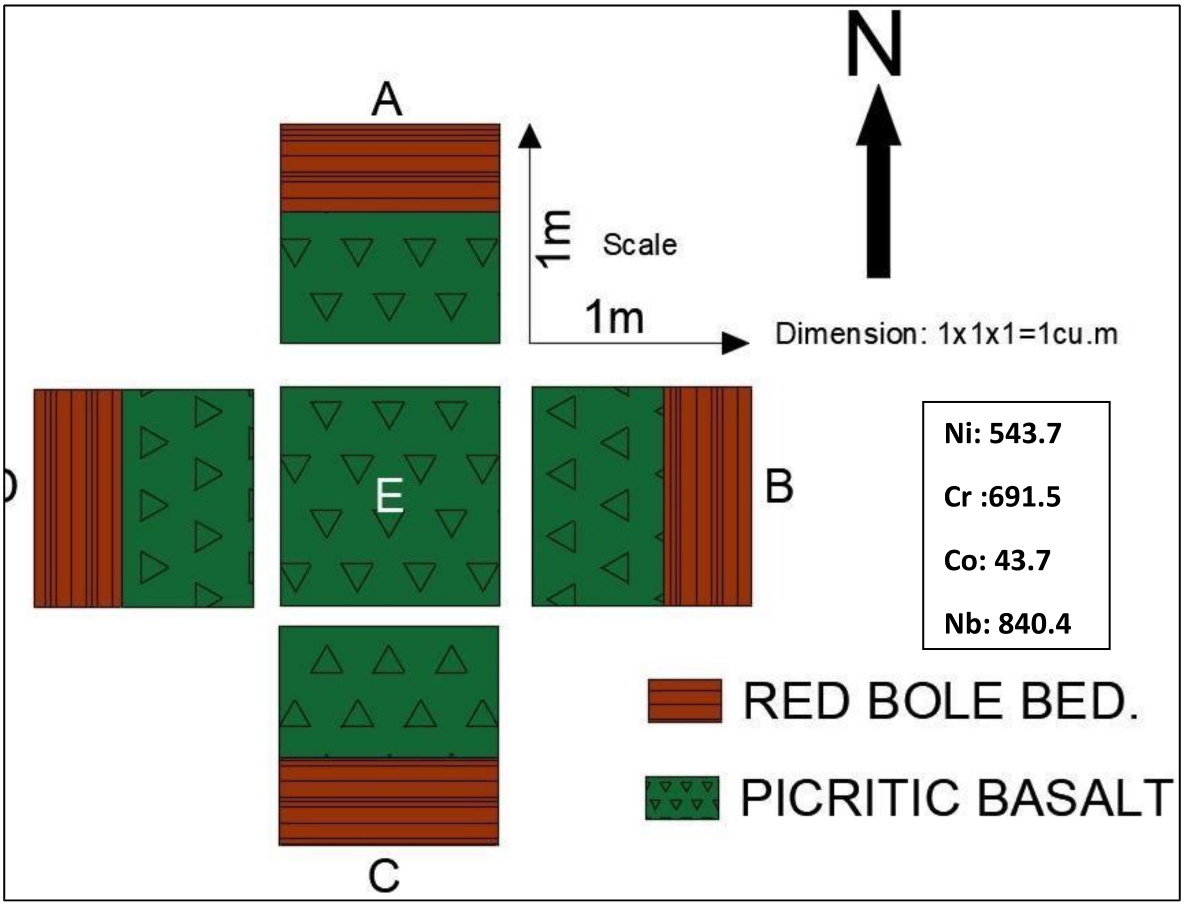
Name of the investigation: Ni, Co and PGE	Pit no: P8/BTB/2025
Location: 22.179830,71.688527	Elevation: 89m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 9 profile:



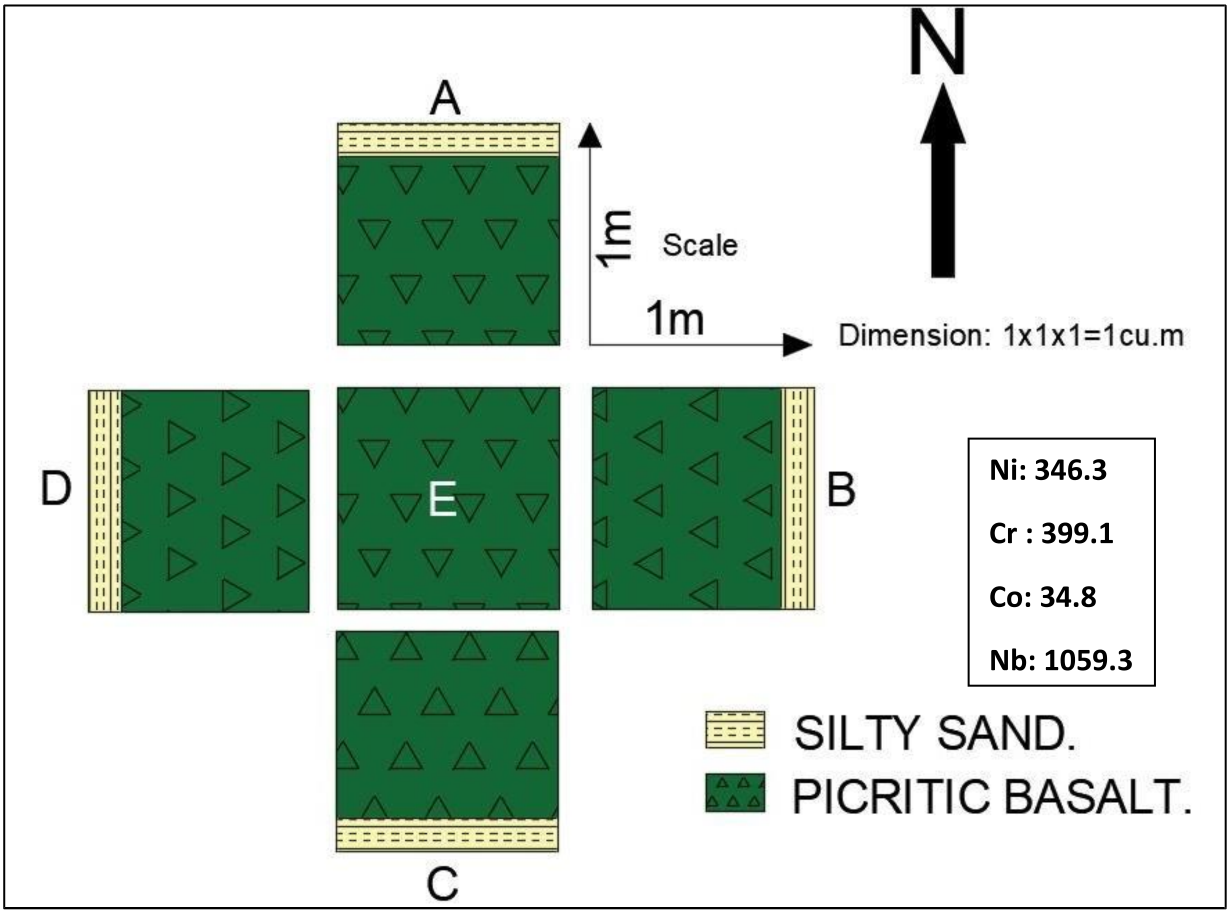
Name of the investigation: Ni, Co and PGE	Pit no: P9/BTB/2025
Location: 22.182173,71.687272	Elevation: 84m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 10 profile:



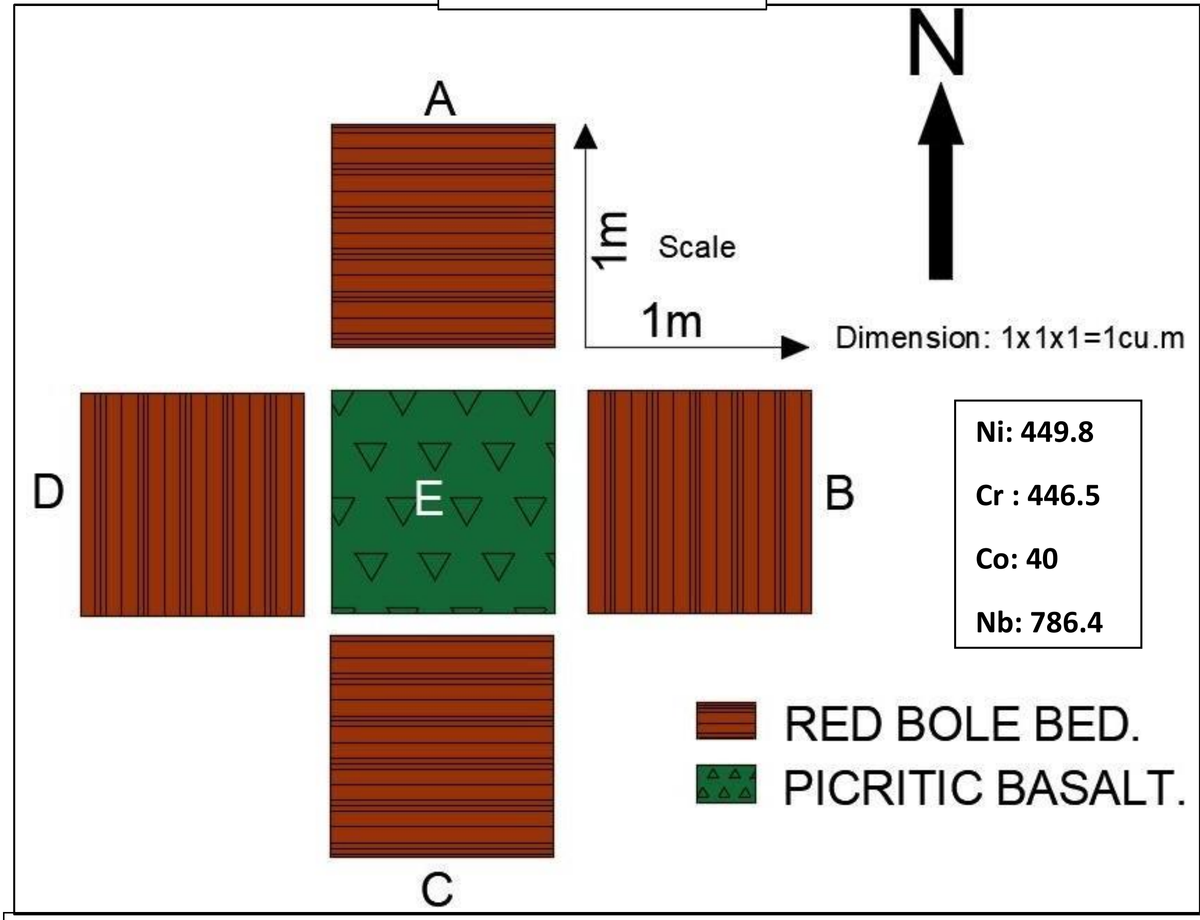
Name of the investigation: Ni, Co and PGE	Pit no: P10/BTB/2025
Location: 22.174173,71.690027	Elevation: 85m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 11 profile:



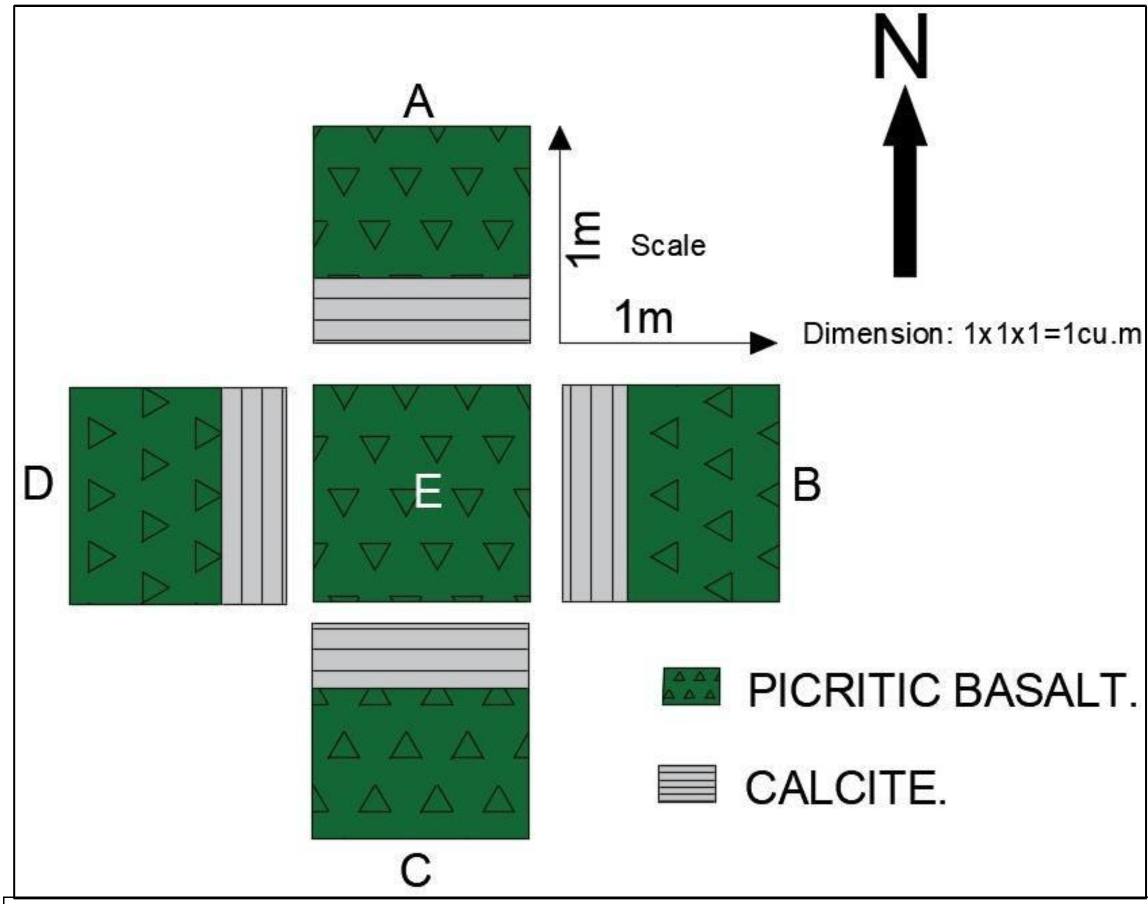
Name of the investigation: Ni, Co and PGE	Pit no: P11/BTB/2025
Location: 22.172245,71.689718	Elevation: 102m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 12 profile:



Name of the investigation: Ni, Co and PGE	Pit no: P12/BTB/2025
Location: 22.170800,71.689153	Elevation: 89m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 13 profile:



Ni: 598

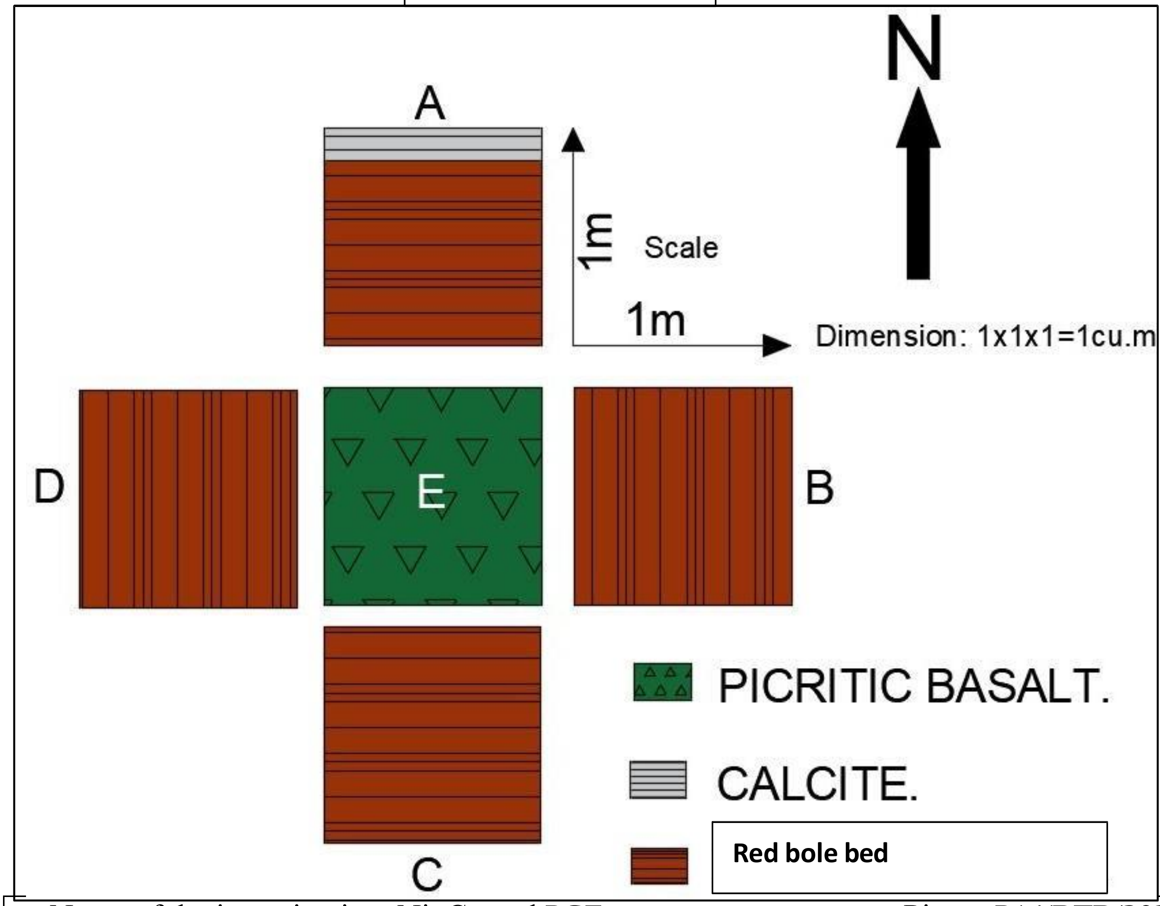
Cr : 507.7

Co: 64.1

Nb: 661

Name of the investigation: Ni, Co and PGE	Pit no: P13/BTB/2025
Location: 22.196212,71.698200	Elevation: 93m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 14 profile:



Ni: 285.8

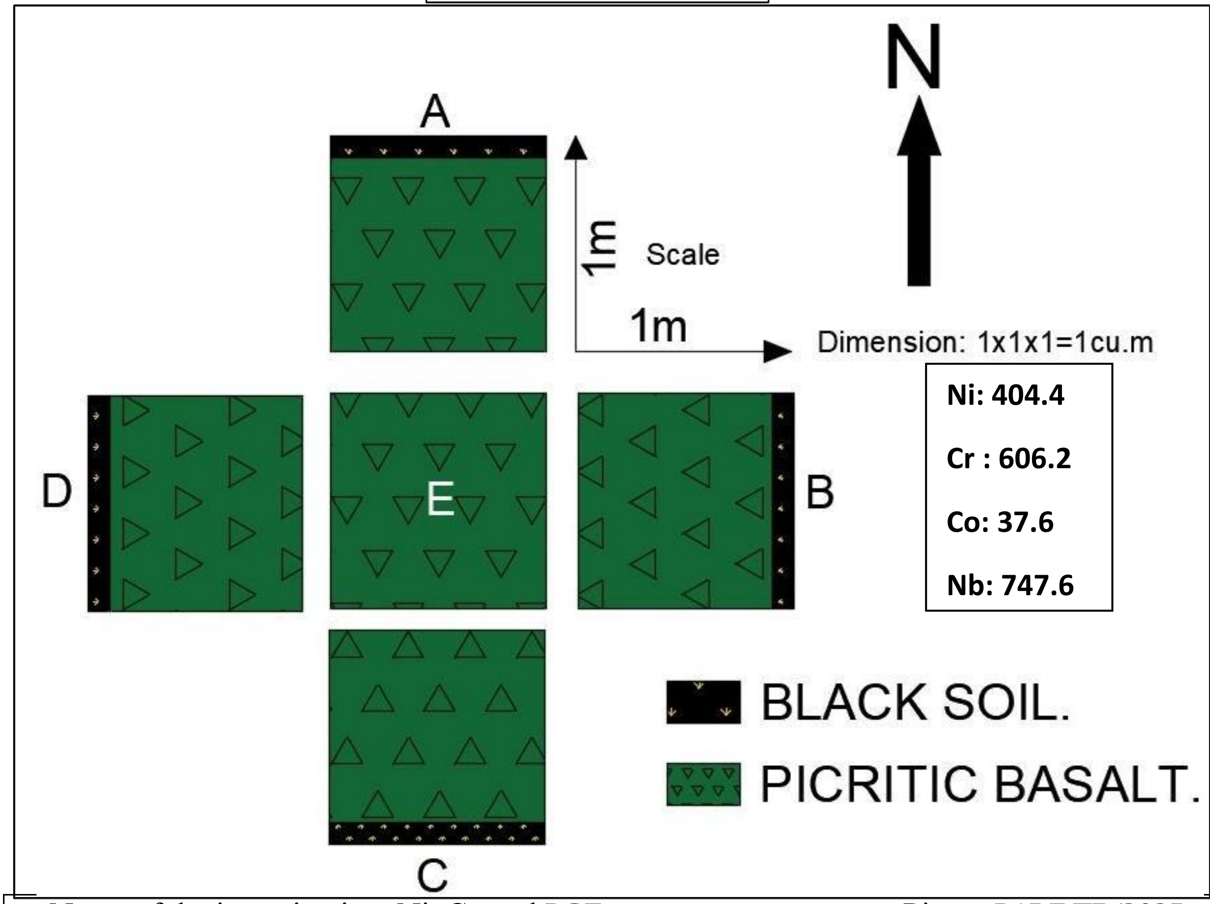
Cr : 344.4

Co: 17.6

Nb: 252.3

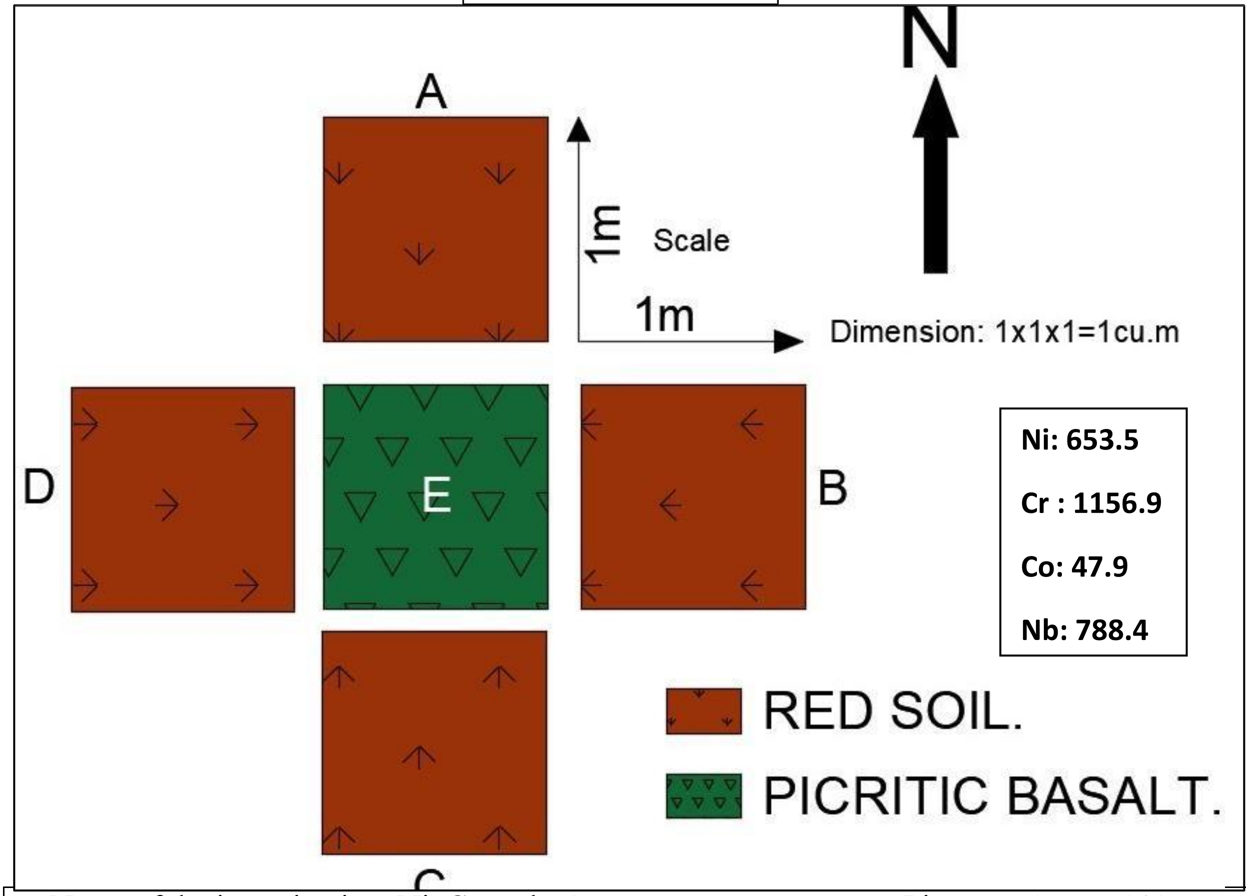
Name of the investigation: Ni, Co and PGE	Pit no: P14/BTB/2025
Location: 22.192557,71.692855	Elevation: 91m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay Kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 15 profile:



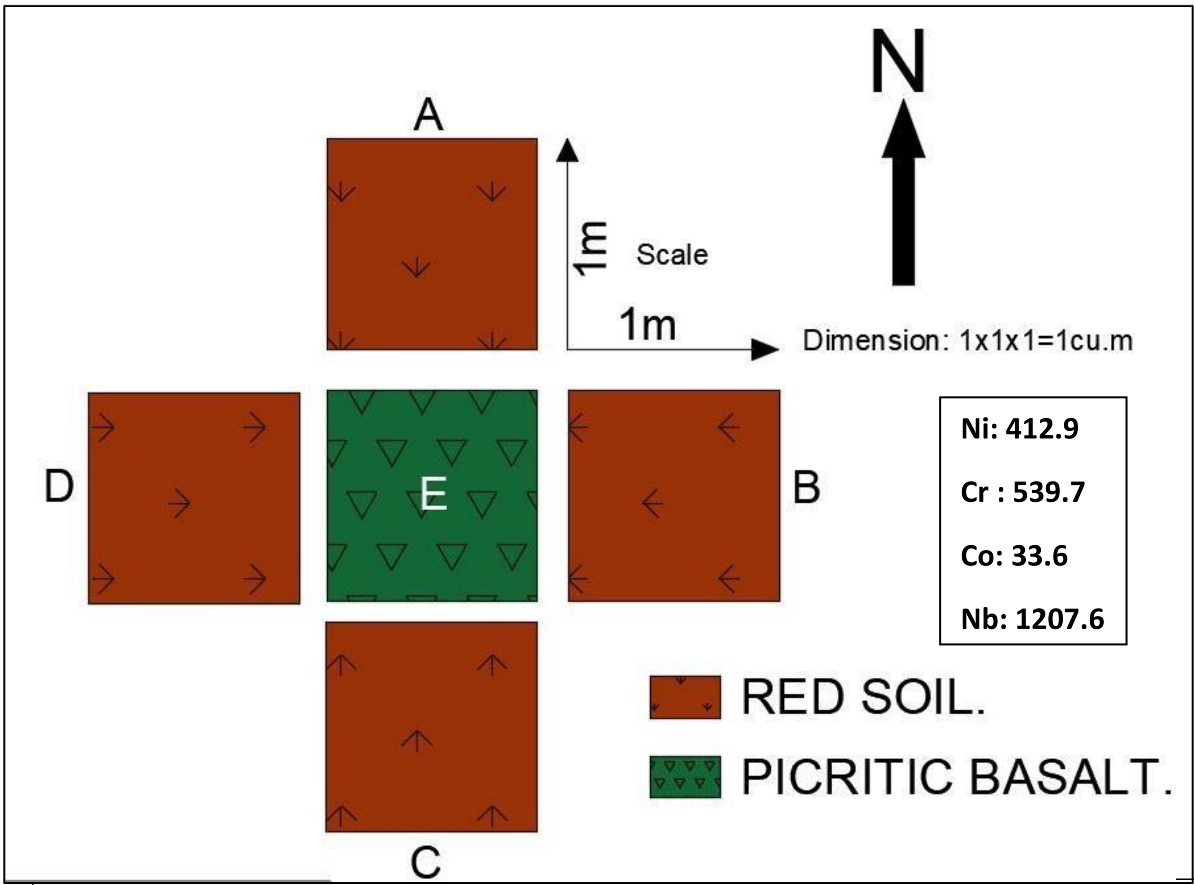
Name of the investigation: Ni, Co and PGE	Pit no: P15/BTB/2025
Location: 22.187255,71.691693	Elevation: 91m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay Kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 16 profile:



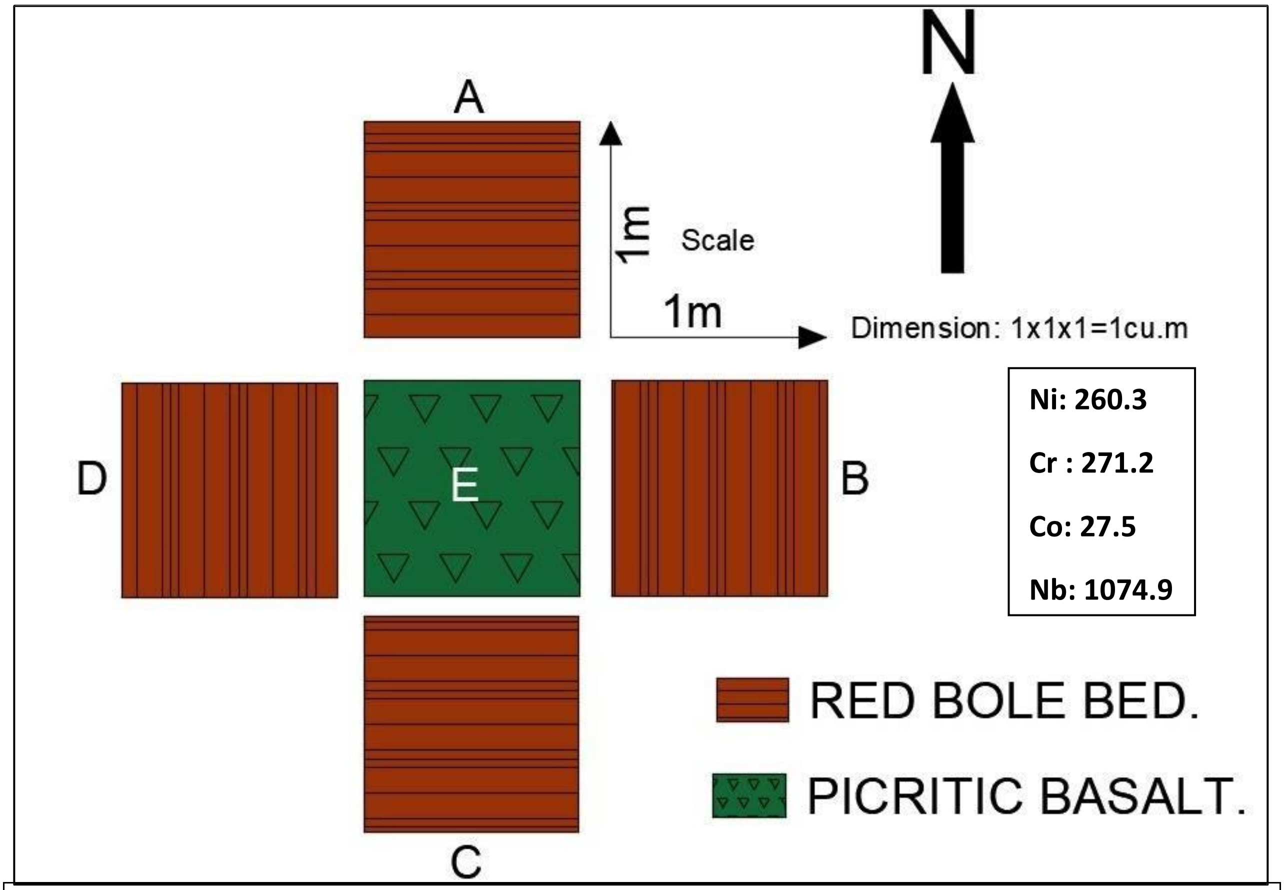
Name of the investigation: Ni, Co and PGE	Pit no: P16/BTB/2025
Location: 22.184922,71.692865	Elevation: 99m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay Kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 17 profile:



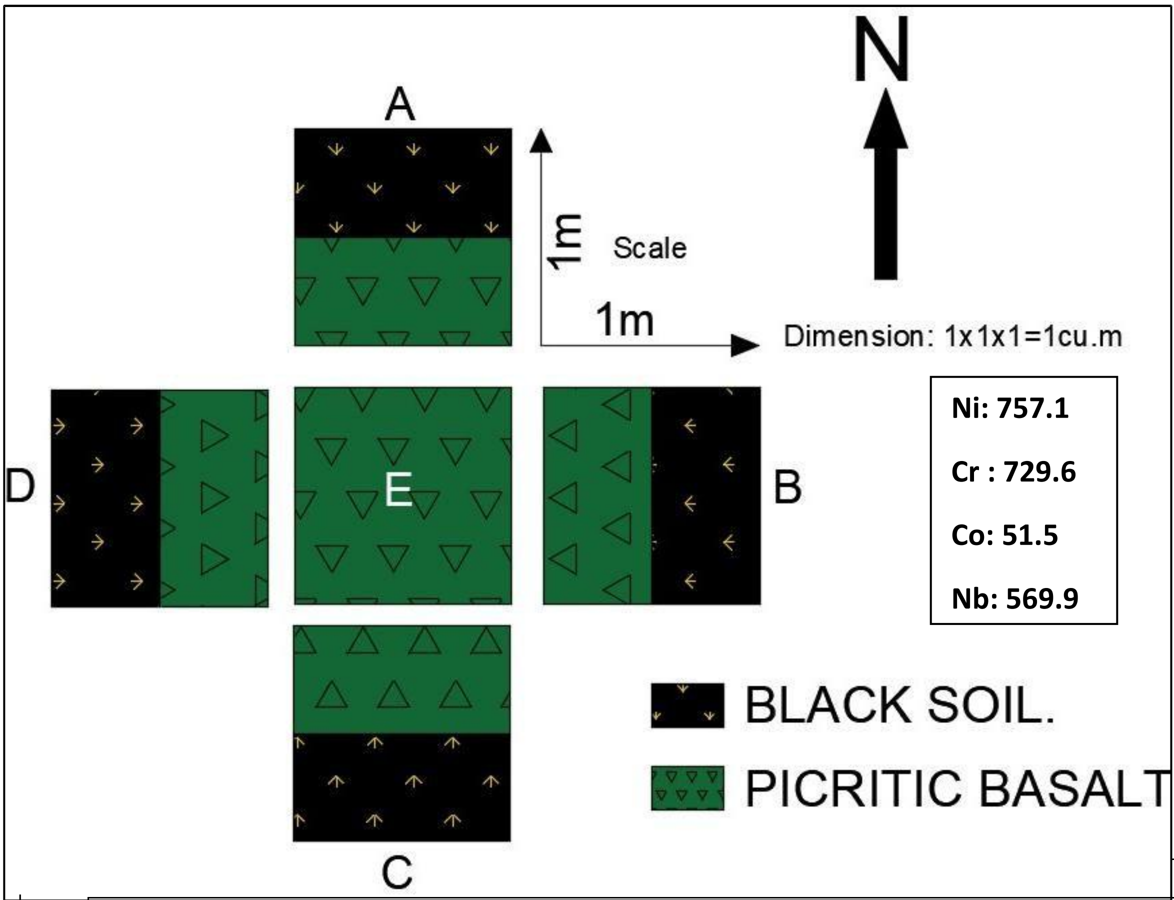
Name of the investigation: Ni, Co and PGE	Pit no: P17/BTB/2025
Location: 22.182715,71.692312	Elevation: 87
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay Kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 18 profile:



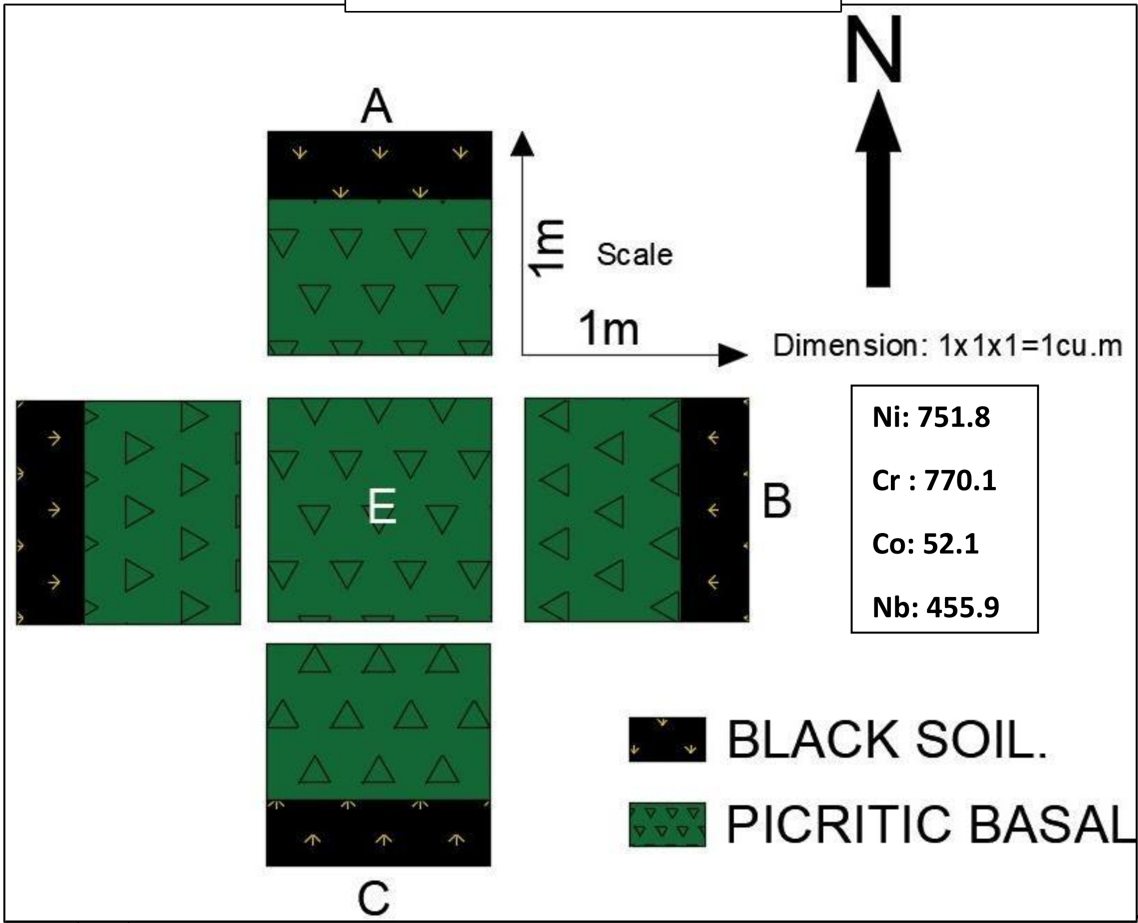
Name of the investigation: Ni, Co and PGE	Pit no: P18/BTB/2025
Location: 22.181883,71.695478	Elevation: 86m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay Kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 19 profile:



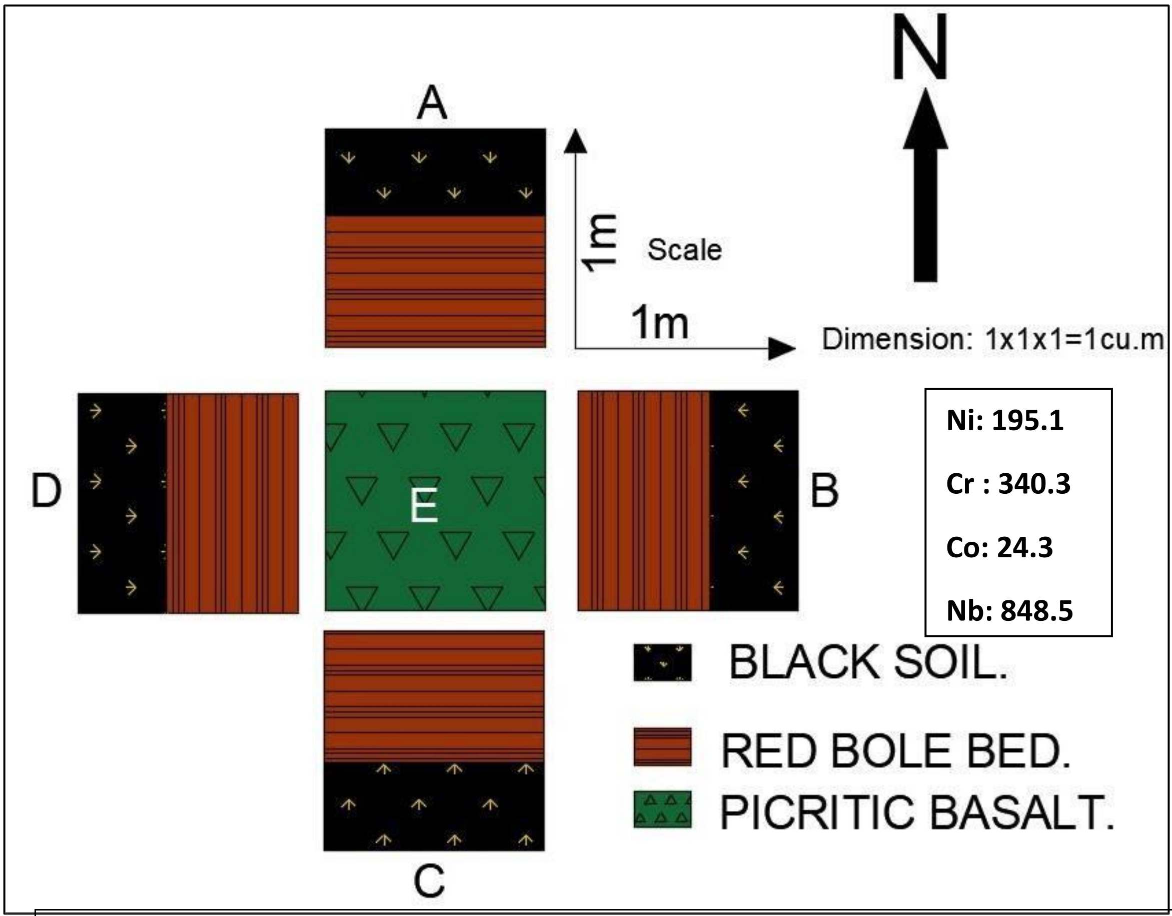
Name of the investigation: Ni, Co and PGE	Pit no: P19/BTB/2025
Location: 22.180908,71.701997	Elevation: 80m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 20 profile:



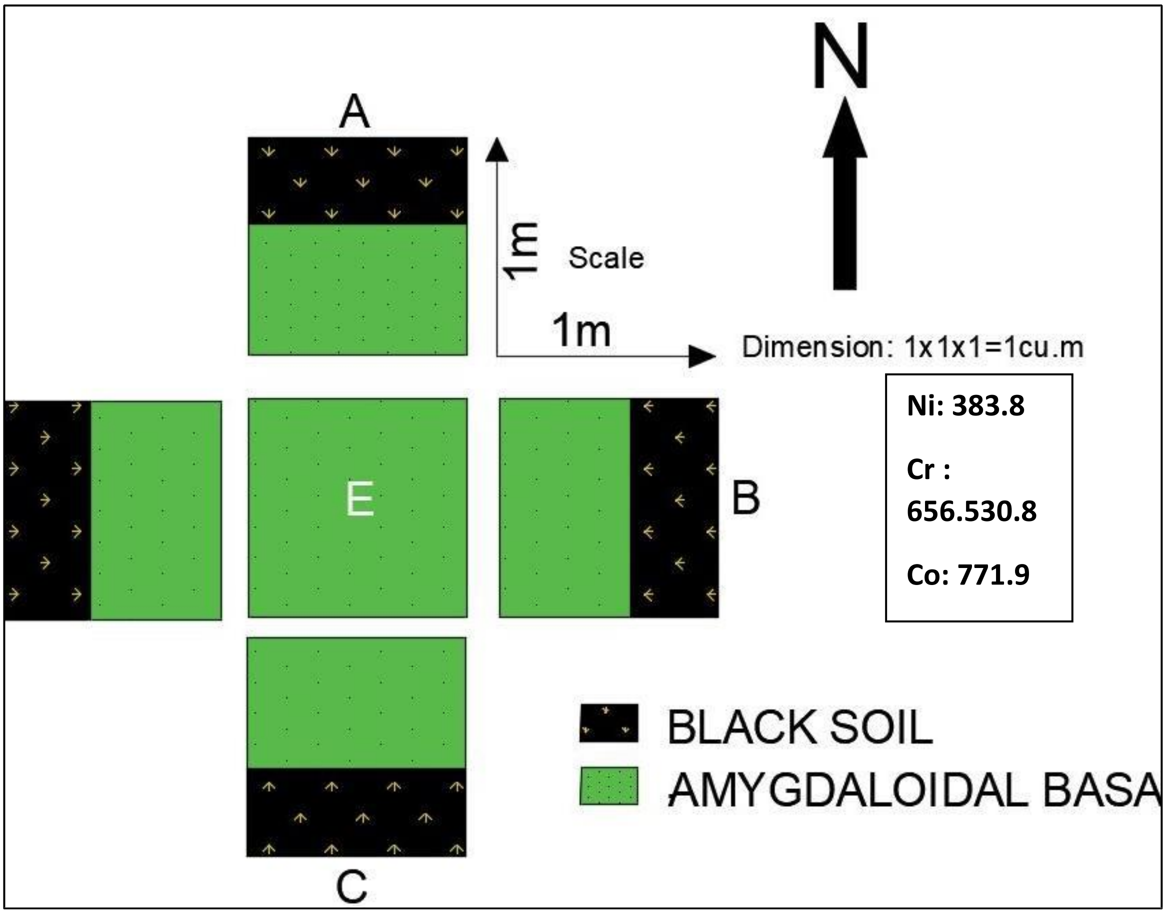
Name of the investigation: Ni, Co and PGE	Pit no: P20/BTB/2025
Location: 22.178752,71.698485	Elevation: 83m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 21 profile:



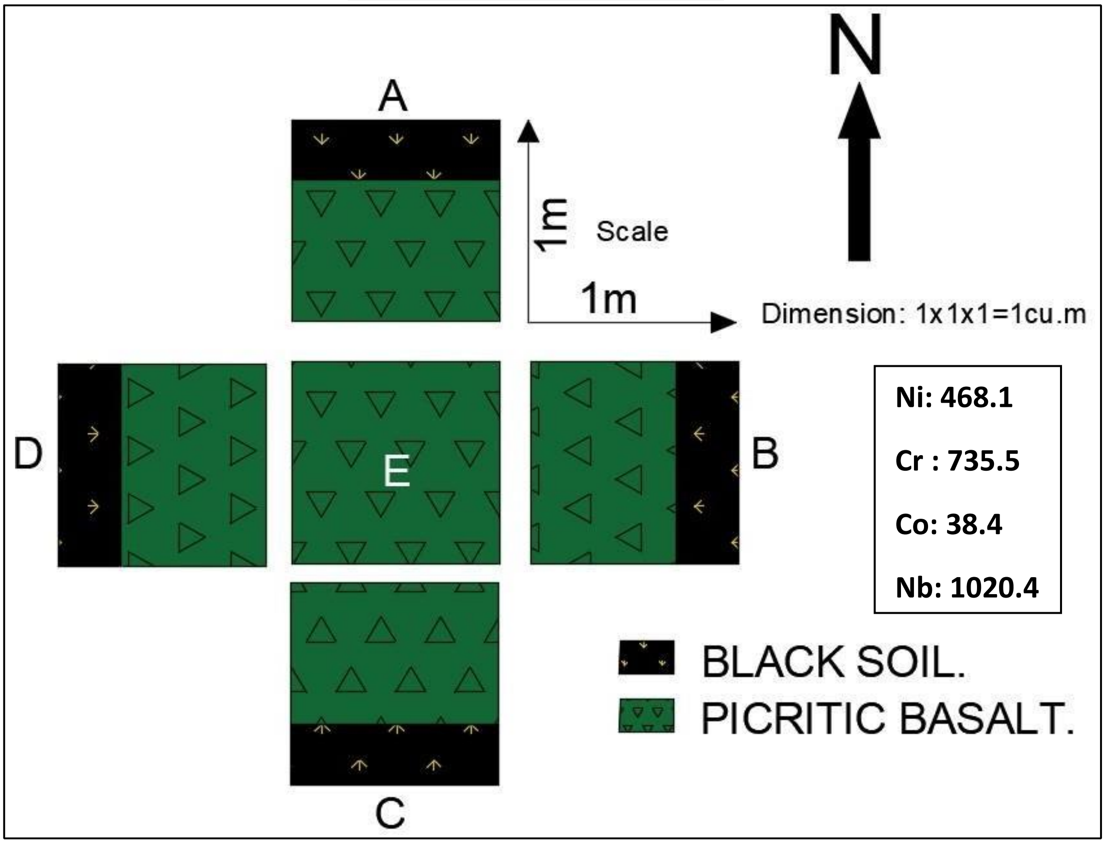
Name of the investigation: Ni, Co and PGE	Pit no: P21/BTB/2025
Location: 22.178628,71.693582	Elevation: 81m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay Kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 22 profile:



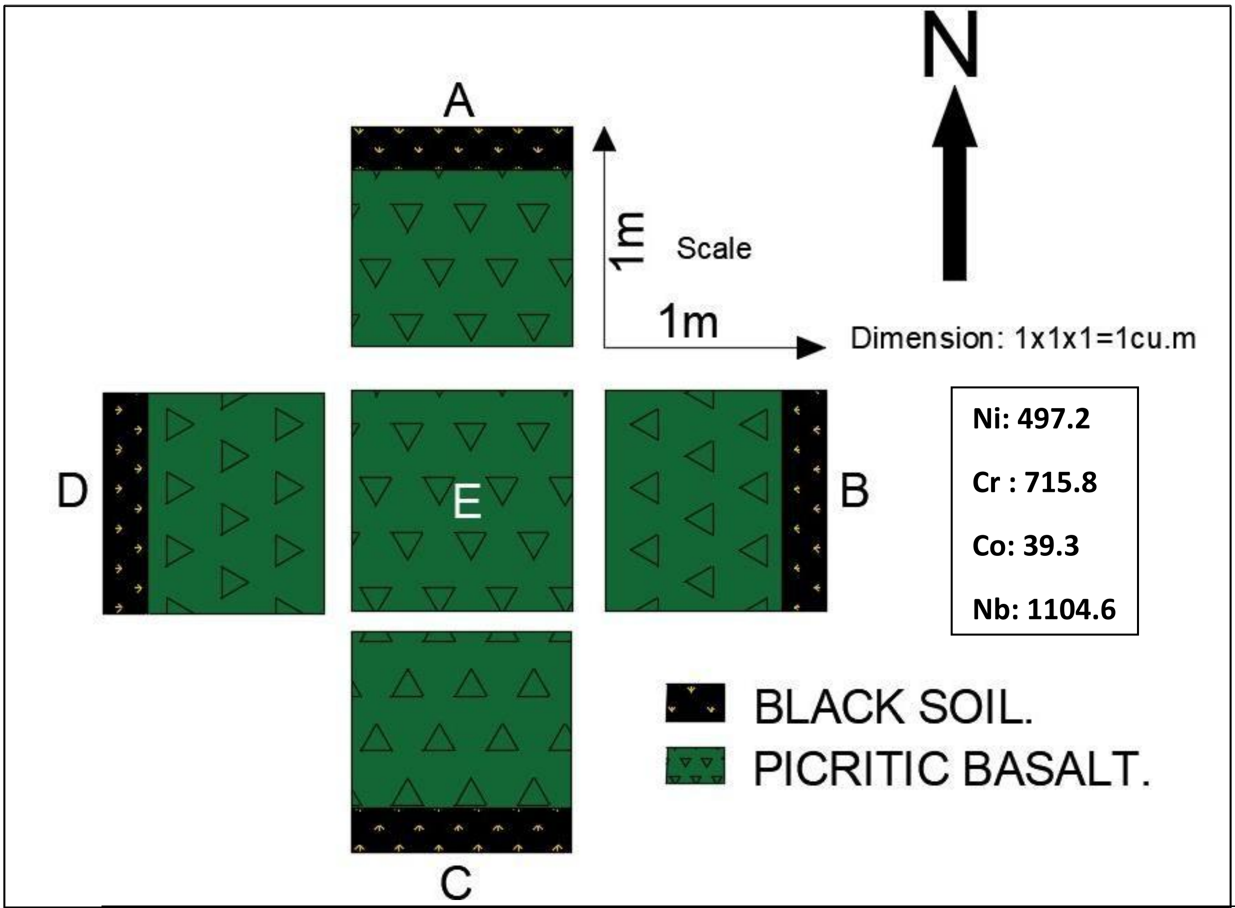
Name of the investigation: Ni, Co and PGE	Pit no: P22/BTB/2025
Location: 22.170000,,71.71833	Elevation: 87m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay Kumar, Geologists	
Lithology details: Amygdaloidal basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 23 profile:



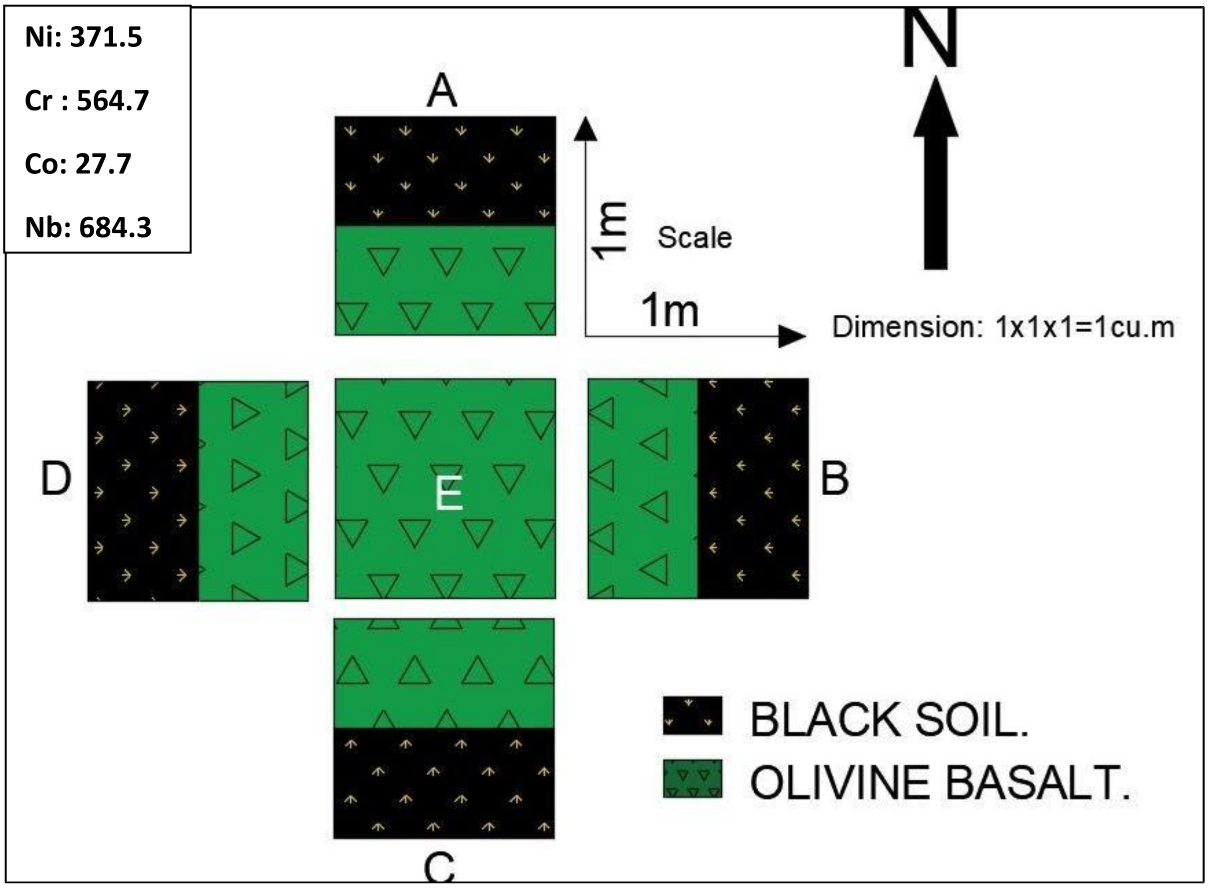
Name of the investigation: Ni, Co and PGE Pit no: P23/BTB/2025	
Location: 22.169528,71.685037	Elevation: 104m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 24 profile:



Name of the investigation: Ni, Co and PGE	Pit no: P24BTB/2025
Location: 22.168800,71.684002	Elevation: 101m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 25 profile:



<table>
<tr><td colspan="2">Name of the investigation: Ni, Co and PGE   Pit no: P25/BTB/2025</td></tr>
<tr><td>Location: 22.166423,71.678943</td><td>Elevation: 84m</td></tr>
<tr><td>Pit top measurement:
a. Length: 1m
b. Breadth: 1m</td><td>Pit bottom measurement:
a. Length: 1m
b. Breadth: 1m
c. Depth: 1m</td></tr>
<tr><td colspan="2">Recorded by: Mekala Chandu and Ajay Kumar, Geologists</td></tr>
<tr><td colspan="2">Lithology details: olivine basalt</td></tr>
<tr><td colspan="2">Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.</td></tr>
</table>

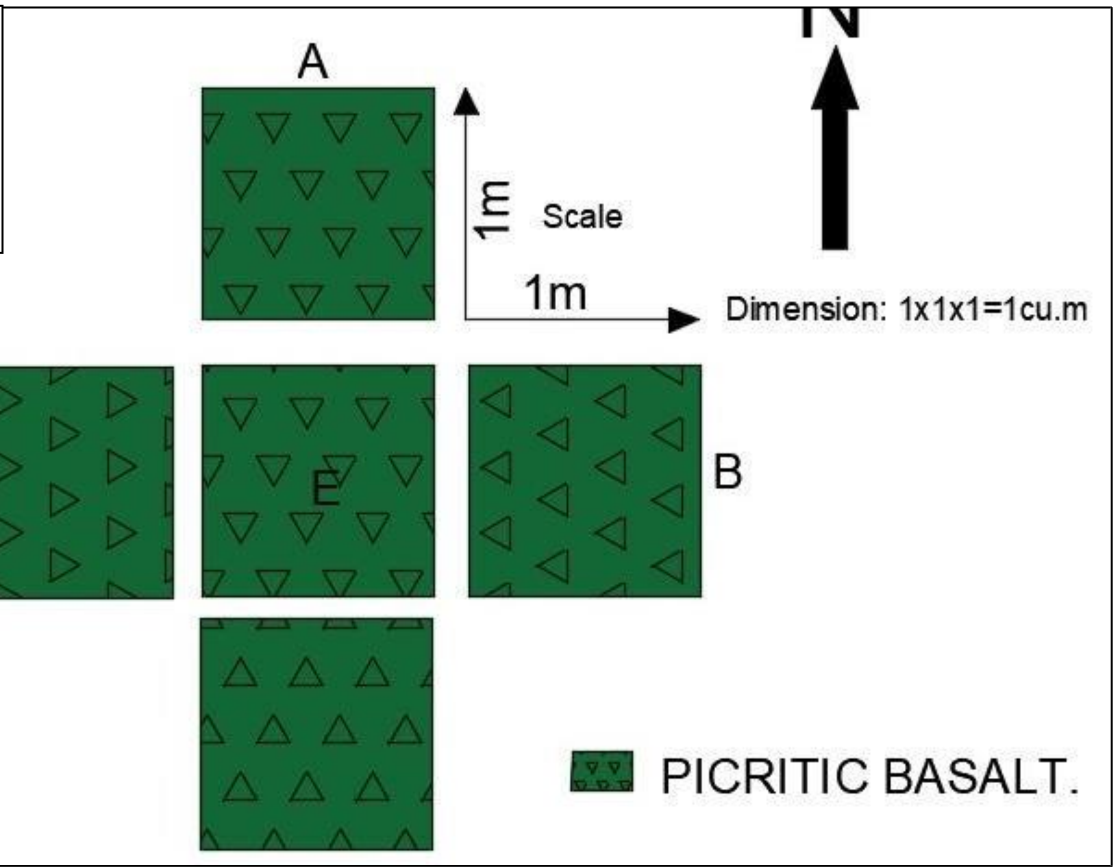
Pit 26 profile:

Ni: 351.9

Cr : 530.2

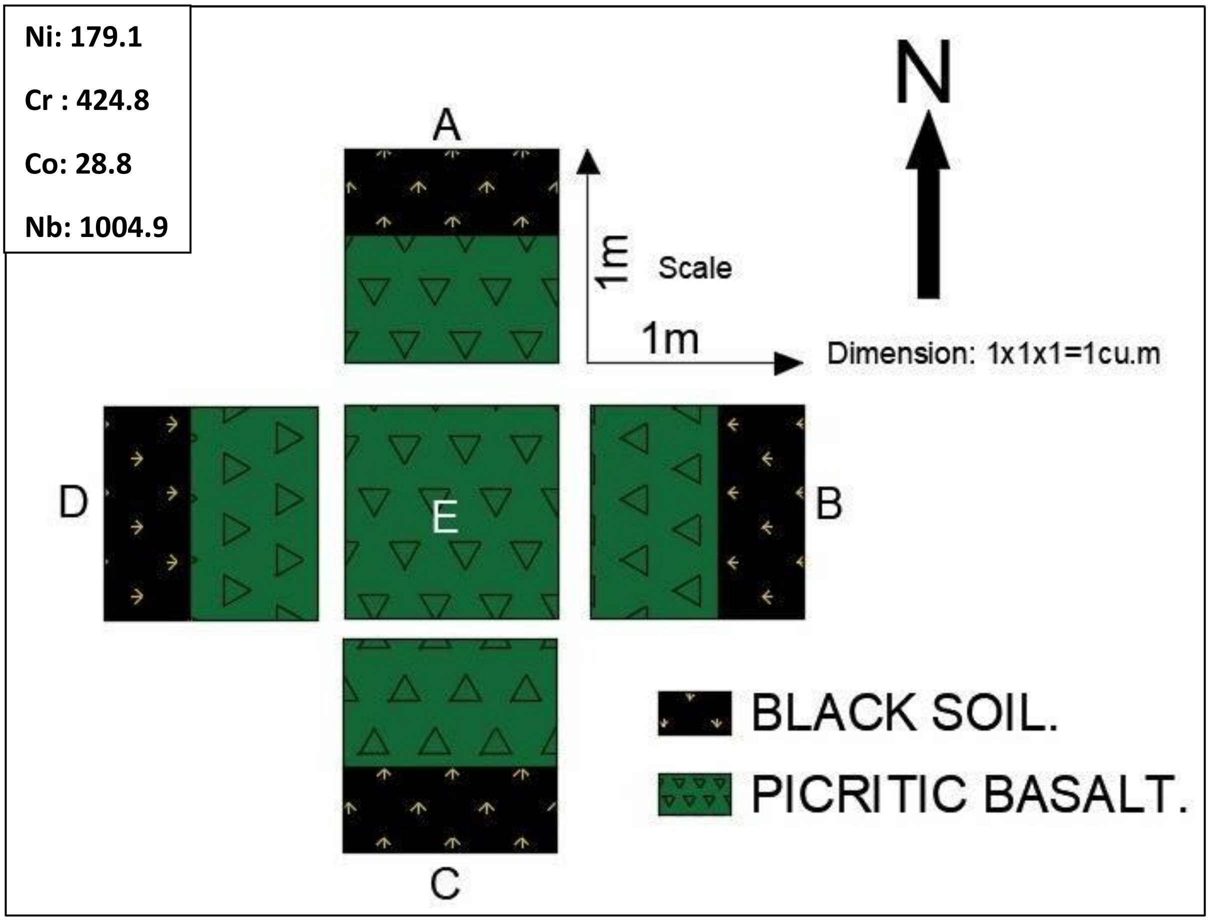
Co: 33.3

Nb: 1164.8



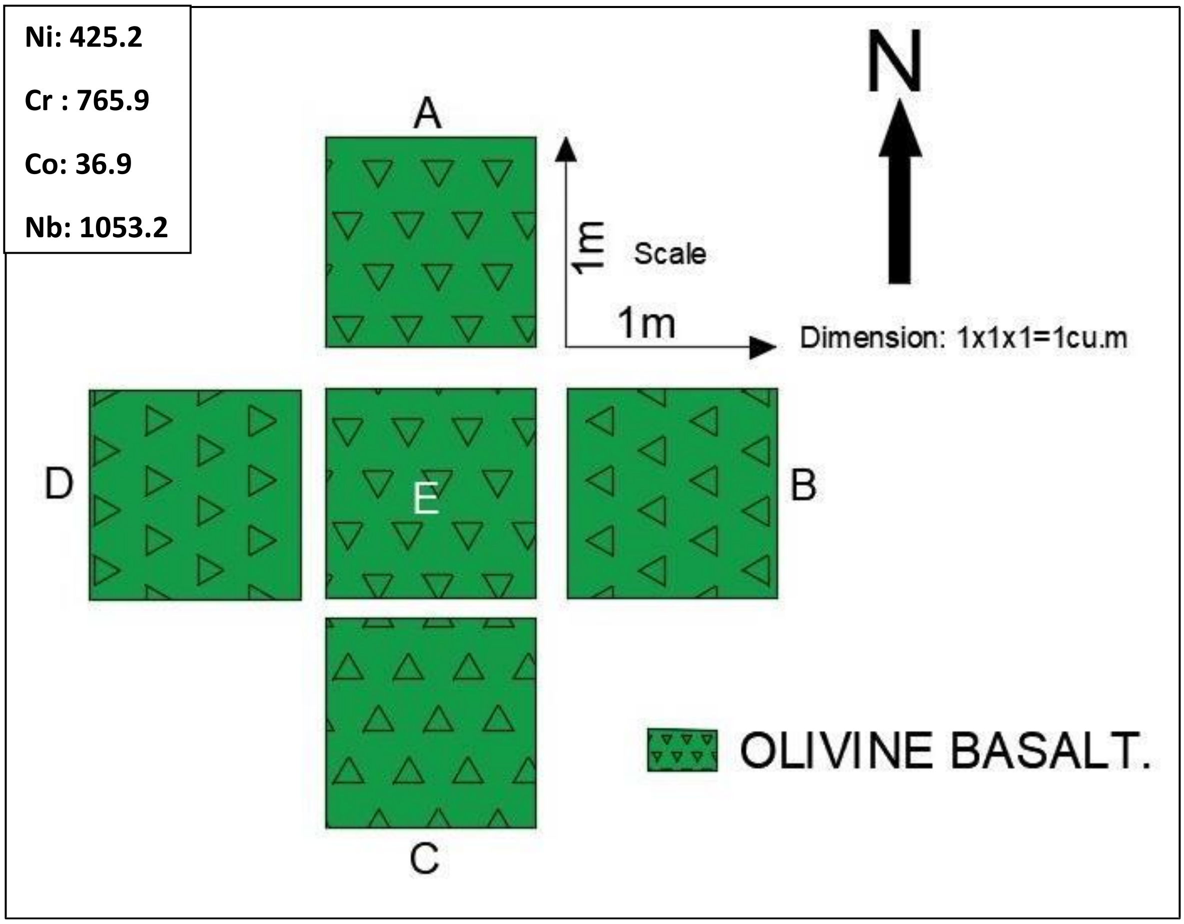
Name of the investigation: Ni, Co and PGE	Pit no: P26/BTB/2025
Location: 22.162388,71.679848	Elevation: 90m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay Kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 27 profile:



Name of the investigation: Ni, Co and PGE	Pit no: P27/BTB/2025
Location: 22.164405,71.684322	Elevation: 81m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay Kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 28 profile:



Name of the investigation: Ni, Co and PGE	Pit no: P28/BTB/2025
Location: 22.175482,71.681255	Elevation: 94m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay Kumar, Geologists	
Lithology details: olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

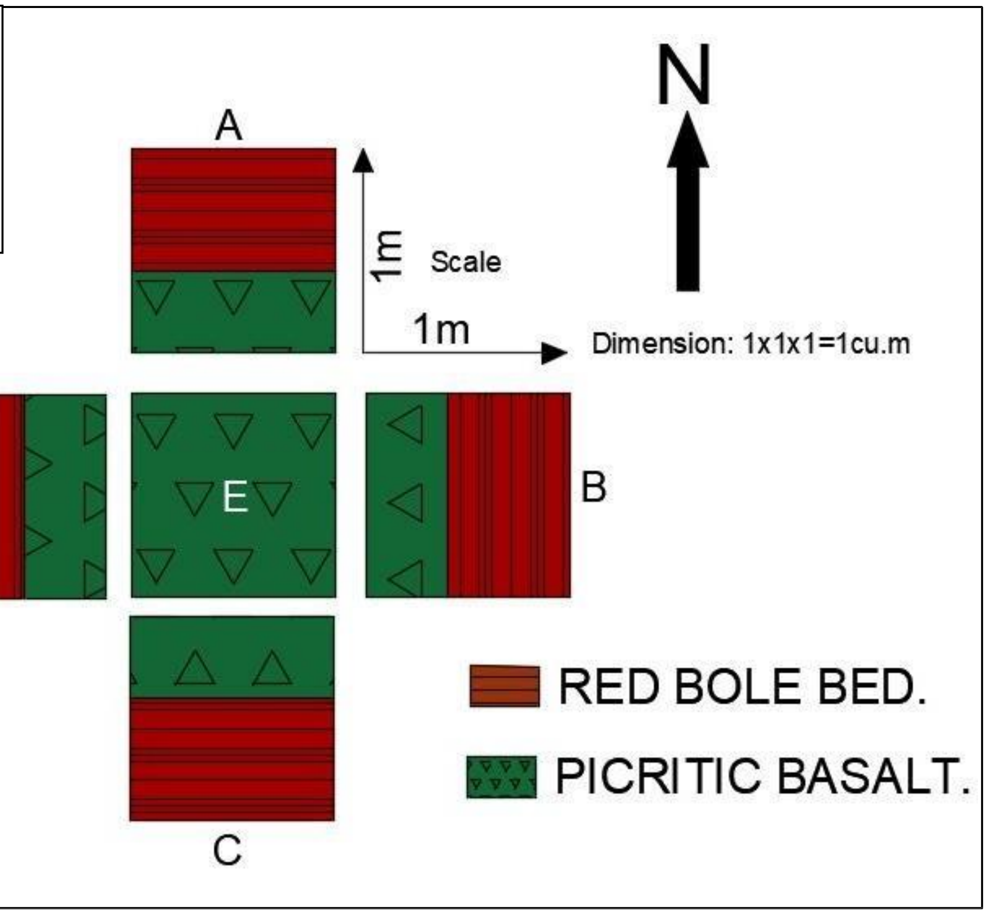
Pit 29 profile:

Ni: 561.9

Cr : 438.6

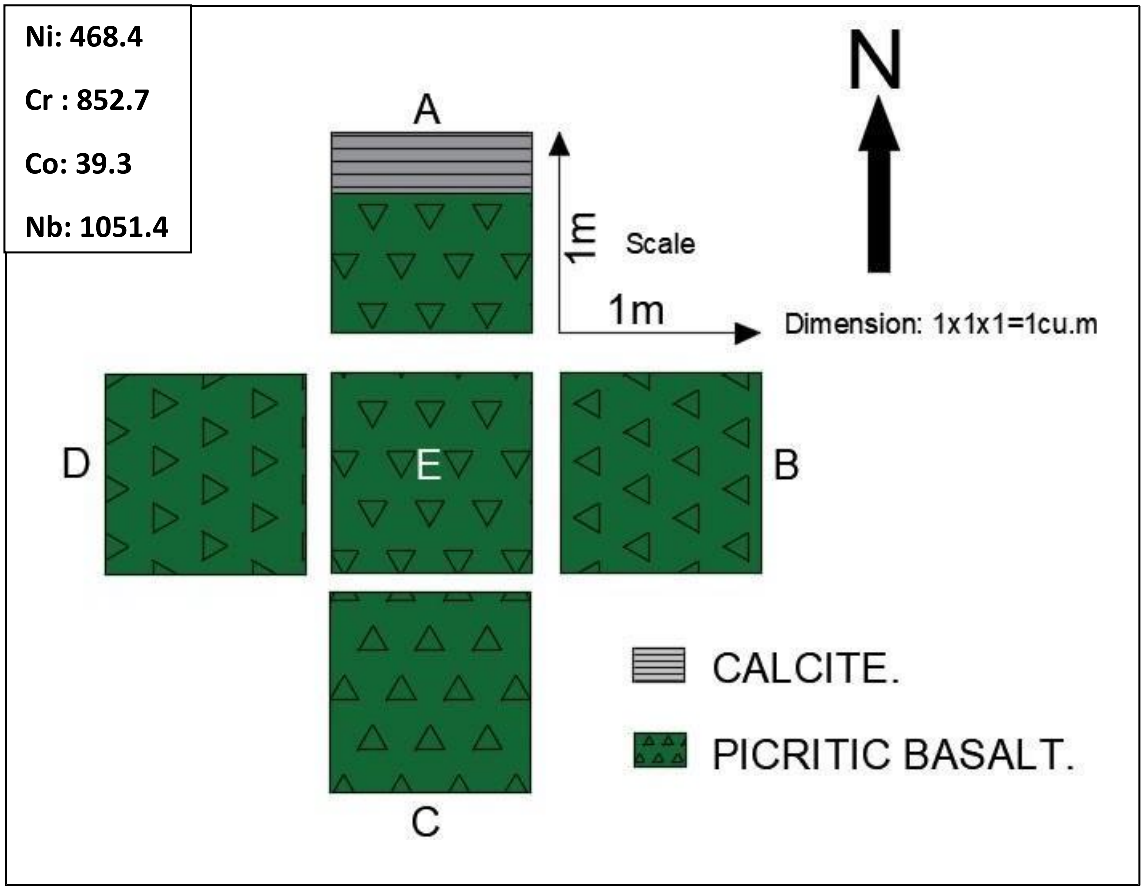
Co: 36.6

Nb: 1001.1



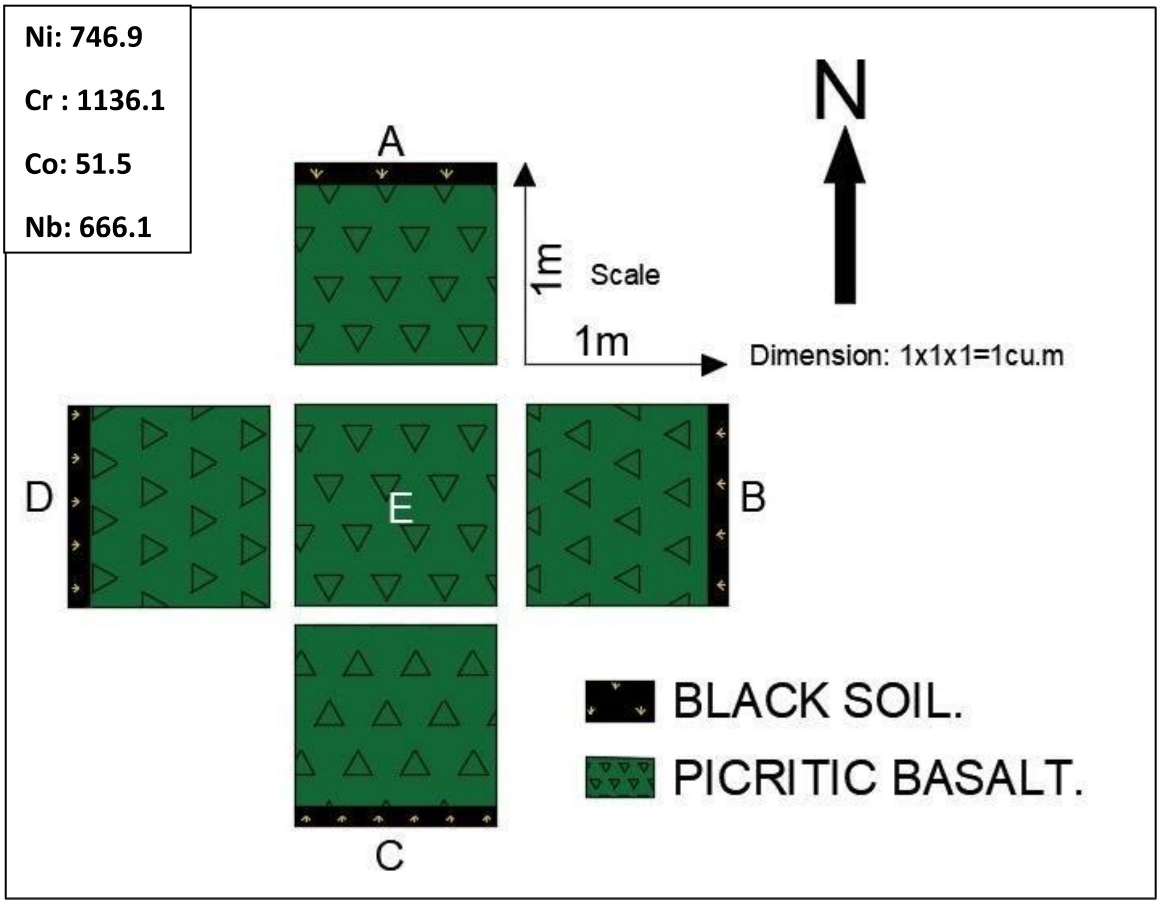
Name of the investigation: Ni, Co and PGE	Pit no: P29/BTB/2025
Location: 22.184031,71.695361	Elevation: 89m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay Kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 30 profile:



Name of the investigation: Ni, Co and PGE	Pit no: P30/BTB/2025
Location: 22.168650,71.685003	Elevation: 99m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay Kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 31 profile:



Name of the investigation: Ni, Co and PGE	Pit no: P31/BTB/2025
Location: 22.120888,71.696067	Elevation: 86m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay Kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

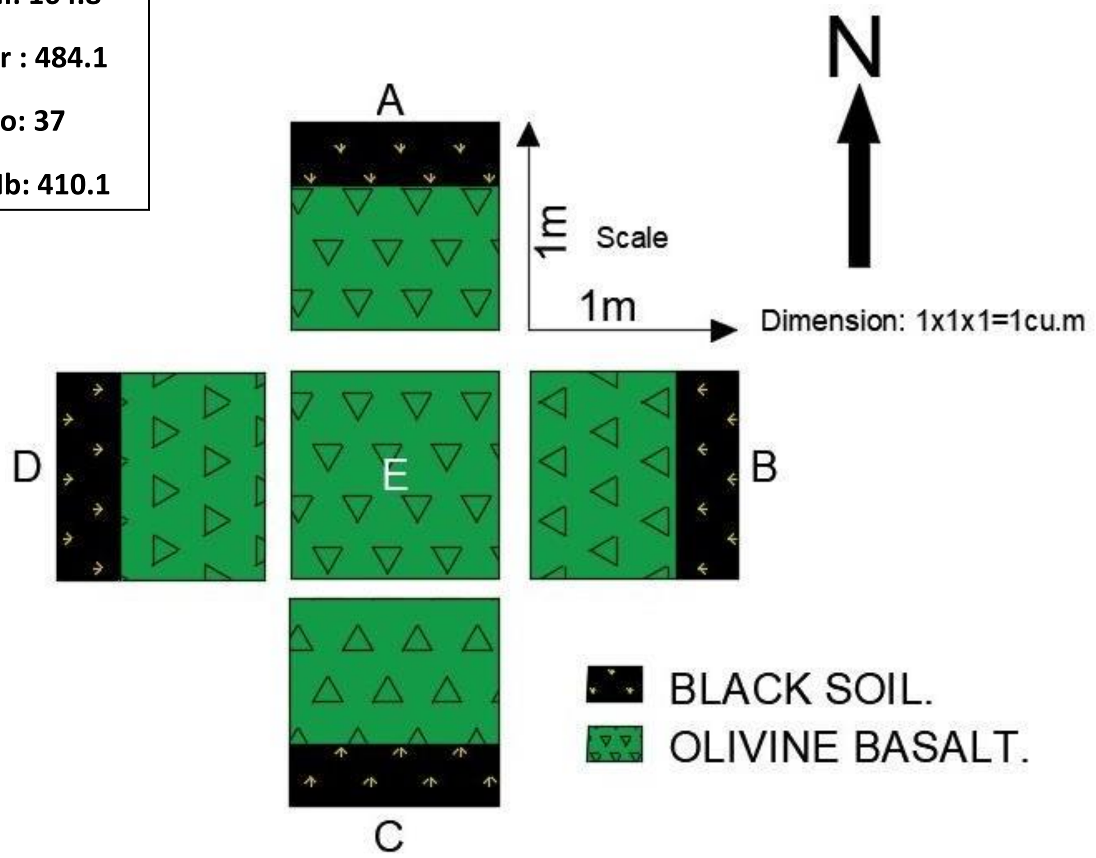
Pit 32 profile:

Ni: 164.8

Cr : 484.1

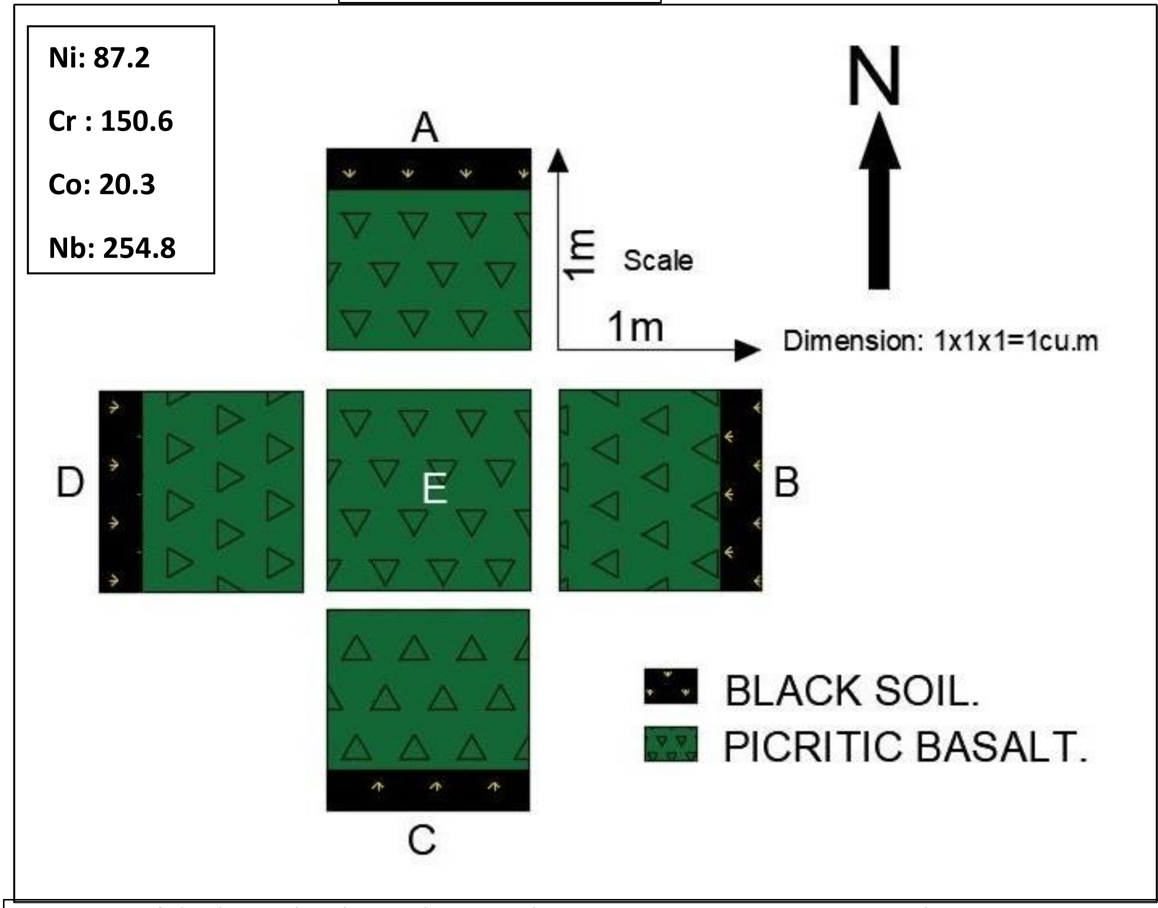
Co: 37

Nb: 410.1



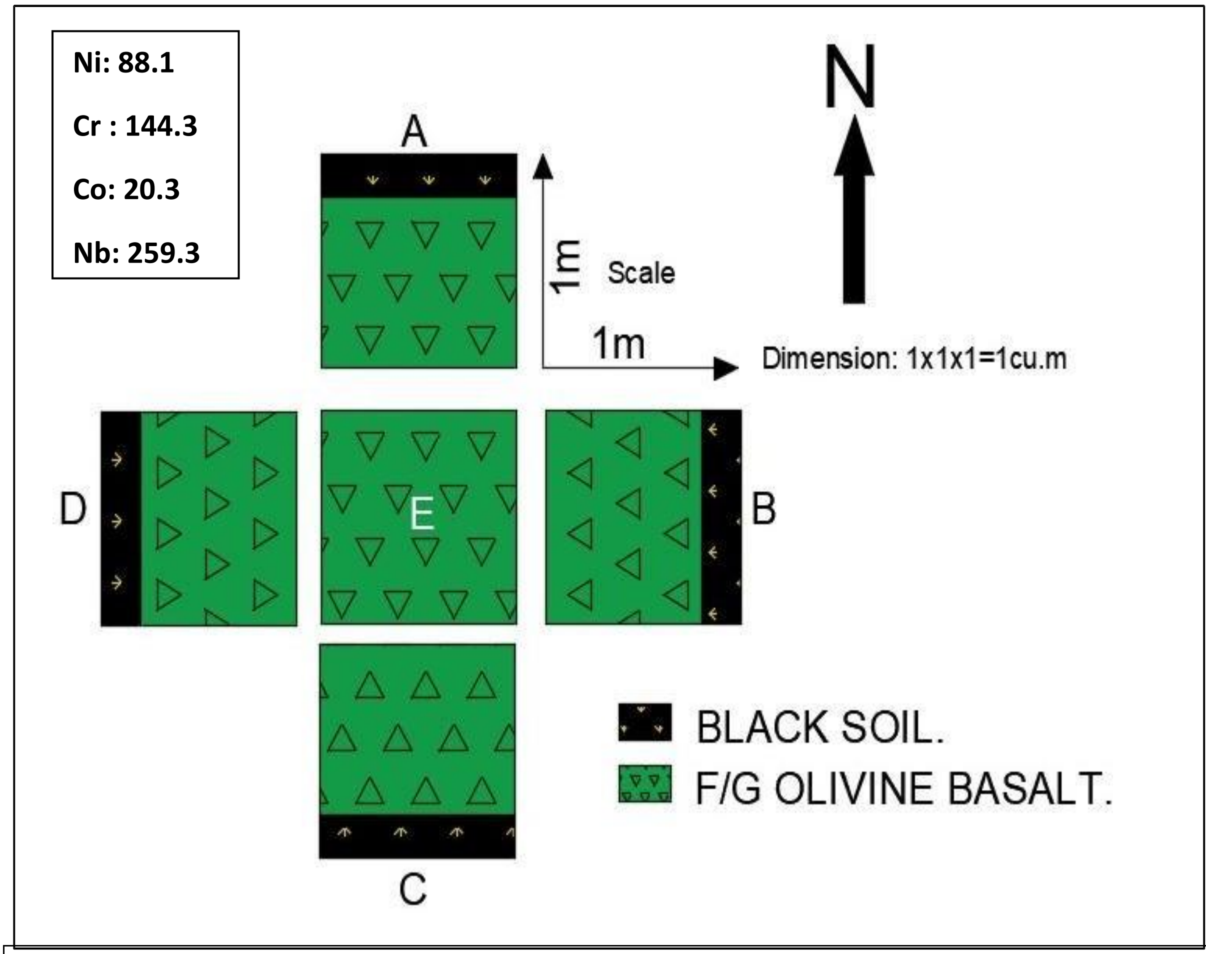
Name of the investigation: Ni, Co and PGE	Pit no: P32/BTB/2025
Location: 22.169232,71.3553	Elevation: 76m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay Kumar, Geologists	
Lithology details: olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 33 profile:



Name of the investigation: Ni, Co and PGE	Pit no: P33/BTB/2025
Location: 22.168056,71.713889	Elevation: 85m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay Kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 34 profile:



Name of the investigation: Ni, Co and PGE	Pit no: P34/BTB/2025
Location: 22.167500,71.721667	Elevation: 85m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay Kumar, Geologists	
Lithology details: Fine grained olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

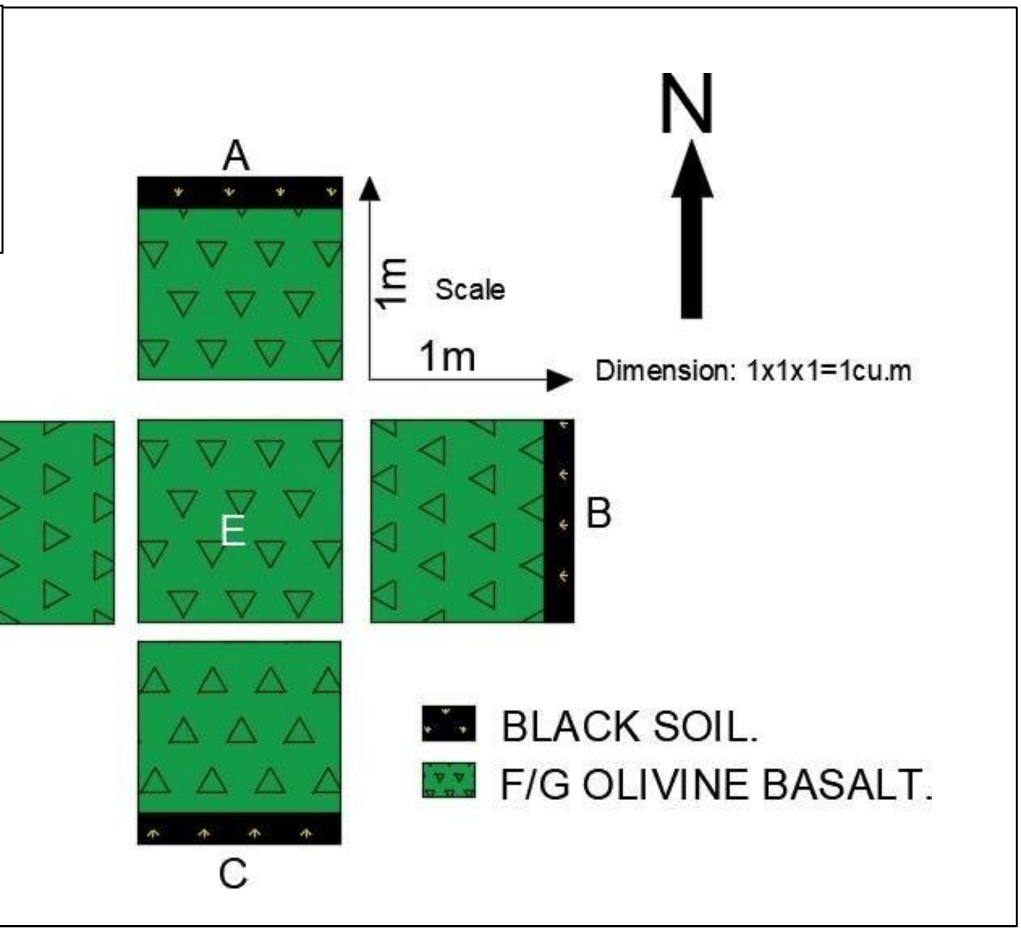
Pit 35 profile:

Ni: 93.1

Cr : 164

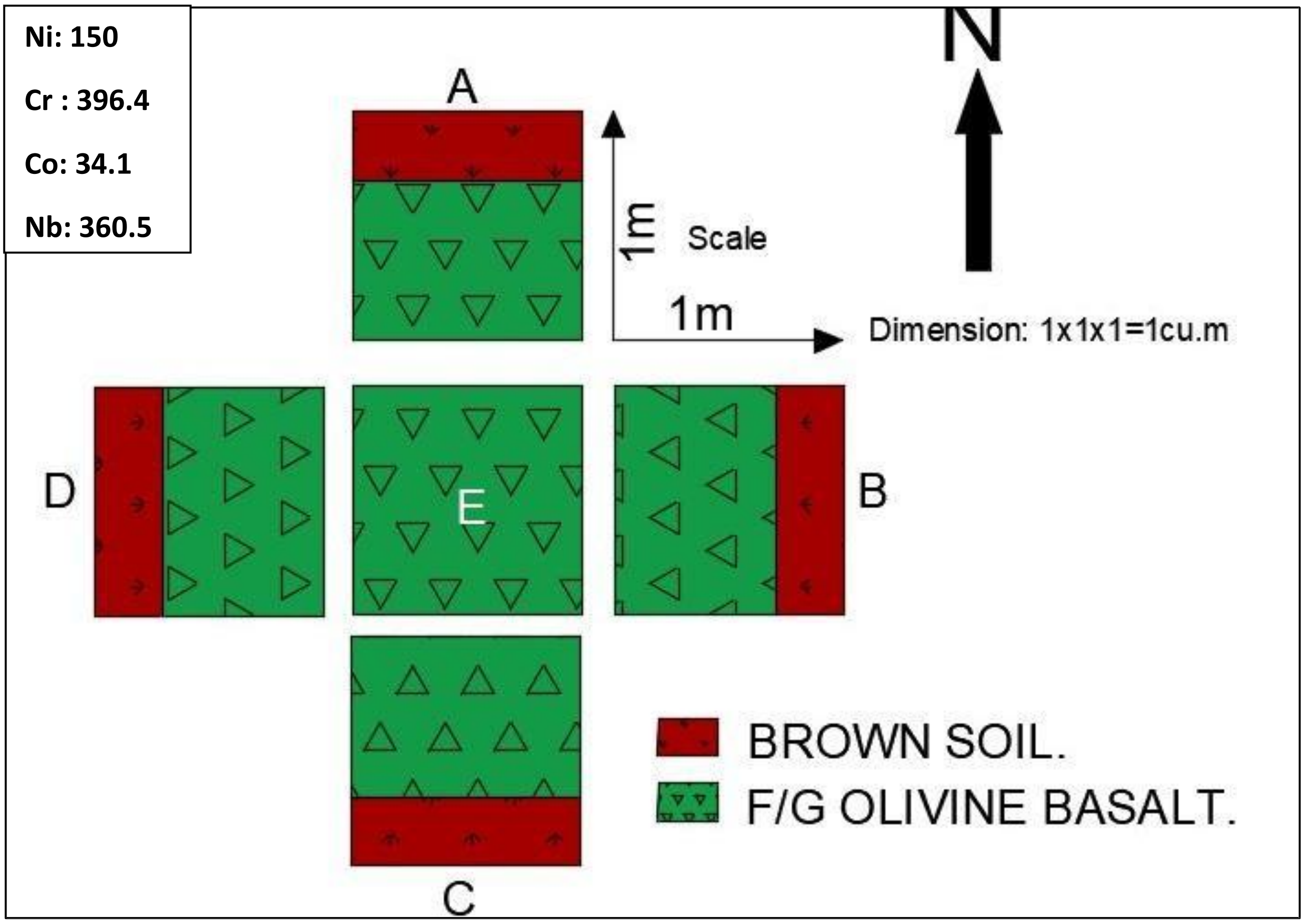
Co: 65.2

Nb: 1084.3

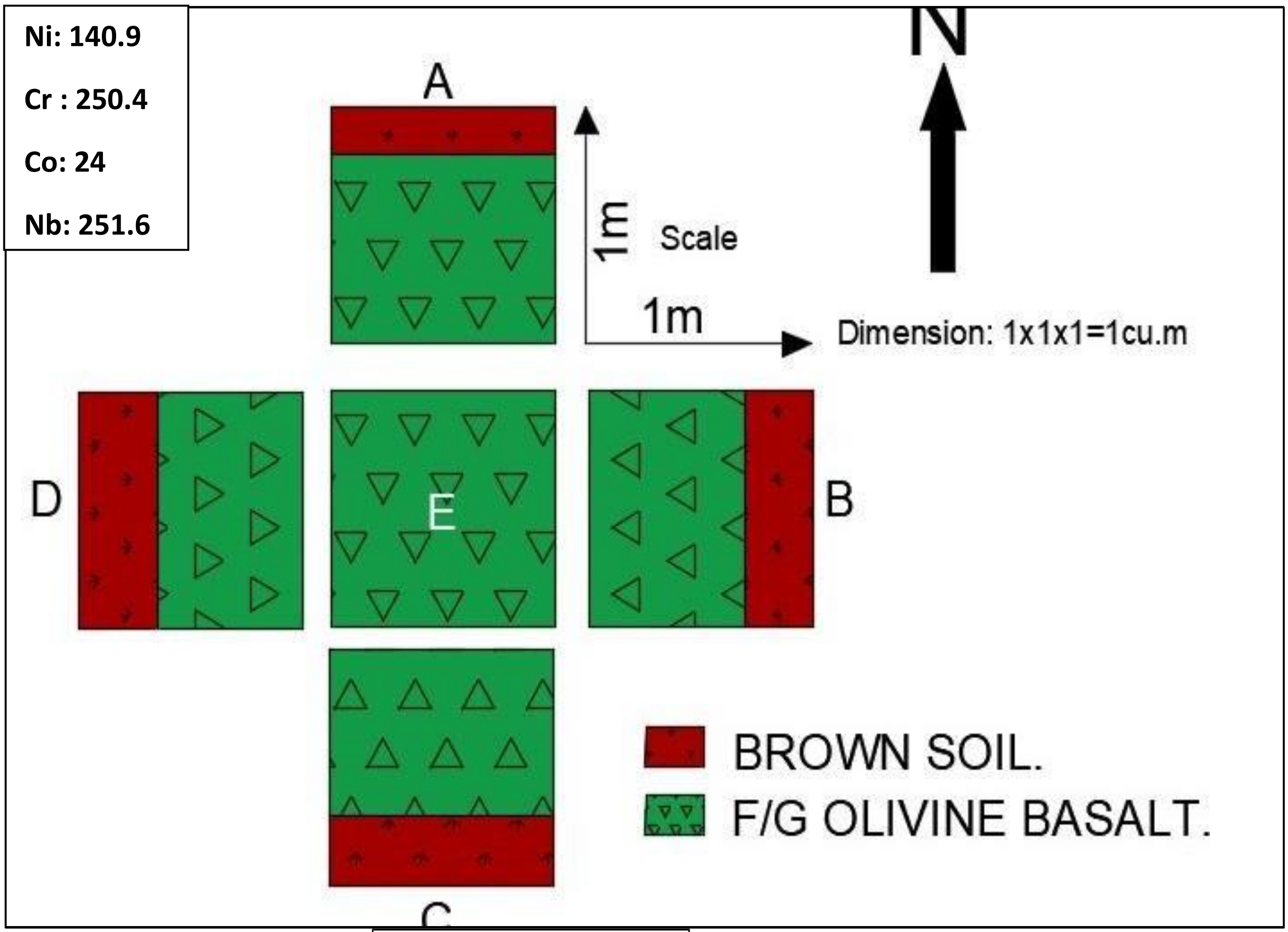


Name of the investigation: Ni, Co and PGE	Pit no: P35/BTB/2025
Location: 22.161389,71.726944	Elevation: 82m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay Kumar, Geologists	
Lithology details: Fine grained olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 36 profile:



Name of the investigation: Ni, Co and PGE	Pit no: P36/BTB/2025
Location: 22.158056,71.724167	Elevation: 81m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay Kumar, Geologists	
Lithology details: Fine grained olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	



Pit 37 profile:

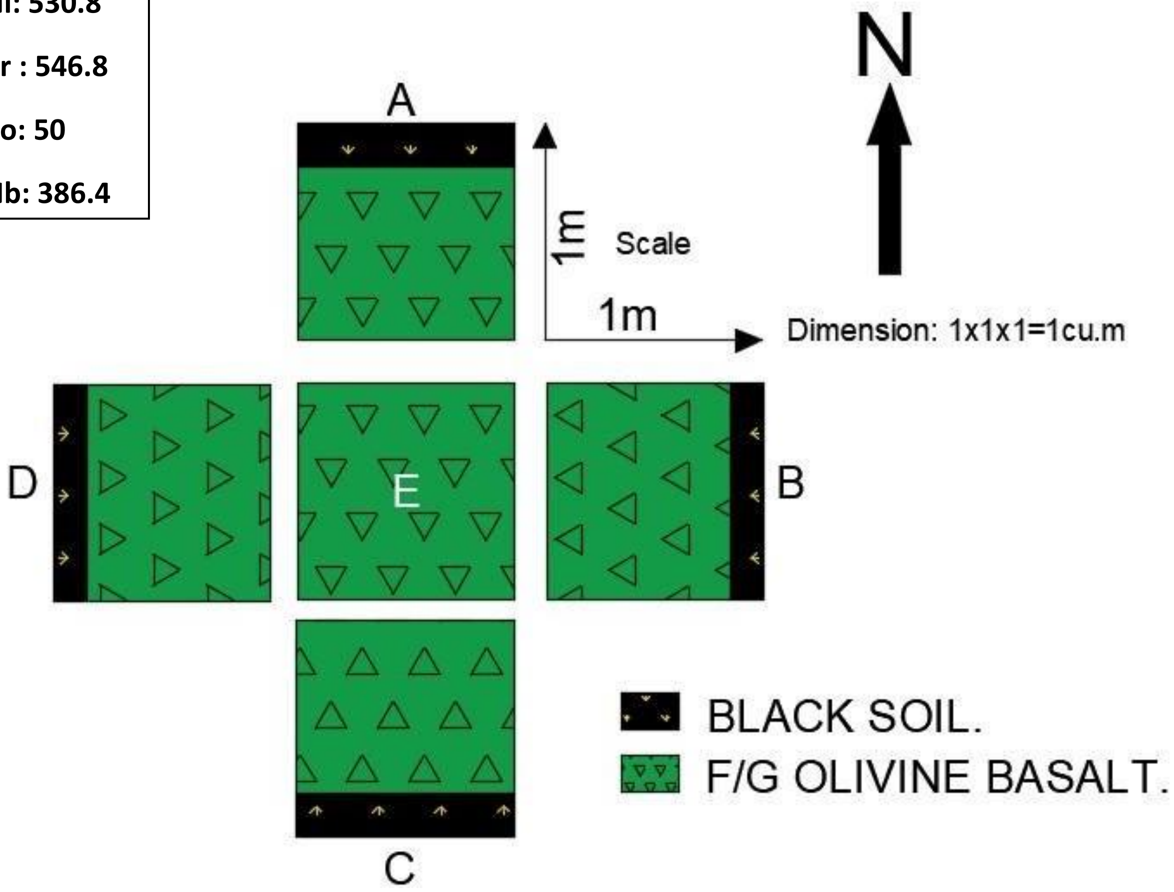
Name of the investigation: Ni, Co and PGE	Pit no: P37/BTB/2025
Location: 22.153889,71.727778	Elevation: 83m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Fine grained olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Ni: 530.8

Cr : 546.8

Co: 50

Nb: 386.4



Pit 38 profile:

Name of the investigation: Ni, Co and PGE	Pit no: P38/BTB/2025
Location: 22.155570,71.725395	Elevation: 100m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Fine grained olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

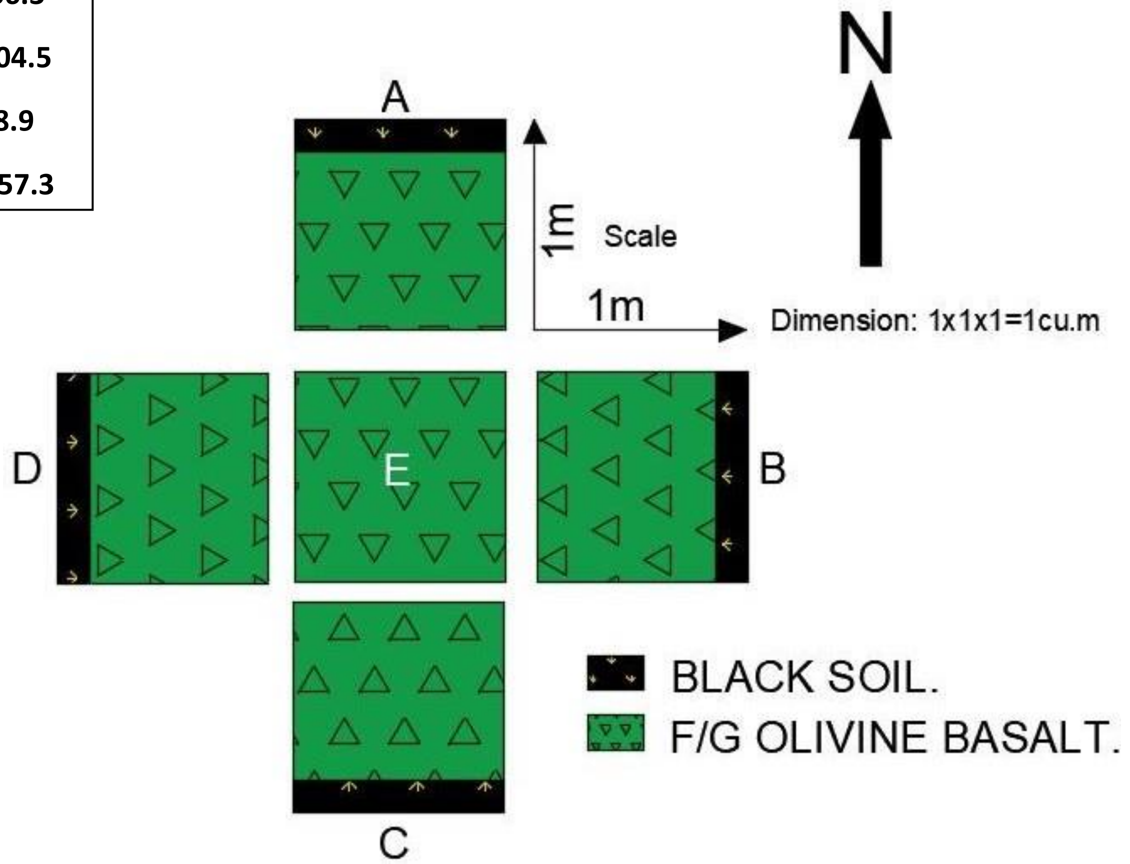
Pit 39 profile:

Ni: 266.3

Cr : 604.5

Co: 98.9

Nb: 857.3



Name of the investigation: Ni, Co and PGE	Pit no: P39/BTB/2025
Location: 22.159444,71.722222	Elevation: 84m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar , Geologists	
Lithology details: Fine grained olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

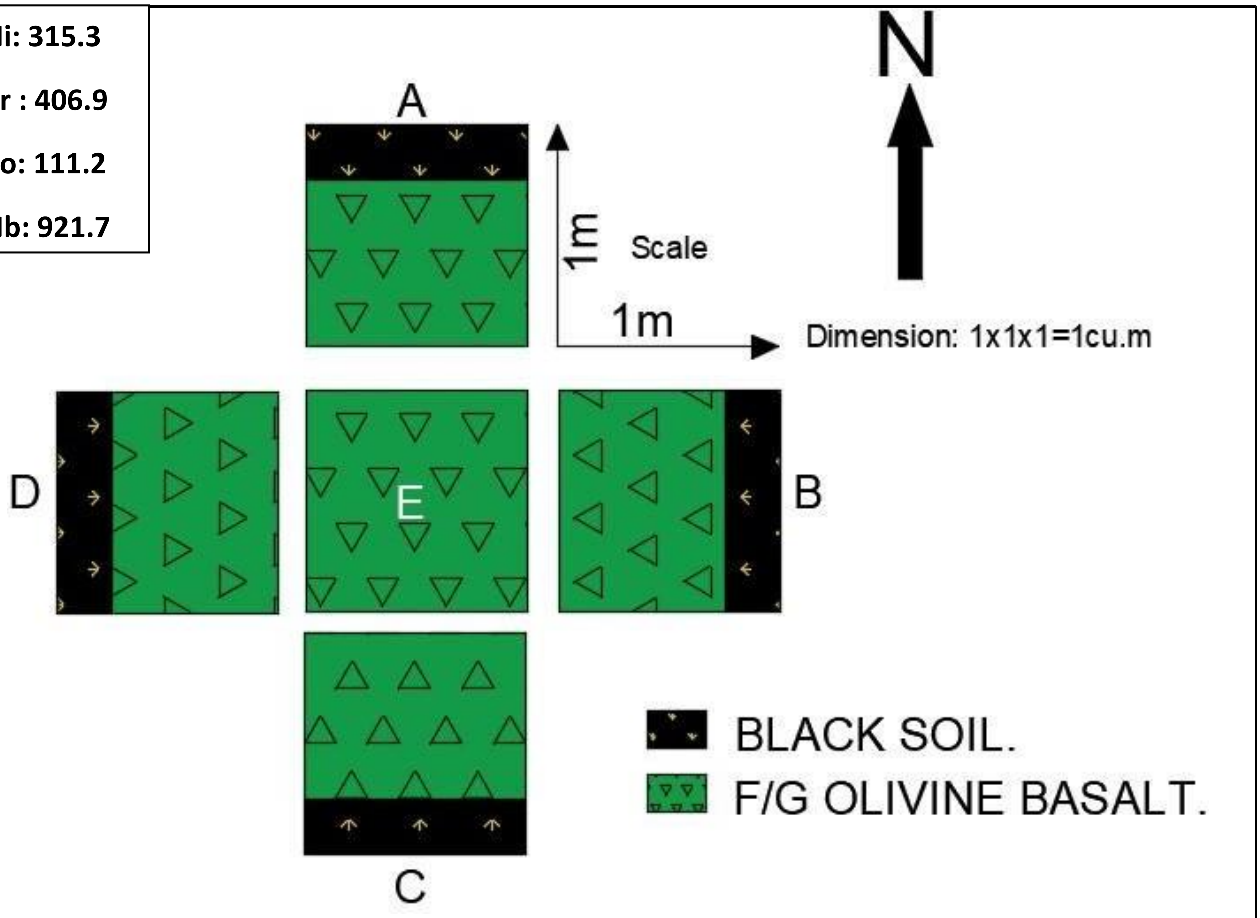
Pit 40 profile:

Ni: 315.3

Cr : 406.9

Co: 111.2

Nb: 921.7



Name of the investigation: Ni, Co and PGE	Pit no: P40/BTB/2025
Location: 22.141183,71.727643	Elevation: 57m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Fine grained olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

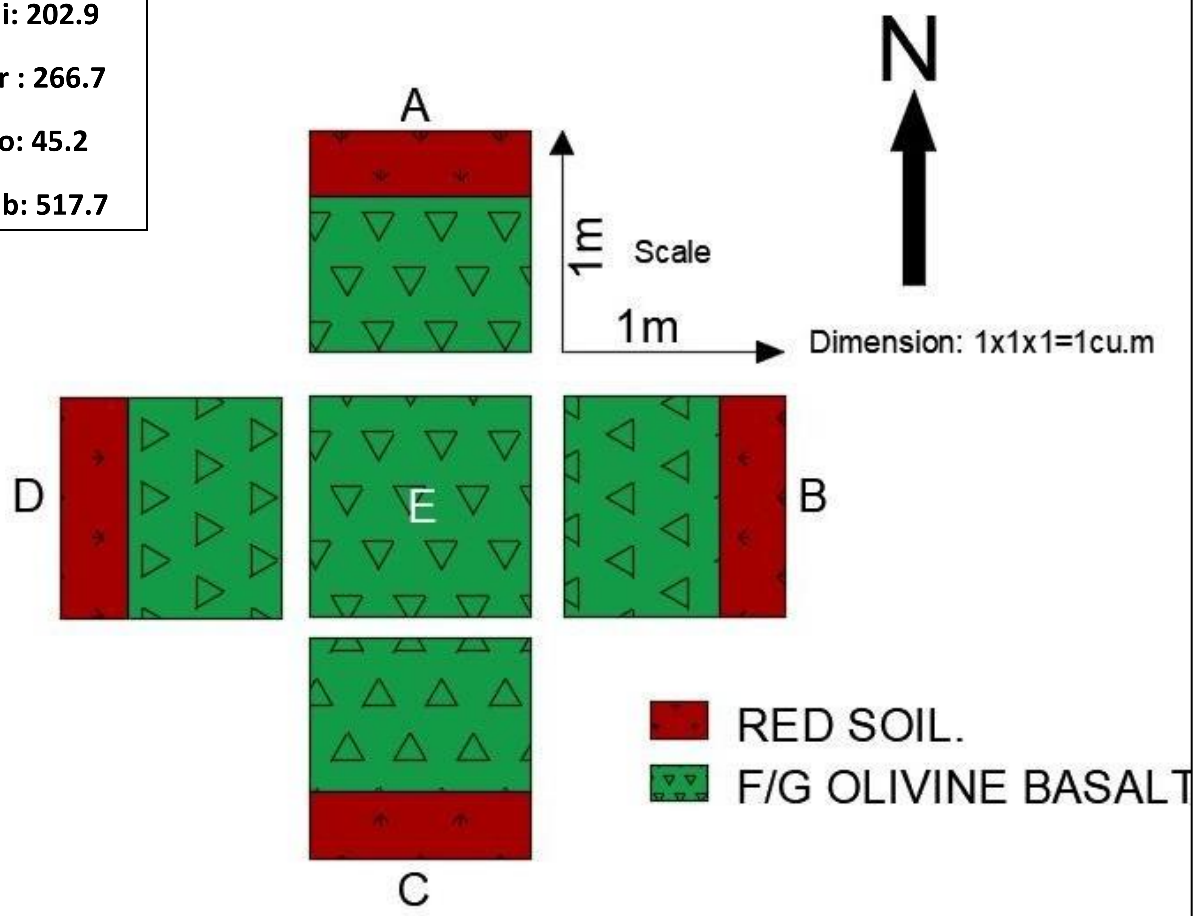
Pit 41 profile:

Ni: 202.9

Cr : 266.7

Co: 45.2

Nb: 517.7



Name of the investigation: Ni, Co and PGE	Pit no: P41/BTB/2025
Location: 22.142363,71.720277	Elevation: 68m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Fine grained olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

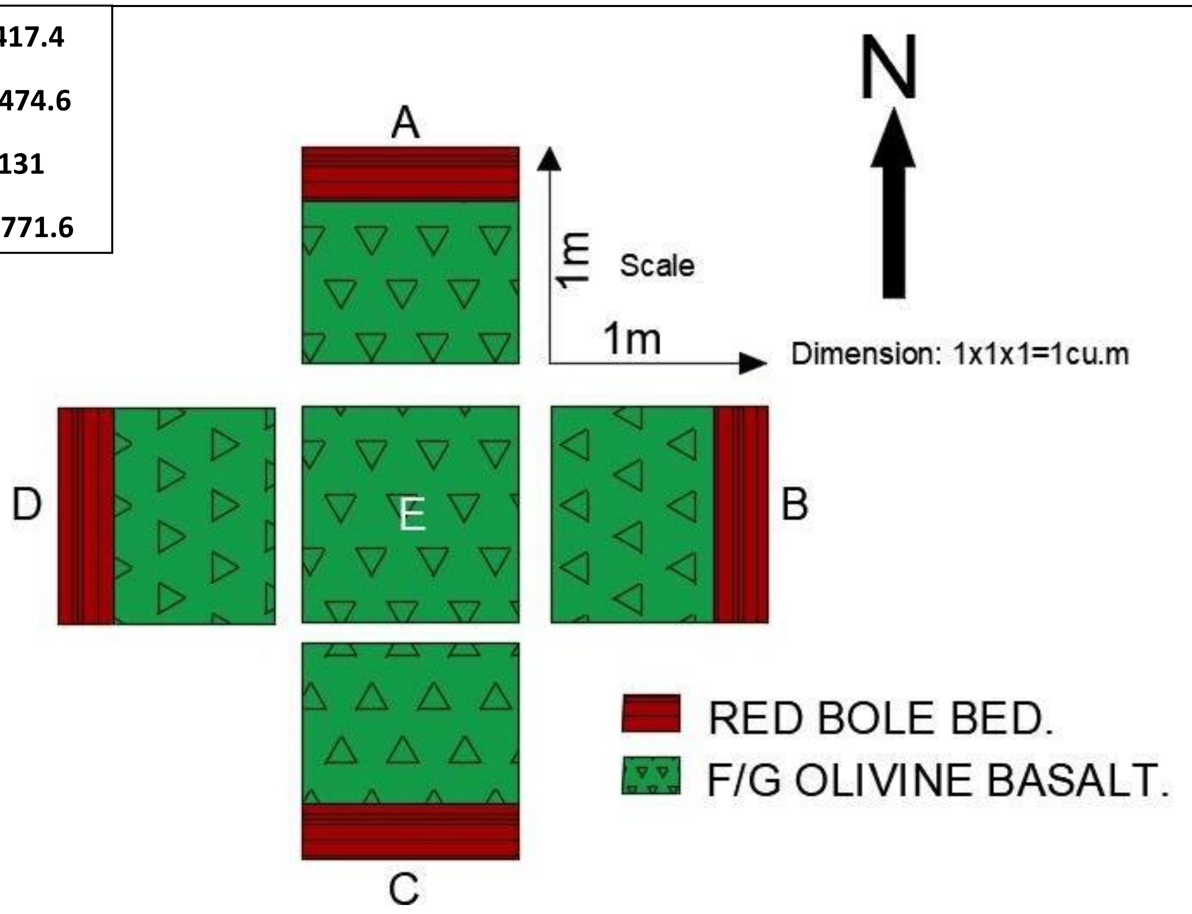
Pit 42 profile:

Ni: 417.4

Cr : 474.6

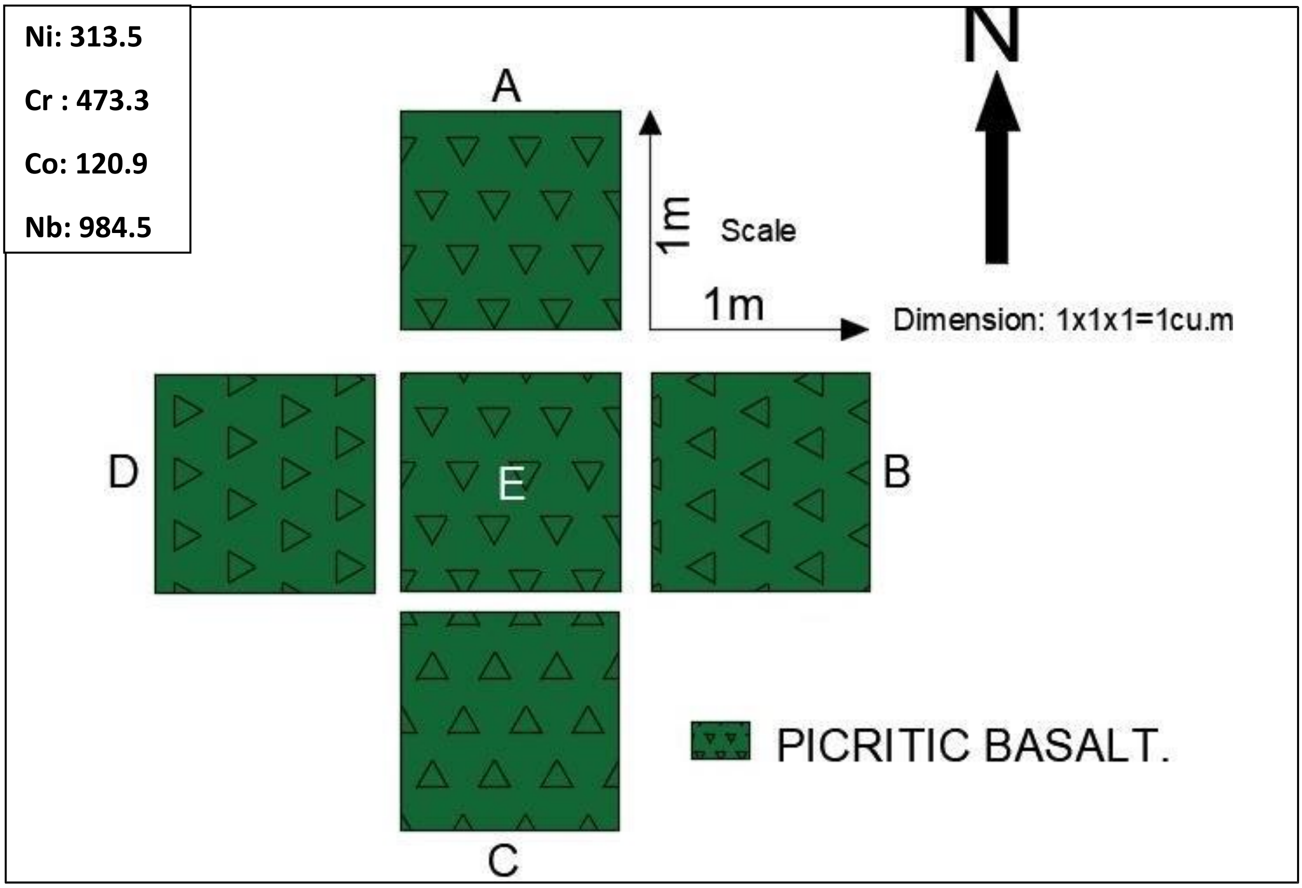
Co: 131

Nb: 771.6



Name of the investigation: Ni,Co and PGE	Pit no:P42/BTB/2025
Location: 22.145588,71.714840	Elevation: 69m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Fine grained olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 43 profile:



Name of the investigation: Ni,Co and PGE	Pit no:P43/BTB/2025
Location: 22.143911,71.705497	Elevation: 96m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

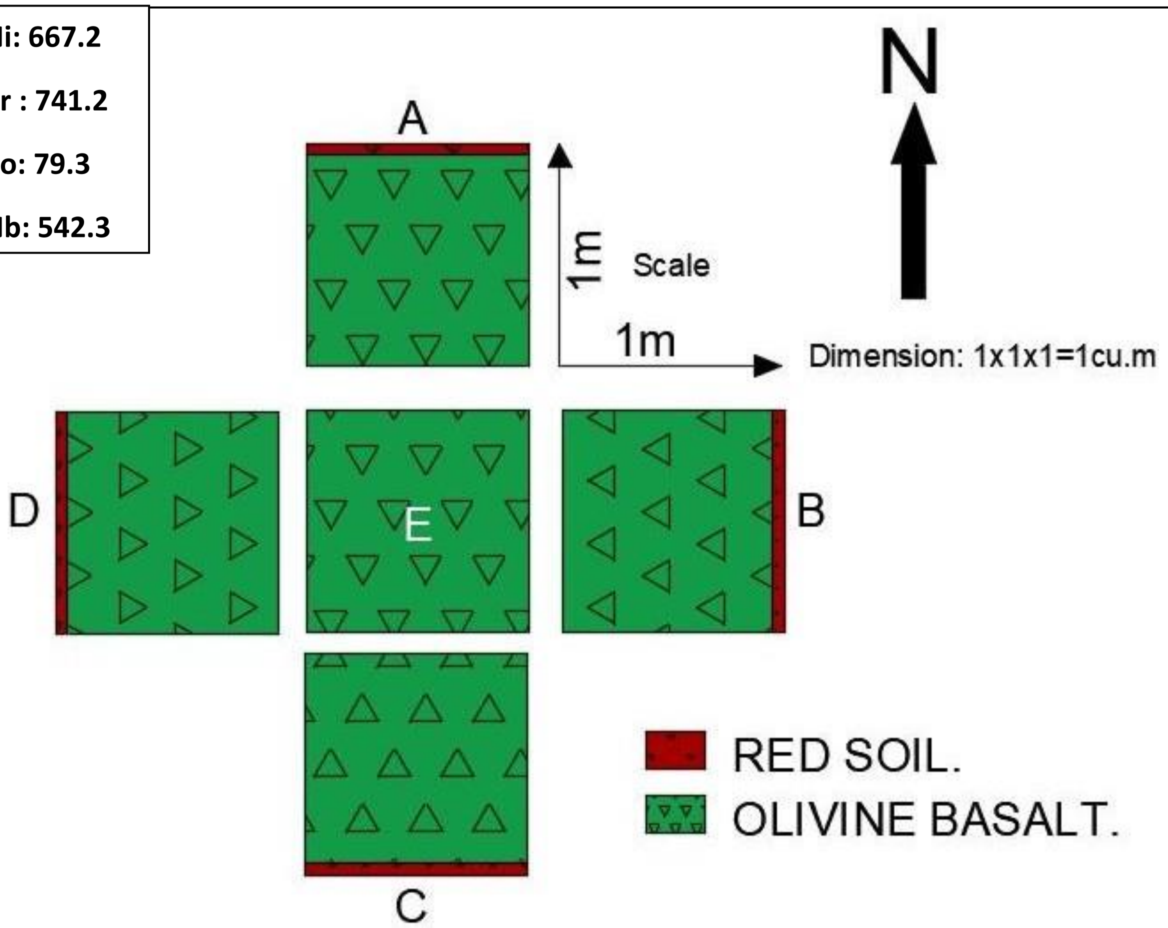
Pit 44 profile:

Ni: 667.2

Cr : 741.2

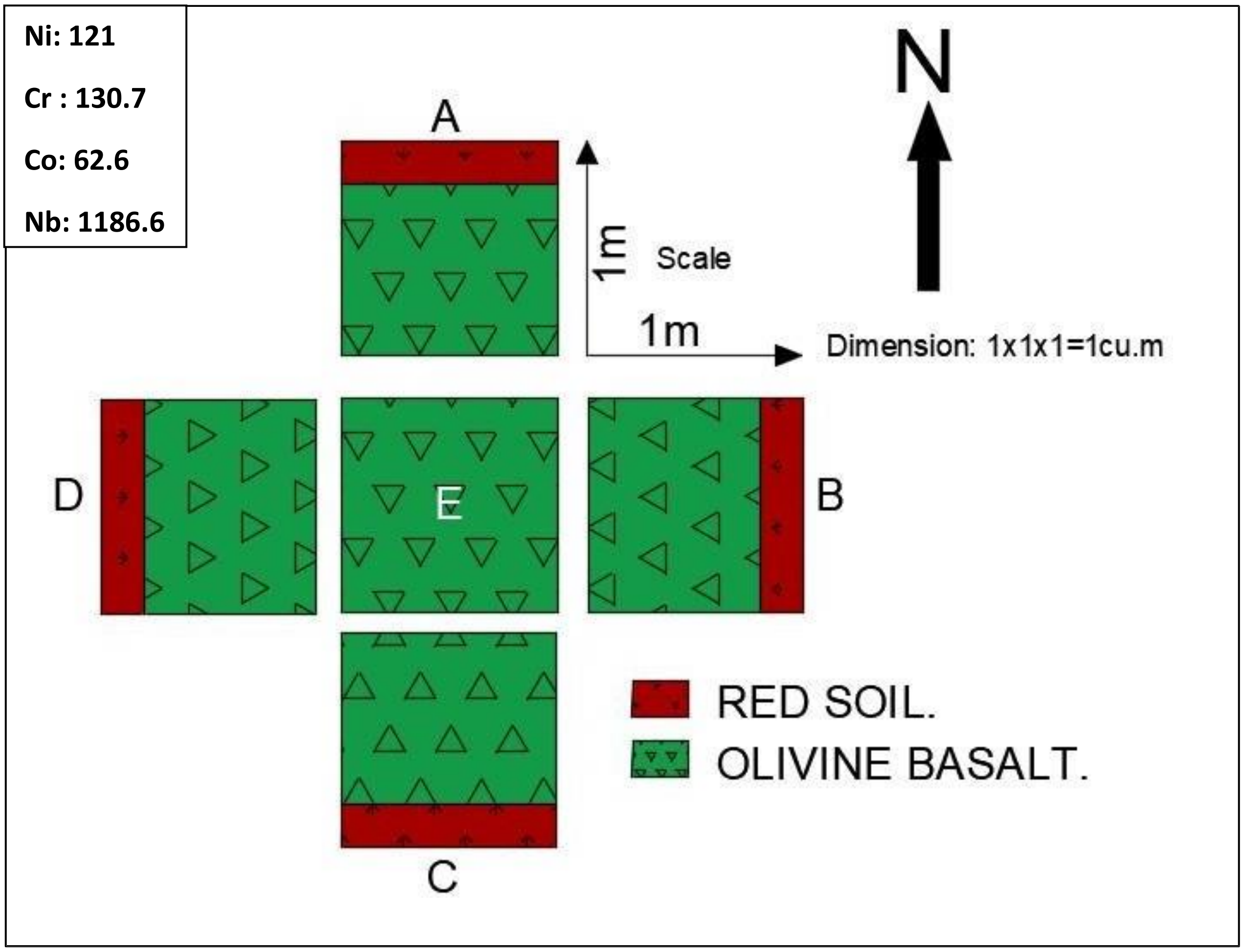
Co: 79.3

Nb: 542.3



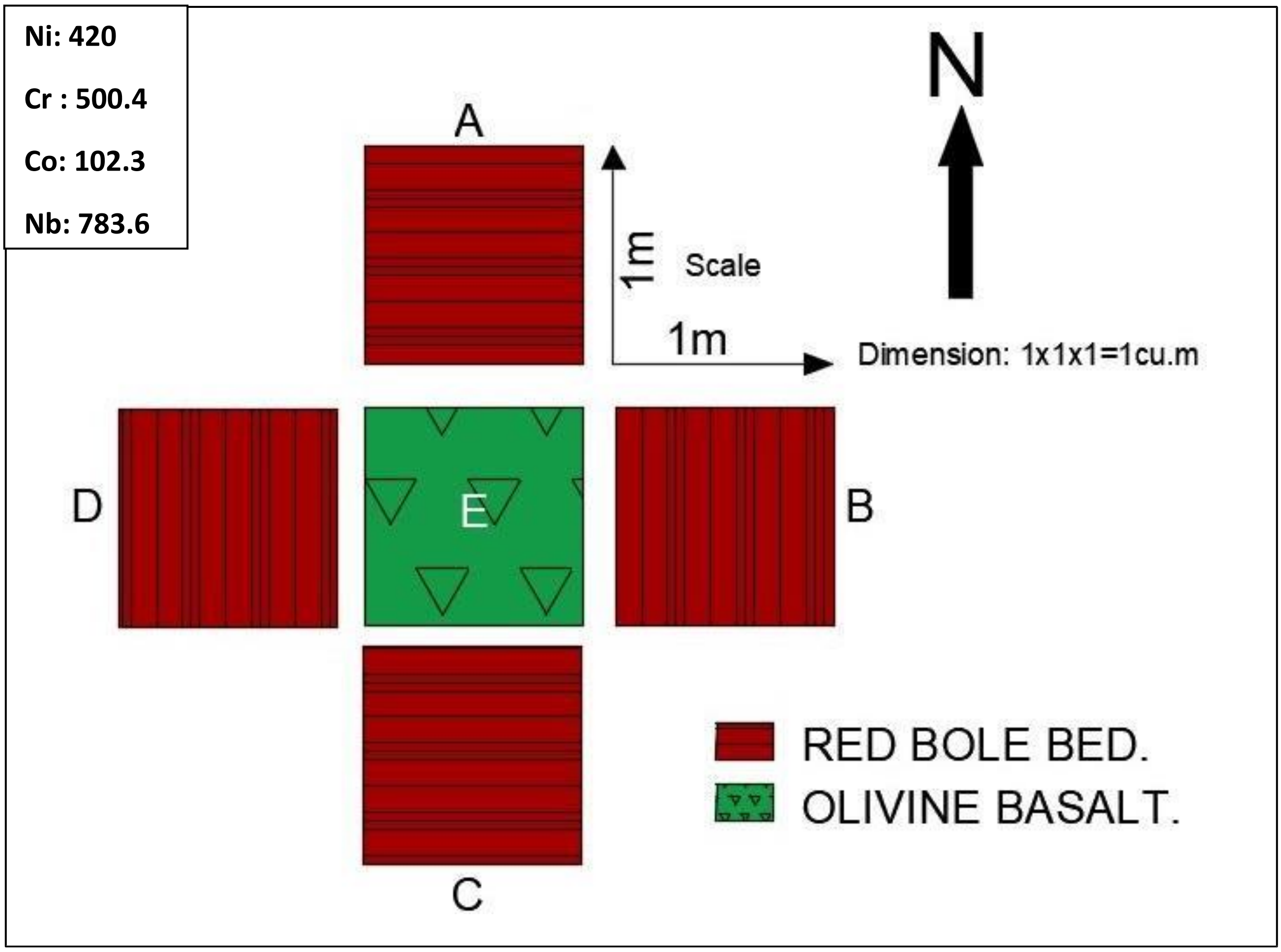
Name of the investigation: Ni, Co and PGE	Pit no: P44/BTB/2025
Location: 22.151969,71.698906	Elevation: 75m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 45 profile:



Name of the investigation: Ni, Co and PGE	Pit no: P45/BTB/2025
Location: 22.159397,71.689622	Elevation: 77m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 46 profile:



Name of the investigation: Ni, Co and PGE	Pit no: P46/BTB/2025
Location: 22.149444,71.671944	Elevation: 89m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by:Mekala Chandu and Ajay kumar , Geologists	
Lithology details: Olivine basalt in red bole bed	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

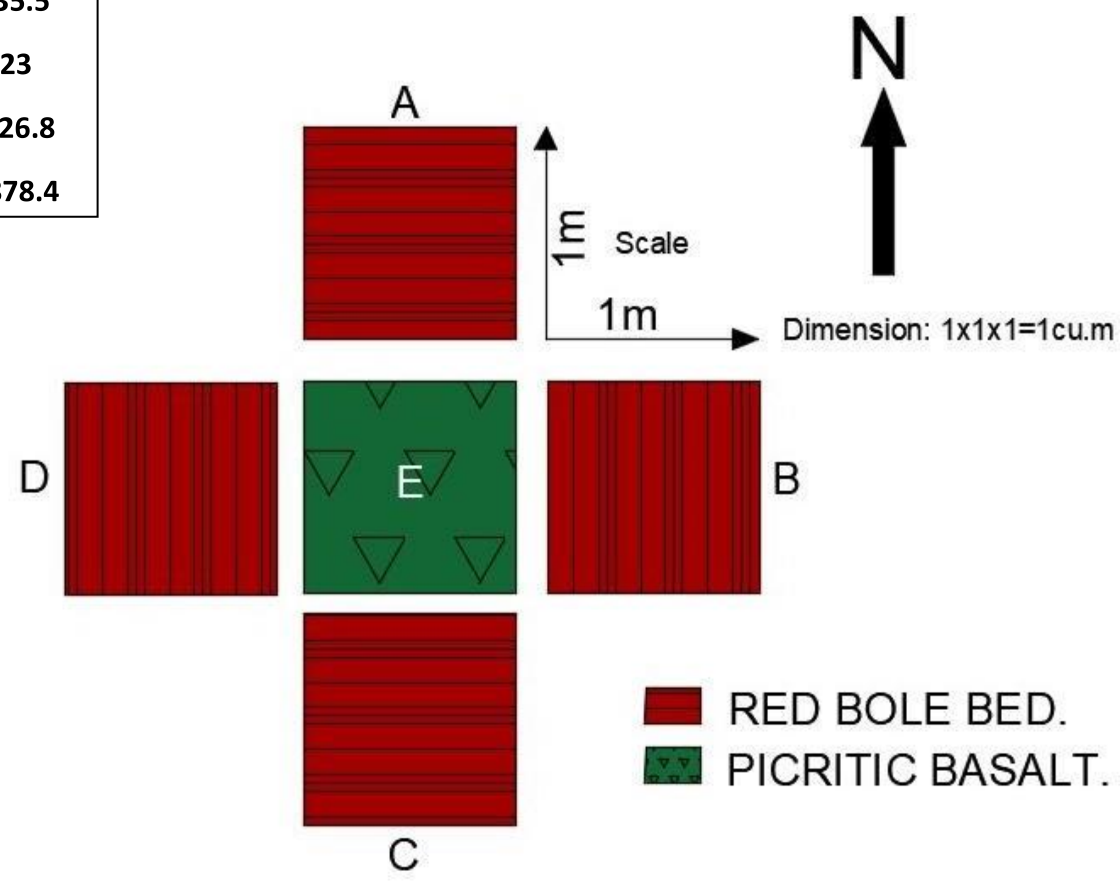
Pit 47 profile:

Ni: 435.5

Cr : 823

Co: 126.8

Nb: 878.4



Name of the investigation: Ni, Co and PGE	Pit no: P47/BTB/2025
Location: 22.146667,71.673333	Elevation: 101m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt in red bole bed	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

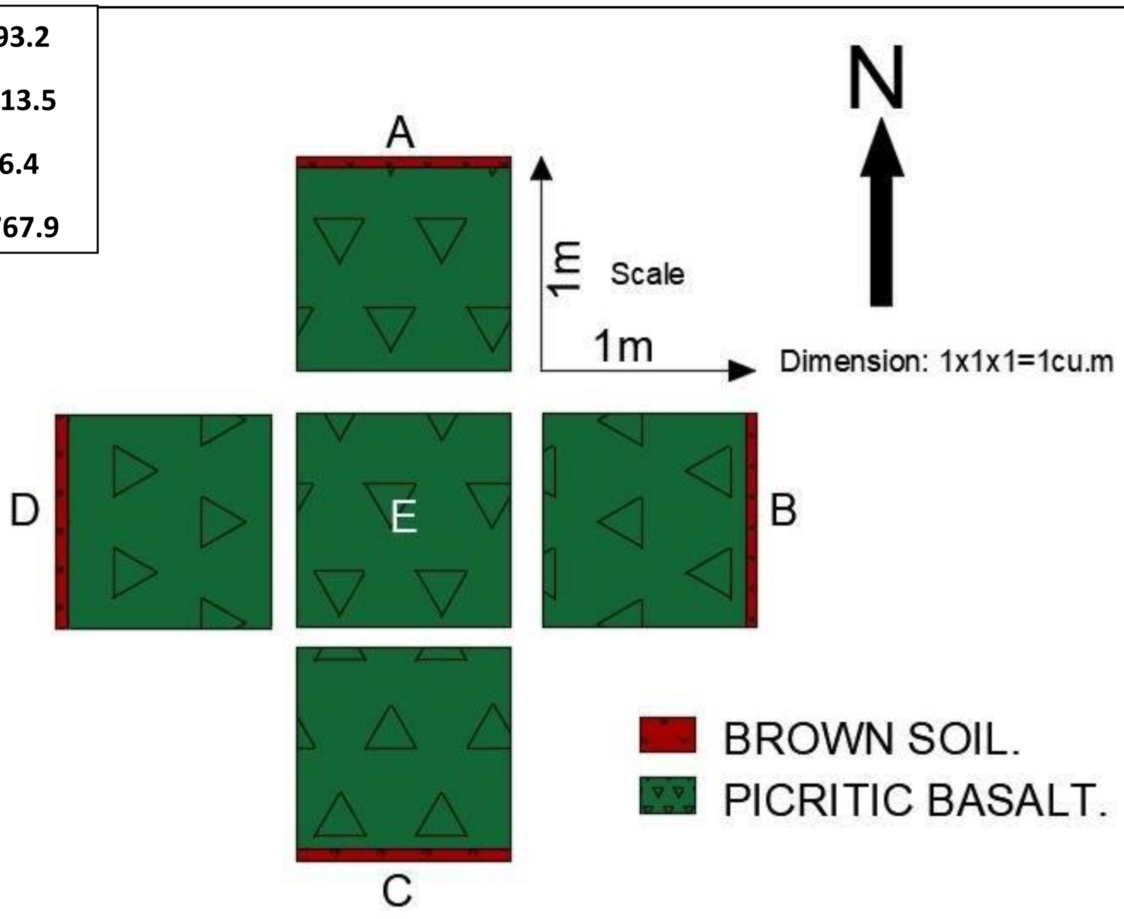
Pit 48 profile:

Ni: 393.2

Cr : 813.5

Co: 86.4

Nb: 767.9



Name of the investigation: Ni,Co and PGE	Pit no:P48/BTB/2025
Location: 22.145886,71.679947	Elevation: 91m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

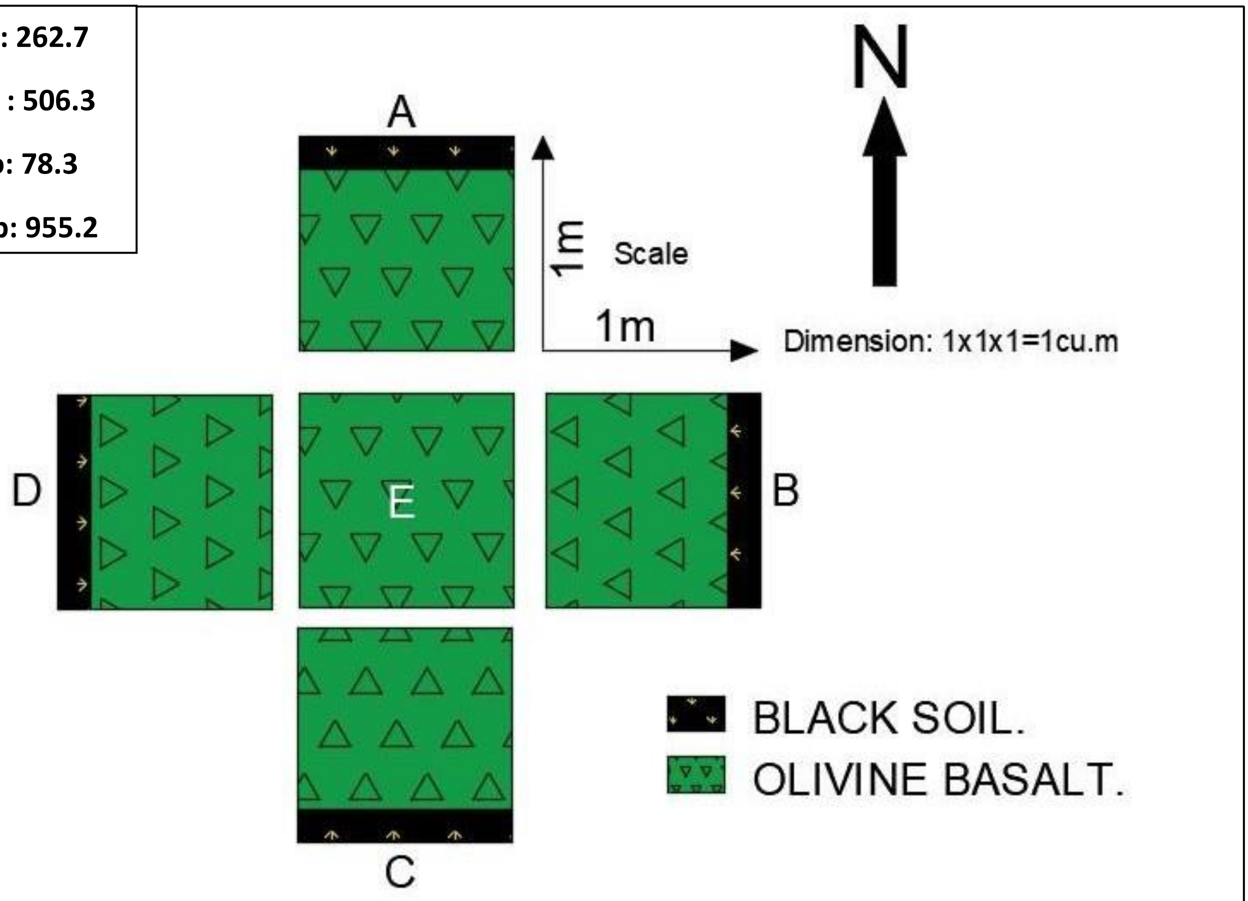
Pit 49 profile:

Ni: 262.7

Cr : 506.3

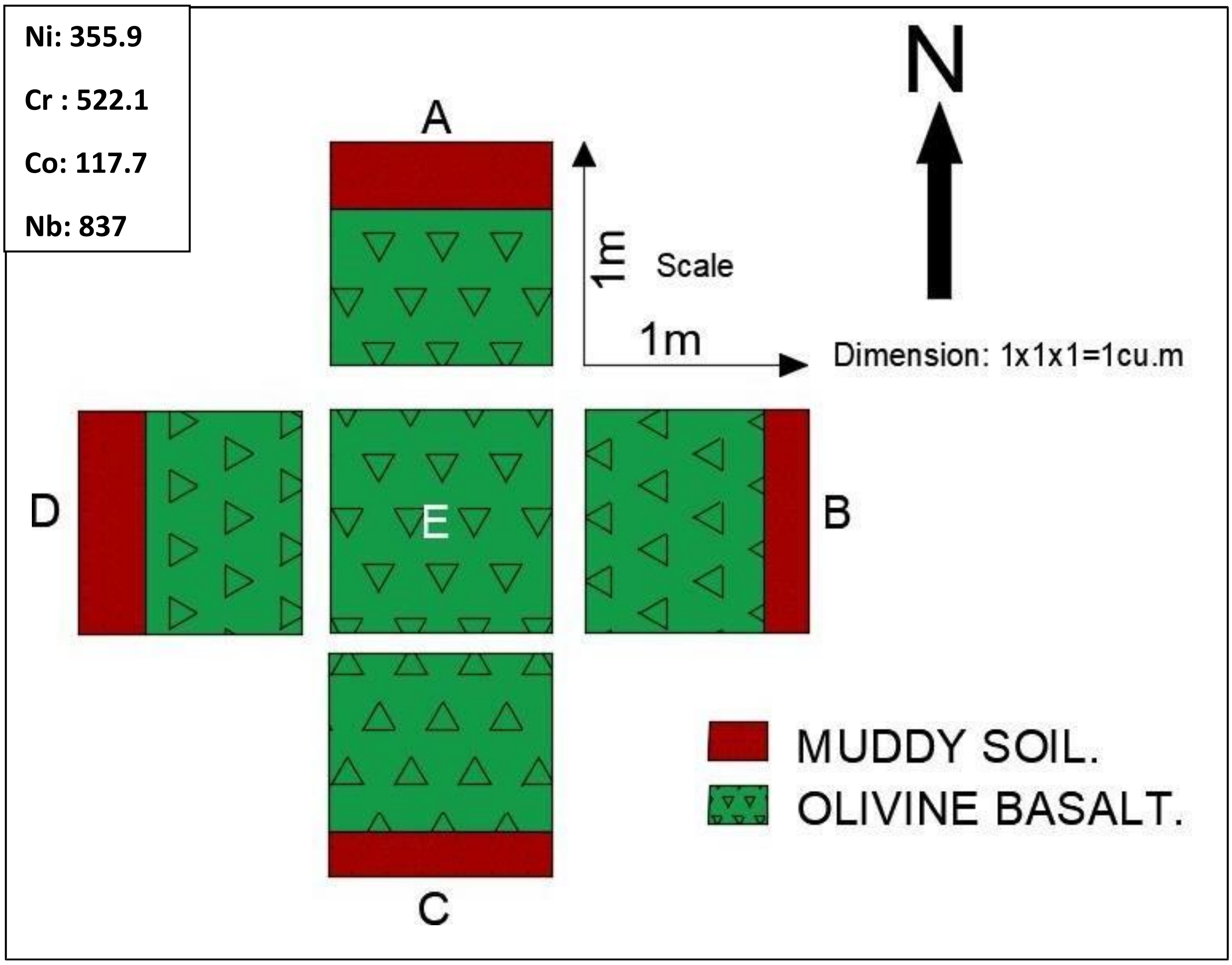
Co: 78.3

Nb: 955.2



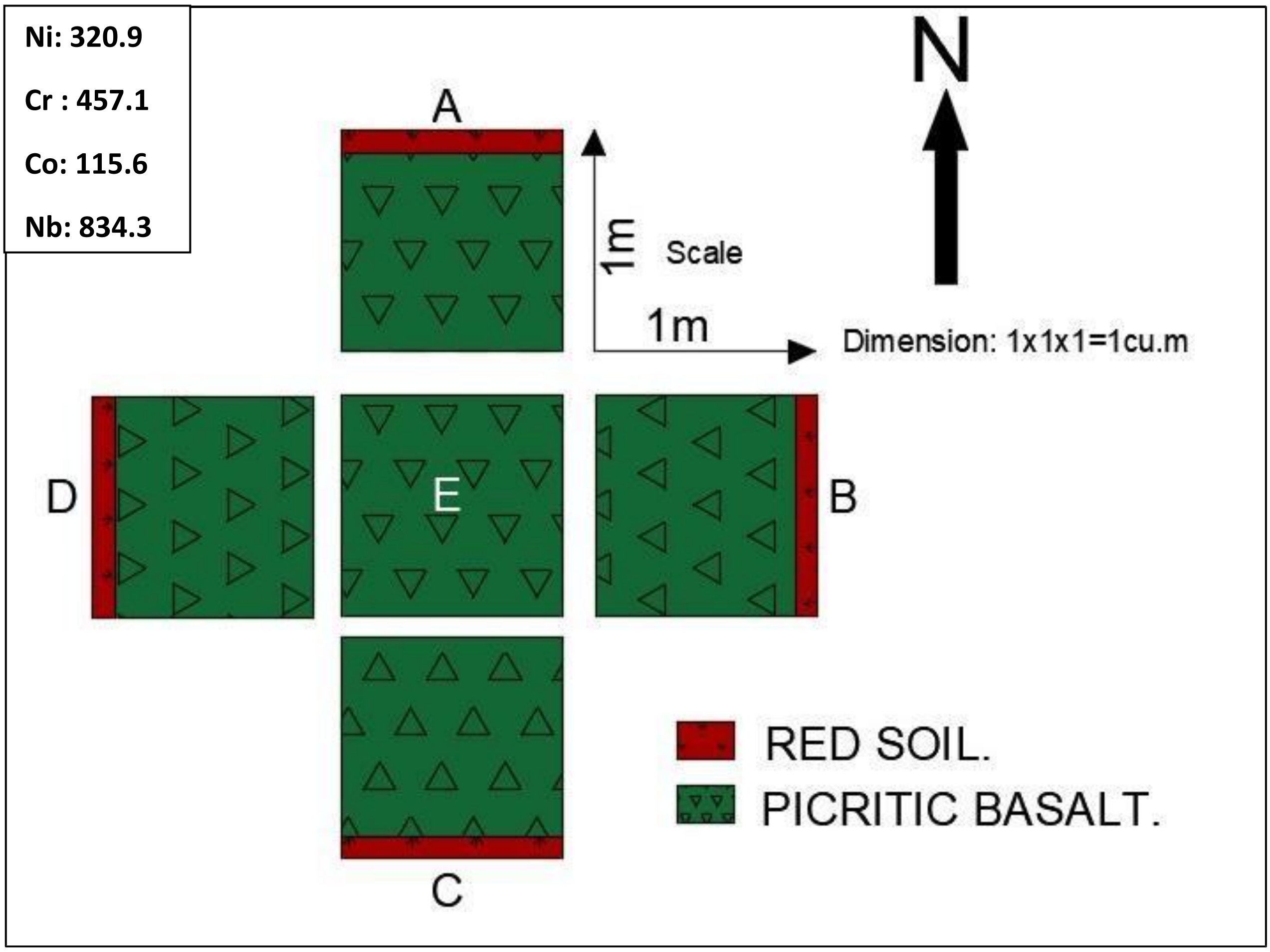
Name of the investigation: Ni,Co and PGE	Pit no:P49/BTB/2025
Location: 22.136086,71.664194	Elevation: 79m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 50 profile:



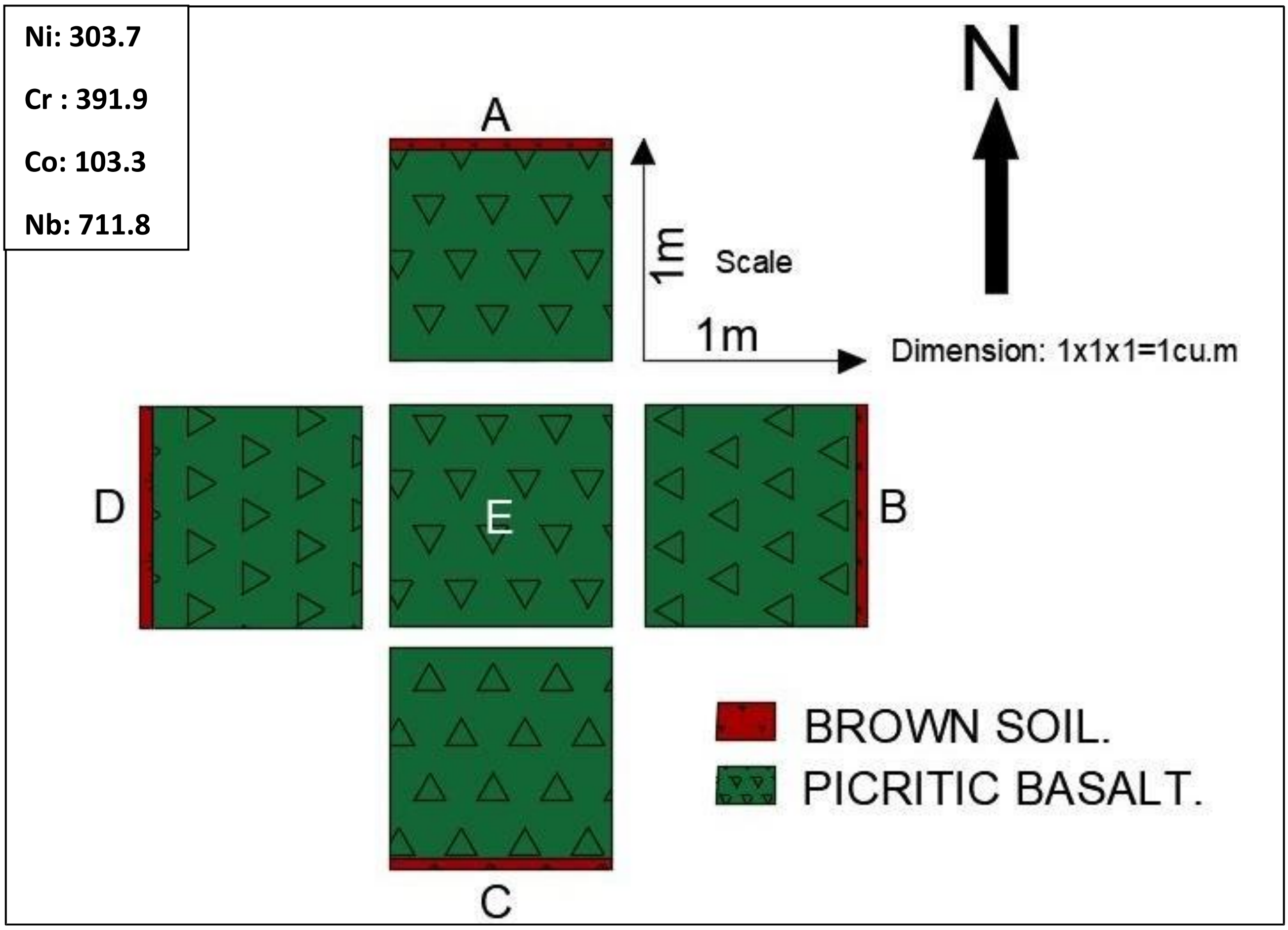
Name of the investigation: Ni, Co and PGE	Pit no: P50/BTB/2025
Location: 22.114444,71.658889	Elevation: 89m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 51 profile:



Name of the investigation: Ni, Co and PGE	Pit no: P51/BTB/2025
Location: 22.116389,71.660000	Elevation: 89m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 52 profile:



Name of the investigation: Ni, Co and PGE	Pit no: P52/BTB/2025
Location: 22.116667,71.660833	Elevation: 89m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

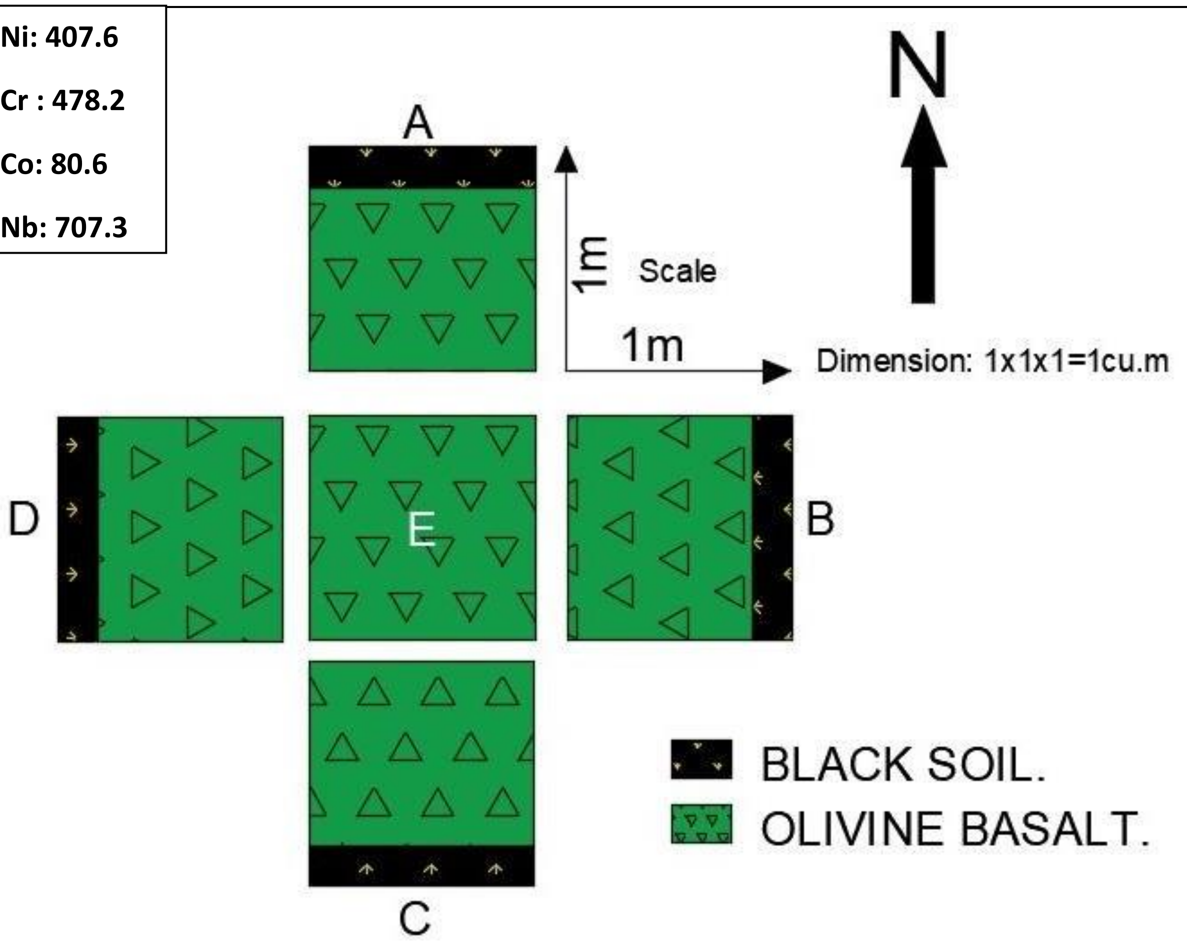
Pit 53 profile:

Ni: 407.6

Cr : 478.2

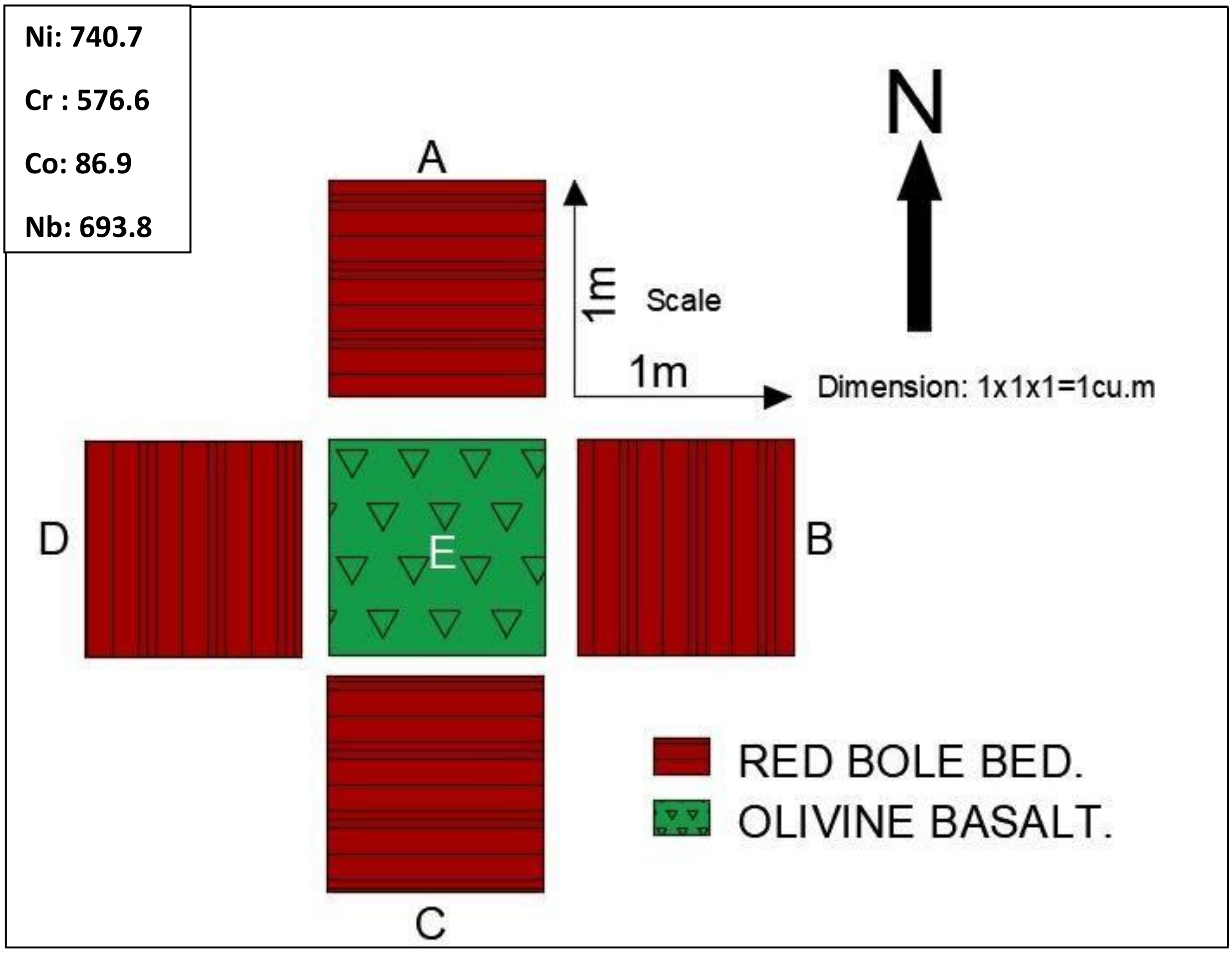
Co: 80.6

Nb: 707.3



Name of the investigation: Ni, Co and PGE	Pit no: P53/BTB/2025
Location: 22.128056,71.667500	Elevation: 79m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 54 profile:



Name of the investigation: Ni, Co and PGE	Pit no: P54/BTB/2025
Location: 22.103611,71.679167	Elevation: 92m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Olivine basalt in red bole bed	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

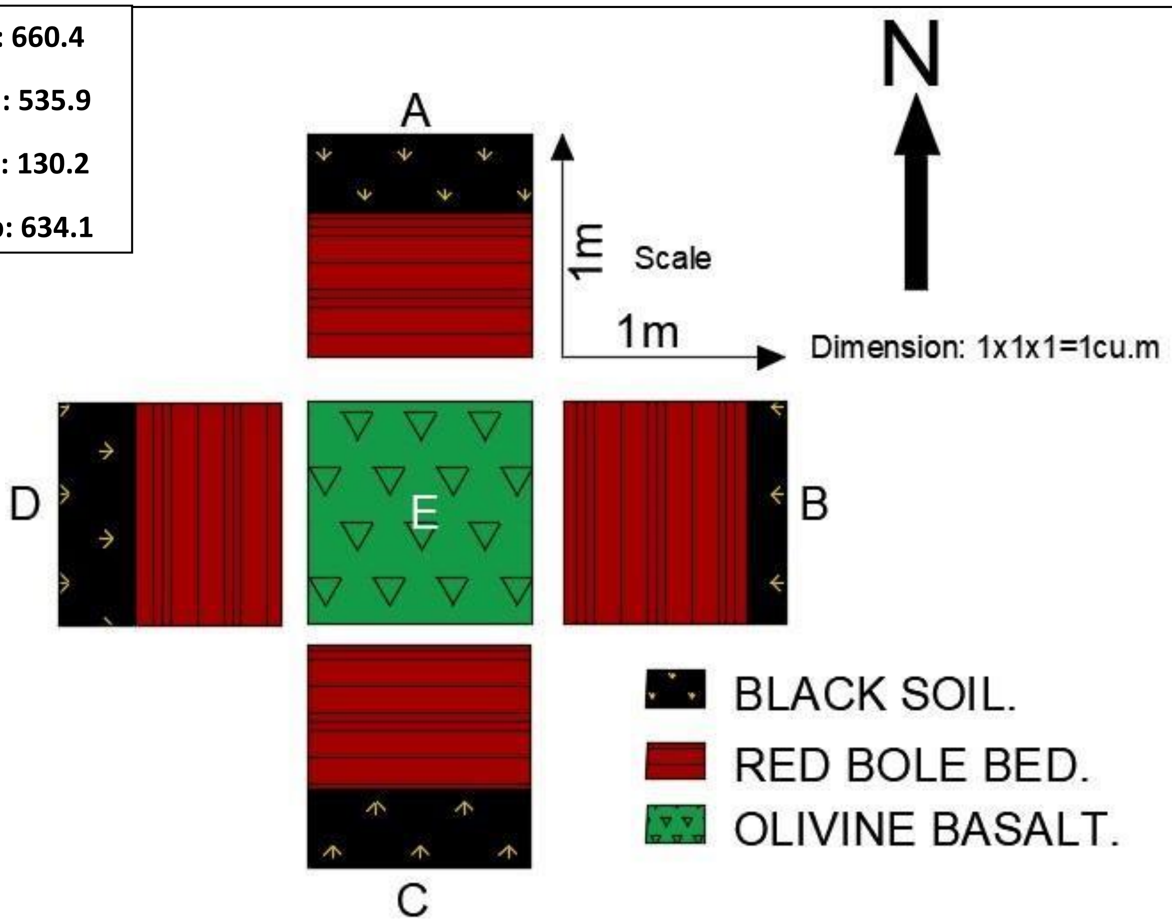
Pit 55 profile:

Ni: 660.4

Cr : 535.9

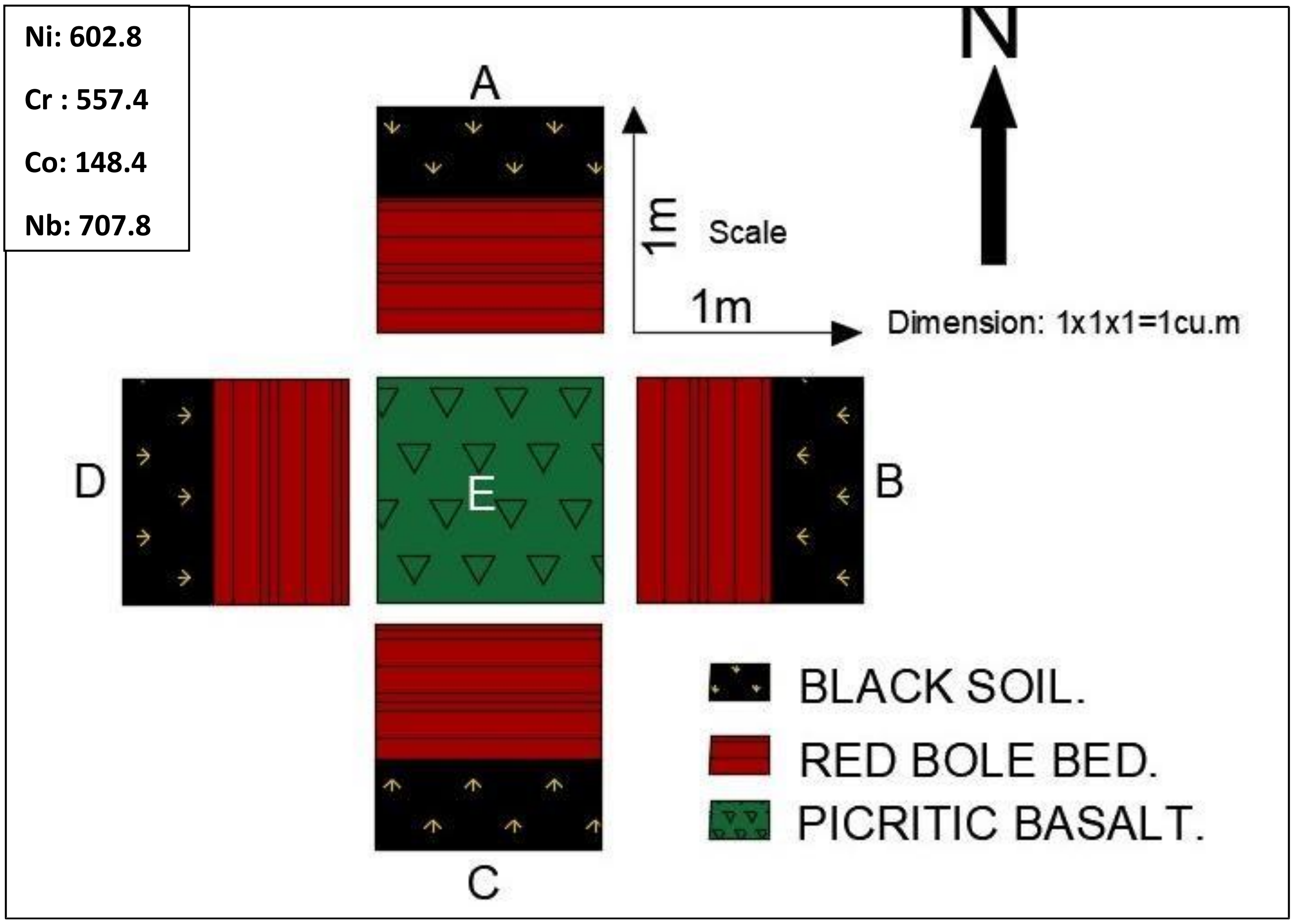
Co: 130.2

Nb: 634.1



Name of the investigation: Ni, Co and PGE	Pit no: P55/BTB/2025
Location: 22.122500,71.667500	Elevation: 98m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Olivine basalt in red bole bed	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 56 profile:



Name of the investigation: Ni, Co and PGE	Pit no: P56/BTB/2025
Location: 22.124167,71.671111	Elevation: 97m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

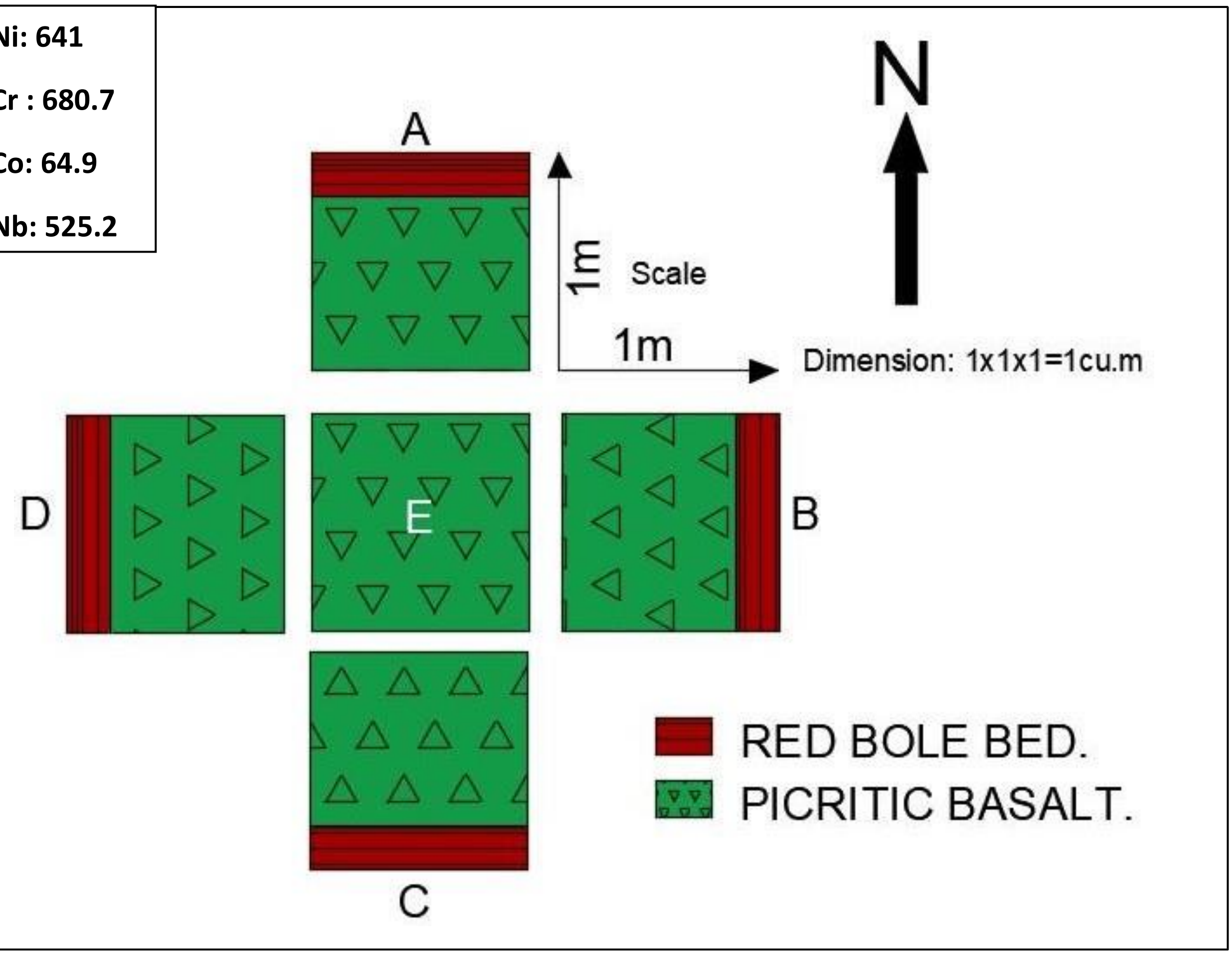
Pit 57 profile:

Ni: 641

Cr : 680.7

Co: 64.9

Nb: 525.2



Name of the investigation: Ni, Co and PGE	Pit no: P57/BTB/2025
Location: 22.118056,71.677222	Elevation: 73m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

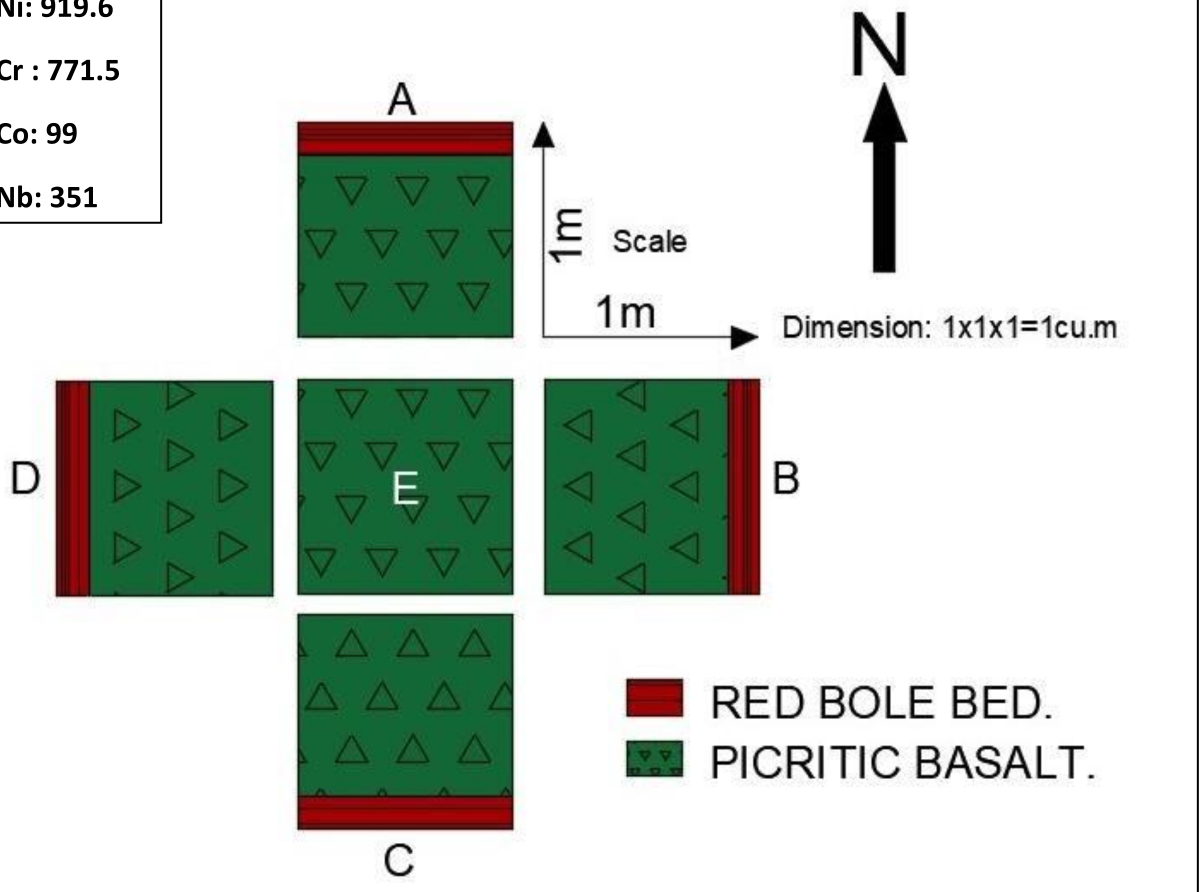
Pit 58 profile:

Ni: 919.6

Cr : 771.5

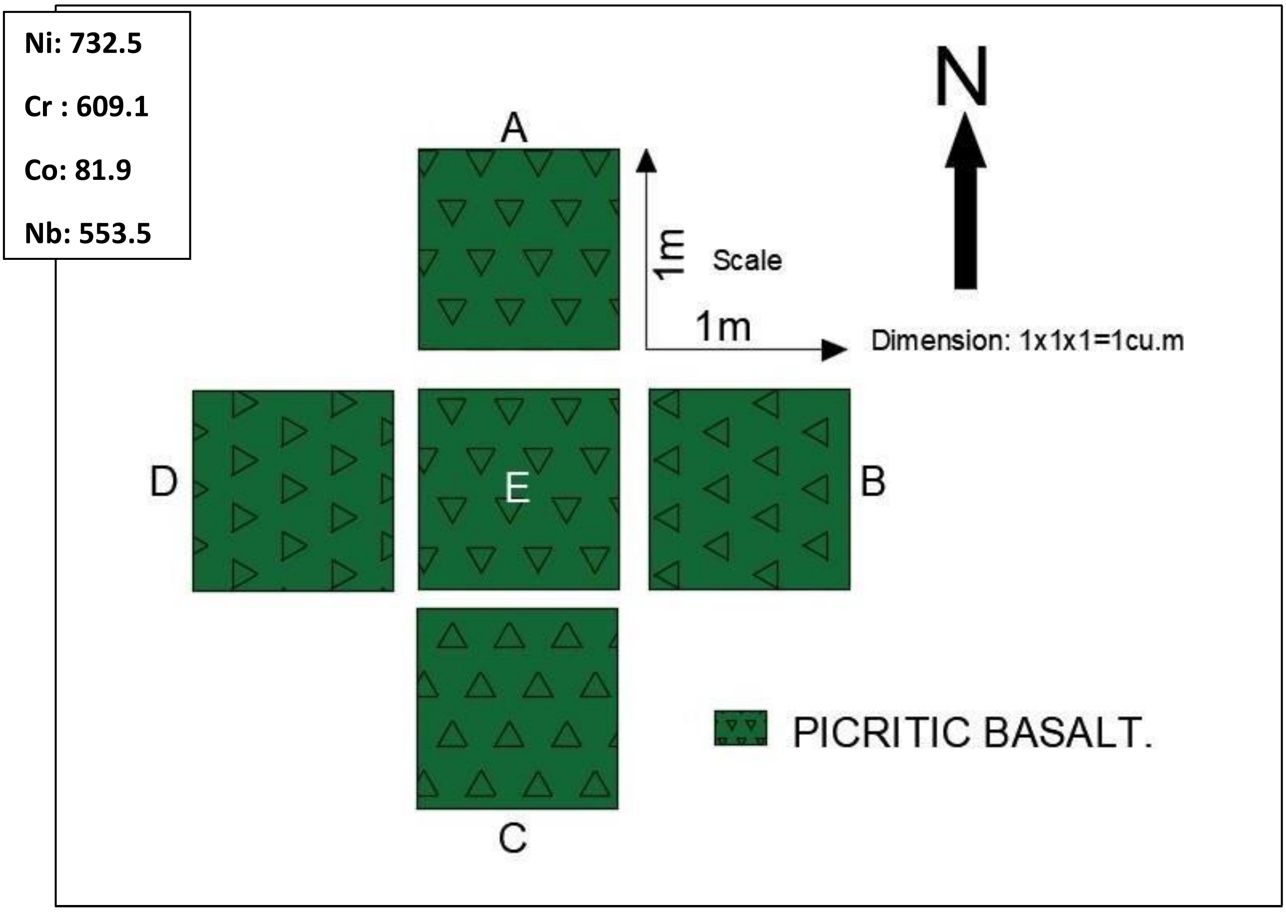
Co: 99

Nb: 351



Name of the investigation: Ni, Co and PGE	Pit no: P58/BTB/2025
Location: 22.120556,71.677500	Elevation: 76m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

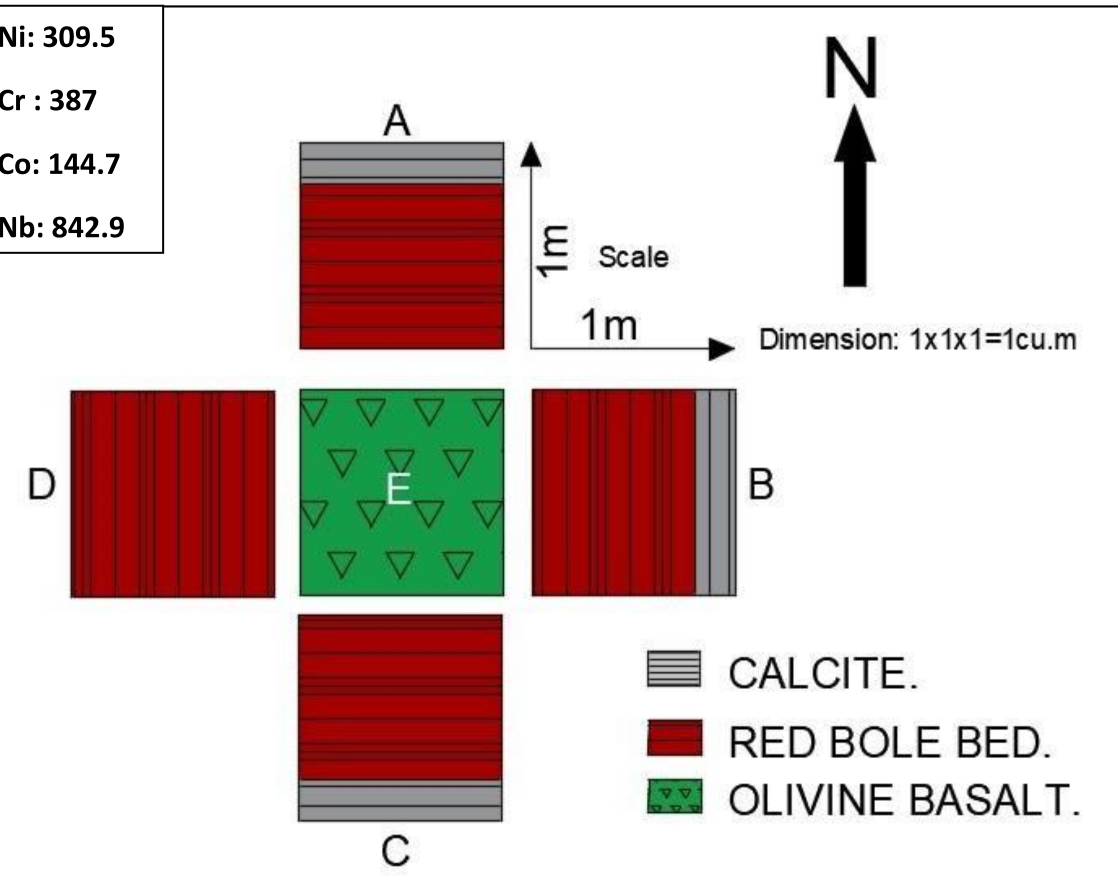
Pit 59 profile:



Name of the investigation: Ni, Co and PGE	Pit no: P59/BTB/2025
Location: 22.133644,71.674756	Elevation: 84m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

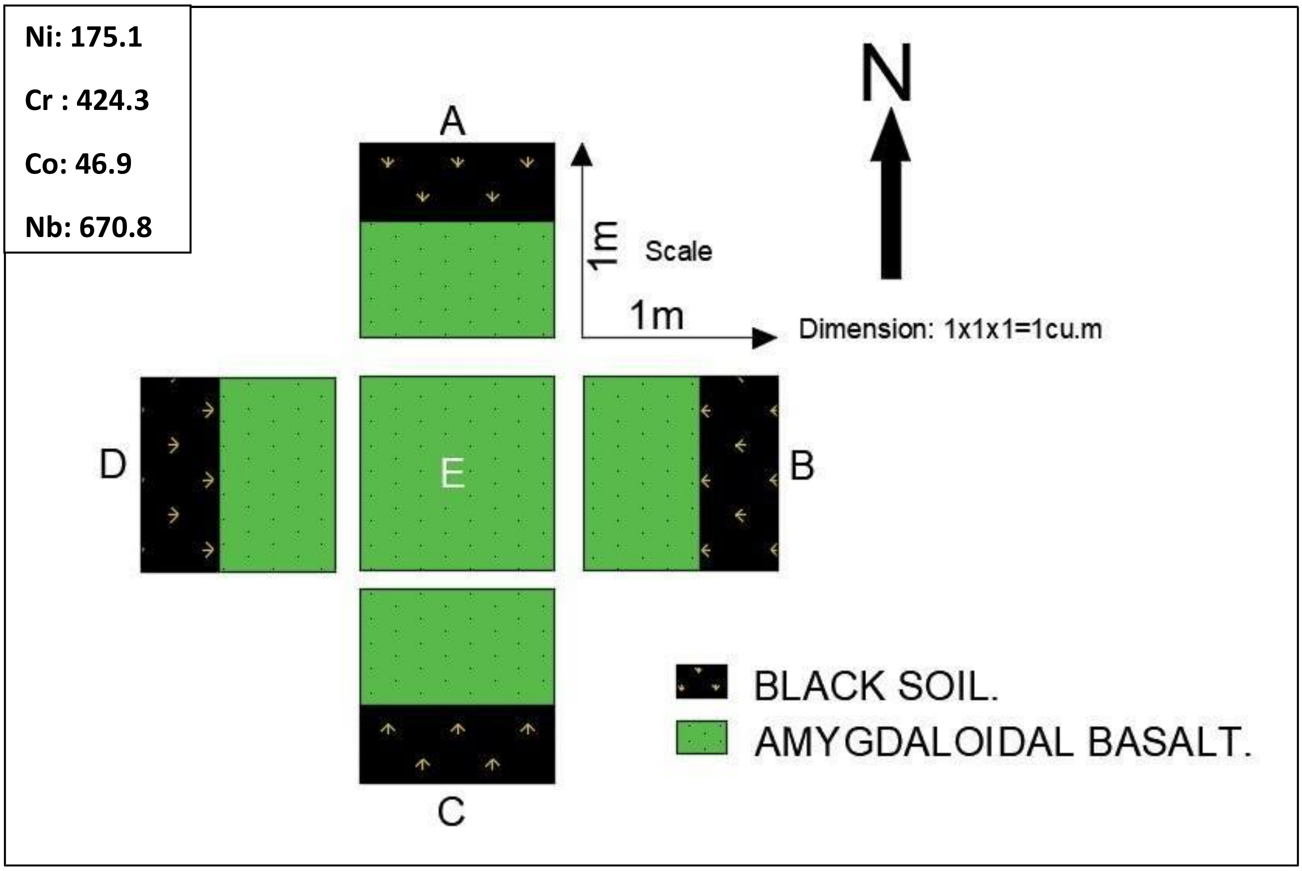
Pit 60 profile:

Ni: 309.5	
Cr : 387	
Co: 144.7	
Nb: 842.9	



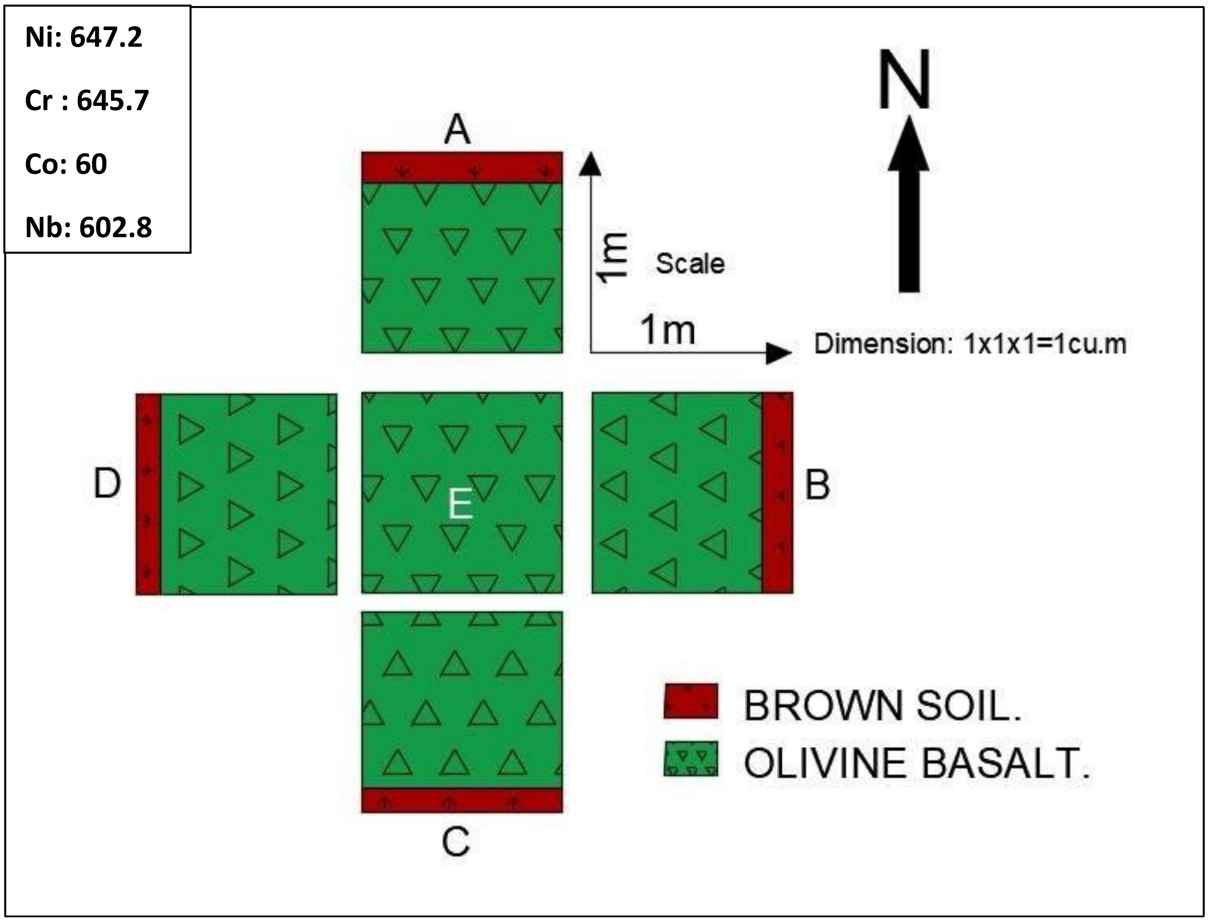
Name of the investigation: Ni, Co and PGE	Pit no: P60/BTB/2025
Location: 22.204069,71.707147	Elevation: 73m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Olivine basalt in red bole bed	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 61 profile:



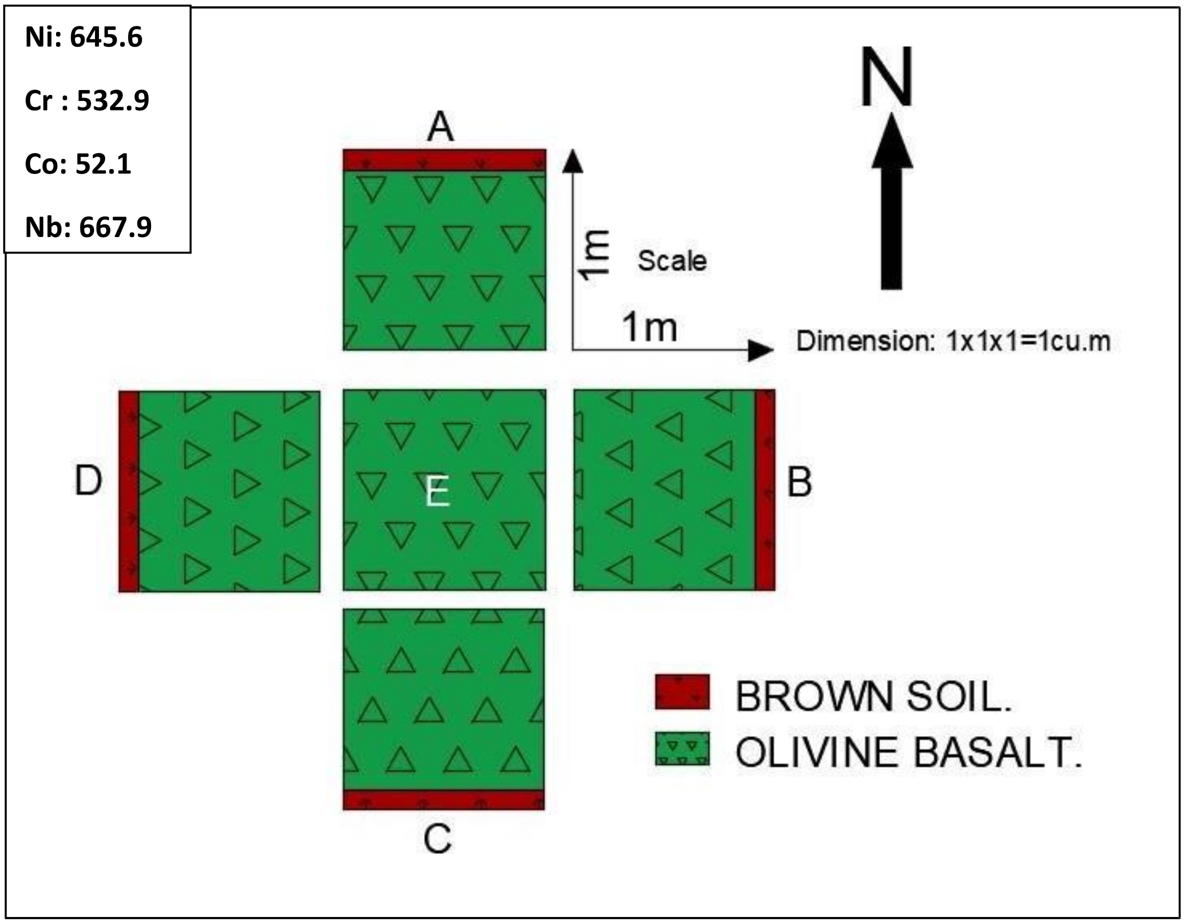
Name of the investigation: Ni, Co and PGE	Pit no: P61/BTB/2025
Location: 22.214167,71.711111	Elevation: 68m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Amygdaloidal basalt (precipitated form)	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 62 profile:



Name of the investigation: Ni, Co and PGE	Pit no: P62/BTB/2025
Location: 22.113889,71.686667	Elevation: 82m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 63 profile:



Name of the investigation: Ni, Co and PGE	Pit no: P63/BTB/2025
Location: 22.116667,71.686389	Elevation: 84m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

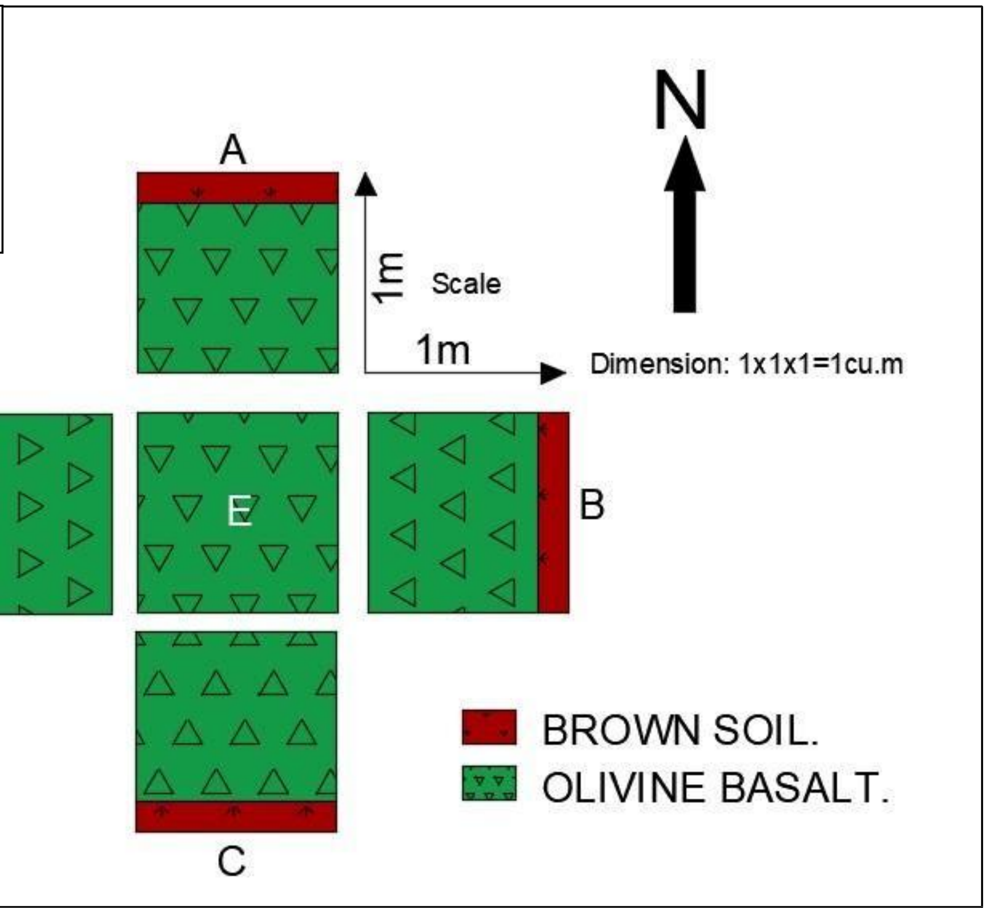
Pit 64 profile:

Ni: 989.4

Cr : 825.8

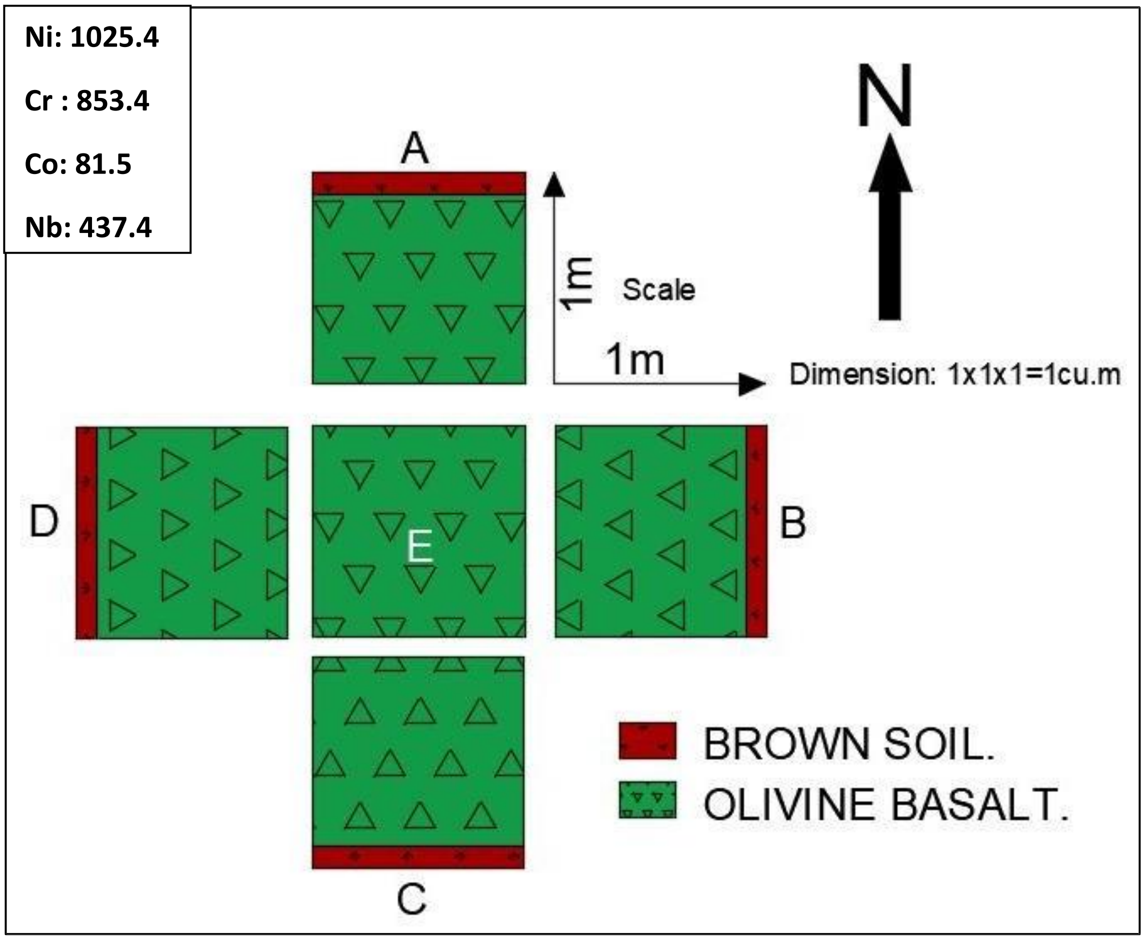
Co: 71.9

Nb: 447.7



Name of the investigation: Ni, Co and PGE	Pit no: P64/BTB/2025
Location: 22.118889,71.688056	Elevation: 85m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 65 profile:



<table>
<tr><td colspan="2">Name of the investigation: Ni, Co and PGE   Pit no: P65/BTB/2025</td></tr>
<tr><td>Location: 22.118903,71.692731</td><td>Elevation: 100m</td></tr>
<tr><td>Pit top measurement:
a. Length: 1m
b. Breadth: 1m</td><td>Pit bottom measurement:
a. Length: 1m
b. Breadth: 1m
c. Depth: 1m</td></tr>
<tr><td colspan="2">Recorded by: Mekala Chandu and Ajay kumar, Geologists</td></tr>
<tr><td colspan="2">Lithology details: Olivine basalt</td></tr>
<tr><td colspan="2">Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.</td></tr>
</table>

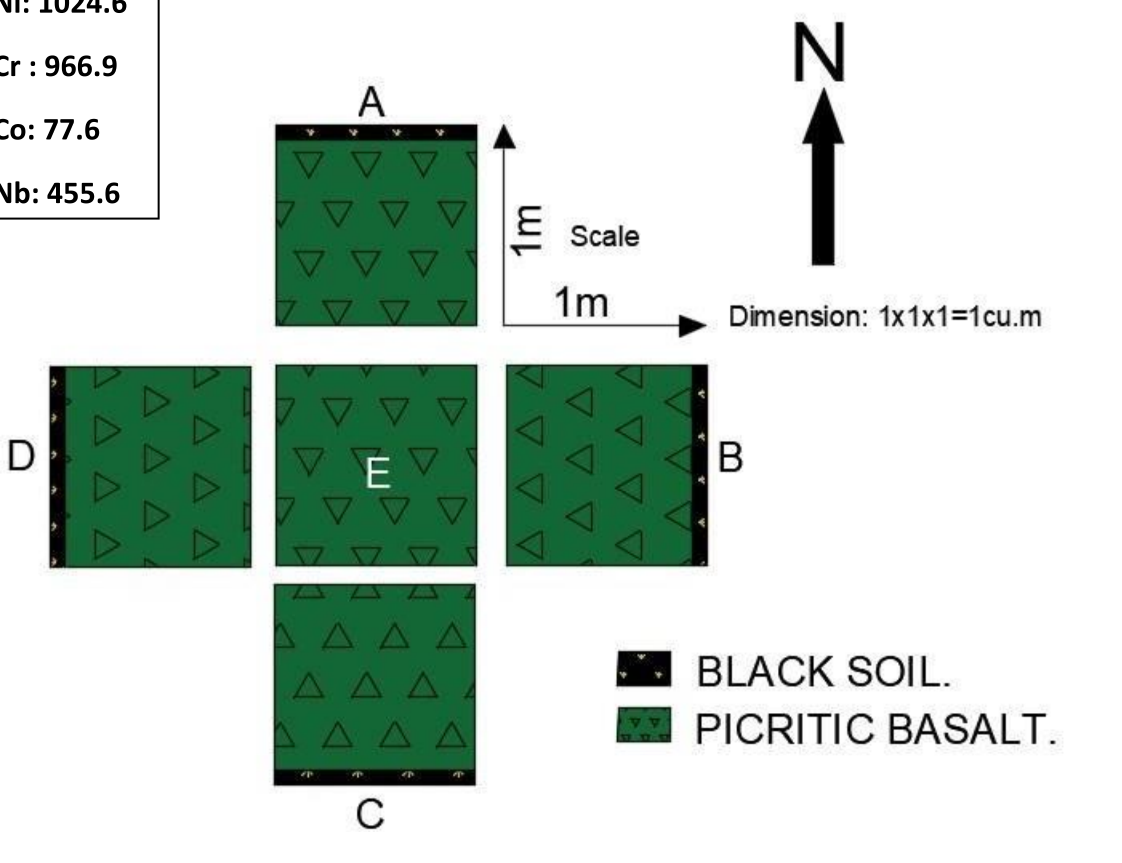
Pit 66 profile:

Ni: 1024.6

Cr : 966.9

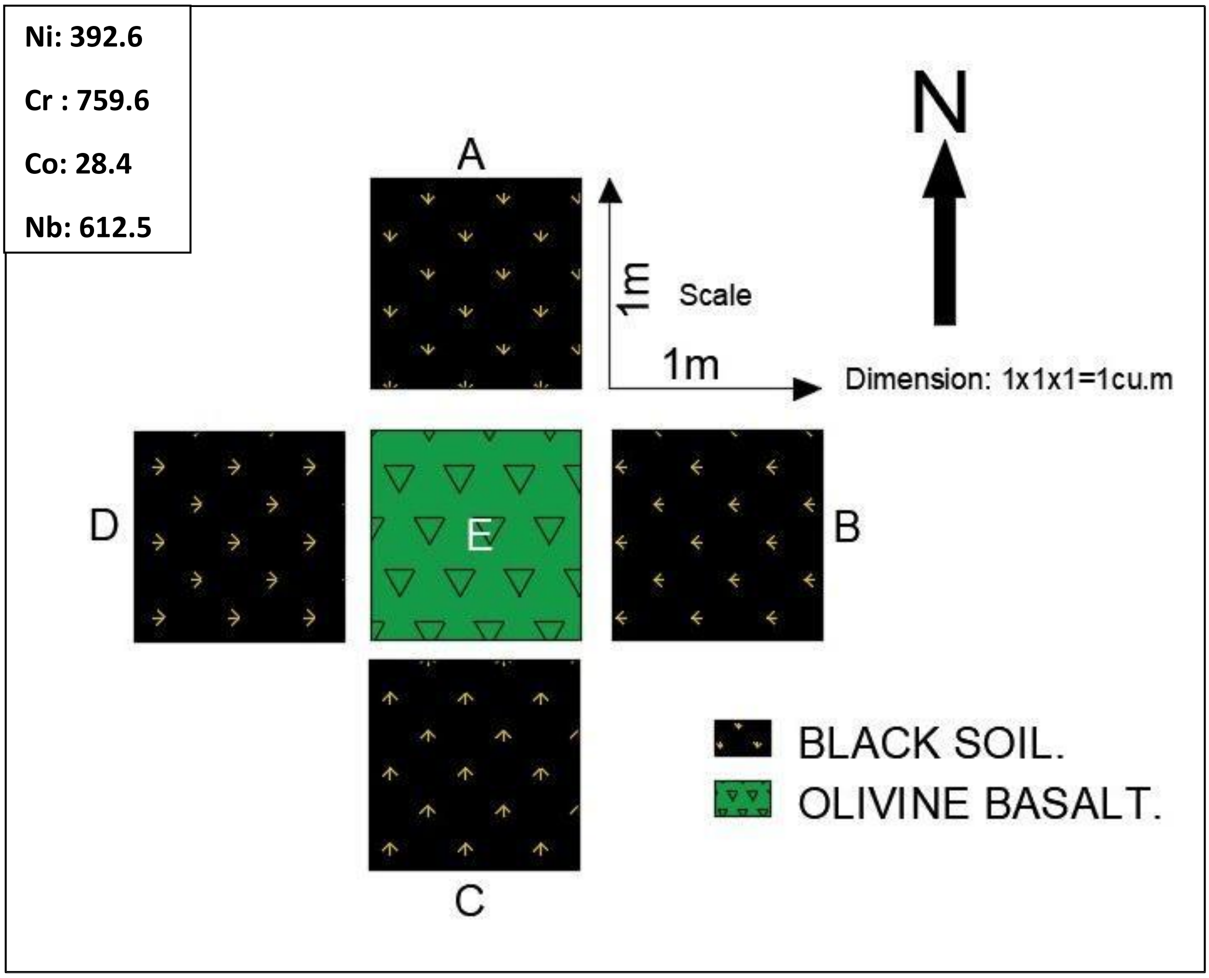
Co: 77.6

Nb: 455.6



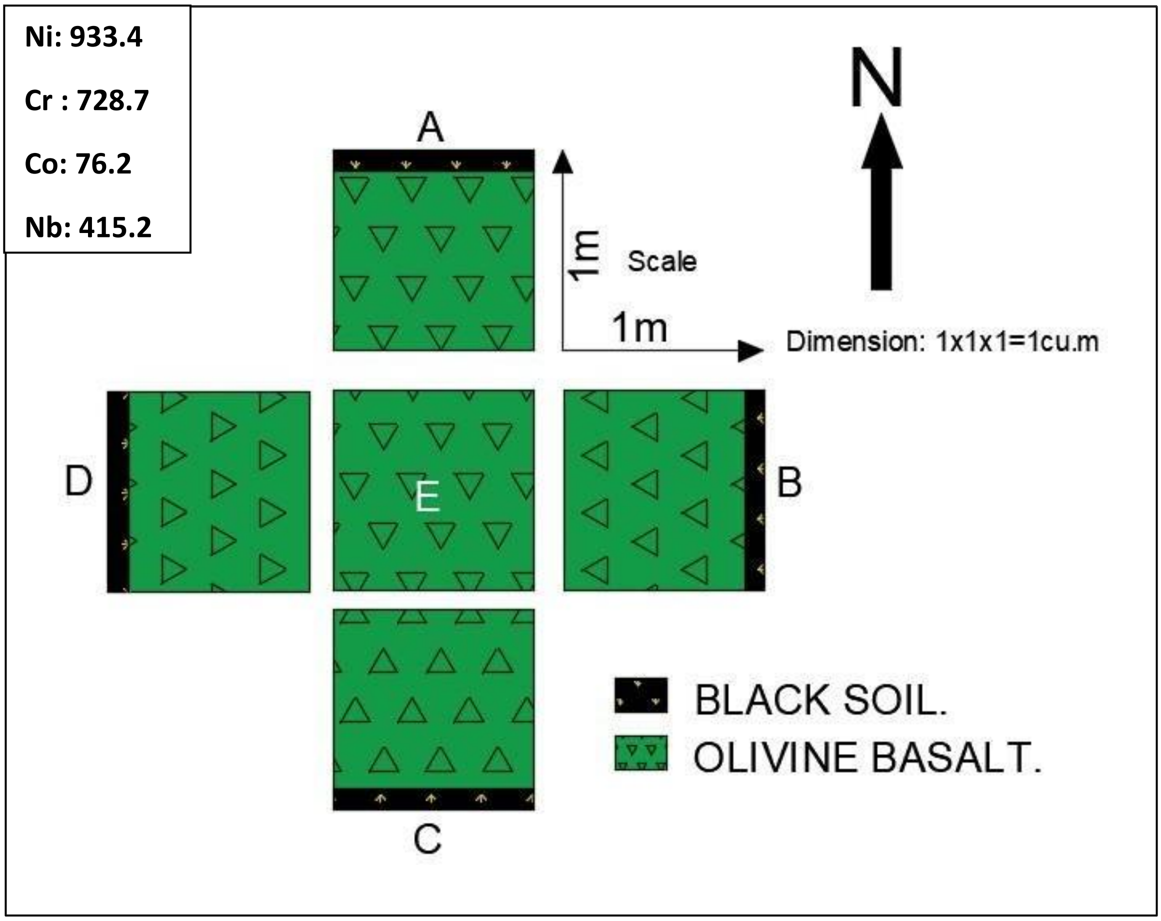
Name of the investigation: Ni, Co and PGE	Pit no: P66/BTB/2025
Location: 22.121389,71.697778	Elevation: 86m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 67 profile:



Name of the investigation: Ni, Co and PGE	Pit no: P67/BTB/2025
Location: 22.094167,71.705833	Elevation: 70m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 68 profile:



Name of the investigation: Ni, Co and PGE	Pit no: P68/BTB/2025
Location: 22.098333,71.691667	Elevation: 69m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

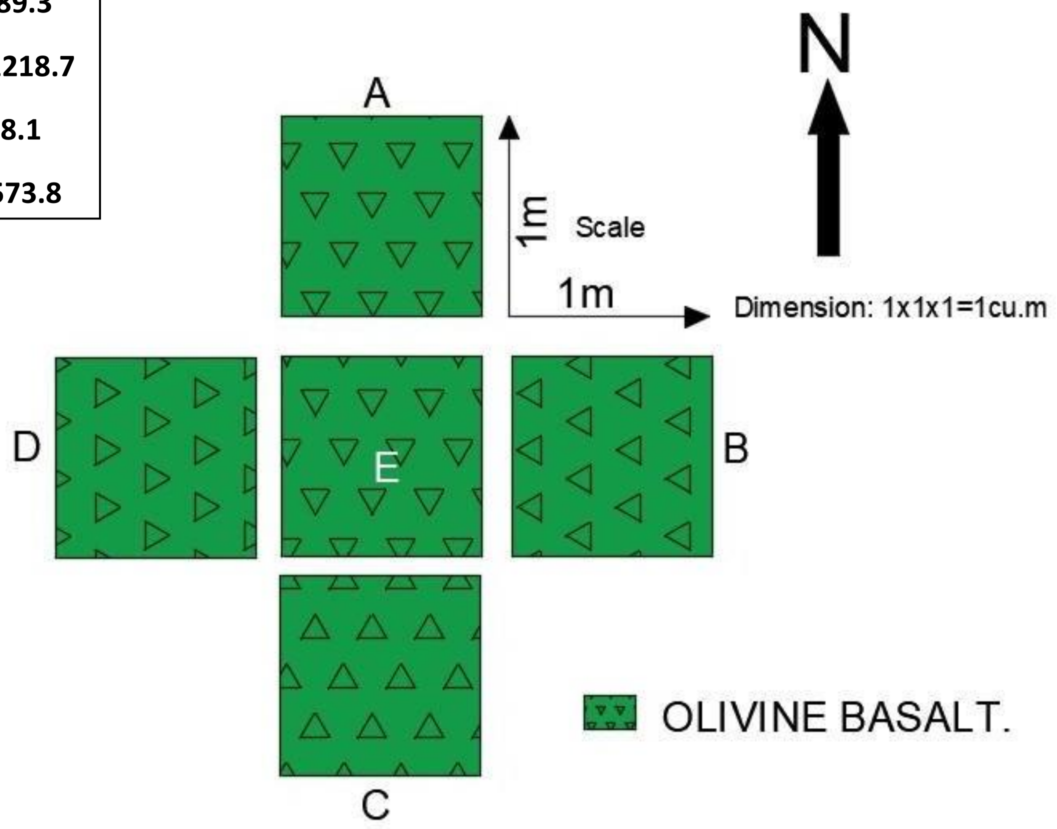
Pit 69 profile:

Ni: 989.3

Cr : 1218.7

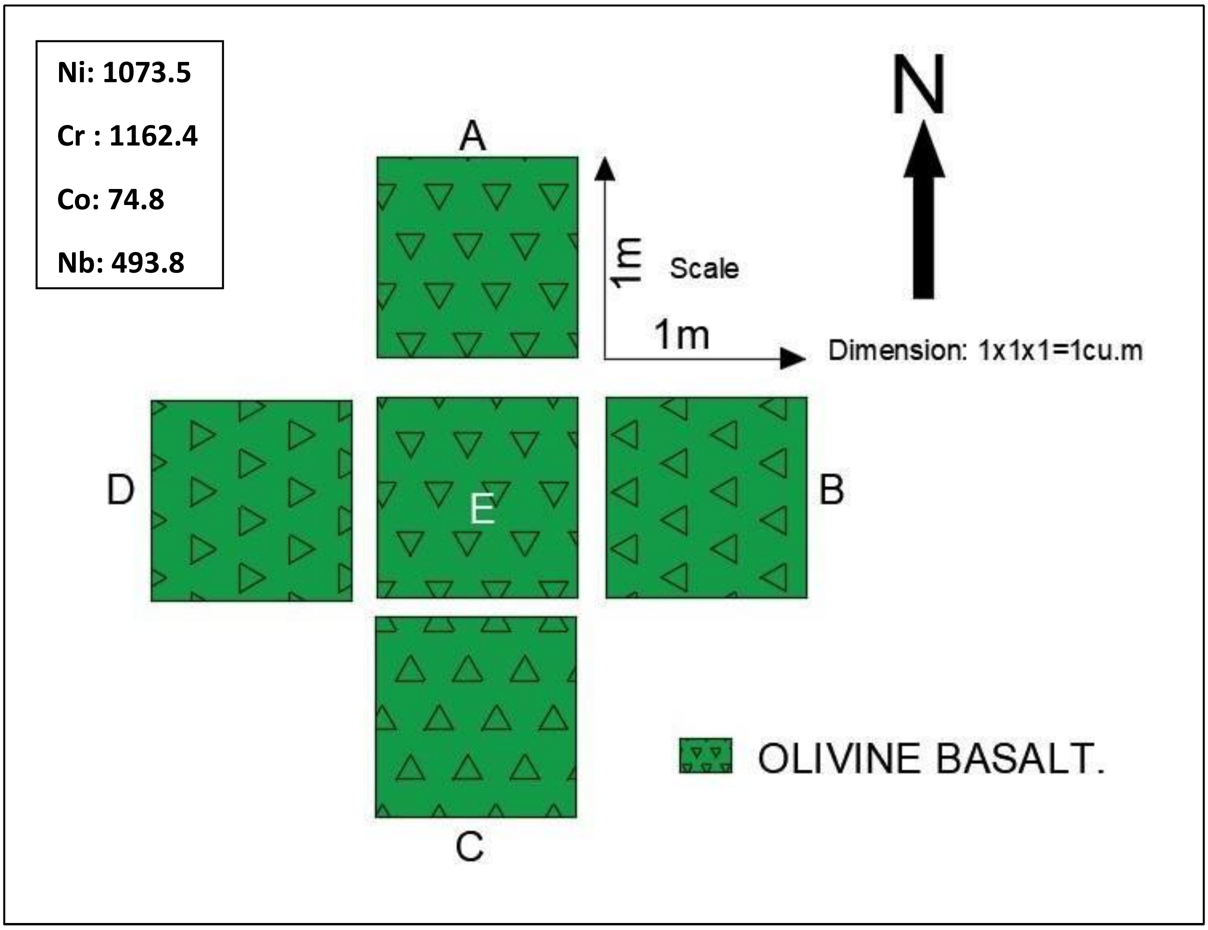
Co: 68.1

Nb: 573.8



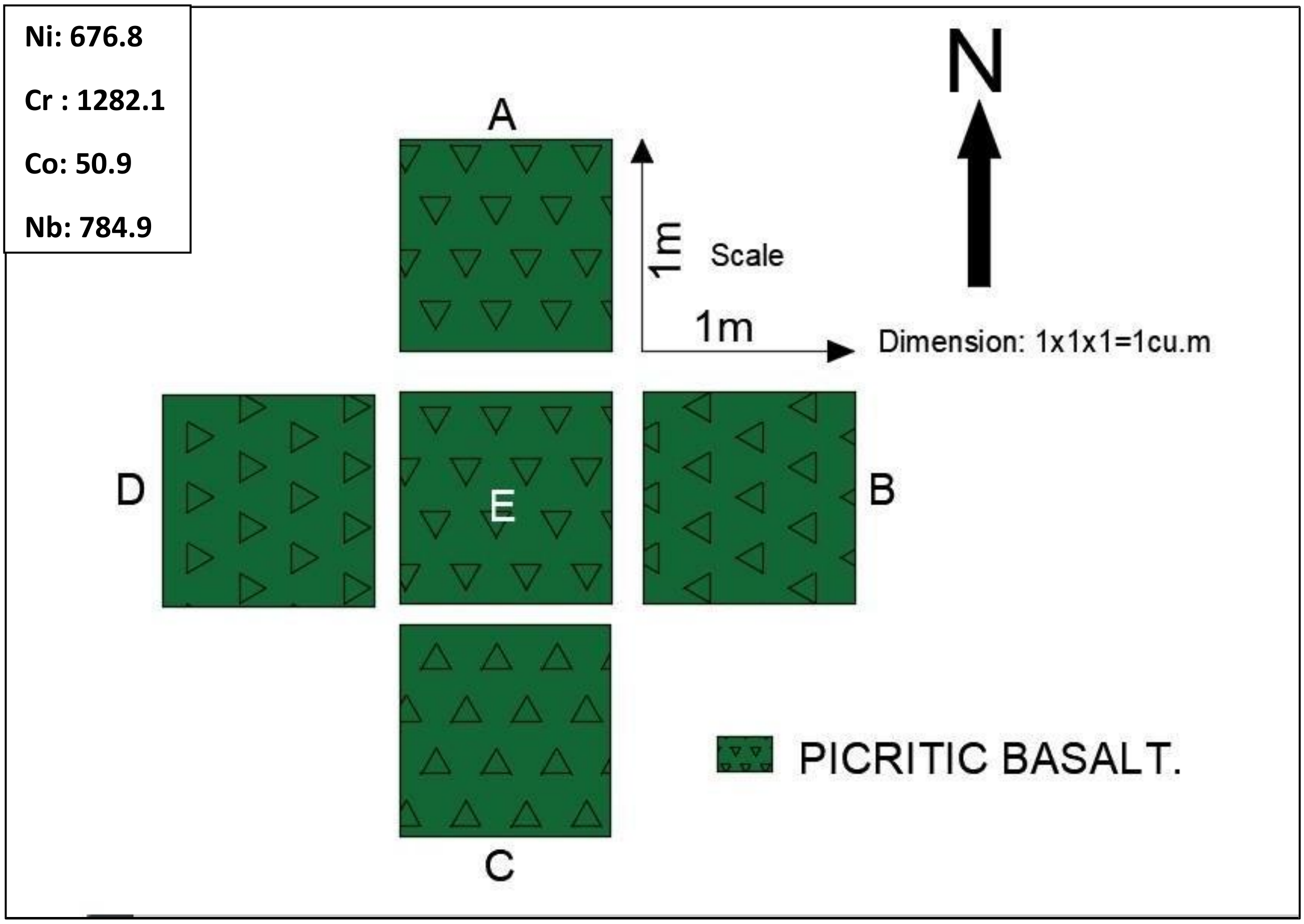
Name of the investigation: Ni, Co and PGE	Pit no: P69/BTB/2025
Location: 22.123980,71.699630	Elevation: 87m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 70 profile:



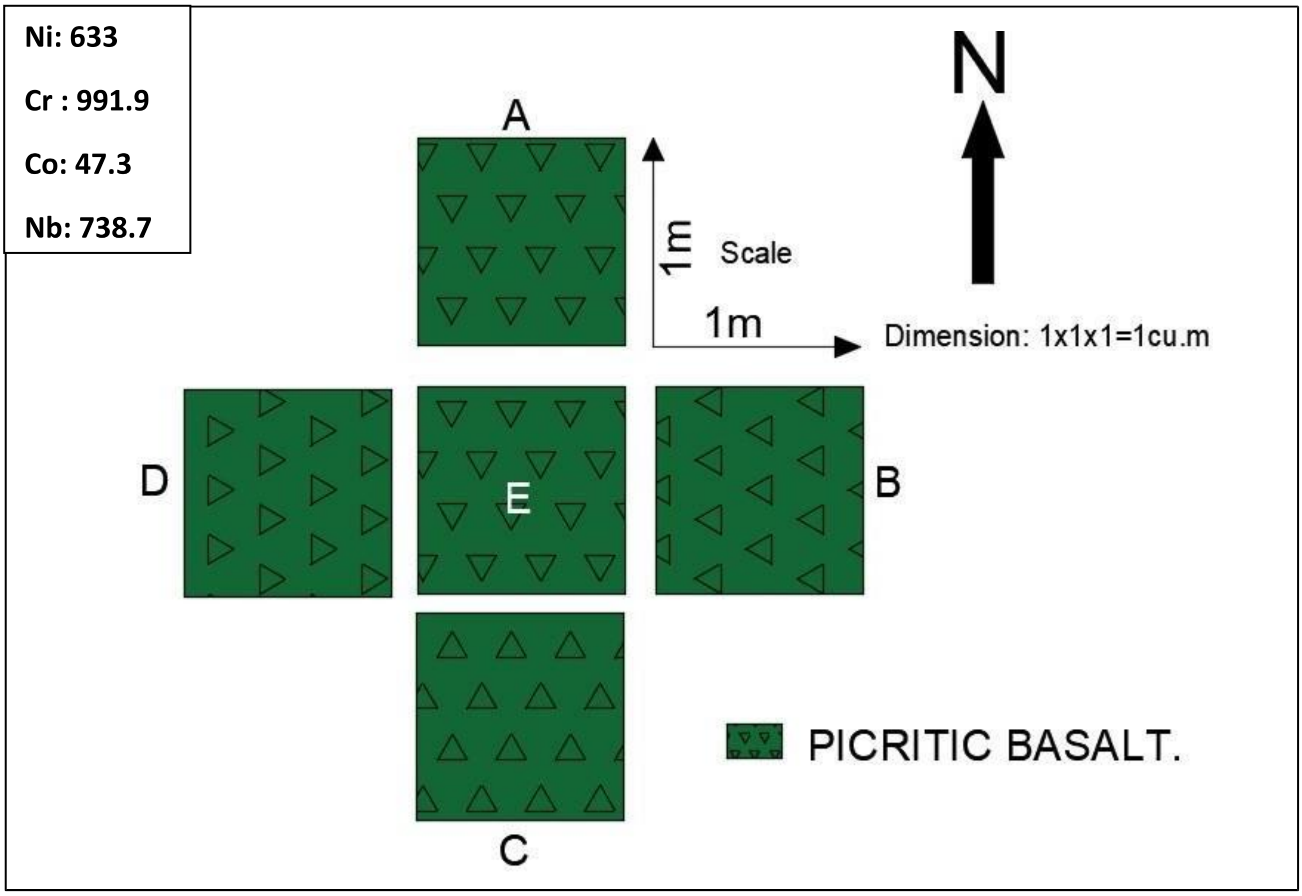
Name of the investigation: Ni, Co and PGE	Pit no: P70/BTB/2025
Location: 22.124167,71.701389	Elevation: 88m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 71 profile:



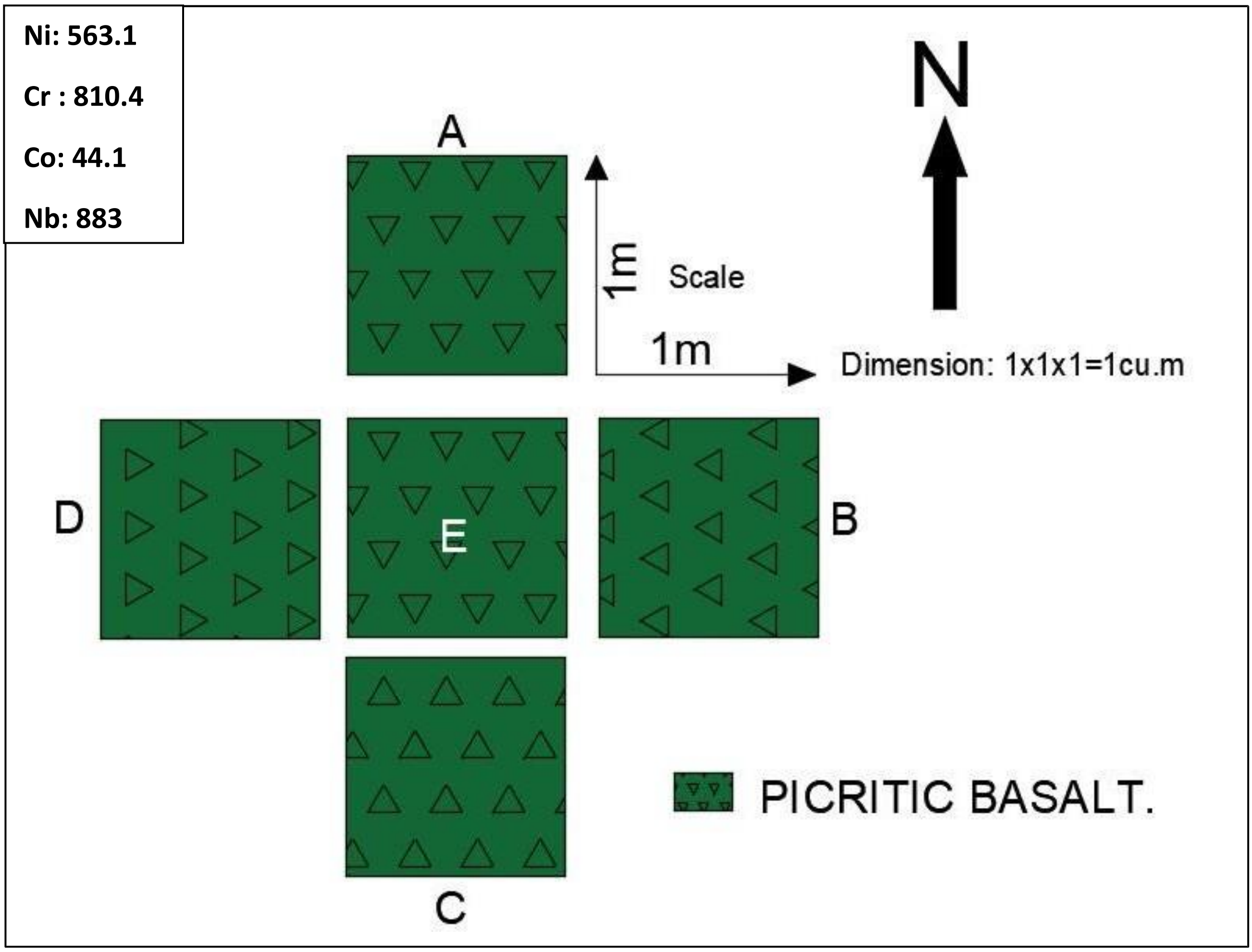
Name of the investigation: Ni, Co and PGE	Pit no: P71/BTB/2025
Location: 22.127778,71.701667	Elevation: 85m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 72 profile:



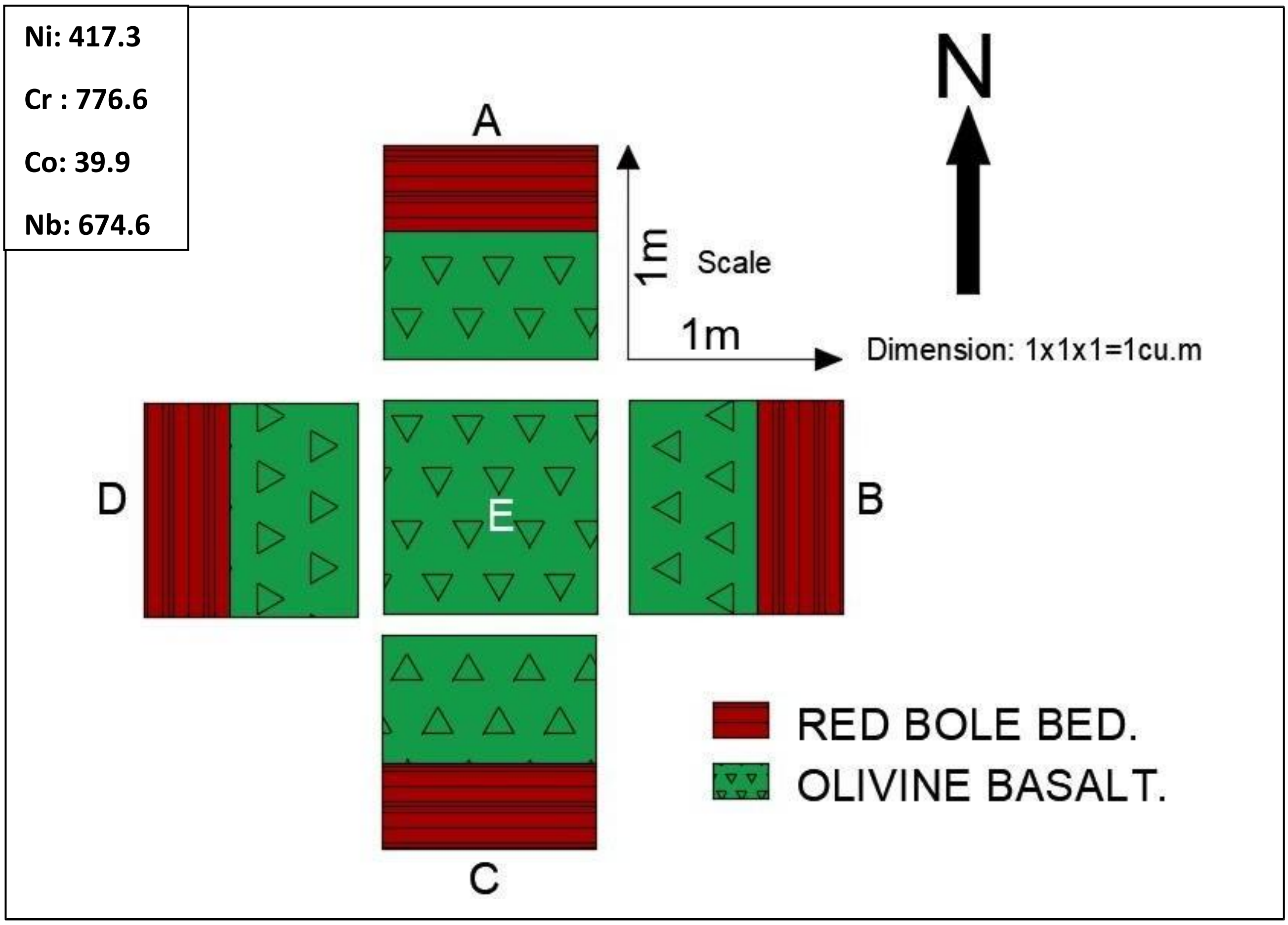
Name of the investigation: Ni, Co and PGE	Pit no: P72/BTB/2025
Location: 22.128056,71.699167	Elevation: 86m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 73 profile:



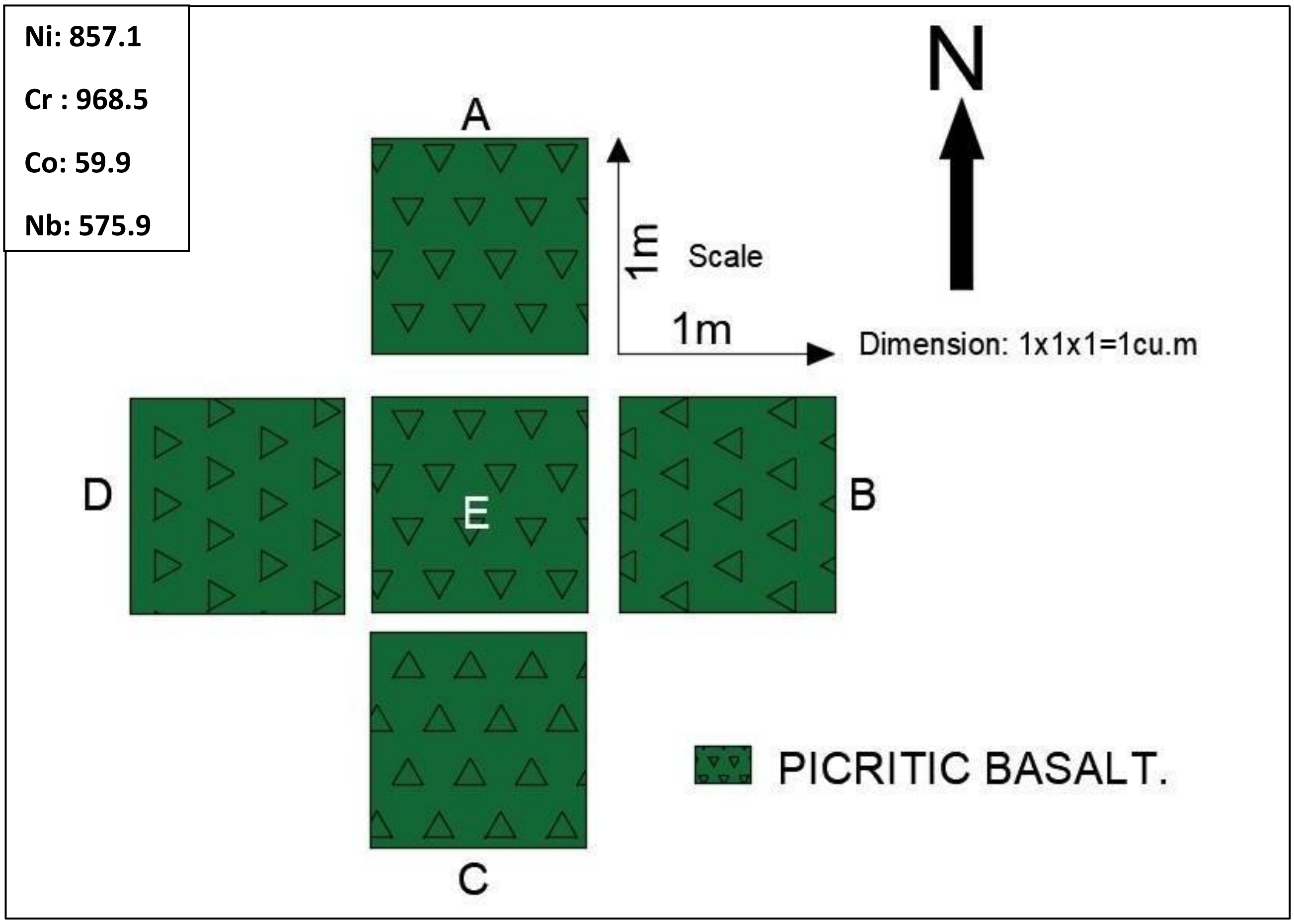
Name of the investigation: Ni, Co and PGE	Pit no: P73/BTB/2025
Location: 22.131111,71.705556	Elevation: 83m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 74 profile:



Name of the investigation: Ni, Co and PGE	Pit no: P74/BTB/2025
Location: 22.132264,71.68595	Elevation: 79m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 75 profile:



Name of the investigation: Ni,Co and PGE	Pit no:P75/BTB/2025
Location: 22.135278,71.700556	Elevation: 90m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

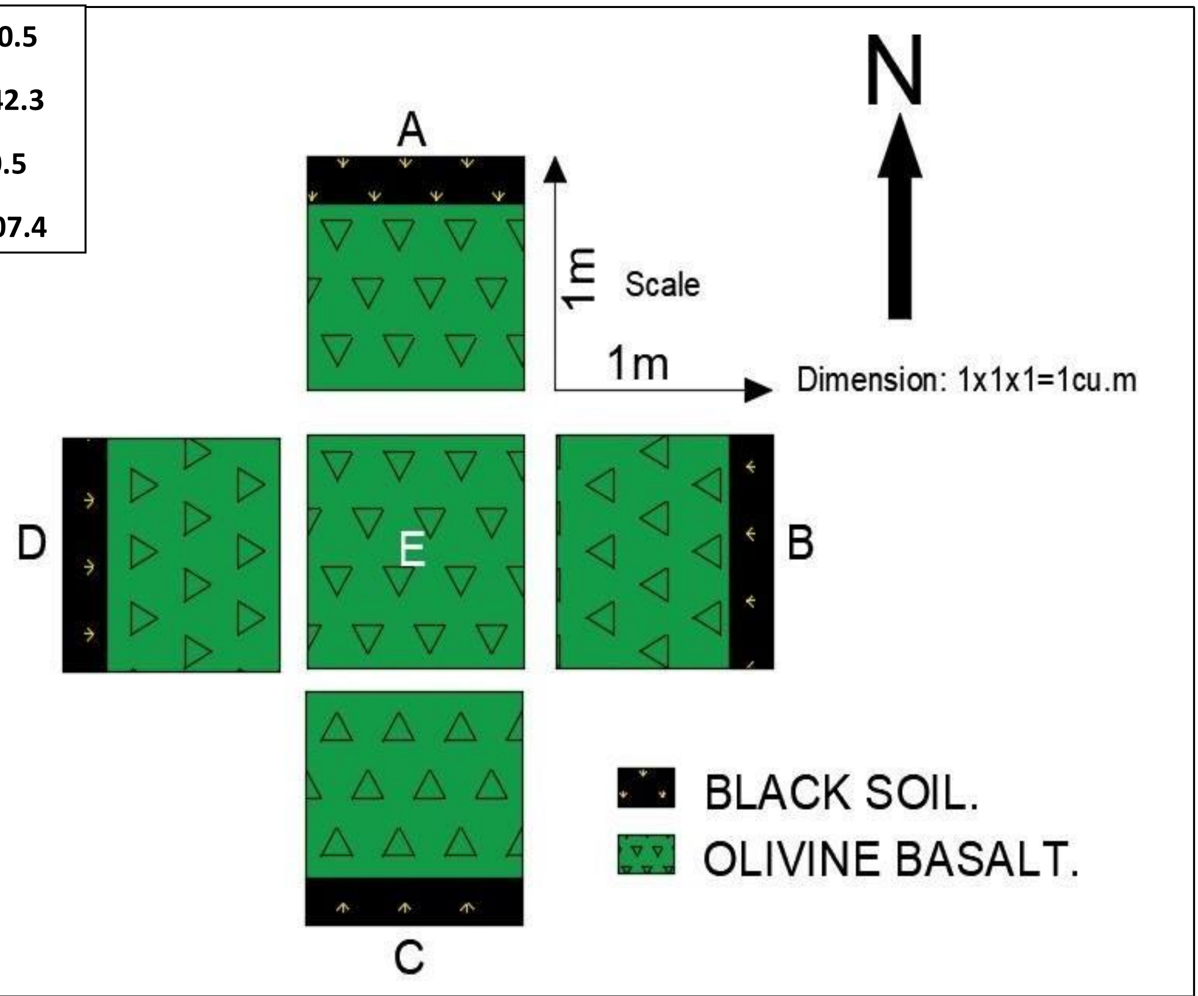
Pit 76 profile:

Ni: 830.5

Cr : 842.3

Co: 60.5

Nb: 707.4



Name of the investigation: Ni, Co and PGE	Pit no: P76/BTB/2025
Location: 22.134444,71.697222	Elevation: 92m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

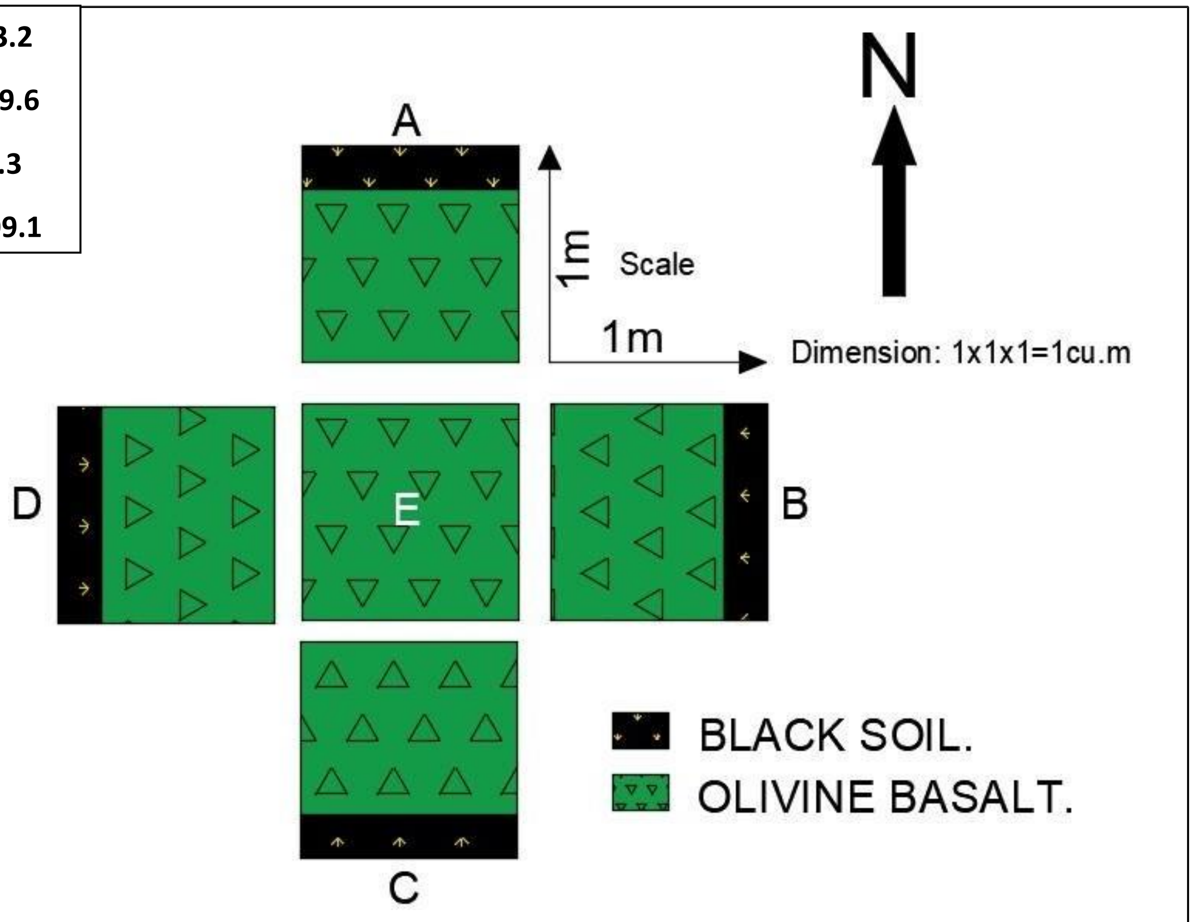
Pit 77 profile:

Ni: 283.2

Cr : 369.6

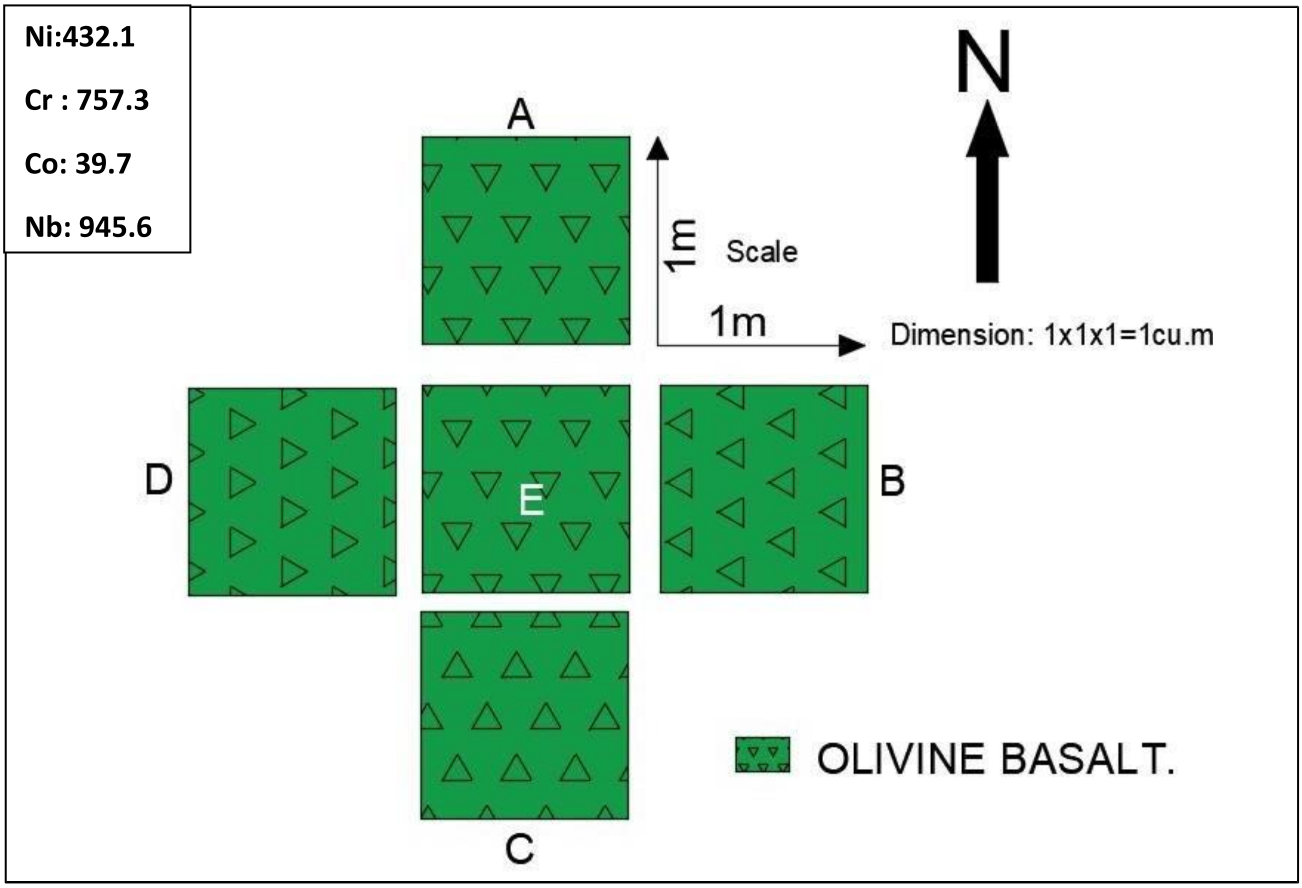
Co: 23.3

Nb: 609.1



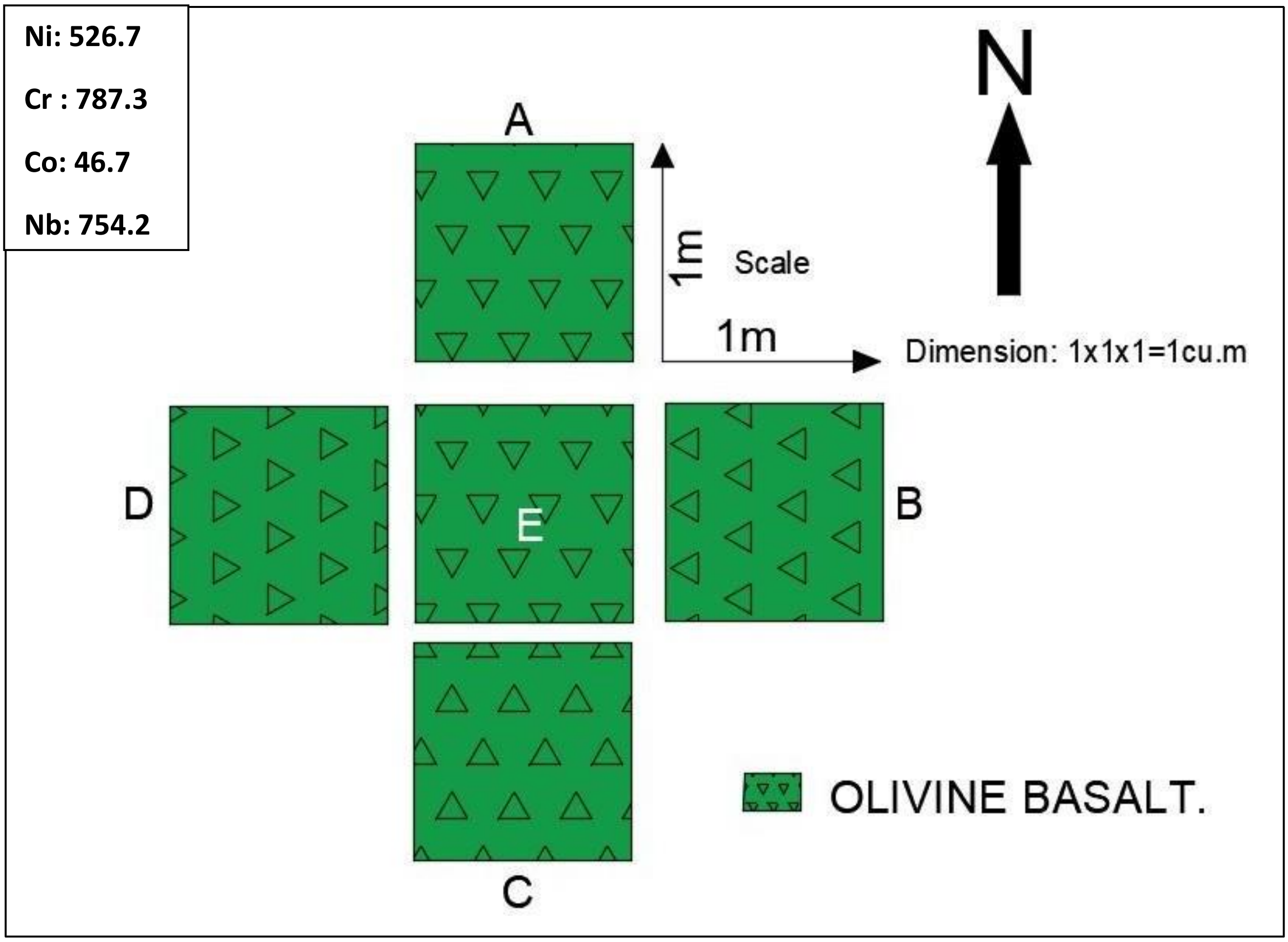
Name of the investigation: Ni, Co and PGE	Pit no: P77/BTB/2025
Location: 22.135750,71.718300	Elevation: 67m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 78 profile:



