Report On
G3 Level Exploration for Vanadium and Titanium in Beach and Dune Sands of Talashil Block in Sindhudurg District, Maharashtra.

By

GEO MARINE SOLUTIONS PVT LTD

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Mangalore-575005, Karnataka, INDIA

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For

National Mineral Exploration Trust (NMET)

Ministry of Mines

Room No. 325 & 326, Wing-F, Udyog Bhawan,

Rafi Ahmed Kidwai Marg,

Rajpath Area, Central Secretariat

New Delhi-1100011

Ref. No: 23/449/2024-NMET/604 dated 12th March 2024

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Approved By	**:**	V.K.K. Kalluraya (CEO, Geo Marine Solutions Pvt. Ltd.)

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EXECUTIVE SUMMARY

National Mineral Exploration Trust (NMET) approved the proposal for G3 exploration with a main objective to evaluate the critical mineral concentration viz; titanium and vanadium in the beach and dune sands in the Talashil Block, in Malvan Mandal, Sindhudurg District, Maharashtra. The approval was accorded vide order No23/449/2024-NMET/604 dt.12/03/2024 after going through the DPR and presentations to TCC and EC. The work components comprise topographic survey and geological mapping, auger drilling and relevant laboratory studies. The field work was started on 25th March 2024.

Regionally, in the Sindhudurg district of Maharashtra, the rocks exposed are (i) metamorphosed gneisses (Peninsular Gneisses); (ii) volcano-sedimentary rocks of Archean age (Dharwar Supergroup); (iii) non-metamorphosed Proterozoic sediments (Kaladagi Group) and (iv) Deccan Traps. Locally, the Talashil Block is dominant with beach and dune sands of Recent age with few laterite exposures in the northern part near Achara River mouth. The area forms a narrow submergent coastal plain in the north of Malvan taluk, which is about 12.8 km in length, 130 m to 900 m wide and an average width of 450m. The anomalous zone that runs parallel to the NNW-SSE trending coastline is structurally undisturbed and unmetamorphosed. Primary depositional features including current bedding, ripple marks, and graded bedding are observed near Achara in the north.

In order to cover the landward extension of the dune, a total of 5.84 sq. kms, as against TCC, NMET demarcated area of 4.68 sq.km, was explored. The topographic and geological mapping on 1: 5000 scale was carried out in parts of old toposheet bearing nos 47H/08 and OSM E43T/8. Topographic survey was carried out with Geomate Real Time Kinematic–Global positioning system (RTK-GPS) receiver in UTM coordinate system. The auger drilling at grid spacing 400 x 200m as per MEMC rule for G3 level exploration was planned, executed and accordingly 52 drill-cores were collected up to 6m bgl (below ground level) except two boreholes that ended up with 4m bgl (TL26) and 5m bgl (TL25) respectively. The sediment samples at every 1m were collected, packed and labelled in the field.

The heavy mineral and grain size analysis of 309 samples was carried out following the SOP of the Geological Survey of India which involves (i) the processing half of the sample while preserving the other half for future reference; (ii) two level magnetic separation using LIRMS (Low Intensity Rotary Magnetic Separator) and REDMS (Rare Earth Drum Magnetic Separator); (iii) the calculation of weight percentage of each magnetic sub-fraction A (LIRMS-magnetics), B (REDMS-magnetics), and C (REDMS-middlings) separately and (iv) subjecting the REDMS non-magnetic fraction to gravity separation and (v) studying the latter under polarising microscope. 234 samples (25% of the total sub-fractions) were subjected to geochemical analysis using WDXRF spectrometer for determining the concentrations of major oxides such as Al2O3, BaO, CaO, Cr_2O_3, Fe_2O_3, K_2O, MgO, MnO, Na_2O, P_2O_5, SiO_2, TiO_2, SO_3 and V_2O_5.

XRD studies for ten representative samples show that the (i) LIRMS-magnetics (A-fractions) contain spinel group of minerals (magnetite, titanomagnetite and magnesioferrite) having

similar spinel crystal structure, comparable lattice parameters and XRD patterns making distinction between these types of minerals challenging in poly-mineralic samples; the other minerals present in the A-fractions are ilmenite and hematite; (ii) the REDMS-magnetics (B-fractions) are mostly composed of ilmenite, hematite and pyroxene;(iii) REDMS-middlings (C-fractions) are composed of feebly magnetic heavy minerals such as amphiboles and pyroxenes and (v) non-magnetic heavy minerals (NMHM) comprise pyroxene, amphibole, zircon, chlorite, epidote etc. and in the non-magnetic light minerals (NMLM), the identified mineral phases are quartz, plagioclase and K-feldspar. Microscopic studies of the nonmagnetic heavy mineral fraction revealed a diverse range of minerals, including clinopyroxene, hornblende, hematite, sphene, plagioclase, magnetite, rutile, epidote, zircon, hypersthene, tremolite, ilmenite and chromite. Ten bulk samples representing the exploration area were analysed for radiometric analysis of monazite equivalent at AMD, Hyderabad. The monazite equivalent varies from 74(±3) ppm to 99(±2) ppm.

Based on the mineral separation analysis data, the percentage of A-fraction in the bulk sediment ranges from 0.23-31.76 % with an average of 6.01%, whereas B-fraction ranges between 0.06 and 14.47% with a low average of 1.50%, C-fraction ranges from 1.64-19.69% with a higher average of 9.33%, whereas D-fraction (NMHM) which is the non-magnetic heavy minerals ranges between very low values from 0.00-3.13% with an average of 0.86% and the nonmagnetic light minerals(NMLM) termed as E fraction ranges from 45.16-97.53% with an average of 81.82%. Since the vanadium and titanium concentrations in A, B and C fractions are significant, the resources were estimated for the entire ore body (A+B+C).

The enormous data generated was compiled, synthesized and interpreted to understand the deposit, generate ore-concentration model and to estimate the resource. The total tonnage of the sand body in the block is estimated to be 53.04678 MMT, in which 8.9076 MMT is the orebody that constitutes about 16.84%. Out of which A-fraction (LIRMS-magnetics) represents about 6.01%, B-fraction (REDMS-magnetics) 1.5% and C-fraction (REDMS-middlings) represents 9.33%. The grade of Fe_2O_3 in the total sand is 5.866%, TiO2 2.039% and V_2O_5 0.034%. Whereas in the orebody, the grades increase considerably as 35.2% Fe2O3, 11.7% TiO2 and 0.18% V2O5. The total tonnage of Fe_2O_3 is estimated as 3.1118 MMT, TiO2 1.0818MMT and V2O5 0.0179MMT in the Talashil Block explored. However, an area of 2.3 sq.km marked as high potential in the southern part of the block having orebody grade between 16% and 34% and the remaining 3.54 sq.km area is marked as potential with orebody grade between 9 and 16%. Further, when the metal enrichment values among A-, B- and C-fractions are determined, it is found that A- and B-fractions together holds 83% of vanadium and 76% of titanium in the high potential zone compared to 71% of vanadium and 60% of titanium in the potential zone. Since the A- and B-fractions constitute only about 45% of the total orebody (A+B+C), this information is vital during the beneficiation of magnetic minerals.

The geological formations in the Talashil Block are conducive to the presence of these valuable heavy minerals. The Talashil block exhibits varying mineralization patterns across regions, influenced by surface and subsurface processes such as erosion, deposition, sorting etc. The concentration of Valuable Heavy Minerals (VHM; the sum of A+B+C) is higher towards southern area in comparison with that of northern part of the block.

These vanadium and titanium bearing minerals are essential for various high-tech industries, including electronics, telecommunications, and renewable energy technologies. The beach and dune sands have been identified as potential sources, and previous exploration activities have also yielded positive results. The key raw materials for vanadium extraction are titanomagnetite ores (~ 88% of total V production in the world).

The present study shows that the Talashil area has promising placer concentrations of Titanium and Vanadium when compared to Vanadiferous titanomagnetite (VTM) deposits hosted mainly within mafic and ultramafic igneous rocks. The latter, the main source of vanadium in different parts of the world, contain 0.2 to 1.0 percent V_2O_5, but some areas have over 1.5 percent V_2O_5. The average TiO_2 concentration of about 18% in A- and B-fractions of the study area is higher than the Windimurra Complex in Western Australia (one of the world's largest titanium-vanadium deposits; has TiO_2 concentrations around 2% and average 0.32% V_2O_5). Similarly, the average V_2O_5 concentration of 0.386%, 0.131% and 0.085% in the A-, B- and C-fractions respectively are comparable to that of global deposits (industrial smelters of Highveld Steel, South Africa), Panzhihua Steel, China, NTMK Steel, Russia and New Zealand Steel, New Zealand).

The importance of liberated ore minerals in placer deposits is significant because the liberation of ore minerals means that the valuable minerals are already separated from the surrounding rock. This makes the extraction process more efficient and cost-effective compared to deposits where the ore minerals are still locked within the host rock, like the titanomagnetite bands in layered gabbro deposits. Hence, we recommend that the high potential area as mentioned in the report may be taken up first for further exploration (G2) so that the close spaced and deep drilling would bring out the size and shape of the entire orebody.

The exploration has been carried out as per Mineral (Evidence of Mineral Contents) Rule-2015, mineral (Evidence of Mineral Contents) Rule-2021 and the Mineral Resources are estimated as per UNFC norms. Since this is preliminary exploration (G3) with no study on 'E' and 'F' axes, the resource has been classified under UNFC G3F3E3.

***

CHAPTER-1 INTRODUCTION

1.1 Details of project

Initiated to unlock the hidden potential of India's coastline, the Vanadium, Titanium Bearing Sand Exploration Project aims to explore and evaluate the vast untapped low-grade resource of beach and dune sand deposits. These deposits scattered along extensive Gujarat-Maharashtra coastline of India hold significant concentrations of vanadium and titanium. A comprehensive geological investigation, involving sampling, mapping, and laboratory analysis was taken up under the G3 level exploration project of NMET at Talashil block of Maharashtra (Fig.1.1). The project aims to identify areas with good concentration of vanadium and titanium deposits. It is hoped that the project may pave the way for their sustainable extraction and utilization.

1.2 Investigating agency

M/s. Geo Marine Solutions Pvt. Ltd (CIN U74900KL2011PTC28241) is a Notified Private Exploration Agency (NPEA), Science and Technology Services Company with a vision to take proactive role in nation building by providing latest scientific know-how in the Earth System Science. The company draws its inspiration and ability to undertake challenging projects from Team Leaders in different disciplines of Earth Sciences who are former scientists from prestigious organizations like Geological Survey of India, National institute of Oceanography etc. Each of the Domain Leaders of Geo Marine Solutions is the leading scientists in their fields and brings in about more than three decades of experience in Offshore and Onshore Geo Scientific Survey and Exploration.

The entire work components were planned and executed by the firm, under the coordination of Dr. Fareeduddin (former Director (Geology), Geological Survey of India), Project Coordinator, and A.C Dinesh, (former Director (Geology), Geological Survey of India), Chief Technology Officer, Geo Marine Solutions Pvt. Ltd.

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1.3 Objectives of investigation

a) The objective of the investigation is G3 Level Exploration for Vanadium and Titanium in Beach and Dune Sands of Talashil Block in Sindhudurg District, Maharashtra.

b) To understand the surficial distribution and downward continuity of economic heavy minerals by sampling at 400m x 200m interval and auger drilling up to 6 m below ground level.

c) To estimate the valuable resource within the exploration area and to recommend the feasibility for further level of exploration.

1.4 Basis for taking up investigation

Indian subcontinent has been endowed with vast placer resources of various minerals of economic importance. The minerals like ilmenite, magnetite, rutile, garnet, zircon, monazite and sillimanite are occurring in these deposits. Important deposits occur in the coastal environments of various states of Kerala (Chavara), Tamil Nadu (Manavalakurichi, Midalam, Vayakallur), Andhra Pradesh (Kakinada, Pentakota, Bhimunipatnam, Konada – Kandivalasa – Mukumpeta – Bendi creek – Donkar), (Sanaekasangi – Gopalpur, Chatrapur, Bajarkot, Satpara and Puri) and Maharastra (Kalbadevi, Newre and Malgund) (Jagannadha Rao et al.2018). The southern coastline of Maharashtra, Central West Coast of India, is known for its rich placer deposits of ilmenite, magnetite, and chromite (Gujar et al. 2004; 2008; 2010) which are derived from the Precambrian and Mesozoic rocks (Gujar et al. 2009).

In recent years, critical minerals such as titanium and vanadium will be having significant demand due to their roles in modern technology and strategic applications. Technological advancements rely on the strategic and economic applications of titanium, vanadium, zirconium and rare earths, in the form of their metals or alloys. Keeping in view India's ever-growing demand for mineral resources, preliminary assessment was conducted to identify concentrations of low-grade heavy minerals with vanadium and titanium along the west coast of India. Gujar et al. (2022) reported that, the region between Pirwadi to Talashil is most promising for further exploration due to significant concentrations of ilmenite, titatno-magnetite, and magnetite with TiO_2 and V_2O_5 contents. The ilmenite grains with TiO_2 between 39 and 50 wt% (average = 44 wt%) indicate these to be of moderate grade. Magnetites with appreciable TiO_2 (14–24 wt%, average 21 wt%) and are of refractory grade.

Geological Survey of India has identified heavy mineral rich zones in nearly 100 km long coastal track along Arabian Sea located in Ratnagiri district, Maharashtra. The economic importance coupled with the resource availability along the west coast of India has prompted beach sand exploration in this area.

The present study is to identify and locate potentially viable zones of titanium and vanadium rich heavy minerals within a 12.8 km stretch of coastal land along the Arabian Sea, situated between the Achara and Gad River mouth in the Malvan Taluk of Sindhudurg district. Vanadiferous-titano-magnetite (VTM) ore is a typical poly-metallic mineral which mainly contains V, Ti, and Fe, with a high comprehensive utilization value. The source of the heavy mineral deposits in the coastal regions likely originates from the east, where lava flows from the Deccan Trap are exposed. These flows are capped by Cenozoic-age laterite and Quaternary-age alluvium. The area is dissected by dolerite dykes. Consequently, it is probable that ilmenite-magnetite heavy mineral concentrations exist in the coastal zone, as rivers and streams in the area transport inland sediments to the coast (Basha, & Pal, 2020).

1.5 Details and nature and quantum of work proposed vs achievement (Table)

The exploration for vanadium and titanium in Talashil block (G3) with quantum of work and targets achieved are given in Table-1.1

Table: 1.1 Quantum of Work – Talashil G3 Exploration Block

Sl. No	Description of Work	Quantum of work proposed (Sq Km/ Number)	Achievement	Remarks
1	Geological, Topographic mapping (1:5000 scale)	4.68 sq km	5.84 sq km	During execution of topographic survey and geological mapping on 1:5000 scale and post data processing in Talashil block, it is observed that the total area with presence of alluvial sand is 5.84 sq.km.
2	Auger drilling of 52 BH up to 6.0m BGL	52 nos (312 m)	52 nos (309 m)	The total sampling depth in TL25 and TL26 was 5.0m and

Sl. No	Description of Work	Quantum of work proposed (Sq Km/ Number)	Achievement	Remarks
				4.0m, respectively. Hence, three meters of samples were not recovered in auger due to the presence of gravel.
3	Grain size analysis	-	309 nos	All recovered samples were subjected to Grain size analysis
4	Mineral Separation and Identification (Two level Magnetic separation and Gravity separation)	312 nos	309 nos	All recovered samples were subjected to Mineral separation.
5	Geochemical analysis for all Major oxides including Ti, V, Fe, and other oxides using XRF/ICPMS (25 % of sub samples) *	234 nos*	234 nos*	-
6	XRD analysis	10 nos	10 nos	-
7	Mineralogical study under microscope	10 nos	10 nos	-
8	Resource estimation and report writing	1	1	-
9	Radiometric analysis of Monazite equivalent (AMD)	10 no.s	10 no.s	-

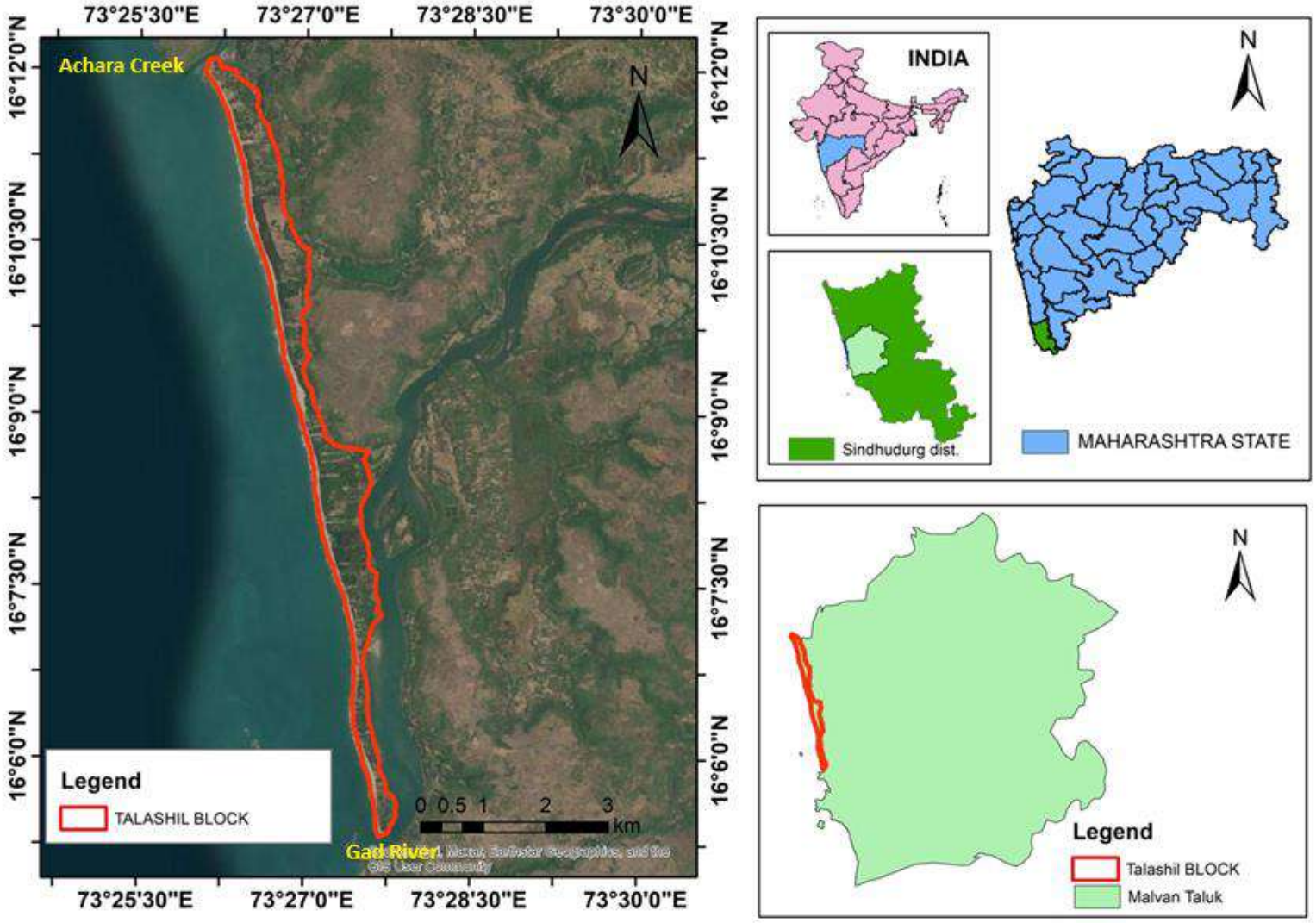


Figure 1.1: Index map of the G3 Exploration area

1.6 Technical Personal involved in the project.

The Table-2 shows the technical experts deployed in the exploration with their qualification, designation, and major contributions in the investigation.

Table-2 Technical persons engaged in exploration				
Sl no	**Name**	**Qualification**	**Designation**	**Main contributions**
1	Dr. Fareeduddin	PhD in Geology with 41 years of experience in Mineral Exploration and Geological mapping	Former Director, GSI, Principal Consultant - Geo Marine Solutions Pvt Ltd. and NABET approved Project Coordinator.	Guidance throughout the field season, sample processing, analysis and report writing.
2	A.C Dinesh	M.Sc. Marine Geology, with 36 years of experience in Mineral Exploration and Geological mapping	Former Director, GSI and Chief Technology Officer, Geo Marine Solutions Pvt. Ltd.	Supervision and guidance in field geological mapping, topographic survey, auger sampling, map preparation, ore modelling, Resource estimation, writing of report.
3	P Praveen Kumar	MSc (Tech) Applied Geology, with 32 years of experience in Mineral Exploration and Geological mapping	Former Director, GSI and Director, Geo Marine Solutions Pvt. Ltd	Field planning, co-ordination of mineral separation in the lab, interpretation of data, and writing of report.
2	Guruprasad S.	M.Sc. Geology with 6 years of experience.	Sr. Geologist, M/s. Geo Marine Solutions Pvt. Ltd.	Geological mapping, Topographical survey, sampling, synthesis and interpretation of data, map preparation, ore modelling. Resource estimation, writing of report.
3	Vidya Vincent	M.Sc. Marine Geology with 3	Geologist, M/s. Geo Marine Solutions Pvt.	Supervision of sub sampling and separation of heavy

		years of experience.	Ltd.	mineral of samples.
4	Aswathy P S	M.Sc. Marine Geology with 3 years of experience.	Geologist, M/s. Geo Marine Solutions Pvt. Ltd.	Separation of heavy mineral of beach samples, Grain size analysis, synthesis and interpretation of data and writing of report.
5	Aparna C V	M.Sc. Marine Geophysics with 4 years of experience.	Geophysicist, M/s. Geo Marine Solutions Pvt. Ltd.	Map preparation, supervision of sample processing.
6	Jithesh	Diploma in Civil Engineering with 7 years of experience	Topographic Surveyor	DGPS fixing and Topographic survey
7	Abhay Krishna S U	Diploma in Civil Engineering with 4 years of experience	Topographic Surveyor	DGPS fixing and Topographic survey
8	M.P Prathep Kumar	Chief Mate Phase I&II, LBS college Mumbai.	Former Chief Nautical Officer, Shipping Corporation of India	Logistics and field Manager

1.7 Mode of operation of different work components and associated agency

During this investigation, the work was executed in three different stages, namely pre-field studies, field studies and post-field studies. The different components and procedures followed in each stage are discussed below.

A. Pre-field studies: It includes preliminary research (published papers and field visits) and feasibility studies on concerned toposheets (47H/08), geological maps, OSM sheets, previous reports, initial site assessments to identify potential area of exploration and preparation of in-principal report. The pre-field studies were undertaken from the first week of January 2024.

During the initial phase, reconnaissance survey was conducted and samples were collected from two locations (13MR, Longitude: 73.45081°, Latitude: 16.14646° and 14MR, Longitude: 73.45287°, Latitude: 16.13544°) within the Talashil area (previously explored by Gujar et al., 2022). These samples were studied to evaluate the Ti and V content in different

mineral phases, with the aim of determining the potential viability of the sampling area. Chemical analysis result shows that the magnetite fractions (13 MR- A and 14 MR- A) contain approximately 27% TiO_2, around 0.75% V_2O_5, and Fe_2O_3 ranging from 57% to 60%. The Ilmenite fractions (13 MR- B and 14 MR- B) have 42% TiO_2, 0.465% V_2O_5 and Fe_2O_3 in the range of 47%. The limonite fraction (13 MR C and 14 MR C) show TiO_2 content in the range of 11-19%, V_2O_5 content between 0.21% to 0.34% and Fe_2O_3 in the range of 37-47%. A proposal based on these findings was prepared and submitted to NMET, which was approved later.

B. Field studies: The field studies were undertaken between the period from 27th April 2024 to 23rd June 2024 and 18th November 2024 to 19th November 2024. Reconnaissance survey was conducted initially to assess the actual conditions of roads, accessibility in different parts of area, communication links therein, hydrography (drainage pattern and nearby streams) and climatic conditions. Topographic survey in the study area was carried out with three sets of Geomate Real Time Kinematic–Global positioning system (RTK-GPS) receivers. A total of 5.84 sq.km area was covered by systemic Geological mapping on 1: 5000 scale with collection of beach and dune sand samples from representative boreholes within 400*200 m grid pattern as per MEMC rule (Fig. 1.2). A total of 309 nos. of beach sediment samples were collected by hand auger drilling from 52 boreholes at 1.0m interval up to a maximum depth of 6.0m below ground level. The samples were dried and subjected to coning and quartering in the riffle splitter. They are packed and labelled separately. One part of the sample is kept as repository and other was used for laboratory studies.

C. Post field studies: The post field study includes data compilation, grain size analysis, magnetic and gravity separation, sample analysis, summarizing analytical results, finalization of maps and writing of report.

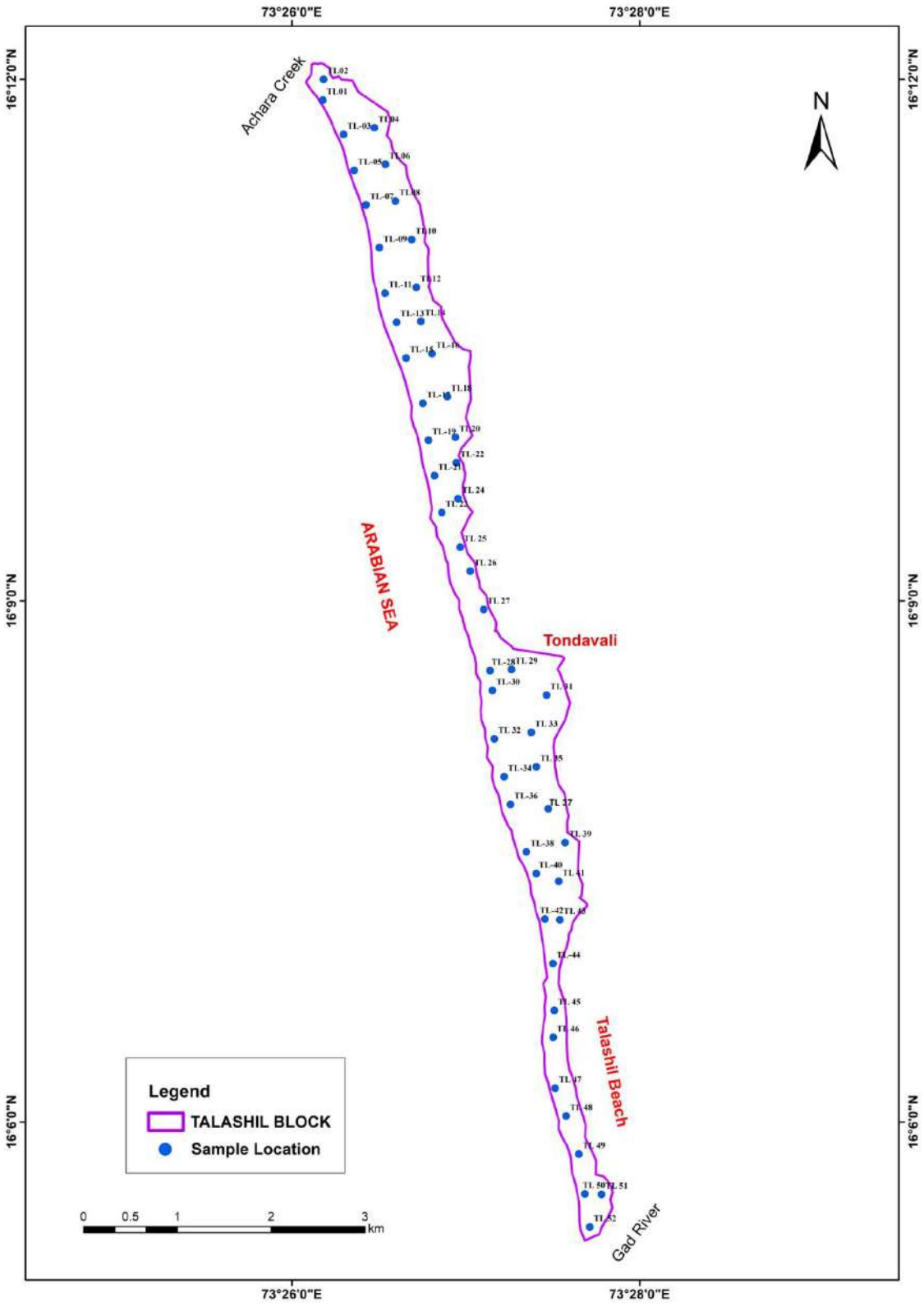


Figure 1.2 Borehole locations in Talashil Block.

Other agencies involved with this project are;

All field components like, geological mapping, topographic survey, auger drilling, sample collection as well as post field components like, grain size analysis, two level magnetic separation using LIRMS & REDMS and mineralogical studies were done in-house at Geo Marine Solutions Pvt Ltd. The associated agencies in the laboratory analysis are mentioned below.

I. Shiva Analyticals (India) Private Ltd., Hoskote, Bangalore- 562 114

(NABL accredited Company)

Founded in 1997, Shiva Analyticals is NABL accredited company and is a leading analytical testing laboratory in India, based in Bangalore. Specializing in diverse sectors such as pharmaceuticals, food & agriculture, ores & minerals, petroleum, environmental, and materials testing, Shiva Analyticals offers comprehensive solutions using advanced instrumentation and expert analysis. With a focus on regulatory compliance, quality control, and innovative testing methods, the lab supports clients in ensuring product safety and efficacy, while also contributing valuable insights to the mining industry and addressing environmental and industrial hygiene concerns. As part of the Cotecna Group (Switzerland), Shiva Analyticals is committed to enhancing service delivery and customer satisfaction in a dynamic market.

Chemical analysis of 234 samples were carried out at Shiva Analytical Lab to determine the Major oxides.

II. IREL (India) Ltd., Kollam, Kerala State, India- 691 001

IREL (India) Limited, originally established as Indian Rare Earths Limited on August 18, 1950, is a government-owned enterprise under the Department of Atomic Energy. It began with its Rare Earths Division in Aluva, Kerala, and expanded by acquiring mining operations in Chavara, Kerala, and Manavalakurichi, Tamil Nadu. In 1986, IREL launched its flagship Orissa Sands Complex (OSCOM) in Odisha, boasting a processing capacity of 600,000 tons per annum for minerals like Ilmenite, Rutile, Zircon, Sillimanite, and Garnet. The company also operates a Rare Earths Extraction Plant and a refining facility in Aluva. With a focus on expanding mineral production and developing related industries, IREL supports its operations through an in-house R&D division in Kollam and maintains its corporate office in Mumbai.

During pre-field studies a few samples were analysed at Research Lab at IREL, Kollam for magnetic separation.

III. AMD

Atomic Minerals Directorate (AMD) for Exploration and Research is the oldest unit of the Department of Atomic Energy (DAE). The Directorate is presently employing latest technology viz. Time Domain EM system along with gamma-ray spectrometer and magnetometer for airborne geophysical surveys, and multi-disciplinary field operations viz. geological, geophysical, Geo-chemical surveys on regional as well as detailed scale and drilling activities by induction of state-of-the-art hydrostatic rigs. The Directorate also has Beach-sands & Offshore, Rare metal and rare earth Investigations Groups and very well-equipped Physics and Instrumentation Groups. The prime mandate of Atomic Minerals Directorate for Exploration and Research is to identify and evaluate uranium resources required for the successful implementation of Atomic Energy programme of the country. The Beach Sand and Offshore Investigations (BSOI) is entrusted with the exploration and evaluation of BSMs associated with shoreline placer deposits confined to East and West coasts of India in general as well as inland sand bodies (palaeo-beach ridges), inland alluvium and red sediments/teri sands along East coast in particular.

10 bulk samples were examined for radiometric analysis equivalent to monazite to verify radioactive substance in the samples.

IV. Bureau of Veritas, Inspectorate Griffith India Pvt. Ltd. Plot No 73, Sector 11, GIDC Gandhidham-370201, Kutch, Gujarat. **(NABL accredited laboratory)**

M/s. Bureau of Veritas, Inspectorate Griffith India Pvt. Ltd., an NABL accredited analytical laboratory, offers biological, chemical, and mechanical testing services along with validations, research, and failure investigations. Bureau Veritas is a world leading inspection and testing organization for the growing commodities industry. Inspectorate Griffith India is the core of the Bureau Veritas Commodities Division in India.

All the 23 check samples were analysed by Bureau of Veritas, Inspectorate Griffith India Pvt. Ltd.

V. IIT ISM Dhanbad

The Indian School of Mines, formally inaugurated on December 9, 1926, by Lord Irwin, the then Viceroy of India, was established to address the growing need for skilled professionals in mining and related fields. Initially focused on Mining and Applied Geology, it was granted the status of a deemed university in 1967 under Section 3 of the UGC Act, 1956. Over the years, IIT(ISM) has expanded its scope to become a comprehensive technology education institution of global repute. It is located at about 260 km from Kolkata, in the heart of India's prime coking coal belt. From its origins in mining education, IIT(ISM) has evolved into a prestigious institution offering a variety of programs, including B.Tech, M.Tech, M.Sc Tech, and MBA. Its vision is to become a leading institution of higher technical and scientific education, both nationally and internationally, with a strong commitment to social responsibility.

During the present project 3D modelling and resource estimation with calculation of tonnage and average grade were carried out using Open Office, anaconda, GSLIB, SGeMS, and QGIS software's by Department of Applied Geology, IIT-ISM, Dhanbad, Jharkhand.

VI. Matter Material Testing & Research Laboratory (P) Ltd. Mini Bypass Road, Thiruvannur Nada (PO), Thiruvannur, Kozhikode Kerala, 673029

Matter Laboratory is exceptionally well equipped with a group of Engineers and Technical Professionals committed to provide best in class Engineering & Technical solutions across the region for construction and other industries through material testing, inspection and consultancy services.

Activities of Matter Laboratory include wide range of construction materials testing, chemical analysis & microbiological examination of water, food & food products, environmental testing, metallurgical (steel) testing, non-destructive concrete testing and forensic investigation of concrete structures.

CHAPTER 2. PROPERTY DESCRIPTION

2.1 Details of the area (Village name, District, State)

Block name	**:**	**Talashil block**
Villages	**:**	**Pirewadi, Hirlewadi, Wayanghni, Tondavalli, Talashil**
Mandal / Taluk	**:**	**Malvan**
District	**:**	**Sindhudurg**
State	**:**	**Maharashtra**

Key location map of the study area is given in (Figure 2.1).

2.2 Survey of India Toposheet No.,

The area under investigation consists of a narrow submergent coastal plain located between the Achara River in the North and Gad River in the South. The Talashil block of G3 Level exploration falls in the Survey of India's old toposheet 47H/8 and OSM E43T/8 (Fig. 2.2).

2.3 Geo-coordinates of the area of all corner points

Boundary Coordinates of block (5.84 sq.km) considered for topographic survey and geological mapping are shown in figure-1 and is given in the Annexure 1.

2.4 Location and accessibility,

The project area is bounded by latitudes16°5'19.20"N to 16°12'5.63"N and longitude 73°26'4.71"E to 73°27'50.65"Ein Survey of India toposheet no. 47H/8. Achara, Wayangani, Hadi, Tondavali, Malvan and Tarkarli are well-known townships in the area. The study area can be approached by Mumbai-Goa National Highway (NH-66) and smaller localities in the area are well connected by a network of state and district level roads as well as village roads. The nearest railway stations are Sindhudurg and Kankavalli. Sindhudurg railway station is at a distance of 25 km from Tondavali and Kankavalli railway station is at 36km from Achara. Nearest airport is Sindhudurg airport at a distance of 16 km from the Talashil area. The Konkan Railway, which connects Mumbai and Goa, is also nearby, with the Kankavali and Sindhudurg stations located close to the study area. The nearest national highway is Mumbai-Goa Highway (NH 66) and the nearest state highway is MSH 4. The Talashil Block is easily accessible via State Highways SH-181 and SH-182, with the Achara-Devgad roads running parallel to the study area which connects both the state highways.

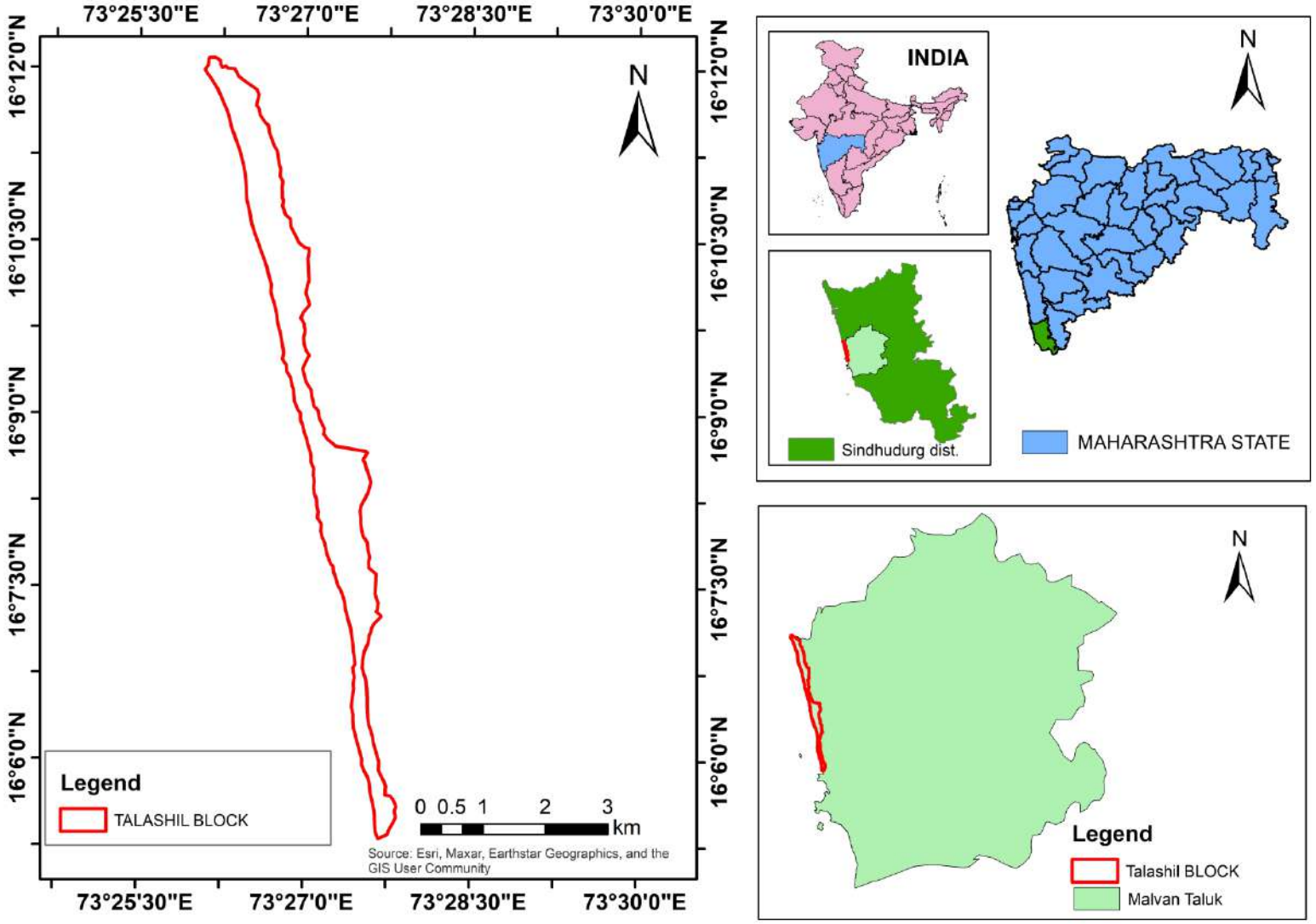


Figure 2.1: Location map of the study area

Figure 2.2Talashil block in Toposheet no. 47H/08

2.5 Cadastral details, land use/cover, forest with type of forest, free hold/lease hold details

Major portion of the study area is under private land. There is no record of leasehold area.

2.6 Climate

Malvan being a coastal Taluk, variation in the temperature during the day and throughout the season is not large. December is the coldest month with mean daily maximum temperature at 32.7 °C and the mean daily minimum temperature at 18.7°C. April is the hottest month. The relative humidity during the southwest monsoon is very high (86 to 90%). The relative humidity during winter and summer months is also above 57 (Somaraj Neenu (2020), Forest Department, Maharashtra, 2020).

The climate of Malvan is typical of monsoon regions, cool and dry seasons with low intensity of north-eastern winds from the land (November to February) and hot- dry season from March to May followed by rainy season (June to September). The annual average rainfall is 2916 mm (District Statistics report 2014-15). The average wind speed in the region is observed to be in the range of 6.6 to 17.9 kmph.

2.7 Flora/Fauna

Malvan is one of the biologically richest coastal regions in Maharashtra in which the climatic condition is favourable for growth of varieties of vegetation. Terrestrial ecosystem consists of all the habitats such as deciduous forests, grasslands, scrub, and freshwater wetland ecosystems. Marine ecosystem consists of coastal belts such as mangroves, mudflats, estuaries, and seashores; and offshore ecosystems. Marine flora and fauna of Malvan pertain to coral reefs, sea turtles, dolphins, whales, fishes, sea anemones, molluscs, seaweed, and mangroves. Mostly agriculture is kharif and the main crops are Rice and Finger Millet. Very few crops like Horse Gram, Black Lentil (Udid), Wal, Groundnut and Pavata are planted after the monsoon but that too mainly for self-consumption and not for commercial sale (Parasnis.et.al.,2013). Smooth coasted otter and monitor lizard is found in the mangrove ecosystems of the study area (Ela foundation and Mangrove cell,2017). The beach plant community is composed of species such as Casuarina equisetifolia and Pandanus tectorius. The tidal forests include species like Avicennia alba, A. officinalis, Excoecariaagallocha, Rhizophora mucronata, Sonneratiacaseolaris, and Acanthus ilicifolius. The inland vegetation consists of Calophylluminophyllum, Pongamia pinnata, Strychnos nux-vomica, and Terminalia paniculata (S. Ghate, V., & Datar, M. 2009).

2.8 Geomorphology

The relief of the Sindhudurg district is highly uneven in nature. It has a very narrow riverine plains that fringe the coastline. About 40 to 50% of the area in the district is hilly. The district has three major physiographic divisions from east to west. (i) The eastern part close to the Western Ghats, is highly dissected with deep valleys. (ii) The middle part of the district is occupied by flat-topped hills with undulating plateau with elevations up to 300 meter above mean sea level (a msl) covered by Laterite. (iii) The coastal plain in the western part with elevations of 100 to 150 m above msl. The physiographic features have given rise to five characteristic landforms viz. (i) The coast line (ii) The estuarine alluvial plains (iii) The lateritic plateau (iv) highly eroded remnant hills (v) scarp faces of Sahayadri hill ranges (Mishra, 2014).

The drainage system of the major rivers in the district is mostly of sub-parallel type and the tributaries drainage pattern tends to be sub-rectangular type. Major joints in the basalt control the drainage pattern. The river systems are young with a small drainage area and westerly seasonal regime. During monsoon the rivers carry heavy load of water having tremendous headward eroding capacity and ultimately drain in the Arabian Sea. All the major rivers originate in the Sahayadri Hill ranges. The five major rivers in the district are Gad (Length- 84km.), Karli (92km.), Terekhol (69km.), Tillari (53 km.), Deogad (48km.) and Wagothan (24km.). All these rivers form part of the westerly flowing river system originating from Sahayadri hill ranges and debouching in Arabian Sea (CGWB,2014). The main rivers in the area mapped include Gad and Achra in Toposheet 47H/08.

2.9 Local infrastructure

The important places in the area are well connected through Mumbai- Goa highway, Konkan Railway and other roads like Achara-Devgad road and state highways. Malvan port is the important port of the area. Sindhudurg fort as well as Malvan Marine Sanctuary with rich marine ecosystem is at a distance of 6-7 km from Talashil. There are only few hotels and home-stays near the Talashil area and larger hotels and resorts are found in nearby towns like Malvan. Primary healthcare centers and hospitals are found in nearby town like Achara, Kankavali and Sindhudurg. Lifeguard services may be available at the beach during the tourist season, though the beach is relatively peaceful compared to more commercialized areas.

2.10 Population

As per the 2001 census, Sindhudurg had a population of 868,825 of which males were 417,890 and remaining 450,935 were females. Subsequently the 2011 census reported a decrease in the Sindhudurg to 849,651 of which male and female were 417,332 and 432,319 respectively. Sindhudurg District population constituted 0.76 percent of total Maharashtra population. In 2001 census, this figure for Sindhudurg District was at 0.90 percent of Maharashtra population. There was change of -2.21 percent in the population compared to population as per 2001. In the previous census of India 2001, Sindhudurg District recorded increase of 4.41 percent to its population compared to 1991 (District Survey Report, 2017, Maharashtra).

2.11 Archaeological & Historical sites

Sindhudurg Fort is one of the most important historical sites in the Konkan region located at 7 km from the Talashil beach. The rock-cut-caves of Malvan are believed to have been used by Buddhist monks for meditation.

2.12 National parks and Environmental settings of the area

Dajipur wild life sanctuary and Radhanagiri wild life sanctuary are located at 49 km and 63 km from the Talashil block. Malvan Marine Sanctuary (rich wildlife) is at a distance of 6-7 km from the study area.

Malvan area is categorised as ‘Am', ie: tropical monsoon according to the Köppen-Geiger system of climate classification. The annual average temperature is 27.1°C, May being the warmest month at 29.6°C and January, the coldest at 25.6°C. The annual precipitation is 2865mm. The highest precipitation of 962 mm was recorded during the month of July (Source: DWIEP).

CHAPTER 3. PREVIOUS WORK

3.1 Details of previous exploration/investigation carried out by other agencies/parties.

Placers are naturally occurring non-renewable resources of high economic value and are explored and exploited for different types of heavy minerals and metals, contributing to the global economy and technological advancement. Heavy mineral sand is explored for minerals such as ilmenite, rutile, zircon, sillimanite, garnet, and monazite etc. Vatuva et al., (2022) reported that the major placer mining regions in the world are southwestern Australia, south-eastern United States, south-eastern Africa, parts of Brazil, China, and the coastlines of India and Sri Lanka. Mineral sands have been mined in Australia for titanium found in ilmenite and rutile, zirconium from zircon, and REEs found in monazite (Hou et al., 2017). The central Brazilian coast has 12 placer deposits of ilmenite, rutile, zircon. China dominates world production of REE minerals, mostly from terrestrial sources (Xie et al., 2016; Van Gosen et al., 2019).

In India major beach sand deposits are present in the states of Tamil Nadu, Kerala, Orissa, Andhra Pradesh, Gujarat, and Maharashtra. The Atomic Mineral Directorate (AMD), Geological Survey of India (GSI) and National Institute of oceanography (NIO) have carried out exploration studies regarding the depositional environment, processes responsible for deposition or erosion, heavy mineral concentration, and provenance etc. along the beach areas.

The Atomic Minerals Directorate (AMD) has been conducting exploration of mineral deposits along India's coastal regions, covering a total coastline of 5,921 km across West Bengal, Odisha, Andhra Pradesh, Tamil Nadu, Kerala, Karnataka, Maharashtra, Goa and Gujarat. Detailed exploration has been completed over 451 km, while 1,873 km has been covered by general exploration and 112 km by preliminary exploration. The average grade of heavy minerals in these deposits ranges from 10% to 25%, with 30% to 40% of it being ilmenite. The production of Ilmenite at 391 thousand tonnes in 2021- 22 increased by 11% as compared to that in the preceding year (IBM., 2021). AMD has explored 20-line km in the Ratnagiri Districts for assessing the heavy mineral potential. Eight occurrences were identified around Purangad, Gaonkhede, Randapar, Bhatya, Ratnagiri, Kalbadevi, Newre and Malgund. The occurrences north of Ratnagiri are predominantly mono-mineralic, mainly of ilmenite whereas in the south of Ratnagiri, ilmenite is admixed with magnetite. Heavy

mineral reserves of 4.88 million tonnes containing 3.04 million tonnes of ilmenite have been estimated from these areas (Ali et al., 2001).

Mining and processing of beach sand are managed by IREL, a Government of India undertaking, and KMML, a Kerala state government undertaking. IREL is currently exploiting beach sand deposits in Chavara in Kerala (22 km), Gopalpur in Odisha (18 km), and Manavalakurichi in Tamil Nadu (6 km). However, the ilmenite from the OSCOM (Odisha Sands Complex) deposit is of lower quality, with a TiO2 content of 50%, compared to the higher-grade ilmenite from Chavara (75.8% TiO_2 content) and Manavalakurichi (55% TiO_2 content).The ilmenite reserves of Maharashtra are 3.68 MMT in Ratnagiri, 1.12 MMT in Munge-Achra-Malvan and 0.70 MMT in Vijayadura-Mithbav.Odisha was the leading producer of Ilmenite, contributing 60% of the total production followed by Kerala (28%) and Tamil Nadu (12%) (Indian Minerals Yearbook, 2022).

NIO carried out heavy mineral studies along the coastal sediments in south Maharashtra stretch for 12.5 km from Pirawadi in the north to Talashil in the south during 2010. The sediments in the area are mainly sands which are moderately well sorted to well sorted. The heavy mineral concentration in the surface sediments varies from 0.69 to 98.32 wt.%, with an average of 28.73 wt.%, and shows a progressive increase in concentration from north to south. Ilmenite in the region contains TiO_2 concentrations ranging from 40.04 to 46.6 wt.%. Ore microscopy reveals two types of magnetite grains: pure magnetite and titano-magnetite. Compositionally, the total magnetite fractions contain Fe_2O_3 levels between 32 and 46 wt.%, FeO between 19.0 and 25 wt.%, and TiO_2 between 14.3 and 23.9 wt.%. The inferred reserves of ilmenite and magnetite are 0.175 and 0.395 million metric tons, respectively (Gujar et al., 2010).

Gujar et al., (2022) reported mineralogy of fluvial and coastal sediments, with special attention to the heavy mineral placers between Vijaydurg and Redi Point along the 105 km stretch of the coastal area of Sindhudurg district, Maharashtra. The heavy mineral assemblage from the beaches chiefly consists of ilmenite, magnetite, leucoxene, goethite, limonite, and pyroxenes (augite) as the major heavy minerals indicating provenance from basaltic terrain and its weathering products like laterite and bauxite.

Two prospective areas have been identified on the basis of the heavy mineral concentration and their extent:

Area 1 includes seven regions that have significant concentrations; Kotharwadi, Phansewadi, Padvanewadi, Pirwadi to Tondavali, Tondavali to Talashil, Bhogwe and Phalephond Nivati.

Area 2 covers five regions that have limited and localized concentrations are Kunkeshwar, Tarkarli, KilleNivati, Mochemad and Vengurla. The region between Pirwadi to Talashil have a significant concentration of ilmenite, magnetite with notable TiO2 content in both ilmenite and magnetite (Gujar et al., 2022).

The inferred reserves of heavy minerals in Area 1 are 2.33 million metric tonnes (MMT), including ilmenite at 0.55 MMT and magnetite at 0.98 MMT. In Area 2, the inferred reserves of heavy minerals are 0.031 MMT, comprising ilmenite at 0.008 MMT and magnetite at 0.004 MMT. It has been noted that ilmenite is of moderate grade, with TiO2 content ranging from 39% to 51% by weight, averaging around 44%. Furthermore, the magnetites present are titano-magnetites, which contain between 14.31% and 22.98% TiO_2 (Gujar et al., 2022).

A G-4 stage of mineral investigation was taken up by Geological Survey of India along the coast of Raigad and Ratnagiri districts of Western Maharashtra with the objective of assessment of heavy mineral in beach placer and near shore region between Guhagar to Ansure (Basha, S. N. H., & Chatterjee, S., 2019) and Dighi and Guhagar (Basha, S. N. H., & Pal, T., 2020).

Large-scale geomorphological mapping at a 1:12,500 scale was conducted across 100 sq. km in parts of toposheets 47G/03, 04, 07, 08, and 47H/05, 06, with 94 grab samples and 20 pit samples collected for analysis. Results indicated TiO2 ranging from 0.56% to 51.17% in grab samples and 3.35% to 49.76% in pit samples, while Fe2O3 ranged from 3.42% to 53.55% and 13.22% to 53.31%, respectively. Total REE ranges from 38.07 to 175.62 mg/kg and 36.33 to 145.45 mg/kg in grab and pit samples respectively. The highest value of Vanadium is recorded from pit sample of Gaonkhadi beach i.e. 3358 mg/kg and in grab sample highest value is recorded from Karulwadi i.e. 3319 mg/kg. The highest wt% of heavy mineral was recorded from Bhatye beach (98.87 wt%) followed by Ril-Undi (97.19 wt%), Malgund (96.46 wt%), Kalbadevi (91.51 wt%), Vengani (96.76 wt%), Gaonkhadi (95.95 wt%) and Narvan (89.67 wt%) (Basha, S. N. H., & Chatterjee, S., 2019).

Similar mapping (scale 1:12,500) was carried out over 100 sq. km in toposheets 47B/15, 16, 47F/04, and 47G/01, 02, 03, with 120 beach samples and 20 pit samples collected. TiO2 content ranged from 0.09% to 33.37% in beach samples and 3.97% to 25.47% in pit samples,

while Fe2O3 varied from 3.49% to 55.00% and 12.84% to 50.18%, respectively. The highest wt% of Heavy mineral was recorded from Harihareshwar (93.21 wt%), Anjarle (89.82 wt%), Karde south (89.40 wt%), Kelshi (88.13 wt%), Kolthare (85.39wt%), Dabhol (84.74 wt%), Srivardhan (83.43 wt%), VelasSakhari (83.05 wt%), Murud (82.66 wt%), Ade-Padle (80.27 wt%), Bhivbandar (79.53 wt%), Palandawadi (63.32 wt%), Guhagar (60.12 wt%) and Saldure (56.57 wt%). (Basha, S. N. H., & Pal, T., 2020)

3.2 A very brief note on previous work on geology, geophysics (aero geophysical, ground geophysical), geochemistry

Gujar et al (2022) carried out geological and geochemical studies of the area that lies between 16° 30′ N latitude (Vijaydurg) and 15° 43′ N latitude (Redi Point) along the Sindhudurg district, west coast of Maharashtra. These authors reported that the that heavy mineral deposits are dominated by opaque minerals such as ilmenite and magnetite, along with pyroxenes, amphiboles, rutile, zircon, garnet, and others. Ilmenite in the area contains TiO2 (38.89–50.69 wt%) and Fe2O3 (15.70–21.33 wt%), while magnetite has Fe2O3 (31–48 wt%) and TiO2 (14–24 wt%). The presence of titano-magnetite with intergrowths of sphene and rutile is noted. The heavy mineral concentrations in the area reach up to 98 wt%. The three distinct mineral assemblages: tourmaline–amphibole–epidote, zircon–titanite–rutile, and staurolite–kyanite indicates the possibility of their derivation from laterite, mafic and felsic igneous rocks, Kaladgi sandstones and high-grade metamorphic rocks (Gujar et al., 2022).

3.3 In case the area forms part of the area covered earlier by exploration then same should be shown in the map with proper scale and a brief description

The study area has been covered earlier by geological studies on placer deposits by National Institute of Oceanography. Ilmenite and magnetite bearing areas of Tondavali (stations 46, 47 and 113) and Talashil (stations 97, 48, 47and 113) studied previously by NIO overlap with the currently proposed Talashil block of Geo Marine. The previous work was based on the study of the surface and sub surface beach sediment samples collected between Pirawadi (16°12′ N lat.) and Talashil (16°06′ N lat.) beaches. These samples were collected from the foreshore (inter-tidal) and backshore (supra-tidal) zones of the beach between Pirwadi and Talashil at a grid interval of 500*800 m, with foreshore samples collected at low-tide and mid-tide levels (0–20 cm) and backshore samples from deeper sub-surface layers (0–100 cm). A total of 91 samples were collected along 26 transects on the beach and 12 samples from the riverbed

(Gujar et al., 2010). These authors reported mineralogy of fluvial and coastal sediments with reference to the heavy mineral placers located between Vijaydurg and Redi Point along a 105 km stretch of the Sindhudurg District coastline in Maharashtra. The heavy minerals (up to 98 wt%, avegrage 27 wt%) identified are opaques (ilmenite, magnetite, chromite), pyroxenes, amphiboles, rutile, tourmaline, kyanite, staurolite, zircon, garnet, epidote, sillimanite, and olivine, while quartz and feldspar form the light fractions. It is observed that the concentration of heavy minerals is more in the supratidal zone as compared to intertidal zone. Samples were collected up to 0.4m to 1.0m depth below ground level.

The TiO_2 in ilmenite varies between 39 and 51% and V_2O_5 ranges between 0.44 and 0.96%. The TiO_2 in magnetite fraction ranges between 14 and 24% and V_2O_5 between 3.78 and 4.76%. The heavy mineral concentration in the sediments of River Achara is much less (0.74-0.79 wt%, avg 0.76 wt%) as compared to that of River Gad (13-34 wt%, avg 25 wt%). The region between Pirwadi to Talashil have a significant concentration of -ilmenite, magnetite with notable TiO2 content, indicating potential for further exploration (Gujar et al., 2022).

In order to reconfirm the ilmenite-titanomagnetite and magnetite concentrations and to understand the prospects for V and Ti in the Talashil, Geo Marine Solutions Pvt Ltd., Mangalore carried out reconnaissance survey during the first week of January 2024. Studied the beach and dune areas (13MR, Longitude: 73.45081°, Latitude: 16.14646° and 14MR, Longitude: 73.45287°, Latitude: 16.13544°) to assess Ti and V contents in different mineral phases. The opaques that comprise three fractions viz; magnetite (12-14%), ilmenite-titanomagnetite (17 18%) and limonite (15-18%) were further analysed for Fe_2O3, TiO_2 and V_2O_5. The magnetite fractions (13 MR- A and 14 MR- A) show TiO_2 content is about 27%, V_2O_5 content is about 0.75% and Fe_2O_3 is in the range of 57 to 60%. The Ilmenite fractions (13 MR- B and 14 MR- B) show about 42% TiO_2, V_2O_5 content is about 0.465% and Fe_2O_3 in the range of 47%. The limonite fraction (13 MR C and 14 MR C) shows TiO2 content in the range of 11-19%, V_2O_5 content is in the range of 0.21% to 0.34% and Fe_2O_3 in the range of 37-47%.

The sample locations of previous studies over lapping with in the present block boundary is shown in the figure 3.1.

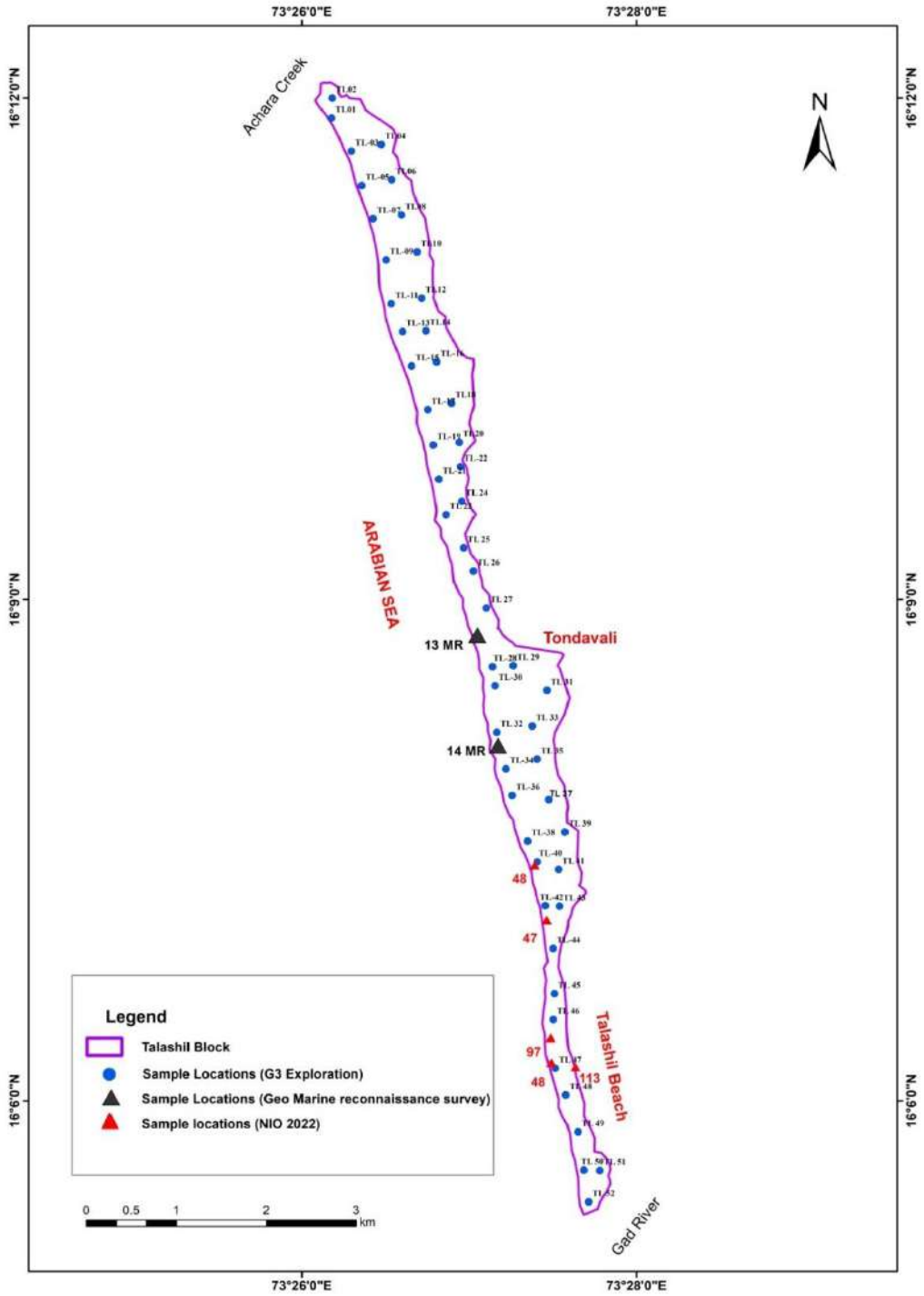


Figure 3.1: Map showing the Borehole location of previous study with in the present block area.

CHAPTER 4. GEOLOGY OF THE AREA

4.1 Aerial reconnaissance

Aerial reconnaissance surveys were not carried out during G3 level exploration, since the area of 5.84 Sq.km is very well accessible and the work scope does not demand the same.

4.2 Regional geological set up of the area with stratigraphy

The Archean rocks are represented by crystalline rocks and meta-sediments of the Dharwar craton, which is cut by concordant veins of pegmatite and quartz. These are unconformably overlain by the shale and sandstones of the Kaladgi group. The extensive eruption of Deccan basalt by the Reunion hotspot, after a time interval, led to an uneven topography of the area. The Deccan Trap is overlain by carbonaceous shales interbedded with peat beds, which contain remnants of fossil fruits and leaf impressions of Tertiary age. In addition to the primary laterite capping the ridges, a considerable area is occupied by laterite spread of variable thickness. Quaternary sediment is represented as alluvial deposits (Suryanarayana, GSI.,1967). The general geology and geological map of the study area is given below.

Regional stratigraphy

General geology of the study area

<table>
<tr><th>Supergroup</th><th>Group</th><th>Formation</th><th>Lithology</th><th>Age</th></tr>
<tr><td rowspan="3">--</td><td rowspan="3">--</td><td rowspan="3">--</td><td>Alluvium</td><td>Quaternary</td></tr>
<tr><td>Laterite</td><td>Cenozoic</td></tr>
<tr><td>Carbonaceous Clay</td><td>Miocene to Pliocene</td></tr>
<tr><td>Deccan Trap</td><td>Sahyadri</td><td>Purandargarh</td><td>Basalt</td><td>Upper Cretaceous to Paleocene</td></tr>
<tr><td>Kaladgi</td><td>Badami</td><td></td><td>Shale</td><td>Neoproterozoic</td></tr>
<tr><td colspan="3"></td><td>Sandstone</td><td>Neoproterozoic</td></tr>
<tr><td rowspan="2">Dharwar</td><td rowspan="2">Chitradurga</td><td></td><td>Quartz Mica Schist</td><td rowspan="3">Archean</td></tr>
<tr><td></td><td>Quartzite</td></tr>
<tr><td colspan="3">Peninsular Gneissic Complex (PGC)</td><td>Granite gneiss</td></tr>
</table>

(Source: Geological Map Series of GSI)

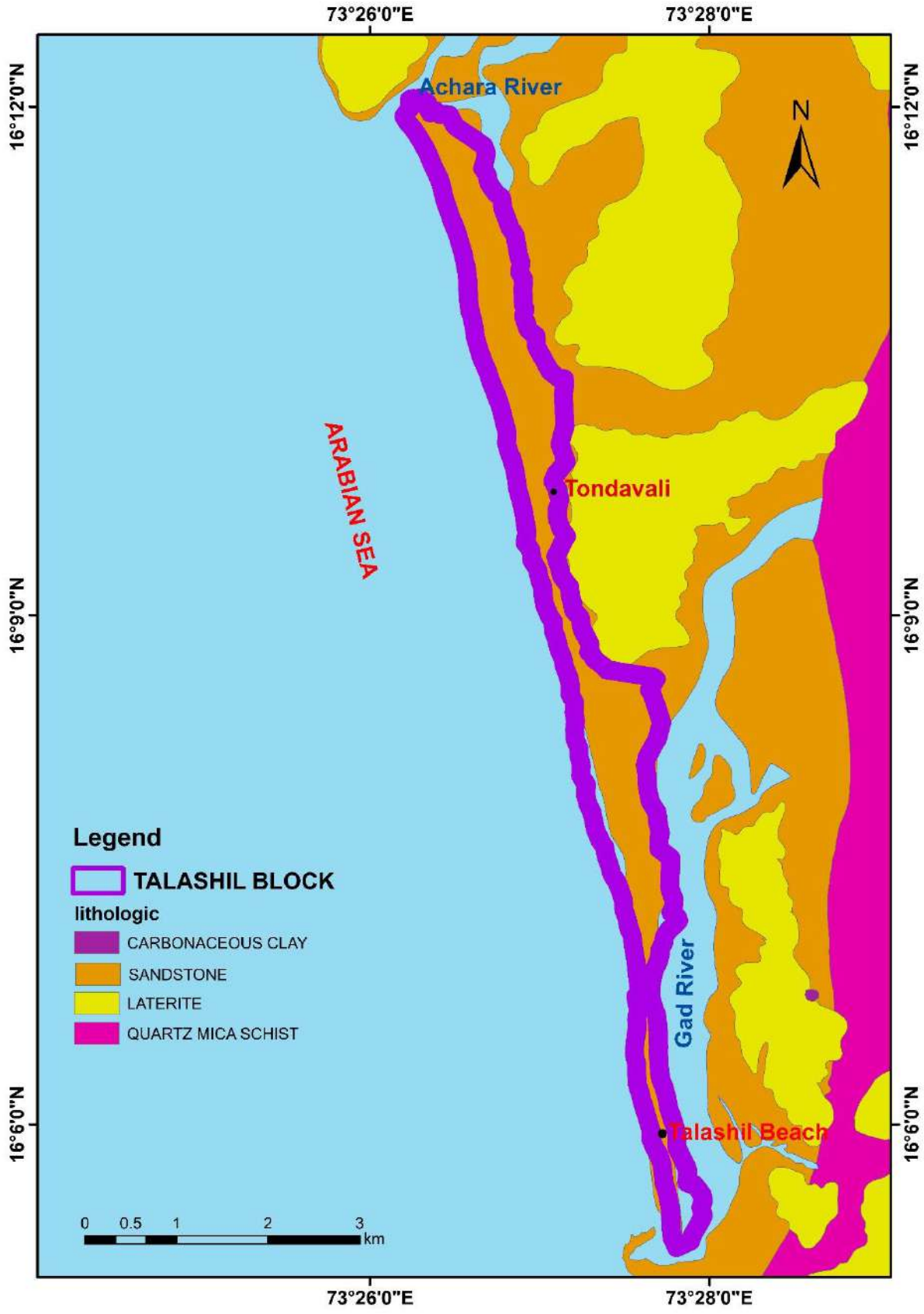


Figure 4.1: Geological map of Talashil block (1:50000; Source: NGDR)

Peninsular Gneissic Complex (PGC)

The Peninsular Gneissic Complex of the Peninsular Indian Shield is the primordial sialic litho-unit of the study area and is represented by granite gneiss and is exposed within Toposheet 47H/08 over a length of 20 km with an average width of 2 km from Tarekarl in the south to Chindar in the north. The rock is medium to coarse grained with gneissic texture formed by alternating light and dark bands differing in mineral composition. The lighter bands contain mostly quartz, microcline, orthoclase and plagioclase whereas the darker band contains biotite and hornblende. It also contains few grains of accessory minerals like zircon and apatite. Exposures of these gneissic rocks are due to their susceptibility to weathering. The trend of foliation of these gneisses is NW-SE with steep westerly foliation dips (Trimbakrao & Jain, 2022).

Dharwar Supergroup

The meta-volcano-sedimentary rocks including metabasalts, quartzite and quartz-mica schist of Chitradurga Group belonging to Archaean age were laid down in elongate proto-geosynclines over the basement rocks belonging to PGC. The quartz-mica schist, phyllites, quartzite and associated granite gneiss of Archean age are exposed in the parts of Toposheet no. 47H/08 (Trimbakrao, & Jain, 2022).

Kaladgi Supergroup

These sedimentary rocks of Neoproterozoic age comprise a sequence of sandstone and shale belonging to Badami Group and rest unconformably on the Archaean rocks. They are unfossiliferous with little or no metamorphic events. These rocks are visible in the area as inliers due to the erosion of the overlying trap and laterite, appear intermittently in valley and well sections, stretching from Dahibhav in the north to Malvan in the south, covering approximately 25 kilometers with an average width of 6 kilometers, and reaching a maximum width of 9 kilometers near Achara. Coarse to medium grained sandstone which is compact to friable in nature is identified in the area. Near Achara shales associated with sandstones are exposed in a nala section. Here the basal conglomerates are missing though they are noticed near Malvan, 10 km south of Achara. The conglomerate contains rounded to sub-rounded pebbles of quartz, banded quartzites, jasper, and banded ferruginous quartzite. The pebbles are likely to have been sourced from nearby Archaean basement rocks. The strike of these

beds ranges from N20°W-S20°E to N20°E-S20°W, with gentle dips of 12° to 15° towards the west (Trimbakrao, & Jain, V., GSI, 2022).

Deccan Trap Supergroup

The Deccan Trap of upper Cretaceous to Paleocene age constitute the predominant rock type in the study area. It is represented by the basaltic lava flows of Purandargarh Formation of Sahyadri Group The basalt flows have flooded the existing undulating topography, including two feldspar-phyric "aa" flows. The denudation of these flows has exposed at many places the underlying Kaladgi and Archaean rocks. These flows are porphyritic, characterized by phenocrysts of plagioclase, and appear to be faulted in many places. They can be recognized by their association with the older rocks alongside the flow. The faulted sections cannot be traced over long distances because the extensive outcrops of laterite obscure the flows. The flows have horizontal disposition, except near Bhatwadi and Kalviwadi with a westerly gradient. The basalt flows are generally massive, dense greenish to greyish black in colour, fine grained slightly porphyritic and amygdaloidal, hard and compact in texture, breaking with sub-conchoidal fracture and showing cooling joints. The basalt flows are intersected by joint sets trending NNW-SSE and ENE-WSW (Trimbakrao & Jain, 2022).

Younger sediments/rocks

a) Carbonaceous Clay (Tertiary)

It belongs to Miocene to Pliocene age and small patches of carbonaceous clay are present at the central part near the Ratnagiri region (Trimbakrao& Jain2022). The lithomarge clay zone has a gradual transition with the upper laterite and the lower weathered basalt (saprolite). Carbonaceous shale beds have been identified in well sections and dissected valley sections along the coast near Malvan. In some areas, these beds contain intercalations of peaty and resinous material, as well as fragmentary fossil flora. Approximately 6 km north of Malvan, leaf impressions can be observed in ferruginous shales within a well section along the Malvan region (Suryanarayana, 1967).

b) Laterite

Laterites along the coastal tract are derived by the lateritisation of Deccan lava flows. Laterite found on the sea coast is of primary nature. The upper part of the plateau consists of a compact and massive type of laterite having small vesicles filled with yellow to gray clay. Underlying this dense laterite, there is a vesicular and cavity-filled layer with limonitic clay.

The surface of the upper laterite is typically pitted, scoriaceous, and pisolitic. The vesicles are usually filled with yellowish and greyish clayey material. Brecciated laterite typically appears at the lowest part of the profile, featuring angular fragments embedded in a reddish-brown clay matrix. Bauxite is often found in association with either the compact or brecciated forms of laterite. This laterite usually displays colors ranging from brick red and pinkish to yellow. In addition to the yellow and red coloration, there are black accumulations on the surface, especially along steep escarpments. The lateritic layer above the lithomarge zone is generally vermicular and frequently contains limonitic and aluminous clay (Trimbakrao, & Jain, 2022). Concentration of hematite as pocket in laterite, are noticed near Achara, Munga and Tondavali. This laterite extending over a distance of 40 km. inland from the coast (Suryanarayana, 1967).

c) Alluvium

The Alluvial deposits are found along the coastal areas in few isolated patches having limited areal extent and limited thickness as Beach Sand. The two main types of soil include brown or brownish-red soil derived from laterite, and lighter-colored clayey or sandy soil likely originating from Kaladgi sandstones and quartzites. The sandy soil is primarily found in the valleys, stretching from Dahibhav in the north to Achara in the south. Additionally, clayey soils can occasionally be found in small patches within the plains that are underlain by Archaean metasediments near Malvan and Kandalgaon (Suryanarayana, 1967).

4.3 Structure and metamorphism

The area studied is largely covered by a thick layer of sand, with only a few patches of laterite. The general trend of the coastline is NNW-SSE and the anomalous zone run parallel to the coastline. The area is structurally undisturbed and unmetamorphosed.

Primary depositional features, including current bedding, ripple marks, and graded bedding, are observed near Achara. Joints in the Kaladgi rocks are oriented in various directions, with several common joint sets identified. Small parallel faults trending approximately NNW-SSE are inferred in the Kaladgi rocks, as they are observed in contact with Archean units (Suryanarayana., 1967).

The Deccan basalt flows are generally horizontal and are traversed by vertical as well as horizontal joints. The elevation differences between the older rocks and the basalt flows

suggest that the basalts are situated on an undulating, pre-existing landscape. The trap rocks show evidence of faulting in several areas, identifiable by their close association with older rocks or different flow units that come together in some valleys where the lava flows are quite thick. These faults trend from N-S to NNW-SSE, but their continuity is difficult to trace over long distances due to the laterite cover that obscures the outcrops. The basaltic flows also exhibit several prominent joint sets. Striking N-S dipping vertical, Striking E-W dipping vertical, Striking N65°E-S65°W dipping vertical, Striking N30°W-S30°E dipping vertical and Striking N30°E-S20°W dipping west 70° (Suryanarayana., 1967).

4.4 Surface indication of mineralisation

Beach and dune sands are primarily composed of recent alluvial deposits. Common heavy minerals such as magnetite/titanomagnetite/magnesioferrite, ilmenite, hematite, pyroxene, amphibole, zircon etc. are typically associated with these placer deposits in the area.

4.5 if so nature of host rock for mineralisation

Placer deposits of recent origin are mostly exposed and easy to identify. The identified mineral assemblages by XRD and microscopic studies indicate the possibility of their derivation from various sources like igneous, metamorphic, and sedimentary rocks. The hinterland rocks include Deccan basalt, quartz mica schist of Chitradurga Group, sandstone of Badami Group, and laterites of Cenozoic age.

CHAPTER 5. GEOSCIENCE INVESTIGATION

5.1 Geological mapping and Topographic survey

Topographic survey of the study area was carried out on 1:5000 scale. The work was carried out in the UTM coordinate system, and the MSL value was transferred to the survey area from Achara Lighthouse. Contour map was prepared with a 1.0 m contour interval.

Geological mapping is also carried out on 1:5000 scale incorporating all geomorphological units. It provides the detailed account of regional geological setup present in the study area. Detailed topographic map and Geological map is attached as Annexure 2 & Annexure 3 respectively.

Plate 5.1 Field photos during topographic survey and geological mapping

5.2 Description of rock types

The area under investigation forms a narrow submergent coastal plain in the north of Malvan taluk, which is about 12.8 km in length, 130 m to 900 m wide and an average width of 450m. This coastal tract is marked by narrow to moderate gentle foreshore with sandy dune-ridges, berm and few laterite exposures. The height of dune ridges varies from 5m to 22 m above msl. The Geological formations in the area investigated are beach sand, dune sand and few patches of laterites (Annexure 2). Beach sand along coastal strip and banks of rivers are recent formations. Kaladgi sandstones and quartzites are exposed in the bed of River Gad around Malvan and to its south in Bhogwe (Gujar.et.al., 2022).

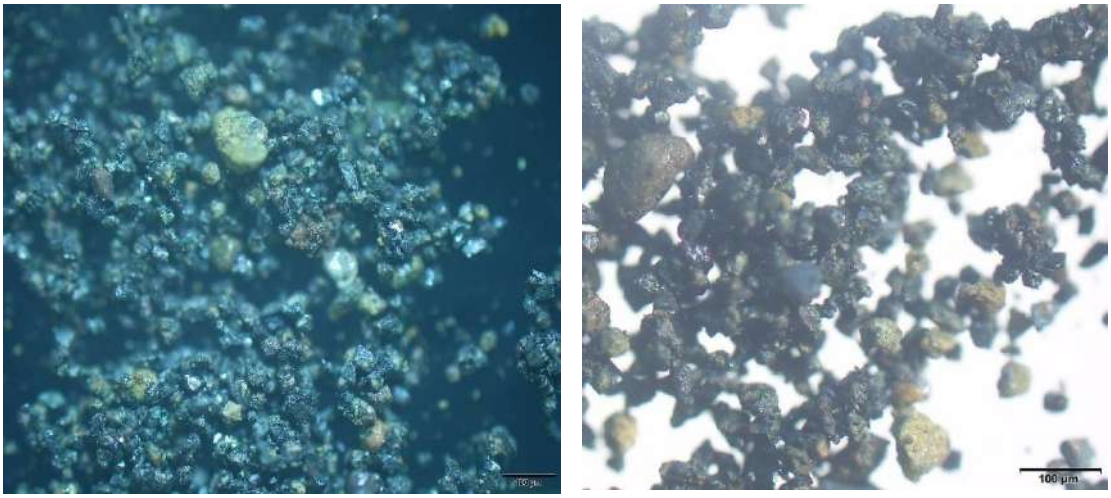
The likely provenance for the heavy mineral concentration in the proposed coastal zones is located due east, exposed lava flows of Sahyadri Group of Deccan Trap Supergroup, Chitradurga Group and Badami Group. Therefore, it is likely that heavy mineral concentrations in the coastal zone are magnetite, titanomagnetite, ilmenite, magnesioferrite, heamatite, pyroxene, amphibole, zircon as rivers and/or streams draining the area are acting as feeders of inland sediments to coastal zone. After sands accumulate on the beach, particularly in the backshore, winds may rework these sands and form sand dunes. The characteristic heavy mineral formed with respect to the source rock is given below in the table.

Table 5.1: Heavy mineral assemblage with respect to the hinterland rock (Gujar et.al., 2022)

Stratigraphic sequence	Type of Rocks	Characteristic heavy minerals
Pleistocene to sub-Recent	Laterite	Ilmenite, hematite, goethite, garnet, and zircon
Upper Cretaceous to Lower Eocene	Deccan Trap basalts	Ilmenite, magnetite titanomagnetite olivine, and augite
Pre-Cambrian	Kaladgi sandstones	Tourmaline, zircon, rutile, staurolite, kyanite, sillimanite, epidote, garnet, ilmenite, magnetite, and pyrite

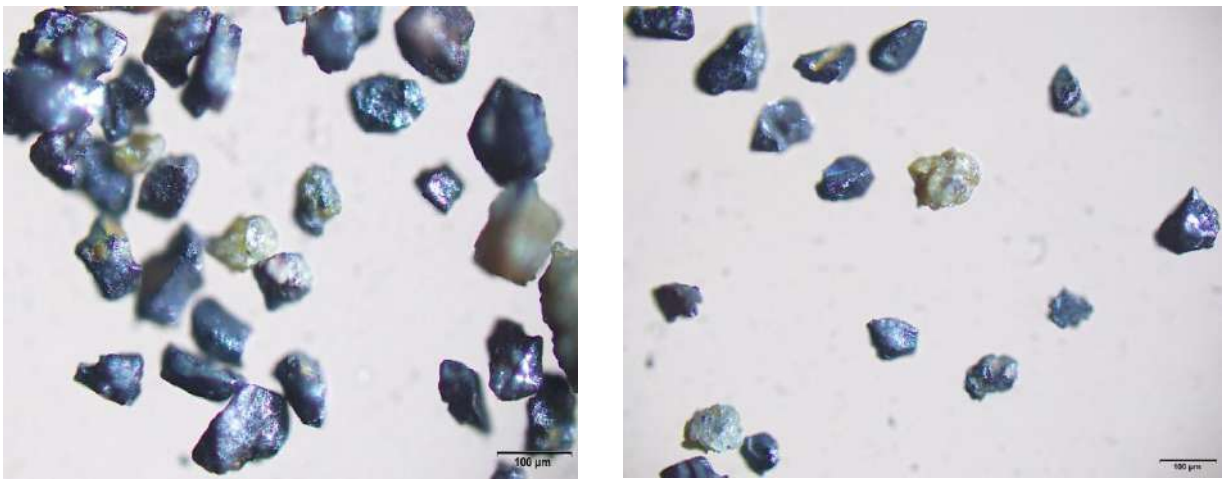
Archean & Dharwars	Phyllite, quartzite, schists and intrusives like dolerite, gabbro, granite, pegmatite, aplite and quartz vein.	Tourmaline, staurolite garnet sillimanite, zircon, chromite and hornblende

5.3 Petrological, petrochemical studies (SEM-EDX, EPMA), whole rock and trace element analysis.



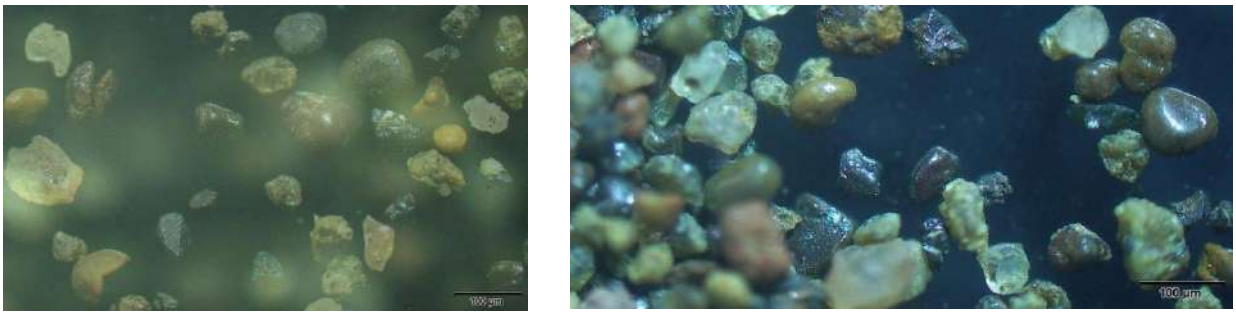
(Major minerals are titano-magnetite and minor ilmenite as per XRD results)

Plate 5.2a Magnetics (LIRMS) under microscope (Sample No. TL-47/3-4m)



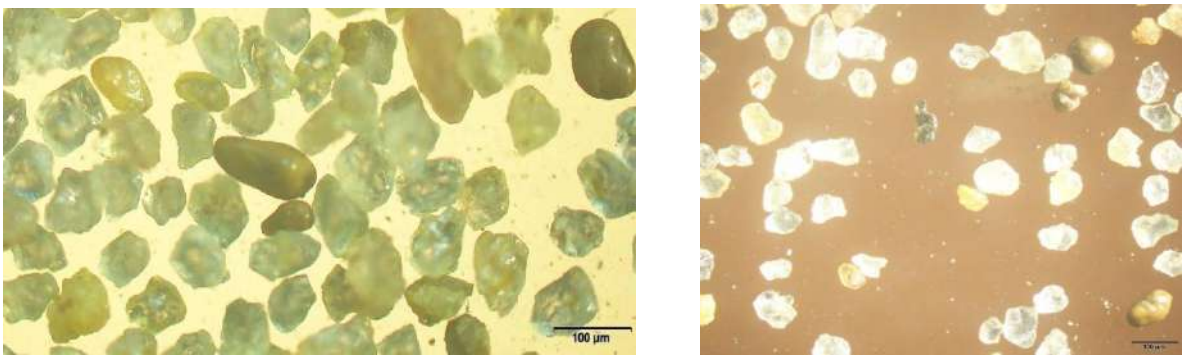
(Major minerals are ilmenite, pyriboles as per XRD results)

Plate 5.2b Magnetics (REDMS) under microscope (Sample No. TL-47/3-4m)



(Minerals present: pyriboles, ilmenite, quartz, rock fragments, feldspar)

Plate 5.2c Middlings(REDMS) under microscope (Sample No. TL-47/3-4m)



(Minerals: quartz, zircon?, pyriboles, feldspar)

Plate 5.2d Non-Mag (REDMS) fraction under microscope (Sample No. TL-47/3-4m)

5.4 Structure and Metamorphism

The explored area consists of recent alluvium (sand) deposits.

5.5 Mineralogy of the ore zones and ore textures

Heavy minerals are characterised by high density (>2.89g/cm^3), durability and resistance to weathering. Unlike any other ore deposits, heavy mineral sands do not exhibit prominent geochemical or mineralogical zonation. Variations in mineral chemistry across a deposit are generally result of the presence or absence of heavy minerals rather than the geochemical gradients typically seen in hypogene, hydrothermal, or supergene processes found in other types of ore deposits. These variations are more reflective of the sorting mechanisms involved in the deposition of the sediments. Hydrothermal alteration and other types of geochemical diffusion typically found in ore deposits are not associated with heavy mineral sands. Additionally, there are no specific textures or structures characteristic of the igneous, metamorphic, or sedimentary source rocks for these deposits (Basha, & Pal, 2020).