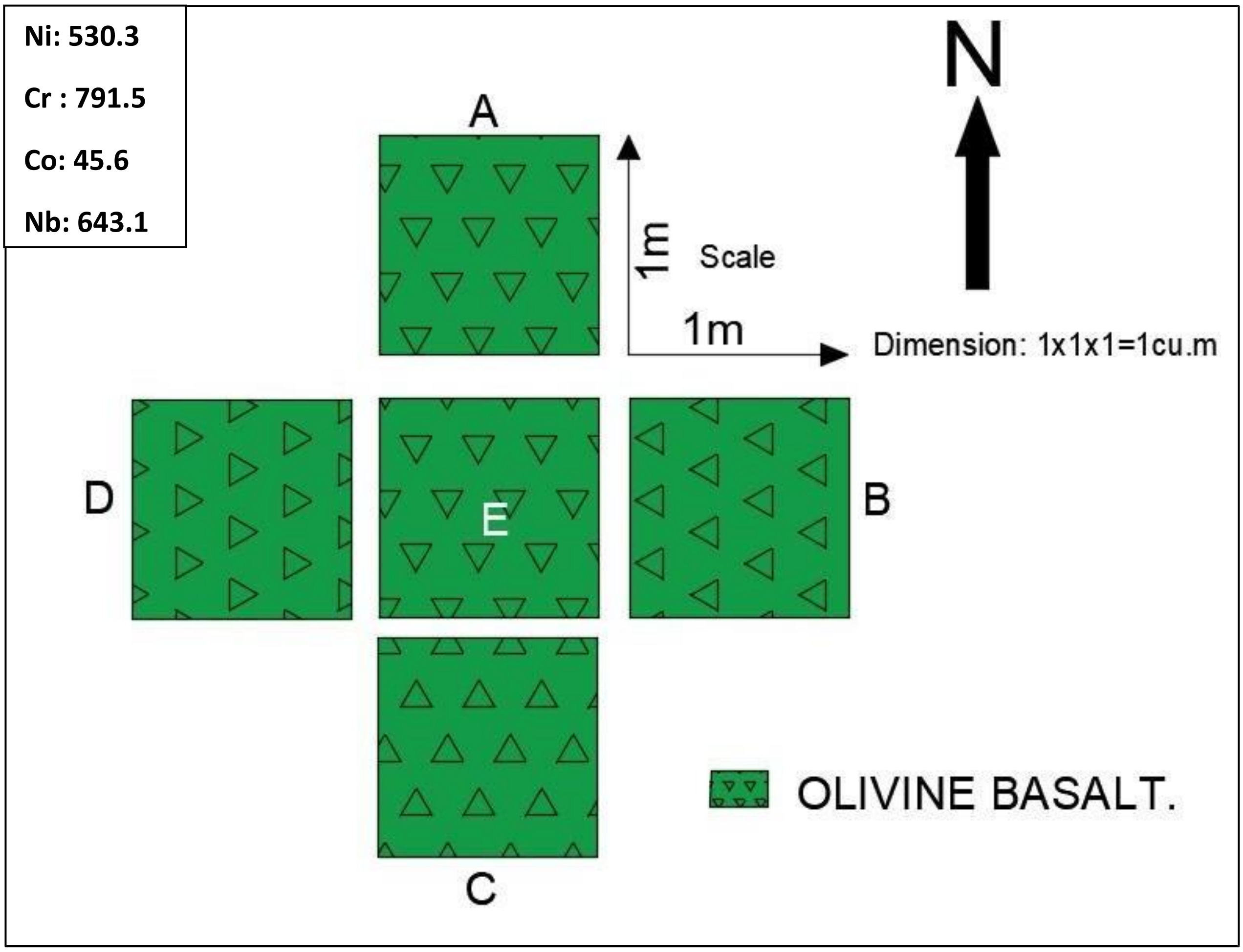
Name of the investigation: Ni, Co and PGE	Pit no: P78/BTB/2025
Location: 22.126667,71.723611	Elevation: 77m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by:Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 79 profile:



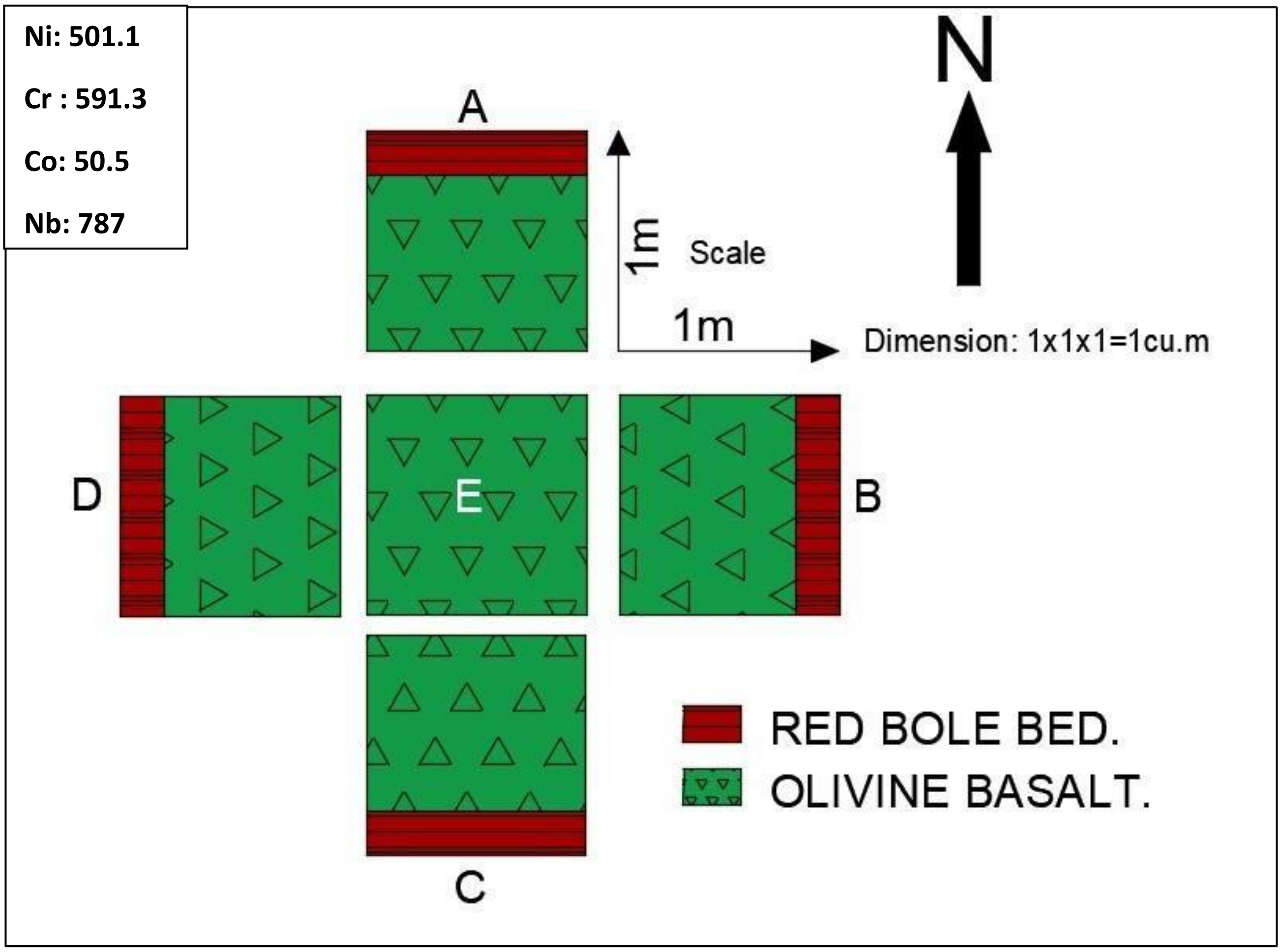
Name of the investigation: Ni, Co and PGE	Pit no: P79/BTB/2025
Location: 22.131667,71.717778	Elevation: 100m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 80 profile:



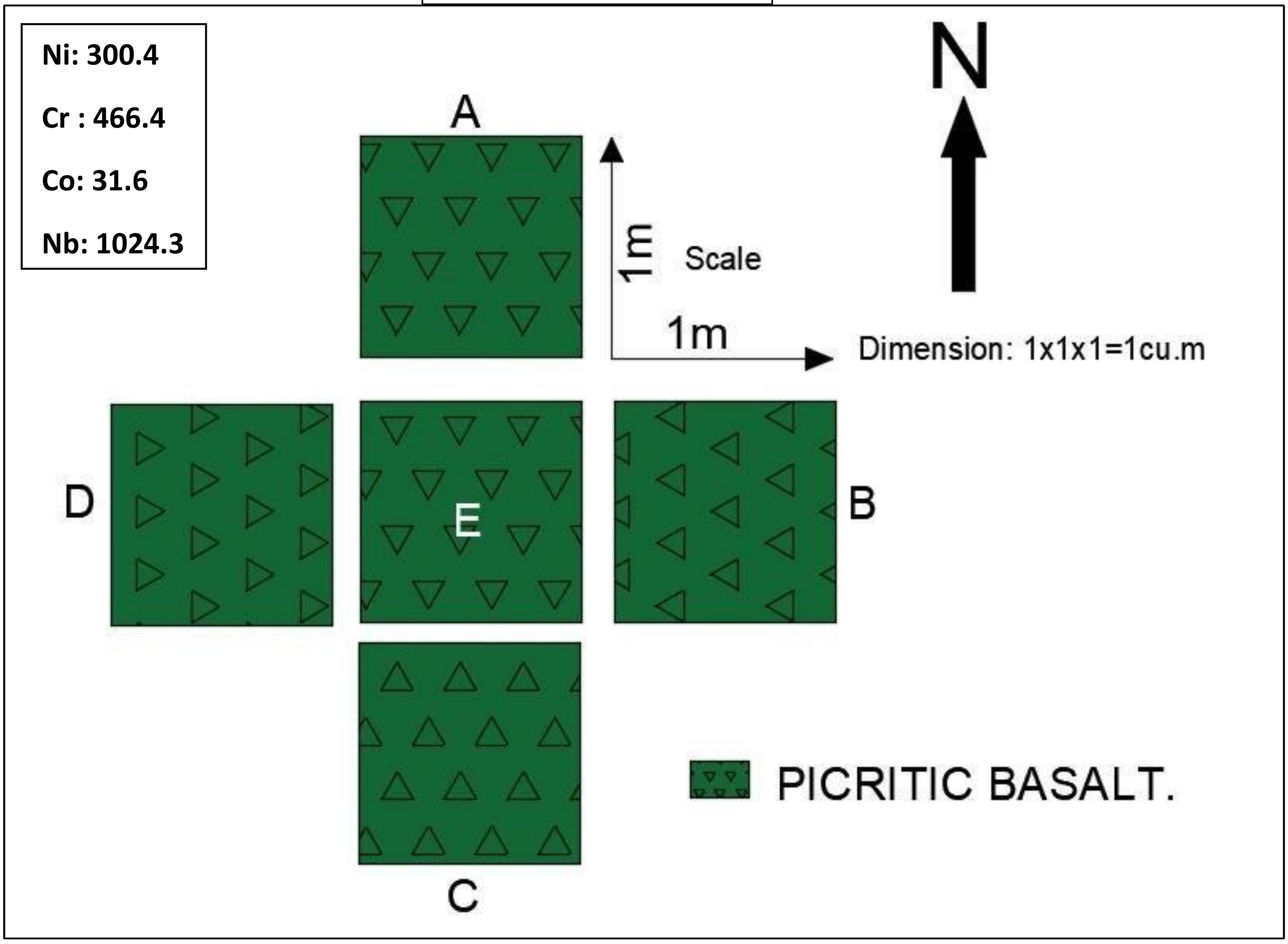
Name of the investigation: Ni, Co and PGE	Pit no: P80/BTB/2025
Location: 22.127222,71.715833	Elevation: 79m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 81 profile:



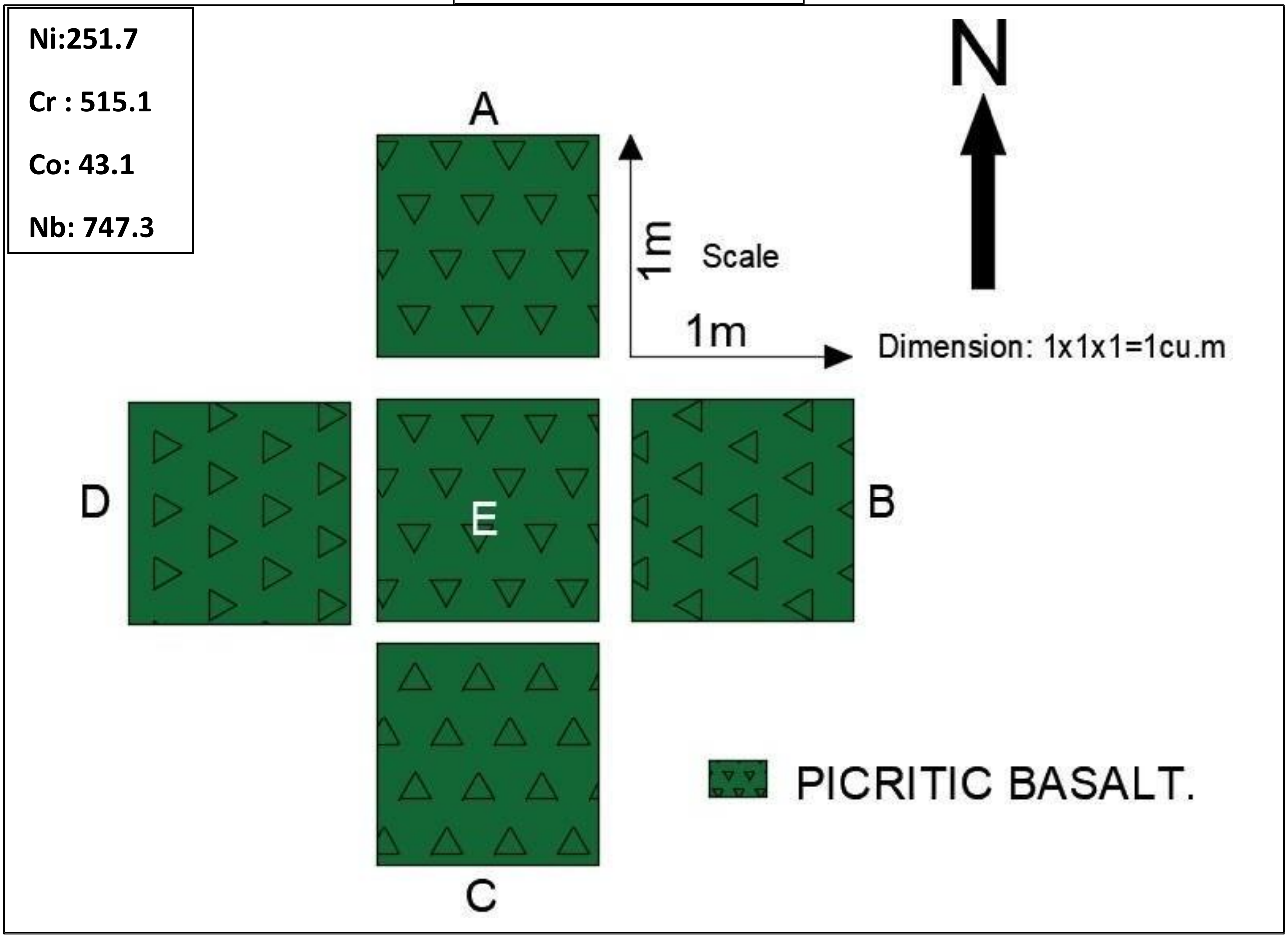
Name of the investigation: Ni, Co and PGE	Pit no: P81/BTB/2025
Location: 22.122778,71.715278	Elevation: 76m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 82 profile:



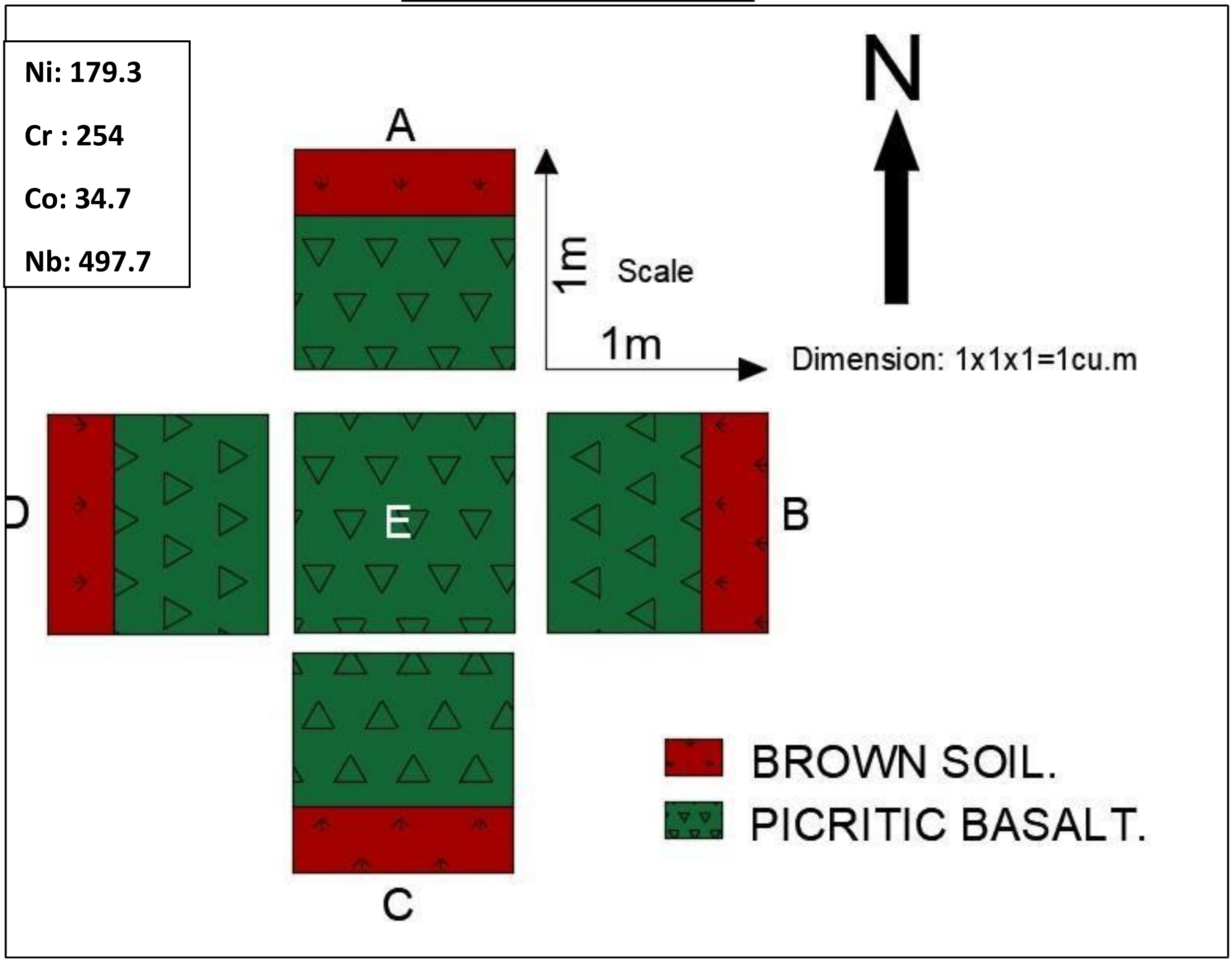
Name of the investigation: Ni, Co and PGE	Pit no: P82/BTB/2025
Location: 22.145278,71.665278	Elevation: 89m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 83 profile:



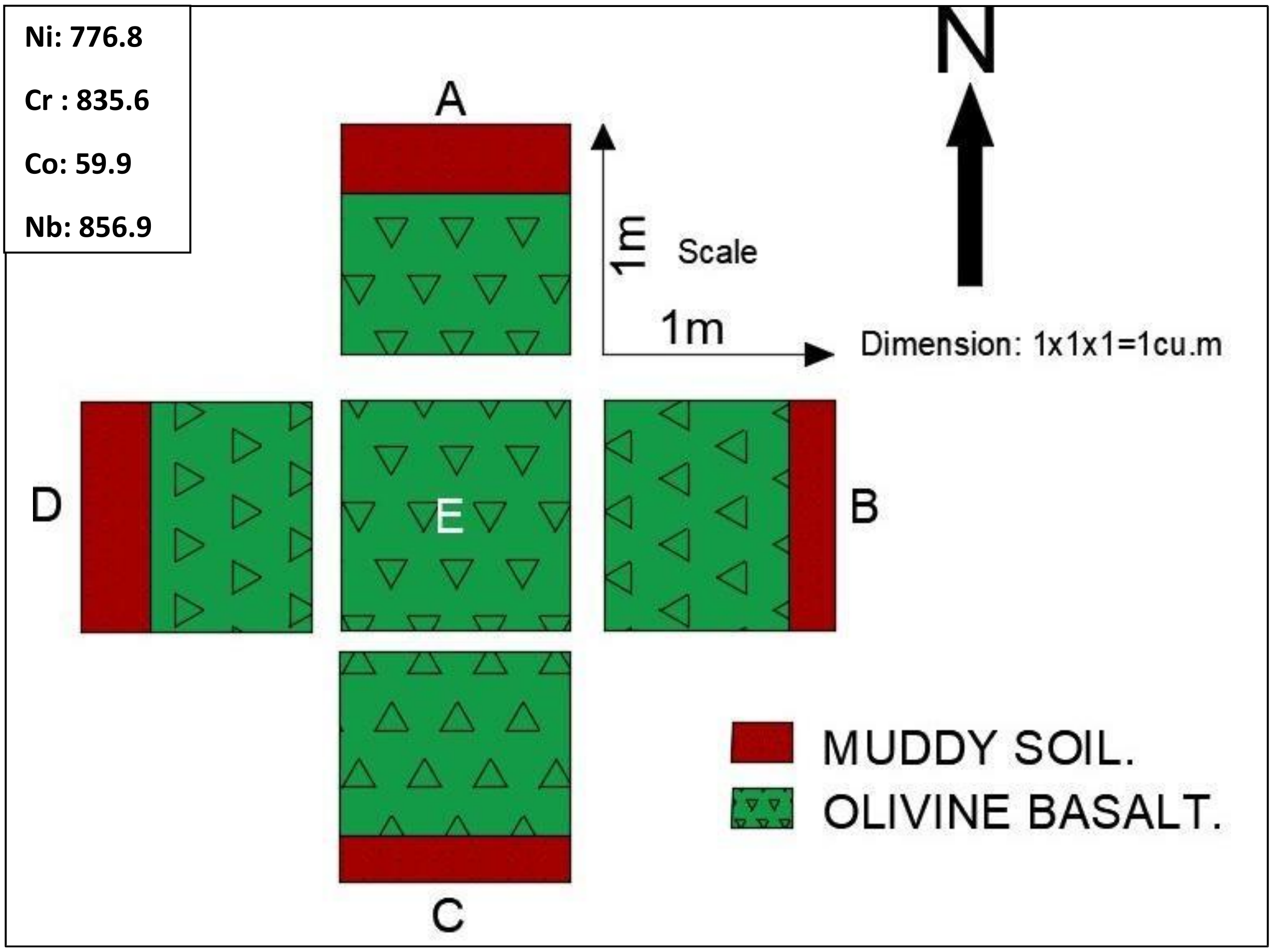
Name of the investigation: Ni, Co and PGE	Pit no: P83/BTB/2025
Location: 22.140148,71.661780	Elevation: 89m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 84 profile:



Name of the investigation: Ni, Co and PGE	Pit no: P84/BTB/2025
Location: 22.135923,71.673618	Elevation: 86m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 85 profile:



Name of the investigation: Ni, Co and PGE	Pit no: P85/BTB/2025
Location: 22.112500,71.678333	Elevation: 74m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

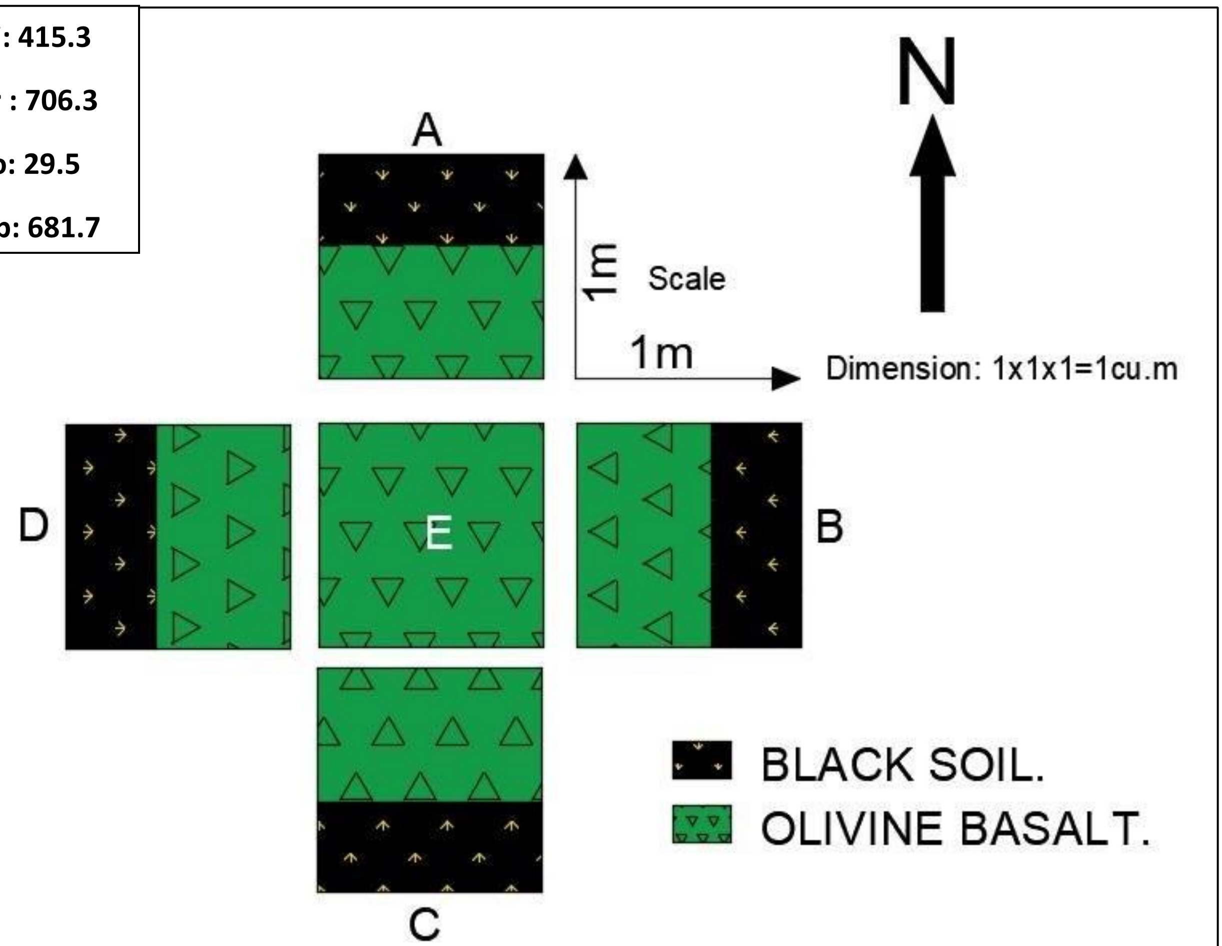
Pit 86 profile:

Ni: 415.3

Cr : 706.3

Co: 29.5

Nb: 681.7



Name of the investigation: Ni, Co and PGE	Pit no: P86/BTB/2025
Location: 22.111418,71.678823	Elevation: 78m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

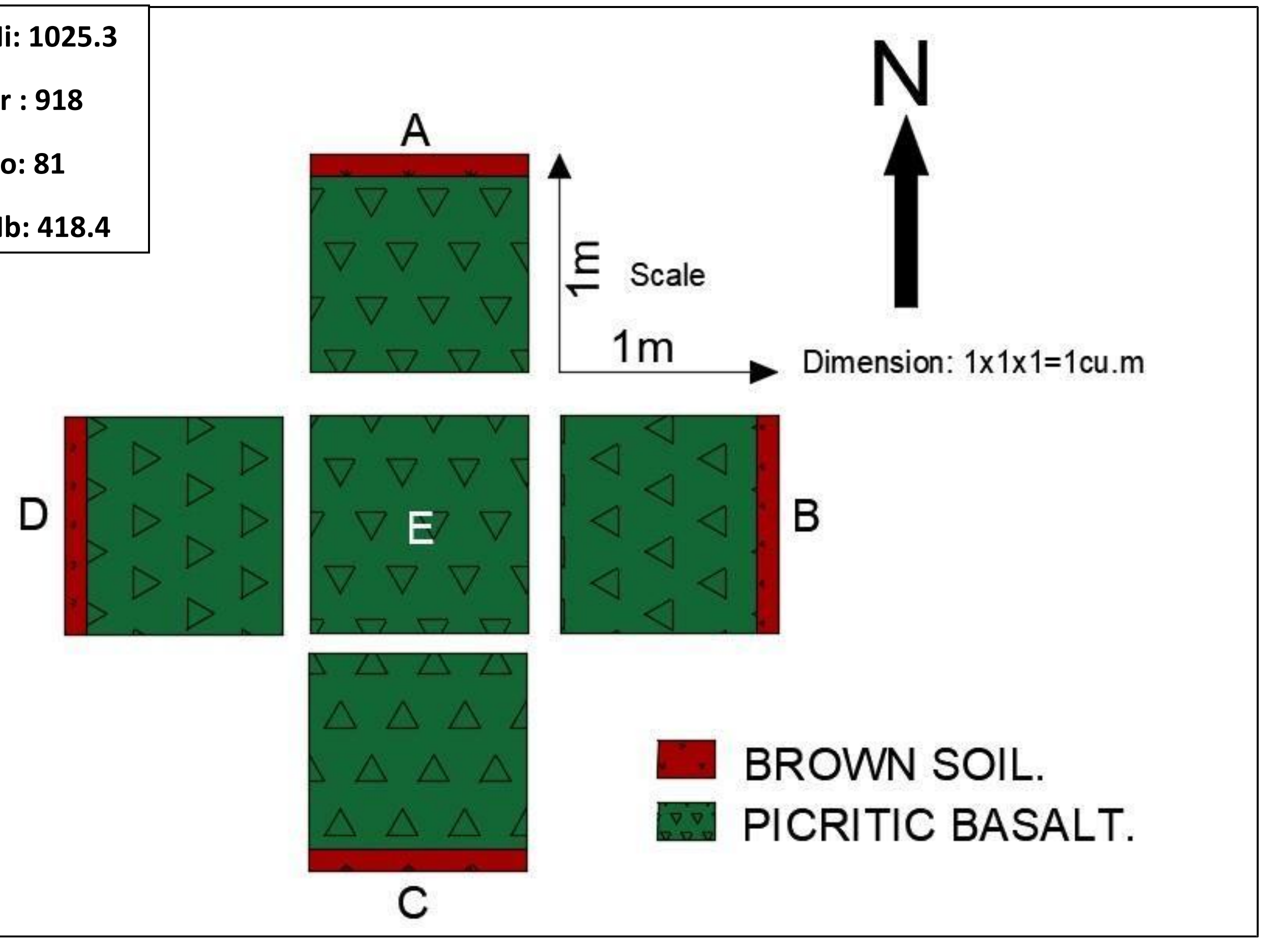
Pit 87 profile:

Ni: 1025.3

Cr : 918

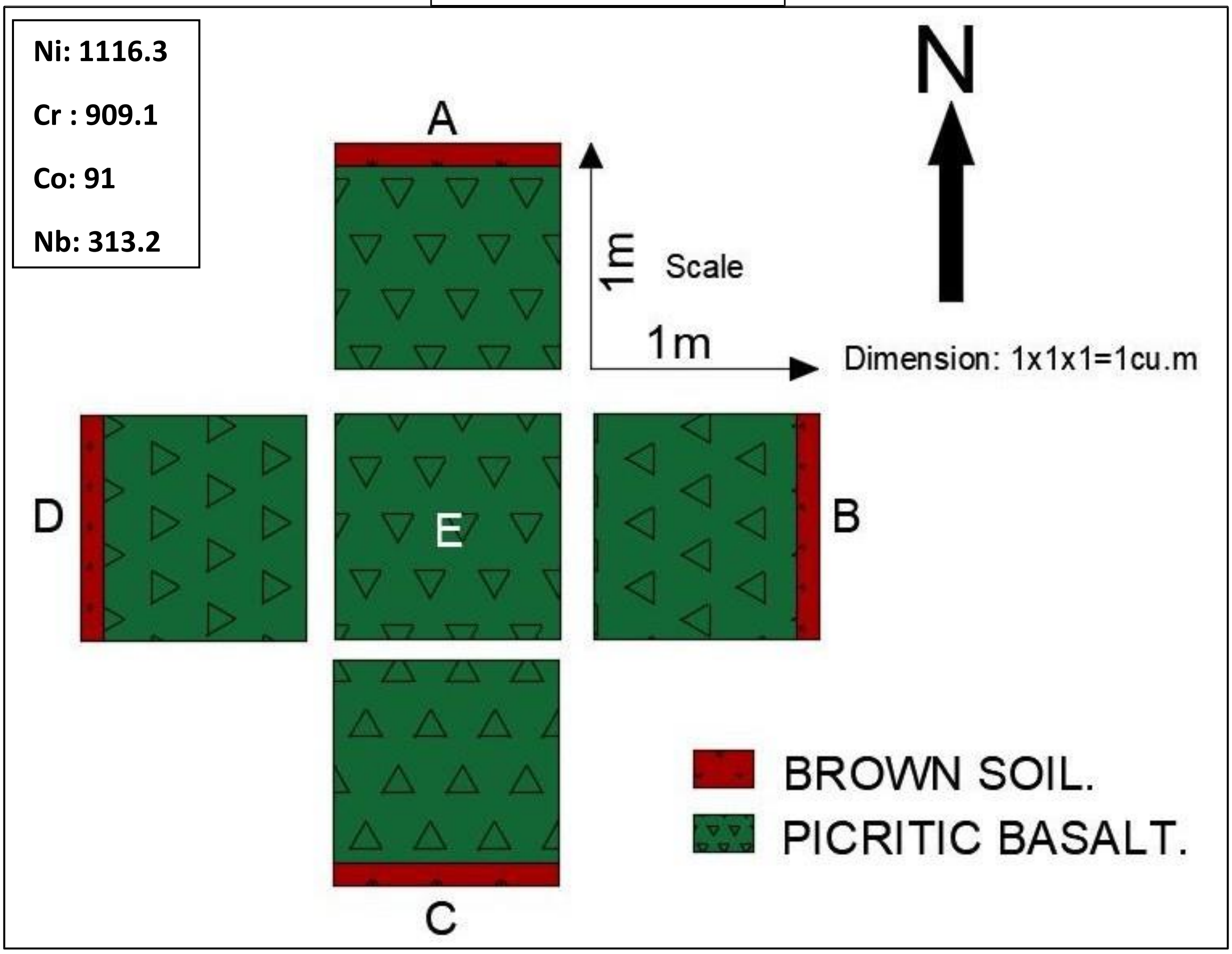
Co: 81

Nb: 418.4



Name of the investigation: Ni, Co and PGE	Pit no: P87/BTB/2025
Location: 22.100278,71.683889	Elevation: 71m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 88 profile:



Name of the investigation: Ni, Co and PGE	Pit no: P88/BTB/2025
Location: 22.088611,71.690000	Elevation: 72m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Picritic basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

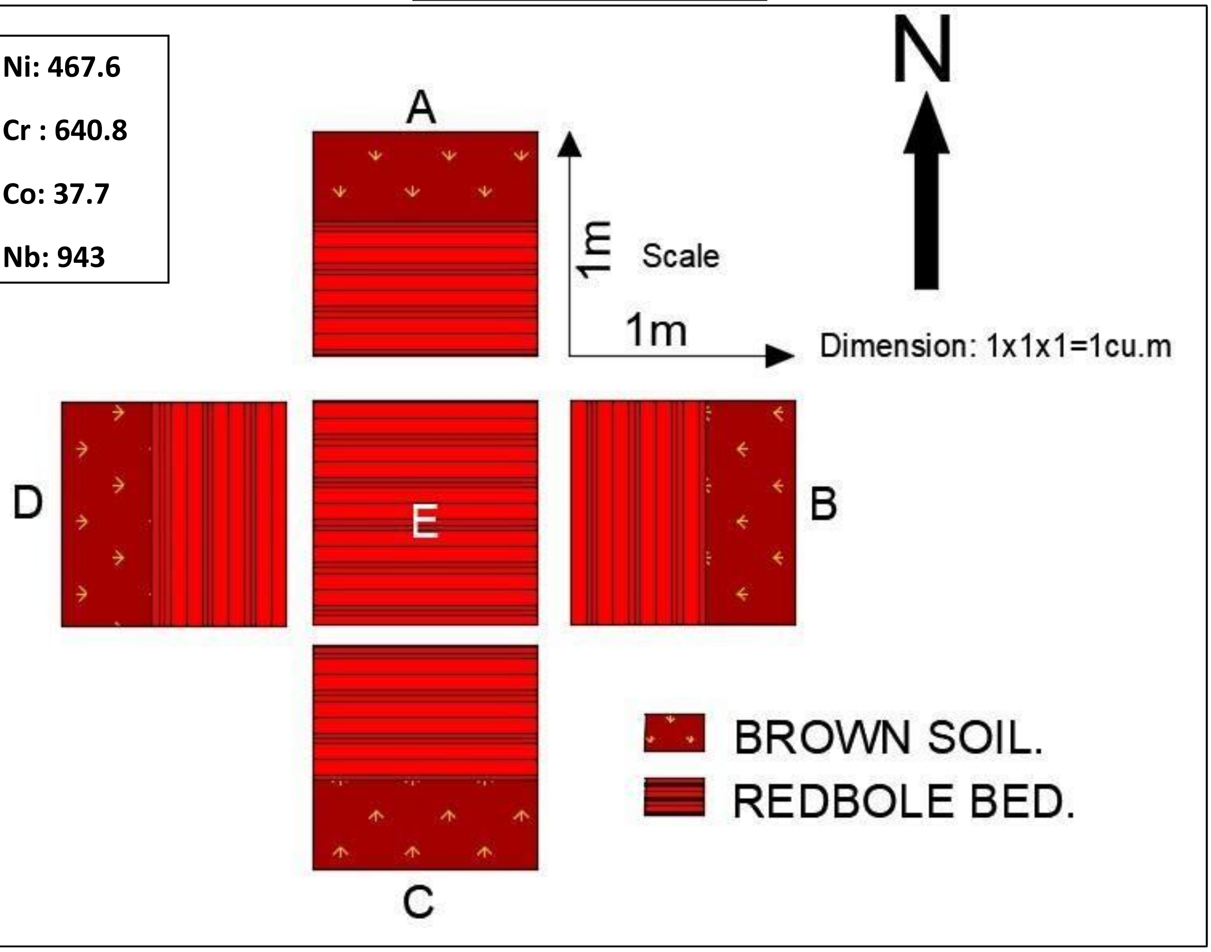
Pit 89 profile:

Ni: 467.6

Cr : 640.8

Co: 37.7

Nb: 943



Name of the investigation: Ni, Co and PGE	Pit no: P89/BTB/2025
Location: 22.101944,71.672500	Elevation: 100m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Red bole bed	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

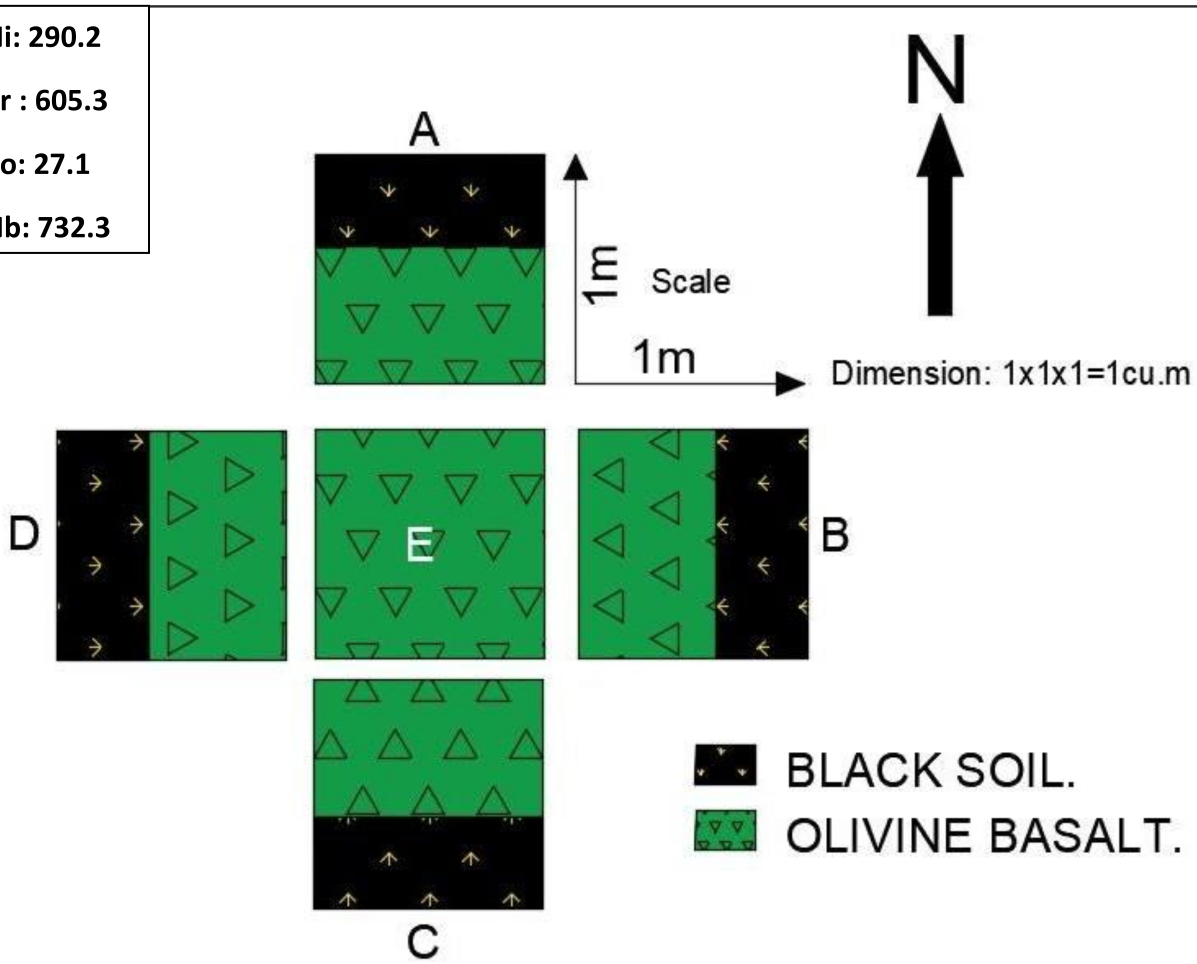
Pit 90 profile:

Ni: 290.2

Cr : 605.3

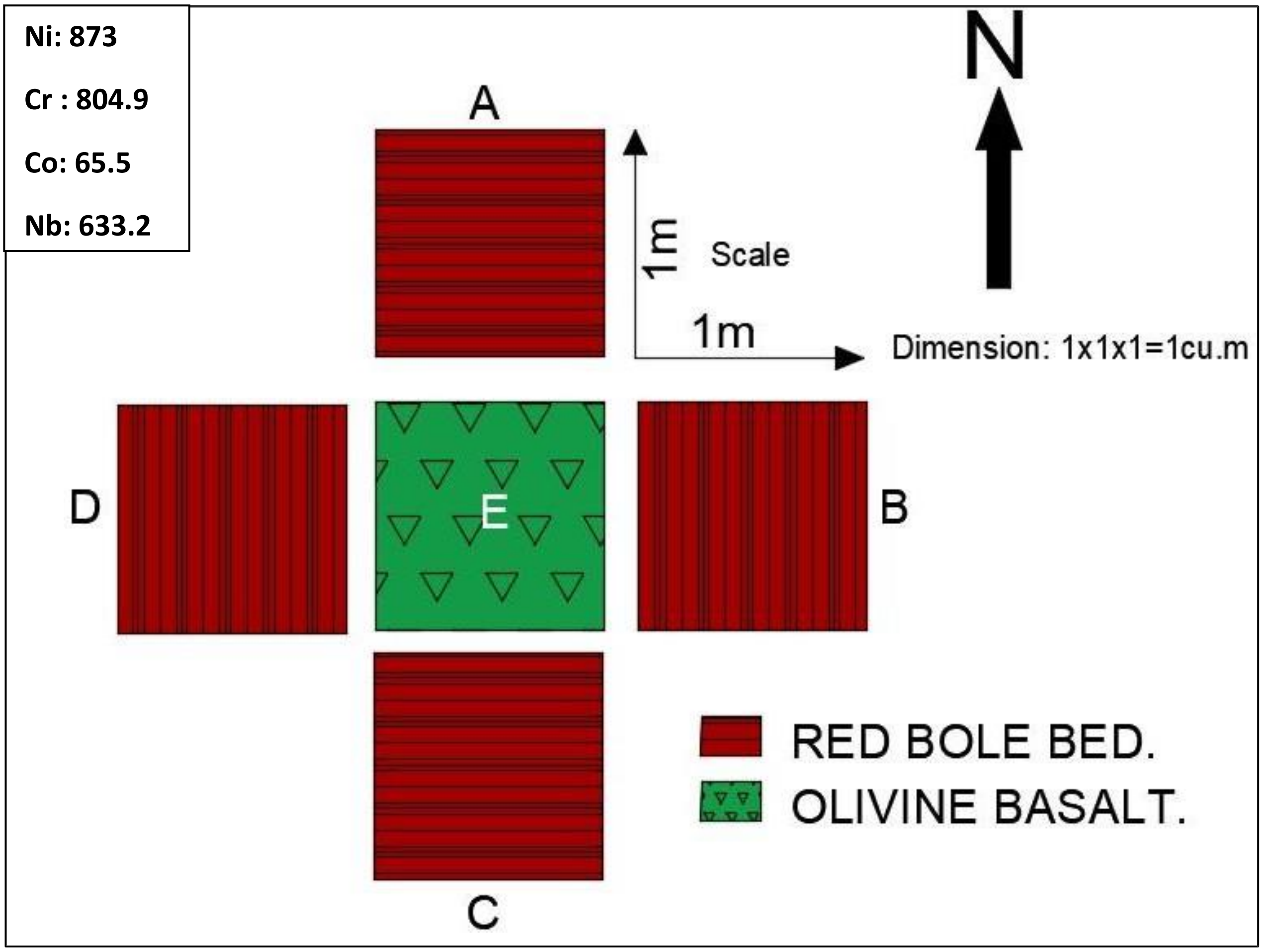
Co: 27.1

Nb: 732.3



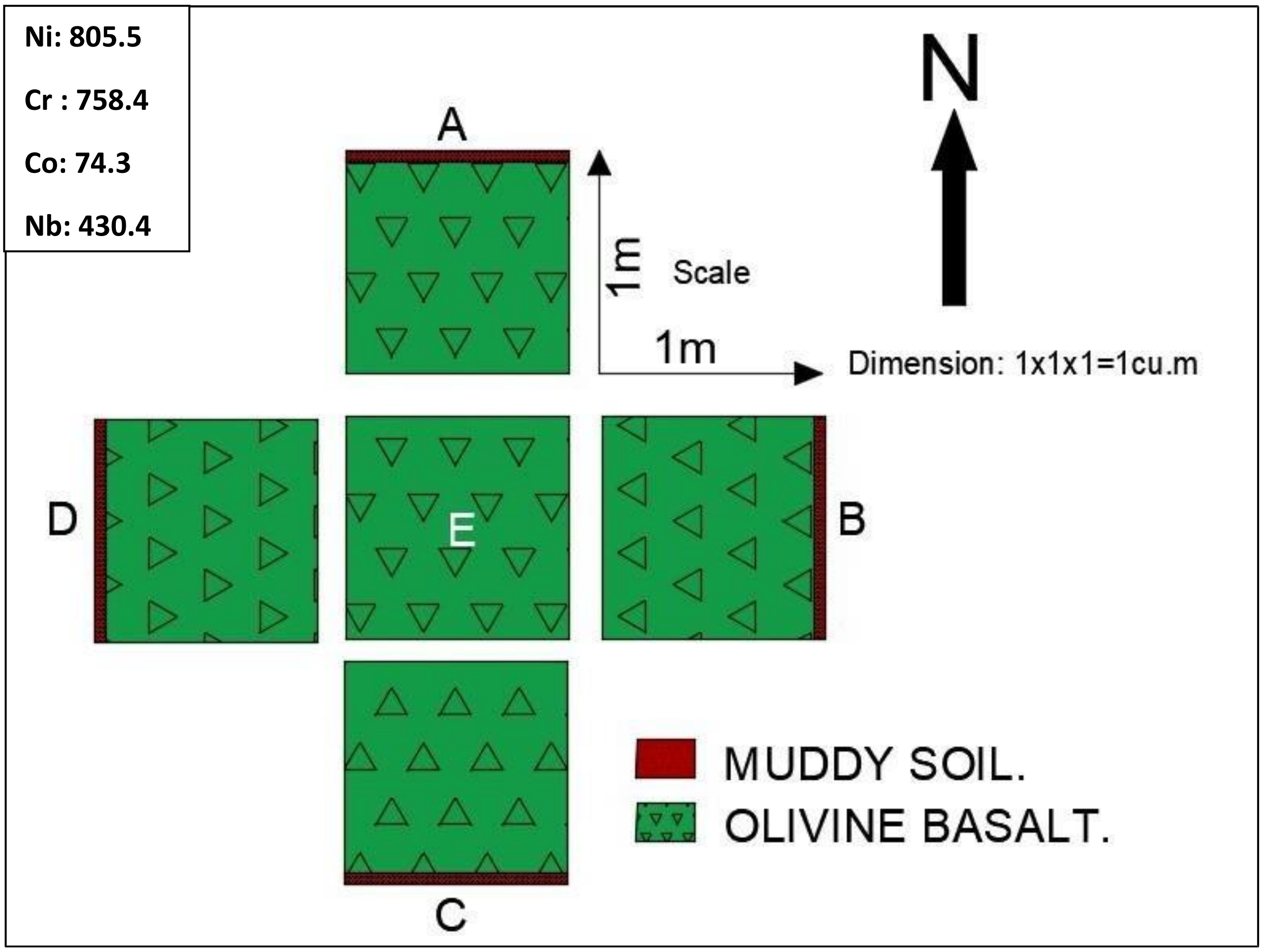
Name of the investigation: Ni, Co and PGE	Pit no: P90/BTB/2025
Location: 22.109740,71.673258	Elevation: 70m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 91 profile:



Name of the investigation: Ni, Co and PGE	Pit no: P91/BTB/2025
Location: 22.113056,71.666944	Elevation: 84m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

Pit 92 profile:



Name of the investigation: Ni, Co and PGE	Pit no: P92/BTB/2025
Location: 22.118611,71.652778	Elevation: 86m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

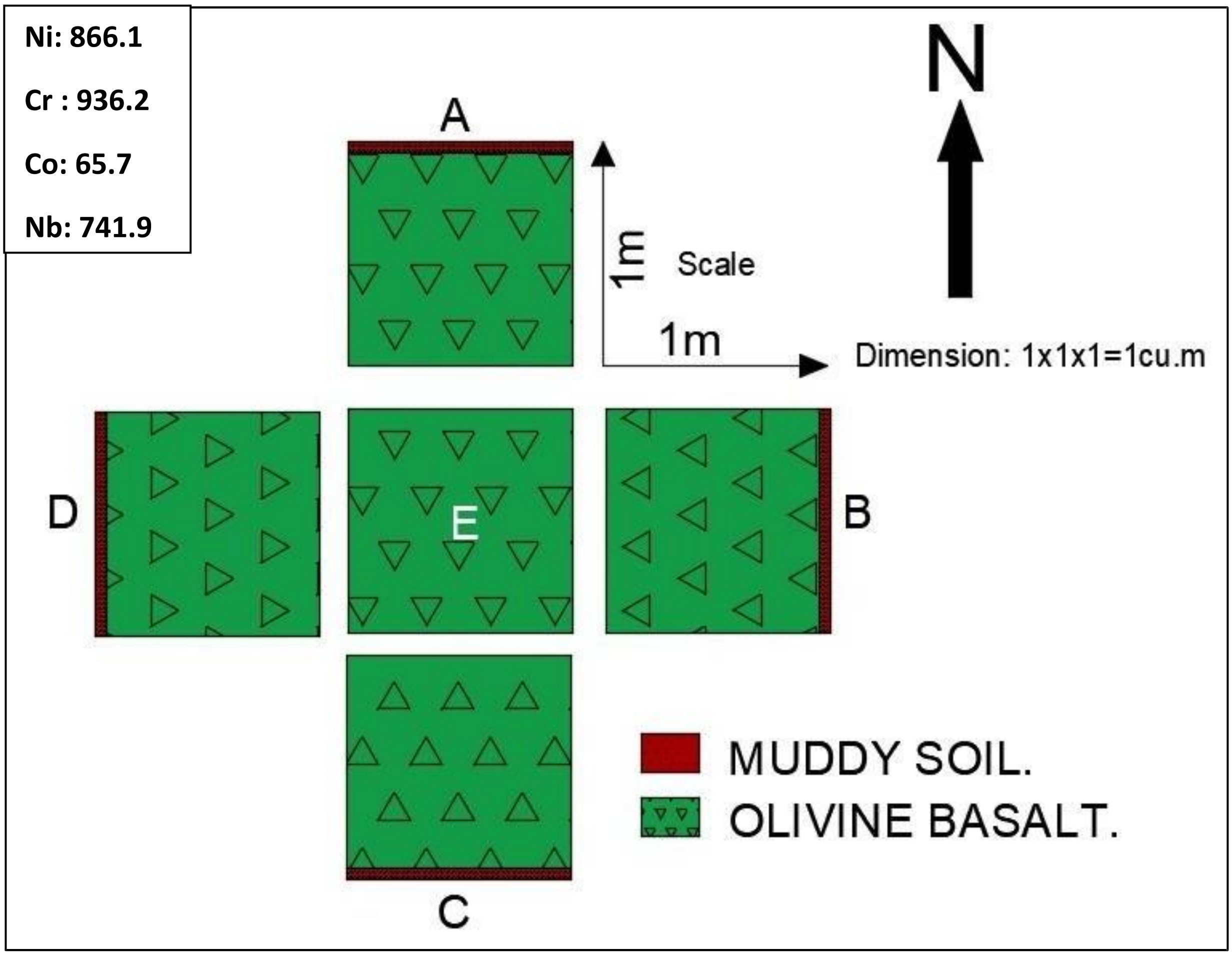
Pit 93 profile:

Ni: 866.1

Cr : 936.2

Co: 65.7

Nb: 741.9



Name of the investigation: Ni, Co and PGE	Pit no: P93/BTB/2025
Location: 22.118056,71.647500	Elevation: 81m
Pit top measurement: a. Length: 1m b. Breadth: 1m	Pit bottom measurement: a. Length: 1m b. Breadth: 1m c. Depth: 1m
Recorded by: Mekala Chandu and Ajay kumar, Geologists	
Lithology details: Olivine basalt	
Log of pit: A, B, C, D are side section and E plan view is bottom of the pit.	

LITHOLOGICAL MAP SHOWING PIT LOCATIONS:

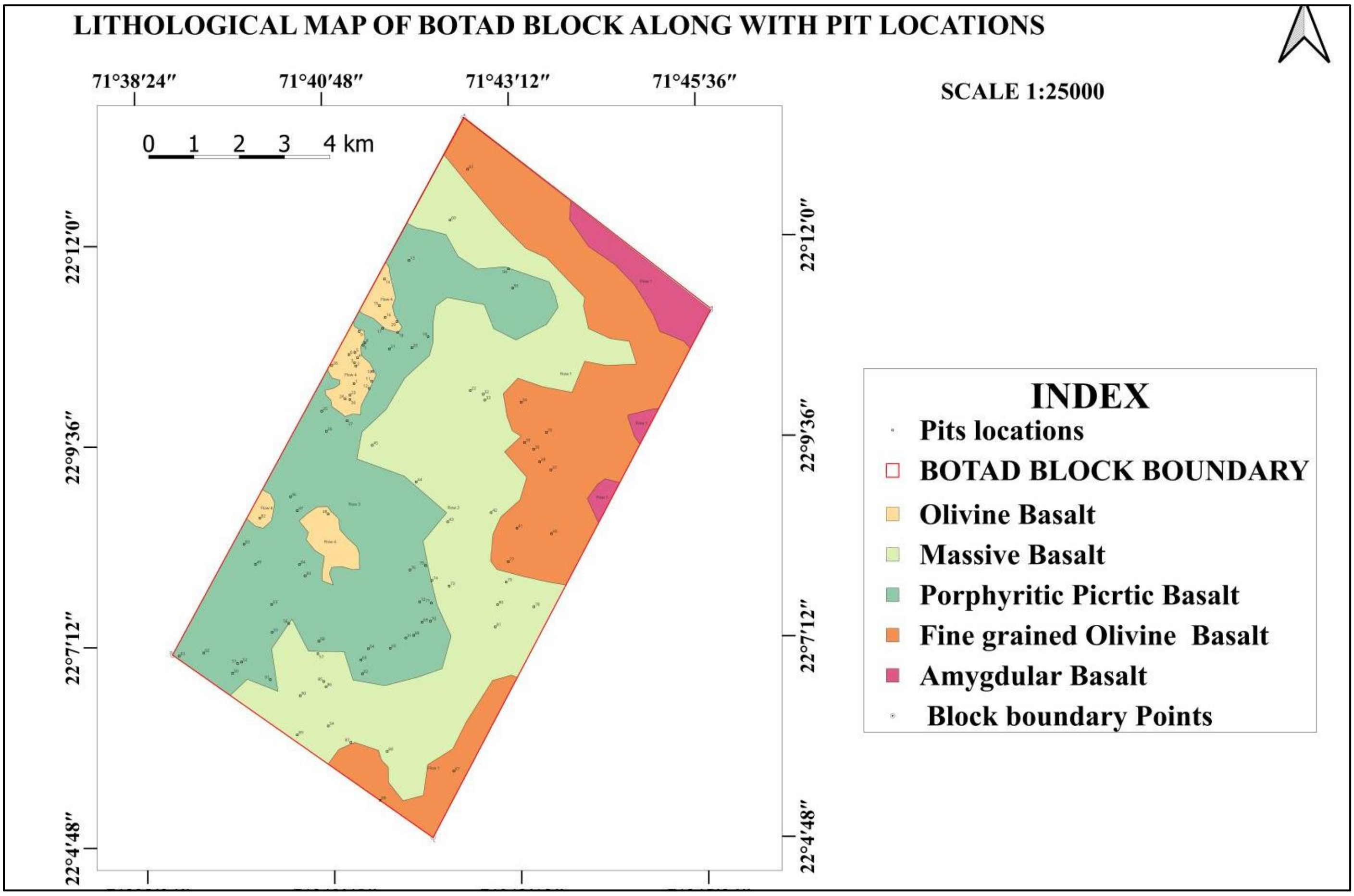


Plate No 12: showing Lithological Map of Botad block with Pit locations

6.1.9 Sampling

The region has been methodically sampled for bedrock during the geological fieldwork. For analysis, picritic basaltic samples are also gathered from the sections. When necessary, sampling has been done; fresh rock samples from outcrops are preferred. To guarantee that every sample is numbered sequentially, a sequential numeric sample numbering scheme has been used. Both the field diary and the sample registry or database provide explicit documentation of the sample type. Furthermore, the sample register/database and the field journal both carefully record GPS locations and sample numbers. A clear picture of the sample bag with the sample number on it, as well as pictures taken during sampling and sample packing, must be included in the photographic documentation.

Bed Rock Sampling

A total of 77 bedrock samples from all exposed outcrops have been gathered, mostly from picrite-basaltic picrite and a small number from amygdular and porphyritic basalt. The regions of Sherthali, Tajpar, Amapar road, samadhiyala 1, Bhambhan are the main locations for picrite-basaltic picrite exposures. Sample collection has been carried out based on the restricted availability of picrite basalt exposures, open mines, and excavated dumps from wells,1.5 kg of material are collected for every bedrock sample. The samples collected from each different basaltic layers and few samples also collected from red bole beds.