The heavy mineral in the area predominantly consists of ilmenite, magnetite, titano-magnetite, magnesioferrite and hematite, other non-magnetic heavy minerals (NMHM) such as amphibole and pyroxene and non- magnetic light minerals (NMLM) such as quartz, plagioclase, and k-feldspar etc. The mineral grains range from rounded to sub-rounded and angular, indicating that the sediments originated from basaltic lava flows.

5.6 Pitting and trenching

No pitting and trenching carried out in the area.

5.7 Sampling

The unconsolidated sand samples were collected from different domains of beach, backshore and dune along the transect perpendicular to the coast in the study area. The sampling method employed is auger drilling, as the terrain is highly undulating and inaccessible to carry large instruments to the area. Beach and dune sand samples are collected using Hand auger. All drill holes are oriented vertically. Samples are collected at one-meter intervals up to a depth of 6 meters except two boreholes (TL25 and TL26). Samples are assessed visually for recoveries and labeled in the following format: location & borehole number - depth range (e.g., TL01-0.m to 1.0m).

Plate: 5.3 Auger sampling on the (a) beach, (b) dune and (c) backshore.

5.8 Discussion

Detailed interpretation of qualitative and quantitative analysis is explained in the Chapter 10.

5.9 Ore Zones

Mineralized zone in the surface was primarily identified on the basis of black sand concentration and presence of magnetic minerals and opaque grains, which can be identified by field magnet and pocket lens. As per the magnetic separation data, the weight percentage of valuable heavy minerals containing iron, titanium, and vanadium ranges from 2% to 54%. As per the geological investigation, the concentration of heavy minerals is higher in the southern side compared to the northern side. Based on gravity separation of heavy minerals, petrography and chemical analyses data, 3D modelling and resource estimation, the total sand body is divided in to High Potential zone (>16% VHM) and Potential Zone (<16% VHM) with area coverage of **2.30 sq.km** and **3.54 sq km** respectively.

5.10 Geophysical exploration

Aerial or ground geophysical surveys were not carried out during G3 level exploration since the area of 5.84 Sq.km is very well accessible, ground data of entire area can be collected by direct observation. Similarly geochemical surveys and geophysical surveys were not carried out in the area as the work scope does not demand the same.

5.11 Geochemical exploration

Although chemical analyses of sediment samples were carried out, the item cannot be categorized into the domain of geochemical exploration. Bed rock/ pedogeochemical sampling was not part of the Quantum of work. Chemical Analysis results are discussed in the Chapter 9.

CHAPTER 6. INTEGRATION OF GEOLOGY, GEOPHYSICS (WITH AVAILABLE AERO GEOPHYSICAL DATA) AND GEOCHEMICAL EXPLORATION DATA AND THE INTERPRETATION

Since the study is G-3 level exploration of beach and dune sands (bedded deposit), this is not part of the work scope.

7. MINERAL PROSPECT

7.1 Surface indication

Surface indications of mineralization are observed as black sand containing opaque grains of ilmenite and magnetite, identifiable with a pocket lens. In this area, the heavy mineral sands consist of unconsolidated to weakly consolidated sediment layers with sandy beaches and dune ridges. Deposits exhibit stratification and ripple marks due to variation in mineral content and changes in environmental settings such as tidal shifts, current patterns, wind shifts and sediment supply. The area consists of laminated or lens-shaped sediments that are rich in heavy minerals, with thicknesses extending to several meters.

The beach and dune sediments in the Talashil area, composed predominantly of recent alluvium, exhibit varying grain size and sorting patterns at 0–1 m depth, indicating potential surface mineralization. The mean grain size (ϕ) of sediments in 0-1 m depth varies from 2.205 ϕ (TL-51) to 2.726 ϕ (TL-10) with an average of 2.51 ϕ. The sediments in the dune area are finer compared to the beach face. The THM values vary from 8.37 wt% to 46.76 wt% in surface (top one meter). Sorting values (standard deviation) range between 0.305 ϕ and 0.566 ϕ, averaging 0.403 ϕ, indicating moderately well-sorted to well-sorted sediments.

7.2 Mode of occurrence

Heavy mineral sands are widely distributed in coastal settings. The cumulative beach area and dune area are 0.83 sq km and 5.01 sq km respectively. In plan view, these occurrences are elongated and generally aligned parallel to the strike of shoreline. These deposits are formed through selective sorting in the intertidal zone due to waves and currents. The deposits are in the form of lens-shaped bodies rich in heavy minerals, stacked along the length of the strandlines (Basha, & Chatterjee, 2019).

The sedimentary material within the investigated area is generally well sorted to moderately well sorted. For samples collected from dunes crest, which correspond to very well sorted materials and the samples taken from the beach face, varying from moderately sorted and moderately well sorted. Along the dune area sediments are finer than the beach face. Sediments show general trend of coarsening with increase in depth in both beach and dune crest. These variations may reflect changes in depositional energy, potentially associated with mineral concentration processes.

7.3 Strike length and width of anomalies identified on the basis of geology, geochemical, geophysical exploration

Based on the geological, geochemical, and mineralogical evidences, the entire sand body having a strike length of 12.8 km trending in NNW to SSE direction is anomalous. The sand body is delineated into High Potential Zone (>16% VHM) and Potential Zone (<16% VHM), occupying 2.30 sq. km and 3.54 sq. km respectively.

7.4 Alteration zones

Not applicable in beach and dune sand.

7.5 Genesis of mineralisation

The deposits in the Talashil block consist of heavy mineral sands, which commonly contain minerals such as magnetite, titanomagnetite, magnesioferrite, ilmenite, pyroxenes, and amphiboles etc. The mineralization of beach placers originates inland and extends to the coastline, involving the weathering of source rock, contributing detritus composed of sand, silt, clay, and heavy minerals to streams/rivers. Rivers transport the detrital minerals along their course and deposit in a variety of coastal environments, such as, the beach face (foreshore), the nearshore, barrier islands or dunes, and tidal lagoons, as well as the channels and floodplains of streams and rivers in the coastal plain, depending up on the energy of the transporting media. This material is then reworked by wave action, tides, long-shore currents, and wind, which sorts the mineral grains according to their size and density. The finest-grained, most dense heavy minerals are the most effectively sorted. The result is that heavy minerals accumulate together, forming laminated or lens-shaped, heavy-mineral-rich sedimentary packages that can be several meters and even as much as tens of meters thick. Most economic deposits of heavy-mineral sands are Paleogene, Neogene, and Quaternary in age; some are modern coastal deposits (Bradley, 2010).

The boundaries of the Talashil block are defined by two rivers: Achara Creek to the North and Gad River to the South. Both rivers drain through the Deccan provenance, Dharwar provenance and Kaladgi Group of rocks and discharge into the Arabian Sea. The distribution of beach placers depends up on the geomorphological features, coupled with entrenched drainage pattern, sediment input, wave dynamics, structural lineaments and sea level fluctuations (Gujar.et.al,2022). These rivers and their tributaries transport heavy minerals

along their courses, and are reworked by the action of nearshore currents as they reach the river mouths. Further wind reworks the sediments in the form of sand dunes.

The increasing concentration of heavy minerals from the North to the South indicates a significant influx from the Gad River compared to the Achara River. Compared to the Achara River, Gad River is having steep graded profile in the upper reaches and steeper slope in the mid-profile. In the northern regions, the sediments are moderately well sorted, while in the southern areas, they exhibit very good sorting. This selective sorting process enriches the heavy minerals in the supra tidal zone, effectively removing the lighter fractions. This pattern suggests that sediment dynamics, river contributions and wave action play a crucial role in the distribution and concentration of mineral deposits in these areas (Gujar.et.al, 2022).

The sediment analysis reveals that beach sands exhibit a trend of coarser and moderately well-sorted sediments, while dune sands are predominantly well-sorted and fine-grained. The degree of sorting decreases towards the depth.

CHAPTER 8. EXPLORATION SYSTEMATIC DRILLING

8.1 Spacing of boreholes should be as per MEMC, 2015

The spacing of boreholes and data acquired from the core boreholes in the Talashil block, using a 400m x 200m grid for auger drilling, is in accordance with the guidelines provided in Parts II and III of the Schedule MEMC Rules 2015. This data is sufficient to establish the degree of geological and grade continuity appropriate for the mineral resource estimation procedures and classifications applied. This approach enables full coverage across an area of 5.84 square kilometers explored, allowing for an effective assessment of spatial and temporal variability in iron, vanadium, and titanium concentrations.

8.2 Methodology of drilling with details of type of drilling

In the Talashil block, unconsolidated beach/dune sand samples are extracted using a hand auger drill that employs a 2-inch sediment sampler made up of GI pipe and a 6-inch diameter flight spiral auger. A core catcher will be fitted to the sample tip to avoid sample loss whenever the samples are very loose and unconsolidated. Maximum depth of sampling in the Talashil block is 6.0m below ground level (bgl). All the drill holes are oriented vertically by eye during the sampling. For the G-3 level exploration in the Talashil block, a total of fifty-two sampling locations by auger drilling are proposed, with grid intervals of 400 meters along the shoreline and 200 meters across, covering an area of 5.84 square kilometers.

Initially the 2inch sampler pipe will drive into the ground by hammering till 1.0m depth and first sample pertaining to 0.00m to 1.00m will be collected. Then the hand auger is rotated manually by a handle attached with 3.0m drill rods which can be extended for deeper sampling. The augers are rotated into the ground until it is filled, then lifted out and emptied. The recovered samples were packed in a polythene cover and labeled with proper sample number format that includes borehole name, sample number, depth of sample and date of collection. The cycle of steps will be repeated starting with driving the sampler GI pipe to get second sample pertaining to 1.00-2.00m from ground level. Samples are collected at one-meter intervals up to a depth of 6.0 meters except two boreholes (TL25 & TL 26), which were ended with gravels at 5.0m & 4.0m at the bottom respectively.

Each sample is carefully labelled and stored to maintain integrity for accurate geochemical analysis, ensuring efficiency and precision in evaluating beach/dune sand characteristics.

8.3 Borehole planning (spacing of boreholes, level of intersection), co-ordinates, RL of collar, borehole logging, core recovery percentage

Boreholes are fixed in a grid pattern of 400 m * 200 m interval (The borehole plan was approved by NMET) covering the entire area (Figure 8.1). All the borehole points, coordinates and collar height (Table 8.1) were fixed using high end DGPS system - Geomate RTK-GPS to an accuracy of 10 mm.

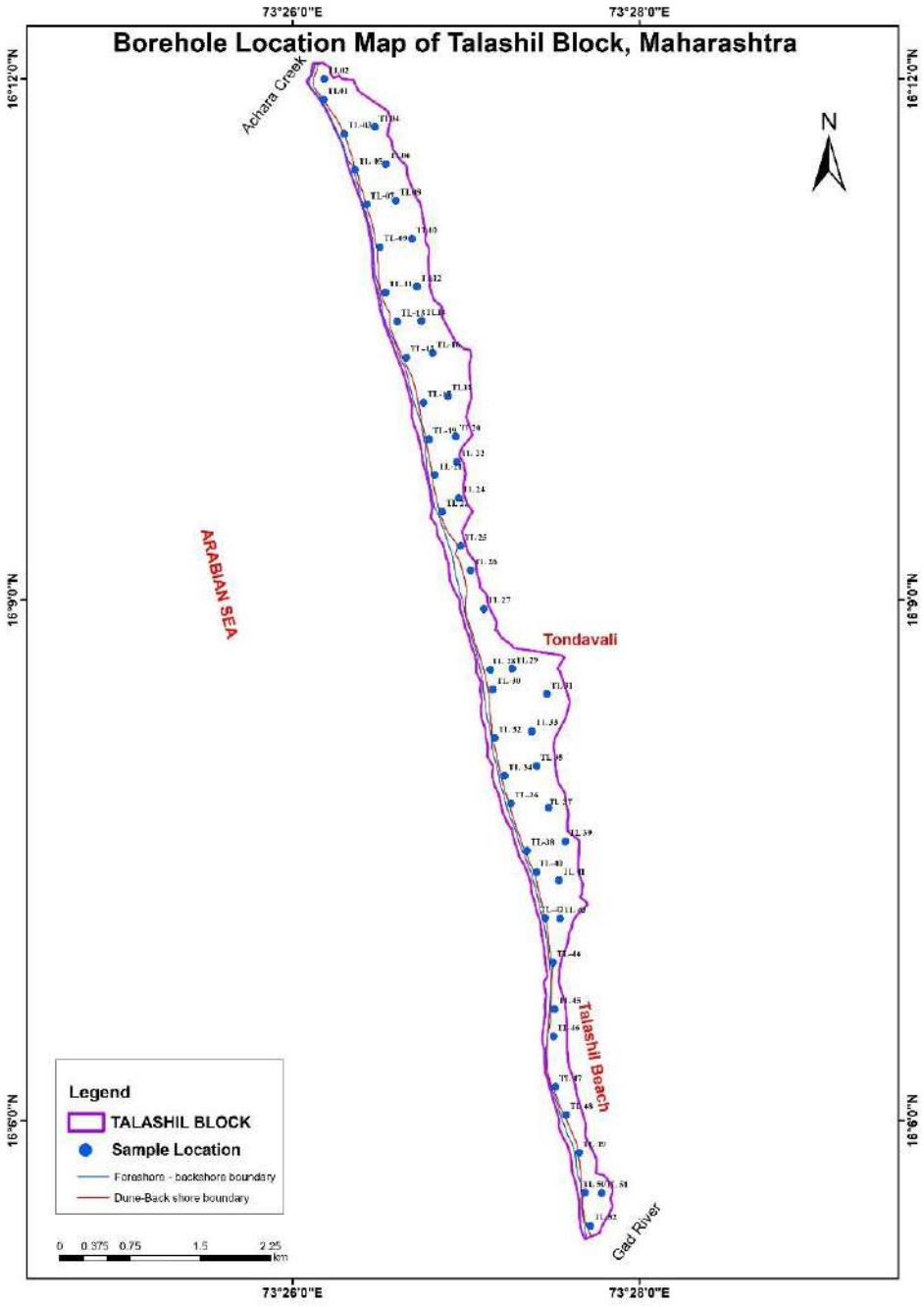


Figure: 8.1 Borehole location Map of Talashil block.

Table. 8.1 Details of borehole

Sl no.	NAME	Longitude	Lattitude	RL (m in MSL)
1	TL01	73.4363	16.1980	2.296
2	TL02	73.4364	16.2000	6.399
3	TL-03	73.4383	16.1947	2.531
4	TL04	73.4412	16.1954	7.11
5	TL-05	73.4393	16.1913	1.741
6	TL06	73.4423	16.1919	3.759
7	TL-07	73.4404	16.1880	2.583
8	TL08	73.4433	16.1883	11.518
9	TL-09	73.4417	16.1839	5.387
10	TL10	73.4448	16.1847	7.63
11	TL-11	73.4423	16.1795	5.203
12	TL12	73.4453	16.1801	7.976
13	TL-13	73.4434	16.1767	4.062
14	TL14	73.4457	16.1768	10.205
15	TL-15	73.4443	16.1733	4.335
16	TL-16	73.4468	16.1737	11.74
17	TL-17	73.4459	16.1689	7.766
18	TL18	73.4482	16.1696	3.093
19	TL-19	73.4464	16.1654	6.755
20	TL20	73.4490	16.1657	14.934
21	TL-21	73.4470	16.1620	7.39
22	TL-22	73.4491	16.1632	14.614
23	TL 23	73.4477	16.1585	5.804
24	TL 24	73.4493	16.1598	9.785
25	TL 25	73.4495	16.1551	5.543
26	TL 26	73.4504	16.1528	3.271
27	TL 27	73.4517	16.1492	7.705
28	TL-28	73.4523	16.1433	8.034
29	TL 29	73.4544	16.1434	8.333
30	TL-30	73.4526	16.1414	7.192
31	TL 31	73.4578	16.1409	19.265
32	TL 32	73.4528	16.1368	4.031
33	TL 33	73.4563	16.1374	9.074
34	TL-34	73.4537	16.1331	4.733
35	TL 35	73.4568	16.1341	4.979
36	TL-36	73.4543	16.1305	4.575
37	TL 37	73.4579	16.1300	6.564
38	TL-38	73.4558	16.1259	4.503
39	TL 39	73.4595	16.1268	12.155
40	TL-40	73.4568	16.1238	6.727
41	TL 41	73.4589	16.1231	6.363
42	TL-42	73.4576	16.1195	3.278

Sl no.	NAME	Longitude	Lattitude	RL (m in MSL)
43	TL 43	73.4590	16.1194	6.768
44	TL-44	73.4584	16.1152	5.961
45	TL 45	73.4585	16.1107	3.721
46	TL 46	73.4584	16.1081	6.208
47	TL 47	73.4586	16.1033	4.562
48	TL 48	73.4596	16.1006	5.479
49	TL 49	73.4609	16.0969	3.638
50	TL 50	73.4614	16.0931	2.568
51	TL 51	73.4630	16.0931	0.626
52	TL 52	73.4619	16.0899	2.155

Topographic survey in the study area was carried out with three sets of Geomate Real Time Kinematic–Global positioning system (RTK-GPS) receivers along with a set of GeoMateGNSS SG7. The work was carried out in the UTM coordinate system, and the MSL value was transferred to the survey area from Achara Lighthouse, accepted as MSL +40.00 m. Traverses were planned at 50 m intervals, covering the entire block, and a contour plan was prepared at a 1:5000 scale with a 1.0 m contour interval. Levels were tied to the benchmark of 40.0 m at Achara Lighthouse, and a few temporary benchmarks were established within the survey area. Cultural features including roads, houses, and buildings, were mapped and represented on the topographic map. 52 bore hole locations and geological details were also included on the geological map, prepared on 1:5000 scale. DGPS survey with Geomate RTK-GPS instrument was used in the topographic survey and borehole fixing, achieving a high degree of accuracy of up to 10 mm. The topographic map of the Talashil block area is prepared on 1:5000 scale (ANNEXURE-2).

Geophysical logging is not carried out as the work does not demands it. Since the sand sediments are loose and unconsolidated, the core recovery method is not applicable. To ensure comprehensive sampling, samples were collected at one-meter intervals, and it is assumed that the entire sample has been recovered.

8.4 Mineralogy of ore zone

Mineralized zone in the surface was primarily identified on the basis of black sand concentration and presence of opaque grains visually estimated by pocket lens. XRD and Petrological studies reveal that diverse range of minerals, magnetite/

titanomagnetite/magnesioferrite, hematite and ilmenite, clinopyroxenes, amphibole, plagioclase, quartz, clay minerals etc. Detailed explanations are given in Chapter 9.

8.5 Borehole deviation test and methodology

Borehole deviation test is not carried out in the given area, since the maximum depth of borehole drilling is in shallow depths up to 6m bgl.

8.6 Methodology of ore zone sampling and sample preparation

The fifty-two drill locations of the Talashil block yielded a maximum of 309 sub-samples by means of 1.0 m sub-sampling down the core by auger drilling, up to a maximum depth of 6.0 m. Sediment sub-samples were subjected to two level magnetic separation and gravity separation using bromoform and the procedures are detailed below.

After collection, samples weighing approximately 2 to 3 kg were dried and subjected to coning and quartering using a riffle splitter. In this method, a homogeneous, dry, and free-flowing sample is evenly poured into the hopper. The material then flows through the alternating passages in the riffle bank into two collecting pans positioned beneath the dividing head outlets. With each operation, the feed sample is divided into two representative halves. One part is being stored as a repository for future reference.

An approximately 100g sample was prepared for grain size analysis from the half portion of the bulk sample through multiple conning and quartering procedures. Remaining sample is used for two level magnetic separation.

All the representative bulk samples were passed through 5# ASTM mesh to remove oversized grains, rock pieces, shells etc if any.

Plate.8.1 Sample processing procedures (a & b) Sun-drying (c) Coning and Quartering

Similarly, the 309 sub-samples (@1m interval) generated were subjected to for grain size analysis following the SoP of Geological Survey of India (Nisha, ,2019).

8.7 Chemical analysis and laboratory procedures

8.7.1 Grain Size Analysis

Sieve analyses involve the shaking of loose or unconsolidated sediments through a set of standard sieves. Larger vegetal matters (if any) were hand-picked and removed before sieving. Here, sieves at one phi interval (ASTM sieve no.s 5#, 10#, 18#, 35#, 60#, 120#, 230# and pan) were stacked in such a manner that larger sieves lie over the smaller ones. The representative fractions of dried samples collected for grain size analysis were exactly weighed using an electronic balance and the weights were recorded against each sample.

Plate 8.2 Grain Size Analysis

Sieves were assembled in the ascending order of sieve numbers such that the sieve with the smallest opening is at the base and the largest is at the top. The pan is placed below ASTM sieve no.230. The sample was introduced into the topmost sieve and covered it. Set the shaker timing for 10 minutes and put the switch on. When the vibration stops, remove the stack and sieves from the shaker. Spread a clean sheet of paper that is larger than the diameter of the sieve and dump contents on a paper from each sieve one by one. The weight of the sand retained in each sieve is weighed accurately. The portion collected on each sieve has been collected separately in a dry pre-weighed beaker and weight of each sample has been recorded (Nisha, 2019).

8.7.2 Heavy Mineral Separation

The mineral separation was carried out inhouse, at the laboratory of Geo Marine Solutions Pvt. Ltd. Mangaluru. The dried bulk sample was weighed first and was subjected to two-level magnetic separation using LIRMS (Low Induced Rotary Magnetic Separator) and REDMS (Rare Earth Drum Magnetic Separator).

8.7.2.1 Separation of Magnetite/ Titanomagnetite/ magnesioferrite by LIRMS

The samples were processed on the Low Intensity Roll Magnetic Separator (LIRMS) to separate the strongly magnetic heavy minerals such as magnetite/titano-magnetite/magnesioferrite etc which is termed as 'A' from the low magnetic (B) minerals like ilmenite, hematite, pyroxene, amphibole etc and paramagnetic (weakly magnetic) (C) minerals such as pyroxene, amphibole etc, and the remaining tailings are non-magnetic fractions containing zircon, pyroxene, plagioclase, quartz, chlorite, epidote etc. The test conditions for the Low Intensity Roll Magnetic Separator (LIRMS) are given below.

Test Conditions:

The feed fraction obtained after separation of the magnetic fraction were further processed 3-4 times in the LIRMS until all the strongly magnetic minerals (magnetite/ titano-magnetite/magnesioferrite) are separated.

Equipment –Swenco Model for ferrite lab roll separator

LIRMS of 4" dia* 5" wide lab roll

Configuration- 3 Roll, Magnetite repass

Roll Speed – 1st 2nd & 3rd roll - 110rpm.

Vibratory Feeder rate- 160 V for 3 rolls

8.7.2.2 Separation of low magnetic, Middlings and Non-mag Fraction by REDMS

The non-magnetic fractions of LIRMS were further processed using Rare Earth Drum Magnetic Separator (REDMS) to obtain three sub fractions; low magnetic minerals (B), feebly magnetic minerals (C) and non-magnetic fractions.

The REDMS efficiently separates minerals with low/weak magnetic properties. Based on the content of low magnetic (B), feebly magnetic (C), and non-magnetic fractions, the separation process on the REDMS was repeated to obtain a pure low magnetic fraction (B) enriched in ilmenite and hematite, which were collected separately.

The non-magnetic fraction from REDMS contains zircon, quartz, feldspar and shells. The test condition on REDMS is given below.

Test Conditions:

Feed: Fraction obtained after separation of magnetite/ titano-magnetite

Equipment –Swenco Model REDMS of 15" dia* 12" wide lab drum

Configuration- 2 Roll, Mids. repass

Roll Speed – 1st & 2nd Roll - 30rpm.

Vibratory Feeder rate- 140 V for both roll

8.7.2.3 Gravity Separation

The REDMS non-magnetic fraction (D) containing quartz, feldspar, shells, amphiboles, pyroxenes etc. are subjected to gravity separation to separate lights from the heavies. The non-magnetic fraction thus obtained from REDMS is coned and quartered and about 100g fraction is taken for gravity separation. The separation medium used is Bromoform ($CHBr_3$), which is a dense liquid with density of 2.89g/cm^3. It is most commonly used medium in density separation to separate minerals based on their density. When a mixture of minerals is combined with bromoform and allowed to settle, the minerals having specific gravity less than 2.89 (bromoform density) will float, while heavier minerals will sink to the bottom of the wide-mouthed separating funnel containing bromoform. The heavy mineral fraction settled at the bottom is collected on to a funnel with filter paper kept below the conical flask by draining out only the heavies. The heavy mineral fraction thus separated will be retained in the filter paper is washed using acetone to remove bromoform from the minerals.

After gravity separation, the lighter fractions (NMLM) such as quartz, feldspar are collected separately by draining out the bromoform and washing in acetone, and the heavier fractions (NMHM) like zircon, amphibole and pyroxene are subjected to mineralogical studies.

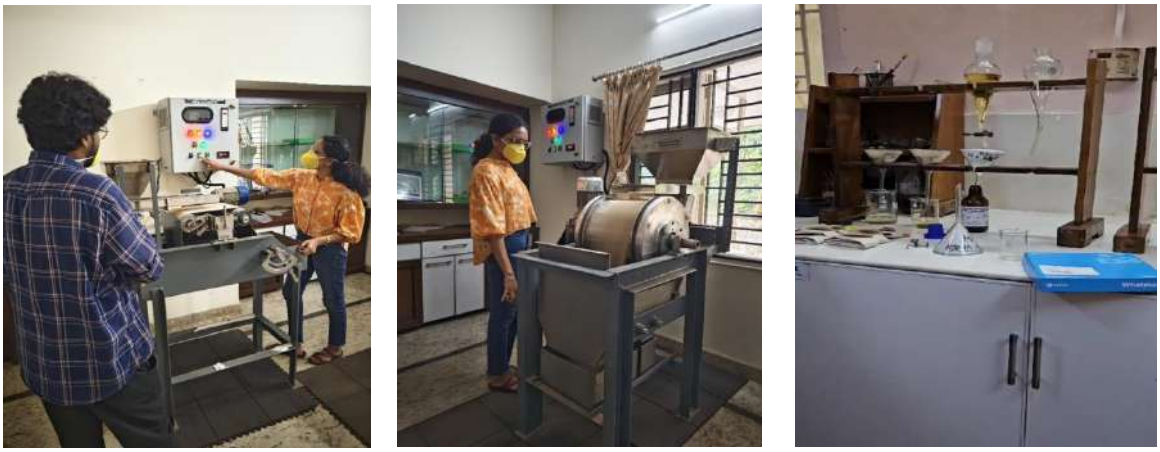


Plate 8.3Mineral separation methods: (a)LIRMS (b) REDMS (c)Gravity Separation using Bromoform

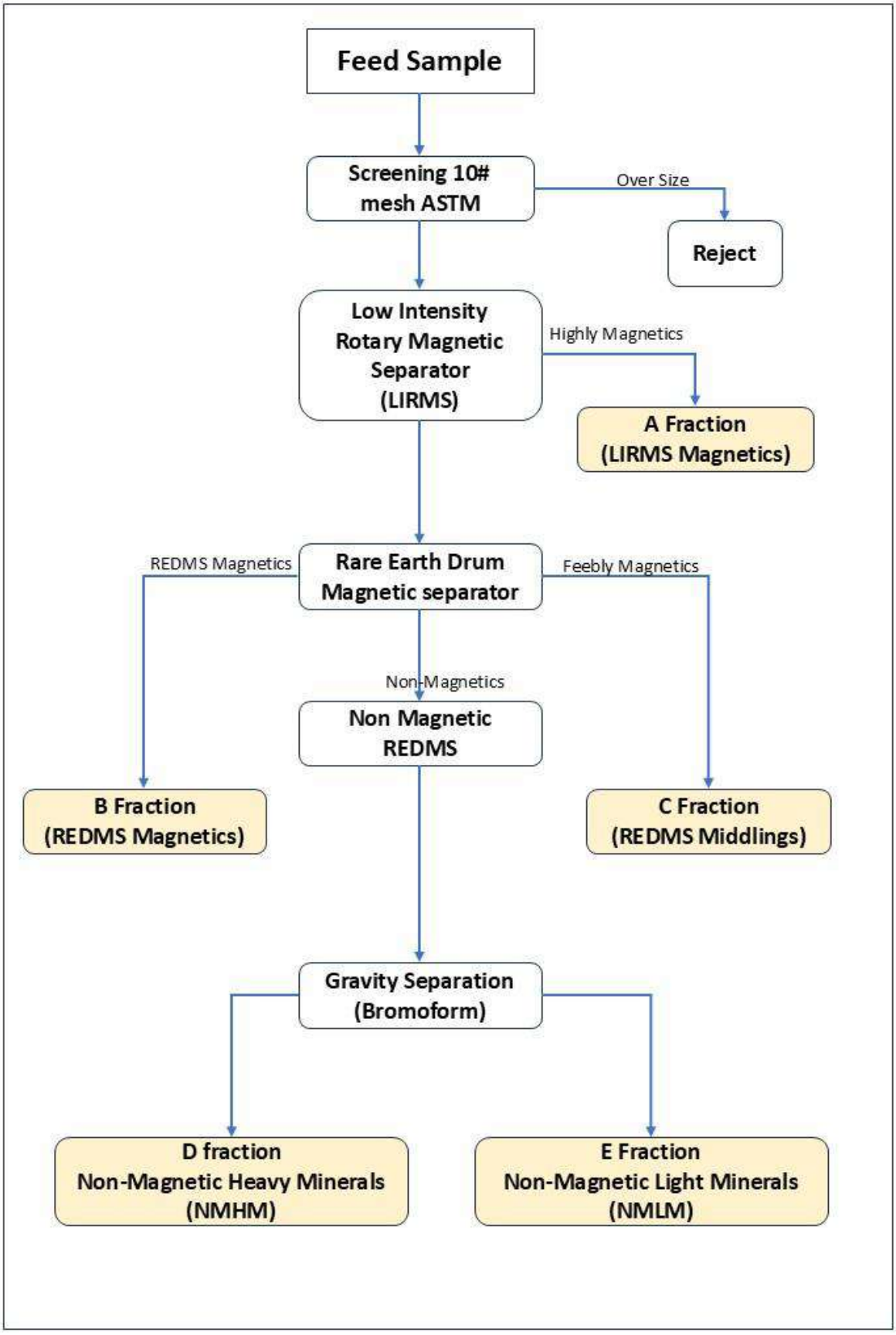


Figure 8.2. Flow chart of Test methodology for heavy mineral separation

8.7.3 Chemical analysis by XRF

The two-level magnetic separation yielded a total of 927 sub-fractions (309*3), including A, B and C sub-fractions, apart from non-magnetic heavies (D) and non-magnetic lights (E). From the 927 sub-fractions obtained, 234 samples (~25% of the total sub-fractions) were subjected to geochemical analysis for determining the concentrations of major oxides such as Fe_2O_3, TiO_2, V_2O_5, MnO, SiO_2 etc. The location of 234 no. of samples from 13 borehole were considered in such a way that, it should represent horizontal as well as vertical distribution of entire sand body explored. The procedure followed for the chemical analysis is mentioned below.

Preparation of Fusion bead for the Analysis of Majors by using flux mixture containing Lithium Tetra borate, Lithium Meta borate, Lithium Bromide in a fusion bead machine in Geological samples by WDXRF spectrometer

The estimation of major elements in geological samples is by making a fusion bead followed by WDXRF analysis for oxides, - Al2O3, BaO, CaO, Cr2O3, Fe2O3, K2O, MgO, MnO, Na2O, P2O5, SiO2, TiO2, SO3, V2O5 and LOI.

All samples were prepared and ensured the sample pulp is 90% passing 200# (75micron) as per SOP/OM/083 before taking for fusion bead. This method describes the fusion and analytical procedure used for the preparation of all types of geological exploration, mining and ore grade rock chips, soils, stream sediment samples for the subsequent analysis by WDXRF. The preparation of fusion bead of the samples by this procedure is 0.55 g sample ~~is~~ taken for bead preparation.

Fusion flux is weighed in glass bottle of 9.45g and sample of 0.55g on the top of the flux. The glass bottle is capped and mixed thoroughly with shaking to get a homogenized mixture. Samples are weighed by the operator/chemist depending upon the availability of 30ml Pt-Au crucibles.

Prior to using 30ml Pt-Au crucibles - Molds are visually inspected for cleanliness without any residues of previous fusions. If residues are seen they are returned for cleaning in 5% citric acid immersed in a glass beaker and in an ultra-sonic bath. Fusion beads are labelled as per the sequence given in the worksheet.

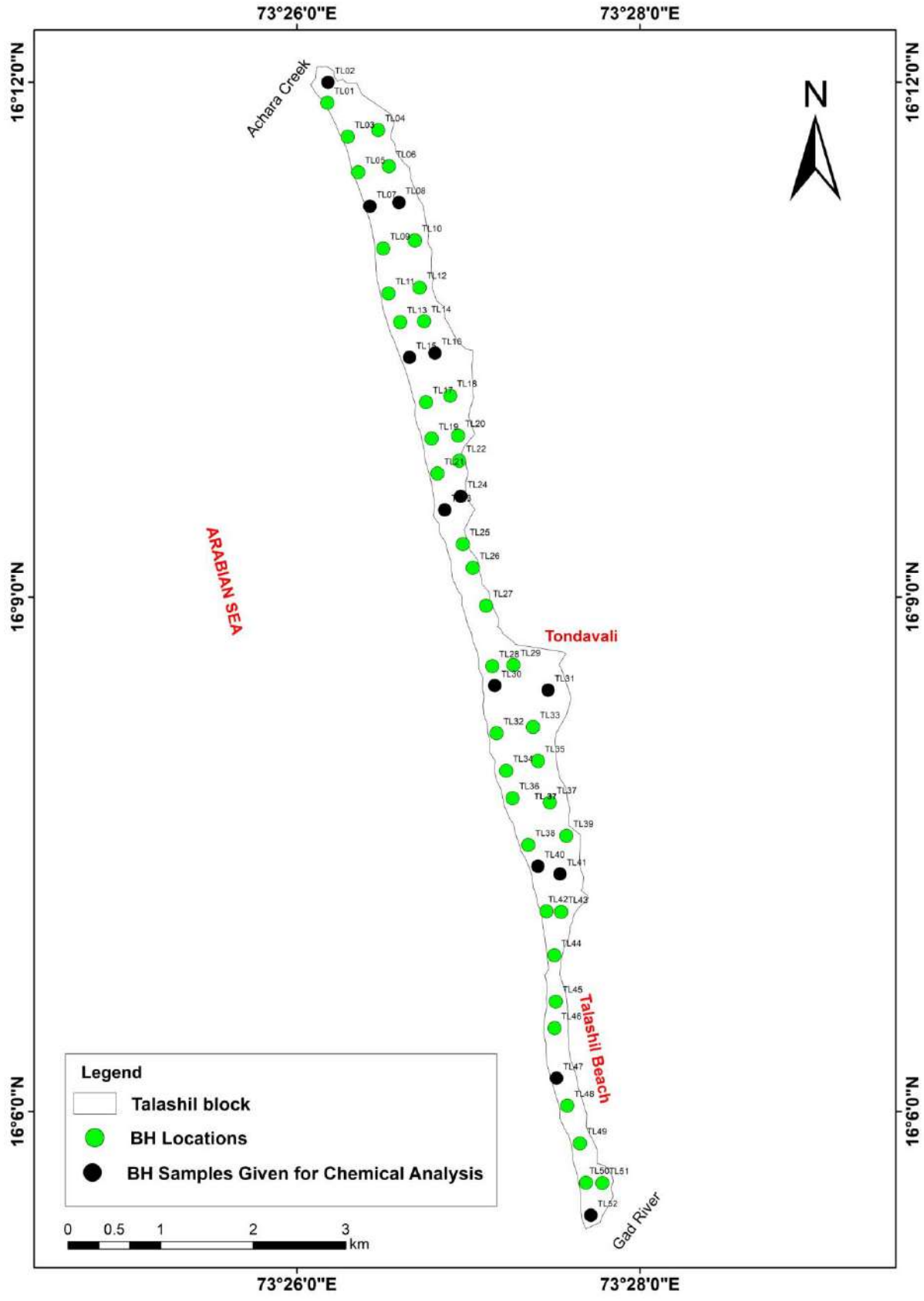


Figure 8.3 Map showing the boreholes selected for chemical analysis.

Instrumentation

The WDXRF procedure is based on X-ray fluorescence spectroscopy and is used for the sequential element determination of elements in a variety of sample matrices. The instrument has a vacuum chamber for sample, goniometer for changing the angle of detectors (both Scintillation and gas detector) and also for crystals for focusing the secondary x-rays from the samples towards the detector. The XRF instrument is connected with a PC which controls the operations, analysis and results. The X-ray tube is protected by a circulating water from a chiller unit which helps to keep the tube at 25°C.

8.7.4 XRD Analysis

XRD analyses of 10 sub-fractions were conducted to understand the mineral phases at Mineral Physics Lab of Geological survey of India, Kolkata. Composite samples were prepared from all the A and B sub-fractions separately from boreholes 02, 31, and 47. Similarly, composite samples of C sub-fractions from borehole 31 and composite samples of non-magnetic heavy minerals from boreholes 02, 07, 08, 15, 16 in the north and 41 and 47 in south and non-magnetic light minerals from boreholes 03, 31, and 47 of the Talashil block were analyzed using X-ray diffraction (XRD) instrument.

Samples were analysed in PANalyticalX'pert PRO powder diffractometer having an X-ray tube with copper target. Analyzing iron-rich samples using XRD with copper radiation results in a high background level due to fluorescence, which affects the quality of the diffractogram. Also, the samples analysed were fractions separated by magnetic separator/bromoform.

Spinel minerals such as magnetite, titanomagnetite and magnesioferrite etc. having similar spinel crystal structure and comparable lattice parameters are identified in the A fractions separated from the LIRMS and their X-ray diffraction (XRD) patterns are quite similar making distinction between these types of minerals challenging in polymineralic samples. B fractions are chiefly composed of ilmenite, hematite etc and C fractions are composed of feebly magnetic heavy minerals such as amphiboles and pyroxenes etc. Non-magnetic heavies comprise pyroxene, amphibole, zircon, chlorite, epidote etc and the non-magnetic light minerals identified are quartz, plagioclase and K-feldspar.

Measurement Conditions:

Instrument: PANalytical*X'Pert PRO*™ powder diffractometer

Software used for analysis of spectra: PANalytical *HighScore Plus*™

Raw Data Origin	XRD measurement (*. XRDML)
Scan Axis	Gonio
Start Position [°2Th.]	4.0054
End Position [°2Th.]	79.9784
Step Size [°2Th.]	0.0170
Scan Step Time [s]	50.8000
Scan Type	Continuous
PSD Mode	Scanning
PSD Length [°2Th.]	2.12
Offset [°2Th.]	0.0000
Divergence Slit Type	Fixed
Divergence Slit Size [°]	0.4354
Specimen Length [mm]	10.00
Measurement Temperature [°C]	25.00
Anode Material	Cu
K-Alpha1 [Å]	1.54060
Generator Settings	30 mA, 40 kV

8.7.5 Petrographic Study

The grain mount sections were prepared by spraying the heavy detritus on an araldite base spread all over a 3" x 1" size thin glass slide. The grains were spread uniformly all over the slide. Care was taken to spread the grains in such a way that individual grains do not overlap one on another. The fixed grain mounts were then subjected to a low-speed polishing in order to bring all the grain mounts on a level-plane surface.

The grains were studied under transmitted light (plane polarized and crossed nicol conditions) and reflected light (plane-polarized and cross nicol conditions) of a Polarizing Microscope. Due to smaller sizes, the silicate grains exhibit many of their inherent optical properties and therefore could be identified. On the other hand, the identification of oxide facies minerals is constrained by un-even surfaces and therefore their identification under

reflected light is based on limited properties. Digital photomicrographs under different magnifications are obtained and reported in the form of plates for each sample.

8.7.6 Radiometric analysis at Atomic Mineral Division

Ten bulk samples that are covering entire explored area are analyzed for radiometric equivalent of monazite (PHY-5) at AMD, Hyderabad. The samples, which had undergone chemical analysis, were selected for radiometric analysis. Composite samples were prepared from 10 boreholes (TL02, TL07, TL08, TL16, TL24, TL30, TL31, TL41, TL47, TL52), up to a depth of 6.0 meters, each weighing approximately 500g to 600g. The map showing the sample locations selected for radiometric analysis is given below (Fig 8.4). The result is attached in Annexure 12.

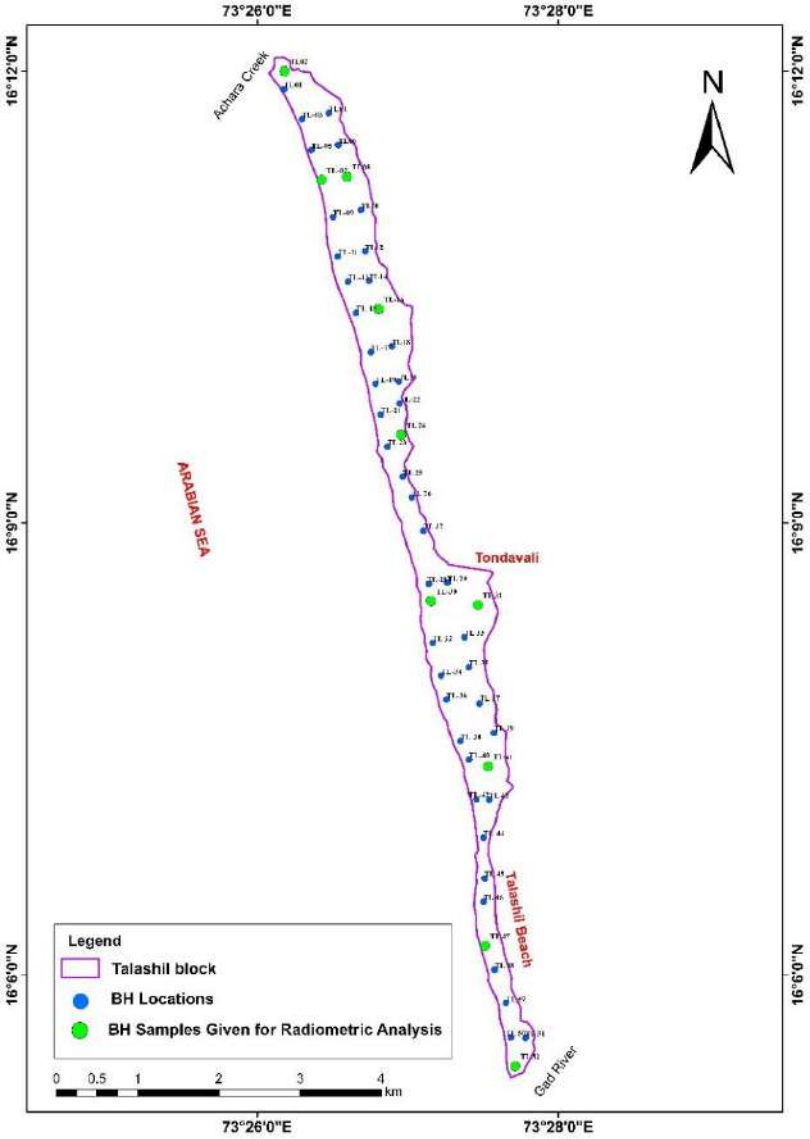


Figure 8.4 Map showing the boreholes selected for Radiometric analysis.

8.8 Check samples (at least 10%) analysed from third party NABL accredited lab

Out of 309 original samples (representing 52 boreholes), 10% samples were taken as check samples (24 samples) were given for Lithium Borate fusion bead followed by WDXRF analysis for the major oxides as per the standard procedure IGI/GDM/TPM-48 NABL accredited lab at Inspectorate Griffith India Pvt. Ltd., Gandhidham, Gujarat. Chemical values of check samples vis-à-vis original samples are compared and the comparison of respective samples are given in Chapter 9.

8.9 Details of intersected ore zones of the boreholes drilled and their correlation

Since the exploration is restricted to beach and dune sands and the heavy minerals are disseminated in the sands, demarcation of ore zones and their correlation is not possible.

8.10 Depth of the ground water condition should be ascertained and reported.

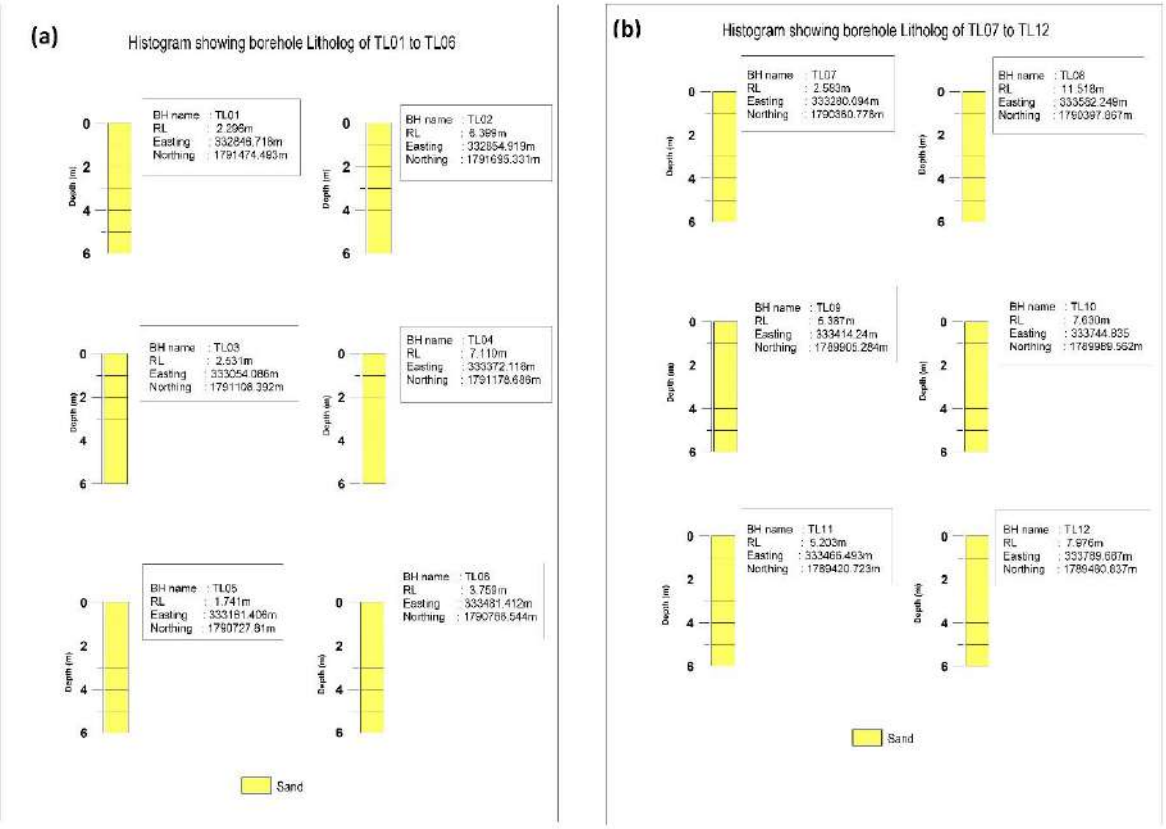
The Alluvial deposits are found along the coastal areas in few isolated patches having limited areal extent and limited thickness as Beach Sand. The ground water occurs in inter-granular pore spaces of sands, gravels, and silts. The ground water occurs under phreatic/unconfined aquifer at relatively shallow depths of 2-10 m bgl and their yield ranges from about 2 to 5m^3/day. The Annual Extractable Ground Water Recharge in Malvan taluk is 32.77% (CGWB, 2014).

CHAPTER 9. ANALYTICAL RESULTS AND INTERPRETATION

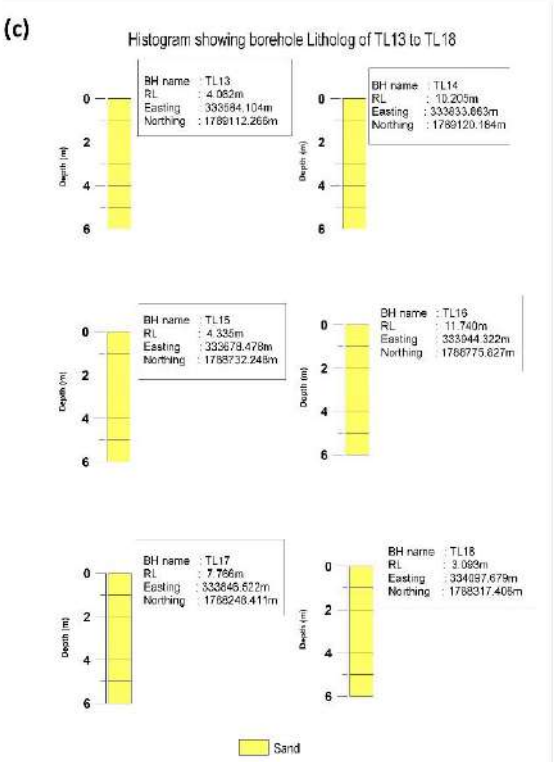
The mineral separation using two level magnetic separators (LIRMS and REDMS) was carried out for the entire 309 sub-samples from 52 boreholes and 927 (309*3) magnetic fractions were generated. A total of 234 samples (25% of magnetic fractions) were subjected to chemical analysis by XRF. The representative magnetic & nonmagnetic heavy mineral samples were subjected to microscopic study. Ten representative samples from different magnetic fractions are subjected to XRD analysis at Mineral Physics lab of GSI, Kolkata to identify the mineral phases and their semi-quantitative presence. Granulometric studies of all the 309 sub-samples are conducted and the results are analysed. A total of 24 numbers of XRF samples (10%) considered as check sample were analysed at a different NABL accredited lab. All the quantitative and qualitative analyses and their results are discussed below.

9.1 Borehole Log

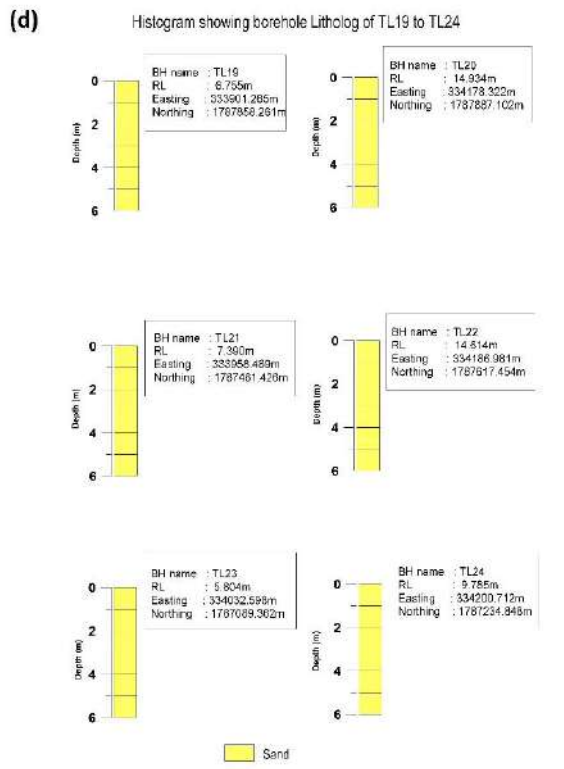
The Litholog of 52 boreholes (Fig.1-9) indicates that the sediments are fall in category of Sand.



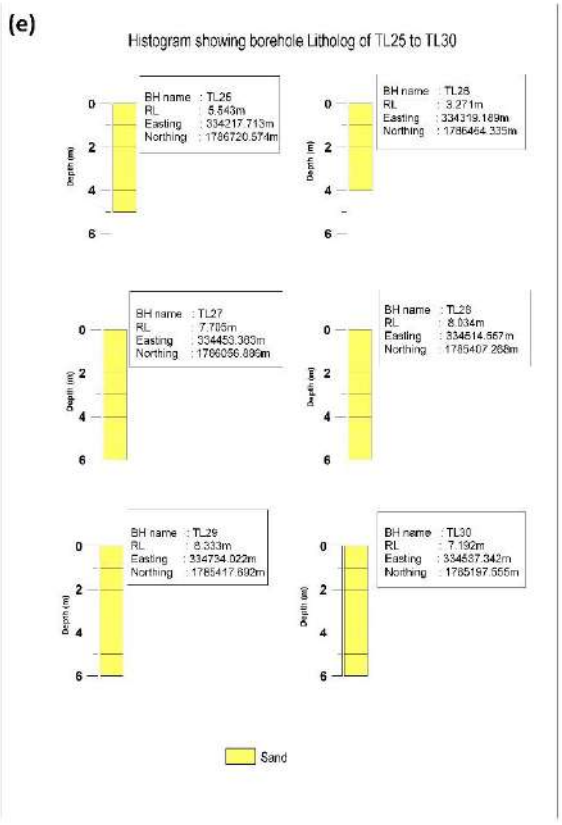
(c)


Histogram showing borehole Litholog of TL13 to TL18
BH name : TL13
RL : 4.082m
Easting : 333884.104m
Northing : 1789112.265m
BH name : TL14
RL : 10.205m
Easting : 333833.663m
Northing : 1789120.164m
BH name : TL15
RL : 4.335m
Easting : 333679.478m
Northing : 1788732.248m
BH name : TL16
RL : 11.740m
Easting : 333944.322m
Northing : 1788775.627m
BH name : TL17
RL : 7.766m
Easting : 333845.522m
Northing : 1788248.411m
BH name : TL18
RL : 3.099m
Easting : 334097.679m
Northing : 1788317.405m
Depth (m)
0
2
4
6
Sand

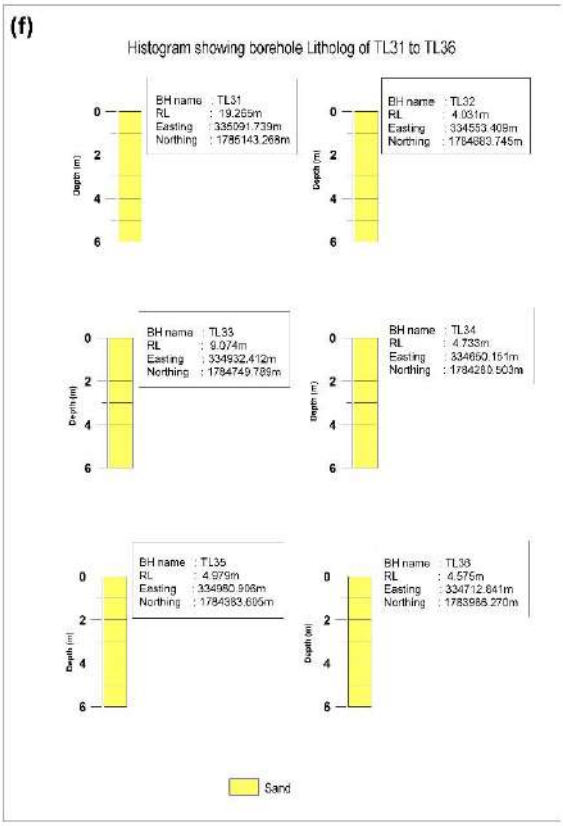
(d)

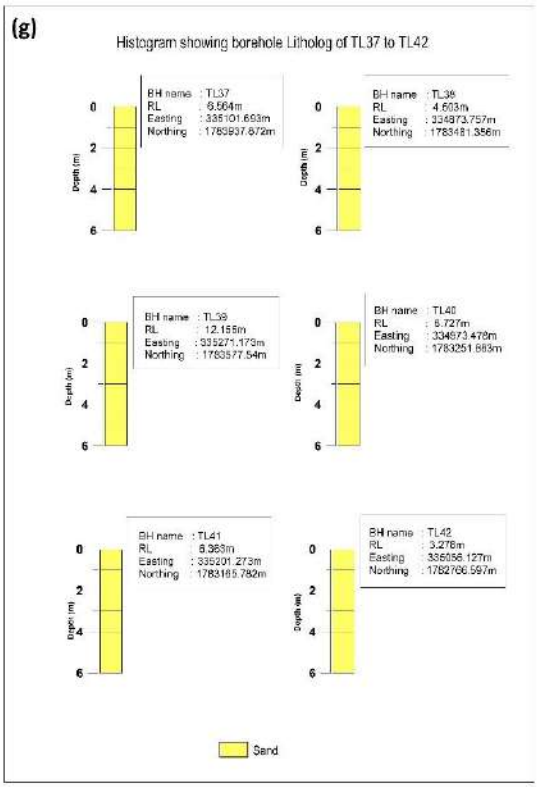

Histogram showing borehole Litholog of TL19 to TL24
BH name : TL19
RL : 6.755m
Easting : 333901.285m
Northing : 1787856.261m
BH name : TL20
RL : 14.934m
Easting : 334178.322m
Northing : 1787887.102m
BH name : TL21
RL : 7.390m
Easting : 333958.488m
Northing : 1787461.426m
BH name : TL22
RL : 14.614m
Easting : 334186.981m
Northing : 1787617.454m
BH name : TL23
RL : 5.804m
Easting : 334032.598m
Northing : 1787089.362m
BH name : TL24
RL : 9.785m
Easting : 334200.712m
Northing : 1787234.848m
Depth (m)
0
2
4
6
Sand

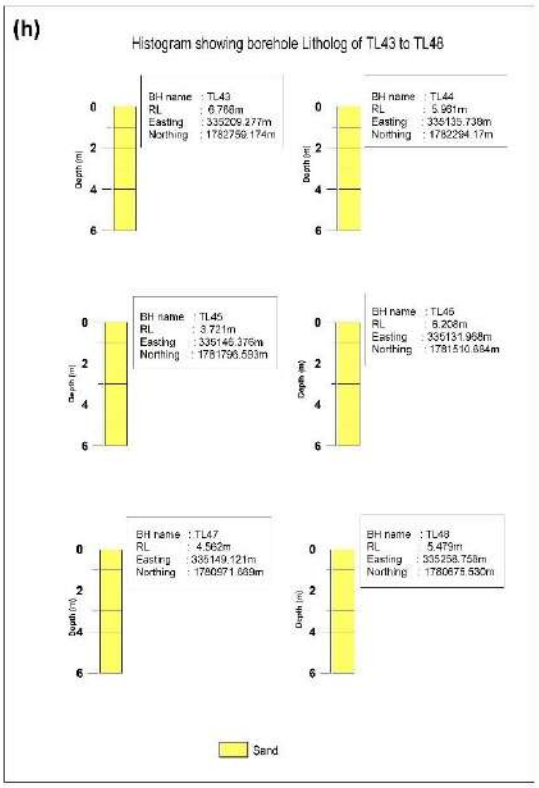
(e)


Histogram showing borehole Litholog of TL25 to TL30
BH name : TL25
RL : 5.543m
Easting : 334217.713m
Northing : 1786720.574m
BH name : TL26
RL : 3.271m
Easting : 334319.189m
Northing : 1786464.335m
BH name : TL27
RL : 7.705m
Easting : 334453.383m
Northing : 1786096.899m
BH name : TL28
RL : 8.034m
Easting : 334514.567m
Northing : 1785407.268m
BH name : TL29
RL : 8.333m
Easting : 334734.022m
Northing : 1785417.892m
BH name : TL30
RL : 7.192m
Easting : 334637.342m
Northing : 1785197.555m
Depth (m)
0
2
4
6
Sand

(f)


Histogram showing borehole Litholog of TL31 to TL36
BH name : TL31
RL : 19.259m
Easting : 335091.739m
Northing : 1786143.268m
BH name : TL32
RL : 4.031m
Easting : 334553.409m
Northing : 1784883.745m
BH name : TL33
RL : 9.074m
Easting : 334932.412m
Northing : 1784749.789m
BH name : TL34
RL : 4.733m
Easting : 334650.151m
Northing : 1784280.503m
BH name : TL35
RL : 4.979m
Easting : 334960.996m
Northing : 1784383.695m
BH name : TL36
RL : 4.575m
Easting : 334712.841m
Northing : 1783988.270m
Depth (m)
0
2
4
6
Sand





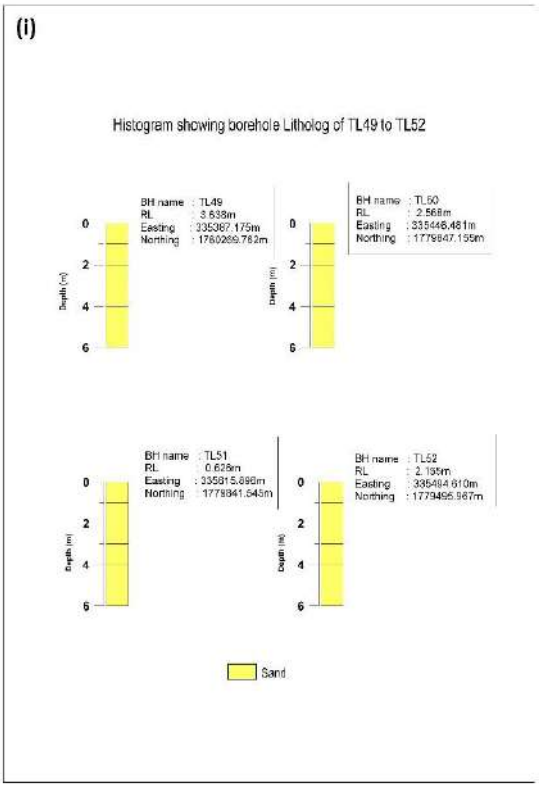


Figure 9.1. Litholog of boreholes (a)TL01-TL06 (b) TL07-TL12 (c) TL13-TL18 (d) TL19-TL24 (e) TL25-TL30 (f) TL31-TL36 (g) TL37-TL42 (h) TL43-TL47 (i) TL48-TL52

9.2 Two-Level Magnetic Separation

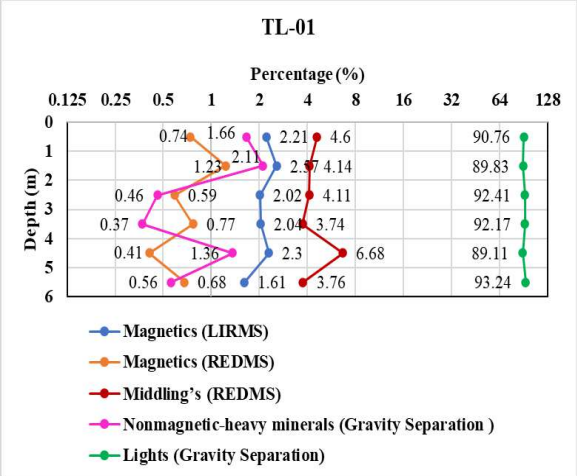
The fifty-two drill locations of the Talashil block yielded a maximum of 309 sub-samples by means of 1.0 m sub-sampling down the core up to a maximum depth of 6 m. The samples are processed by two level magnetic and gravity separation.

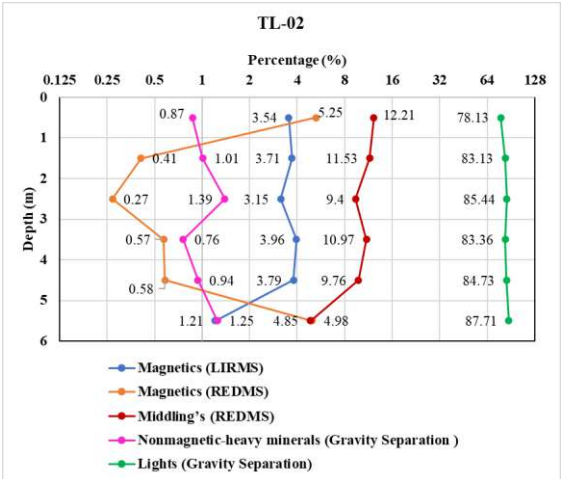
TL01

A total of 6m samples are collected from borehole no TL01 (73.4363°E, 16.1980°N). The two-level magnetic separation indicates that the Weight percentages of Magnetics (LIRMS) ranges from 1.61% to 2.57% with an average of 2.13%, magnetics (REDMS) is between 0.41% and 1.23% with an avg. of 0.74% and the middlings (REDMS) ranges from 3.74% to 6.68% with an avg. of 4.51%.

TL02

A total of 6m samples are collected from borehole no TL02 (73.4364°E, 16.2000°N). Weight percentages of Magnetics (LIRMS) ranges from 1.21 % to 3.96% with an average of 3.23%, magnetics (REDMS) is between 0.27 % and to 5.25% with an avg. of 2.01% and the middlings (REDMS) ranges from 4.85% to 12.21% with an avg. of 9.79%.



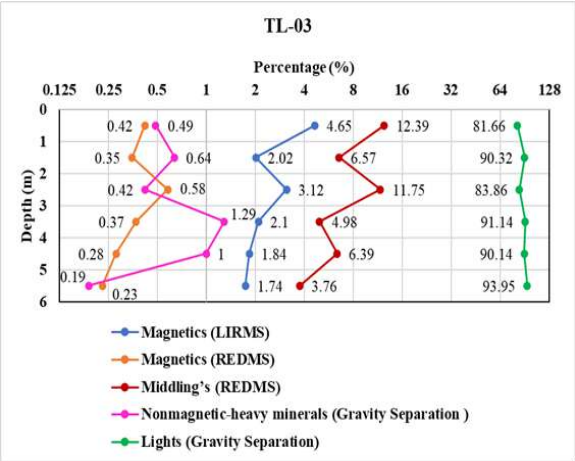


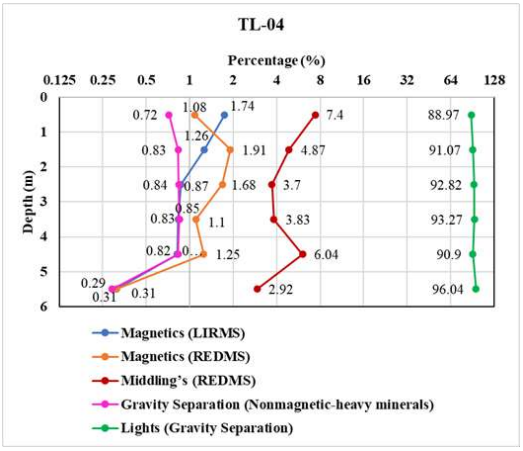
TL03

A total of 6m samples are collected from borehole no TL03 (73.4383°E, 16.1947°N. Weight percentages of Magnetics (LIRMS) ranges from 1.74 % to 4.65% with an average of 2.58%, magnetics (REDMS) is between 0.23 % and 0.58% with an avg. of 0.37% and the middlings (REDMS) ranges from 3.76 % to 12.39% with an avg. of 7.64%.

TL04

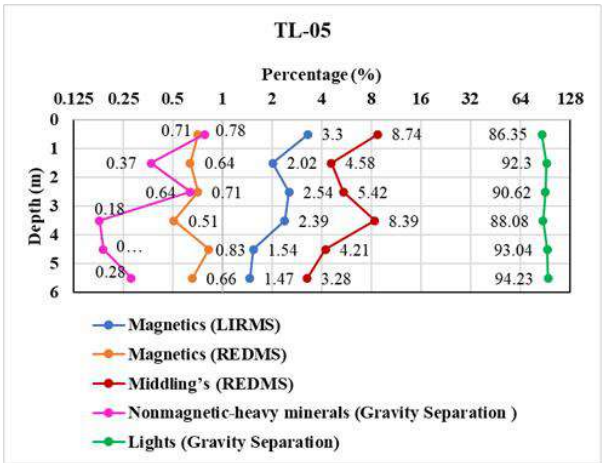
A total of 6m samples are collected from borehole no TL04(73.4412°E, 16.1954°N. Weight percentages of Magnetics (LIRMS) ranges from 0.31 % to 1.74% with an average of 0.97%, magnetics (REDMS) is between 0.31% and 1.91% with an avg. of 1.22% and the middlings (REDMS) ranges from 2.92 % to 7.4% with an avg. of 4.79%.

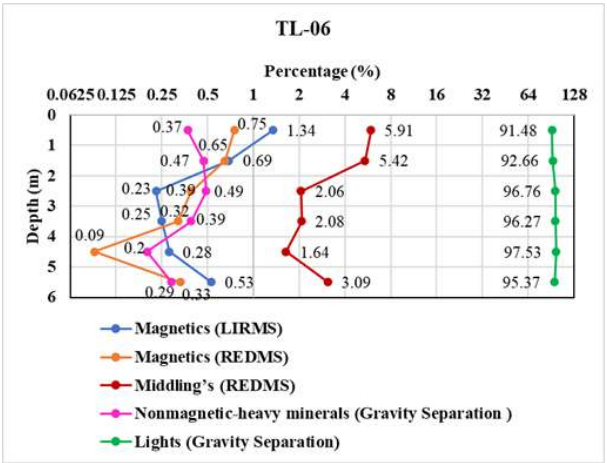




TL05

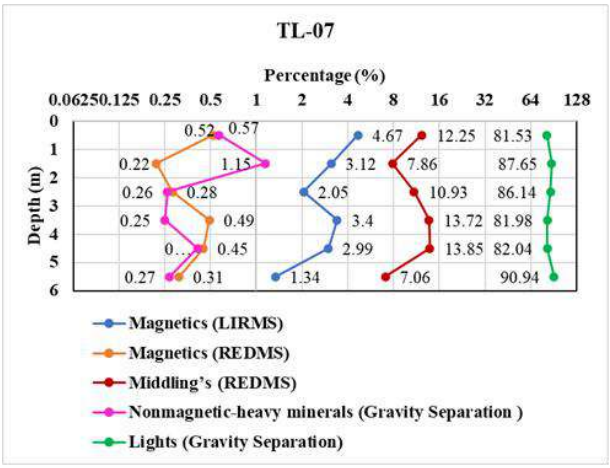
A total of 6m samples are collected from borehole no TL05(73.4393°E, 16.1913°N). Weight percentages of Magnetics (LIRMS) ranges from 1.47 % to 3.3% with an average of 2.21%, magnetics (REDMS) is between 0.51% and 0.83% with an avg. of 0.68% and the middlings (REDMS) ranges from 3.28% to 8.74% with an avg. of 5.77%.

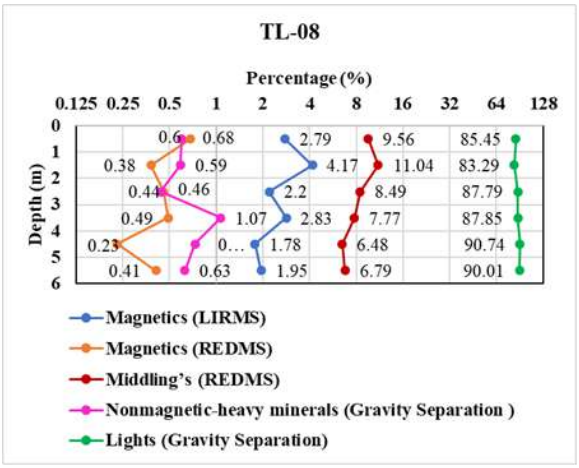




TL06

A total of 6m samples are collected from borehole no TL06(73.4423°E, 16.1919°N). Weight percentages of Magnetics (LIRMS) ranges from 0.23% to 1.34% with an average of 0.55%, magnetics (REDMS) is between 0.09% and 0.75% with an avg. of 0.42% and the middlings (REDMS) ranges from 1.64 % to 5.91% with an avg. of 3.37%.



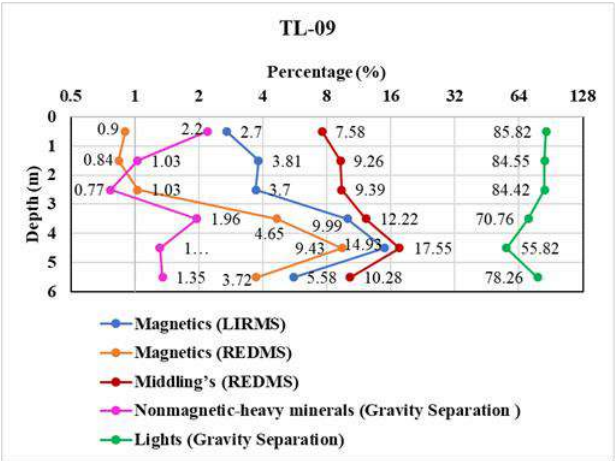


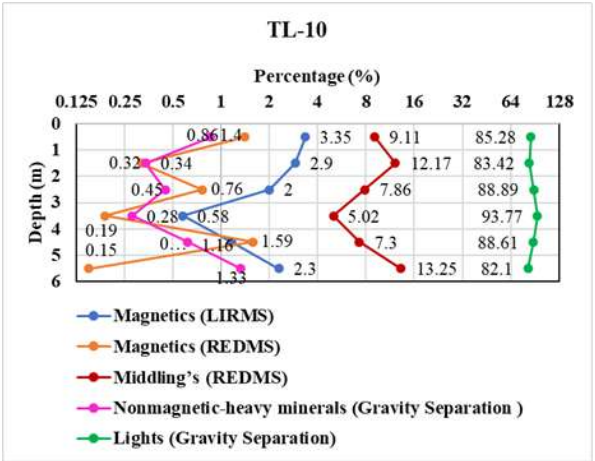
TL07

A total of 6m samples are collected from borehole no TL07(73.4404°E, 16.1880°N). Weight percentages of Magnetics (LIRMS) ranges from 1.34 % to 4.67% with an average of 2.93%, magnetics (REDMS) is between 0.22 % and 0.52% with an avg. of 0.38% and the middlings (REDMS) ranges from 7.06 % to 13.85% with an avg. of 10.95%.

TL08

A total of 6m samples are collected from borehole no TL08(73.4433°E, 16.1883°N. Weight percentages of Magnetics (LIRMS) ranges from 1.78% to 4.17% with an average of 2.62%, magnetics (REDMS) is between 0.23 % and 0.68% with an avg. of 0.44% and the middlings (REDMS) ranges from 6.48 % to 11.04% with an avg. of 8.36%.





TL09

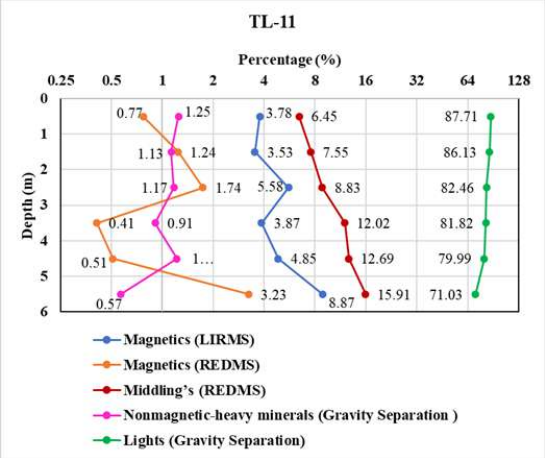
A total of 6m samples are collected from borehole no TL09(73.4417°E, 16.1839°N. Weight percentages of Magnetics (LIRMS) ranges from 2.7% to 14.93% with an average of 6.79%, magnetics (REDMS) is between 0.84 % and 9.43% with an avg. of 3.43% and the middlings (REDMS) ranges from 7.58% to 17.55% with an avg. of 11.05%.

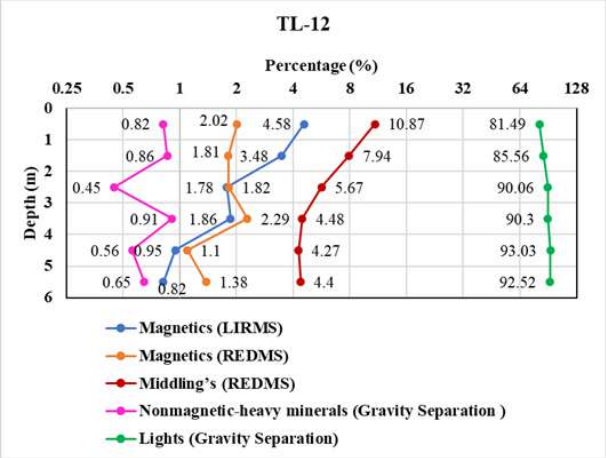
TL10

A total of 6m samples are collected from borehole no TL10(73.4448°E, 16.1847°N. Weight percentages of Magnetics (LIRMS) ranges from 0.58 % to 3.35% with an average of 2.05%, magnetics (REDMS) is between 0.15% and 1.59% with an avg. of 0.74% and the middlings (REDMS) ranges from 5.02 % to 13.25% with an avg. of 9.12%.

TL11

A total of 6m samples are collected from borehole no TL11(73.4423°E, 16.1795°N). Weight percentages of Magnetics (LIRMS) ranges from 3.53 % to 8.87% with an average of 5.08%, magnetics (REDMS) is between 0.41 % and 3.23% with an avg. of 1.32% and the middlings (REDMS) ranges from 6.45% to 15.91% with an avg. of 10.58%.





TL12

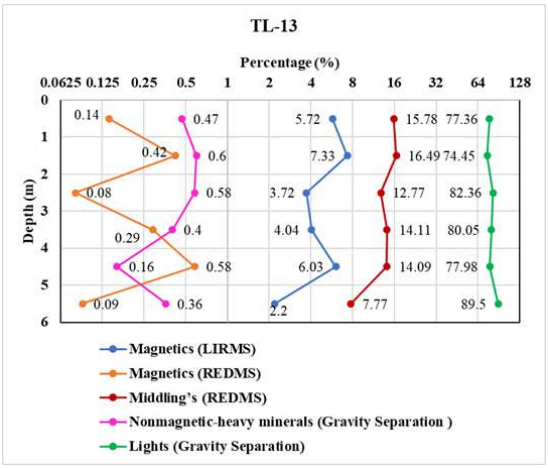
A total of 6m samples are collected from borehole no TL12(73.4453°E, 16.1801°N. Weight percentages of Magnetics (LIRMS) ranges from 0.82% to 4.58% with an average of 2.25%, magnetics (REDMS) is between 1.1% and 2.29% with an avg. of 1.74% and the middlings (REDMS) ranges from 4.27 % to 10.87% with an avg. of 6.27%.

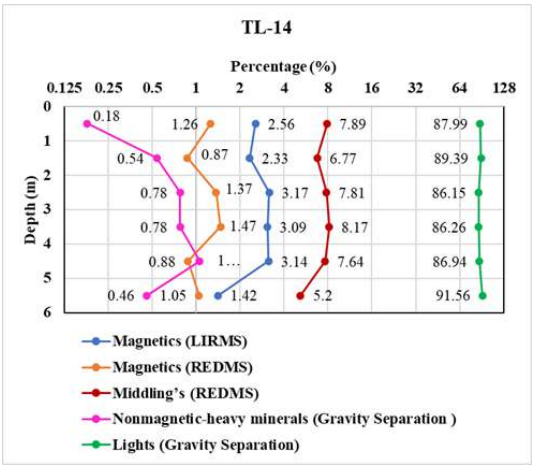
TL13

A total of 6m samples are collected from borehole no TL13(73.4434°E, 16.1767°N). Weight percentages of Magnetics (LIRMS) ranges from 2.2% to 7.33% with an average of 4.84%, magnetics (REDMS) is between 0.08 % and 0.58% with an avg. of 0.27% and the middlings (REDMS) ranges from 7.77% to 16.49% with an avg. of 13.50%.

TL14

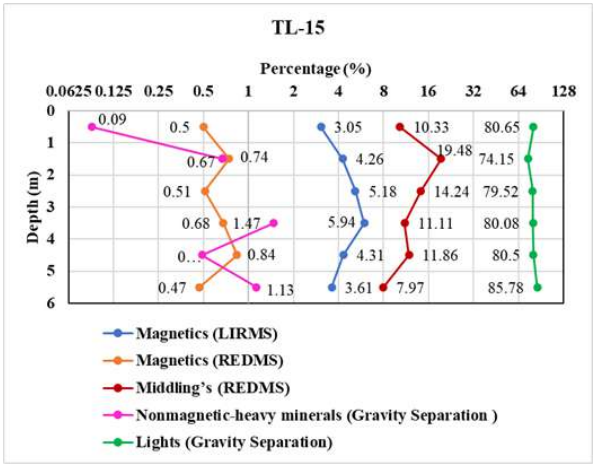
A total of 6m samples are collected from borehole no TL14(73.4457°E, 16.1768°N). Weight percentages of Magnetics (LIRMS) ranges from 1.42% to 3.17% with an average of 2.62%, magnetics (REDMS) is between 0.87 % and 1.47% with an avg. of 1.15% and the middlings (REDMS) ranges from 5.2% to 8.17% with an avg. of 7.25%.

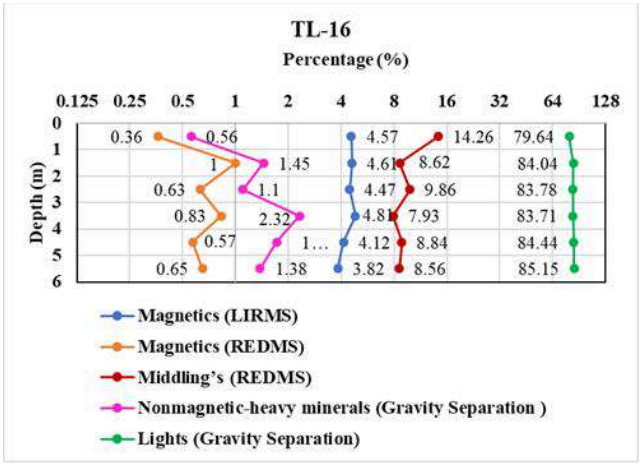




TL15

A total of 6m samples are collected from borehole no TL15(73.4443°E, 16.1733°N). Weight percentages of Magnetics (LIRMS) ranges from 3.05% to 5.94% with an average of 4.39%, magnetics (REDMS) is between 0.47 % and 0.84% with an avg. of 0.62% and the middlings (REDMS) ranges from 7.97 % to 19.48% with an avg. of 12.50%.





TL16

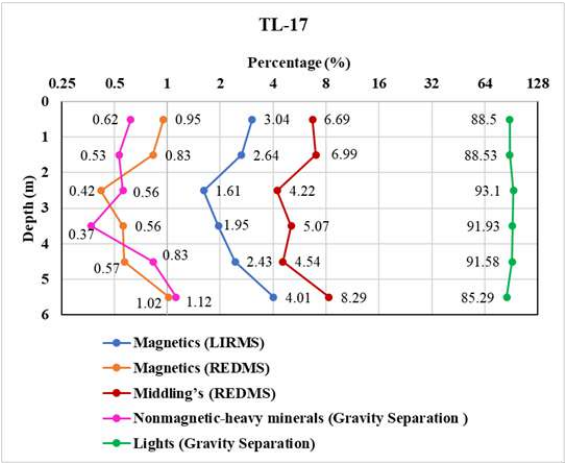
A total of 6m samples are collected from borehole no TL16(73.4468°E, 16.1737°N). Weight percentages of Magnetics (LIRMS) ranges from 3.82 % to 4.81% with an average of 4.4%, magnetics (REDMS) is between 0.36 % and 1.0% with an avg. of 0.67% and the middlings (REDMS) ranges from 7.93 % to 14.26% with an avg. of 9.68%.

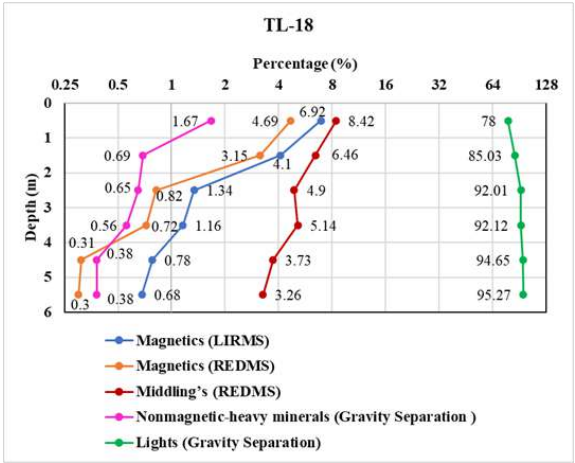
TL17

A total of 6m samples are collected from borehole no TL17(73.4459°N, 16.1689°E). Weight percentages of Magnetics (LIRMS) ranges from 1.61% to 4.01% with an average of 2.61%, magnetics (REDMS) is between 0.42 % and 1.02% with an avg. of 0.73% and the middlings (REDMS) ranges from 4.22 % to 8.29 % with an avg. of 5.97 %.

TL18

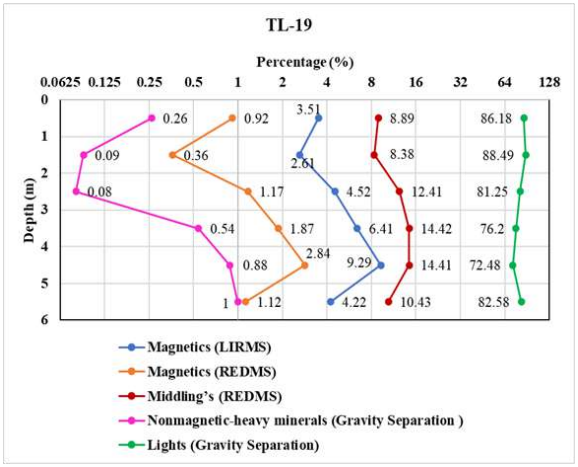
A total of 6m samples are collected from borehole no TL18(73.4482°E, 16.1696°N). Weight percentages of Magnetics (LIRMS) ranges from 0.6 % to 6.92% with an average of 2.50%, magnetics (REDMS) is between 0.3% and 4.69% with an avg. of 1.67% and the middlings (REDMS) ranges from 3.26% to 8.42% with an avg. of 5.32%.

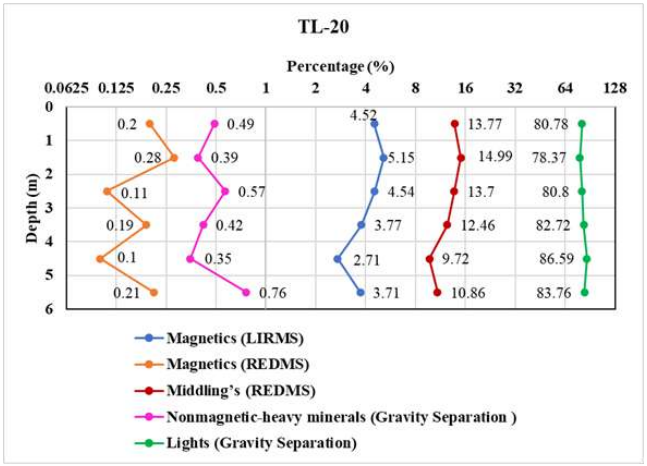




TL19

A total of 6m samples are collected from borehole no TL19(73.4464°E, 16.1654°N). Weight percentages of Magnetics (LIRMS) ranges from 2.61 % to 9.29% with an average of 5.09%, magnetics (REDMS) is between 0.36 % and 2.84% with an avg. of 1.38% and the middlings (REDMS) ranges from 8.38% to 14.42% with an avg. of 11.49%.