MAP SHOWING OUTCROP LOCATIONS OF BOTAD BLOCK ON TOPOSHEET (41N/12 & 41N/16)

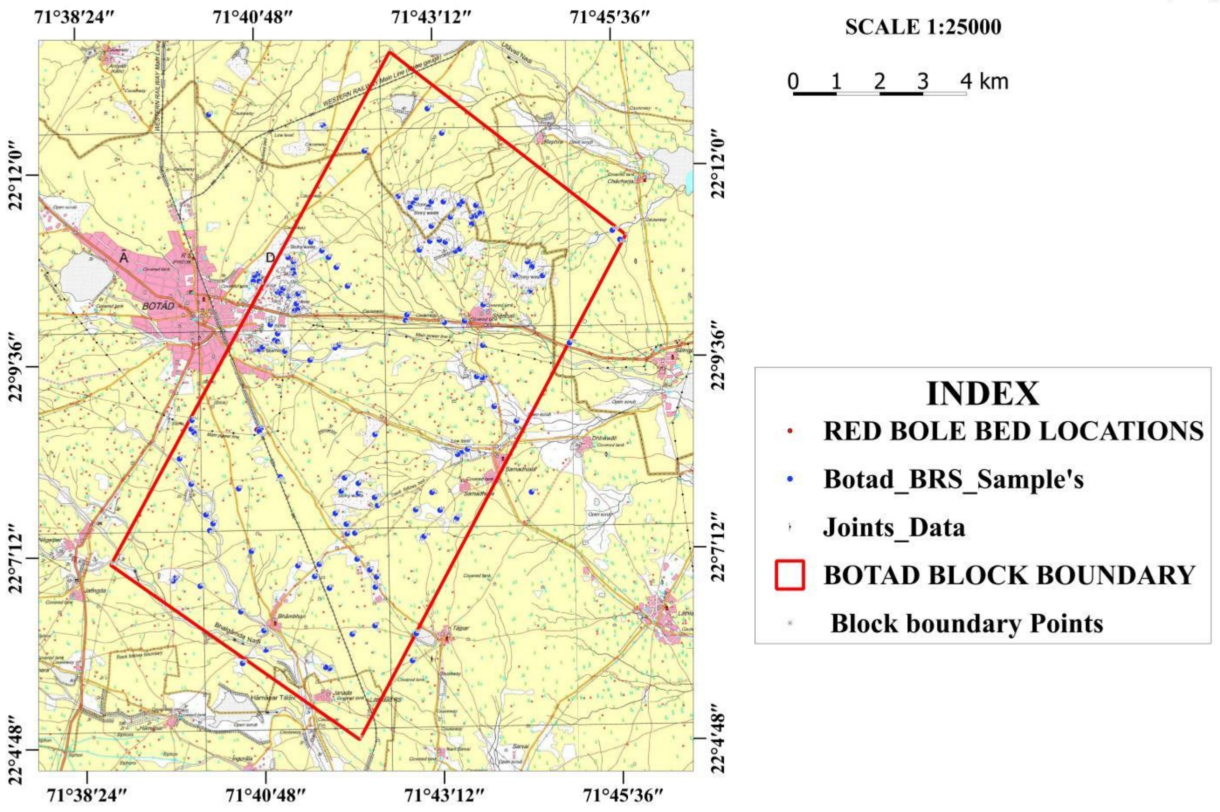


PLATE-13

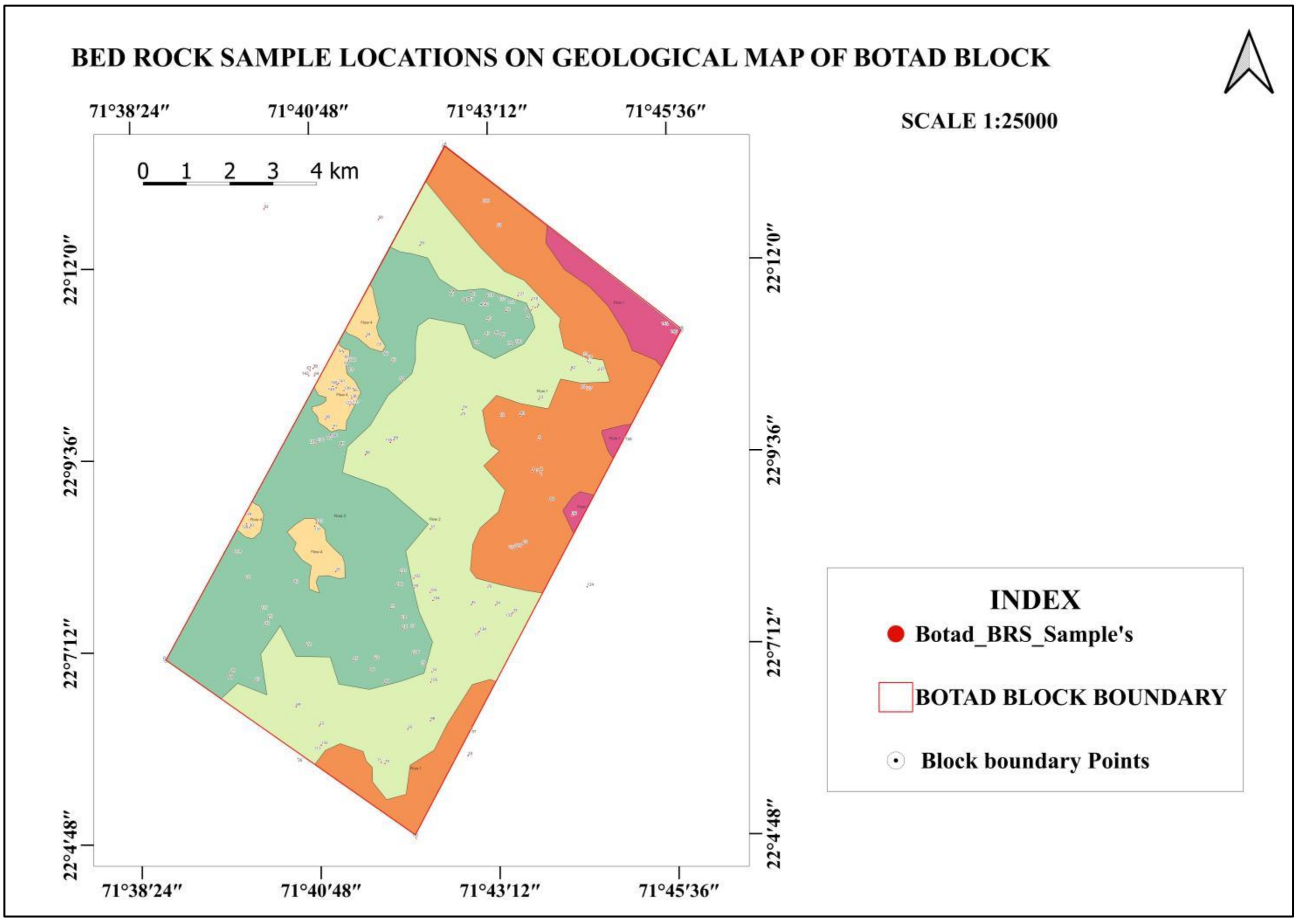

BED ROCK SAMPLE LOCATIONS ON GEOLOGICAL MAP OF BOTAD BLOCK
SCALE 1:25000
71°38′24″
71°40′48″
71°43′12″
71°45′36″
22°12′0″
22°9′36″
22°7′12″
22°4′48″
0 1 2 3 4 km
INDEX
Botad_BRS_Sample's
BOTAD BLOCK BOUNDARY
Block boundary Points

PLATE-14

6.2 Geochemical Exploration:

Surface Samples:

During Field work 77 BRS samples have collected from all the areas, covering different rock types and different flows.

77 BRS samples has been analysed. The chemical analysis of this samples in the range of:

- **Co values, in the block, are in the range of 2.9 ppm to 80.3 ppm**
- **Cr values, in the block, are in the range of 12.4 ppm to 1411.6 ppm**
- **Ni values, in the block, are in the range of 23.6 ppm to 1105.1 ppm**
- **Nb values, in the block, are in the range of 4.4 ppm to 1214.6 ppm.**

Sub-surface samples:

Pitting work is complete and all the pit locations have been plotted on the geological map of the area. Chemical analysis of the 95 pit samples has been received from the lab. Elemental distribution maps for Ni, Cr, Co and Nb have been prepared. Based on the distribution patterns of the above elements, it is observed that Flow 3 appears to be more promising and to some extent Flow 4 also

- **Cr values, in the block, are in the range of 122 ppm to 1280 ppm**
- **Co values, in the block, are in the range of 8 ppm to 90 ppm**
- **Ni values, in the block, are in the range of 87 ppm to 1116 ppm**
- **Nb values, in the block, are in the range of 250 ppm to 1395 ppm but sample number 94 in northern part of the block in the flow no 3 analysed more 39850 ppm (3.985%).**
- Major Oxides of 20 Pit samples have been plotted. According to TAS and R1-R2 Plot, the samples were of picritic basalt and basaltic nature. As per the Pearce and Mullet triangular plot, the rocks were originated in Oceanic ridge and oceanic floor.

Map showing Elemental Distribution values of Nickel (Ni), Niobium (Nb), Chromium (Cr), Cobalt (Co):

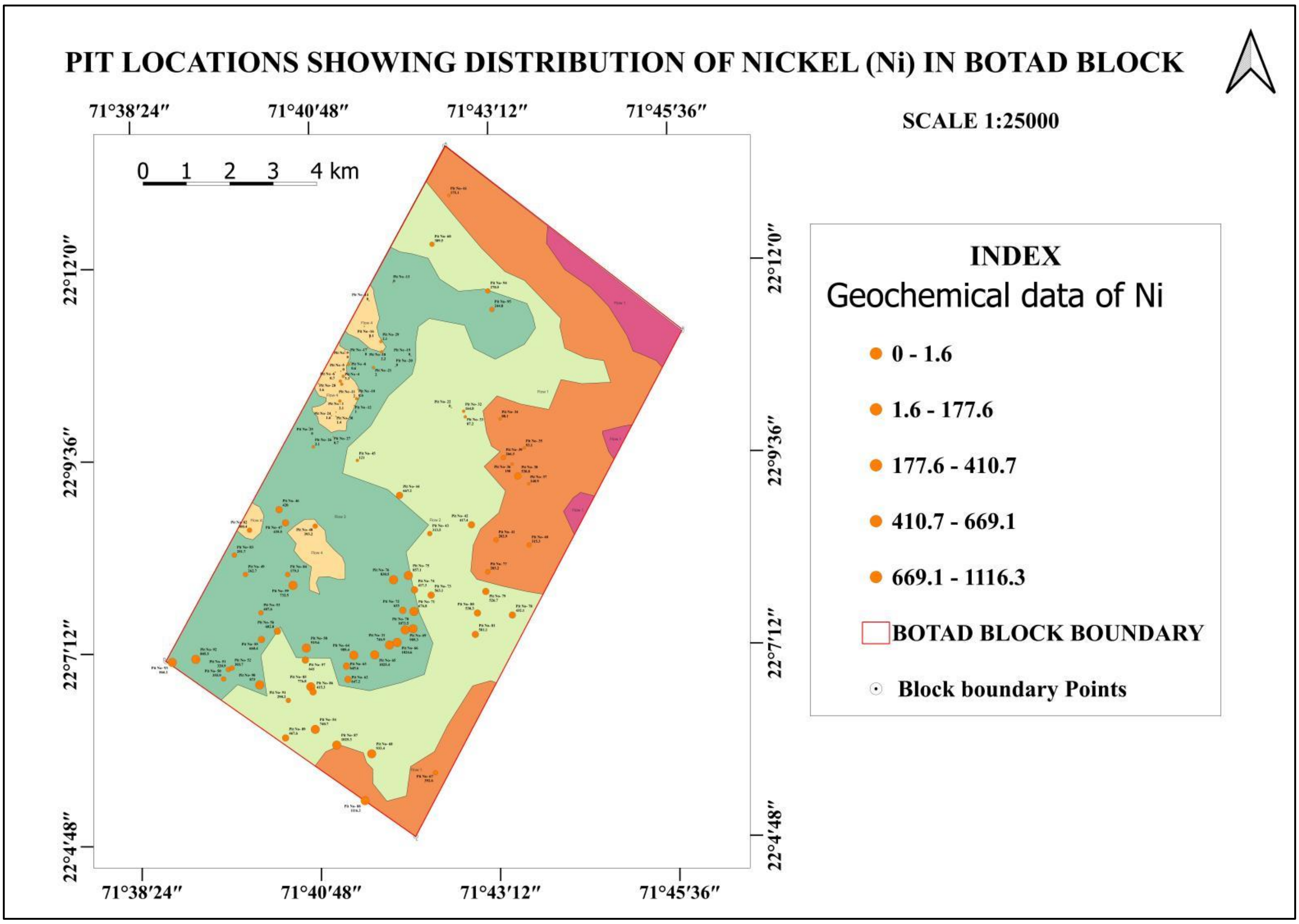


PLATE-15

NICKEL:

420ppm is 5 times the crustal abundance

Results: In the range of- 425.2 to 1116.3 ppm

Out of 93+2 pit samples, 47 pit samples met the values of crustal abundance

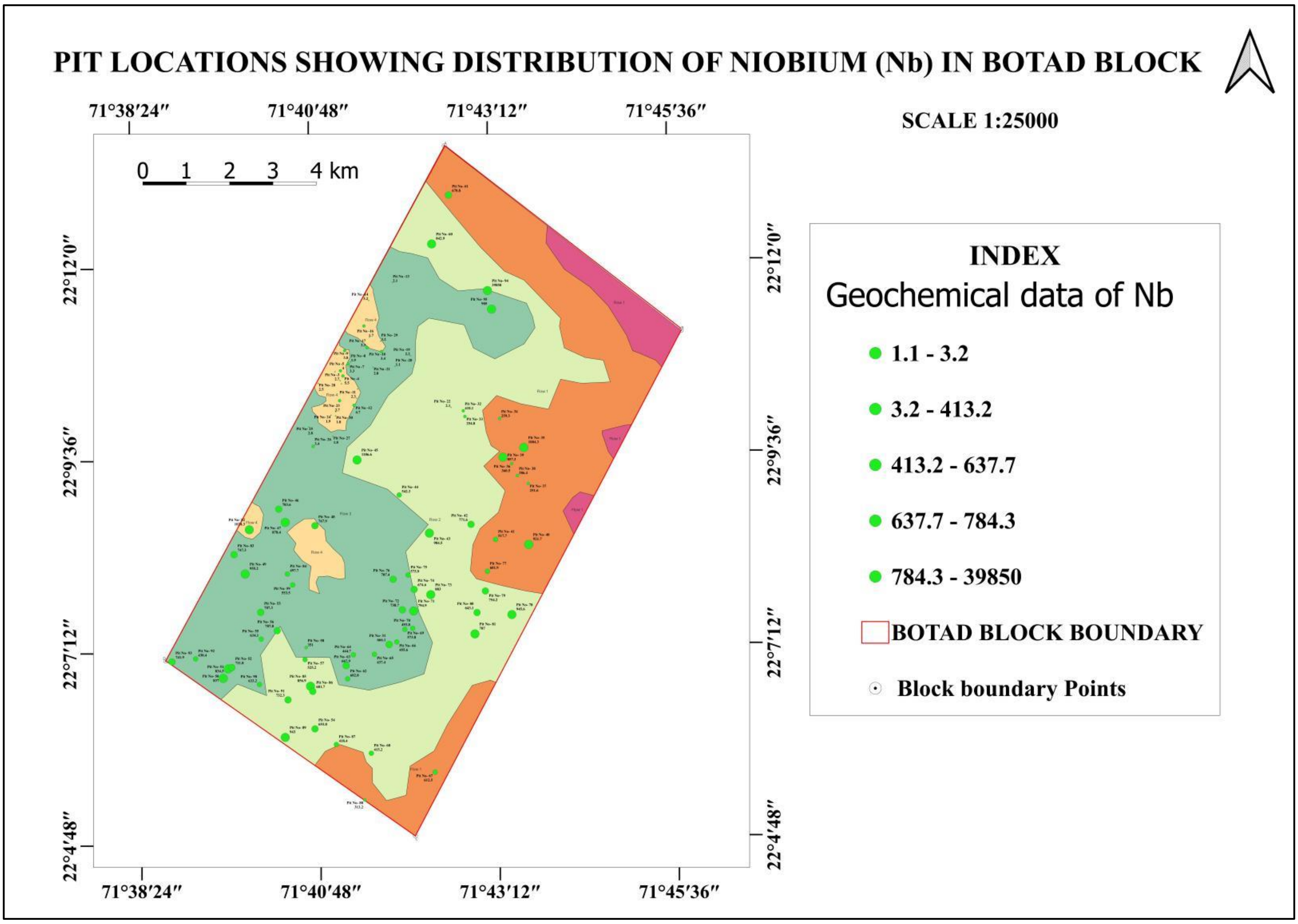


PLATE-16

NIOBIUM:

100ppm is 5 times the crustal abundance

Results: In the range of- 251 to 39850ppm

Out of 95 pit samples, every sample met the values of crustal abundance

PIT LOCATIONS SHOWING DISTRIBUTION OF CHROMIUM (Cr) IN BOTAD BLOCK

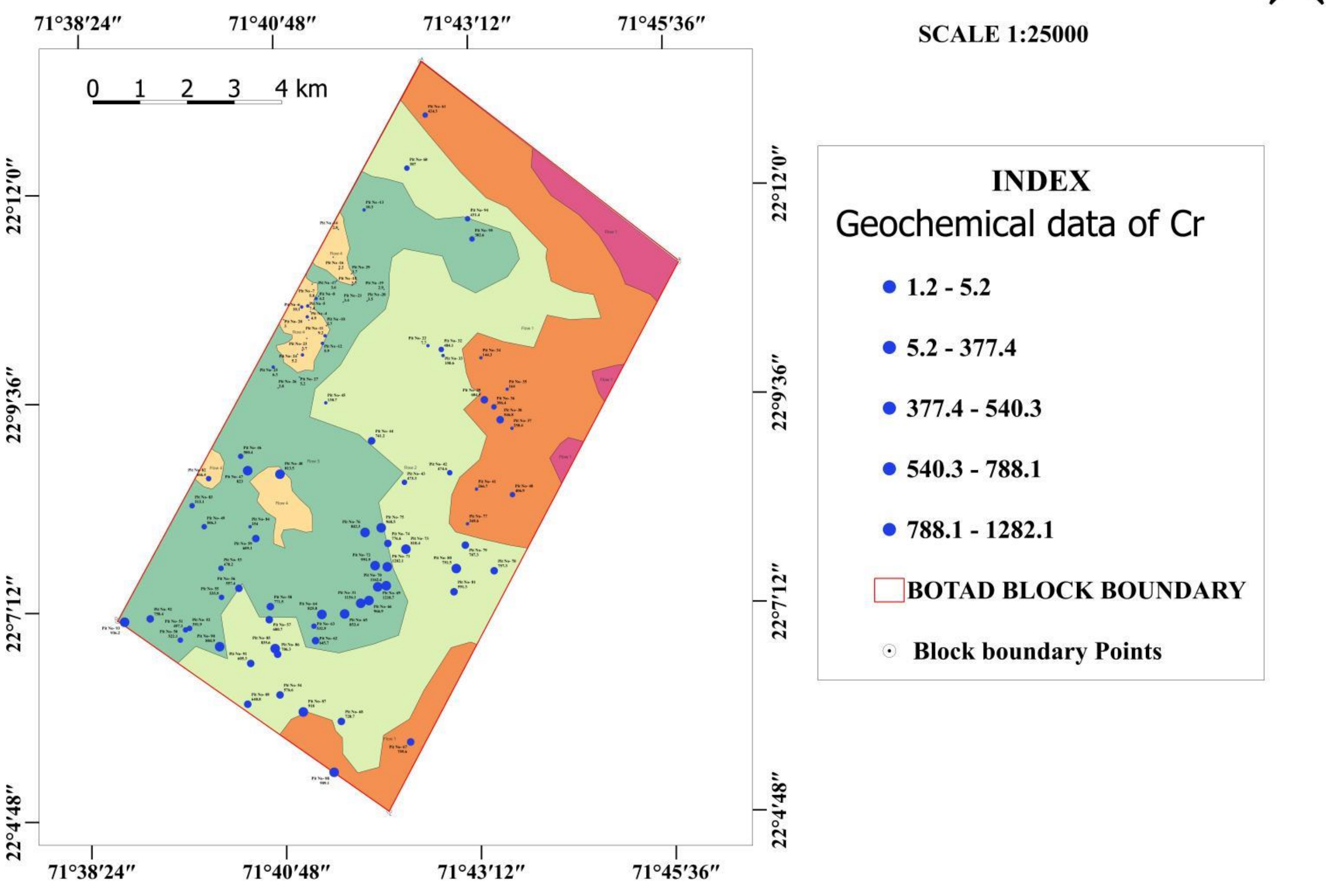


PLATE-17

CHROMIUM:

510ppm is 5 times the crustal abundance

Results: In the range of- 515 to 1218 ppm

Out of 95 pit samples, 56 Pit samples met the values of crustal abundance.

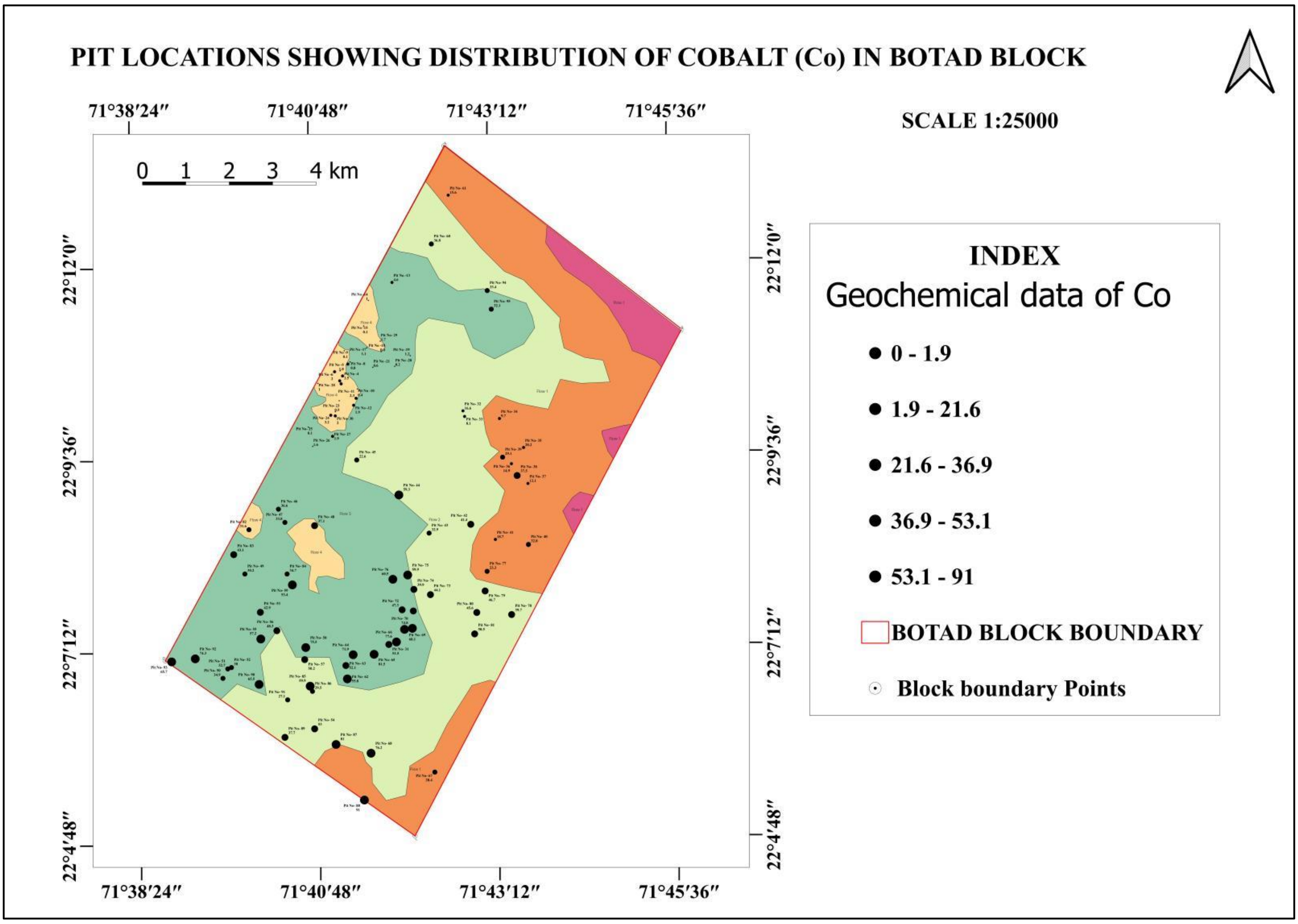


PLATE-18

COBALT:

120ppm is 5 times the crustal abundance

Results:< 120ppm

Geochemical Interpretation of the analytical data:

The integrated geochemical dataset comprising 172 samples collected through Bed rock (BRS) and pit (PITS) sampling methods defines a predominantly mafic to ultramafic geochemical environment with evidence of secondary hydrothermal overprinting and localized high field strength element (HFSE) enrichment, particularly Niobium (Nb). The overall elemental distribution pattern suggests a polyphase event dominant geochemical signature is characterized by elevated **Nickel** (Ni), **Chromium** (Cr), and **Cobalt** (Co), with strong positive inter-element correlations indicating derivation from olivine and pyroxene-rich parental lithologies. **Nickel** concentrations reaching values above 800 ppm and **Chromium** exceeding 1000 ppm in several samples strongly support an ultramafic source, likely representing serpentinite peridotites or picritic compositions. The coherence between Ni–Cr–Co suggests primary magmatic control with limited secondary remobilization for these elements. Chromium is likely hosted in spinel or chromite phases, whereas Nickel may occur within olivine, secondary serpentine phases, or minor disseminated sulfides. The persistence of this association across bed rock sample intervals indicates a lithologically controlled geochemical regime rather than structurally focused mineralization.

Major oxide data reinforces this interpretation. Silica values ranging broadly within the ultramafic to mafic field (approximately 30–44% SiO_2) confirm the low-silica character of the host rocks. Elevated MgO inferred from the compositional balance and high Loss on Ignition (LOI) values—reaching up to approximately 18% in some samples—indicate extensive serpentinization and hydration. Such alteration processes may have modified primary mineral assemblages, potentially redistributed mobile elements while leaving relatively immobile components intact. High LOI values point toward secondary mineral formation such as serpentine, talc, and carbonate phases, suggesting post-emplacement hydrothermal alteration or low-grade metamorphism.

Niobium presents a distinct geochemical behaviour compared to Ni and Cr. It shows weak correlation with ultramafic-associated elements and instead exhibits moderate affinity toward titanium and likely zirconium, consistent with its classification as a high field strength element. This decoupling from the mafic-ultramafic suite indicates that Nb is not controlled by primary mantle-derived mineral phases such as olivine or pyroxene. Instead, it is likely hosted in accessory minerals including titaniferous oxides, titanite, or potentially columbite-type phases if present. The distribution pattern suggests either late-stage magmatic differentiation or minor alkaline affinity within the system.

Superimposed on this primary ultramafic signature is a localized hydrothermal component evidenced by strong Copper (Cu) anomalies and moderate Molybdenum (Mo) enrichment. Copper shows highly skewed distribution patterns with isolated high values, indicating structurally controlled or vein-type mineralization rather than uniform lithological dispersion. The association of Cu with Mo in certain surface samples suggests a magmatic-hydrothermal overprint, potentially related to late-stage intrusive activity. This may represent minor porphyry-style mineralization or fracture-controlled sulphide deposition. The hydrothermal system appears spatially restricted and does not significantly disrupt the overall ultramafic geochemical coherence.

The Nb behaviour implies the presence of localized differentiation pockets within the mafic-ultramafic framework. If Nb enrichment corresponds spatially with elevated TiO_2 or Fe-oxide concentrations, this may indicate concentration within titanomagnetite or ilmenite-bearing zones. Alternatively, discrete Nb enrichment could reflect subtle alkaline intrusive influence not directly evident from major oxide data alone. The absence of strong correlation between Nb and Ni–Cr further supports the interpretation that Nb enrichment represents a separate geochemical event or phase within the broader magmatic evolution.

The dataset collectively defines three geochemical domains within the study area. The first domain represents the ultramafic/picrite core characterized by coherent Ni–Cr–Co enrichment and low silica content. The second domain reflects hydrothermal influence marked by localized Cu–Mo anomalies. The third domain comprises HFSE enrichment zones defined by Nb variability and association with titanium-bearing phases. These domains likely represent sequential geological processes: primary mantle-derived magmatic emplacement, subsequent serpentinization and alteration, late-stage magmatic-hydrothermal fluid activity, and minor differentiation-related HFSE concentration.

From a metallogenic perspective, the system is multi-commodity in nature. The ultramafic signature supports potential for nickel and chromium resources, particularly if sulphide segregation or cumulate layering is present at depth. Copper and molybdenum anomalies warrant structural and geophysical follow-up to determine continuity and economic concentration. Niobium, although not clearly indicative of high-grade mineralization at this stage, introduces the possibility of HFSE-enriched accessory phases that require mineralogical confirmation through heavy mineral separation and advanced microanalytical techniques.

In summary, the geochemical dataset reveals a complex, multi-stage evolutionary history. The primary ultramafic signature is robust and regionally consistent, while hydrothermal and HFSE signatures are localized and likely represent later superimposed events. **The presence of Niobium adds a critical dimension to the interpretation, suggesting magmatic differentiation or subtle alkaline influence within an otherwise mafic–ultramafic geological framework**.

Reconnaissance Survey (G4) for Ni, Co and PGE in Botad area, Botad District, Gujarat

Major oxides in %

Sno	Sample ID	SiO2	Al2O3	Fe2O3	MgO	CaO	MnO	Na2O	K2O	TiO2	P2O5	V2O5	LOI
1	P61/BTB/2025	30.11	13.29	9.357	4.703	20.576	0.123	0.633	0.491	1.641	0.182	<0.01	18.67
2	P60/BTB/2025	41.259	10.878	9.371	14.4	9.514	0.18	0.668	0.695	1.304	0.174	<0.01	11.17
3	P12/BTB/2025	44.029	10.998	11.271	16.875	9.812	0.171	2.068	0.708	1.291	0.331	<0.01	1.75
4	P6/BTB/2025	45.174	14.598	11.373	10.291	10.022	0.173	3.051	1.096	1.879	0.452	<0.01	1.51
5	P16/BTB/2025	46.443	17.254	9.851	6.206	9.391	0.153	4.243	1.724	1.971	0.387	<0.01	2.07
6	P26/BTB/2025	24.308	4.879	3.537	15.026	17.886	<0.01	0.407	0.142	0.516	<0.01	<0.01	32.78
7	P62/BTB/2025	44.659	15.055	11.554	9.573	10.08	0.175	3.492	0.853	1.857	0.385	<0.01	1.89
8	P53/BTB/2025	43.848	12.682	10.685	12.182	9.209	0.176	1.878	0.76	1.132	0.295	<0.01	6.73
9	P86/BTB/2025	42.473	9.803	11.555	15.897	4.59	0.16	0.162	<0.01	1.512	<0.01	<0.01	13.16
10	P69/BTB/2025	43.504	13.153	10.458	12.743	8.088	0.171	1.121	0.745	1.555	0.272	<0.01	7.87
11	P75/BTB/2025	37.083	10.137	7.269	10.719	13.042	<0.01	1.266	0.58	1.302	0.103	<0.01	18.05
12	P78/BTB/2025	40.882	7.439	10.558	16.757	9.768	0.166	1.25	0.15	0.633	0.124	<0.01	11.79
13	P80/BTB/2025	42.359	10.92	12.808	20.169	7.674	0.199	1.945	0.504	0.961	0.272	<0.01	1.44
14	P37/BTB/2025	42.912	11.176	12.518	19.403	7.428	0.196	2.184	0.283	0.987	0.264	<0.01	2.07
15	P35/BTB/2025	44.178	14.244	11.329	11.457	10.275	0.175	3.395	0.518	1.411	0.37	<0.01	2.16
16	P54/BTB/2025	44.002	14.376	11.531	11.795	9.689	0.189	2.261	0.411	0.925	0.233	<0.01	4.19
17	P68/BTB/2025	33.37	11.741	9.643	8.903	15.195	0.114	1.678	0.52	1.31	0.134	<0.01	16.92
18	P43/BTB/2025	38.955	6.523	12.046	14.019	11.312	0.247	0.508	0.183	0.565	0.1	<0.01	15.05
19	BRS95/BTB/2025	49.517	13.896	11.146	9.334	7.625	0.147	2.477	1.426	1.399	0.303	<0.01	2.29
20	BRS94/BTB/2025	49.688	14.242	10.959	8.866	7.764	0.163	2.752	1.512	1.456	0.336	<0.01	1.79

CHAPTER 7

7.1 Integration of Geology, geophysics (with available aero geophysical data) and geochemical exploration data and the interpretation

Creation of geological (lithological & structural), geophysical, geochemical and out-crop maps on true scale, overlay studies in GIS platform. Discuss on the interpretation and results and attach the soft copy of the same in shape file

Shape files in GIS format for the themes lithology, Oriented structures, Outcrop map, sample locations, pit locations and various elemental distribution maps viz Ni, Cr, Co and Nb etc have been prepared and discussed in the CHAPTER 6.

No geophysical component is in the scope of the present investigation.

No aero geophysical data is available in the public domain for the block area

Drilling is not recommended by the TCC-II of NMDET in view of the non-encouraging analytical results of bed rock and pit samples collected from the study area.

CHAPTER-8

Mineral prospect

Olivine bearing/Mg rich basaltic flows have been delineated during the large-scale geological mapping. Also indicated the locations of Red bole beds (though not mappable on this scale) have identified and incorporated in the geological map as point locations. Whole rock analysis of the bed rock and pit samples indicates some consistent high values of Ni, Cr, Co and Nb in the flow 3 and flow 4 in the area.

Unusually high values of Nb (3.8%) in one of the bed rock samples collected in the north eastern part of the block is worth mentioning for future studies if needed.

Analytical data of the bed rock and pit samples of the are presented to TCC-II and the honourable members of the TCC-II, after detailed scrutiny of the data, recommended not to go for drilling and submit the Geological report.

Note: Number of rock Quarry's of different variants of basalts are reported from the mapped area for construction and building material. Red bole material can be used for agricultural purpose

CHAPTER-9

Exploration by scout Drilling

Based on the analytical data of both bed rock and pit samples of the area presented to the TCC-II of NMDET, drilling is not recommended by the TCC-II. Hence the Drilling was not undertaken in the area.

CHAPTER-10

Resource estimation

As there is no potential area for the commodities like Cr, Ni, Co and PGE in the area, there is no scope for resource estimation

CHAPTER-11

Conclusion and Recommendation

A reconnaissance stage (G4) exploration programme for **Ni–Co–PGE** was carried out in the **Botad area, Botad District, Gujarat**, under **NMET funding**, and executed by **M/s Critical Minerals Trackers** (hereafter referred to as the *Botad Project*). The total investigation area covers **99.6 sq. km**, falling within **Survey of India toposheets 41N/12 and 41N/16**, bounded by latitudes **22°03′45″ N to 22°14′30″ N** and longitudes **71°38′15″ E to 71°46′15″ E**.

Large scale geological mapping on 1: 12500 scale reveals that the area is dominantly occupied by Olivine rich basalts / **picritic basalts**. The Deccan Traps in the area comprise **Upper Cretaceous–Lower Paleocene porphyritic and amygdaloidal basalt flows**, intruded by **picrite and olivine basaltic sills and dykes**. Four basalt flows were delineated, separated by **intermittently developed red bole horizons**, observed both in surface exposures and dug-well sections.

Lithologies identified include **picrite basalt, aphanitic basalt, and porphyritic basalt**. Picrites are characterized by **olivine with frequent clinopyroxene and minor feldspar**, occurring as phenocrysts and groundmass. Olivine alteration to **serpentine and iddingsite** in several samples suggests **localized hydrothermal activity**. Picrite and basaltic picrite exhibit **medium-grained holocrystalline to porphyritic textures**, with vugs commonly filled by **zeolites**. Basalts are dominated by **plagioclase phenocrysts** with minor olivine and clinopyroxene in the groundmass. Four flows were delineated, separated by **intermittently developed red bole horizons.**

Major oxide data from **20 pit samples**, plotted on **TAS and R1–R2 diagrams** classify the rocks as **picritic basalt and basalt**. **Pearce and Mullen discrimination diagrams** indicate an **oceanic ridge/oceanic floor tectonic affinity.**

95 pits (1x1x1m dimension) have been excavated in the soil cover areas to expose the bed rock and bed rock samples have been collected and got them analysed for major oxides and Cr, Ni, Co, Nb and other elements. Based on the geochemical patterns, **Flow 3 appear to be the most promising**, followed by **Flow 4 in respect of the spatially consistent anomalous values of Cr, Ni, Co and Nb**.

Salient points of chemical analysis of pit samples:

Ni values range from 425.2 ppm to 1116.3 ppm

Cr value ranges from 515 ppm to 1218 ppm

Co value ranges from 12 ppm to 95 ppm

Nb value ranges from 251 ppm to **39850** ppm (a nugget value)

Salient points of chemical analysis of bed rock samples:

Ni ranges from 23.6 ppm to 1105.1 ppm

Cr ranges from 12.4 ppm to 1411.6 ppm

Co ranges from 2.9 ppm to 80.3 ppm

Nb ranges from 4.4 ppm to 1214.6 ppm

CHAPTER-12

Expenditure

The total expenditure incurred for execution of the project "Reconnaissance survey (G4) for Nickel, Cobalt and PGE in Botad area, Botad District, Gujarat" is Rs. **46.44 lakhs (Rupees forty-six lakhs forty-four thousand)** only as detailed below. This has been approved by the 20th TCC-2 held on 2nd & 5th Jan 2026 and also in the 4th PSC held on 13th Jan 2026 of NMDET (Vide No. 117/1/2025/NMET/739, dated : 20.1.2026

Annexure-12

Estimate Cost for Reconnaissance survey(G4) for Nickel,Cobalt and PGE in Botad area,Botad District,Gujarat
Total Area-99.6(say 100) sq.km; No of Boreholes-3; Completion Time -10 months, Total Drilling meterage: 300m, Review: after 4 months
Implementing Agency-Critical Mineral Trackers,Hyderabad

S.No	Item of Work	Unit	Rates as per NMEDT SoC		Estimated Cost of the Proposal		Revised Cost		Remarks
			SoC-Item-Sl No.	Rates as per SOC	Qtm	Total Amount (Rs)	Qty.	Amount (Rs)	
A	Geological Work								
1	Large Scale Geological Mapping (1:25K/12.5K) & sampling – Geologist field-days	100Sq.km	1.2(b)	11000	180	19,80,000	135	14,85,000	240man days
2	Geologists (HQ)days, pre & post field interpretation, Report writing 20 +20+10 days	One Geologist Per Day	1.2(a)	9000	60	5,40,000	30	2,70,000	45man days (including Remote sensing studies
3	Satellite imagery (Ortho-corrected PAN-A/F (2.5m) (Cartosat-1) +	Two scenes	NA	10470	1	10,470	0	0	Rate is as per NRSC. To study Trap flows
	Carto sat 2			2890	2	5,780	0	0	Rate is as per NRSC
4	Pitting-100nos each one size 1*1*1m (1 Cu.m each)	Per Cu.m	2.1.2	3800	100	3,80,000	93	3,53,400	100 cu.m
5	sampler:	180 days	1.5.2	5100	46	2,34,600	30	1,53,000	
6	Labour (4 labour) attached to sampler	360 labour days	5.7	526	184	96,784	120	63,120	

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7	Labour for geologist		5.7	526	360	1,89,360	270	1,42,020	
	Sub-Total -A					**34,36,994**		**24,66,540**	
B	**Survey Work:**								
1	Surveyor: Fixation & connection of boundary points (4 nos),3 Bh by Total station/DGPS	One surveyor	1.6.2	19,200	7	1,34,400	0		Total 7 points
	Sub-total-B					**1,34,400**		**0**	
C	**Core Drilling**								
1	Scout drilling(coring) :3 points (each 100 m deep) 3*100	Per meter	2.2.1.4a	11,500	300	34,50,000		0	
2	Construction of BH pillar (12" *12" * 30")	Per pillar	2.2.7a	2000	0	0		0	3 pillars
3	**Mob & demob drilling machine & inner BH shifting	Per shifting	lumpsum	0	0	0		0	lumpsum
4	Compensation for 3 Bhs		5.6	20,000	0	0		0	3 BHs
5	Drill core preservation in GI boxes	Per meter	5.3	1590	100	1,59,000		0	
	Subtotal-C					**36,09,000**		**0**	
D	**Laboratory Studies**								
1		For PGE	4.1.5d	11800	25	2,95,000			

	Pitting Sample: 100*1=100 nos)-by Fire Assay (ICPMS NiS)								PGE analysis will done only 1where Ni exceeds 0.2 %, high As, high Cu,If PGM grains are found in the microprobe analysis
2	Core drilling Samples- 3*100=300	For PGE	4.1.5d	11800	50	5,90,000	0	0	PGE analysis will done only where Ni exceeds 0.2%, high As, high Cu
	Total depth 100m each, samples will be collected at every 1.0m interval.						0	0	
	by ICP-MS method						0	0	
3	Trace element analysis (Ni,Cu, As, Mo, Re, In, Te & Co)- 14 element by ICPMS	For Ni,Co	4.1.13	5380	245	13,18,100	182	9,79,160	total 245 samples (2 trace elements)
	Major oxides by XRF technique (Whole rock analysis)		4.1.15a	4200	40	1,68,000	20	84,000	for BRS and selected core samples
3	Preparation of standard thin section	per sample	4.3.1	2353	10	23,530	10	23,530	5 sections
4	Complete petrographic/ore microscopic/ mineragraphic studies	per sample	4.3.4	4232	10	42,320	10	42,320	5 samples
5	XRD analysis for identification of minerals(random)	Per sample	4.5.1	4000	10	40,000	5	20,000	5 samples
	EPMA	per Hours	4.4.1	8540	10	85,400	4	34,160	
	Sub-total-D					**25,62,350**		**11,83,170**	

E	**Surface Geophysical Survey**		**Not recommended**						
1	Electrical resistivity	Per Station							
2	gravity surveys	Per station							
3	Geo Physicist Man days (Field Man-days)								
4	Geo Physicist Man days (HQ)								
	Sub-total-E								
	TOTAL (A+B+C+D)					**97,42,744**		**36,49,710**	
F	**Preparation of Exploration Proposal** (5 Hard copies with a soft copy)		5.1	2% of the project cost subject to a maximum of 5 lakhs	1	1,94,855		72,994	2% of the Project cost.
G	**Geological Report** (5 Hard copies with a soft copy)		5.2	5% of the Project cost or 2.5lakhs		4,87,137		1,82,486	5% of the Project Cost.or 7.5lakhs
	peer review charges					30,000		30,000	
	operational charges (10% of approved drilling cost)	6	ii			3,45,000		0	
	tendering cost (2% of the approved drilling cost		2.3			69,000		0	
	Additional Copy			3000	0	0		0	

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	Project Cost without GST	**1,08,68,736**		**39,35,190**		
	18% GST	**19,56,372**		**7,08,334**		
	Total Project Cost	**1,28,25,109**		**46,43,524**		
	Rs. In Lakh	**128.25**		**46.44**		

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
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.

CHAPTER-13

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CHAPTER-14

LOCALITY INDEX

Sno	Name	Latitude (DD)	Longitude (DD)
1	Amapar	22.14825400	71.66537100
2	ARTO road	22.18100600	71.68811600
3	Bhambhan	22.10825500	71.67504200
4	Bhambhan (SW)	22.18272700	71.72457200
5	Khas	22.18992700	71.72917200
6	Khas road canal	22.17916667	71.74472222
7	Samadhiyala No 1	22.13238700	71.70181500
8	Sherthali/senthali	22.18819000	71.72824600
9	Tajpar	22.12338900	71.70025700
10	Tajpar road	22.14601800	71.67920300

List of Annexures: Analytical Results

	Sample ID	Latitude	Longitude	Nickel as Ni	Niobium as Nb (ppm)	Lead as Pb (ppm)	Silver as Ag (ppm)	Scandium as sc (ppm)	Selenium as Se (ppm)	Strontium as Sr (ppm)	Tin as Sn (ppm)	Tantalum as Ta (ppm)	Tellurium as Te (ppm)	Thallium as TI (ppm)
1	CMT/011/23/2025	22.134914	71.664417	539.7	631.0	<1.0	0.2	32.7	<1.0	239.7	<1.0	9.9	13.6	10.6
2	CMT/011/03/2025	22.179533	71.74162314	481.6	665.2	1.4	0.1	34.9	<1.0	270.6	<1.0	9.4	14.4	10.7
3	CMT/011/26/2025	22.128592	71.72004	538.8	830.5	1.5	0.5	28.3	<1.0	347.6	1.9	11.1	17.7	17.5
4	CMT/011/28/2025	22.128766	71.71457	349.1	310.2	<1.0	<0.1	26.1	<1.0	244.6	<1.0	1.9	10.5	1.7
5	CMT/011/05/2025	22.190593	71.730503	520.9	835.8	<1.0	0.4	34.4	<1.0	334.1	1.1	10.0	14.3	8.8
6	CMT/011/53/2025	22.164236	71.684342	1056.2	544.2	3.4	0.5	27.2	<1.0	209.9	1.7	8.6	13.9	10.6
7	CMT/011/22/2025	22.14564	71.665273	82.2	1098.3	2.0	0.5	32.0	<1.0	491.0	<1.0	13.3	18.0	19.7
8	CMT/011/07/2025	22.179873	71.741795	88.3	1214.6	1.3	0.3	33.0	1.7	728.9	<1.0	13.2	19.8	19.6
9	CMT/011/31/2025	22.203853	71.704497	889.6	576.7	<1.0	0.8	26.6	8.6	245.3	<1.0	9.1	19.1	7.7
10	CMT/011/39/2025	22.184536	71.700083	800.0	694.5	<1.0	0.8	30.5	<1.0	319.9	<1.0	11.8	15.6	8.6
11	CMT/011/73/2025	22.19294	71.717018	550.0	674.1	<1.0	0.6	34.7	1.2	306.4	<1.0	10.3	15.2	11.5
12	CMT/011/69/2025	22.127396	71.71592	723.0	593.3	<1.0	0.2	23.4	<1.0	449.9	<1.0	8.5	14.5	9.6
13	CMT/011/25/2025	22.126934	71.723863	28.9	479.0	10.6	3.3	12.2	<1.0	223.4	5.7	3.6	8.6	5.7
14	CMT/011/63/2025	22.177045	71.68412	795.2	585.3	<1.0	0.2	25.5	1.9	247.1	<1.0	8.7	14.9	8.0
15	CMT/011/54/2025	22.132387	71.701815	247.1	1057.7	<1.0	3.6	32.1	2.0	477.2	4.1	9.6	17.5	20.5
16	CMT/011/21/2025	22.14564	71.665273	190.5	761.7	<1.0	0.5	29.5	<1.0	378.7	1.4	8.5	13.9	15.7
17	CMT/011/02/2025	22.18013889	71.74058333	150.7	791.9	<1.0	0.2	24.3	<1.0	214.3	<1.0	6.8	14.6	15.8
18	CMT/011/12/2025	22.14631833	71.679646	111.6	1023.1	4.2	0.5	26.7	<1.0	596.1	4.1	8.6	19.1	18.6
19	CMT/011/04/2025	22.128766	71.71457	43.2	249.4	<1.0	<0.1	6.9	2.4	215.0	<1.0	1.3	10.1	9.4
20	CMT/011/15/2025	22.11544	71.660568	144.5	742.8	3.1	0.4	20.5	<1.0	170.1	<1.0	5.5	17.0	12.5
21	CMT/011/01/2025	22.16286111	71.73025833	792.8	733.9	<1.0	1.2	30.6	<1.0	285.8	<1.0	10.4	15.6	13.2
22	CMT/011/20/2025	22.14564	71.665273	429.5	809.9	<1.0	0.6	31.0	<1.0	142.7	<1.0	7.7	14.3	16.3
23	CMT/011/08/2025	22.167777	71.721737	490.2	871.4	1.1	0.6	36.3	<1.0	396.6	1.1	11.4	17.0	17.9
24	CMT/011/11/2025	22.126006	71.698981	446.8	818.5	5.8	0.4	35.4	<1.0	338.6	1.2	12.7	15.8	15.3
25	CMT/011/30/2025	22.178578	71.680141	385.9	886.4	2.1	0.6	32.0	<1.0	138.1	5.0	7.0	16.7	14.5
26	CMT/011/32/2025	22.194163	71.711685	614.2	865.3	<1.0	0.4	36.2	<1.0	321.1	2.4	10.1	17.8	11.5
27	CMT/011/06/2025	22.190593	71.730503	294.5	1085.1	1.0	0.7	33.3	<1.0	486.5	1.7	14.7	18.2	20.2
28	CMT/011/13/2025	22.10409	71.618138	506.4	774.5	3.3	0.8	36.7	<1.0	382.8	1.1	12.8	17.1	14.2
29	CMT/011/09/2025	22.116374	71.704047	542.6	843.9	1.6	0.5	34.9	<1.0	315.7	1.0	9.1	16.1	13.9
30	CMT/011/05/2025	22.190593	71.730503	894.4	645.8	1.8	0.3	30.3	<1.0	260.2	<1.0	9.4	15.1	9.5
31	CMT/011/56/2025	22.134416	71.701844	969.3	578.3	<1.0	0.5	29.5	<1.0	240.0	0.6	10.5	13.6	9.1
32	CMT/011/14/2025	21.09789	71.713274	1105.1	550.8	3.8	0.7	26.0	2.6	234.6	0.1	7.7	15.2	9.6
33	CMT/011/40/2025	22.209364	71.695371	990.4	543.3	5.0	0.6	34.1	<1.0	216.1	1.0	9.6	13.5	4.7
34	CMT/011/58/2025	22.162114	71.75142	95.1	989.7	<1.0	0.2	36.6	<1.0	289.8	1.2	10.7	19.2	19.8
35	CMT/011/37/2025	22.184795	71.718794	246.5	1001.5	<1.0	0.5	33.7	1.7	451.6	27.2	12.5	20.4	18.4
36	CMT/011/45/2025	22.180843	71.688229	581.3	680.1	1.3	0.2	31.1	<1.0	267.2	2.2	11.7	14.4	9.4
37	CMT/011/42/2025	22.185044	71.692137	659.7	726.0	<1.0	0.1	36.5	<1.0	290.2	<1.0	11.0	15.9	12.9
38	CMT/011/61/2025	22.2073	71.71899	110.1	889.3	<1.0	<0.1	33.3	<1.0	534.5	<1.0	9.7	14.9	16.3
39	CMT/011/49/2025	22.095689	71.694667	442.6	878.8	1.7	0.3	33.6	<1.0	360.4	<1.0	13.5	18.0	15.6
40	CMT/011/41/2025	22.2073	71.721899	665.8	724.0	<1.0	0.1	31.8	<1.0	334.0	<1.0	10.7	13.5	9.8
41	CMT/011/55/2025	22.134415	71.701847	368.1	907.6	1.2	0.2	29.9	<1.0	372.0	<1.0	11.6	17.5	15.8
42	CMT/011/46/2025	22.174263	71.689048	407.0	965.2	1.4	0.4	30.5	<1.0	444.0	2.0	13.2	19.9	17.4
43	CMT/011/36/2025	22.191927	71.714521	123.1	1143.8	21.3	0.4	30.4	<1.0	616.0	81.7	12.4	16.9	19.9
44	CMT/011/34/2025	22.19274	71.715262	35.4	15.6	0.3	<0.1	1.2	2.1	89.6	1.6	0.0	5.8	1.0
45	CMT/011/43/2025	22.179362	71.688045	70.6	35.6	10.0	0.9	14.5	1.3	74.8	5.4	4.2	12.8	8.3
46	CMT/011/68/2025	22.099934	71.680573	140.3	35.6	<1.0	0.2	32.1	<1.0	409.5	<1.0	6.9	17.3	17.5
47	CMT/011/71/2025	22.14027194	71.724475	175.9	25.9	<1.0	3.9	22.7	<1.0	301.1	<1.0	5.6	13.6	15.1
48	CMT/011/24/2025	22.126934	71.723863	23.6	4.4	<1.0	<0.1	3.4	2.2	306.3	<1.0	0.0	3.3	<1.0
49	CMT/011/27/2025	22.128766	71.71457	196.4	32.0	<1.0	<0.1	25.2	<1.0	1006.7	1.8	7.2	15.6	18.4
50	CMT/011/38/2025	22.184536	71.722283	194.7	33.2	<1.0	0.8	34.2	1.2	210.6	1.4	8.1	13.3	9.3
51	CMT/011/18/2025	22.148254	71.66481544	194.7	5.0	<1.0	<0.1	2.1	<1.0	466.2	1.6	0.0	6.2	0.6
52	CMT/011/17/2025	22.148254	71.66481544	19.9	10.0	1.8	<0.1	2.8	3.1	64.9	<1.0	0.0	9.9	4.9
53	CMT/011/66/2025	22.1266	71.66916944	56.6	20.0	1.5	<0.1	28.2	1.3	390.1	<1.0	5.5	12.5	7.5
54	CMT/011/19/2025	22.14564	71.66527	629.6	21.4	1.1	<0.1	35.4	<1.0	222.6	<1.0	9.4	14.6	7.5
55	CMT/011/57/2025	22.162114	71.71542	113.6	327.6	<1.0	0.2	38.2	<1.0	401.1	3.7	12.6	18.6	16.4
56	CMT/011/77/2025	22.14634444	71.68003333	158.7	40.1	<1.0	0.	39.5	1.6	412.2	2.1	10.1	17.5	13.4
57	CMT/011/47/2025	22.177428	71.680213	140.5	34.0	<1.0	0.1	31.8	<1.0	286.2	<1.0	7.4	16.7	14.0
58	CMT/011/35/2025	22.191927	71.714521	308.6	26.4	<1.0	0.1	33.9	<1.0	269.7	<1.0	10.5	15.4	8.0
59	CMT/011/52/2025	22.18247778	71.71603333	180.5	33.1	<1.0	1.5	27.2	<1.0	382.8	<1.0	9.6	15.6	13.6
60	CMT/011/67/2025	22.097325	71.675208	367.0	37.5	<1.0	0.3	33.9	1.1	359.0	<1.0	10.3	17.5	14.5
61	CMT/011/50/2025	22.126561	71.66904	688.5	37.6	2.2	0.3	30.4	<1.0	263.3	1.1	11.1	17.3	14.6
62	CMT/011/65/2025	22.140141	71.661763	46.5	42.4	2.0	0.6	17.1	<1.0	756.5	<1.0	11.4	16.6	14.9
63	CMT/011/60/2025	22.2073	71.721899	502.5	30.7	<1.0	0.4	33.8	2.3	284.0	<1.0	8.8	15.0	10.0
64	CMT/011/51/2025	22.18247778	71.71603333	72.3	36.5	18.4	0.4	21.2	1.5	323.0	1.4	7.1	14.9	11.0
65	CMT/011/44/2025	22.114746	71.659994	496.6	40.9	<1.0	0.3	30.0	1.9	375.3	<1.0	10.3	17.2	18.8
66	CMT/011/59/2025	22.2073	71.721899	668.6	26.4	1.0	0.2	30.6	<1.0	206.3	<1.0	8.3	15.7	12.9
67	CMT/011/33/2025	22.193824	71.715931	529.8	34.7	1.4	0.3	35.3	<1.0	327.3	1.2	12.4	16.2	13.7
68	CMT/011/62/2025	22.177045	71.680412	259.6	-	-	-	-	-	-	-	-	-	-
69	CMT/011/70/2025	22.123044	71.716298	442.8	-	-	-	-	-	-	-	-	-	-
70	CMT/011/64/3035	22.192224	71.725071	336.7	-	-	-	-	-	-	-	-	-	-
71	CMT/011/74/2025	22.180883	71.688233	119.3	-	-	-	-	-	-	-	-	-	-
72	CMT/011/76/2025	22.13204167	71.70177222	321.5	-	-	-	-	-	-	-	-	-	-
73	CMT/011/75/2025	22.170773	71.688231	240.8	-	-	-	-	-	-	-	-	-	-
74	CMT/011/72/2025	22.181636	71.720663	648.2	-	-	-	-	-	-	-	-	-	-
75	CMT/011/29/2026	22.144641	71.705762	329.3	-	-	-	-	-	-	-	-	-	-
76	CMT/011/16/2027	22.11544	71.660568	539.1	-	-	-	-	-	-	-	-	-	-
77	CMT/011/10/2027	22.123988	71.699138	694.2	-	-	-	-	-	-	-	-	-	-

S.No	Sample ID	Latitude	Longitude	Nickel as Ni	Niobium as Nb (ppm)	Lead as Pb (ppm)	Silver as Ag (ppm)	Scandium as sc (ppm)	Selenium as Se (ppm)	Strontium as Sr (ppm)	Tin as Sn (ppm)	Tantalum as Ta (ppm)	Tellurium as Te (ppm)	Thallium as Tl (ppm)	Vanadium as V (ppm)	Tungsten as W (ppm)	Zironium as Zr (ppm)	Zinc as Zn (ppm)	Antimony Sb (ppm)	Arsenic as As (ppm)	Barium as Ba (ppm)	Beryllium as Be (ppm)	Bismuth as Bi (ppm)	Cadmium as Cd (ppm)	Chromium as Cr (ppm)	Cobalt as Co (ppm)	Copper as Cu (ppm)	Gallium as Ga (ppm)	Germanium as Ge (ppm)	Hafnium as He (ppm)	Indium as In (ppm)	Lithium as Li (ppm)	Molybdenum as Mo (ppm)
1	P1/BTB/2025	22.171803	71.68595	297.2	1262.6	<1.0	<0.1	291	1.4	431.6	<1.0	40.9	4.6	33.2	218.8	<1.0	165.3	89.5	0.6	4.7	339.6	<1.0	<0.5	<0.5	468.0	31.2	131.2	25.2	4.1	2.1	<1.0	8.3	1.7
2	P2/BTB/2025	22.1753	71.686443	405.4	1188.7	31.4	<0.1	287.4	<0.5	436.6	<1.0	17.9	4.1	31.8	237.5	<1.0	167.9	80.0	<0.5	4.8	342.4	<1.0	<0.5	<0.5	374.3	32.0	133.1	25.6	3.0	2.3	<1.0	8.8	1.9
3	P3/BTB/2025	22.175935	71.686137	315.3	1219.6	6.0	<0.1	299.6	<0.5	445.7	<1.0	17.7	3.5	34.1	274.5	27.8	172.7	88.7	<0.5	6.1	350.7	<1.0	<0.5	<0.5	433.4	29.9	142.4	27.1	2.7	2.2	<1.0	9.2	2.4
4	P4/BTB/2025	22.17693	71.686795	139.5	1395.9	720.9	<0.1	316.9	<0.5	386.8	<1.0	19.1	5.2	40.4	276.9	<1.0	193.8	92.2	<0.5	4.9	427.6	<1.0	<0.5	<0.5	122.2	23.0	157.4	27.6	5.5	3.3	<1.0	8.4	2.5
5	P5/BTB/2025	22.178015	71.686268	209.3	660.4	1.0	<0.1	178.3	<0.5	445.4	<1.0	9.9	5.7	22.4	125.7	<1.0	92.8	34.2	<0.5	7.4	116.1	<1.0	<0.5	<0.5	269.8	18.2	77.3	15.6	4.0	2.2	<1.0	5.7	1.8
6	P6/BTB/2025	22.177838	71.685027	160.0	933.8	2.6	<0.1	250.1	<0.5	301.1	<1.0	13.5	2.5	28.1	223.5	<1.0	123.4	57.5	0.5	10.1	229.7	<1.0	<0.5	<0.5	218.4	20.6	115.5	21.1	2.9	0.7	<1.0	11.2	2.0
7	P7/BTB/2025	22.179392	71.68802	434.7	1097.1	<1.0	<0.1	317.7	<0.5	595.0	<1.0	15.2	3.4	31.3	234.9	<1.0	154.1	76.2	0.5	5.8	458.4	<1.0	<0.5	<0.5	658.2	34.3	152.6	24.8	2.2	<1.0	<1.0	7.8	2.1
8	P8/BTB/2025	22.17983	71.688527	223.5	838.5	<1.0	0.1	232.5	<0.5	477.9	<1.0	11.0	2.1	15.6	154.6	<1.0	113.9	80.1	<0.5	4.2	243.1	<1.0	<0.5	<0.5	452.0	32.2	52.4	22.4	3.3	0.6	<1.0	7.8	0.8
9	P9/BTB/2025	22.182173	71.687272	511.3	536.2	3.7	<0.1	178.8	<0.5	406.1	<1.0	8.6	1.1	15.6	102.0	<1.0	76.6	59.1	<0.5	3.2	136.4	<1.0	0.5	<0.5	377.8	48.1	98.2	17.2	3.8	2.3	<1.0	5.8	0.1
10	P10/BTB/2025	22.174173	71.690027	543.7	840.4	1.6	<0.1	292.3	<0.5	321.0	<1.0	12.5	1.2	22.2	164.9	<1.0	118.0	80.2	<0.5	2.7	240.8	<1.0	0.5	<0.5	691.5	43.7	100.2	21.4	2.3	0.6	<1.0	7.6	0.1
11	P11/BTB/2025	22.1722445	71.689718	346.3	1059.3	5.3	<0.1	261.3	<0.5	734.6	<1.0	14.7	4.2	32.7	215.5	<1.0	150.7	74.1	<0.5	9.2	361.7	<1.0	0.5	<0.5	399.1	34.8	128.3	23.3	2.3	2.0	<1.0	20.5	2.3
12	P12/BTB/2025	22.1708	71.689153	449.8	796.4	<1.0	<0.1	251.4	<0.5	698.5	<1.0	12.2	2.0	23.1	154.7	<1.0	114.6	74.9	0.5	5.9	327.0	<1.0	0.5	<0.5	446.5	40.0	102.4	21.4	4.7	2.3	<1.0	10.3	1.9
13	P13/BTB/2025	22.196212	71.6982	598.0	661.0	<1.0	<0.1	202.6	1.7	251.3	<1.0	11.2	2.3	19.1	144.6	<1.0	93.0	75.3	<0.5	10.3	248.8	<1.0	<0.5	<0.5	507.7	64.1	129.2	22.1	2.1	<1.0	<1.0	10.1	4.6
14	P14/BTB/2025	22.192557	71.692855	285.8	252.3	2.1	<0.1	117.0	<0.5	288.4	<1.0	3.3	<0.5	12.5	70.2	<1.0	32.7	17.7	<0.5	2.8	70.6	<1.0	<0.5	<0.5	344.4	17.6	25.4	7.1	3.2	<1.0	<1.0	4.7	1.0
15	P15/BTB/2025	22.187255	71.691693	404.4	747.6	<1.0	<0.1	328.0	<0.5	354.2	<1.0	12.6	1.6	20.0	172.8	17.4	96.8	65.4	<0.5	1.2	266.9	<1.0	<0.5	<0.5	606.2	37.6	111.1	22.8	3.3	0.4	<1.0	7.8	0.1
16	P16/BTB/2025	22.184922	71.692865	653.5	788.4	<1.0	<0.1	329.0	4.7	268.0	<1.0	12.4	1.4	21.8	161.3	<1.0	103.5	65.7	<0.5	2.2	222.0	<1.0	0.5	<0.5	1156.9	47.9	57.0	19.8	1.7	0.1	<1.0	6.0	<1.0
17	P17/BTB/2025	22.182715	71.692312	412.9	1207.6	3.7	<0.1	273.7	<0.5	404.6	<1.0	15.6	1.0	32.5	227.3	168.0	84.7	89.6	<0.5	3.6	326.6	<1.0	0.5	<0.5	539.7	33.6	145.6	26.9	3.3	<1.0	<1.0	6.4	1.1
18	P18/BTB/2025	22.181883	71.695478	260.3	1074.9	4.0	<0.1	259.9	<0.5	290.6	<1.0	15.1	3.9	30.6	200.4	3.9	155.9	71.0	<0.5	3.7	424.3	<1.0	<0.5	<0.5	271.2	27.5	139.6	21.0	4.0	3.0	<1.0	12.0	0.4
19	P19/BTB/2025	22.180908	71.701997	757.1	569.9	1.7	<0.1	278.0	<0.5	167.5	<1.0	10.0	0.3	14.0	104.5	<1.0	77.7	57.4	0.5	2.9	40.8	<1.0	<0.5	<0.5	729.6	51.5	84.5	15.9	2.7	2.0	<1.0	9.6	1.2
20	P20/BTB/2025	22.178752	71.698485	751.8	455.9	<1.0	<0.1	239.7	3.6	197.6	<1.0	7.9	0.7	13.2	107.2	<1.0	59.9	47.5	3.7	3.5	5.9	<1.0	<0.5	<0.5	770.1	52.1	41.5	13.4	5.5	2.0	<1.0	7.3	0.2
21	P21/BTB/2025	22.178628	71.693582	195.1	848.5	1.5	<0.1	226.0	<0.5	1020.4	<1.0	10.2	0.3	23.3	131.4	<1.0	59.5	59.6	<0.5	3.4	517.6	<1.0	0.5	<0.5	340.3	24.3	72.2	20.5	4.0	1.0	<1.0	11.0	0.6
22	P22/BTB/2025	22.17	71.710833	383.8	771.9	4.2	<0.1	249.0	<0.5	622.5	<1.0	11.0	1.2	22.3	155.9	<1.0	92.3	62.7	<0.5	7.7	215.5	<1.0	0.5	<0.5	656.5	30.8	72.5	19.9	<1.0	<1.0	<1.0	23.0	<1.0
23	P23/BTB/2025	22.169528	71.685037	468.1	1020.4	<1.0	<0.1	307.6	10.4	395.7	<1.0	15.1	3.4	27.5	196.2	<1.0	144.3	74.0	<0.5	3.7	321.4	<1.0	<0.5	<0.5	735.5	38.4	127.6	23.8	1.5	1.6	<1.0	7.9	0.5
24	P24/BTB/2025	22.1688	71.684002	497.2	1104.6	<1.0	<0.1	323.8	8.7	406.8	<1.0	15.4	4.0	28.6	239.9	<1.0	147.7	79.1	0.5	5.2	308.8	<1.0	<0.5	<0.5	715.8	39.3	144.1	25.0	1.9	<1.0	<1.0	8.5	3.2
25	P25/BTB/2025	22.166423	71.678943	371.5	684.3	2.5	<0.1	217.9	<0.5	546.2	<1.0	8.2	2.3	18.9	134.6	<1.0	77.8	52.5	<0.5	6.3	170.5	<1.0	0.5	<0.5	564.7	27.7	65.7	17.3	1.6	<1.0	<1.0	19.5	0.1
26	P26/BTB/2025	22.162388	71.679848	351.9	1164.8	<1.0	<0.1	309.3	<0.5	433.0	<1.0	15.7	3.6	31.8	218.7	4.0	165.7	78.2	<0.5	3.8	365.6	<1.0	<0.5	<0.5	530.2	33.3	146.4	26.5	1.5	<1.0	<1.0	12.0	1.6
27	P27/BTB/2025	22.164405	71.684322	179.1	1004.9	<1.0	<0.1	260.7	<0.5	377.9	<1.0	13.3	2.0	27.1	209.3	<1.0	124.2	71.5	<0.5	5.2	236.2	<1.0	<0.5	<0.5	424.8	28.8	46.7	25.0	1.5	0.7	<1.0	7.1	1.5
28	P28/BTB/2025	22.175482	71.681255	425.2	1053.2	<1.0	<0.1	312.2	4.5	390.3	<1.0	14.8	2.5	27.6	188.8	<1.0	147.2	72.6	<0.5	3.0	318.5	<1.0	<0.5	<0.5	765.9	36.9	126.5	24.5	1.5	1.6	<1.0	8.7	1.0
29	P29/BTB/2025	22.184031	71.695361	561.9	1000.1	<1.0	<0.1	313.2	<0.5	435.4	<1.0	13.0	1.5	26.0	198.5	<1.0	140.7	79.5	30	<0.5	3.7	477.0	<1.0	<0.5	<0.5	438.6	36.6	124.2	17.9	3.2	2.1	<1.0	15.8
30	P30/BTB/2025	22.16865	71.685003	468.4	1051.4	<1.0	<0.1	314.6	7.3	435.9	<1.0	15.9	3.4	27.0	203.6	<1.0	146.9	79.6	2.4	5.4	320.7	<1.0	<0.5	<0.5	852.7	39.3	128.2	24.6	1.8	1.4	<1.0	7.8	2.0
31	P31/BTB/2025	22.120888	71.696067	746.9	666.1	1.5	<0.1	26.7	<0.5	217.0	37.0	12.2	16.4	<0.5	166.5	2.5	100.2	63.0	9.9	7.1	196.7	<1.0	2.3	<0.5	1136.1	51.5	85.4	17.3	2.9	<1.0	<1.0	5.1	10.7
32	P32/BTB/2025	22.169232	71.713553	164.8	410.1	3.2	<0.1	18.4	<0.5	531.8	1.8	531.8	531.8	531.8	131.6	1.6	24.3	56.7	3.7	11.2	212.2	<1.0	1.1	<0.5	484.1	37.0	16.6	10.9	1.4	1.3	<1.0	22.7	9.9
33	P33/BTB/2025	22.168056	71.713889	87.2	254.8	3.8	<0.1	8.9	<0.5	719.3	<1.0	719.3	719.3	719.3	84.6	1.3	10.4	36.6	<0.5	8.6	120.4	<1.0	<0.5	<0.5	150.6	20.3	8.1	7.3	<1.0	0.6	<1.0	13.2	9.1
34	P34/BTB/2025	22.1675	71.721667	88.1	259.3	2.6	<0.1	9.0	<0.5	738.9	<1.0	738.9	738.9	738.9	89.1	<1.0	8.5	37.7	<0.5	8.9	124.5	<1.0	<0.5	<0.5	144.3	20.3	9.7	7.9	2.1	0.6	<1.0	13.2	7.0