TL20

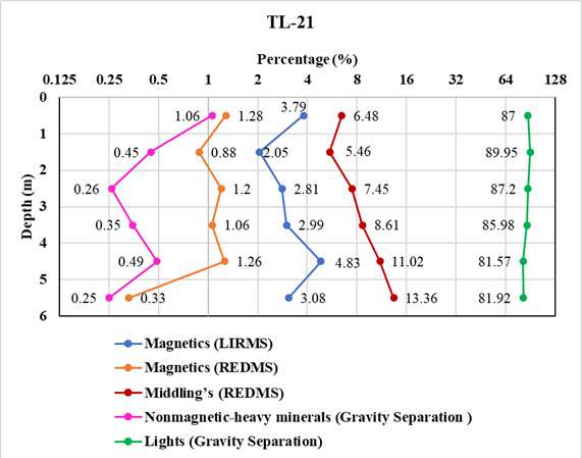
A total of 6m samples are collected from borehole no TL20(73.4490°E, 16.1657°N). Weight percentages of Magnetics (LIRMS) ranges from 2.71% to 5.15% with an average of 4.07%, magnetics (REDMS) is between 0.1% and 0.28% with an avg. of 0.18% and the middlings (REDMS) ranges from 9.72% to 14.99% with an avg. of 12.58%.

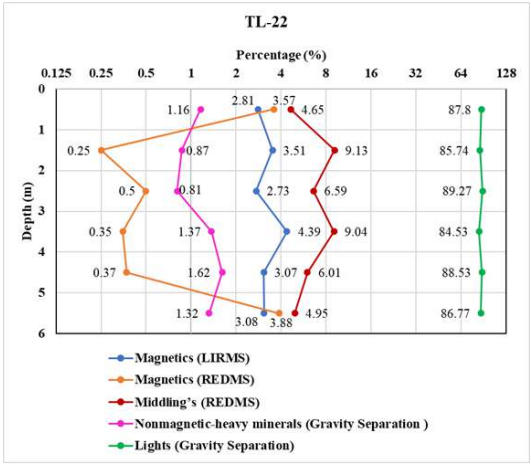
TL21

A total of 6m samples are collected from borehole no TL21(73.4470°E, 16.1620°N). Weight percentages of Magnetics (LIRMS) ranges from 2.05% to 4.83% with an average of 3.26%, magnetics (REDMS) is between 0.33% and 1.28% with an avg. of 1.00% and the middlings (REDMS) ranges from 5.46 % to 13.36% with an avg. of 8.73%.

TL22

A total of 6m samples are collected from borehole no TL22(73.4491°E, 16.1632°N). Weight percentages of Magnetics (LIRMS) ranges from 2.73% to 4.39% with an average of 3.27%, magnetics (REDMS) is between 0.25% and 3.88% with an avg. of 1.49% and the middlings (REDMS) ranges from 4.65 % to 9.13% with an avg. of 6.73%.





TL23

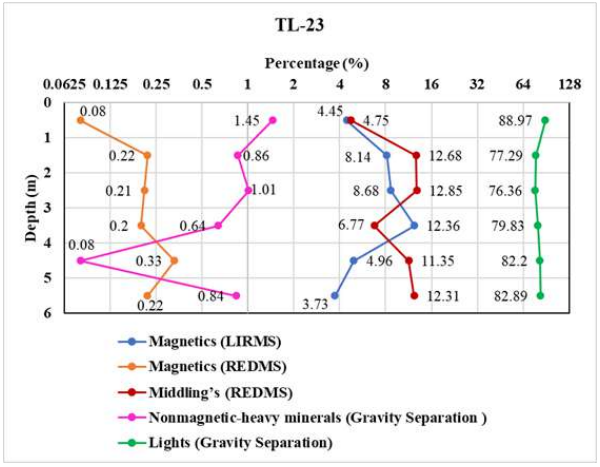
A total of 6m samples are collected from borehole no TL23(73.4477°E, 16.1585°N). Weight percentages of Magnetics (LIRMS) ranges from 3.73 % to 12.36% with an average of 7.05%, magnetics (REDMS) is between 0.08% and 3.88% with an avg. of 0.21% and the middlings (REDMS) ranges from 4.75% to 12.85% with an avg. of 10.12%.

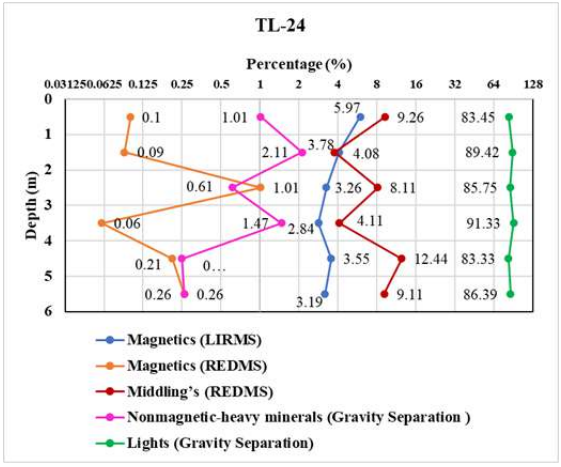
TL24

A total of 6m samples are collected from borehole no TL24(73.4493°E, 16.1598°N). Weight percentages of Magnetics (LIRMS) ranges from 2.84% to 5.97% with an average of 3.82%, magnetics (REDMS) is between 0.06 % and 1.01% with an avg. of 0.29% and the middlings (REDMS) ranges from 3.78 % to 12.44% with an avg. of 7.80%.

TL25

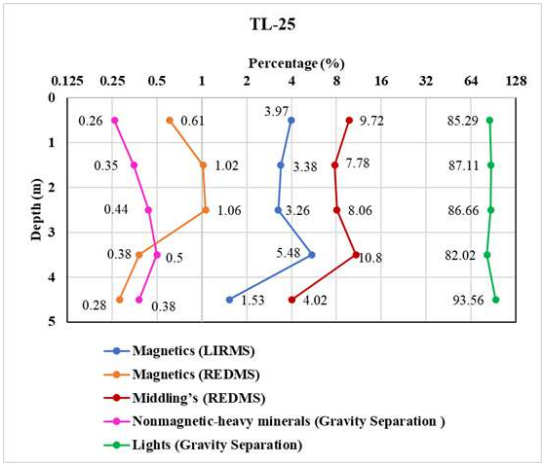
A total of 5m samples are collected from borehole no TL25(73.4495°E, 16.1551°N). Weight percentages of Magnetics (LIRMS) ranges from 1.53% to 5.48% with an average of 3.52%, magnetics (REDMS) is between 0.28% and 1.06% with an avg. of 0.67% and the middlings (REDMS) ranges from 4.02% to 10.8% with an avg. of 8.08%.

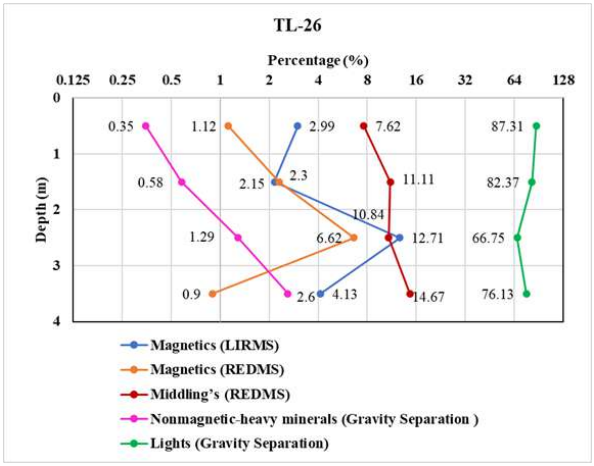




TL26

A total of 4m samples are collected from borehole no TL26(73.4504°E, 16.1528°N). Weight percentages of Magnetics (LIRMS) ranges from 2.15% to 12.71% with an average of 5.50%, magnetics (REDMS) is between 0.9% and 6.62% with an avg. of 2.74% and the middlings (REDMS) ranges from 7.62% to 14.67% with an avg. of 11.06%.





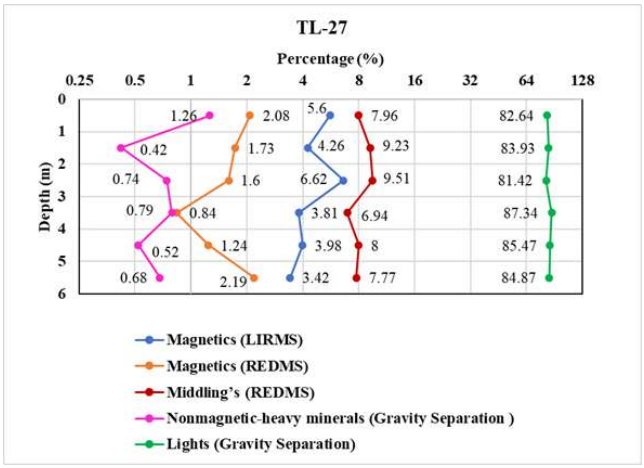
TL27

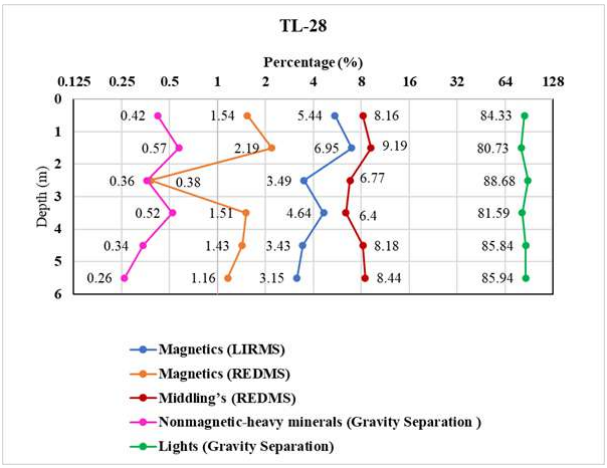
A total of 6m samples are collected from borehole no TL27(73.4517°E, 16.1492°N). Weight percentages of Magnetics (LIRMS) ranges from 3.42% to 6.62% with an average of 4.62%, magnetics (REDMS) is between 0.84% and 2.19% with an avg. of 1.16% and the middlings (REDMS) ranges from 6.94 % to 9.51% with an avg. of 8.24%.

TL28

A total of 6m samples are collected from borehole no TL28(73.4523°E, 16.1433°N). Weight percentages of Magnetics (LIRMS) ranges from 3.15 % to 6.95% with an average of 4.52%,

magnetics (REDMS) is between 0.38% and 2.19% with an avg. of 1.37% and the middlings (REDMS) ranges from 6.4 % to 9.19% with an avg. of 7.86%.





TL29

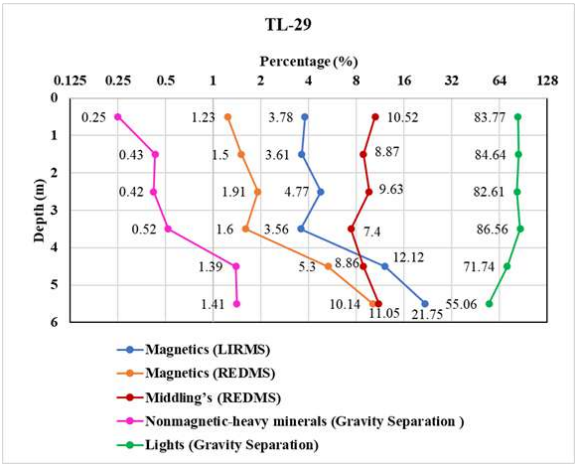
A total of 6m samples are collected from borehole no TL29(73.4544°E, 16.1434°N). Weight percentages of Magnetics (LIRMS) ranges from 3.56% to 21.75% with an average of 8.27%, magnetics (REDMS) is between 1.23 % and 10.14% with an avg. of 3.61 % and the middlings (REDMS) ranges from 7.4 % to 11.05% with an avg. of 11.05%.

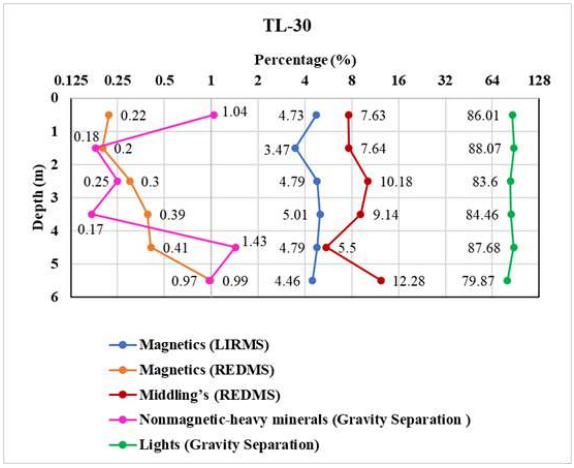
TL30

A total of 6m samples are collected from borehole no TL30(73.4526°E, 16.1414°N). Weight percentages of Magnetics (LIRMS) ranges from 3.47% to 5.01% with an average of 4.54%, magnetics (REDMS) is between 0.2 % and 0.97 % with an avg. of 0.42% and the middlings (REDMS) ranges from 5.5% to 12.28% with an avg. of 8.73%.

TL31

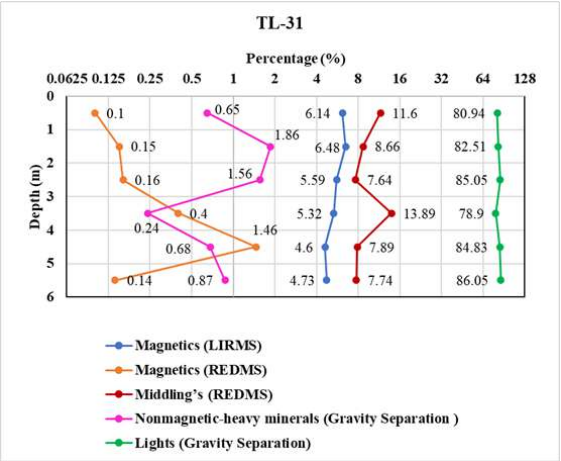
A total of 6m samples are collected from borehole no TL31(73.4578°E, 16.1409°N). Weight percentages of Magnetics (LIRMS) ranges from 4.6% to 6.48% with an average of 5.48%, magnetics (REDMS) is between 0.1% and 1.46% with an avg. of 0.40% and the middlings (REDMS) ranges from 7.64 % to 13.89% with an avg. of 9.57%.

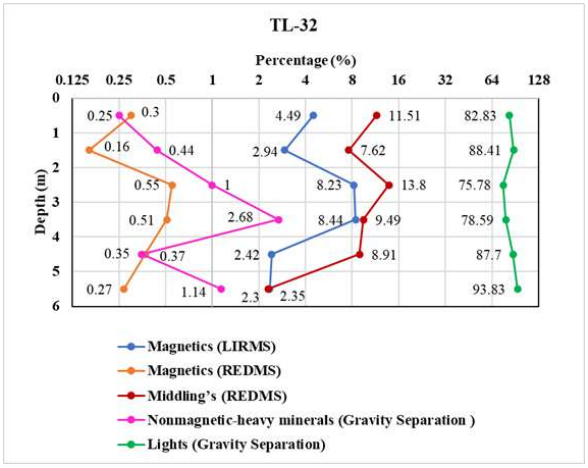




TL32

A total of 6m samples are collected from borehole no TL32(73.4528°E, 16.1368°N). Weight percentages of Magnetics (LIRMS) ranges from 2.35 % to 8.44% with an average of 4.81%, magnetics (REDMS) is between 0.16% and 0.55% with an avg. of 0.36% and the middlings (REDMS) ranges from 2.3% to 13.8% with an avg. of 8.94%.



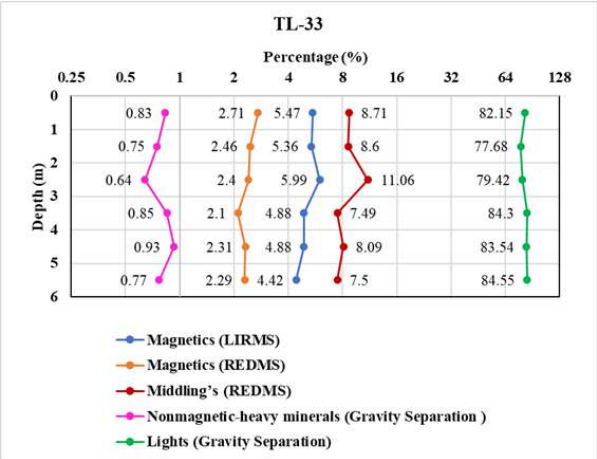


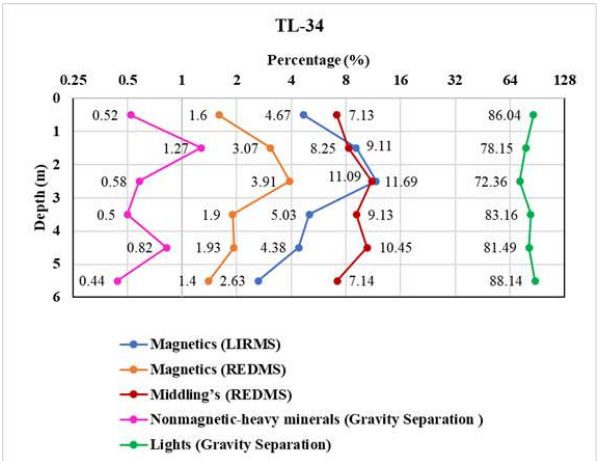
TL33

A total of 6m samples are collected from borehole no TL33(73.4563°E, 16.1374°N). Weight percentages of Magnetics (LIRMS) ranges from 4.42% to 5.99% with an average of 5.17%, magnetics (REDMS) is between 2.1% and 2.71% with an avg. of 2.38% and the middlings (REDMS) ranges from 7.49% to 11.06% with an avg. of 8.58%.

TL34

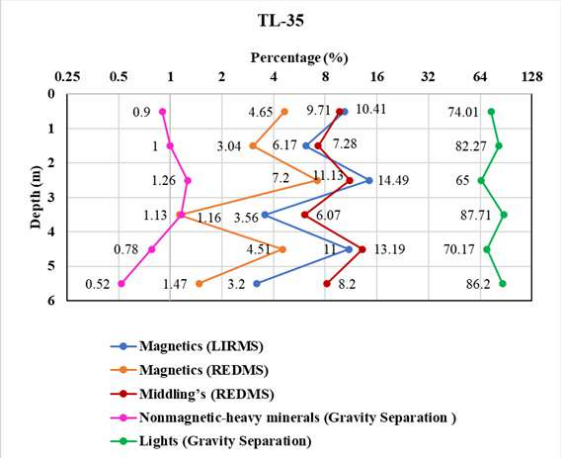
A total of 6m samples are collected from borehole no TL34(73.4537°E, 16.1331°N). Weight percentages of Magnetics (LIRMS) ranges from 2.63% to 11.69% with an average of 6.25%, magnetics (REDMS) is between 1.4% and 3.91% with an avg. of 2.30% and the middlings (REDMS) ranges from 7.13% to 11.09% with an avg. of 8.87%.

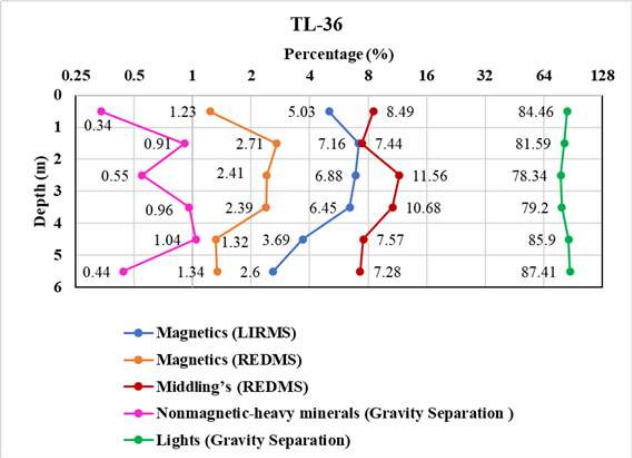




TL35

A total of 6m samples are collected from borehole no TL35(73.4568°E, 16.1341°N). Weight percentages of Magnetics (LIRMS) ranges from 3.2% to 14.49% with an average of 8.14%, magnetics (REDMS) is between 1.13% and 7.2% with an avg. of 3.67% and the middlings (REDMS) ranges from 6.07% to 13.19% with an avg. of 9.26%.





TL36

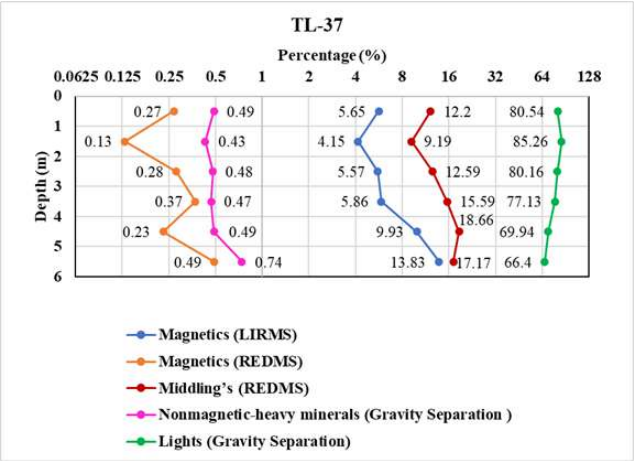
A total of 6m samples are collected from borehole no TL36(73.4543°E, 16.1305°N). Weight percentages of Magnetics (LIRMS) ranges from 2.6% to 7.16% with an average of 5.30%, magnetics (REDMS) is between 1.23% and 2.71% with an avg. of 1.90% and the middlings (REDMS) ranges from 7.28% to 11.56% with an avg. of 8.84%.

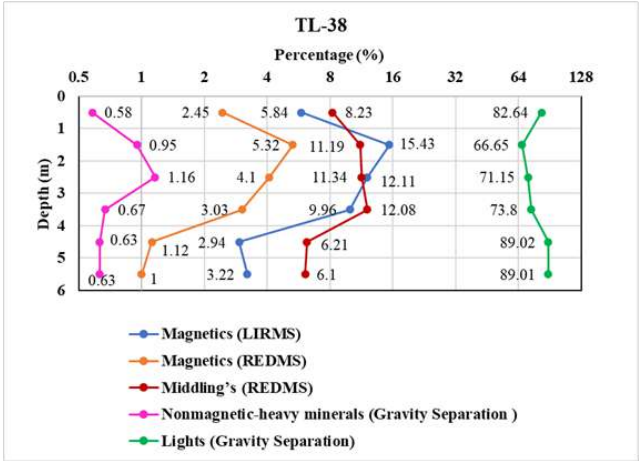
TL37

A total of 6m samples are collected from borehole no TL37(73.4579°E, 16.1300°N). Weight percentages of Magnetics (LIRMS) ranges from 4.15% to 13.83% with an average of 7.50%, magnetics (REDMS) is between 0.13% and 0.49% with an avg. of 0.30% and the middlings (REDMS) ranges from 9.19% to 18.66% with an avg. of 14.23%.

TL38

A total of 6m samples are collected from borehole no TL38(73.4558°E, 16.1259°N). Weight percentages of Magnetics (LIRMS) ranges from 2.94% to 15.43% with an average of 8.25%, magnetics (REDMS) is between 1.0 % and 5.32% with an avg. of 2.84% and the middlings (REDMS) ranges from 6.1% to 12.08% with an avg. of 9.19%.



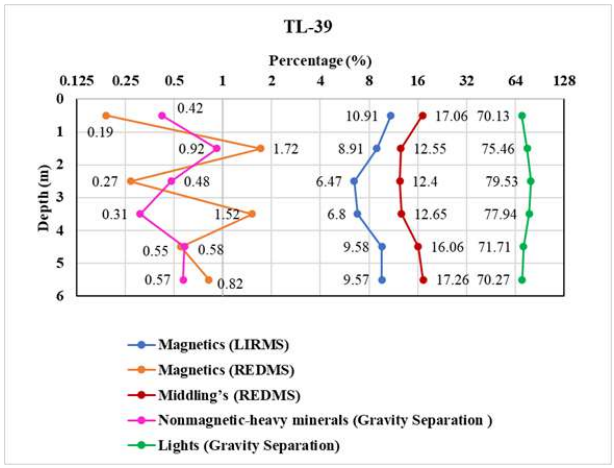


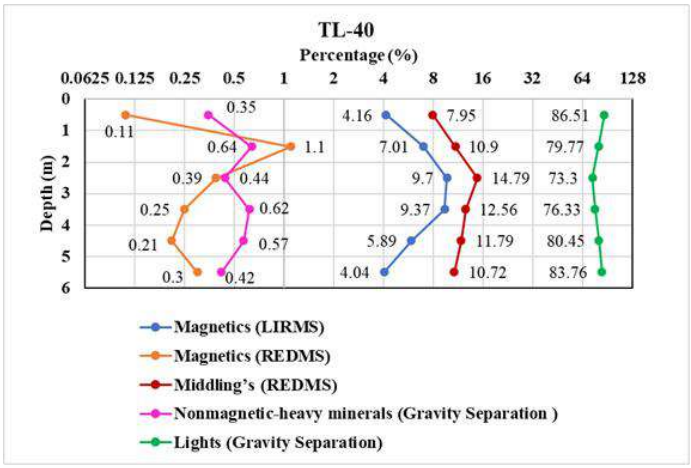
TL39

A total of 6m samples are collected from borehole no TL39(73.4595°E, 16.1268°N). Weight percentages of Magnetics (LIRMS) ranges from 6.47% to 10.91% with an average of 8.71%, magnetics (REDMS) is between 0.91% and 1.72% with an avg. of 0.85% and the middlings (REDMS) ranges from 12.4% to 17.26% with an avg. of 14.66%.

TL40

A total of 6m samples are collected from borehole no TL40(73.4568°E, 16.1238°N). Weight percentages of Magnetics (LIRMS) ranges from 6.70% to 9.70% with an average of 6.70%, magnetics (REDMS) is between 0.11% and 1.1% with an avg. of 0.39% and the middlings (REDMS) ranges from 7.95% to 14.79% with an avg. of 11.45%.



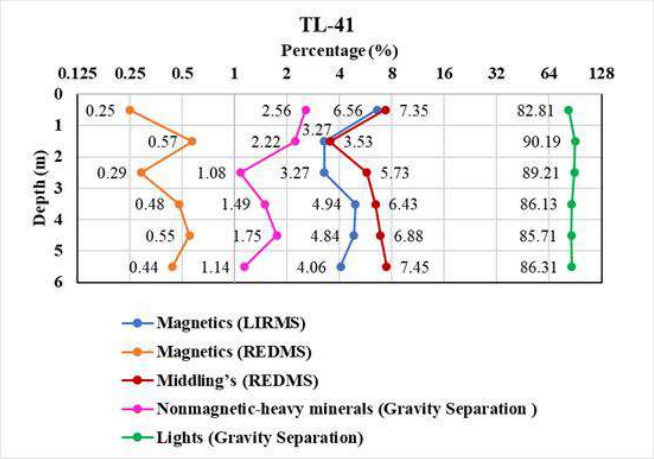


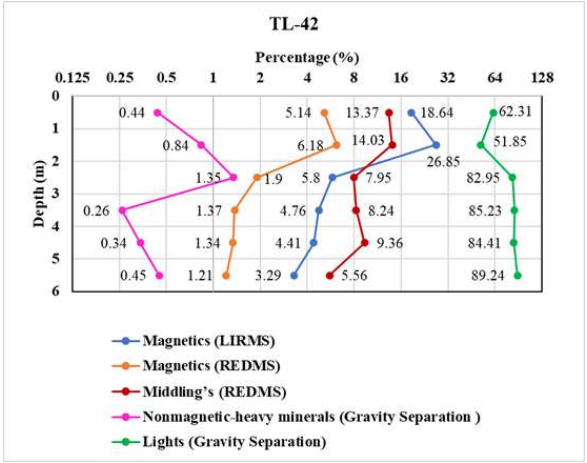
TL41

A total of 6m samples are collected from borehole no TL41(73.4589°E, 16.1231°N). Weight percentages of Magnetics (LIRMS) ranges from 3.27% to 6.56% with an average of 4.49%, magnetics (REDMS) is between 0.25% and 0.57% with an avg. of 0.43% and the middlings (REDMS) ranges from 3.53% to 7.45% with an avg. of 6.23%.

TL42

A total of 6m samples are collected from borehole no TL42(73.4576°E, 16.1195°N). Weight percentages of Magnetics (LIRMS) ranges from 3.29% to 26.85% with an average of 10.63%, magnetics (REDMS) is between 1.21% and 6.18% with an avg. of 2.86% and the middlings (REDMS) ranges from 5.56% to 14.03% with an avg. of 9.75%.



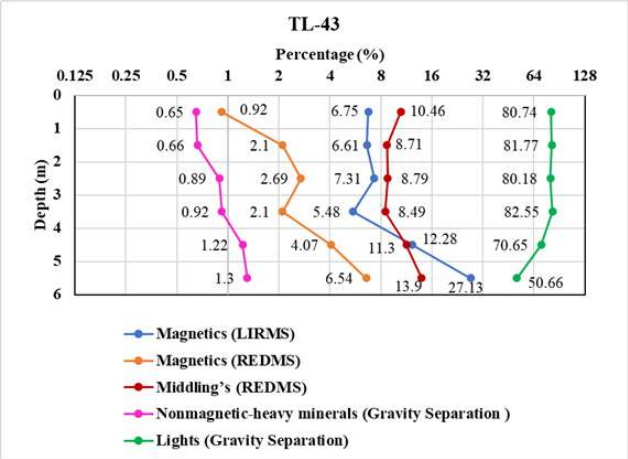


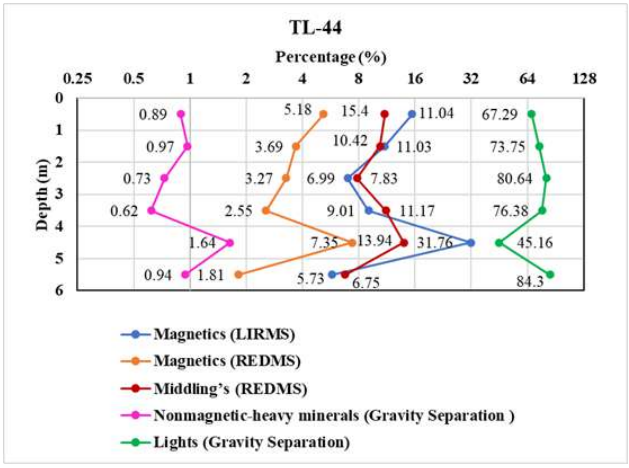
TL43

A total of 6m samples are collected from borehole no TL43(73.4590°E, 16.1194°N). Weight percentages of Magnetics (LIRMS) ranges from 5.48% to 27.13% with an average of 10.93%, magnetics (REDMS) is between 0.92% and 6.54% with an avg. of 3.07% and the middlings (REDMS) ranges from 8.49 % to 13.9% with an avg. of 10.28%.

TL44

A total of 6m samples are collected from borehole no TL44(73.4584°E, 16.1152°N). Weight percentages of Magnetics (LIRMS) ranges from 5.73% to 31.76% with an average of 13.32%, magnetics (REDMS) is between 1.81% and 7.35% with an avg. of 3.98% and the middlings (REDMS) ranges from 6.75 % to 13.94% with an avg. of 10.19%.



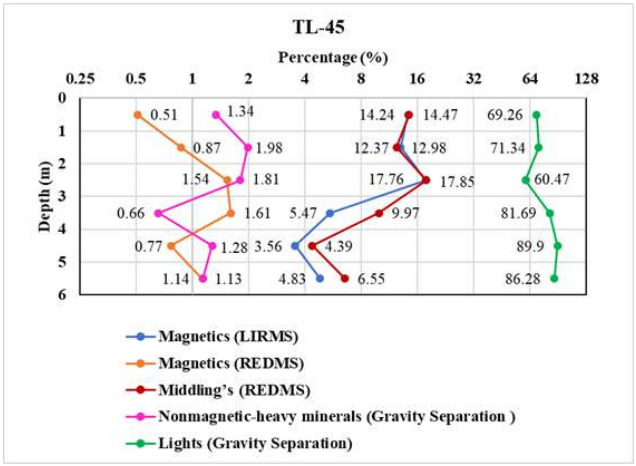


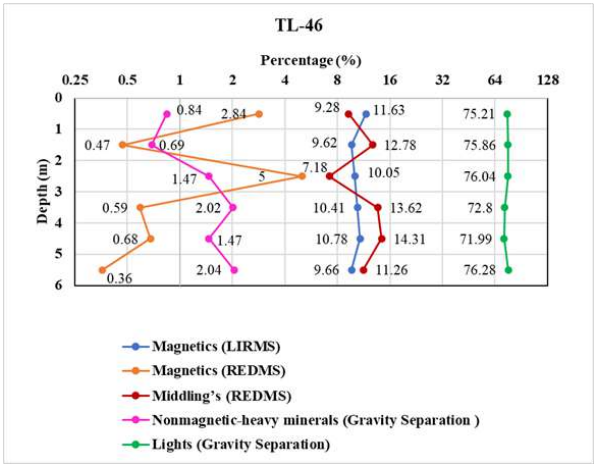
TL45

A total of 6m samples are collected from borehole no TL45(73.4585°E, 16.1107°N). Weight percentages of Magnetics (LIRMS) ranges from 3.56% to 17.76% with an average of 9.81%, magnetics (REDMS) is between 0.51% and 1.61% with an avg. of 1.07% and the middlings (REDMS) ranges from 4.39% to 17.85% with an avg. of 10.93%.

TL46

A total of 6m samples are collected from borehole no TL46(73.4584°E, 16.1081°N). Weight percentages of Magnetics (LIRMS) ranges from 9.62% to 11.63% with an average of 10.36%, magnetics (REDMS) is between 0.36% and 5.0% with an avg. of 1.66% and the middlings (REDMS) ranges from 7.18% to 14.31% with an avg. of 11.41%.



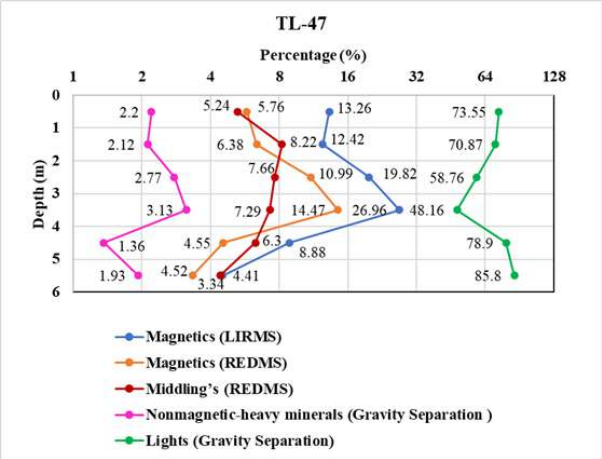


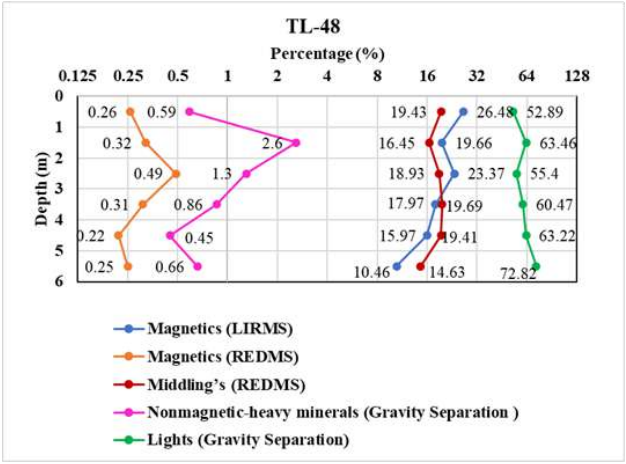
TL47

A total of 6m samples are collected from borehole no TL47(73.4586°E, 16.1033°N). Weight percentages of Magnetics (LIRMS) ranges from 4.52% to 26.96% with an average of 14.31%, magnetics (REDMS) is between 7.58% and 14.47% with an avg. of 7.58% and the middlings (REDMS) ranges from 4.41 % to 8.22% with an avg. of 6.52%.

TL48

A total of 6m samples are collected from borehole no TL48(73.4596°E, 16.1006°N). Weight percentages of Magnetics (LIRMS) ranges from 10.46% to 26.48% with an average of 18.99%, magnetics (REDMS) is between 0.22% and 0.49% with an avg. of 0.31% and the middlings (REDMS) ranges from 14.63% to 19.69% with an avg. of 18.09%.





TL49

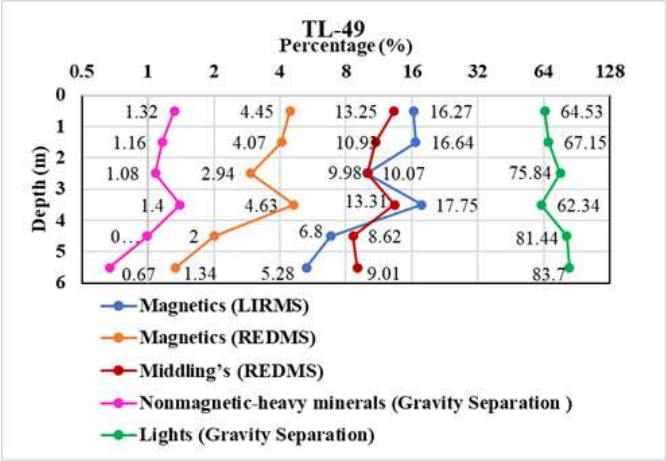
A total of 6m samples are collected from borehole no TL49(73.4609°E, 16.0969°N). Weight percentages of Magnetics (LIRMS) ranges from 5.28 % to 17.75% with an average of 12.12%, magnetics (REDMS) is between 1.34% and 4.63% with an avg. of 3.24% and the middlings (REDMS) ranges from 8.62 % to 13.31% with an avg. of 10.84%.

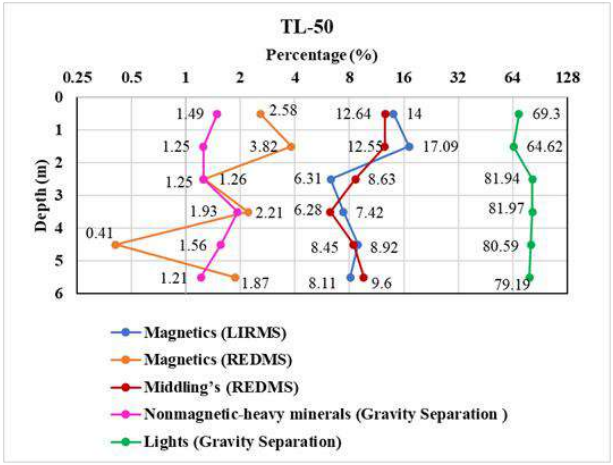
TL50

A total of 6m samples are collected from borehole no TL50(73.4614°E, 16.0931°N). Weight percentages of Magnetics (LIRMS) ranges from 6.31% to 17.09% with an average of 10.31%, magnetics (REDMS) is between 0.41 % and 3.82% with an avg. of 2.03% and the middlings (REDMS) ranges from 6.28 % to 12.64% with an avg. of 9.69%.

TL51

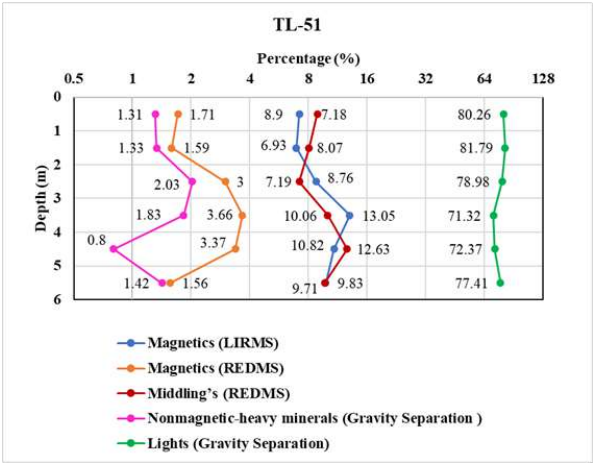
A total of 6m samples are collected from borehole no TL51(73.4630°E, 16.0931°N). Weight percentages of Magnetics (LIRMS) ranges from 6.93% to 13.05% with an average of 9.43%, magnetics (REDMS) is between 1.56% and 3.66% with an avg. of 2.48% and the middlings (REDMS) ranges from 7.19% to 12.63% with an avg. of 9.43%.

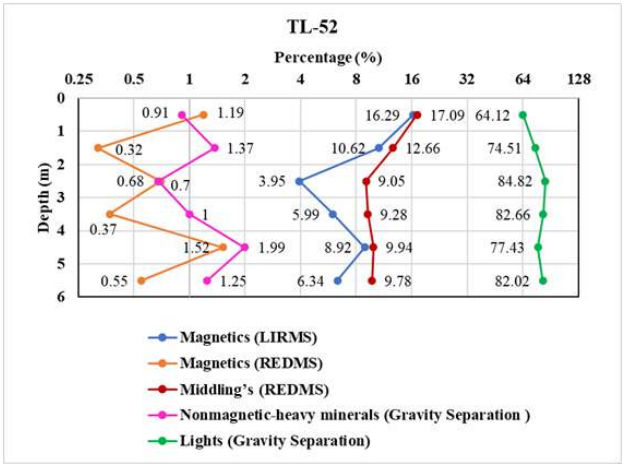




TL52

A total of 6m samples are collected from borehole no TL52(73.4619°E, 16.0899°N). Weight percentages of Magnetics (LIRMS) ranges from 8.69% to 16.29% with an average of 8.69%, magnetics (REDMS) is between 0.78% and 1.52% with an avg. of 0.78% and the middlings (REDMS) ranges from 9.05% to 17.09% with an avg. of 11.30%.





Summary

Based on the analysis, the percentage of heavy minerals in A fraction range from 0.23-31.76 % with an average of 6.01%, B fraction ranges between 0.06 and 14.47% with an average of 1.50%, C fraction ranges from 1.64-19.69% with an average of 9.33%, whereas D fraction ranges from 0.00-3.13% with an average of 0.87% and E fraction ranges from 45.16-97.53% with an average of 81.81%.

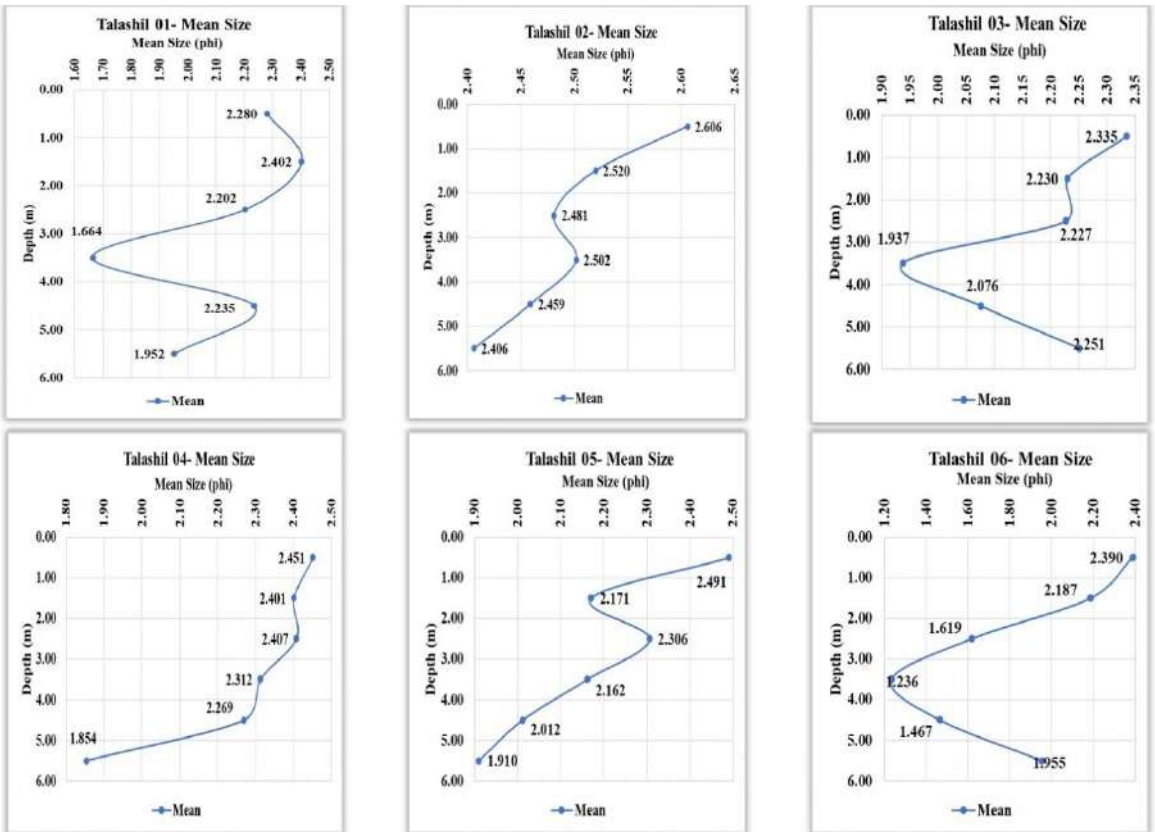
The Talashil block exhibits varying mineralization patterns across regions, influenced by surface and subsurface processes such as erosion and deposition. In general, the concentration of THM is higher towards southern area in comparison with the northern region.

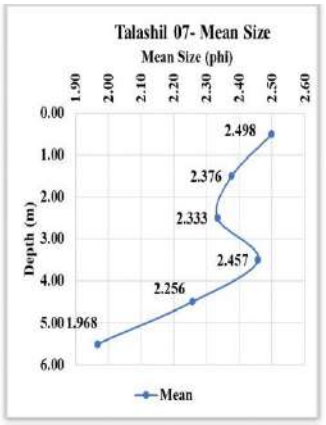
9.3 Granulometric studies

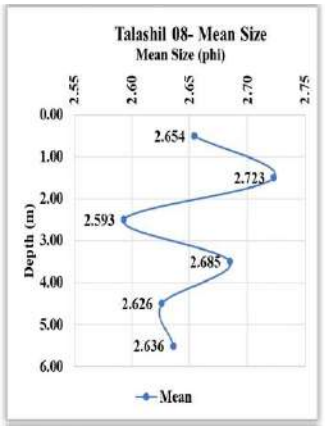
Grain size analysis helps to classify unconsolidated material and also provides a clue about the sediment transport and depositional conditions. The sediments in the study area mainly consist of sand whereas gravels are noticed in deeper depth of boreholes (TL01, TL03, TL25,

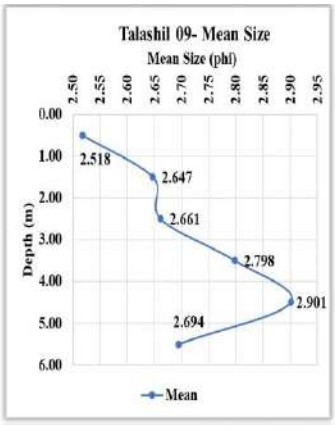
TL26 etc). Granulometric analysis (Annex:6) reveals the sand to be medium to fine and range in size between 1.236Φ and 2.901Φ. Skewness ranges from -0.538 to 0.229 and suggest symmetrical to finely skewed sediments. Kurtosis values between 0.858 and 1.591 typically suggest a platykurtic distributionwith fewer extreme fine or coarse particles compared to a normal or leptokurtic distribution. The medium to fine sand sediments are moderately well sorted to well-sorted, symmetrically to finely skewed and mesokurtic to leptokurtic in nature.

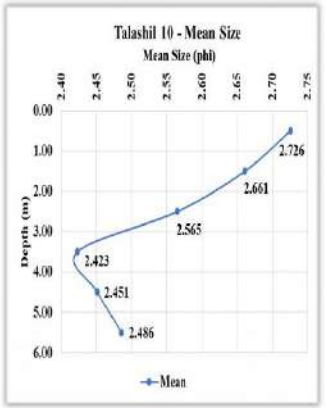
Granulometric study of all 309 samples from 52 borehole location reveals that fining up of sequence in grain size with fluctuations in 22 boreholes, which includes northern boreholes (TL01, TL02, TL07 etc.) and central boreholes (TL23, TL 26, TL34 etc) and Southern boreholes (TL50, TL 51, TL52) as well. Five number of boreholes (TL09, 11, 29, 43,47) show coarsening up of grain size distribution with grain size fluctuations, while 26 number of boreholes exhibit nether fining up nor coarsening up. Fifty percent of the boreholes showing sudden deviation in grain size distribution trend at the depth of 3.0m to 4.0m from ground level. This deviation indicates the fluctuation in energy level there by addition or removal of sediments. In general, the beach sediments are coarser than that of dune suggesting accumulation of wind-blown finer sands from beach towards east.

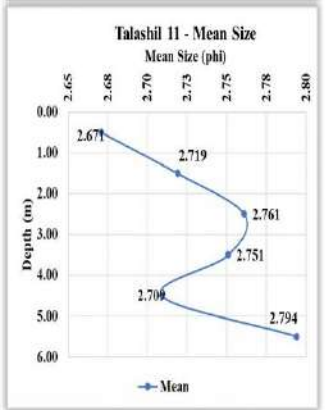


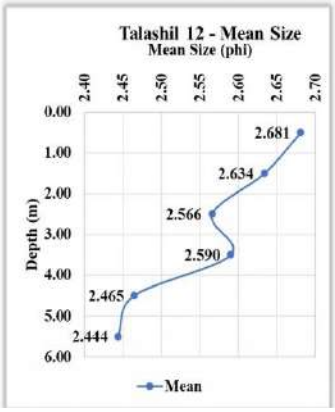

Talashil 07- Mean Size
Mean Size (phi)
1.90 2.00 2.10 2.20 2.30 2.40 2.50 2.60
0.00 1.00 2.00 3.00 4.00 5.00 6.00
Depth (m)
2.498
2.376
2.333
2.457
2.256
1.968
Mean

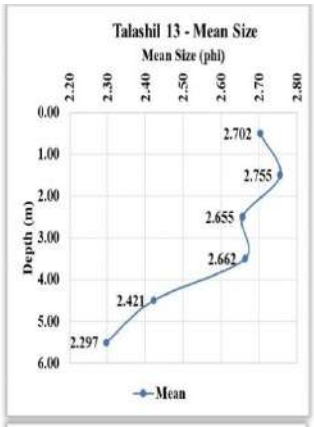

Talashil 08- Mean Size
Mean Size (phi)
2.55 2.60 2.65 2.70 2.75
0.00 1.00 2.00 3.00 4.00 5.00 6.00
Depth (m)
2.654
2.723
2.593
2.685
2.626
2.636
Mean

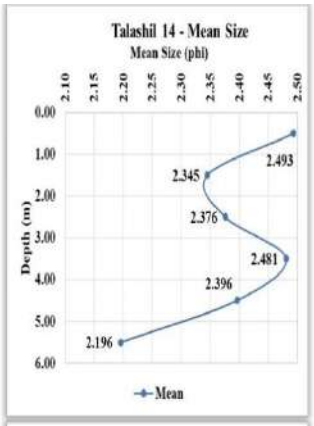

Talashil 09- Mean Size
Mean Size (phi)
2.50 2.55 2.60 2.65 2.70 2.75 2.80 2.85 2.90 2.95
0.00 1.00 2.00 3.00 4.00 5.00 6.00
Depth (m)
2.518
2.647
2.661
2.798
2.901
2.694
Mean

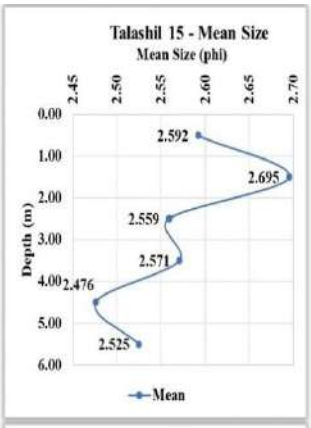

Talashil 10 - Mean Size
Mean Size (phi)
2.40 2.45 2.50 2.55 2.60 2.65 2.70 2.75
0.00 1.00 2.00 3.00 4.00 5.00 6.00
Depth (m)
2.726
2.661
2.565
2.423
2.451
2.486
Mean

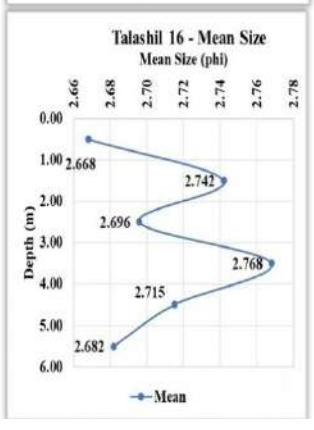

Talashil 11 - Mean Size
Mean Size (phi)
2.65 2.68 2.70 2.73 2.75 2.78 2.80
0.00 1.00 2.00 3.00 4.00 5.00 6.00
Depth (m)
2.671
2.719
2.761
2.751
2.709
2.794
Mean

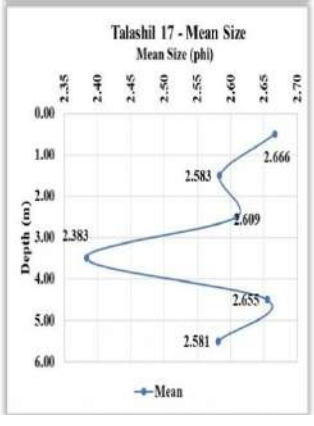

Talashil 12 - Mean Size
Mean Size (phi)
2.40 2.45 2.50 2.55 2.60 2.65 2.70
0.00 1.00 2.00 3.00 4.00 5.00 6.00
Depth (m)
2.681
2.634
2.566
2.590
2.465
2.444
Mean

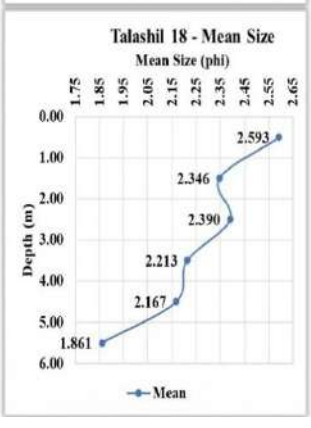

Talashil 13 - Mean Size
Mean Size (phi)
2.20 2.30 2.40 2.50 2.60 2.70 2.80
0.00 1.00 2.00 3.00 4.00 5.00 6.00
Depth (m)
2.702
2.755
2.655
2.662
2.421
2.297
Mean

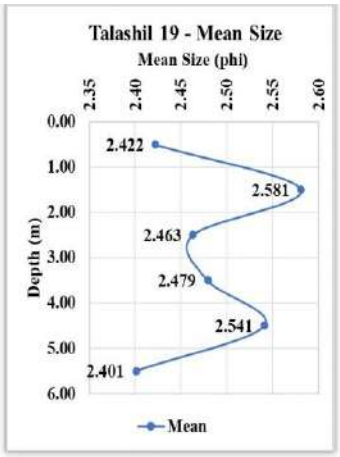

Talashil 14 - Mean Size
Mean Size (phi)
2.10 2.15 2.20 2.25 2.30 2.35 2.40 2.45 2.50
0.00 1.00 2.00 3.00 4.00 5.00 6.00
Depth (m)
2.493
2.345
2.376
2.481
2.396
2.196
Mean

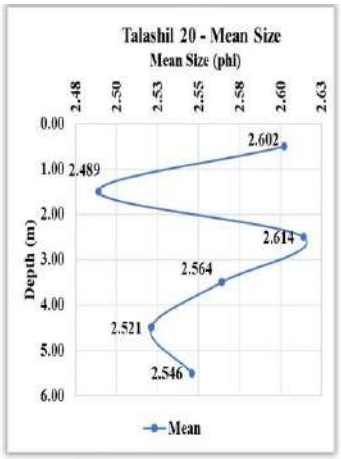

Talashil 15 - Mean Size
Mean Size (phi)
2.45 2.50 2.55 2.60 2.65 2.70
0.00 1.00 2.00 3.00 4.00 5.00 6.00
Depth (m)
2.592
2.695
2.559
2.571
2.476
2.525
Mean

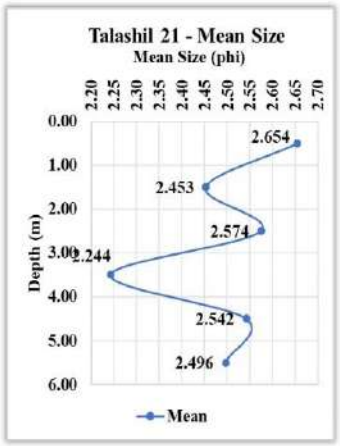

Talashil 16 - Mean Size
Mean Size (phi)
2.66 2.68 2.70 2.72 2.74 2.76 2.78
0.00 1.00 2.00 3.00 4.00 5.00 6.00
Depth (m)
2.668
2.742
2.696
2.768
2.715
2.682
Mean

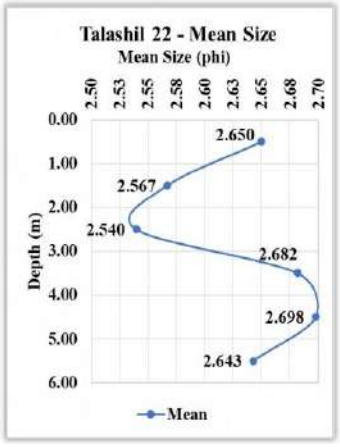

Talashil 17 - Mean Size
Mean Size (phi)
2.35 2.40 2.45 2.50 2.55 2.60 2.65 2.70
0.00 1.00 2.00 3.00 4.00 5.00 6.00
Depth (m)
2.666
2.583
2.609
2.383
2.655
2.581
Mean

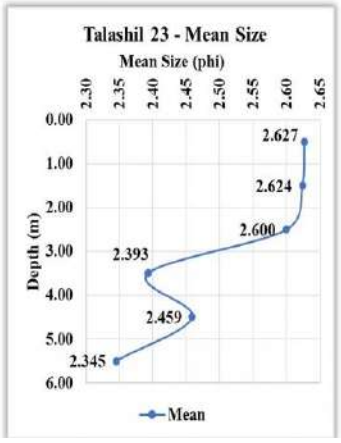

Talashil 18 - Mean Size
Mean Size (phi)
1.75 1.85 1.95 2.05 2.15 2.25 2.35 2.45 2.55 2.65
0.00 1.00 2.00 3.00 4.00 5.00 6.00
Depth (m)
2.593
2.346
2.390
2.213
2.167
1.861
Mean

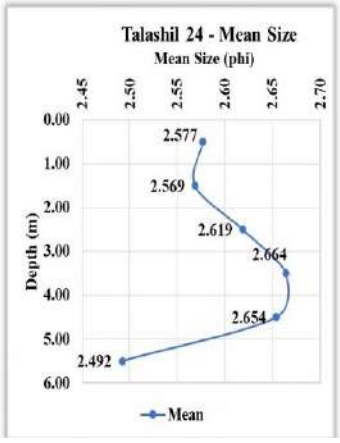

Talashil 19 - Mean Size
Mean Size (phi)
Depth (m)
Mean
2.422
2.581
2.463
2.479
2.541
2.401

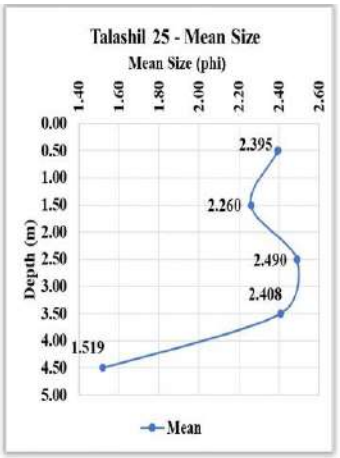

Talashil 20 - Mean Size
Mean Size (phi)
Depth (m)
Mean
2.602
2.489
2.614
2.564
2.521
2.546

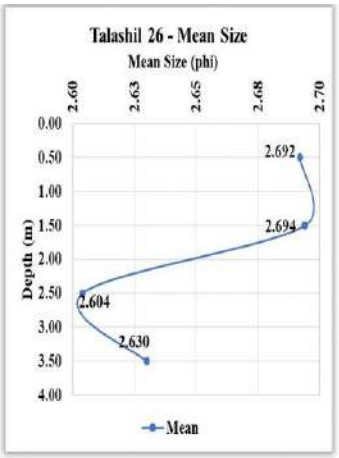

Talashil 21 - Mean Size
Mean Size (phi)
Depth (m)
Mean
2.654
2.453
2.574
2.244
2.542
2.496

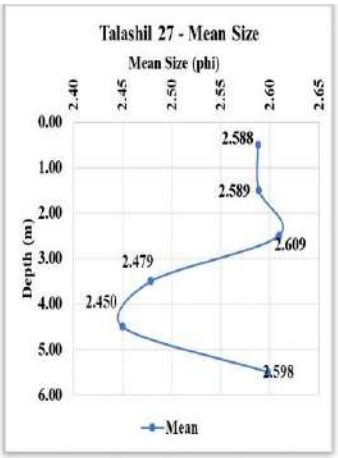

Talashil 22 - Mean Size
Mean Size (phi)
Depth (m)
Mean
2.650
2.567
2.540
2.682
2.698
2.643

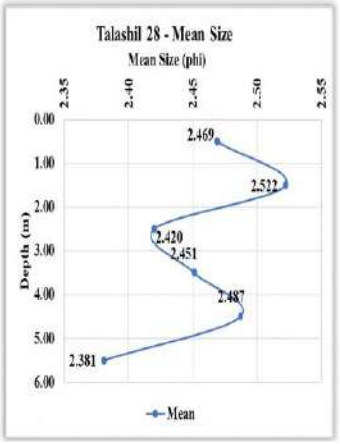

Talashil 23 - Mean Size
Mean Size (phi)
Depth (m)
Mean
2.627
2.624
2.600
2.393
2.459
2.345

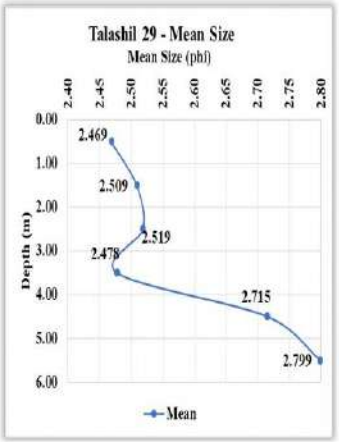

Talashil 24 - Mean Size
Mean Size (phi)
Depth (m)
Mean
2.577
2.569
2.619
2.664
2.654
2.492

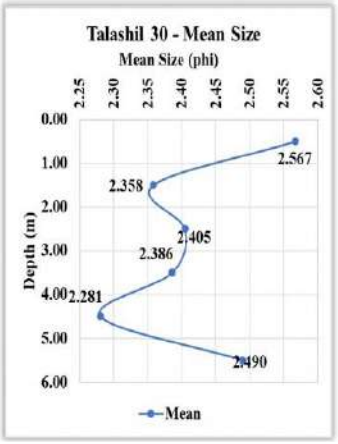

Talashil 25 - Mean Size
Mean Size (phi)
Depth (m)
Mean
2.395
2.260
2.490
2.408
1.519

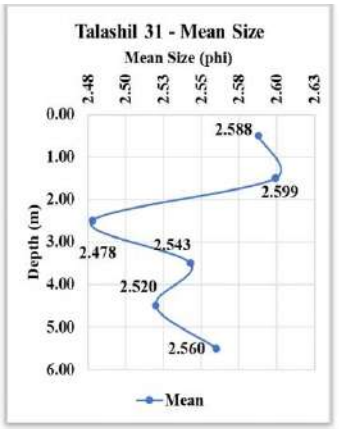

Talashil 26 - Mean Size
Mean Size (phi)
Depth (m)
Mean
2.692
2.694
2.604
2.630

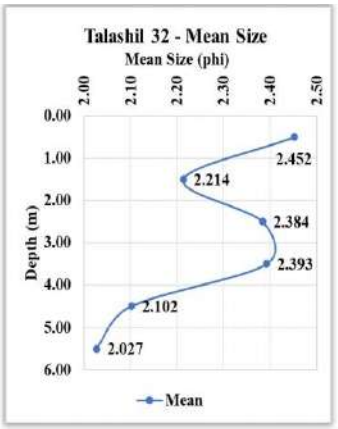

Talashil 27 - Mean Size
Mean Size (phi)
Depth (m)
Mean
2.588
2.589
2.609
2.479
2.450
2.598

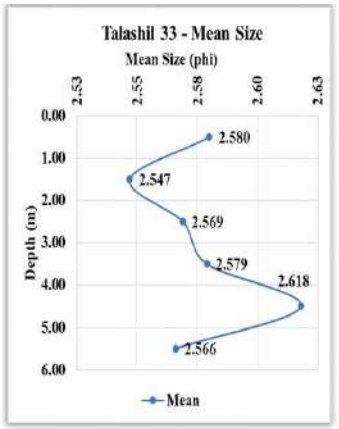

Talashil 28 - Mean Size
Mean Size (phi)
Depth (m)
Mean
2.469
2.522
2.420
2.451
2.487
2.381

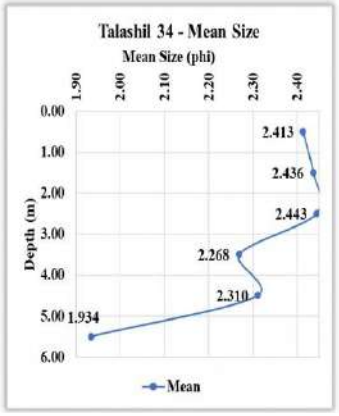

Talashil 29 - Mean Size
Mean Size (phi)
Depth (m)
Mean
2.469
2.509
2.519
2.478
2.715
2.799

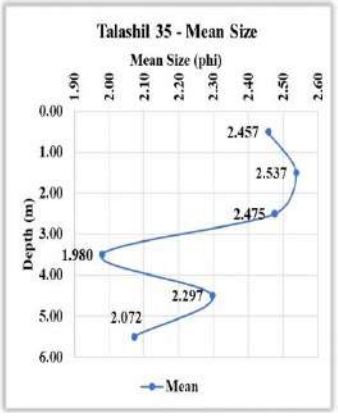

Talashil 30 - Mean Size
Mean Size (phi)
Depth (m)
Mean
2.567
2.358
2.405
2.386
2.281
2.490

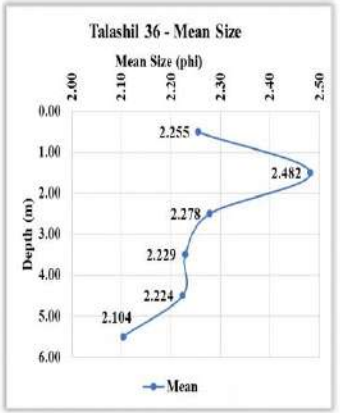

Talashil 31 - Mean Size
Mean Size (phi)
2.48 2.50 2.53 2.55 2.58 2.60 2.63
0.00 1.00 2.00 3.00 4.00 5.00 6.00
Depth (m)
2.588
2.599
2.478
2.543
2.520
2.560
Mean

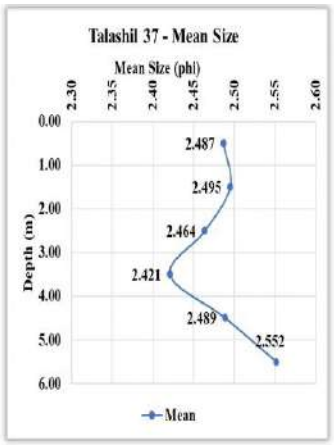

Talashil 32 - Mean Size
Mean Size (phi)
2.00 2.10 2.20 2.30 2.40 2.50
0.00 1.00 2.00 3.00 4.00 5.00 6.00
Depth (m)
2.452
2.214
2.384
2.393
2.102
2.027
Mean

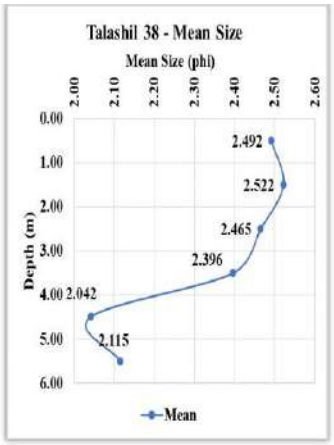

Talashil 33 - Mean Size
Mean Size (phi)
2.53 2.55 2.58 2.60 2.63
0.00 1.00 2.00 3.00 4.00 5.00 6.00
Depth (m)
2.580
2.547
2.569
2.579
2.618
2.566
Mean

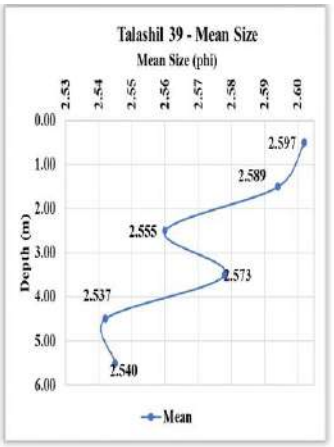

Talashil 34 - Mean Size
Mean Size (phi)
1.90 2.00 2.10 2.20 2.30 2.40
0.00 1.00 2.00 3.00 4.00 5.00 6.00
Depth (m)
2.413
2.436
2.443
2.268
2.310
1.934
Mean

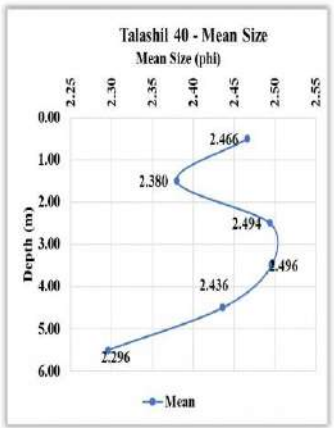

Talashil 35 - Mean Size
Mean Size (phi)
1.90 2.00 2.10 2.20 2.30 2.40 2.50 2.60
0.00 1.00 2.00 3.00 4.00 5.00 6.00
Depth (m)
2.457
2.537
2.475
1.980
2.297
2.072
Mean

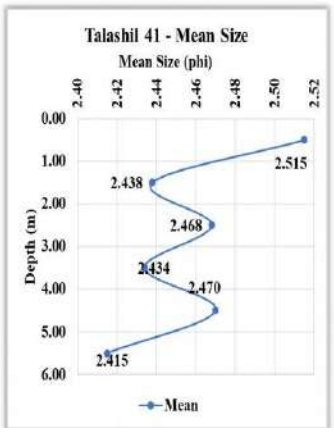

Talashil 36 - Mean Size
Mean Size (phi)
2.00 2.10 2.20 2.30 2.40 2.50
0.00 1.00 2.00 3.00 4.00 5.00 6.00
Depth (m)
2.255
2.482
2.278
2.229
2.224
2.104
Mean

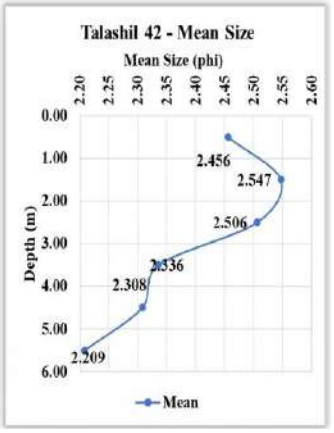

Talashil 37 - Mean Size
Mean Size (phi)
2.30 2.35 2.40 2.45 2.50 2.55 2.60
0.00 1.00 2.00 3.00 4.00 5.00 6.00
Depth (m)
2.487
2.495
2.464
2.421
2.489
2.552
Mean


Talashil 38 - Mean Size
Mean Size (phi)
2.00 2.10 2.20 2.30 2.40 2.50 2.60
0.00 1.00 2.00 3.00 4.00 5.00 6.00
Depth (m)
2.492
2.522
2.465
2.396
2.042
2.115
Mean


Talashil 39 - Mean Size
Mean Size (phi)
2.53 2.54 2.55 2.56 2.57 2.58 2.59 2.60
0.00 1.00 2.00 3.00 4.00 5.00 6.00
Depth (m)
2.597
2.589
2.555
2.573
2.537
2.540
Mean


Talashil 40 - Mean Size
Mean Size (phi)
2.25 2.30 2.35 2.40 2.45 2.50 2.55
0.00 1.00 2.00 3.00 4.00 5.00 6.00
Depth (m)
2.466
2.380
2.494
2.496
2.436
2.296
Mean


Talashil 41 - Mean Size
Mean Size (phi)
2.40 2.42 2.44 2.46 2.48 2.50 2.52
0.00 1.00 2.00 3.00 4.00 5.00 6.00
Depth (m)
2.515
2.438
2.468
2.434
2.470
2.415
Mean


Talashil 42 - Mean Size
Mean Size (phi)
2.20 2.25 2.30 2.35 2.40 2.45 2.50 2.55 2.60
0.00 1.00 2.00 3.00 4.00 5.00 6.00
Depth (m)
2.456
2.547
2.506
2.536
2.308
2.209
Mean

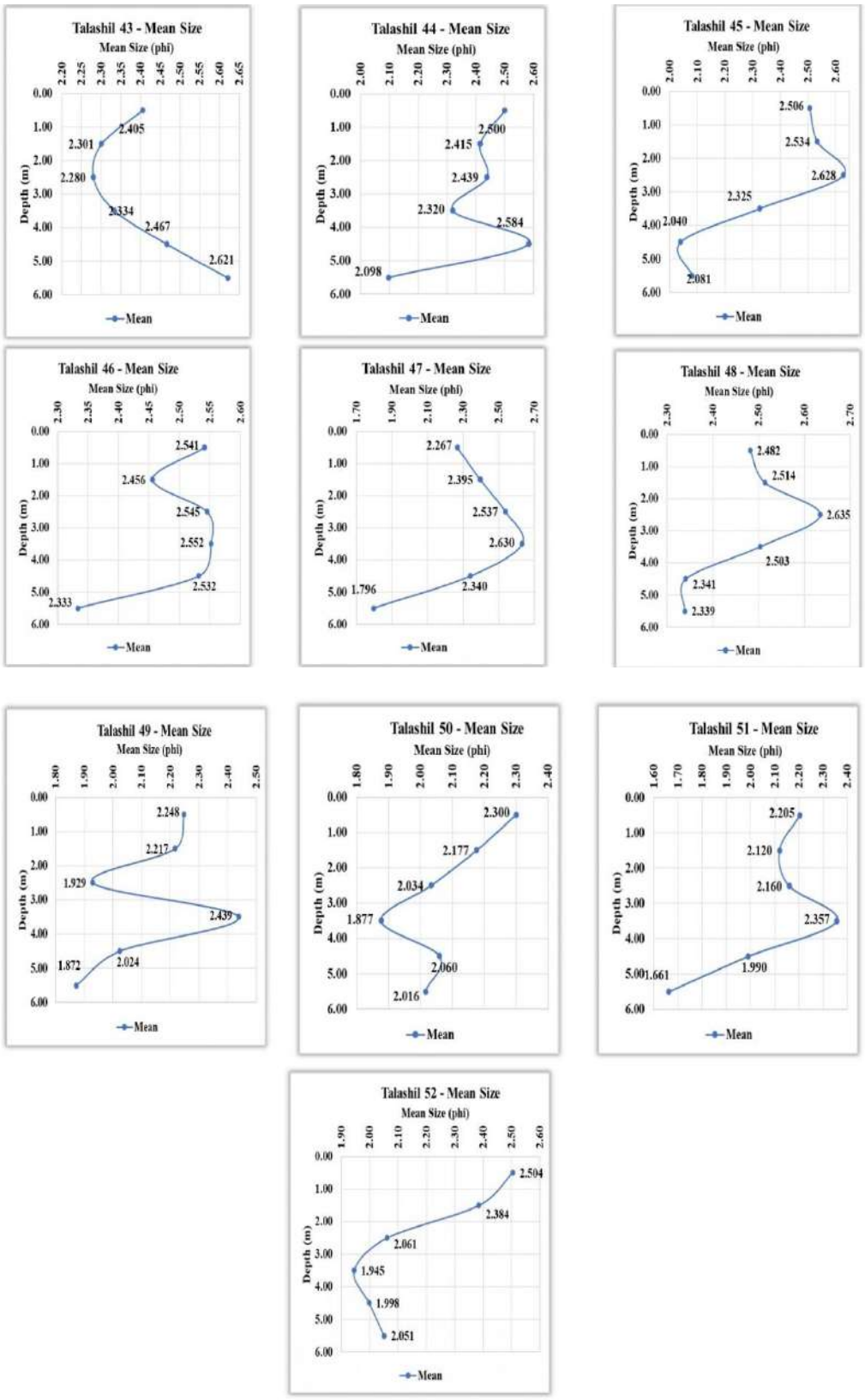


Figure 9.2 Downcore variation of sediment size in 52 boreholes

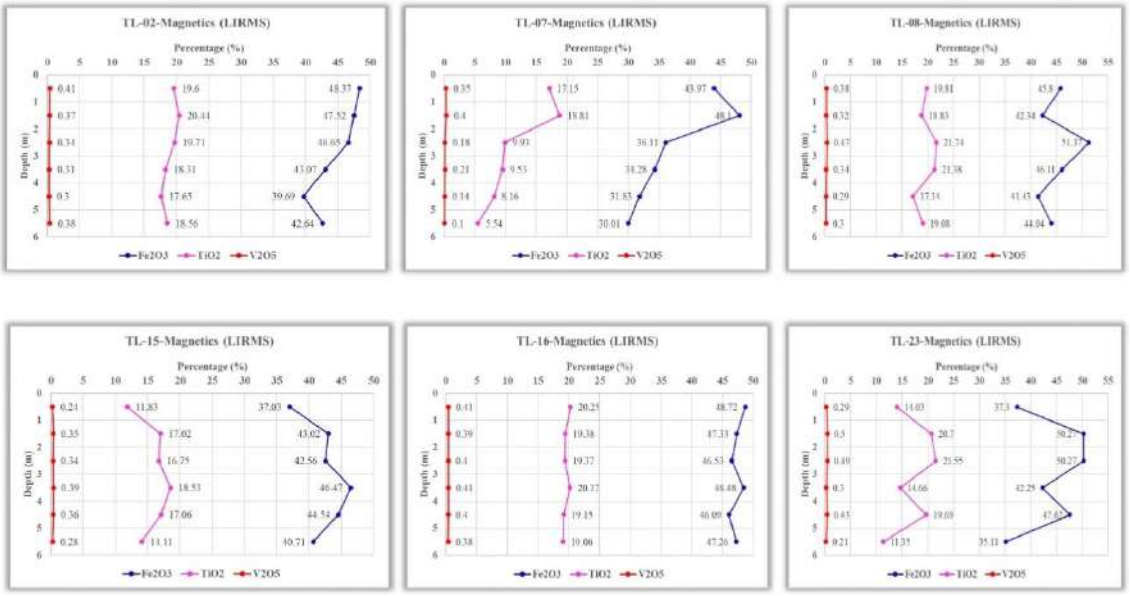
9.4 Chemical Analysis by XRF

The chemical results of samples along the depth with respect to the magnetics (LIRMS) and magnetics and middlings of REDMS are discussed below.

i. Magnetics (LIRMS)

In the Magnetics of LIRMS, the highest concentrations of oxides such as V2O5, TiO2, and Fe2O3 are observed in the southernmost portion of the Talashil block in TL-47 where the values are 0.61%, 25.59%, and 59.61%, respectively. The least concentration is found in the northern part of the study area (TL-07) with values of 0.1%, 5.54%, and 30.01% respectively. Hence, V2O5% varies between 0.1 and 0.61%, TiO2 between 6 and 26% and Fe2O3 between 30 and 60% in the explored block area. The average values of V2O5 is 0.385%, TiO2 18.254% in this fraction. In most of the cores analysed, V2O5 shows slight decrement at the bottom layer (5-6m) in comparison with that of the topmost layer (0-1m). Minimum concentration of V2O5 (0.1%) is noticed in the bottommost layer (5-6m) of TL-07 which falls in the northern part of the explored block.

In the southern part of the study area (TL-47) the highest concentrations of these oxides are found compared to the northern part (TL-02) indicating the greater sediment input may be from the Gad River in the south compared to Achara River in the north or there may be southward movement (littoral drift) of sediments from Achara River mouth.



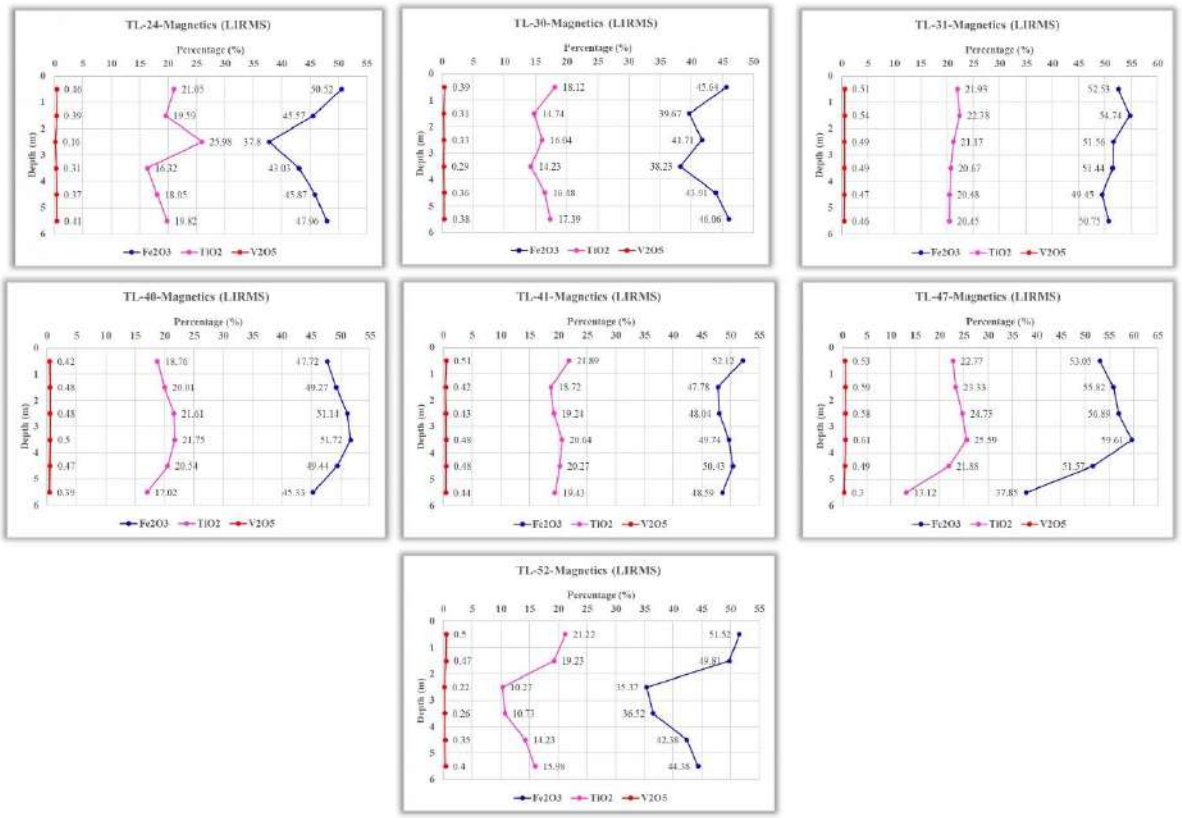


Figure 9.3 (a) Downcore variation of TiO2, Fe2O2 and V2O5 in LIRMS Magnetics fractions

ii. Magnetics (REDMS)

The geochemical analysis of magnetics of REDMS shows that the highest concentration of V2O5% is 0.23 and is found in the core TL-40, the minimum value 0.05% is noticed in TL-07 and TL-15. The maximum TiO2 value is about 41% (TL-40) and minimum value is 2.89% (TL-24) and minimum and maximum values of Fe2O3 in the block area are 21%(TL-15) and 47% (TL-40 and TL-47). The average values of V2O5 in the fraction is 0.131% and TiO2 is 17.979%.