35	P35/BTB/2025	22.161389	71.726944	93.1	1084.3	1.4	<0.1	27.1	<0.5	525.9	3.2	525.9	525.9	525.9	240.7	1.8	77.1	154.1	1.7	7.5	417.7	<1.0	<1.0	<0.5	164.0	65.2	20.2	23.9	4.6	3.8	<1.0	8.1	54.6
36	P36/BTB/2025	22.158056	71.724167	150.0	360.5	1.7	<0.1	14.7	<0.5	1176.5	<1.0	1176.5	1176.5	1176.5	151.1	14.3	15.3	52.8	1.3	6.6	184.9	<1.0	<1.0	<0.5	396.4	34.1	14.9	9.2	2.7	1.0	<1.0	15.5	13.2
37	P37/BTB/2025	22.153889	71.727778	140.9	251.6	1.0	<0.1	10.8	<0.5	1671.9	<1.0	1671.9	1671.9	1671.9	94.9	<1.0	10.4	34.1	<0.5	6.6	106.3	<1.0	<1.0	<0.5	250.4	24.0	12.1	6.4	1.9	0.4	<1.0	9.8	5.1
38	P38/BTB/2025	22.15557	71.725395	530.8	386.4	<1.0	<0.1	19.1	<0.5	933.1	<1.0	933.1	933.1	933.1	73.8	<1.0	32.8	56.6	3.6	5.8	58.5	<1.0	<1.0	<0.5	546.8	50.0	37.5	8.8	1.2	0.6	<1.0	17.6	3.3
39	P39/BTB/2025	22.159444	71.722222	266.3	857.3	2.5	<0.1	31.6	0.9	405.8	<1.0	405.8	405.8	405.8	200.8	8.7	62.7	178.0	5.7	7,6	338.8	<1.0	0.6	<0.5	604.5	98.9	29.1	19.1	2.5	3.8	<1.0	15.2	<0.5
40	P40/BTB/2025	22.141183	71.727643	315.3	921.7	1.1	<0.1	27.4	2.0	367.3	10.4	367.3	367.3	367.3	216.7	<1.0	66.2	131.8	4.7	6.2	234.5	<1.0	0.9	<0.5	406.9	111.2	32.8	19.9	2.4	2.5	<1.0	24.1	2.3
41	P41/BT8/2025	22.142363	71.720277	202.9	517.7	1.1	<0.1	13.7	<0.5	406.7	<1.0	406.7	406.7	406.7	102.5	<1.0	25.8	67.8	1.4	4.2	122.1	<1.0	<0.5	<0.5	266.7	45.2	18.7	11.3	1.6	1.0	<1.0	8.9	<1.0
42	P42/BTB/2025	22.145588	71.71484	417.4	771.6	1.0	<0.1	27.9	<0.5	497.3	3.1	497.3	497.3	497.3	159.2	12.5	73.2	113.8	4.0	5.2	157.4	<1.0	2.0	<1.0	474.6	131.0	41.4	18.9	4.5	1.8	<1.0	6.7	0.4
43	P43/BTB/2025	22.143911	71.705497	313.5	984.5	1.6	<0.1	28.9	<0.5	365.0	53.0	365.0	365.0	365.0	217.2	<1.0	68.4	138.8	3.3	7.6	323.1	<1.0	1.4	0.5	473.3	120.9	32.9	21.2	3.5	2.7	<1.0	6.1	0.6
44	P44/BTB/2025	22.151969	71.698906	667.2	542.3	<1.0	<0.1	20.0	<0.5	173.6	<1.0	173.6	173.6	173.6	128.1	<1.0	56.6	76.8	6.4	6.3	140.3	<1.0	0.6	<0.5	741.2	79.3	59.3	15.3	1.2	1.0	<1.0	9.7	0.5
45	P45/BTB/2025	22.159397	71.689622	121.0	1186.6	2.8	<0.1	26.3	<0.5	375.1	1.7	375.1	375.1	375.1	226.4	<1.0	72.1	178.7	4.1	4.8	386.6	<1.0	0.5	0.5	130.7	62.6	22.6	24.3	5.9	4.0	<1.0	7.5	1.4
46	P46/BTB/2025	22.149444	71.671944	420.0	783.6	1.8	<0.1	22.5	<0.5	210.2	20.7	210.2	210.2	210.2	120.2	<1.0	59.1	103.4	4.1	4.7	138.2	<1.0	1.4	<0.5	500.4	102.3	36.6	16.6	2.7	1.6	<1.0	4.7	<0.5
47	P47/BTB/2025	22.146667	71.673333	435.5	878.4	1.3	<0.1	25.4	0.9	236.9	<1.0	236.9	236.9	236.9	100.3	1.2	62.7	118.4	6.4	4.4	107.8	<1.0	0.8	<0.5	823.0	126.8	33.8	20.1	2.3	1.7	<1.0	16.5	0.8
48	P48/BTB/2025	22.145886	71.679947	393.2	767.9	1.6	<0.1	31.5	<0.5	289.2	<1.0	289.2	289.2	289.2	183.1	23.0	56.0	103.1	7.2	4.0	226.7	<1.0	0.9	0.5	813.5	86.4	37.1	19.1	3.0	1.6	<1.0	5.9	0.9
49	P49/BTB/2025	22.136086	71.664194	262.7	955.2	<1.0	<0.1	32.8	<0.5	426.5	8.4	426.5	426.5	426.5	218.4	<1.0	65.8	139.0	5.0	3.9	294.3	<1.0	1.4	<0.5	506.3	78.3	30.2	20.5	5.1	2.8	<1.0	10.2	1.4
50	P50/BTB/2025	22.114444	71.658889	355.9	837.0	<1.0	<0.1	30.2	<0.5	329.5	<1.0	329.5	329.5	329.5	203.7	<1.0	59.2	119.5	6.0	4.4	278.4	<1.0	0.9	<0.5	522.1	117.7	34.9	19.4	4.1	2.1	<1.0	6.6	<0.5
51	PS1/BTB/2025	22.116389	71.66	320.9	834.3	1.9	<0.1	30.1	<0.5	368.8	<1.0	368.8	368.8	368.8	176.6	<1.0	77.1	123.8	5.0	4.8	341.2	<1.0	1.5	<0.5	457.1	115.6	32.7	20.1	1.8	2.4	<1.0	6.6	1.5
52	PS2/BTB/2025	22.116667	71.660833	303.7	711.8	3.7	<0.1	25.8	<0.5	325.0	<1.0	325.0	325.0	325.0	182.5	<1.0	74.8	106.1	7.1	4.3	390.4	<1.0	1.5	0.5	391.9	103.3	30.0	18.4	4.6	2.4	<1.0	6.0	<0.5
53	P53/BTB/2025	22.128056	781.6675	407.6	707.3	<1.0	<0.1	25.9	<0.5	455.4	<1.0	455.4	455.4	455.4	143.4	<1.0	55.6	105.3	3.8	4.9	411.3	<1.0	1.7	<0.5	478.2	80.6	42.9	18.8	1.2	<1.0	<1.0	11.1	1.7
54	P54/BTB/2025	22.103611	71.679167	740.7	693.8	1.0	<0.1	29.9	<0.5	331.1	22.5	331.1	331.1	331.1	88.7	1.7	61.8	100.0	12.5	4.6	120.0	<1.0	1.1	0.5	576.6	86.9	53.0	17.6	2.0	<1.0	<1.0	12.3	<1.0
55	PS5/BTB/2025	22.1225	71.6675	660.4	634.1	1.2	<0.1	22.1	<0.5	438.6	<1.0	438.6	438.6	438.6	126.2	<1.0	62.0	89.6	4,9	4.8	180.4	<1.0	0.8	0.5	535.9	130.2	57.2	18.6	1.8	<1.0	<1.0	10.6	<1.0
56	PS6/BTB/2025	22.124167	71.671111	602.8	707.8	<1.0	<0.1	23.0	<0.5	436.7	<1.0	436.7	436.7	436.7	135.9	<1.0	63.0	97.1	6.4	5.6	169.3	<1.0	1.2	<0.5	557.4	148.4	48.3	18.3	4.0	<1.0	<1.0	10.6	<1.0
57	PS7/BTB/2025	22.118056	71.677222	641.0	525.2	<1.0	<0.1	21.9	<0.5	158.8	1.1	158.8	158.8	158.8	124.0	<1.0	62.6	75.9	6.0	4.6	97.3	<1.0	1.5	<0.5	680.7	64.9	50.2	14.3	1.7	0.9	<1.0	6.2	1.7
58	P58/BTB/2025	22.120556	71.6775	919.6	351.0	<1.0	<0.1	17.7	<0.5	137.7	<1.0	137.7	137.7	137.7	111.9	<1.0	62.7	53.0	7.5	5.0	117.2	<1.0	1.4	<0.5	771.5	99.0	75.5	15.5	2.4	0.2	<1.0	6.8	3.0
59	P59/BTB/2025	22.133644	71.674756	732.5	553.5	4.5	<0.1	23.2	<0.5	220.4	<1.0	220.4	220.4	220.4	129.5	<1.0	97.8	87.2	11.6	6.0	158.8	<1.0	1.1	<0.5	609.1	81.9	53.4	15.8	3.0	<1.0	<1.0	6.6	2.1
60	P60/BTB/2025	22.204069	71.707147	309.5	842.9	1.6	<0.1	26.6	<0.5	315.6	<1.0	315.6	315.6	315.6	163.3	1.0	64.2	139.0	4.4	6.5	280.1	<1.0	1.6	<0.5	387.0	144.7	36.8	19.6	5.3	<1.0	<1.0	10.7	9.4

60	P60/BTB/2025	22.204069	71.707147	309.5	842.9	1.6	<0.1	26.6	<0.5	315.6	<1.0	315.6	315.6	315.6	163.3	1.0	64.2	139.0	4.4	6.5	280.1	<1.0	1.6	<0.5	387.0	144.7	36.8	19.6	5.3	<1.0	<1.0	10.7	9.4
61	P61/BTB/2025	22.214167	71.711111	175.1	670.8	3.5	<0.1	23.1	<0.5	1089.5	<1.0	6.7	9.2	11.9	140.4	1	103.0	48.2	<0.5	8.6	166.1	<1.0	<0.5	<0.5	424.3	46.9	15.6	13.4	2	<1.0	<1.0	11.9	<1.0
62	P62/BTB/2025	22.113889	71.686667	647.2	602.8	5.8	1.6	27.9	<0.5	253.6	<1.0	11.5	11.7	9.9	146.5	4.5	277.2	152.2	4.6	5.0	279.1	<1.0	<0.5	<0.5	645.7	60.0	55.8	17.3	<1.0	10.0	<1.0	4.5	1.2
63	P63/BTB/2025	22.116667	71.686389	645.6	667.9	3.9	1.5	28.2	<0.5	278.2	1.4	11.1	12.7	8.2	117.0	1.6	90.7	113.6	3.7	4.3	261.6	<1.0	<0.5	<0.5	532.9	52.1	71.2	15.9	<1.0	2.2	<1.0	4.1	1.7
64	P64/BTB/2025	22.118889	71.688056	989.4	444.7	3.3	0.7	20.0	<0.5	183.4	<1.0	11.3	11.6	1.1	117.8	1.5	93.3	78.3	7.3	110.9	186.5	<1.0	1.7	12.1	825.8	71.9	64.5	13.3	<1.0	1.3	<1.0	4.5	<1.0
65	P65/BTB/2025	22.118903	71.692731	1025.4	437.4	1.3	0.5	21.0	<0.5	195.8	<1.0	11.3	10.1	2.9	113.5	2.0	84.4	77.0	7.8	135.3	197.8	<1.0	<0.5	16.3	853.4	81.5	65.2	14.2	<1.0	1.5	<1.0	4.8	<1.0
66	P66/BTB/2025	22.121389	71.697778	1024.6	455.6	2.4	0.8	20.4	<0.5	180.3	<1.0	10.8	8.7	2.6	112.2	0.6	89.9	84.2	9.9	44.8	194.9	<1.0	1.4	17.5	966.9	77.6	68.8	14.7	<1.0	1.8	<1.0	4.9	<1.0
67	P67/BTB/2025	22.094167	71.705833	392.6	612.5	4.2	1.2	21.8	<0.5	529.8	<1.0	8.6	7.1	7.9	144.4	2.8	62.7	91.1	6.3	119.2	117.0	<1.0	<0.5	13.0	759.6	28.4	51.2	13.6	<1.0.	1.3	<1.0	15.7	<1.0
68	P68/BTB/2025	22.098333	71.691667	933.4	415.2	1.6	0.6	20.3	<0.5	250.5	<1.0	7.1	11.4	4.7	103.2	3.0	65.8	70.6	7.6	4.6	121.4	<1.0	<0.5	<0.5	728.7	76.2	69.1	12.8	<1.0	0.9	<1.0	7.3	1.5
69	P69/BTB/2025	22.12398	71.69963	989.3	573.8	15.2	2.0	23.8	<0.5	181.7	<1.0	10.3	13.1	7.4	115.6	3.0	107.1	99.5	11.6	8.9	145.8	<1.0	<0.5	<0.5	1218.7	68.1	76.4	14.5	<1.0	1.2	<1.0	4.4	3.6
70	P70/BTB/2025	22.124167	71.701389	1073.5	493.8	1.7	0.4	27.6	<0.5	159.8	<1.0	12.1	12.3	5.5	94.3	1.7	95.7	88.3	9.1	6.9	148.0	<1.0	<0.5	<0.5	1162.4	74.8	88.4	14.7	<1.0	1.4	<1.0	4.5	2.9
71	P71/BTB/202	22.127778	71.701667	676.8	794.9	1.5	0.5	30.6	<0.5	269.1	3.3	15.3	16.2	8.0	159.8	2.2	72.7	133.4	11.2	59.4	186.9	<1.0	<0.5	12.9	1282.1	50.9	80.1	18.0	2.7	1.9	<1.0	1.8	<1.0
72	P72/BTB/202	22.128056	71.699167	633.0	738.7	2.4	0.6	29.5	<0.5	258.4	<1.0	7.9	15.7	8.6	149.8	2.5	99.2	123.4	10.5	120.5	178.7	<1.0	<0.5	14.9	991.9	47.3	80.3	15.9	<1.0	2.0	<1.0	5.2	1.6
73	P73/BTB/2025	22.131111	71.705556	563.1	883.0	1.5	0.6	31.5	<0.5	273.4	<1.0	10.2	16.1	8.5	169.3	3.5	75.5	149.2	6.9	7.2	200.0	<1.0	<0.5	<0.5	810.4	44.1	78.9	17.8	1.1	2.7	<1.0	4.7	<1.0
74	P74/BTB/2025	22.132264	71.701878	417.3	674.6	1.5	1.6	28.6	<0.5	398.1	<1.0	8.3	13.5	6.7	119.2	2.2	65.6	104.3	7.3	6.0	93.4	<1.0	<0.5	14.2	776.6	39.9	73.2	15.9	1.6.	2.0	<1.0	314.4	1.4
75	P75/BTB/2025	22.135278	71.700556	857.1	575.9	<1.0	0.5	25.4	<0.5	217.5	<1.0	10.2	14.0	6.7	128.2	2.5	82.0	107.6	6.9	5.3	144.8	2.9	<0.5	<0.5	968.5	59.9	78.8	16.0	2.5	1.6	<1.0	5.1	1.8
76	P76/BTB/2025	22.134444	71.697222	830.5	707.4	4.1	0.5	27.6	<0.5	255.7	<1.0	10.3	15.2.	13.1	155.8	2.3	84.4	121.5	5.6	7.5	167.3	<1.0	<0.5	<0.5	842.3	60.5	83.8	16.4	4.1	2.2	<1.0	11.2	<1.0
77	P77/BTB/2025	22.13575	71.7183	283.2	601.9	4.4.	0.4	16.7	1.7	671.2	<1.0	5.9	10.5	4.1	115.9	1.4	45.4	88.3	2.7	90.2	107.0	<1.0	<0.5	10.0	369.6	23.3	57.3	13.4	3.5	1.6	<1.0	4.8	<1.0
78	P78/BTB/2025	22.126667	71.723611	432.1	945.6	2.6	0.8	33.1	1.3	329.6	<1.0	16.0	16.1	12.6	208.7	2.5	95.4	154.3	9.7	19.1	278.6	<1.0	3.5	14.8	757.3	39.7	111.1	19.5	<1.0	3.1	<1.0	4.8	<1.0
79	P79/BTB/2025	22.131667	71.717778	526.7	754.2	3.1	0.8	29.7	1.3	298.1	11.1	278.3	9.7	15.6	<1.0	162.5	126.2	2.2	2.8	4.8	241.2	<1.0	0.5	<0.5	787.3	46.7	94.3	17.1	<1.0	3.3	<1.0	2.7	2.9
80	P80/BTB/2025	22.127222	71.715833	530.3	643.1	2.4	0.8	30.3	<0.5	299.2	10.7	281.7	8.4	16.6	<1.0	163.2	97.0	2.6	5.3	4.6	242.5	<1.0	<0.5	<0.5	791.5	45.6	95.2	16.6	1.3	2.1	<1.0	2.2	5.2
81	P81/BTB/2025	22.122778	71.715278	501.1	787.0	4.3	0.7	25.6	<0.5	302.8	<1.0	15.2	14.9	13.9	159.9	2.7	84.8	115.9	3.5	8.7	180.8	<1.0	<0.5	<0.5	591.3	50.5	91.8	18.1	<1.0	2.2	<1.0	2.2	1.6
82	P82/BTB/2025	22.145278	71.665278	300.4	1024.3	8.5	0.8	30.3	<0.5	425.9	<1.0	12.2	17.9	13.1	190.2	3.5	167.7	178.4	8.3	6.8	305.5	<1.0	3.2	<0.5	466.4	31.6	95.0	21.1	1.8	3.9	<1.0	1.6	<1.0
83	P83/BTB/2025	22.140148	71.66178	251.7	747.3	34.6	0.	22.2	<0.5	320.5	<1.0	11.5	16.0	12.2	153.8	3.7	179.2	121.1	6.3	10.3	180.1	<1.0	<0.5	<0.5	515.1	43.1	36.0	20.1	2.6	2.1	<1.0	2.0	<1.0
84	P84/BTB/2025	22.135923	71.673618	179.3	497.7	5.9	0.	34.5	1.5	362.8	<1.0	9.6	13.2	2.8	246.3	7.9	87.4	62.1	5.2	9.3	215.7	<1.0	<0.5	<0.5	254.0	34.7	193.9	20.3	<1.0	1.3	<1.0	1.9	<1.0
85	P85/BTB/2025	22.1125	71.678333	776.8	856.9	1.	0.	32.7	<0.5	445.2	1.6	12.2	16.4	10.9	130.3	2.1	93.5	138.5	10.2	109.8	228.7	<1.0	<0.5	12.6	835.6	59.9	123.5	18.1	1.2	2.8	<1.0	2.7	<1.0
86	PB6/BTB/2025	22.111418	71.678823	415.3	681.7	4.	0.	26.7	<0.5	758.7	<1.0	9.0	13.4	8.9	173.1	2.5	62.5	105.3	6.5	12.6	261.7	<1.0	<0.5	<0.5	706.3	29.5	70.0	15.9	<1.0	2.2	<1.0	2.0	<1.0
87	P87/BTB/2025	22.100278	71.683889	1025.3	418.4	2.	0.	19.3	<0.5	207.5	<1.0	11.4	11.8	4.0	112.0	1.3	68.9	70.0	8.6	29.3	95.9	<1.0	<0.5	13.0	918.0	81.0	61.9	13.2	<1.0	0.8	<1.0	1.4	<1.0
88	P88/BTB/2025	22.088611	71.69	1116.3	313.2	<1.0	0.4	16.6	<0.5	207.2	<1.0	8.4	9.7	0.6	96.6	1.6	65.0	54.4	10.0	37.5	115.0	<1.0	<0.5	13.8	909.1	91.0	51.7	13.3	<1.0	1.0	<1.0	1.3	<1.0
89	P89/BTB/2025	22.101944	71.6725	467.6	943.0	1.3	11.6	31.3	1.0	232.9	<1.0	10.7	16.9	15.0	117.2	2.3	66.3	138.2	8.5	49.2	420.7	<1.0	2.0	14.1	640.8	37.7	63.2	18.7	<1.0	3.9	<1.0	3.1	<1.0
90	P90/BTB/2025	22.10974	71.673258	290.2	732.3	4.9	0.4	31.3	<0.5	583.6	<1.0	10.0	12.0	11.2	191.2	2.1	58.9	113.1	4.4	34.2	226.3	<1.0	<0.5	15.7	605.3	27.1	48.6	16.6	<1.0	2.5	<1.0	3.3	<1.0
91	P91/BTB/2025	22.113056	71.666944	873.0	633.2	2.4	0.	20.9	<0.5	163.3	<1.0	9.3	14.3	9.1	128.7	3.0	79.6	102.1	5.8	136.0	87.0	<1.0	0.6	16.0	804.9	65.5	77.2	16.0	<1.0	1.3	<1.0	3.9	<1.0
92	P92/BTB/2025	22.118611	71.652778	805.5	430.4	<0.5	0.4	25.9	<0.5	383.3	<1.0	8.1	11.7	1.4	122.0	3.4	74.0	75.4	5.9	4.3	156.9	<1.0	0.8	14.6	758.4	74.3	69.5	12.5	<1.0	2	<1.0	0.8	<1.0
93	P93/BTB/2025	22.118056	71.6475	866.1	741.9	<0.5	0.8	18.1	1.4	284.3	<1.0	13.9	15.0	6	162.2	3.2	91.2	123.3	8.8	13.0	185.2	<1.0	0.5	16.2	936.2	65.7	102.3	16.1	<1.0	2.0	<1.0	10.9	<1.0
94	BRS94/BTB/2025	22.1941667	71.7194444	270.5	39850.0	<1.0	1.0	29.1	0.2	344.5	<1.0	21.7	<1.0	42.1	210.4	15.1	213.1	99.3	7	47.7	366.5	<1.0	<1.0	11.3	431.4	33.4	167.7	16.3	4.5	4.2	<1.0	8.4	61.4
95	BRS95/BTB/2025	22.1902778	71.7202778	244.8	905.0	4.5	0.9	28.7	1.9	360.8	<1.0	11.3	16.5	12.1	216.3	20.5	195.3	1752.6	3.7	4.8	374.4	<1.0	<1.0	13.9	382.6	32.1	75.6	20.7	6.2	4.8	<1.0	8.4	<1.0

Test results:Major oxides in %

TEST RESULTS

LUCID Laboratories Pvt. Ltd.
Testing to the Core

Issued to:

Critical Mineral Trackers
N.No 7-1-58/CC/406, 'Concourse ', Opp.Lal Bungalow
Greenlands, Begumpet,
Hyderabad-500 016
Kind Attn: Mr.K.Mahender Reddy, 9032012955

LAB REGISTRATION NO: LL/25-26/006623(1 to 20)
Date. Of Receipt of Sample : 15.09.2025
Date. Of Starting of Analysi : 16.092025
Date. Of Completing of Analysis : .20.09.2025
Customer Ref: Test Request

Sample Particulars : Olivine Basalt / Picritic Basalt Pits

S.No	Registration Number	Sample ID	Silica as SiO2	Aluminium as Al2O3	Iron as Fe2O3	Magnesium as MgO	Calcium as CaO	Manganese as MnO	Sodium as Na2O	Potassium as K2O	Titanium as TiO2	Phosphorus as P2O5	Vanadium as V2O5	Loss on Ignition
			(% by mass)	(% by mass)	(% by mass)	(% by mass)	(% by mass)	(% by mass)	(% by mass)	(% by mass)	(% by mass)	(% by mass)	(% by mass)	(% by mass)
1	6623/1	P61/BTB/2025	30.11	13.29	9.36	4.70	20.58	0.12	0.63	0.49	1.64	0.18	<0.01	18.67
2	6623/2	P60/BTB/2025	41.26	10.88	9.37	14.40	9.51	0.18	0.67	0.70	1.30	0.17	<0.01	11.17
3	6623/3	P12/BTB/2025	44.03	11.00	11.27	16.88	9.81	0.17	2.07	0.71	1.29	0.33	<0.01	1.75
4	6623/4	P6/BTB/2025	45.17	14.60	11.37	10.29	10.02	0.17	3.05	1.10	1.88	0.45	<0.01	1.51
5	6623/5	P16/BTB/2025	46.44	17.25	9.85	6.21	9.39	0.15	4.24	1.72	1.97	0.39	<0.01	2.07
6	6623/6	P26/BTB/2025	24.31	4.88	3.54	15.03	17.89	0.02	0.41	0.14	0.52	0.05	<0.01	32.78
7	6623/7	P62/BTB/2025	44.66	15.06	11.55	9.57	10.08	0.18	3.49	0.85	1.86	0.39	<0.01	1.89
8	6623/8	P53/BTB/2025	43.85	12.68	10.69	12.18	9.21	0.18	1.88	0.76	1.13	0.30	<0.01	6.73
9	6623/9	P86/BTB/2025	42.47	9.80	11.56	15.90	4.59	0.16	0.16	0.08	1.51	0.09	<0.01	13.16
10	6623/10	P69/BTB/2025	43.50	13.15	10.46	12.74	8.09	0.17	1.12	0.75	1.56	0.27	<0.01	7.87
11	6623/11	P75/BTB/2025	37.08	10.14	7.27	10.72	13.04	0.08	1.27	0.58	1.30	0.10	<0.01	18.05
12	6623/12	P78/BTB/2025	40.88	7.44	10.56	16.76	9.77	0.17	1.25	0.15	0.63	0.12	<0.01	11.79
13	6623/13	P80/BTB/2025	42.36	10.92	12.81	20.17	7.67	0.20	1.95	0.50	0.96	0.27	<0.01	1.44
14	6623/14	P37/BTB/2025	42.91	11.18	12.52	19.40	7.43	0.20	2.18	0.28	0.99	0.26	<0.01	2.07
15	6623/15	P35/BTB/2025	44.18	14.24	11.33	11.46	10.28	0.18	3.40	0.52	1.41	0.37	<0.01	2.16
16	6623/16	P54/BTB/2025	44.00	14.38	11.53	11.80	9.69	0.19	2.26	0.41	0.93	0.23	<0.01	4.19
17	6623/17	P68/BTB/2025	33.37	11.74	9.64	8.90	15.20	0.11	1.68	0.52	1.31	0.13	<0.01	16.92
18	6623/18	P43/BTB/2025	38.96	6.52	12.05	14.02	11.31	0.25	0.51	0.18	0.57	0.10	<0.01	15.05
19	6623/19	BRS95/BTB/2025	49.52	13.90	11.15	9.33	7.63	0.15	2.48	1.43	1.40	0.30	<0.01	2.29
20	6623/20	BRS94/BTB/2025	49.69	14.24	10.96	8.87	7.76	0.16	2.75	1.51	1.46	0.34	<0.01	1.79

Test method:SOP OM-11 & **Insteument Used:** WDXRF PANalytical Axios Max
Note: Theabove results are expressed on dry basis
NOTE : This report and results relate only to the sample / items tested.

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Reviewed by

A.L.Kanta Rao
AUTHORISED SIGNATORY

Lucid Laboratories Pvt. Ltd.
Plot No. 3, IDA, Balanagar, Hyderabad - 500 037, Telangana, INDIA, Ph : .040-69042222/10 Lines
E-mail: info@lucidlabsindia.com, website : www.lucidlabsindia.com **CIN No. : U24239TG2004PTC042390**

TEST RESULTS

LUCID Laboratories Pvt. Ltd.
Testing to the Core

Issued to:

Critical Mineral Trackers
N.No 7-1-58/CC/406, 'Concourse ', Opp.Lal Bungalow
Greenlands, Begumpet,
Hyderabad-500 016
Kind Attn: Mr.K.Mahender Reddy, 9032012955

LAB REGISTRATION NO: LL/25-26/006623(1 to 20)
Date. Of Receipt of Sample : 15.09.2025
Date. Of Starting of Analysi : 16.092025
Date. Of Completing of Analysis : .20.09.2025
Customer Ref: Test Request

Sample Particulars : Olivine Basalt / Picritic Basalt Pits

S.No	Registration Number	Sample ID	Silica as SiO_2 (% by mass)	Aluminium as Al_2O_3 (% by mass)	Iron as Fe_2O_3 (% by mass)	Magnesium as MgO (% by mass)	Calcium as CaO (% by mass)	Manganese as MnO (% by mass)	Sodium as Na_2O (% by mass)	Potassium as K_2O (% by mass)	Titanium as TiO_2 (% by mass)	Phosphorus as P_2O_5 (% by mass)	Vanadium as V_2O_5 (% by mass)	Loss on Ignition (% by mass)
1	6623/1	P61/BTB/2025	30.11	13.29	9.36	4.70	20.58	0.12	0.63	0.49	1.64	0.18	<0.01	18.67
2	6623/2	P60/BTB/2025	41.26	10.88	9.37	14.40	9.51	0.18	0.67	0.70	1.30	0.17	<0.01	11.17
3	6623/3	P12/BTB/2025	44.03	11.00	11.27	16.88	9.81	0.17	2.07	0.71	1.29	0.33	<0.01	1.75
4	6623/4	P6/BTB/2025	45.17	14.60	11.37	10.29	10.02	0.17	3.05	1.10	1.88	0.45	<0.01	1.51
5	6623/5	P16/BTB/2025	46.44	17.25	9.85	6.21	9.39	0.15	4.24	1.72	1.97	0.39	<0.01	2.07
6	6623/6	P26/BTB/2025	24.31	4.88	3.54	15.03	17.89	0.02	0.41	0.14	0.52	0.05	<0.01	32.78
7	6623/7	P62/BTB/2025	44.66	15.06	11.55	9.57	10.08	0.18	3.49	0.85	1.86	0.39	<0.01	1.89
8	6623/8	P53/BTB/2025	43.85	12.68	10.69	12.18	9.21	0.18	1.88	0.76	1.13	0.30	<0.01	6.73
9	6623/9	P86/BTB/2025	42.47	9.80	11.56	15.90	4.59	0.16	0.16	0.08	1.51	0.09	<0.01	13.16
10	6623/10	P69/BTB/2025	43.50	13.15	10.46	12.74	8.09	0.17	1.12	0.75	1.56	0.27	<0.01	7.87
11	6623/11	P75/BTB/2025	37.08	10.14	7.27	10.72	13.04	0.08	1.27	0.58	1.30	0.10	<0.01	18.05
12	6623/12	P78/BTB/2025	40.88	7.44	10.56	16.76	9.77	0.17	1.25	0.15	0.63	0.12	<0.01	11.79
13	6623/13	P80/BTB/2025	42.36	10.92	12.81	20.17	7.67	0.20	1.95	0.50	0.96	0.27	<0.01	1.44
14	6623/14	P37/BTB/2025	42.91	11.18	12.52	19.40	7.43	0.20	2.18	0.28	0.99	0.26	<0.01	2.07
15	6623/15	P35/BTB/2025	44.18	14.24	11.33	11.46	10.28	0.18	3.40	0.52	1.41	0.37	<0.01	2.16
16	6623/16	P54/BTB/2025	44.00	14.38	11.53	11.80	9.69	0.19	2.26	0.41	0.93	0.23	<0.01	4.19
17	6623/17	P68/BTB/2025	33.37	11.74	9.64	8.90	15.20	0.11	1.68	0.52	1.31	0.13	<0.01	16.92
18	6623/18	P43/BTB/2025	38.96	6.52	12.05	14.02	11.31	0.25	0.51	0.18	0.57	0.10	<0.01	15.05
19	6623/19	BRS95/BTB/2025	49.52	13.90	11.15	9.33	7.63	0.15	2.48	1.43	1.40	0.30	<0.01	2.29
20	6623/20	BRS94/BTB/2025	49.69	14.24	10.96	8.87	7.76	0.16	2.75	1.51	1.46	0.34	<0.01	1.79

Test method:SOP OM-11 & **Insteument Used:** WDXRF PANalytical Axios Max
Note: Theabove results are expressed on dry basis
NOTE : This report and results relate only to the sample / items tested.

Page 1 of 1

Reviewed by

A.L.Kanta Rao
AUTHORISED SIGNATORY

Lucid Laboratories Pvt. Ltd.
Plot No. 3, IDA, Balanagar, Hyderabad - 500 037, Telangana, INDIA, Ph : .040-69042222/10 Lines
E-mail: info@lucidlabsindia.com, website : www.lucidlabsindia.com **CIN No. : U24239TG2004PTC042390**

BRS Test Results:

F-01-MSP7.8-TRP

LUCID
Laboratories Pvt. Ltd.
Testing to the Core

Plot No. 3, IDA, Balanagar,
Hyderabad - 500 037, Telangana.
Ph: 040-6904 2222/10 Lines
E-mail: info@lucidlabsindia.com
Web: www.lucidlabsindia.com

TEST REPORT

Issued to:
Critical Mineral Trackers
H No. 7-1-58/CC/406, 'Concourse', Opp. Lal Bungalow
Greenlands, Begumpet
Hyderabad - 500 016
Kind Attn.:Mr. K Nageswara Rao, 78938-47742

Report No. : LL/25-26/004095
Issue Date : 17/07/2025
Customer Ref.: Test Request Form
Ref.Date : 09/07/2025

Sample Particulars : Picrite Basalt Sample

Sample description : Picrite Basalt Sample,Sample ID:CMT/011/72/2025

Qty. Received : ~ 500 Grms X1 No

Mode of Packing : Polythene Cover
Test Parameters : Nickel as Ni,Cobalt as Co,Copper as Cu,Arsenic as As

Date of Receipt of Sample : 10/07/2025
Date of Starting of Analysis : 17/07/2025
Date of completion of analysis : 17/07/2025

SAMPLE TESTED AS RECEIVED

TEST RESULTS

S.No.	Parameters	Units	Results	Test Method
1	Nickel as Ni	ppm	648.2	SOP OM-12
2	Cobalt as Co	ppm	50.1	SOP OM-12
3	Copper as Cu	ppm	99.5	SOP OM-12
4	Arsenic as As	ppm	12.7	SOP OM-12

Note:The aboveresults are expressed on dry basis.
NOTE : This report and results relate only to the sample / items tested.

End of Report

Reviewed by

P.V.V. Satya Kumari
PVV.Satya Kumari
Authorized Signatory

Page No. 1/1

Note: This report is subject to the terms and conditions mentioned overleaf 129724

F-01-MSP7.8-TRP

LUCID
Laboratories Pvt. Ltd.
Testing to the Core

Plot No. 3, IDA, Balanagar,
Hyderabad - 500 037, Telangana.
Ph: 040-6904 2222/10 Lines
E-mail: info@lucidlabsindia.com
Web: www.lucidlabsindia.com

TEST REPORT

Issued to:
Critical Mineral Trackers
H No. 7-1-58/CC/406, 'Concourse', Opp. Lal Bungalow
Greenlands, Begumpet
Hyderabad - 500 016
Kind Attn.:Mr. K Nageswara Rao, 78938-47742

Report No. : LL/25-26/004092
Issue Date : 17/07/2025
Customer Ref.: Test Request Form
Ref.Date : 09/07/2025

Sample Particulars : Picrite Basalt Sample

Sample description : Picrite Basalt Sample,Sample ID:CMT/011/10/2025

Qty. Received : ~ 500 Grms X1 No.

Mode of Packing : Polythene Cover
Test Parameters : Nickel as Ni,Cobalt as Co,Copper as Cu,Arsenic as As

Date of Receipt of Sample : 10/07/2025
Date of Starting of Analysis : 17/07/2025
Date of completion of analysis : 17/07/2025

SAMPLE TESTED AS RECEIVED

TEST RESULTS

S.No.	Parameters	Units	Results	Test Method
1	Nickel as Ni	ppm	694.2	SOP OM-12
2	Cobalt as Co	ppm	48.5	SOP OM-12
3	Copper as Cu	ppm	77.3	SOP OM-12
4	Arsenic as As	ppm	19	SOP OM-12

Note:The aboveresults are expressed on dry basis.
NOTE : This report and results relate only to the sample / items tested.

End of Report

Reviewed by

P.V.V. Satya Kumari
PVV.Satya Kumari
Authorized Signatory

Page No. 1/1

Note: This report is subject to the terms and conditions mentioned overleaf 129721

CMT
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F-01-MSP7.8-TRP

LUCID
Laboratories Pvt. Ltd.
Testing to the Core

Plot No. 3, IDA, Balanagar,
Hyderabad - 500 037, Telangana.
Ph: 040-6904 2222/10 Lines
E-mail: info@lucidlabsindia.com
Web: www.lucidlabsindia.com

TEST REPORT

Issued to:
Critical Mineral Trackers
H No. 7-1-58/CC/406, 'Concourse', Opp. Lal Bungalow
Greenlands, Begumpet
Hyderabad - 500 016
Kind Attn.:Mr. K Nageswara Rao, 78938-47742

Report No. : LL/25-26/004094
Issue Date : 17/07/2025
Customer Ref.: Test Request Form
Ref.Date : 09/07/2025

Sample Particulars : Picrite Basalt Sample

Sample description : Picrite Basalt Sample,Sample ID:CMT/011/29/2025

Qty. Received : ~ 500 Grms X1 No

Mode of Packing : Polythene Cover
Test Parameters : Nickel as Ni,Cobalt as Co,Copper as Cu,Arsenic as As

Date of Receipt of Sample : 10/07/2025
Date of completion of analysis : 17/07/2025
Date of Starting of Analysis : 17/07/2025

SAMPLE TESTED AS RECEIVED

TEST RESULTS

S.No.	Parameters	Units	Results	Test Method
1	Nickel as Ni	ppm	329.3	SOP OM-12
2	Cobalt as Co	ppm	34.0	SOP OM-12
3	Copper as Cu	ppm	106.3	SOP OM-12
4	Arsenic as As	ppm	10.1	SOP OM-12

Note:The aboveresults are expressed on dry basis.

NOTE : This report and results relate only to the sample / items tested.

End of Report

Reviewed by

P.V.V.Satya Kumari
PVV.Satya Kumari
Authorized Signatory

Page No. 1/1

Note: This report is subject to the terms and conditions mentioned overleaf 129723

F-01-MSP7.8-TRP

LUCID
Laboratories Pvt. Ltd.
Testing to the Core

Plot No. 3, IDA, Balanagar,
Hyderabad - 500 037, Telangana.
Ph: 040-6904 2222/10 Lines
E-mail: info@lucidlabsindia.com
Web: www.lucidlabsindia.com

TEST REPORT

Issued to:
Critical Mineral Trackers
H No. 7-1-58/CC/406, 'Concourse', Opp. Lal Bungalow
Greenlands, Begumpet
Hyderabad - 500 016
Kind Attn.:Mr. K Nageswara Rao, 78938-47742

Report No. : LL/25-26/004093
Issue Date : 17/07/2025
Customer Ref.: Test Request Form
Ref.Date : 09/07/2025

Sample Particulars : Picrite Basalt Sample

Sample description : Picrite Basalt Sample,Sample ID:CMT/011/16/2025

Qty. Received : ~ 500 Grms X1 No

Mode of Packing : Polythene Cover
Test Parameters : Nickel as Ni,Cobalt as Co,Copper as Cu,Arsenic as As

Date of Receipt of Sample : 10/07/2025
Date of completion of analysis : 17/07/2025
Date of Starting of Analysis : 17/07/2025

SAMPLE TESTED AS RECEIVED

TEST RESULTS

S.No.	Parameters	Units	Results	Test Method
1	Nickel as Ni	ppm	539.1	SOP OM-12
2	Cobalt as Co	ppm	38.1	SOP OM-12
3	Copper as Cu	ppm	90.6	SOP OM-12
4	Arsenic as As	ppm	11.4	SOP OM-12

Note:The aboveresults are expressed on dry basis.

NOTE : This report and results relate only to the sample / items tested.

End of Report

Reviewed by

P.V.V.Satya Kumari
PVV.Satya Kumari
Authorized Signatory

Page No. 1/1

Note: This report is subject to the terms and conditions mentioned overleaf 129722

TC-5918

TEST RESULTS

LUCID Laboratories Pvt. Ltd.

Testing to the Core

ULR : TC591825000003132F

Issued to:

Critical Mineral Trackers
N.No 7-1-58/CC/406, 'Concourse', Opp.Lal Bungalow
Greenlands, Begumpet,
Hyderabad-500 016
Kind Attn: Mr.K.Mahender Reddy, 9032012955

LAB REGISTRATION NO: LL/25-26/005691(1 to 67)
Date. Of Receipt of Sample : 19.08.2025
Date. Of Starting of Analysi : 01.09.2025
Date. Of Completing of Analysis :09.09.2025
Customer Ref: Test Request Form

Sample Particulars : Olivine Basalt

S.No	Sample ID	Reg no	Antimony Sb (ppm)	Arsenic as As (ppm)	Barium as Ba (ppm)	Beryllium as Be (ppm)	Bismuth as Bi (ppm)	Cadmium as Cd (ppm)	Cobalt as Co (ppm)	Chromium as Cr (ppm)	Copper as Cu (ppm)	Gallium as Ga (ppm)	Germanium as Ge (ppm)	Hafnium as Hf (ppm)	Indium as In (ppm)	Lithium as Li (ppm)	Molybdenum as Mo (ppm)
1	CMT/011/23/2025	5691/1	4.9	4.7	154.0	<1.0	<1.0	<1.0	46.8	638.2	99.6	18.6	3.0	1.1	<1.0	6.2	<1.0
2	CMT/011/03/2025	5691/2	8.0	2.2	182.8	<1.0	<1.0	<1.0	48.9	1036.2	90.1	19.6	1.1	1.6	<1.0	6.2	<1.0
3	CMT/011/26/2025	5691/3	6.1	3.3	274.4	<1.0	<1.0	<1.0	48.5	514.4	151.5	20.3	3.5	2.4	<1.0	8.0	<1.0
4	CMT/011/28/2025	5691/4	2.2	4.6	21.5	<1.0	<1.0	<1.0	34.6	482.3	62.7	10.1	<1.0	<1.0	<1.0	4.2	<1.0
5	CMT/011/05/2025	5691/5	13.8	4.0	244.9	<1.0	<1.0	<1.0	48.8	868.2	100.9	19.9	<1.0	1.9	<1.0	7.0	<1.0
6	CMT/011/53/2025	5691/6	11.0	3.8	209.0	<1.0	<1.0	<1.0	69.8	1052.3	104.0	15.4	<1.0	1.1	<1.0	9.0	<1.0
7	CMT/011/22/2025	5691/7	6.8	3.7	332.1	<1.0	<1.0	<1.0	23.4	212.0	105.3	23.7	4.8	3.7	<1.0	12.5	<1.0
8	CMT/011/07/2025	5691/8	4.1	8.4	337.3	<1.0	1.8	<1.0	28.0	214.1	65.3	24.3	3.7	4.4	<1.0	7.0	3.4
9	CMT/011/31/2025	5691/9	9.8	3.8	149.2	<1.0	<1.0	<1.0	67.7	990.8	302.3	17.1	<1.0	1.0	<1.0	4.3	23.0
10	CMT/011/39/2025	5691/10	9.7	3.6	193.6	<1.0	<1.0	<1.0	60.4	911.5	86.9	17.7	5.2	1.8	<1.0	10.7	2.3
11	CMT/011/73/2025	5691/11	9.8	2.8	197.6	<1.0	<1.0	<1.0	53.2	1028.6	89.8	19.0	2.5	1.1	<1.0	7.6	<1.0
12	CMT/011/69/2025	5691/12	6.5	2.6	167.2	<1.0	<1.0	<1.0	51.0	678.3	135.2	17.8	<1.0	1.0	<1.0	6.8	<1.0
13	CMT/011/25/2025	5691/13	0.7	4.8	1169.1	2.0	<1.0	<1.0	4.9	44.2	55.1	21.3	2.0	12.4	<1.0	2.6	<1.0
14	CMT/011/63/2025	5691/14	5.7	2.0	200.1	<1.0	<1.0	<1.0	59.0	971.4	106.7	17.4	<1.0	<1.0	<1.0	6.5	3.6
15	CMT/011/54/2025	5691/15	3.8	4.8	352.5	<1.0	1.2	<1.0	33.7	404.5	110.9	23.0	4.3	3.7	<1.0	13.7	<1.0
16	CMT/011/21/2025	5691/16	6.7	6.6	332.6	<1.0	<1.0	<1.0	33.0	515.1	91.5	21.7	3.0	2.8	<1.0	14.3	2.0
17	CMT/011/02/2025	5691/17	4.8	3.8	385.8	<1.0	<1.0	<1.0	26.0	238.0	77.7	17.5	<1.0	2.9	<1.0	7.5	<1.0
18	CMT/011/12/2025	5691/18	3.0	6.6	659.8	<1.0	1.9	<1.0	22.0	244.3	99.9	17.1	1.8	6.6	<1.0	2.3	<1.0
19	CMT/011/04/2025	5691/19	2.1	2.0	80.7	<1.0	<1.0	<1.0	11.6	163.9	20.5	6.0	<1.0	<1.0	<1.0	2.4	<1.0
20	CMT/011/15/2025	5691/20	4.1	3.4	122.5	<1.0	<1.0	<1.0	28.4	144.8	26.5	13.9	<1.0	2.2	<1.0	4.7	1.1
21	CMT/011/01/2025	5691/21	8.7	4.1	212.0	<1.0	<1.0	<1.0	57.3	886.3	94.6	18.2	<1.0	1.8	<1.0	6.6	<1.0
22	CMT/011/20/2025	5691/22	6.3	4.7	290.8	<1.0	<1.0	<1.0	46.2	427.6	1633.3	37.6	<1.0	2.7	<1.0	3.9	<1.0
23	CMT/011/08/2025	5691/23	6.2	2.1	245.0	<1.0	3.4	<1.0	46.4	730.6	102.6	19.3	4.7	2.4	<1.0	7.0	<1.0
24	CMT/011/11/2025	5691/24	6.5	2.0	289.0	<1.0	<1.0	<1.0	43.0	759.2	122.4	20.9	4.6	2.3	<1.0	7.4	<1.0
25	CMT/011/30/2025	5691/25	8.5	2.2	290.1	<1.0	1.7	<1.0	42.0	505.1	116.0	26.1	<1.0	2.7	<1.0	8.0	1.6
26	CMT/011/32/2025	5691/26	8.6	3.7	260.1	<1.0	2.7	<1.0	51.7	737.7	107.4	21.2	<1.0	2.4	<1.0	7.3	2.3
27	CMT/011/06/2025	5691/27	7.5	4.4	378.8	<1.0	<1.0	<1.0	38.3	483.9	144.8	24.2	1.9	3.9	<1.0	10.1	1.1
28	CMT/011/13/2025	5691/28	7.3	5.5	284.9	<1.0	<1.0	<1.0	47.7	719.5	112.8	20.3	<1.0	2.4	<1.0	7.3	<1.0
29	CMT/011/09/2025	5691/29	11.0	4.1	268.9	<1.0	<1.0	<1.0	52.2	891.0	98.0	20.4	<1.0	2.1	<1.0	10.1	1.1
30	CMT/011/05/2025	5691/30	11.8	6.8	220.5	<1.0	<1.0	<1.0	70.9	922.3	78.9	18.2	1.3	2.0	<1.0	7.3	<1.0
31	CMT/011/56/2025	5691/31	7.7	3.3	225.4	<1.0	<1.0	<1.0	67.9	994.5	86.2	15.3	<1.0	1.4	<1.0	6.6	<1.0
32	CMT/011/14/2025	5691/32	8.5	5.1	188.3	<1.0	<1.0	<1.0	80.3	946.3	64.9	17.1	<1.0	<1.0	<1.0	7.1	<1.0
33	CMT/011/40/2025	5691/33	12.0	4.1	192.1	<1.0	<1.0	<1.0	74.0	1411.6	89.7	16.7	2.5	1.0	<1.0	6.9	4.7
34	CMT/011/58/2025	5691/34	8.5	2.9	168.8	<1.0	3.3	<1.0	27.7	260.2	125.6	28.0	6.2	2.2	<1.0	10.7	2.0
35	CMT/011/37/2025	5691/35	6.7	5.0	348.8	<1.0	4.4	<1.0	32.0	355.7	100.7	21.4	3.4	3.7	<1.0	12.9	8.4

Reviewed

A.L.Kanta Rao
AUTHORISED SIGNATORY

Lucid Laboratories Pvt. Ltd.
Plot No. 3, IDA, Balanagar, Hyderabad - 500 037, Telangana, INDIA, Ph : .040-69042222/10 Lines
E-mail: info@lucidlabsindia.com, website : www.lucidlabsindia.com **CIN No. : U24239TG2004PTC042390**

CRITICAL MINERAL TRACKERS raashtr pratham

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TC-5918

TEST RESULTS

LUCID Laboratories Pvt. Ltd.
Testing to the Core

ULR : TC591825000003132F

Issued to:

Critical Mineral Trackers
N.No 7-1-58/CC/406, 'Concourse ', Opp.Lal Bungalow
Greenlands, Begumpet,
Hyderabad-500 016
Kind Attn: Mr.K.Mahender Reddy, 9032012955

LAB REGISTRATION NO: LL/25-26/005691(1 to 67)
Date. Of Receipt of Sample : 19.08.2025
Date. Of Starting of Analysi : 01.09.2025
Date. Of Completing of Analysis :09.09.2025
Customer Ref: Test Request Form

Sample Particulars : Olivine Basalt

S.No	Sample ID	Reg no	Nickel as Ni (ppm)	Niobium as Nb (ppm)	Lead as Pb (ppm)	Silver as Ag (ppm)	Scandium as Sc (ppm)	Selenium as Se (ppm)	Strontium as Sr (ppm)	Tin as Sn (ppm)	Tantalum as Ta (ppm)	Tellurium as Te (ppm)	Thallium as Tl (ppm)	Vanadium as V (ppm)	Tungsten as W (ppm)	Zironium as Zr (ppm)	Zin as Zn (ppm)
1	CMT/011/23/2025	5691/1	539.7	631.0	<1.0	0.2	32.7	<1.0	239.7	<1.0	9.9	13.6	10.6	167.3	1.1	80.4	77.9
2	CMT/011/03/2025	5691/2	481.6	665.2	1.4	0.1	34.9	<1.0	270.6	<1.0	9.4	14.4	10.7	177.5	1.5	111.3	68.1
3	CMT/011/26/2025	5691/3	538.8	830.5	1.5	0.5	28.3	<1.0	347.6	1.9	11.1	17.7	17.5	229.5	3.3	127.4	90.2
4	CMT/011/28/2025	5691/4	349.1	310.2	<1.0	<0.1	26.1	<1.0	244.6	<1.0	1.9	10.5	1.7	50.4	0.5	52.8	41.1
5	CMT/011/05/2025	5691/5	520.9	835.8	<1.0	0.4	34.4	<1.0	334.1	1.1	10.0	14.3	8.8	162.6	1.3	109.5	89.7
6	CMT/011/53/2025	5691/6	1056.2	544.2	3.4	0.5	27.2	<1.0	209.9	1.7	8.6	13.9	10.6	124.7	1.6	85.5	93.9
7	CMT/011/22/2025	5691/7	82.2	1098.3	2.0	0.5	32.0	<1.0	491.0	<1.0	13.3	18.0	19.7	222.3	1.6	157.9	94.4
8	CMT/011/07/2025	5691/8	88.3	1214.6	1.3	0.3	33.0	1.7	728.9	<1.0	13.2	19.8	19.6	185.5	2.5	181.8	113.8
9	CMT/011/31/2025	5691/9	889.6	576.7	<1.0	0.8	26.6	8.6	245.3	<1.0	9.1	19.1	7.7	131.2	1.7	88.7	87.8
10	CMT/011/39/2025	5691/10	800.0	694.5	<1.0	0.8	30.5	<1.0	319.9	<1.0	11.8	15.6	8.6	173.7	30.3	101.6	87.9
11	CMT/011/73/2025	5691/11	550.0	674.1	<1.0	0.6	34.7	1.2	306.4	<1.0	10.3	15.2	11.5	179.8	0.7	88.1	84.6
12	CMT/011/69/2025	5691/12	723.0	593.3	<1.0	0.2	23.4	<1.0	449.9	<1.0	8.5	14.5	9.6	144.3	3.7	75.4	89.9
13	CMT/011/25/2025	5691/13	28.9	479.0	10.6	3.3	12.2	<1.0	223.4	5.7	3.6	8.6	5.7	46.3	3.8	305.4	100.7
14	CMT/011/63/2025	5691/14	795.2	585.3	<1.0	0.2	25.5	1.9	247.1	<1.0	8.7	14.9	8.0	139.4	6.1	83.2	84.1
15	CMT/011/54/2025	5691/15	247.1	1057.7	<1.0	3.6	32.1	2.0	477.2	4.1	9.6	17.5	20.5	236.4	2.1	159.8	92.8
16	CMT/011/21/2025	5691/16	190.5	761.7	<1.0	0.5	29.5	<1.0	378.7	1.4	8.5	13.9	15.7	182.6	2.5	100.9	81.4
17	CMT/011/02/2025	5691/17	150.7	791.9	<1.0	0.2	24.3	<1.0	214.3	<1.0	6.8	14.6	15.8	118.2	1.5	117.7	65.7
18	CMT/011/12/2025	5691/18	111.6	1023.1	4.2	0.5	26.7	<1.0	596.1	4.1	8.6	19.1	18.6	107.4	2.6	208.7	116.0
19	CMT/011/04/2025	5691/19	43.2	249.4	<1.0	<0.1	6.9	2.4	215.0	<1.0	1.3	10.1	9.4	50.7	1.1	31.2	28.3
20	CMT/011/15/2025	5691/20	144.5	742.8	3.1	0.4	20.5	<1.0	170.1	<1.0	5.5	17.0	12.5	82.9	1.3	111.4	74.7
21	CMT/011/01/2025	5691/21	792.8	733.9	<1.0	1.2	30.6	<1.0	285.8	<1.0	10.4	15.6	13.2	182.5	1.3	108.5	91.9
22	CMT/011/20/2025	5691/22	429.5	809.9	<1.0	0.6	31.0	<1.0	142.7	<1.0	7.7	14.3	16.3	203.9	2.7	128.8	73.0
23	CMT/011/08/2025	5691/23	490.2	871.4	1.1	0.6	36.3	<1.0	396.6	1.1	11.4	17.0	17.9	163.6	2.4	121.4	104.8
24	CMT/011/11/2025	5691/24	446.8	818.5	5.8	0.4	35.4	<1.0	338.6	1.2	12.7	15.8	15.3	228.0	3.4	120.5	102.2
25	CMT/011/30/2025	5691/25	385.9	886.4	2.1	0.6	32.0	<1.0	138.1	5.0	7.0	16.7	14.5	129.3	2.2	117.5	104.0
26	CMT/011/32/2025	5691/26	614.2	865.3	<1.0	0.4	36.2	<1.0	321.1	2.4	10.1	17.8	11.5	225.3	3.8	125.6	102.7
27	CMT/011/06/2025	5691/27	294.5	1085.1	1.0	0.7	33.3	<1.0	486.5	1.7	14.7	18.2	20.2	227.2	2.1	170.0	97.6
28	CMT/011/13/2025	5691/28	506.4	774.5	3.3	0.8	36.7	<1.0	382.8	1.1	12.8	17.1	14.2	170.8	3.2	127.9	101.6
29	CMT/011/09/2025	5691/29	542.6	843.9	1.6	0.5	34.9	<1.0	315.7	1.0	9.1	16.1	13.9	165.8	1.9	122.0	100.2
30	CMT/011/05/2025	5691/30	894.4	645.8	1.8	0.3	30.3	<1.0	260.2	<1.0	9.4	15.1	9.5	148.7	1.8	98.2	99.8
31	CMT/011/56/2025	5691/31	969.3	578.3	<1.0	0.5	29.5	<1.0	240.0	0.6	10.5	13.6	9.1	117.2	1.3	86.6	92.2
32	CMT/011/14/2025	5691/32	1105.1	550.8	3.8	0.7	26.0	2.6	234.6	0.1	7.7	15.2	9.6	144.7	1.0	81.6	111.7
33	CMT/011/40/2025	5691/33	990.4	543.3	5.0	0.6	34.1	<1.0	216.1	1.0	9.6	13.5	4.7	127.6	2.2	76.7	88.9
34	CMT/011/58/2025	5691/34	95.1	989.7	<1.0	0.2	36.6	<1.0	289.8	1.2	10.7	19.2	19.8	241.9	31.5	118.9	107.5
35	CMT/011/37/2025	5691/35	246.5	1001.5	<1.0	0.5	33.7	1.7	451.6	27.2	12.5	20.4	18.4	223.3	68.5	151.5	99.1

Reviewed

A.L.Kanta Rao
AUTHORISED SIGNATORY

Lucid Laboratories Pvt. Ltd.
Plot No. 3, IDA, Balanagar, Hyderabad - 500 037, Telangana, INDIA, Ph : .040-69042222/10 Lines
E-mail: info@lucidlabsindia.com, website : www.lucidlabsindia.com **CIN No. : U24239TG2004PTC042390**

TC-5918

TEST RESULTS

LUCID Laboratories Pvt. Ltd.
Testing to the Core

ULR : TC591825000003132F

Issued to:

Critical Mineral Trackers
N.No 7-1-58/CC/406, 'Concourse ', Opp.Lal Bungalow
Greenlands, Begumpet,
Hyderabad-500 016
Kind Attn: Mr.K.Mahender Reddy, 9032012955

LAB REGISTRATION NO: LL/25-26/005691(1 to 67)
Date. Of Receipt of Sample : 19.08.2025
Date. Of Starting of Analysi : 01.09.2025
Date. Of Completing of Analysis :09.09.2025
Customer Ref: Test Request Form

Sample Particulars : Olivine Basalt

S.No	Sample ID	Reg no	Antimony as Sb (ppm)	Arsenic as As (ppm)	Barium as Ba (ppm)	Beryllium as Be (ppm)	Bismuth as Bi (ppm)	Cadmium as Cd (ppm)	Chromium as Cr (ppm)	Cobalt as Co (ppm)	Copper as Cu (ppm)	Gallium as Ga (ppm)	Germanium as Ge (ppm)	Hafnium as Hf (ppm)	Indium as In (ppm)	Lithium as Li (ppm)	Molybdenum as Mo (ppm)
36	CMT/011/45/2025	5691/36	3.6	1.7	208.3	<1.0	<1.0	<1.0	903.5	52.4	122.2	18.3	<1.0	1.7	<1.0	8.3	<1.0
37	CMT/011/42/2025	5691/37	6.3	2.1	242.7	<1.0	<1.0	<1.0	1015.0	52.6	101.2	19.4	1.6	1.7	<1.0	7.3	<1.0
38	CMT/011/61/2025	5691/38	2.0	2.2	155.8	<1.0	1.6	<1.0	309.7	31.1	92.9	22.6	2.1	1.8	<1.0	9.1	<1.0
39	CMT/011/49/2025	5691/39	6.0	2.4	311.1	<1.0	2.0	<1.0	685.8	47.0	110.3	22.5	<1.0	2.4	<1.0	10.1	1.0
40	CMT/011/41/2025	5691/40	10.8	2.4	228.3	<1.0	<1.0	<1.0	1040.3	53.9	94.4	20.1	1.1	1.7	<1.0	7.5	<1.0
41	CMT/011/55/2025	5691/41	5.8	1.8	315.1	<1.0	1.4	<1.0	521.2	39.8	122.2	20.6	2.3	2.9	<1.0	9.4	<1.0
42	CMT/011/46/2025	5691/42	4.9	3.2	317.4	<1.0	<1.0	<1.0	600.3	43.8	119.2	22.7	3.8	3.2	<1.0	9.9	<1.0
43	CMT/011/36/2025	5691/43	0.9	4.1	440.3	<1.0	1.0	<1.0	159.1	27.0	177.3	23.0	1.2	4.2	<1.0	11.9	<1.0
44	CMT/011/34/2025	5691/44	0.1	3.5	19.7	<1.0	<1.0	<1.0	12.4	2.9	39.7	6.1	1.1	<1.0	<1.0	2.0	<1.0
45	CMT/011/43/2025	5691/45	1.8	7.4	1027.1	1.7	<1.0	<1.0	69.9	9.7	29.6	18.4	4.7	11.1	<1.0	3.4	<1.0
46	CMT/011/68/2025	5691/46	3.8	5.4	247.8	<1.0	<1.0	<1.0	253.9	29.6	99.3	20.3	3.1	3.1	<1.0	7.3	<1.0
47	CMT/011/71/2025	5691/47	2.4	4.9	223.1	<1.0	<1.0	<1.0	292.8	27.2	65.0	18.2	<1.0	2.1	<1.0	5.4	<1.0
48	CMT/011/24/2025	5691/48	0.2	3.0	45.6	<1.0	<1.0	<1.0	47.2	3.8	22.6	9.5	<1.0	<1.0	<1.0	0.7	<1.0
49	CMT/011/27/2025	5691/49	4.8	3.2	180.9	<1.0	<1.0	<1.0	458.7	38.9	33.9	21.1	4.7	1.7	<1.0	9.0	<1.0
50	CMT/011/38/2025	5691/50	3.7	1.8	159.0	<1.0	0.2	<1.0	326.8	32.2	144.5	19.8	2.0	1.1	<1.0	5.3	<1.0
51	CMT/011/18/2025	5691/51	1.5	0.9	12.9	<1.0	-0.2	<1.0	46.7	3.7	7.2	1.6	<1.0	<1.0	<1.0	1.9	<1.0
52	CMT/011/17/2025	5691/52	0.9	9.5	199.5	<1.0	<1.0	<1.0	101.9	9.7	15.1	2.3	<1.0	<1.0	<1.0	2.4	2.8
53	CMT/011/66/2025	5691/53	6.8	6.1	57.8	<1.0	<1.0	<1.0	826.3	51.8	77.4	14.9	4.6	<1.0	<1.0	7.5	1.0
54	CMT/011/19/2025	5691/54	10.8	4.7	209.6	<1.0	<1.0	<1.0	1312.3	69.1	91.6	17.3	2.0	<1.0	<1.0	6.9	<1.0
55	CMT/011/57/2025	5691/55	3.7	2.3	190.1	<1.0	<1.0	<1.0	326.7	31.6	177.2	26.6	4.3	1.9	<1.0	7.0	<1.0
56	CMT/011/77/2025	5691/56	5.8	6.1	197.0	<1.0	1.3	<1.0	391.9	38.3	85.7	24.6	3.1	1.9	<1.0	10.7	3.1
57	CMT/011/47/2025	5691/57	5.3	2.8	111.0	<1.0	<1.0	<1.0	336.3	38.0	83.5	22.9	<1.0	1.0	<1.0	9.3	<1.0
58	CMT/011/35/2025	5691/58	8.2	1.6	142.5	<1.0	<1.0	<1.0	736.9	45.5	128.4	20.0	1.3	<1.0	<1.0	8.3	<1.0
59	CMT/011/52/2025	5691/59	5.4	3.1	217.1	<1.0	<1.0	<1.0	397.7	36.5	38.5	22.8	0.2	1.9	<1.0	6.8	<1.0
60	CMT/011/67/2025	5691/60	5.1	3.5	254.7	<1.0	1.4	<1.0	618.0	39.2	85.0	20.7	5.6	2.4	<1.0	13.3	<1.0
61	CMT/011/50/2025	5691/61	7.0	5.6	171.8	<1.0	<1.0	<1.0	986.9	56.1	145.7	20.0	<1.0	1.9	<1.0	7.2	<1.0
62	CMT/011/65/2025	5691/62	5.3	3.5	814.2	<1.0	<1.0	<1.0	20.9	29.3	33.5	27.3	6.1	4.4	<1.0	13.1	<1.0
63	CMT/011/60/2025	5691/63	6.7	0.7	244.8	<1.0	<1.0	<1.0	952.5	47.3	109.6	19.3	<1.0	2.1	<1.0	7.9	4.7
64	CMT/011/51/2025	5691/64	1.9	3.4	475.0	1.0	<1.0	<1.0	114.7	19.5	42.0	22.2	1.8	4.4	<1.0	32.8	<1.0
65	CMT/011/44/2025	5691/65	5.9	2.5	329.9	<1.0	<1.0	<1.0	590.0	46.9	169.9	21.6	<1.0	2.8	<1.0	8.3	<1.0
66	CMT/011/59/2025	5691/66	7.0	1.3	162.7	<1.0	<1.0	<1.0	823.5	53.3	129.8	18.8	<1.0	1.6	<1.0	8.3	<1.0
67	CMT/011/33/2025	5691/67	5.7	1.6	247.6	<1.0	<1.0	<1.0	816.7	45.7	123.9	19.3	2.3	2.1	<1.0	6.9	<1.0

Reviewed

A.L.Kanta Rao
AUTHORISED SIGNATORY

Lucid Laboratories Pvt. Ltd.
Plot No. 3, IDA, Balanagar, Hyderabad - 500 037, Telangana, INDIA, Ph : .040-69042222/10 Lines
E-mail: info@lucidlabsindia.com, website : www.lucidlabsindia.com **CIN No. : U24239TG2004PTC042390**

TC-5918

TEST RESULTS

LUCID Laboratories Pvt. Ltd.

Testing to the Core

ULR : TC591825000003132F

Issued to:

Critical Mineral Trackers
N.No 7-1-58/CC/406, 'Concourse ', Opp.Lal Bungalow
Greenlands, Begumpet,
Hyderabad-500 016
Kind Attn: Mr.K.Mahender Reddy, 9032012955

LAB REGISTRATION NO: LL/25-26/005691(1 to 67)
Date. Of Receipt of Sample : 19.08.2025
Date. Of Starting of Analysi : 01.09.2025
Date. Of Completing of Analysis :09.09.2025
Customer Ref: Test Request Form

Sample Particulars : Olivine Basalt

S.No	Sample ID	Reg no	Nickel as Ni (ppm)	Niobium as Nb (ppm)	Lead as Pb (ppm)	Scandium as Sc (ppm)	Selenium as Se (ppm)	Silver as Ag (ppm)	Strontium as Sr (ppm)	Tantalum as Ta (ppm)	Tellurium as Te (ppm)	Thallium as Tl (ppm)	Tin as Sn (ppm)	Vanadium as V (ppm)	Tungsten as W (ppm)	Zin as Zn (ppm)	Zironium as Zr (ppm)
36	CMT/011/45/2025	5691/36	581.3	680.1	1.3	31.1	<1.0	0.2	267.2	11.7	14.4	9.4	2.2	155.3	0.6	77.8	101.4
37	CMT/011/42/2025	5691/37	659.7	726.0	<1.0	36.5	<1.0	0.1	290.2	11.0	15.9	12.9	<1.0	191.3	0.8	82.0	103.5
38	CMT/011/61/2025	5691/38	110.1	889.3	<1.0	33.3	<1.0	<0.1	534.5	9.7	14.9	16.3	<1.0	229.1	1.8	79.8	99.0
39	CMT/011/49/2025	5691/39	442.6	878.8	1.7	33.6	<1.0	0.3	360.4	13.5	18.0	15.6	<1.0	246.0	3.0	96.6	128.8
40	CMT/011/41/2025	5691/40	665.8	724.0	<1.0	31.8	<1.0	0.1	334.0	10.7	13.5	9.8	<1.0	208.0	2.0	88.6	103.8
41	CMT/011/55/2025	5691/41	368.1	907.6	1.2	29.9	<1.0	0.2	372.0	11.6	17.5	15.8	<1.0	185.6	1.5	83.8	133.0
42	CMT/011/46/2025	5691/42	407.0	965.2	1.4	30.5	<1.0	0.4	444.0	13.2	19.9	17.4	2.0	211.5	158.3	99.7	141.9
43	CMT/011/36/2025	5691/43	123.1	1143.8	21.3	30.4	<1.0	0.4	616.0	12.4	16.9	19.9	81.7	255.4	2.9	97.9	169.1
44	CMT/011/34/2025	5691/44	35.4	15.6	0.3	1.2	2.1	<0.1	89.6	0.0	5.8	1.0	1.6	7.4	1.0	4.5	5.0
45	CMT/011/43/2025	5691/45	70.6	35.6	10.0	14.5	1.3	0.9	74.8	4.2	12.8	8.3	5.4	53.1	81.0	86.7	304.3
46	CMT/011/68/2025	5691/46	140.3	35.6	<1.0	32.1	<1.0	0.2	409.5	6.9	17.3	17.5	<1.0	116.3	1.8	74.0	139.2
47	CMT/011/71/2025	5691/47	175.9	25.9	<1.0	22.7	<1.0	3.9	301.1	5.6	13.6	15.1	<1.0	90.5	1.5	71.7	93.3
48	CMT/011/24/2025	5691/48	23.6	4.4	<1.0	3.4	2.2	<0.1	306.3	0.0	3.3	<1.0	<1.0	17.1	0.0	8.6	13.4
49	CMT/011/27/2025	5691/49	196.4	32.0	<1.0	25.2	<1.0	<0.1	1006.7	7.2	15.6	18.4	1.8	157.5	2.1	86.2	106.7
50	CMT/011/38/2025	5691/50	194.7	33.2	<1.0	34.2	1.2	0.8	210.6	8.1	13.3	9.3	1.4	214.2	1.6	81.6	71.8
51	CMT/011/18/2025	5691/51	194.7	5.0	<1.0	2.1	<1.0	<0.1	466.2	0.0	6.2	0.6	1.6	24.6	0.0	6.2	7.5
52	CMT/011/17/2025	5691/52	19.9	10.0	1.8	2.8	3.1	<0.1	64.9	0.0	9.9	4.9	<1.0	67.2	1.1	17.0	9.0
53	CMT/011/66/2025	5691/53	56.6	20.0	1.5	28.2	1.3	<0.1	390.1	5.5	12.5	7.5	<1.0	112.6	5.5	60.4	61.5
54	CMT/011/19/2025	5691/54	629.6	21.4	1.1	35.4	<1.0	<0.1	222.6	9.4	14.6	7.5	<1.0	124.3	3.0	90.5	71.5
55	CMT/011/57/2025	5691/55	113.6	327.6	<1.0	38.2	<1.0	0.2	401.1	12.6	18.6	16.4	3.7	253.7	3.6	88.2	114.7
56	CMT/011/77/2025	5691/56	158.7	40.1	<1.0	39.5	1.6	0.4	412.2	10.1	17.5	13.4	2.1	245.6	1.5	99.7	101.2
57	CMT/011/47/2025	5691/57	140.5	34.0	<1.0	31.8	<1.0	<0.1	286.2	7.4	16.7	14.0	<1.0	206.9	1.5	93.3	73.6
58	CMT/011/35/2025	5691/58	308.6	26.4	<1.0	33.9	<1.0	0.1	269.7	10.5	15.4	8.0	<1.0	157.2	0.8	82.1	80.4
59	CMT/011/52/2025	5691/59	180.5	33.1	<1.0	27.2	<1.0	1.9	382.8	9.6	15.6	13.6	<1.0	158.9	1.7	93.8	108.7
60	CMT/011/67/2025	5691/60	367.0	37.5	<1.0	33.9	1.1	0.3	359.0	10.3	17.5	14.5	<1.0	164.9	0.5	80.4	121.5
61	CMT/011/50/2025	5691/61	688.5	37.6	2.2	30.4	<1.0	0.3	263.3	11.1	17.3	14.6	1.1	218.9	1.7	101.4	106.4
62	CMT/011/65/2025	5691/62	46.5	42.4	2.0	17.1	<1.0	0.6	756.5	11.4	16.6	14.9	<1.0	194.0	1.3	105.5	121.2
63	CMT/011/60/2025	5691/63	502.5	30.7	<1.0	33.8	2.3	0.4	284.0	8.8	15.0	10.0	<1.0	138.9	133.9	79.4	103.8
64	CMT/011/51/2025	5691/64	72.3	36.5	18.4	21.2	1.5	0.4	323.0	7.1	14.9	11.0	1.4	176.4	2.7	72.1	136.4
65	CMT/011/44/2025	5691/65	496.6	40.9	<1.0	30.0	1.9	0.3	375.3	10.3	17.2	18.8	<1.0	171.4	2.3	89.8	129.0
66	CMT/011/59/2025	5691/66	668.6	26.4	1.0	30.6	<1.0	0.2	206.3	8.3	15.7	12.9	<1.0	125.4	6.2	87.0	95.8
67	CMT/011/33/2025	5691/67	529.8	34.7	1.4	35.3	<1.0	0.2	327.3	12.4	16.2	13.7	1.2	142.4	2.4	87.7	114.3

Test Method: SOP OM-12(Instrument Used: ICP-OES)

Note 1: The above results are expressed on dry basis.

Reviewed

A.L.Kanta Rao
AUTHORISED SIGNATORY

Lucid Laboratories Pvt. Ltd.
Plot No. 3, IDA, Balanagar, Hyderabad - 500 037, Telangana, INDIA, Ph : .040-69042222/10 Lines
E-mail: info@lucidlabsindia.com, website : www.lucidlabsindia.com **CIN No. : U24239TG2004PTC042390**

Pits Test Results:

TC-5918

TEST RESULTS

LUCID Laboratories Pvt. Ltd.

Testing to the Core

ULR : TC591825000003086F

Issued to:

Critical Mineral Trackers
N.No 7-1-58/CC/406, 'Concourse', Opp.Lal Bungalow
Greenlands, Begumpet,
Hyderabad-500 016
Kind Attn: Mr.K.Mahender Reddy, 9032012955

LAB REGISTRATION NO: LL/25-26/004958(1 to 30)
Date. Of Receipt of Sample : 29.07.2025
Date. Of Starting of Analysi : 12.08.2025
Date. Of Completing of Analysis : .16.08.2025
Customer Ref: Test Request Form

Sample Particulars : Picritic Basalt Pits

S.No	Sample ID	Reg no	Antimony Sb (ppm)	Arsenic as As (ppm)	Barium as Ba (ppm)	Beryllium as Be (ppm)	Bismuth as Bi (ppm)	Cadmium as Cd (ppm)	Chromium as Cr (ppm)	Cobalt as Co (ppm)	Copper as Cu (ppm)	Gallium as Ga (ppm)	Germanium as Ge (ppm)	Hafnium as Hf (ppm)	Indium as In (ppm)	Lithium as Li (ppm)	Molybdenum as Mo (ppm)
1	P1/BTB/2025	4958/1	0.6	4.7	339.6	<1.0	<0.5	<0.5	468.0	31.2	131.2	25.2	4.1	2.1	<1.0	8.3	1.7
2	P2/BTB/2025	4958/2	<0.5	4.8	342.4	<1.0	<0.5	<0.5	374.3	32.0	133.1	25.6	3.0	2.3	<1.0	8.8	1.9
3	P3/BTB/2025	4958/3	<0.5	6.1	350.7	<1.0	<0.5	<0.5	433.4	29.9	142.4	27.1	2.7	2.2	<1.0	9.2	2.4
4	P4/BTB/2025	4958/4	<0.5	4.9	427.6	<1.0	<0.5	<0.5	122.2	23.0	157.4	27.6	5.5	3.3	<1.0	8.4	2.5
5	P5/BTB/2025	4958/5	<0.5	7.4	116.1	<1.0	<0.5	<0.5	269.8	18.2	77.3	15.6	4.0	<1.0	<1.0	5.7	1.8
6	P6/BTB/2025	4958/6	<0.5	10.1	229.7	<1.0	<0.5	<0.5	218.4	20.6	115.5	21.1	2.9	0.7	<1.0	11.2	2.0
7	P7/BTB/2025	4958/7	<0.5	5.8	458.4	<1.0	<0.5	<0.5	658.2	34.3	152.6	24.8	3.3	2.2	<1.0	7.8	2.1
8	P8/BTB/2025	4958/8	<0.5	4.2	243.1	<1.0	<0.5	<0.5	452.0	32.2	52.4	22.4	1.9	0.6	<1.0	7.8	0.8
9	P9/BTB/2025	4958/9	<0.5	3.2	136.4	<1.0	<0.5	<0.5	377.8	48.1	98.2	17.2	3.8	<1.0	<1.0	5.8	0.1
10	P10/BTB/2025	4958/10	<0.5	2.7	240.8	<1.0	<0.5	<0.5	691.5	43.7	100.2	21.4	2.3	0.6	<1.0	7.6	0.4
11	P11/BTB/2025	4958/11	<0.5	9.2	361.7	<1.0	<0.5	<0.5	399.1	34.8	128.3	23.3	2.3	2.0	<1.0	20.5	2.3
12	P12/BTB/2025	4958/12	<0.5	5.9	327.0	<1.0	<0.5	<0.5	446.5	40.0	102.4	21.4	4.7	1.0	<1.0	10.3	1.9
13	P13/BTB/2025	4958/13	<0.5	10.3	248.8	<1.0	<0.5	<0.5	507.7	64.1	129.2	22.1	2.1	<1.0	<1.0	10.1	4.6
14	P14/BTB/2025	4958/14	<0.5	2.8	70.6	<1.0	<0.5	<0.5	344.4	17.6	25.4	7.1	3.2	<1.0	<1.0	4.7	1.0
15	P15/BTB/2025	4958/15	<0.5	1.2	266.9	<1.0	<0.5	<0.5	606.2	37.6	111.1	22.8	3.3	0.4	<1.0	7.8	0.1
16	P16/BTB/2025	4958/16	<0.5	2.2	222.0	<1.0	<0.5	<0.5	1156.9	47.9	57.0	19.8	1.7	0.1	<1.0	6.0	<1.0
17	P17/BTB/2025	4958/17	<0.5	3.6	326.6	<1.0	<0.5	<0.5	539.7	33.6	145.6	26.9	3.3	<1.0	<1.0	6.4	1.1
18	P18/BTB/2025	4958/18	<0.5	3.7	424.3	<1.0	<0.5	<0.5	271.2	27.5	139.6	21.0	3.4	2.2	<1.0	12.0	0.4
19	P19/BTB/2025	4958/19	<0.5	2.9	40.8	<1.0	<0.5	<0.5	729.6	51.5	84.5	15.9	2.2	<1.0	<1.0	9.6	1.2
20	P20/BTB/2025	4958/20	3.7	3.5	5.9	<1.0	<0.5	<0.5	770.1	52.1	41.5	13.4	1.1	<1.0	<1.0	7.3	0.2
21	P21/BTB/2025	4958/21	<0.5	3.4	517.6	<1.0	<0.5	<0.5	340.3	24.3	72.2	20.5	2.8	2.0	<1.0	11.0	0.6
22	P22/BTB/2025	4958/22	<0.5	7.7	215.5	<1.0	<0.5	<0.5	656.5	30.8	72.5	19.9	2.1	<1.0	<1.0	23.0	<1.0
23	P23/BTB/2025	4958/23	<0.5	3.7	321.4	<1.0	<0.5	<0.5	735.5	38.4	127.6	23.8	2.7	1.4	<1.0	7.9	0.5
24	P24/BTB/2025	4958/24	<0.5	5.2	308.8	<1.0	<0.5	<0.5	715.8	39.3	144.1	25.0	1.9	1.6	<1.0	8.5	3.2
25	P25/BTB/2025	4958/25	<0.5	6.3	170.5	<1.0	<0.5	<0.5	564.7	27.7	65.7	17.3	2.8	<1.0	<1.0	19.5	0.1
26	P26/BTB/2025	4958/26	<0.5	3.8	365.6	<1.0	<0.5	<0.5	530.2	33.3	146.4	26.5	3.4	2.1	<1.0	12.0	1.6
27	P27/BTB/2025	4958/27	<0.5	5.2	236.2	<1.0	<0.5	<0.5	424.8	28.8	46.7	25.0	1.8	0.7	<1.0	7.1	1.9
28	P28/BTB/2025	4958/28	<0.5	3.0	318.5	<1.0	<0.5	<0.5	765.9	36.9	126.5	24.5	2.5	1.6	<1.0	8.7	1.0
29	P29/BTB/2025	4958/29	<0.5	3.7	477.0	<1.0	<0.5	<0.5	438.6	36.6	124.2	17.9	3.2	2.1	<1.0	15.8	1.7
30	P30/BTB/2025	4958/30	2.4	5.4	320.7	<1.0	<0.5	<0.5	852.7	39.3	128.2	24.6	1.8	1.4	<1.0	7.8	2.0
31	P31/BTB/2025	4958/31	9.9	7.1	196.7	<1.0	2.3	<0.5	1136.1	51.5	85.4	17.3	2.9	1.4	<1.0	5.1	10.7

Page 1 of 6

Reviewed

A.L.Kanta Rao
AUTHORISED SIGNATORY

TC-5918

TEST RESULTS

LUCID Laboratories Pvt. Ltd.
Testing to the Core

ULR : TC591825000003086F

Issued to:

Critical Mineral Trackers
N.No 7-1-58/CC/406, 'Concourse ', Opp.Lal Bungalow
Greenlands, Begumpet,
Hyderabad-500 016
Kind Attn: Mr.K.Mahender Reddy, 9032012955

LAB REGISTRATION NO: LL/25-26/004958(1 to 30)
Date. Of Receipt of Sample : 29.07.2025
Date. Of Starting of Analysi : 12.08.2025
Date. Of Completing of Analysis : .16.08.2025
Customer Ref: Test Request Form

Sample Particulars : Picritic Basalt Pits

S.No	Sample ID	Reg no	Nickel as Ni (ppm)	Niobium as Nb (ppm)	Lead as Pb (ppm)	Scandium as Sc (ppm)	Selenium as Se (ppm)	Silver as Ag (ppm)	Strontium as Sr (ppm)	Tantalum as Ta (ppm)	Tellurium as Te (ppm)	Thallium as Tl (ppm)	Tin as Sn (ppm)	Vanadium as V (ppm)	Tungsten as W (ppm)	Zin as Zn (ppm)	Zironium as Zr (ppm)
1	P1/BTB/2025	4958/1	297.2	1262.6	<1.0	291.0	1.4	<0.1	431.6	40.9	4.6	33.2	<1.0	218.8	<1.0	89.5	165.3
2	P2/BTB/2025	4958/2	405.4	1188.7	31.4	287.4	<0.5	<0.1	436.6	17.9	4.1	31.8	<1.0	237.5	<1.0	80.0	167.9
3	P3/BTB/2025	4958/3	315.3	1219.6	6.0	299.6	<0.5	<0.1	445.7	17.7	3.5	34.1	<1.0	274.5	27.8	88.7	172.7
4	P4/BTB/2025	4958/4	139.5	1395.9	720.9	316.9	<0.5	<0.1	386.8	19.1	5.2	40.4	<1.0	276.9	<1.0	92.2	193.8
5	P5/BTB/2025	4958/5	209.3	660.4	1.0	178.3	<0.5	<0.1	445.4	9.9	5.7	22.4	<1.0	125.7	<1.0	34.2	92.8
6	P6/BTB/2025	4958/6	160.0	933.8	2.6	250.1	<0.5	<0.1	301.1	13.5	2.5	28.1	<1.0	223.5	<1.0	57.5	123.4
7	P7/BTB/2025	4958/7	434.7	1097.1	<1.0	317.7	<0.5	<0.1	595.0	15.2	3.4	31.3	<1.0	234.9	<1.0	76.2	154.1
8	P8/BTB/2025	4958/8	223.5	838.5	<1.0	232.5	<0.5	<0.1	477.9	11.0	2.1	25.4	<1.0	154.6	<1.0	80.1	113.9
9	P9/BTB/2025	4958/9	511.3	536.2	3.7	178.8	<0.5	<0.1	406.1	8.6	1.1	15.6	<1.0	102.0	<1.0	59.1	76.6
10	P10/BTB/2025	4958/10	543.7	840.4	1.6	292.3	<0.5	<0.1	321.0	12.5	1.7	22.2	<1.0	164.9	<1.0	80.2	118.0
11	P11/BTB/2025	4958/11	346.3	1059.3	5.3	261.3	<0.5	<0.1	734.6	14.7	4.2	32.7	<1.0	215.5	<1.0	74.1	150.7
12	P12/BTB/2025	4958/12	449.8	796.4	<1.0	251.4	<0.5	<0.1	698.5	12.2	2.0	23.1	<1.0	154.7	<1.0	74.9	114.6
13	P13/BTB/2025	4958/13	598.0	661.0	<1.0	202.6	1.7	<0.1	251.3	11.2	2.3	19.1	<1.0	144.6	<1.0	75.3	93.0
14	P14/BTB/2025	4958/14	285.8	252.3	2.5	117.0	<0.5	<0.1	288.4	3.3	<0.5	12.5	<1.0	70.2	<1.0	17.7	32.7
15	P15/BTB/2025	4958/15	404.4	747.6	<1.0	328.0	<0.5	<0.1	354.2	12.6	1.6	20.0	<1.0	172.8	17.4	65.4	96.8
16	P16/BTB/2025	4958/16	653.5	788.4	<1.0	329.0	4.7	<0.1	268.0	12.4	1.4	21.8	<1.0	161.3	<1.0	65.7	103.5
17	P17/BTB/2025	4958/17	412.9	1207.6	3.7	273.7	<0.5	<0.1	404.6	15.6	4.0	32.5	<1.0	227.3	168.0	89.6	84.7
18	P18/BTB/2025	4958/18	260.3	1074.9	4.0	259.9	<0.5	<0.1	290.6	15.1	3.9	30.6	<1.0	200.4	3.9	71.0	155.9
19	P19/BTB/2025	4958/19	757.1	569.9	1.7	278.0	<0.5	<0.1	167.5	10.0	0.3	14.0	<1.0	104.5	<1.0	57.4	77.7
20	P20/BTB/2025	4958/20	751.8	455.9	<1.0	239.7	3.6	<0.1	197.6	7.9	0.7	13.2	<1.0	107.2	<1.0	47.5	59.9
21	P21/BTB/2025	4958/21	195.1	848.5	1.5	226.0	<0.5	<0.1	1020.4	10.2	0.3	23.3	<1.0	131.4	59.6	59.5	123.5
22	P22/BTB/2025	4958/22	383.8	771.9	4.2	249.0	<0.5	<0.1	622.5	11.0	1.2	22.3	19.9	155.9	<1.0	62.7	92.3
23	P23/BTB/2025	4958/23	468.1	1020.4	<1.0	307.6	10.4	<0.1	395.7	15.1	3.4	27.5	<1.0	196.2	<1.0	74.0	144.3
24	P24/BTB/2025	4958/24	497.2	1104.6	<1.0	323.8	8.7	<0.1	406.8	15.4	4.0	28.6	<1.0	239.9	<1.0	79.1	147.7
25	P25/BTB/2025	4958/25	371.5	684.3	2.5	217.9	5.4	<0.1	546.2	8.2	2.3	18.9	<1.0	134.6	<1.0	52.5	77.8
26	P26/BTB/2025	4958/26	351.9	1164.8	<1.0	309.3	<0.5	<0.1	433.0	15.7	3.6	31.8	<1.0	218.7	4.0	78.2	165.7
27	P27/BTB/2025	4958/27	179.1	1004.9	<1.0	260.7	<0.5	<0.1	377.9	13.3	2.0	27.1	<1.0	209.3	<1.0	71.5	124.2
28	P28/BTB/2025	4958/28	425.2	1053.2	<1.0	312.2	4.5	<0.1	390.3	14.8	2.9	27.6	<1.0	188.8	<1.0	72.6	147.2
29	P29/BTB/2025	4958/29	561.9	1000.1	<1.0	313.2	<0.5	<0.1	435.4	13.0	1.9	26.0	<1.0	198.5	<1.0	79.5	140.7
30	P30/BTB/2025	4958/30	468.4	1051.4	<1.0	314.6	7.3	<0.1	435.9	15.9	3.4	27.0	<1.0	203.6	<1.0	79.6	146.9
31	P31/BTB/2025	4958/31	746.9	666.1	1.5	26.7	<0.5	<0.1	217.0	12.2	16.4	<0.5	37.0	166.5	2.5	63.0	100.2

Reviewed

A.L.Kanta Rao
AUTHORISED SIGNATORY

Lucid Laboratories Pvt. Ltd.
Plot No. 3, IDA, Balanagar, Hyderabad - 500 037, Telangana, INDIA, Ph : .040-69042222/10 Lines
E-mail: info@lucidlabsindia.com, website : www.lucidlabsindia.com **CIN No. : U24239TG2004PTC042390**

TC-5918

TEST RESULTS

LUCID Laboratories Pvt. Ltd.
Testing to the Core

ULR : TC591825000003086F

Issued to:

Critical Mineral Trackers
N.No 7-1-58/CC/406, 'Concourse ', Opp.Lal Bungalow
Greenlands, Begumpet,
Hyderabad-500 016
Kind Attn: Mr.K.Mahender Reddy, 9032012955

LAB REGISTRATION NO: LL/25-26/004958(1 to 30)
Date. Of Receipt of Sample : 29.07.2025
Date. Of Starting of Analysi : 12.08.2025
Date. Of Completing of Analysis : .16.08.2025
Customer Ref: Test Request Form

Sample Particulars : Picritic Basalt Pits

S.No	Sample ID	Reg no	Antimony Sb (ppm)	Arsenic as As (ppm)	Barium as Ba (ppm)	Beryllium as Be (ppm)	Bismuth as Bi (ppm)	Cadmium as Cd (ppm)	Chromium as Cr (ppm)	Cobalt as Co (ppm)	Copper as Cu (ppm)	Gallium as Ga (ppm)	Germanium as Ge (ppm)	Hafnium as Hf (ppm)	Indium as In (ppm)	Lithium as Li (ppm)	Molybdenum as Mo (ppm)
32	P32/BTB/2025	4958/32	3.7	11.2	212.2	<1.0	1.1	<0.5	484.1	16.6	37.0	10.9	1.4	1.3	<1.0	22.7	9.9
33	P33/BTB/2025	4958/33	<0.5	8.6	120.4	<1.0	<0.5	<0.5	150.6	8.1	20.3	7.3	<1.0	0.6	<1.0	13.2	9.1
34	P34/BTB/2025	4958/34	<0.5	8.9	124.5	<1.0	<0.5	<0.5	144.3	9.7	20.3	7.9	2.1	0.6	<1.0	13.2	7.0
35	P35/BTB/2025	4958/35	1.7	7.5	417.7	<1.0	1.1	0.5	164.0	20.2	65.2	23.9	4.6	3.8	<1.0	8.1	54.6
36	P36/BTB/2025	4958/36	1.3	6.6	184.9	<1.0	1.0	<0.5	396.4	14.9	34.1	9.2	2.7	1.0	<1.0	15.5	5.1
37	P37/BTB/2025	4958/37	<0.5	6.6	106.3	<1.0	<0.5	<0.5	250.4	12.1	24.0	6.4	1.9	0.4	<1.0	9.8	10.0
38	P38/BTB/2025	4958/38	3.6	5.8	58.5	<1.0	1.4	<0.5	546.8	37.5	50.0	8.8	1.2	0.6	<1.0	17.6	3.3
39	P39/BTB/2025	4958/39	5.7	7.6	338.8	<1.0	0.6	<0.5	604.5	29.1	98.9	19.1	2.5	3.8	<1.0	15.2	3.4
40	P40/BTB/2025	4958/40	4.7	6.2	234.5	<1.0	0.9	<0.5	406.9	32.8	111.2	19.9	2.4	2.5	<1.0	24.1	2.3
41	P41/BTB/2025	4958/41	1.4	4.2	122.1	<1.0	<0.5	<0.5	266.7	18.7	45.2	11.3	1.6	1.0	<1.0	8.9	<1.0
42	P42/BTB/2025	4958/42	4.0	5.2	157.4	<1.0	2.0	<0.5	474.6	41.4	131.0	18.9	4.5	1.8	<1.0	8.9	1.7
43	P43/BTB/2025	4958/43	3.3	7.6	323.1	<1.0	1.4	<0.5	473.3	32.9	120.9	21.2	3.5	2.7	<1.0	6.7	18.8
44	P44/BTB/2025	4958/44	6.4	6.3	140.3	<1.0	0.6	<0.5	741.2	59.3	79.3	15.3	1.2	1.0	<1.0	6.1	6.3
45	P45/BTB/2025	4958/45	4.1	4.8	386.6	<1.0	0.5	0.5	130.7	22.6	62.6	24.3	5.9	4.0	<1.0	9.7	2.4
46	P46/BTB/2025	4958/46	4.1	4.7	138.2	<1.0	1.4	<0.5	500.4	36.6	102.3	16.6	2.7	1.6	<1.0	7.5	<1.0
47	P47/BTB/2025	4958/47	6.4	4.4	107.8	<1.0	0.8	<0.5	823.0	33.8	126.8	20.1	2.3	1.7	<1.0	4.7	16.5
48	P48/BTB/2025	4958/48	7.2	4.0	226.7	<1.0	0.9	0.5	813.5	37.1	86.4	19.1	3.0	1.6	<1.0	5.9	1.6
49	P49/BTB/2025	4958/49	5.0	3.9	294.3	<1.0	1.4	<0.5	506.3	30.2	78.3	20.5	5.1	2.8	<1.0	10.2	1.7
50	P50/BTB/2025	4958/50	6.0	4.4	278.4	<1.0	0.9	<0.5	522.1	34.9	117.7	19.4	4.1	2.1	<1.0	6.6	2.5
51	P51/BTB/2025	4958/51	5.0	4.8	341.2	<1.0	1.5	<0.5	457.1	32.7	115.6	20.1	1.8	2.4	<1.0	6.6	41.4
52	P52/BTB/2025	4958/52	7.1	4.3	390.4	<1.0	1.5	0.5	391.9	30.0	103.3	18.4	4.6	2.4	<1.0	6.0	4.3
53	P53/BTB/2025	4958/53	3.8	4.9	411.3	<1.0	1.7	<0.5	478.2	42.9	80.6	18.8	3.2	2.5	<1.0	11.1	1.7
54	P54/BTB/2025	4958/54	12.5	4.6	120.0	<1.0	1.1	0.5	576.6	53.0	86.9	17.6	2.0	1.3	<1.0	12.3	<1.0
55	P55/BTB/2025	4958/55	4.9	4.8	180.4	<1.0	0.8	0.5	535.9	57.2	130.2	18.6	1.8	1.4	<1.0	10.6	1.0
56	P56/BTB/2025	4958/56	6.4	5.6	169.3	<1.0	1.2	<0.5	557.4	48.3	148.4	18.3	4.0	1.4	<1.0	10.6	<1.0
57	P57/BTB/2025	4958/57	6.0	4.6	97.3	<1.0	1.5	<0.5	680.7	50.2	64.9	14.3	1.7	0.9	<1.0	6.2	1.7
58	P58/BTB/2025	4958/58	7.5	5.0	117.2	<1.0	1.4	<0.5	771.5	75.5	99.0	15.5	2.4	0.2	<1.0	6.8	3.0
59	P59/BTB/2025	4958/59	11.6	6.0	158.8	<1.0	1.1	<0.5	609.1	53.4	81.9	15.8	3.0	1.2	<1.0	6.6	2.1
60	P60/BTB/2025	4958/60	4.4	6.5	280.1	<1.0	1.6	<0.5	387.0	36.8	144.7	19.6	5.3	2.7	<1.0	10.7	9.4
61	P61/BTB/2025	4958/61	<0.5	8.6	166.1	<1.0	<0.5	<0.5	424.3	15.6	46.9	13.4	<1.0	2.2	<1.0	11.9	<1.0
62	P62/BTB/2025	4958/62	4.6	5.0	279.1	<1.0	<0.5	<0.5	645.7	55.8	60.0	17.3	<1.0	10.0	<1.0	4.5	1.2

Reviewed

A.L.Kanta Rao
AUTHORISED SIGNATORY

TC-5918

TEST RESULTS

LUCID Laboratories Pvt. Ltd

Testing to the Core

ULR : TC591825000003086F

Issued to:

Critical Mineral Trackers
N.No 7-1-58/CC/406, 'Concourse', Opp.Lal Bungalow
Greenlands, Begumpet,
Hyderabad-500 016
Kind Attn: Mr.K.Mahender Reddy, 9032012955

LAB REGISTRATION NO: LL/25-26/004958(1 to 30)
Date. Of Receipt of Sample : 29.07.2025
Date. Of Starting of Analysi : 12.08.2025
Date. Of Completing of Analysis : .16.08.2025
Customer Ref: Test Request Form

Sample Particulars : Picritic Basalt Pits

S.No	Sample ID	Reg no	Nickel as Ni (ppm)	Niobium as Nb (ppm)	Lead as Pb (ppm)	Scandium as Sc (ppm)	Selenium as Se (ppm)	Silver as Ag (ppm)	Strontium as Sr (ppm)	Tantalum as Ta (ppm)	Tellurium as Te (ppm)	Thallium as Tl (ppm)	Tin as Sn (ppm)	Vanadium as V (ppm)	Tungsten as W (ppm)	Zin as Zn (ppm)	Zironium as Zr (ppm)
32	P32/BTB/2025	4958/32	164.8	410.1	3.2	18.4	<0.5	<0.1	531.8	531.8	531.8	531.8	1.8	131.6	1.6	56.7	24.3
33	P33/BTB/2025	4958/33	87.2	254.8	3.8	8.9	<0.5	<0.1	719.3	719.3	719.3	719.3	<1.0	84.6	1.3	36.6	10.4
34	P34/BTB/2025	4958/34	88.1	259.3	2.6	9.0	<0.5	<0.1	738.9	738.9	738.9	738.9	<1.0	89.1	<1.0	37.7	8.5
35	P35/BTB/2025	4958/35	93.1	1084.3	1.4	27.1	<0.5	<0.1	525.9	525.9	525.9	525.9	3.2	240.7	1.8	154.1	77.1
36	P36/BTB/2025	4958/36	150.0	360.5	1.7	14.7	<0.5	<0.1	1176.5	1176.5	1176.5	1176.5	<1.0	151.1	14.3	52.8	15.3
37	P37/BTB/2025	4958/37	140.9	251.6	1.0	10.8	<0.5	<0.1	1671.9	1671.9	1671.9	1671.9	<1.0	94.9	<1.0	34.1	10.4
38	P38/BTB/2025	4958/38	530.8	386.4	<1.0	19.1	<0.5	<0.1	933.1	933.1	933.1	933.1	<1.0	73.8	<1.0	56.6	32.8
39	P39/BTB/2025	4958/39	266.3	857.3	2.5	31.6	0.9	<0.1	405.8	405.8	405.8	405.8	<1.0	200.8	8.7	178.0	62.7
40	P40/BTB/2025	4958/40	315.3	921.7	1.1	27.4	2.0	<0.1	367.3	367.3	367.3	367.3	10.4	216.7	<1.0	131.8	66.2
41	P41/BTB/2025	4958/41	202.9	517.7	1.1	13.7	<0.5	<0.1	406.7	406.7	406.7	406.7	<1.0	102.5	<1.0	67.8	25.8
42	P42/BTB/2025	4958/42	417.4	771.6	1.0	27.9	<0.5	<0.1	497.3	497.3	497.3	497.3	3.1	159.2	12.5	113.8	73.2
43	P43/BTB/2025	4958/43	313.5	984.5	1.6	28.9	<0.5	<0.1	365.0	365.0	365.0	365.0	53.0	217.2	<1.0	138.8	68.4
44	P44/BTB/2025	4958/44	667.2	542.3	<1.0	20.0	<0.5	<0.1	173.6	173.6	173.6	173.6	<1.0	128.1	<1.0	76.8	56.6
45	P45/BTB/2025	4958/45	121.0	1186.6	2.8	26.3	<0.5	<0.1	375.1	375.1	375.1	375.1	1.7	226.4	<1.0	178.7	72.1
46	P46/BTB/2025	4958/46	420.0	783.6	1.8	22.5	<0.5	<0.1	210.2	210.2	210.2	210.2	20.7	120.2	<1.0	103.4	59.1
47	P47/BTB/2025	4958/47	435.5	878.4	1.3	25.4	0.9	<0.1	236.9	236.9	236.9	236.9	<1.0	100.3	1.2	118.4	62.7
48	P48/BTB/2025	4958/48	393.2	767.9	1.6	31.5	<0.5	<0.1	289.2	289.2	289.2	289.2	<1.0	183.1	23.0	103.1	56.0
49	P49/BTB/2025	4958/49	262.7	955.2	<1.0	32.8	<0.5	<0.1	426.5	426.5	426.5	426.5	8.4	218.4	<1.0	139.0	65.8
50	P50/BTB/2025	4958/50	355.9	837.0	<1.0	30.2	<0.5	<0.1	329.5	329.5	329.5	329.5	<1.0	203.7	<1.0	119.5	59.2
51	P51/BTB/2025	4958/51	320.9	834.3	1.9	30.1	<0.5	<0.1	368.8	368.8	368.8	368.8	<1.0	176.6	<1.0	123.8	77.1
52	P52/BTB/2025	4958/52	303.7	711.8	3.7	25.8	<0.5	<0.1	325.0	325.0	325.0	325.0	<1.0	182.5	<1.0	106.1	74.8
53	P53/BTB/2025	4958/53	407.6	707.3	<1.0	25.9	<0.5	<0.1	455.4	455.4	455.4	455.4	<1.0	143.4	<1.0	105.3	55.6
54	P54/BTB/2025	4958/54	740.7	693.8	1.0	29.9	<0.5	<0.1	331.1	331.1	331.1	331.1	22.5	88.7	1.7	100.0	61.8
55	P55/BTB/2025	4958/55	660.4	634.1	1.2	22.1	<0.5	<0.1	438.6	438.6	438.6	438.6	<1.0	126.2	<1.0	89.6	62.0
56	P56/BTB/2025	4958/56	602.8	707.8	<1.0	23.0	<0.5	<0.1	436.7	436.7	436.7	436.7	<1.0	135.9	<1.0	97.1	63.0
57	P57/BTB/2025	4958/57	641.0	525.2	<1.0	21.9	<0.5	<0.1	158.8	158.8	158.8	158.8	1.1	124.0	<1.0	75.9	62.6
58	P58/BTB/2025	4958/58	919.6	351.0	<1.0	17.7	<0.5	<0.1	137.7	137.7	137.7	137.7	<1.0	111.9	<1.0	53.0	62.7
59	P59/BTB/2025	4958/59	732.5	553.5	4.5	23.2	<0.5	<0.1	220.4	220.4	220.4	220.4	<1.0	129.5	<1.0	87.2	97.8
60	P60/BTB/2025	4958/60	309.5	842.9	1.6	26.6	<0.5	<0.1	315.6	315.6	315.6	315.6	<1.0	163.3	1.0	139.0	64.2
61	P61/BTB/2025	4958/61	175.1	670.8	3.5	23.1	<0.5	<0.1	1089.5	6.7	9.2	11.9	<1.0	140.4	1.5	48.2	103.0
62	P62/BTB/2025	4958/62	647.2	602.8	5.8	27.9	<0.5	1.6	253.6	11.5	11.7	9.9	<1.0	146.5	4.5	152.2	277.2

Reviewed

A.L.Kanta Rao
AUTHORISED SIGNATORY

Lucid Laboratories Pvt. Ltd.
Plot No. 3, IDA, Balanagar, Hyderabad - 500 037, Telangana, INDIA, Ph : .040-69042222/10 Lines
E-mail: info@lucidlabsindia.com, website : www.lucidlabsindia.com **CIN No. : U24239TG2004PTC042390**

TC-5918

TEST RESULTS

LUCID Laboratories Pvt. Ltd.
Testing to the Core

ULR : TC591825000003086F

Issued to:

Critical Mineral Trackers
N.No 7-1-58/CC/406, 'Concourse ', Opp.Lal Bungalow
Greenlands, Begumpet,
Hyderabad-500 016
Kind Attn: Mr.K.Mahender Reddy, 9032012955

LAB REGISTRATION NO: LL/25-26/004958(1 to 30)
Date. Of Receipt of Sample : 29.07.2025
Date. Of Starting of Analysi : 12.08.2025
Date. Of Completing of Analysis : .16.08.2025
Customer Ref: Test Request Form

Sample Particulars : Picritic Basalt Pits

S.No	Sample ID	Reg no	Antimony as Sb (ppm)	Arsenic as As (ppm)	Barium as Ba (ppm)	Beryllium as Be (ppm)	Bismuth as Bi (ppm)	Cadmium as Cd (ppm)	Chromium as Cr (ppm)	Cobalt as Co (ppm)	Copper as Cu (ppm)	Gallium as Ga (ppm)	Germanium as Ge (ppm)	Hafnium as Hf (ppm)	Indium as In (ppm)	Lithium as Li (ppm)	Molybdenum as Mo (ppm)
63	P63/BTB/2025	4958/63	3.7	4.3	261.6	<1.0	<0.5	<0.5	532.9	52.1	71.2	15.9	<1.0	2.2	<1.0	4.1	1.7
64	P64/BTB/2025	4958/64	7.3	110.9	186.5	<1.0	1.7	12.1	825.8	71.9	64.5	13.3	<1.0	1.3	<1.0	4.5	<1.0
65	P65/BTB/2025	4958/65	7.8	135.3	197.8	<1.0	<0.5	16.3	853.4	81.5	65.2	14.2	<1.0	1.5	<1.0	4.8	<1.0
66	P66/BTB/2025	4958/66	9.9	44.8	194.9	<1.0	1.4	17.5	966.9	77.6	68.8	14.7	<1.0	1.8	<1.0	4.9	<1.0
67	P67/BTB/2025	4958/67	6.3	119.2	117.0	<1.0	<0.5	13.0	759.6	28.4	51.2	13.6	<1.0	1.3	<1.0	15.7	<1.0
68	P68/BTB/2025	4958/68	7.6	4.6	121.4	<1.0	<0.5	<0.5	728.7	76.2	69.1	12.8	<1.0	0.9	<1.0	7.3	1.5
69	P69/BTB/2025	4958/69	11.6	8.9	145.8	<1.0	<0.5	<0.5	1218.7	68.1	76.4	14.5	<1.0	1.2	<1.0	4.4	3.6
70	P70/BTB/2025	4958/70	9.1	6.9	148.0	<1.0	<0.5	<0.5	1162.4	74.8	88.4	14.7	<1.0	1.4	<1.0	4.5	2.9
71	P71/BTB/2025	4958/71	11.2	59.4	186.9	<1.0	<0.5	12.9	1282.1	50.9	80.1	18.0	2.7	1.9	<1.0	4.8	<1.0
72	P72/BTB/2025	4958/72	10.5	120.5	178.7	<1.0	<0.5	14.9	991.9	47.3	80.3	15.9	<1.0	2.0	<1.0	5.2	<1.0
73	P73/BTB/2025	4958/73	6.9	7.2	200.0	<1.0	<0.5	<0.5	810.4	44.1	78.9	17.8	1.1	2.7	<1.0	5.2	1.6
74	P74/BTB/2025	4958/74	7.3	6.0	93.4	<1.0	<0.5	14.2	776.6	39.9	73.2	15.9	1.6	2.0	<1.0	4.7	<1.0
75	P75/BTB/2025	4958/75	6.9	5.3	144.8	2.9	<0.5	<0.5	968.5	59.9	78.8	16.0	2.5	1.6	<1.0	314.4	1.4
76	P76/BTB/2025	4958/76	5.6	7.5	167.3	<1.0	<0.5	<0.5	842.3	60.5	83.8	16.4	4.1	2.2	<1.0	5.1	1.8
77	P77/BTB/2025	4958/77	2.7	90.2	107.0	<1.0	<0.5	10.0	369.6	23.3	57.3	13.4	3.5	1.6	<1.0	11.2	<1.0
78	P78/BTB/2025	4958/78	9.7	19.1	278.6	<1.0	3.5	14.8	757.3	39.7	111.1	19.5	<1.0	3.1	<1.0	4.8	<1.0
79	P79/BTB/2025	4958/79	2.8	4.8	241.2	<1.0	0.5	<0.5	787.3	46.7	94.3	17.1	<1.0	3.3	<1.0	4.8	<1.0
80	P80/BTB/2025	4958/80	5.3	4.6	242.5	<1.0	<0.5	<0.5	791.5	45.6	95.2	16.6	1.3	2.1	<1.0	4.8	2.7
81	P81/BTB/2025	4958/81	3.5	8.7	180.8	<1.0	<0.5	<0.5	591.3	50.5	91.8	18.1	<1.0	2.2	<1.0	3.8	2.2
82	P82/BTB/2025	4958/82	8.3	6.8	305.5	<1.0	3.2	<0.5	466.4	31.6	95.0	21.1	1.8	3.9	<1.0	8.8	2.9
83	P83/BTB/2025	4958/83	6.3	10.3	180.1	<1.0	<0.5	<0.5	515.1	43.1	36.0	20.1	2.6	2.1	<1.0	6.9	5.2
84	P84/BTB/2025	4958/84	5.2	9.3	215.7	<1.0	<0.5	<0.5	254.0	34.7	193.9	20.3	<1.0	1.3	<1.0	4.1	3.6
85	P85/BTB/2025	4958/85	10.2	109.8	228.7	<1.0	<0.5	12.6	835.6	59.9	123.5	18.1	1.2	2.8	<1.0	17.5	<1.0
86	P86/BTB/2025	4958/86	6.5	12.6	261.7	<1.0	<0.5	<0.5	706.3	29.5	70.0	15.9	<1.0	2.2	<1.0	32.0	1.5
87	P87/BTB/2025	4958/87	8.6	29.3	95.9	<1.0	<0.5	13.0	918.0	81.0	61.9	13.2	<1.0	0.8	<1.0	8.5	<1.0
88	P88/BTB/2025	4958/88	10.0	37.5	115.0	<1.0	<0.5	13.8	909.1	91.0	51.7	13.3	<1.0	1.0	<1.0	7.1	<1.0
89	P89/BTB/2025	4958/89	8.5	49.2	420.7	<1.0	2.0	14.1	640.8	37.7	63.2	18.7	<1.0	3.9	<1.0	6.5	<1.0
90	P90/BTB/2025	4958/90	4.4	34.2	226.3	<1.0	<0.5	15.7	605.3	27.1	48.6	16.6	<1.0	2.5	<1.0	17.5	<1.0
91	P91/BTB/2025	4958/91	5.8	136.0	87.0	<1.0	0.6	16.0	804.9	65.5	77.2	16.0	<1.0	1.3	<1.0	7.4	<1.0
92	P92/BTB/2025	4958/92	5.9	4.3	156.9	<1.0	0.8	14.6	758.4	74.3	69.5	12.5	<1.0	1.2	<1.0	4.2	<1.0
93	P93/BTB/2025	4958/93	8.8	13.0	185.2	<1.0	0.5	16.2	936.2	65.7	102.3	16.1	<1.0	2.0	<1.0	10.9	<1.0

Test Method: SOP OM-8 and SOP-OM-1, Instrument Used: ICP-OES
Note 1: The above results are expressed on dry basis

Reviewed

A.L.Kanta Rao
AUTHORISED SIGNATORY

Lucid Laboratories Pvt. Ltd.
Plot No. 3, IDA, Balanagar, Hyderabad - 500 037, Telangana, INDIA, Ph : .040-69042222/10 Lines
E-mail: info@lucidlabsindia.com, website : www.lucidlabsindia.com **CIN No. : U24239TG2004PTC042390**

TC-5918

TEST RESULTS

LUCID Laboratories Pvt. Ltd.

Testing to the Core

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Sample Particulars : Picritic Basalt Pits

S.No	Sample ID	Reg no	Nickel as Ni (ppm)	Niobium as Nb (ppm)	Lead as Pb (ppm)	Scandium as Sc (ppm)	Selenium as Se (ppm)	Silver as Ag (ppm)	Strontium as Sr (ppm)	Tantalum as Ta (ppm)	Tellurium as Te (ppm)	Thallium as Tl (ppm)	Tin as Sn (ppm)	Vanadium as V (ppm)	Tungsten as W (ppm)	Zin as Zn (ppm)	Zironium as Zr (ppm)
63	P63/BTB/2025	4958/63	645.6	667.9	3.9	28.2	<0.5	1.5	278.2	11.1	12.7	8.2	1.4	117.0	1.6	113.6	90.7
64	P64/BTB/2025	4958/64	989.4	444.7	3.3	20.0	<0.5	0.7	183.4	11.3	11.6	1.1	<1.0	117.8	1.5	78.3	93.3
65	P65/BTB/2025	4958/65	1025.4	437.4	1.3	21.0	<0.5	0.5	195.8	11.3	10.1	2.9	<1.0	113.5	2.0	77.0	84.4
66	P66/BTB/2025	4958/66	1024.6	455.6	2.4	20.4	<0.5	0.8	180.3	8.1	10.8	2.6	<1.0	112.2	0.6	84.2	89.9
67	P67/BTB/2025	4958/67	392.6	612.5	4.2	21.8	<0.5	1.2	529.8	8.6	8.7	7.9	<1.0	144.4	2.8	91.1	62.7
68	P68/BTB/2025	4958/68	933.4	415.2	1.6	20.3	<0.5	0.6	250.5	7.1	11.4	4.7	<1.0	103.2	3.0	70.6	65.8
69	P69/BTB/2025	4958/69	989.3	573.8	15.2	23.8	<0.5	2.0	181.7	10.3	13.1	7.4	<1.0	115.6	3.0	99.5	107.1
70	P70/BTB/2025	4958/70	1073.5	493.8	1.7	21.9	<0.5	0.4	159.8	12.1	12.3	5.5	<1.0	94.3	1.7	88.3	95.7
71	P71/BTB/2025	4958/71	676.8	794.9	1.5	30.6	<0.5	0.5	269.1	15.3	16.2	8.0	3.3	159.8	2.2	133.4	72.7
72	P72/BTB/2025	4958/72	633.0	738.7	2.4	29.5	<0.5	0.6	258.4	7.9	15.7	8.6	<1.0	149.8	2.5	123.4	99.2
73	P73/BTB/2025	4958/73	563.1	883.0	1.5	31.5	<0.5	0.6	273.4	10.2	16.1	8.5	<1.0	169.3	3.5	149.2	75.5
74	P74/BTB/2025	4958/74	417.3	674.6	1.5	28.6	<0.5	0.6	398.1	8.3	13.5	6.7	<1.0	119.2	2.2	104.3	65.6
75	P75/BTB/2025	4958/75	857.1	575.9	<1.0	25.4	<0.5	0.5	217.5	10.2	14.0	6.7	<1.0	128.2	2.5	107.6	82.0
76	P76/BTB/2025	4958/76	830.5	707.4	4.1	27.6	<0.5	0.5	255.7	10.3	15.2	13.1	<1.0	155.8	2.3	121.5	84.4
77	P77/BTB/2025	4958/77	283.2	601.9	4.4	16.7	1.7	0.4	671.2	5.9	10.5	4.1	<1.0	115.9	1.4	88.3	45.4
78	P78/BTB/2025	4958/78	432.1	945.6	2.6	33.1	1.3	0.8	329.6	16.0	16.1	12.6	<1.0	208.7	2.5	154.3	95.4
79	P79/BTB/2025	4958/79	526.7	754.2	3.1	29.7	1.3	298.1	278.3	9.7	15.6	11.1	<1.0	162.5	2.2	126.2	77.9
80	P80/BTB/2025	4958/80	530.3	643.1	2.4	30.3	<0.5	299.2	281.7	8.4	16.6	10.7	<1.0	163.2	2.6	97.0	78.7
81	P81/BTB/2025	4958/81	501.1	787.0	4.3	25.6	<0.5	0.7	302.8	15.2	14.9	13.9	<1.0	159.9	2.7	115.9	84.8
82	P82/BTB/2025	4958/82	300.4	1024.3	8.5	30.3	<0.5	0.8	425.9	12.2	17.9	13.1	<1.0	190.2	3.5	178.4	167.7
83	P83/BTB/2025	4958/83	251.7	747.3	34.6	22.2	<0.5	0.5	320.5	11.5	16.0	12.2	<1.0	153.8	3.7	121.1	179.2
84	P84/BTB/2025	4958/84	179.3	497.7	5.9	34.5	1.5	0.8	362.8	9.6	13.2	2.8	<1.0	246.3	7.9	62.1	87.4
85	P85/BTB/2025	4958/85	776.8	856.9	1.5	32.7	<0.5	0.9	445.2	12.2	16.4	10.9	1.6	130.3	2.1	138.5	93.5
86	P86/BTB/2025	4958/86	415.3	681.7	4.7	26.7	<0.5	0.8	758.7	9.0	13.4	8.9	<1.0	173.1	2.5	105.3	62.5
87	P87/BTB/2025	4958/87	1025.3	418.4	2.3	19.3	<0.5	0.7	207.5	11.4	11.8	4.0	<1.0	112.0	1.3	70.0	68.9
88	P88/BTB/2025	4958/88	1116.3	313.2	<1.0	16.6	<0.5	0.4	207.2	8.4	9.7	0.6	<1.0	96.6	1.6	54.4	65.0
89	P89/BTB/2025	4958/89	467.6	943.0	1.3	31.3	1.0	11.6	232.9	10.7	16.9	15.0	<1.0	117.2	2.3	138.2	66.3
90	P90/BTB/2025	4958/90	290.2	732.3	4.9	25.9	<0.5	0.4	583.6	10.0	12.0	11.2	<1.0	191.2	2.1	113.1	58.9
91	P91/BTB/2025	4958/91	873.0	633.2	2.4	20.9	<0.5	0.5	163.3	9.3	14.3	9.1	<1.0	128.7	3.0	102.1	79.6
92	P92/BTB/2025	4958/92	805.5	430.4	1.5	18.1	<0.5	0.4	383.3	8.1	11.7	4.4	<1.0	122.0	3.4	75.4	74.0
93	P93/BTB/2025	4958/93	866.1	741.9	1.4	26.3	<0.5	0.8	284.3	13.9	15.0	7.6	<1.0	162.2	3.2	123.3	91.2

Test Method: SOP OM-8 and SOP-OM-1, Instrument Used: ICP-OES
Note 1: The above results are expressed on dry basis

Reviewed

A.L.Kanta Rao
AUTHORISED SIGNATORY

Lucid Laboratories Pvt. Ltd.
Plot No. 3, IDA, Balanagar, Hyderabad - 500 037, Telangana, INDIA, Ph : .040-69042222/10 Lines
E-mail: info@lucidlabsindia.com, website : www.lucidlabsindia.com **CIN No. : U24239TG2004PTC042390**

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CRITICAL MINERAL TRACKERS
raashtr pratham

LUCID Laboratories Pvt. Ltd.
Testing to the Core

TC-5918

LL/MSP7.8/F03

Plot No. 3, IDA, Balanagar,
Hyderabad - 500 037, Telangana.
Ph: 040-6904 2222/10 Lines
E-mail: info@lucidlabsindia.com
Web: www.lucidlabsindia.com

TEST REPORT

ULR : TC591825000003086F

Issued to:
Critical Mineral Trackers
H No. 7-1-58/CC/406, 'Concourse', Opp. Lal Bungalow
Greenlands, Begumpet
Hyderabad - 500 016
Kind Attn.:Mr. K Nageswara Rao, 9032012955

Report No. : LL/25-26/004959
Issue Date : 16/08/2025
Customer Ref.: Test Request Form
Ref.Date : 29/07/2025

Sample Particulars : Picritic Basalt Pits, Samples

Sample description : Picritic Basalt Pits, Samples

Qty. Received : ~1Kg x 2Nos
Sample Code : BRS 94/BTB/2025 & BRS 95/BTB/2025
Mode of Packing : Polythene cover
Test Parameters : Trace Elements

Date of Receipt of Sample : 29/07/2025
Date of completion of analysis : 16/08/2025
Date of Starting of Analysis : 12/08/2025
SAMPLE TESTED AS RECEIVED

TEST RESULTS

S.No	Test Parameters	Units	Reg No:LL/25-26/004958/94 Sample ID: BRS 94/BTB/2025	Reg No:LL/25-26/004958/95 Sample ID: BRS 95/BTB/2025
21	Silver as Ag	ppm	1.0	0.9
22	Strontium as Sr	ppm	344.5	360.8
23	Tantalum as Ta	ppm	21.7	11.3
24	Tellurium as Te	ppm	<1.0	16.5
25	Thallium as Tl	ppm	42.1	12.1
26	Tin as Sn	ppm	<1.0	<1.0
27	Vanadium as V	ppm	210.4	216.3
28	Tungsten as W	ppm	15.1	20.5
29	Zin as Zn	ppm	213.1	195.3
30	Zironium as Zr	ppm	99.3	1752.6

Test Method: SOP OM-12(Instrument Used: ICP-OES)
Note:The above results are expressed on dry bassis.
NOTE: This report and results relate only to the sample / items tested

End of Report

Reviewed by

A.L.Kanta Rao
Authorized Signatory

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Note: This report is subject to the terms and conditions mentioned overleaf