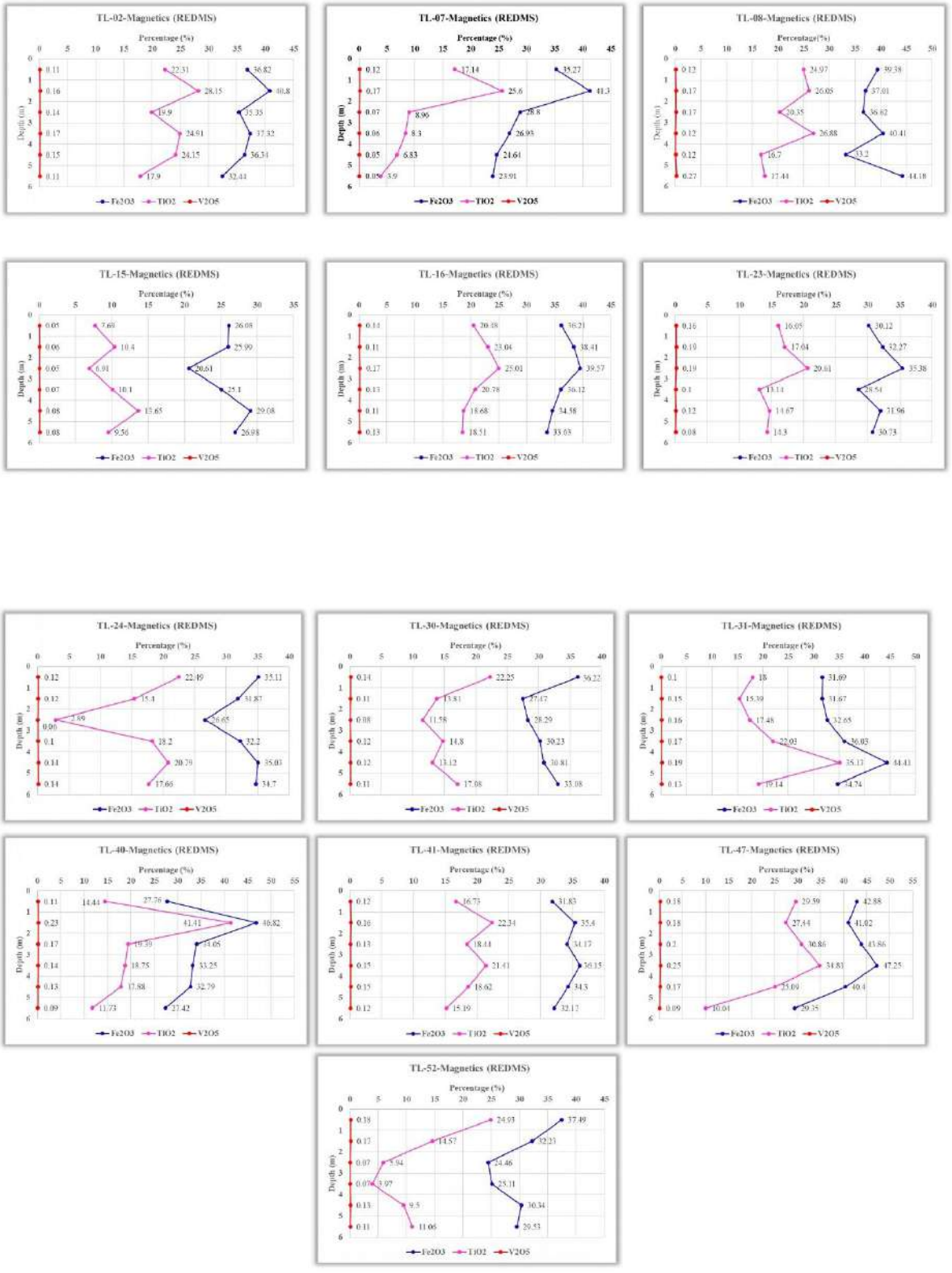
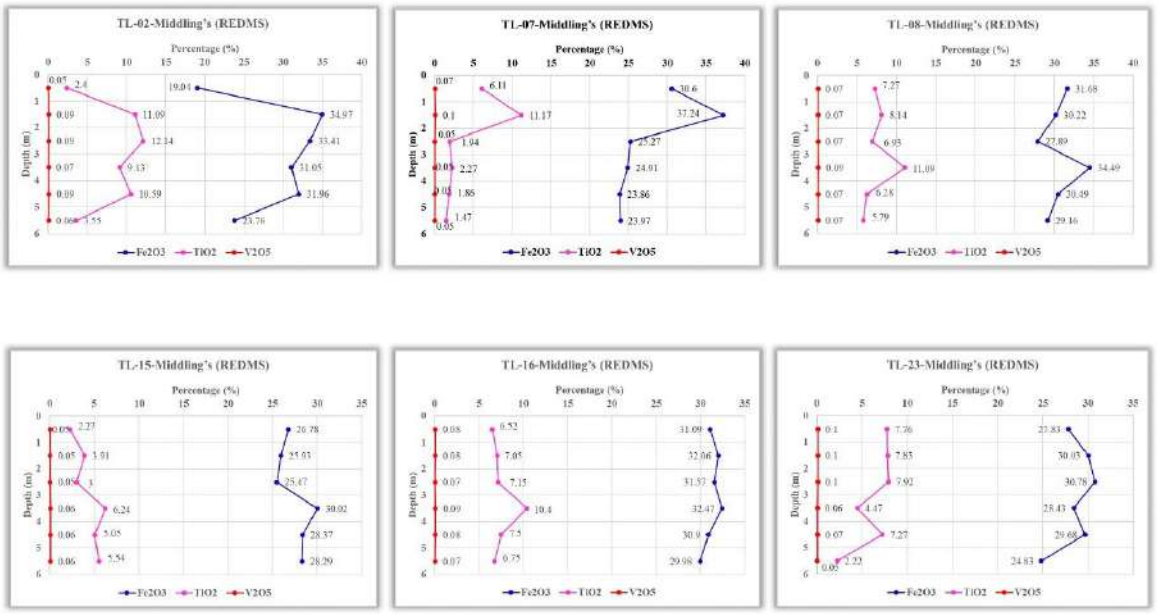


Figure 9.4 (a) Downcore variation of TiO2, Fe2O2 and V2O5 in REDMS magnetics fractions

iii. Middlings (REDMS)

The geochemical analysis of middlings (REDMS) in the study area shows Fe2O3 between 19.01 and 37.65 wt%, TiO2 between 1.47 and 15.32 wt% and V2O5 between 0.05-0.16 wt %. The average values of V2O5 in the middlings is 0.084% and TiO2 is 7.0%. An unusual peak in mineralization at 3-4 meters is noted in TL-47, with V2O5 at 0.16%, TiO2 at 10.39%, and Fe2O3 at 37.65% in the southern part. At further south in TL-52the surface layers show V2O5 0.11%, TiO2 13.96%, and Fe2O3 35.82%.



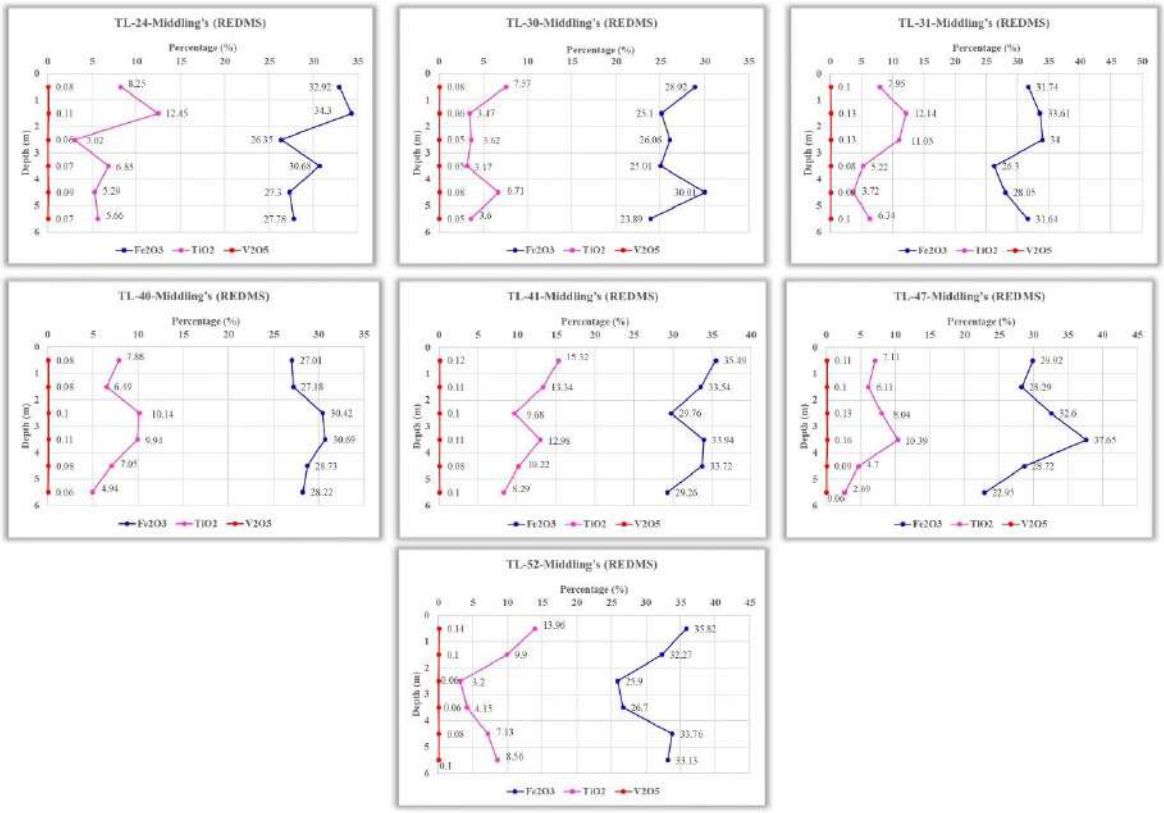


Figure 9.5 (a) Downcore variation of TiO2, Fe2O2 and V2O5 in REDMS middling fractions

Data Interpretation (In General)

The geochemical analysis of LIRMS magnetics, REDMS magnetic sand REDMS middlings of the Talashil block area suggests much of the area has more or less consistent values of titanium and vanadium. Concentration of V2O5% more than 0.2 is considered to be potential. Here, in the explored area, 75 samples falling in the category of A fraction are having more than 0.2% V2O5, whereas 51 samples are having >18% TiO2 and 23 samples have TiO2 between 10 and 18% out of 78 samples analysed. However, in B fraction, V2O5 with >0.2% is only 4 samples. TiO2 with >18% is 38 samples and between 10 and 18% TiO2 is 29 samples out of 78 samples analysed. The C fraction is considered to be less promising but contains 16 samples with TiO2% between 10 and 18 and no sample has >0.2% V2O5. These factors suggest the fractions A and B can be considered to be potential ore.

iv. XRF Analysis for Selected (hand) Magnetic and less Magnetic Samples

In order to study the concentration pattern of vanadium, iron and titanium between magnetic fractions separated using a hand magnet, 3 samples (magnetics-LIRMS) were selected (TL-

09A, TL-40A and TL-52A). The fractions were separated using a hand magnet to get more magnetic fraction and less magnetic fraction. All the 6 sub-fractions were analysed for Fe2O3, TiO2 and V2O5 at M/s Inspectorate Griffith India Pvt. Ltd., Gujarat which is a NABL accredited lab. The analysis employed lithium borate fusion bead followed by WDXRF following the standard procedure IGI/GDM/TPM-48.

In the more magnetic fraction, the TiO_2 content ranges from 21.05% to 24.66%, with an average of 23.24%; the V_2O_5 content ranged from 0.67% to 0.73%, averaging 0.7%; and the Fe_2O_3 content ranged from 55.17% to 57.46%, with an average of 56.66%.

In the less magnetic fraction, the TiO_2 content ranges from 9.42% to 23.51%, with an average of 17.11%; the V_2O_5 content ranged from 0.20% to 0.41%, with an average of 0.30%; and the Fe_2O_3 content ranged from 27.89% to 50.52%, with an average of 34.14%. The data is given in the Table 9.1.

Table 9.1. Chemical Analysis data for selected magnetic and less magnetic samples

Customer ID	**Fe_2O_3**	**TiO_2**	**V_2O_5**
unit	**%**	**%**	**%**
TL/09/3-4A/Mt (more magnetic)	57.35	24.66	0.70
TL/09/3-4ANMt (less magnetic)	40.52	23.51	0.41
TL/40/3-4A/Mt (more magnetic)	57.46	24.03	0.73
TL/40/3-4A/NMt (less magnetic)	34.02	18.42	0.30
TL/52/4-5A/Mt (more magnetic)	55.17	21.05	0.67
TL/52/4-5ANMt (less magnetic)	27.89	9.42	0.20

This clearly suggests that Fe, Ti and V are being concentrated in more magnetic minerals like vanadiferous titano-magnetite (VTM).

9.5 XRD Analysis

X-ray diffraction (XRD) analysis was carried on fractions A, B, and C, obtained through two-stage magnetic separation, as well as on non-magnetic light minerals (NMLM) and non-magnetic heavy minerals (NMHM) separated using the gravity (bromoform) to identify the mineral phases present in each sample. There are three A fractions, three B fractions, one C fraction, two non-magnetic heavies (NMHM) and one non-magnetic lights among the ten samples analyzed.

The results show that A fraction is chiefly composed of spinel minerals such as magnetite/ titanomagnetite/magnesioferrite etc. Spinel minerals such as magnetite, titanomagnetite and magnesioferrite etc. have similar spinel crystal structure and comparable lattice parameters and their X-ray diffraction (XRD) patterns are quite similar making distinction between these types of minerals challenging in polymineralic samples. However, the chemical analysis data suggest the spinel group mineral would be vanadiferous titano-magnetite. Other minerals present along with A fraction are hematite, ilmenite and K-feldspar. The dominance of spinel minerals (magnetite, titanomagnetite, magnesioferrite) suggests a primary igneous origin from the basaltic terrain (Deccan Supergroup)

B fraction is predominantly composed of hematite and ilmenite with three types of mineral phases identified are amphibole, k-feldspar and magnetite. The prevalence of hematite and ilmenite, coupled with amphibole and K-feldspar, points to contributions from both igneous and metamorphic sources.

C fraction is composed of pyroxenes, amphibole, plagioclase, quartz, clay minerals and magnetite. The composition suggests the input from mafic to intermediate igneous rocks, with clay minerals indicating weathering or alteration processes.

The non-magnetic heavy minerals identified are amphibole and pyroxene with the mineral phases chlorite and quartz. The presence of amphibole and pyroxene, along with chlorite and quartz phases, suggests contributions from metamorphic rocks and hydrothermal alteration zones. The non-magnetic light minerals are composed of quartz, plagioclase, K-feldspar.

In XRD analysis minerals like magnetite, ilmenite, titanomagnetite, magnesioferrite, hematite, amphibole, feldspar, pyroxene, quartz, plagioclase with trace amount of zircon were identified. The presence of minerals such as ilmenite, spinel group of minerals and hematite suggests source rocks would be basalt and its weathering products like laterite. The presence of amphibole, K-feldspar, quartz with trace amount of zircon may be suggesting these minerals are derived from metamorphic sources.

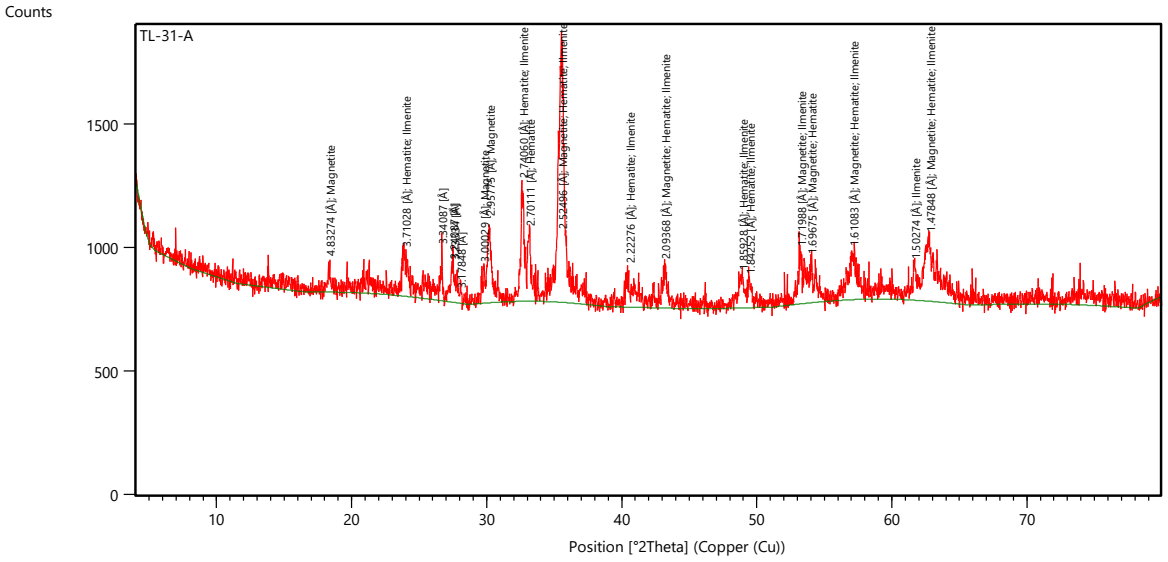
Instrument specifications and histogram provided by GSI, Kolkata

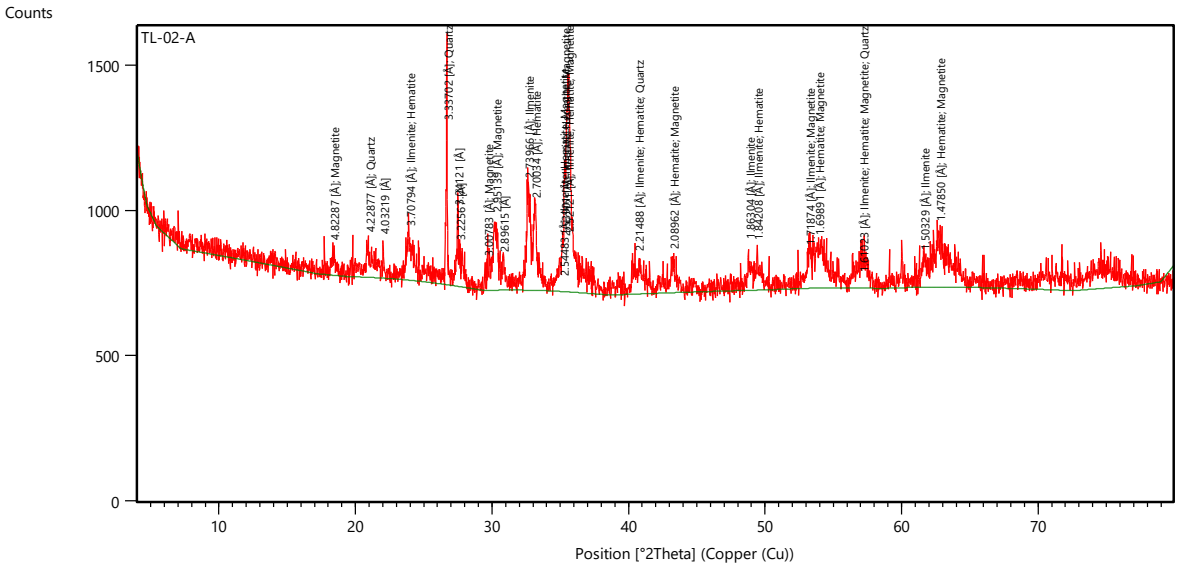
Measurement Conditions:

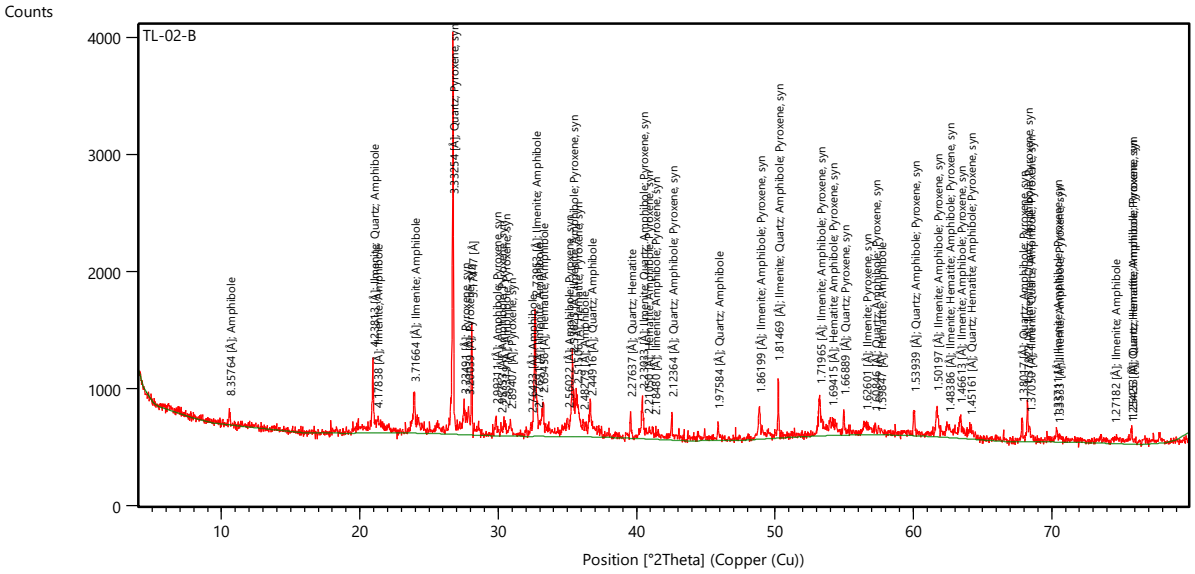
Instrument: PANalytical*X'Pert PRO*™ powder diffractometer
Software used for analysis of spectra: Panalytical*HighScore Plus*™

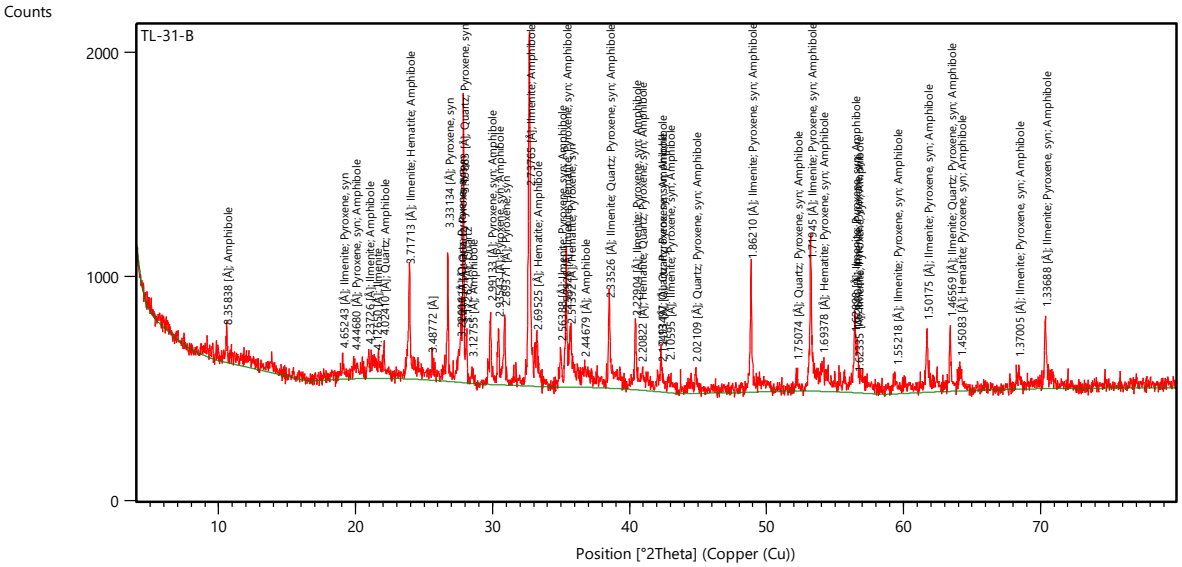
Raw Data Origin	XRD measurement (*. XRDML)
Scan Axis	Gonio

Start Position [°2Th.]	4.0054
End Position [°2Th.]	79.9784
Step Size [°2Th.]	0.0170
Scan Step Time [s]	50.8000
Scan Type	Continuous
PSD Mode	Scanning
PSD Length [°2Th.]	2.12
Offset [°2Th.]	0.0000
Divergence Slit Type	Fixed
Divergence Slit Size [°]	0.4354
Specimen Length [mm]	10.00
Measurement Temperature [°C]	25.00
Anode Material	Cu
K-Alpha1 [Å]	1.54060
Generator Settings	30 mA, 40 kV
Diffractometer Type	0000000083041433
Diffractometer Number	0
Goniometer Radius [mm]	240.00
Dist. Focus-Diverg. Slit [mm]	100.00
Incident Beam Monochromator	No
Spinning	Yes




Counts
TL-02-A
1500
1000
500
0
10
20
30
40
50
60
70
Position [°2Theta] (Copper (Cu))
4.82287 [Å]; Magnetite
4.22877 [Å]; Quartz
4.03219 [Å]
3.70794 [Å]; Ilmenite; Hematite
3.33702 [Å]; Quartz
2.70034 [Å]; Hematite
2.21488 [Å]; Ilmenite; Hematite; Quartz
2.08962 [Å]; Hematite; Magnetite
1.69891 [Å]; Hematite; Magnetite
1.50329 [Å]; Ilmenite
1.47850 [Å]; Hematite; Magnetite


Counts
TL-02-B
4000
3000
2000
1000
0
10
20
30
40
50
60
70
Position [°2Theta] (Copper (Cu))
8.35764 [Å]; Amphibole
4.17838 [Å]; Ilmenite; Quartz; Amphibole
3.71664 [Å]; Ilmenite; Amphibole
3.33254 [Å]; Quartz; Pyroxene, syn
2.27637 [Å]; Quartz; Hematite
2.12364 [Å]; Quartz; Amphibole; Pyroxene, syn
1.97584 [Å]; Quartz; Amphibole
1.86199 [Å]; Ilmenite; Amphibole; Pyroxene, syn
1.81469 [Å]; Ilmenite; Quartz; Amphibole; Pyroxene, syn
1.53939 [Å]; Quartz; Amphibole; Pyroxene, syn
1.27182 [Å]; Ilmenite; Amphibole


Counts
TL-31-B
2000
1000
0
10
20
30
40
50
60
70
Position [°2Theta] (Copper (Cu))
8.35838 [Å]; Amphibole
4.65243 [Å]; Ilmenite; Pyroxene, syn
4.44680 [Å]; Pyroxene, syn; Amphibole
4.23726 [Å]; Ilmenite
4.02410 [Å]; Amphibole
3.71713 [Å]; Ilmenite; Hematite; Amphibole
3.48772 [Å]
3.33134 [Å]; Pyroxene, syn
3.12753 [Å]; Pyroxene, syn; Amphibole
2.98113 [Å]; Pyroxene, syn; Amphibole
2.95537 [Å]; Pyroxene, syn
2.89537 [Å]; Pyroxene, syn
2.77365 [Å]; Ilmenite; Amphibole
2.69525 [Å]; Hematite; Amphibole
2.56188 [Å]; Ilmenite; Pyroxene, syn; Amphibole
2.53127 [Å]; Ilmenite; Pyroxene, syn; Amphibole
2.44679 [Å]; Amphibole
2.33526 [Å]; Ilmenite; Quartz; Pyroxene, syn; Amphibole
2.20822 [Å]; Hematite; Quartz; Pyroxene, syn; Amphibole
2.13549 [Å]; Ilmenite; Pyroxene, syn; Amphibole
2.02109 [Å]; Quartz; Pyroxene, syn; Amphibole
1.86210 [Å]; Ilmenite; Pyroxene, syn; Amphibole
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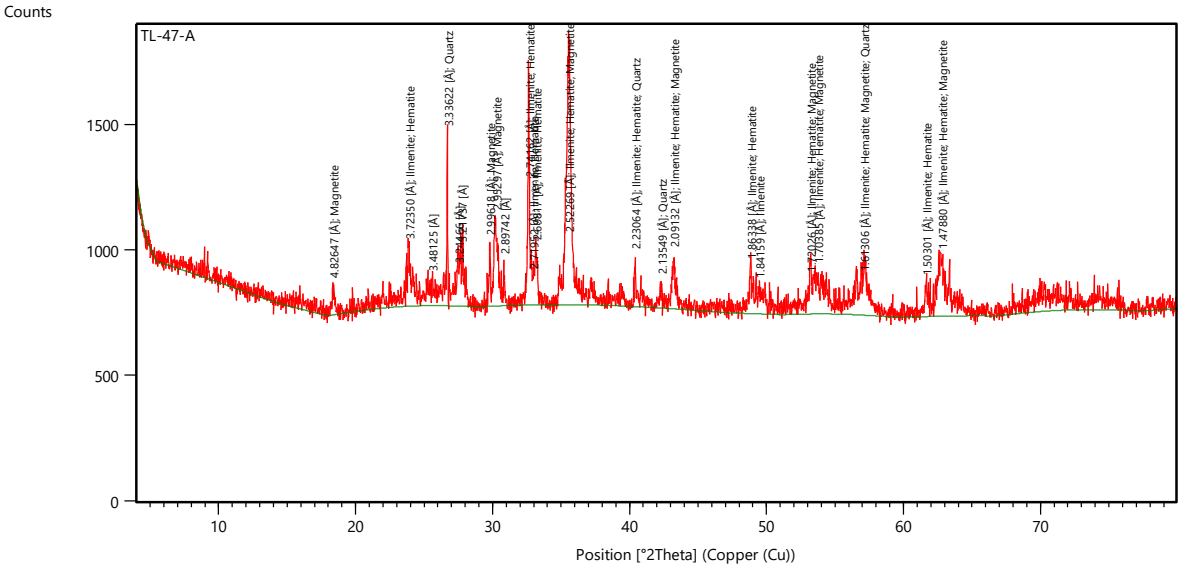
1.73745 [Å]; Ilmenite; Pyroxene, syn; Amphibole
1.69378 [Å]; Hematite; Pyroxene, syn; Amphibole
1.55218 [Å]; Ilmenite; Pyroxene, syn; Amphibole
1.50175 [Å]; Ilmenite; Pyroxene, syn; Amphibole
1.46569 [Å]; Ilmenite; Quartz; Pyroxene, syn; Amphibole
1.45083 [Å]; Hematite; Pyroxene, syn; Amphibole
1.37005 [Å]; Ilmenite; Pyroxene, syn; Amphibole
1.33688 [Å]; Ilmenite; Pyroxene, syn; Amphibole


Counts
TL-47-A
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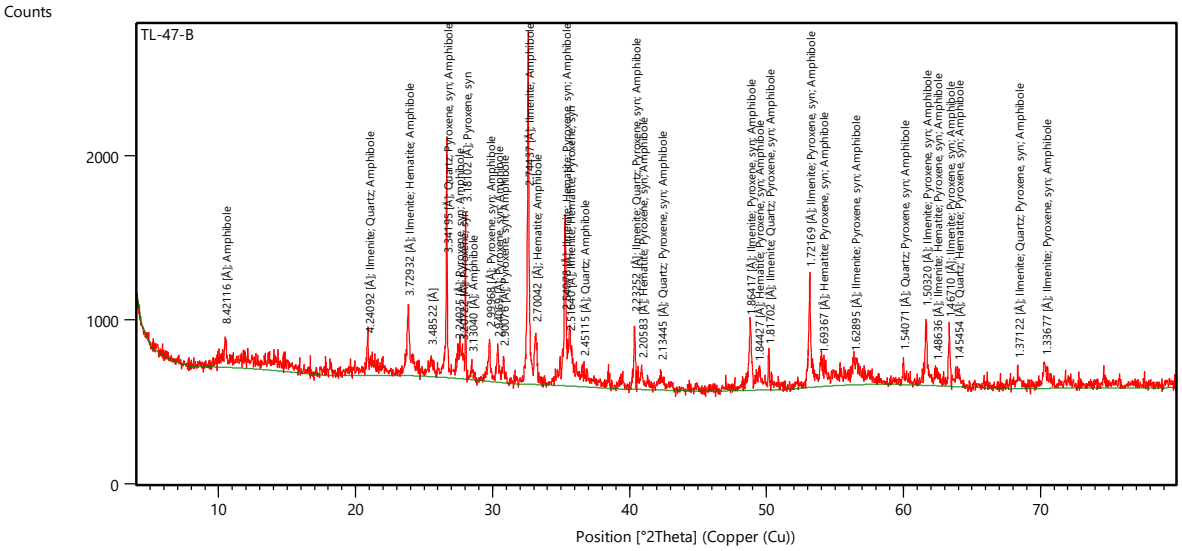
1000
500
0
10
20
30
40
50
60
70
Position [°2Theta] (Copper (Cu))
4.82647 [Å]; Magnetite
3.72350 [Å]; Ilmenite; Hematite
3.48125 [Å]
3.33622 [Å]; Quartz
2.99518 [Å]; Magnetite
2.89742 [Å]
2.74162 [Å]; Ilmenite; Hematite
2.68817 [Å]; Ilmenite; Hematite
2.52269 [Å]; Ilmenite; Hematite; Magnetite
2.23064 [Å]; Ilmenite; Hematite; Quartz
2.13549 [Å]; Quartz
2.09132 [Å]; Ilmenite; Hematite; Magnetite
1.86338 [Å]; Ilmenite; Hematite
1.84159 [Å]; Ilmenite
1.72026 [Å]; Ilmenite; Magnetite
1.70395 [Å]; Ilmenite; Hematite; Magnetite
1.61306 [Å]; Ilmenite; Hematite; Magnetite; Quartz
1.50301 [Å]; Ilmenite; Hematite
1.47880 [Å]; Ilmenite; Hematite; Magnetite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1000
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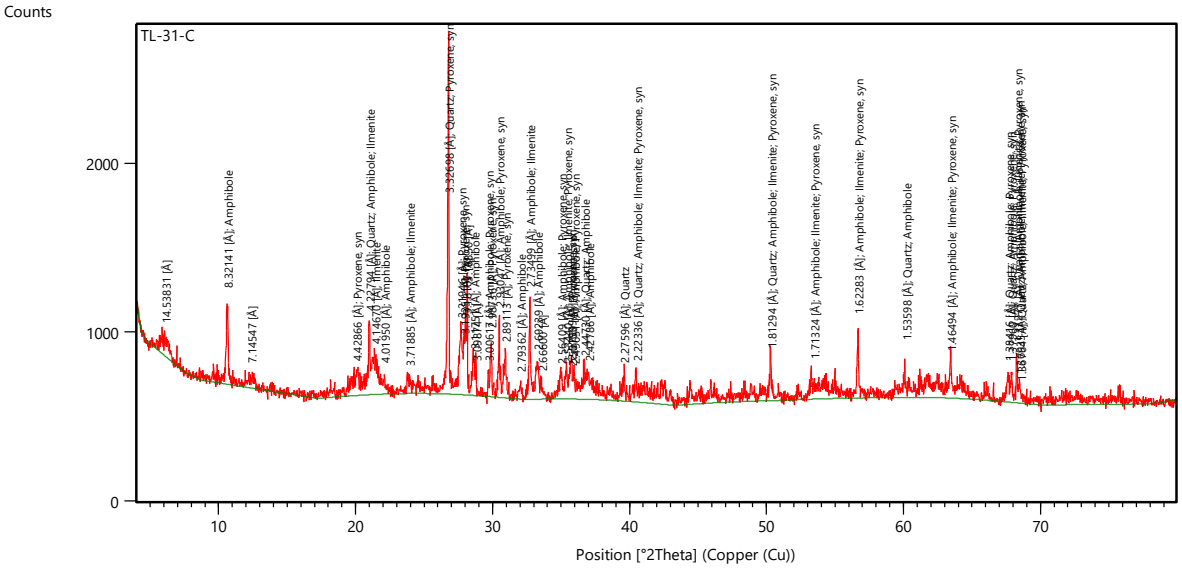
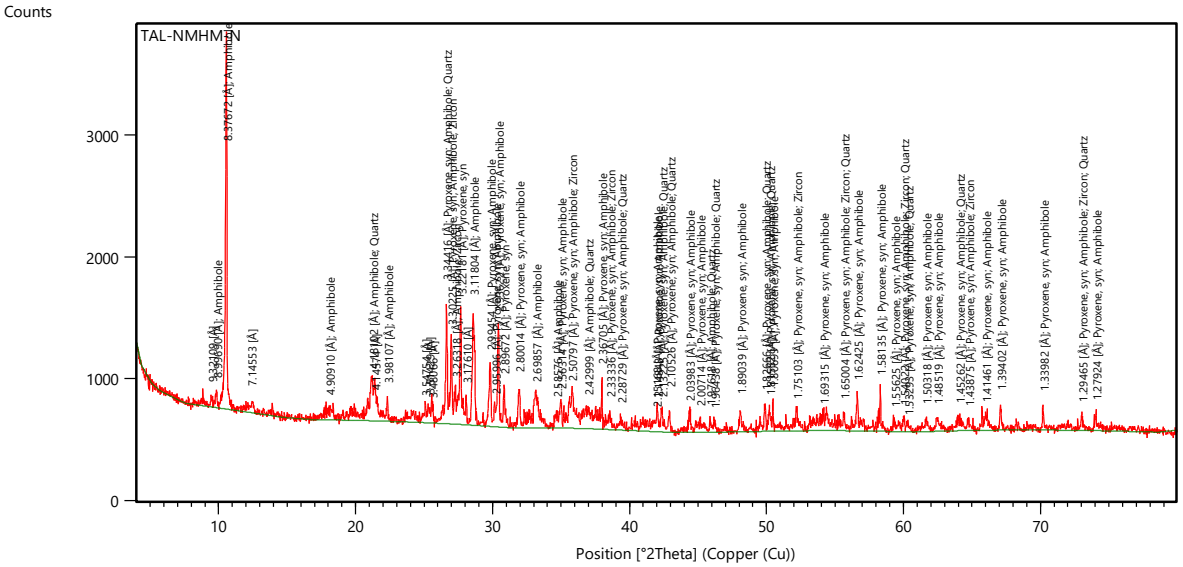
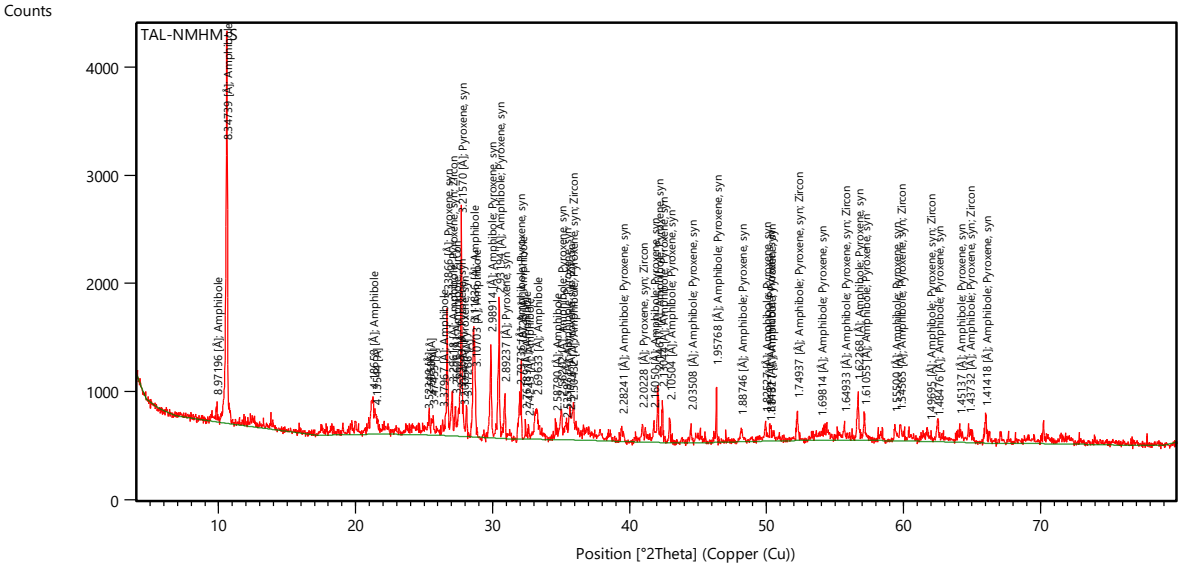
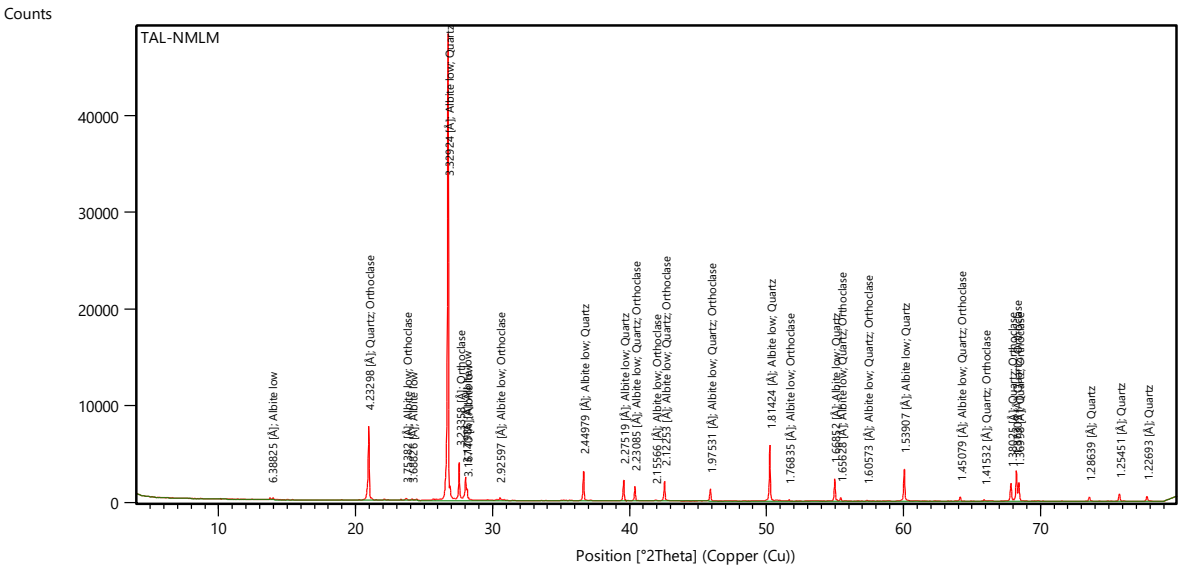
20
30
40
50
60
70
Position [°2Theta] (Copper (Cu))


Counts
TL-31-C
2000
1000
0
10
20
30
40
50
60
70
Position [°2Theta] (Copper (Cu))


Counts
TAL-NMHM-N
Position [°2Theta] (Copper (Cu))


Counts
TAL-NMHM-S
Position [°2Theta] (Copper (Cu))



9.6 Petrographic studies

Microscopic studies of the nonmagnetic heavy mineral fraction revealed a diverse range of minerals, including ilmenite, clinopyroxene, hornblende, hematite, sphene, plagioclase, magnetite, rutile, epidote, zircon, hypersthene, tremolite, and chromite. The heavy detritus size ranged between 0.1mm and 2.0mm. The large size grains of 2.0mm are rare. Majority of grains were of 0.5mm size. Larger Fe-Ti grains are sub-rounded to rounded and very often perfectly well rounded. Many of the silicate grains have sub-rounded outline. Smaller grains (zircon) both in oxide and silicate categories were sub-rounded to sub-angular to angular in nature

Mineral constituents in the heavy detritus: Both oxide and silicate facies grains present. The opaque grains dominate over the silicate grains (in approximately 70:30 ratio; in one case the ratio was 40:60). Generally, all the samples studied had similar mineral phases. Some exceptions however are in the relative proportions of oxide-facies minerals versus and silicate facies minerals and also predominance of one silicate mineral over the other.

Among the opaque grains Fe-Ti oxide grains i.e. ilmenite and ilmeno-magnetite and magnetite grains may be present. Since it is not possible to get all the optical properties of the grains it is not possible to identify the exact member of Ti-Fe mineral series. Therefore, these grains are identified in this report as “Ilmenite”. Hematite is another major mineral recorded. Sphene, zircon and rutile are not uncommon. One grain of chromite is identified. Among silicates, clinopyroxene grains are most dominant. Next in abundance is hornblende. Tremolite and

epidote also occur. Occasional grains of zircon and apatite noticed. Biotite is conspicuous by absence. Occasional grains of plagioclase also noticed.

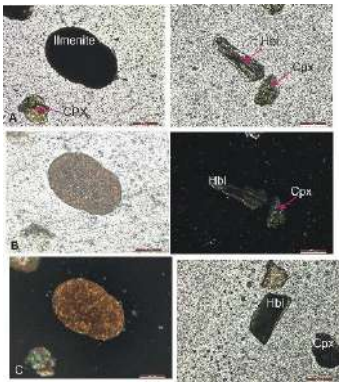
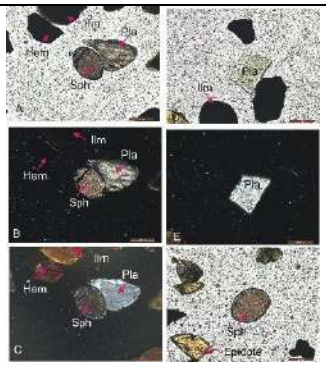
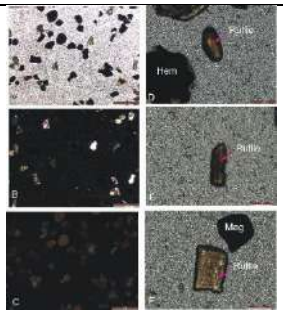
Optical properties: Ilmenites are sub-rounded to well rounded. Due to uneven surface the grains invariably exhibit brownish internal reflections. Margins of the grains show evidences of alteration. Subhedral to disintegrated grains of reddish-brown hematite exhibits deep red internal reflections. Acicular grains of yellowish to deep brown rutile with thick outer margin are identified. Some grains show well-defined cleavages. A prismatic (basal section) of chromite with well defined, angular margins is recorded.

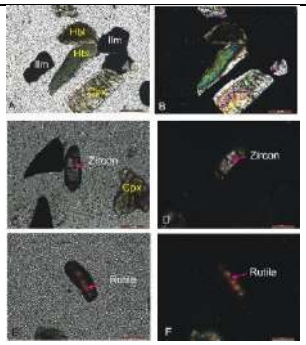
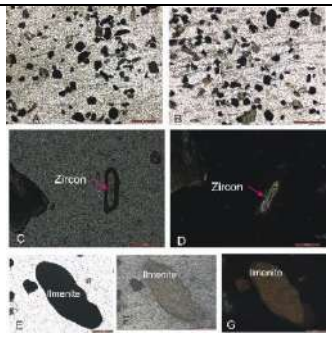
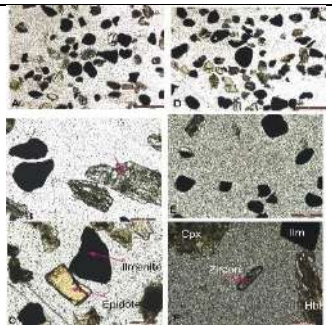
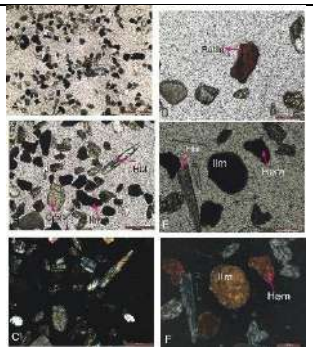
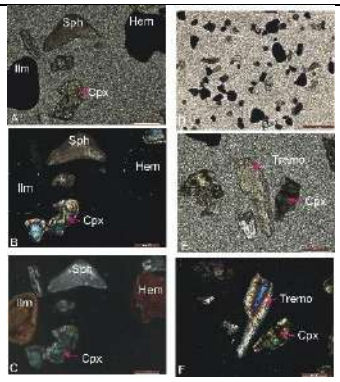
Diopside is the most dominant pyroxene mineral identified. These are short prismatic, with well-defined pyroxenic cleavages. These are pleochroic in paler shades of green and have a large extinction angle (~30). Hypersthene grains showing pleochroism between pale pink and green and straight extinction are also seen. Long prismatic grains of hornblende with well-defined amphibolic cleavages are also recorded. These are pleochroic in shades of green and yellowish green and have low extinction angle (<15). Rare grains of tremolites (colorless to pale green, extinction angle 25-30) and chlorite (pale green-colored grains) are the other common silicates observed. Rare grains of zircon (bipyramidal acicular grains, with thick borders, straight extinction and high birefringence) recorded.

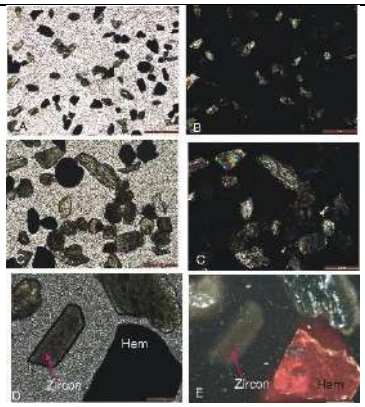
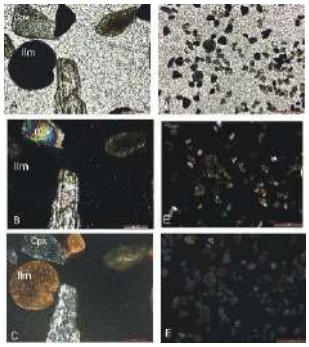
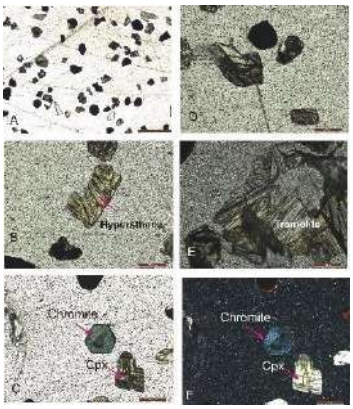
Details of the samples studied are given in the following table.

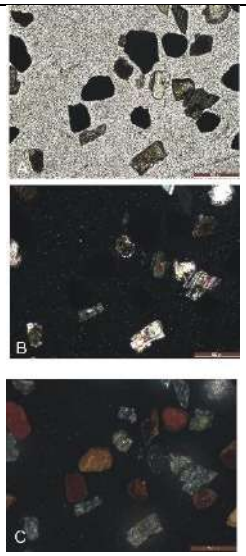
Serial Number	Sample Number	Minerals Present (in order of abundance)	Photomicrograph plate appended
1	TL-02	Ilmenite, clinopyroxene, hornblende, hematite, sphene, plagioclase	Plate-1 andPlate-2
2	TL-08	Ilmenite, hematite, magnetite, rutile, clinopyroxene, epidote	Plate-3
3	TL-15	Ilmenite, hornblende, clinopyroxene, sphene, epidote. Rare zircon.	Plate-4, Plate-5
4	TL-16	Silicate minerals dominate over oxide minerals. Clinopyroxene, epidote, ilmenite, hornblende. Rare zircon	Plate-6
6	TL-23	Ilmenite, hornblende, tremolite, clinopyroxene, sphene, epidote. Rare zircon.	Plate-7 Plate-8
7	TL-31	Ilmenite, hematite, hornblende, clinopyroxene, sphene, epidote. Rare zircon.	Plate-9
8	TL-32	Ilmenite, hematite, clinopyroxene, hornblende, epidote, sphene, epidote.	Plate-10

Serial Number	Sample Number	Minerals Present (in order of abundance)	Photomicrograph plate appended
9	TL-41	Ilmenite, hornblende, hypersthene, tremolite, clinopyroxene, sphene, epidote. Rare chromite.	Plate-11
10	TL-47	Ilmenite, hematite, clinopyroxene, hornblende, epidote, sphene, epidote.	Plate-12

Photomicrographs	Description
	Plate-1 A. Well-rounded grain of ilmenite and subhedral grain of clinopyroxene; transmitted light, plane polarized light (PPL). B. B: Same as A, under plane polarized reflected light. C. C: Same as A under reflected light crossed nicol conditions. Bright colours of ilmenite is due to internal reflections. D. D: Subhedral grains of hornblende and clinopyroxene (diopside). PPL; note well defined cleavages in both the grains. E. E: Same as D, under PPL. F. Hornblende and clinopyroxene under PPL. Another grain towards top of hornblende is of epidote.
	Plate-2 A. Ilmenite, hematite, plagioclase and sphene under PPL. B. Same as A, under crossed nicols C. Same as A, under reflected light crossed nicols D. Plagioclase, ilmenite and hematite grains. A grain towards southwest corner is epidote. PPL. E. Same as D., under crossed nicols. F. Grains of sphene and epidote. PPL.
	Plate-3 A. General view of heavy detritus under plane polarizedlight. B. Same as A, under crossed nicols C. Same as A, under reflected light crossed nicols. D. Rutile and hematite grain. PPL. E. Rutile grain. PPL F. Rutile and magnetite grain. PPL

	Plate-4 A. Hornblende (Hbl), clinopyroxene (CPx) and Ilmenite (Ilm) under PPL. B. Same as A under crossed nicols. C. Zircon and clinopyroxene under PPL. D. Zircon under crossed nicols E. Rutile under PPL. F. Rutile under crossed nicols.
	Plate-5 A. General view of detritus B. General view of detritus C. Zircon under PPL. D. Zircon under crossed nicols E. Ilmenite. Under transmitted PPL. F. Ilmenite under Reflected PPL. G. Ilmenite under Reflected crossed nicol conditions.
	Plate-6 A. General view of detritus.PPL B. Pyroxene grains.PPL C. Ilmenite, epidote and pyroxene. PPL D. General view of detritus. PPL E. Same as D. F. Clinopyroxene, zircon, hornblende and ilmenite. PPL.
	Plate-7 A. General view of detritus.PPL B. Hornblende, clinopyroxene and ilmenite.PPL. C. Same as B, under crossed nicols D. Altered grain of rutile.PPL. E. Ilmenite, hematite and hornblende. Transmitted PPL. F. Same as E,under Reflected Crossed nicol conditions.
	Plate-8 A. Ilmenite, hematite, sphene and clinopyroxene in transmitted PPL condition. B. Same as A, under transmitted light, crossed nicol conditions. C. Same as A, under reflected light,crossed niocl condition D. General view of detritus. E. Tremolite and clinopyroxene. Under PPL condition F. Same as E, under transmitted crossed nicol condition.

	Plate-9 A. General view of detritus.PPL B. Same as A, under transmitted light, crossed nicol condition. C. General view of detritus. PPL. D. Sam as C. Undr transmitted light, crossed nicol condition E. Zircon and Hematite, under transmitted PPL condition. F. Same as E. Under reflected light, crossed nicol conditions. Note strong internal reflections in hematite.
	Plate-10 A. Clinopyroxene, ilmenite and epidote (top right). Transmitted PPL condition. B. Same as A, under transmitted crossed nicol condition. C. Same as A, under reflected light, crossed nicol conditions D. Over view of detritus in the sample. Transmitted PPL conditions E. Same as D, under transmitted crossed nicol condition F. Same as D, under reflected crossed nicol condition. Note strong internal reflection in ilmenite.
	Plate-11 A. Over view of detritus in the sample. Transmitted PPL condition. B. Hypersthene grain in the sample. Transmitted, PPl condition C. Chromite and clinopyroxene (diopside) in the sample. Transmitted, ppl Condition D. Hornblende and clinopyroxene. E. A cluster of tremolite grains. Transmitted PPL condition. F. Chromite and pyroxene grains as in C. Under crossed nicol conditions.

	Plate – 12 A. General view of detritus in the sample. Under transmitted PPL condition. B. Same as A. Under transmitted crossed nicol conditions. C. Same as A. Under reflected light crossed nicol conditions.

9.7 Check Samples

The chemical analysis value of 24 number of check samples is well matching with the chemical analysis results of the original sample. The analysis results are tabulated in the Annexure 10. The variation of differences between the original sample and check sample is lies within 2%. Hence, it proves that the chemical analysis is consistent. The analysis employed lithium borate fusion bead followed by WDXRF following the standard procedure IGI/GDM/TPM-48.

9.7.1 Comparison of Fe2O3 Values.

Table 9.2 Comparison table of Fe2O3 Values.

Sample No.	Fe2O3 %		
	Original Sample	Check sample	Difference
TL02/0-1/A	48.37	46.963	1.407
TL02/0-1/B	36.82	34.495	2.325
TL02/0-1/C	19.04	18.057	0.983
TL07/1-2/C	37.237	36.059	1.178
TL07/3-4/B	26.927	26.794	0.133
TL08/1-2/A	42.337	40.57	1.767
TL15/1-2/A	43.015	41.974	1.041
TL15/3-4/A	46.466	44.72	1.746
TL15/3-4/B	25.1	24.11	0.99
TL23/4-5/A	47.622	47.195	0.427
TL24/0-1/A	50.521	48.828	1.693
TL24/2-3/B	37.796	35.85	1.946
TL24/5-6/A	47.956	46.795	1.161

Sample No.	Fe2O3 %		
	Original Sample	Check sample	Difference
TL24/5-6/B	34.696	33.053	1.643
TL30/5-6/A	46.06	44.19	1.87
TL31/4-5/B	44.413	43.073	1.34
TL47/1-2/A	55.82	54.24	1.58
TL47/1-2/C	28.29	26.794	1.496
TL47/1-2/B	41.02	39.015	2.005
TL52/0-1/C	35.815	30.232	5.583
TL52/1-2/A	49.805	48.06	1.745
TL52/4-5/A	42.375	40.343	2.032
TL52/4-5/B	30.341	29.003	1.338
TL52/4-5/C	33.755	31.53	2.225

9.7.2 Comparison of TiO2 Values.

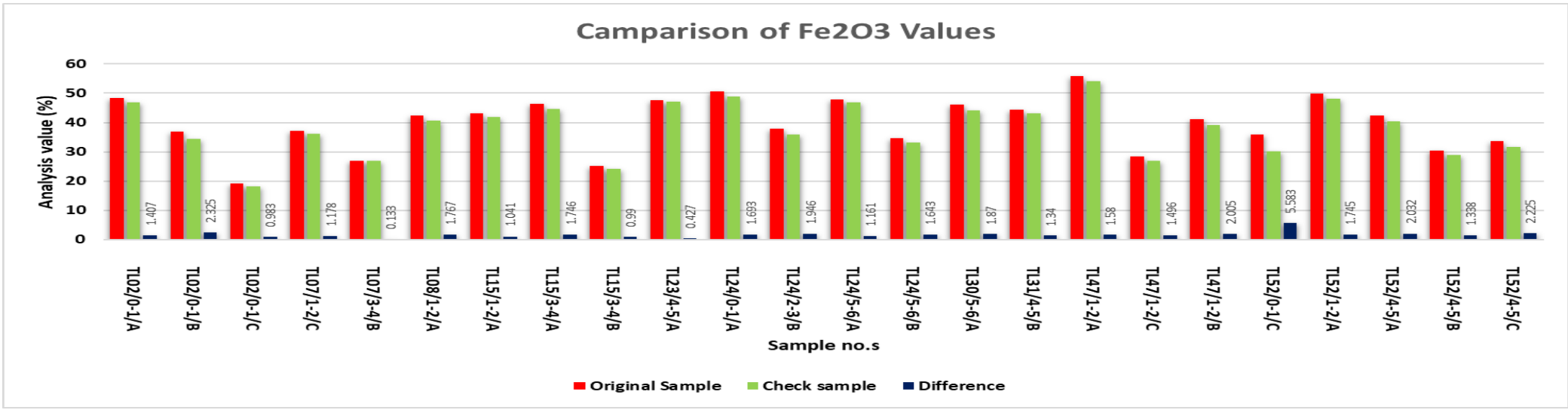
Table 9.3 Comparison table of TiO2 Values.

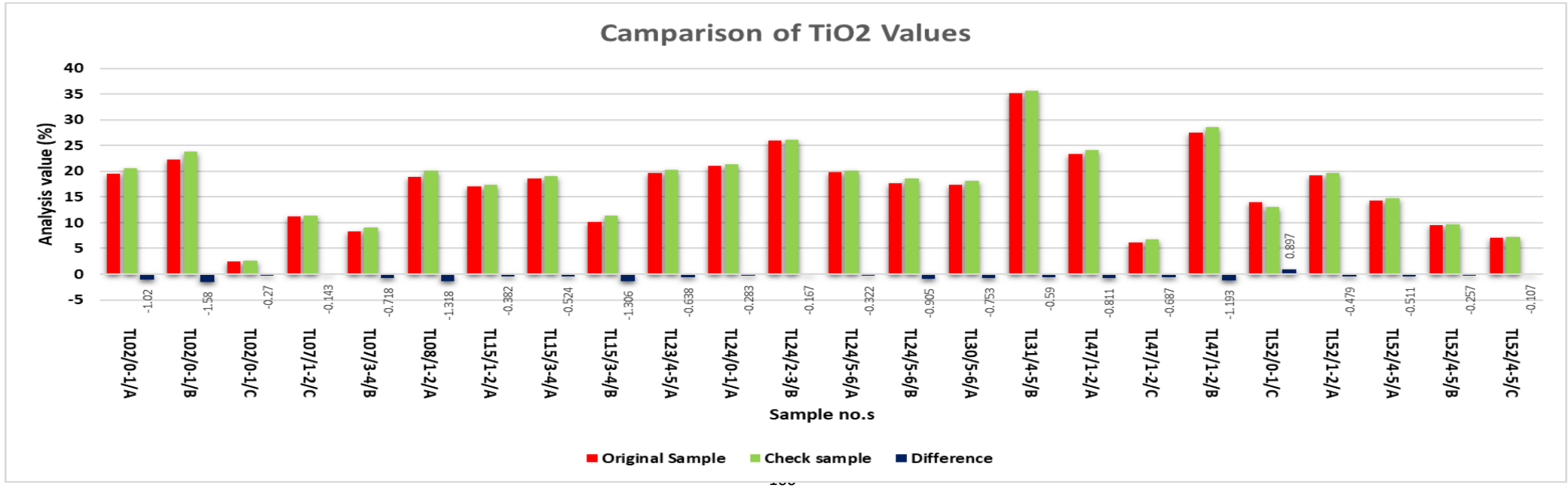
Sample No.	TiO2 %		
	Original Sample	Check sample	Difference
TL02/0-1/A	19.6	20.62	-1.02
TL02/0-1/B	22.31	23.89	-1.58
TL02/0-1/C	2.4	2.67	-0.27
TL07/1-2/C	11.171	11.314	-0.143
TL07/3-4/B	8.303	9.021	-0.718
TL08/1-2/A	18.834	20.152	-1.318
TL15/1-2/A	17.02	17.402	-0.382
TL15/3-4/A	18.529	19.053	-0.524
TL15/3-4/B	10.097	11.403	-1.306
TL23/4-5/A	19.692	20.33	-0.638
TL24/0-1/A	21.047	21.33	-0.283
TL24/2-3/B	25.976	26.143	-0.167
TL24/5-6/A	19.818	20.14	-0.322
TL24/5-6/B	17.662	18.567	-0.905
TL30/5-6/A	17.386	18.139	-0.753
TL31/4-5/B	35.127	35.717	-0.59
TL47/1-2/A	23.33	24.141	-0.811
TL47/1-2/C	6.11	6.797	-0.687
TL47/1-2/B	27.44	28.633	-1.193
TL52/0-1/C	13.959	13.062	0.897
TL52/1-2/A	19.229	19.708	-0.479
TL52/4-5/A	14.234	14.745	-0.511
TL52/4-5/B	9.498	9.755	-0.257
TL52/4-5/C	7.131	7.238	-0.107

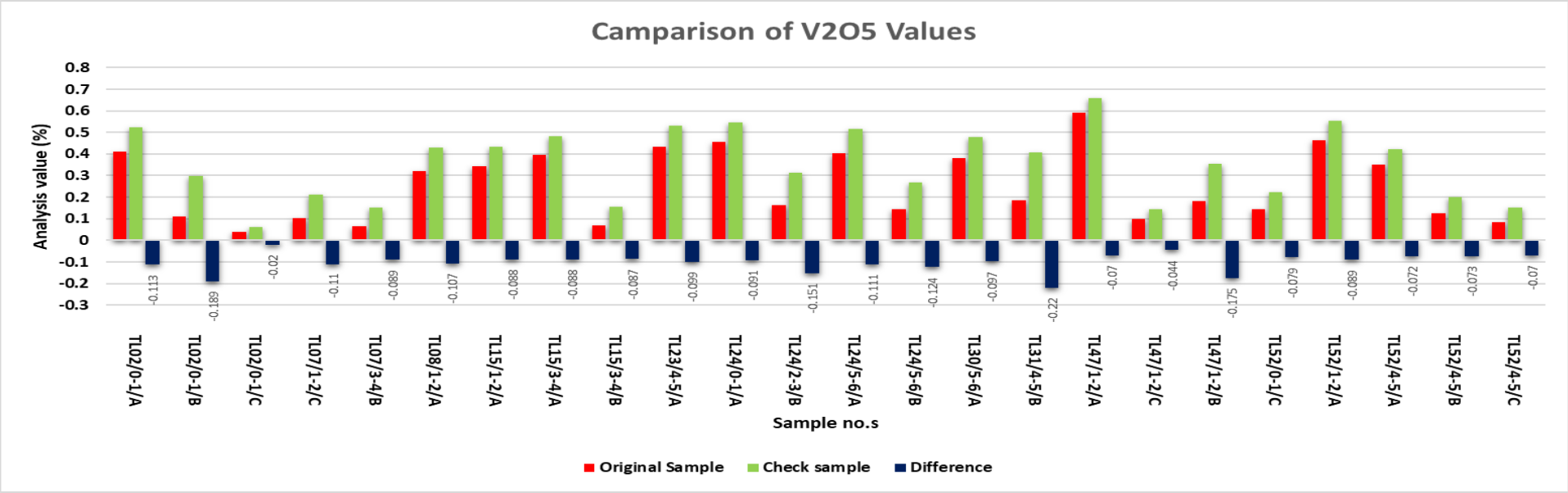
9.7.3 Comparison of V2O5 Values.

Table 9.4 Comparison table of V2O5 Values.

Sample No.	V2O5 %		
	Original Sample		Original Sample
TL02/0-1/A	0.41	0.523	-0.113
TL02/0-1/B	0.11	0.299	-0.189
TL02/0-1/C	0.04	0.06	-0.02
TL07/1-2/C	0.102	0.212	-0.11
TL07/3-4/B	0.064	0.153	-0.089
TL08/1-2/A	0.321	0.428	-0.107
TL15/1-2/A	0.345	0.433	-0.088
TL15/3-4/A	0.394	0.482	-0.088
TL15/3-4/B	0.068	0.155	-0.087
TL23/4-5/A	0.432	0.531	-0.099
TL24/0-1/A	0.455	0.546	-0.091
TL24/2-3/B	0.164	0.315	-0.151
TL24/5-6/A	0.405	0.516	-0.111
TL24/5-6/B	0.144	0.268	-0.124
TL30/5-6/A	0.382	0.479	-0.097
TL31/4-5/B	0.187	0.407	-0.22
TL47/1-2/A	0.59	0.66	-0.07
TL47/1-2/C	0.1	0.144	-0.044
TL47/1-2/B	0.18	0.355	-0.175
TL52/0-1/C	0.143	0.222	-0.079
TL52/1-2/A	0.465	0.554	-0.089
TL52/4-5/A	0.349	0.421	-0.072
TL52/4-5/B	0.126	0.199	-0.073
TL52/4-5/C	0.083	0.153	-0.07


Camparison of Fe2O3 Values
Analysis value (%)
60
50
40
30
20
10
0
1.407
2.325
0.983
1.178
0.133
1.767
1.041
1.746
0.99
0.427
1.693
1.946
1.161
1.643
1.87
1.34
1.58
1.496
2.005
5.583
1.745
2.032
1.338
2.225
TL02/0-1/A
TL02/0-1/B
TL02/0-1/C
TL07/1-2/C
TL07/3-4/B
TL08/1-2/A
TL15/1-2/A
TL15/3-4/A
TL15/3-4/B
TL23/4-5/A
TL24/0-1/A
TL24/2-3/B
TL24/5-6/A
TL24/5-6/B
TL30/5-6/A
TL31/4-5/B
TL47/1-2/A
TL47/1-2/C
TL47/1-2/B
TL52/0-1/C
TL52/1-2/A
TL52/4-5/A
TL52/4-5/B
TL52/4-5/C
Sample no.s
Original Sample
Check sample
Difference


Camparison of TiO2 Values
Analysis value (%)
40
35
30
25
20
15
10
5
0
-5
-1.02
-1.58
-0.27
-0.143
-0.718
-1.318
-0.382
-0.524
-1.306
-0.638
-0.283
-0.167
-0.322
-0.905
-0.753
-0.59
-0.811
-0.687
-1.193
0.897
-0.479
-0.511
-0.257
-0.107
TL02/0-1/A
TL02/0-1/B
TL02/0-1/C
TL07/1-2/C
TL07/3-4/B
TL08/1-2/A
TL15/1-2/A
TL15/3-4/A
TL15/3-4/B
TL23/4-5/A
TL24/0-1/A
TL24/2-3/B
TL24/5-6/A
TL24/5-6/B
TL30/5-6/A
TL31/4-5/B
TL47/1-2/A
TL47/1-2/C
TL47/1-2/B
TL52/0-1/C
TL52/1-2/A
TL52/4-5/A
TL52/4-5/B
TL52/4-5/C
Sample no.s
Original Sample
Check sample
Difference



9.7.4 Radiometric analysis of Monazite equivalent (PHY-5)

The radiometric analysis value of 10 number of samples is tabulated below.

Sl no.	Sample No	Monazite equivalent (ppm)		Sl no.	Sample No	Monazite equivalent (ppm)
1	TL02	74±3		6	TL30	92±3
2	TL47	75±3		7	TL41	80±3
3	TL31	74±4		8	TL08	76±3
4	TL16	99±2		9	TL07	75±3
5	TL52	97±3		10	TL24	76±3

CHAPTER 10. RESOURCE ESTIMATION

Characteristically titaniferous magnetite ores vary significantly in composition, containing from 16% to 60% Fe, 1.5% to 38% Ti02 and 0.1% to 2% V205 and are also generally low in S and P (Fischer, 1975; Pang et al., 2010). Deposits of titanomagnetite are found in significant quantities throughout the world. Substantial and expanding resources are found in the Panzhihua Complex in Sichuan Province, China (Pang et al., 2010) and the Windimurra Complex, Australia (Ivanic et al., 2010). Most titaniferous magnetite deposits are vanadium-bearing, and many also contain inter-grown or spatially associated ilmenite (Peck and Huminicki, 2016).

10.1 Domain creation and 3D modelling

The resource estimation was carried out at the Department of Applied Geology, IIT-ISM Dhanbad based on the Magnetic Separation Values (309 no.s) and Chemical analysis results (234no.s). The magnetic fractions A, B, and C are collectively considered as the ore body due to their respective average concentrations of key components (Ti and V). Specifically, the average Fe2O3 content in fraction A, B, and C is above 29.561%, the average TiO2 content is above 7.005%, and the average V2O5 content exceeds 0.131%. These concentrations of A, B, and C together constitute the **Valuable Heavy Mineral (VHM)** of the Talashil block, hence collectively considered as the Ore body (Table 10.1).

Table 10.1 Statistical analysis of Fe2O3, TiO2 and V2O5 in Magnetic fractions (309 samples)

	LIRMS magnetics (A Fraction)			**REDMS magnetics (B Fraction)**			**REDMS middlings (C Fraction)**		
	Min (%)	**Max (%)**	**Average (%)**	**Min (%)**	**Max (%)**	**Average (%)**	**Min (%)**	**Max (%)**	**Average (%)**
Fe2O3	30.01	59.61	45.736	20.61	47.25	33.525	19.04	37.65	29.561
TiO2	5.54	25.98	18.255	2.89	41.41	17.98	1.47	15.32	7.005
V2O5	0.1	0.61	0.386	0.05	0.27	0.131	0.05	0.16	0.085

10.1.1 Block Kriging:

Block Kriging estimates using Ordinary Kriging (OK**)** involve estimating the average value of a variable over a block (a larger area, 100×100×1m in the current area) based on sample data points and variogram modelling. The kriging estimate minimizes the prediction variance, providing an optimal prediction based on the spatial structure of the input borehole data.

Topography and construction of the domain for the block model: As per the Collar elevation (m msl) of 52 borehole locations, the height of the study area varies from 0.626m to 19.265m. An interpolated Digital Elevation Model (DEM) of 100m grid was constructed. Hence, a total of 611 pixels considered for covering the entire exploration area of 5.84 sq km to match with the block model domain. The depth of a borehole typically extends up to 6m depth, thus the assay values are also available below 0 msl for certain locations. Thus, the block model domain incorporates the average surface elevation for a100×100m grid and extends up to 6m in 1m step, thereby achieving an effective block size of 100×100×1m (x, y, z, in m).

10.1.2 Semivariogram Modelling

10.1.2.a Experimental Semivariogram (SV)

A fundamental tool in geostatistics, an experimental semivariogram, is used to quantify the spatial variability of a dataset. It starts with the identification of pairs of data points within the study area, the distance (h) between each pair of data points, the semivariance calculation for each pair of data points, and the plotting of the calculated semivariance values against the distances (h) to create the experimental semivariogram. The experimental variance **($\%^2$)**, lag (m), and maximum distance (m) for the construction of experimental semivariogram is shown in Table 10.2. This plot helps to visualize how data values are correlated with distance. In the current study, an omni directional model has been attempted due to a limited number of data points and a relatively linear spatial distribution of data points. It's a critical step before fitting a theoretical model to the semivariogram, which can then be used for cross-validation and block kriging.

10.1.2.b Fitted semivariogram model:

A fitted semivariogram is a theoretical model that is fitted to the experimental semivariogram to describe the spatial correlation of the data. The fitting of the best model (or curve) that best describes the experimental semivariogram plot can be manual, freehand-fitting, or automatic in nature. A spherical model has been fitted to the experimental semivariogram for Fe_2O_3, TiO_2, and V_2O_5 and VHM concentration in total Sand body and the model parameters nugget, sill, and range are given in Table 10.2.

In general, to fit the chosen model to the experimental semivariogram involves adjusting the parameters (nugget, sill, and range) so that the model closely matches the experimental data points. Here, the nugget (c0) represents the semivariance at a lag distance of zero, accounting for measurement errors or micro-scale variations. The sill (c) is the value at which the semivariogram levels off, representing the total variance. The range (a) is the distance at which the semivariogram reaches the sill, beyond which data points are no longer correlated.

It is an iterative procedure to obtain a best-fit model selected through performance metrics of the cross-validation tests (Table 10.2). The fitted model ensures that it adequately represents the spatial structure of the geophysical variable for the given data, assumptions, and limitations.

Table 10.2. Semi-variogram modelling (experimental, fitted) parameters and cross-validation statistics.

		Fittedsemivariogram model(sphericalmodel)			**Cross-validation**			**Experimental SV.**		
SNo.	**Variable**	**Nugget ($\%^2$)**	**Sill ($\%^2$)**	**Range (m)**	**R (Z,Z*)**	**Std Error (mean± stdev)**	**CL95% (points/total)**	**Exp. Var. ($\%^2$)**	**Lag (m)**	**Max. dist. (m)**
1.	Fe_2O_3 (in%)	4.71	3.76	4100	0.58	0.03±1.17	95% (74/80)	11.62	2260	6000
2.	TiO_2 (in%)	1.05	1.168	3900	0.60	0.04±1.24	95% (73/80)	3.086	2260	6000
3.	V_2O_5 (in%)	0.00031	0.00034	4400	0.64	0.04±1.20	95% (74/80)	0.0009147	2260	6000
4.	VHM Mag.frac. (in%)	38.25	10.52, 14.5	950, 6300	0.71	0.03±0.89	95% (297/309)	73.66	740	6000
5.	BD (kg/m^3)	2580	380	3300	0.43	0.01±0.99	95% (283/309	3324	1000	6000

10.1.2.c Cross-validation:

The commonly used point kriging cross-validation (PKCV) is subsequently applied to measure the model's performance to understand the model's uncertainty and error. The performance metrics are listed in Table10.2. R (Z, Z*) refers to the correlation coefficient, which measures the strength and direction of the linear relationship between two variables. It ranges from -1 to 1. In the context of cross-validation, a higher rho value indicates a stronger agreement between predicted and actual values. The fitted model achieves a correlation coefficient ranging from 0.58 to 0.64 for assay data (Fe_2O_3, TiO_2, and V_2O_5). The performance of the model for VHM (magnetic fraction) is better with r = 0.71 as the number of available data increases to 52 boreholes where the average depth is approx. 6m (total 309 samples).

10.1.3 Kriging Variance

The variance of the kriged block refers to the kriging variance, which is a measure of the estimation precision at a given location. It quantifies the uncertainty associated with the kriging estimate. In simple terms, it tells you how much the estimated value at a specific location might vary due to the spatial arrangement and density of the sample data points used in the kriging process. A lower kriging variance indicates higher precision and confidence in the estimate, while a higher kriging variance suggests greater uncertainty. Thus, for if the estimates for the block is equal to the true value, the variance is zero. As the value of variance increases, the uncertainty associated with the variance increases. The estimates based on kriging variance show that the standard deviation of the Tonnage estimates are ±18.56%, ±28.84%, ±28.48%, and ±17.31 % for Fe_2O_3, TiO_2, and V_2O_5 and VHM in total sand respectively. The relatively lower uncertainty with the VHM, which is±17.31%, is owing to the higher density of boreholes and total samples available for block kriging. Thus, the uncertainty associated with block estimates of Fe_2O_3, TiO_2, V_2O_5, and VHM can be further reduced with denser sampling as the fitted semi-variogram model is likely to perform better with denser sampling.

10.2 Detailed description of ore zones

The Tonnage of total sand body is calculated as **53.047 MMT**. The ore body constitute LIRMS-magnetics (A fraction), REDMS-magnetics (B Fraction) and REDMS-middlings (C fraction). The total tonnage of ore body (VHM) is **8.908 MMT** with average grade of 16.791% in the total

sand body (Table 10.2). Based on the average grade, the total sand body is divided in to High Potential zone (>16%) and Potential Zone (<16%) with area coverage of **2.30 sq.km** and **3.54 sq km** respectively (Fig 10.1).

The average grade (in %), as per the block kriging estimates, for total of 3804 blocks in the study area is 5.8659±1.0887, 2.0393±0.5881, 0.0338±0.0096 for Fe_2O_3, TiO_2, and V_2O_5 respectively in the total sand body. The Total Tonnage (in million metric tonnes, MMT) is 3.111753±0.577531, 1.081808±0.311987, 0.017910±0.005102 for Fe_2O_3, TiO_2, and V_2O_5 respectively (Table 10.3).

Table 10.3 The grade (in %) and tonnage (values in million metric tonnes, MMT) of Total sand body and Orebody.

Seq.	Name	Grade[$,*] (avg)in %	Block (m3) 100×100×1m	No.of Blocks	Bulk Density[$] (avg) Tonnes/ m^3	Total Tonnage (MMT)	[@]St dev of total tonnage (in %)	Tonnage (metal) MMT
1	**Total sand body**	-	10000	3804	1.3945	**53.04678**	-	-
2	**Ore Body**	16.7914 ±2.9060	10000	3804	1.3945	**8.907618 ±1.541606**	±17.31%	-

Table 10.4 The grade (in %) and tonnage (values in million metric tonnes, MMT) of Fe_2O_3, TiO_2, and V_2O_5 within the sand body.

Seq.	Name	Grade[$,*] (avg)in %	Block (m3) 100×100×1m	No.of Blocks	Bulk Density[$] (avg) Tonnes/ m^3	Total Tonnage (MMT)	Stdevof total tonnage (in %)	Tonnage (metal) MMT
1	Fe_2O_3	5.8659 ±1.0887	10000	3804	1.3945	3.111753 ±0.577531	±18.56%	Fe= 2.176456 ±0.403943
2	TiO_2	2.0393 ±0.5881	10000	3804	1.3945	1.081808 ±0.311987	±28.84%	Ti= 0.648380 ±0.186989
3	V_2O_5	0.0338 ±0.0096	10000	3804	1.3945	0.017910 ±0.005102	±28.48%	V= 0.010033 ±0.002858

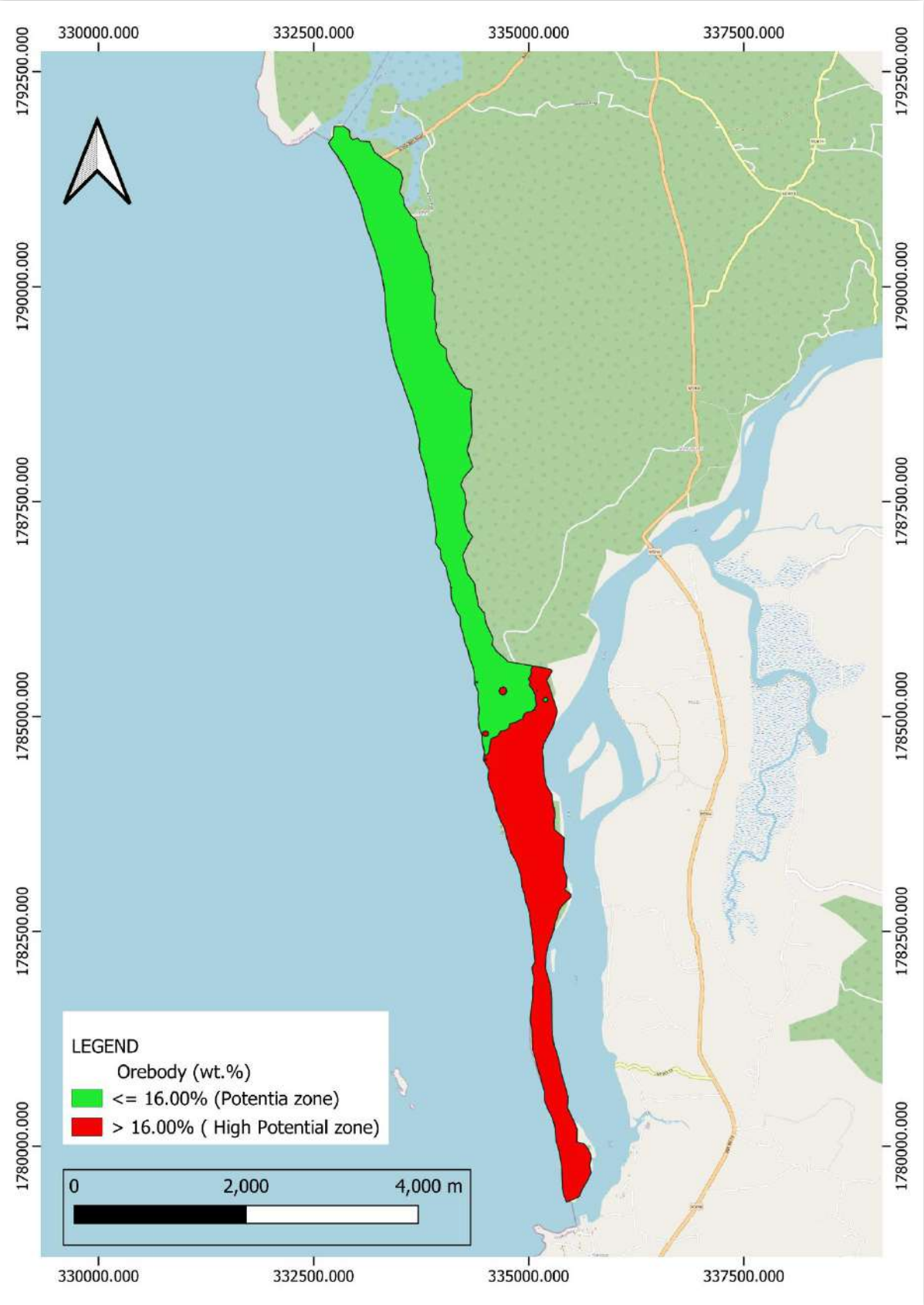


Figure 10.1 Map Showing Potential Zones

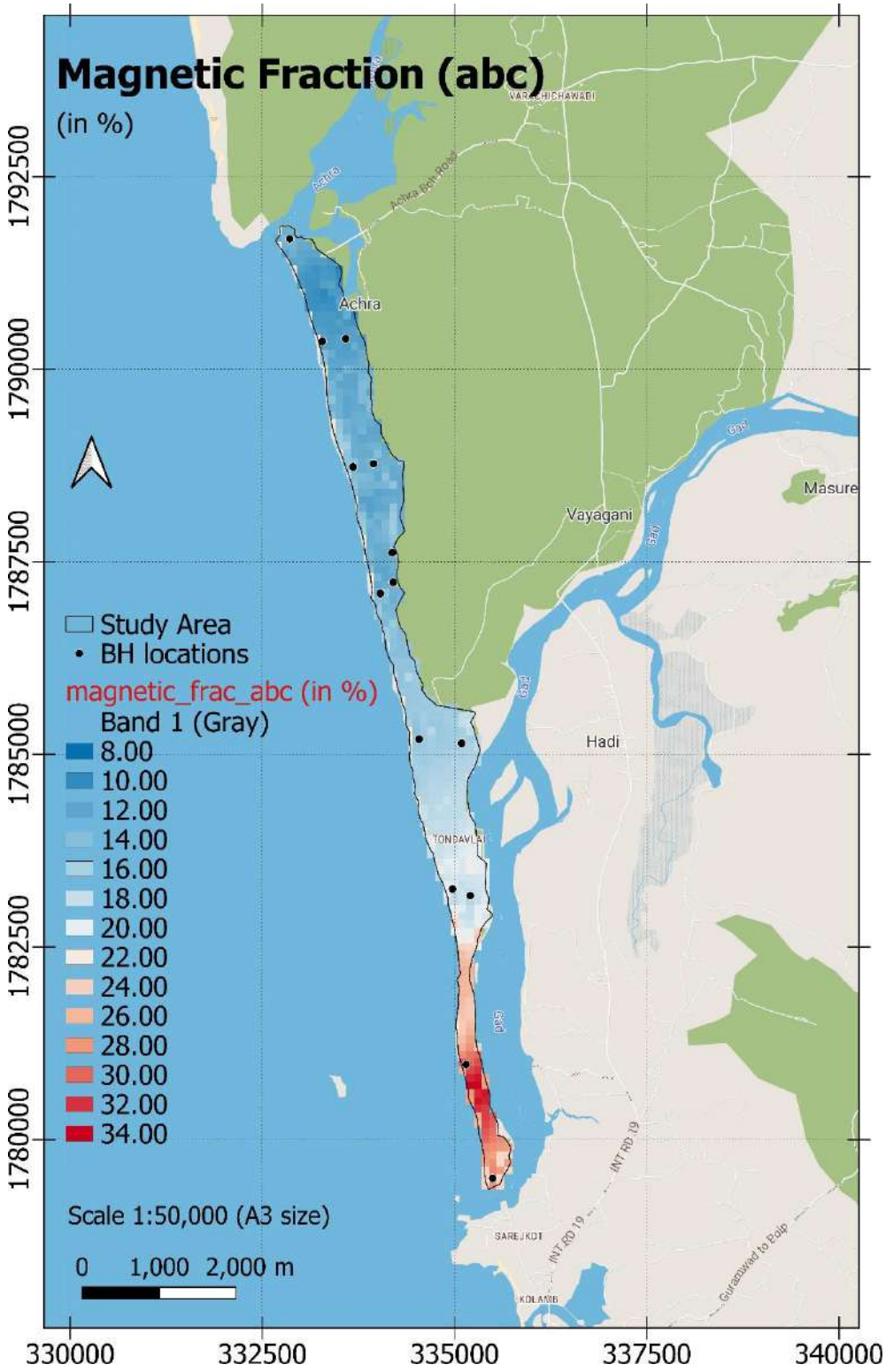


Figure 10.2. Spatial variability map of VHM concentration (wt%) in the sand body (Thickness of 6.0m)

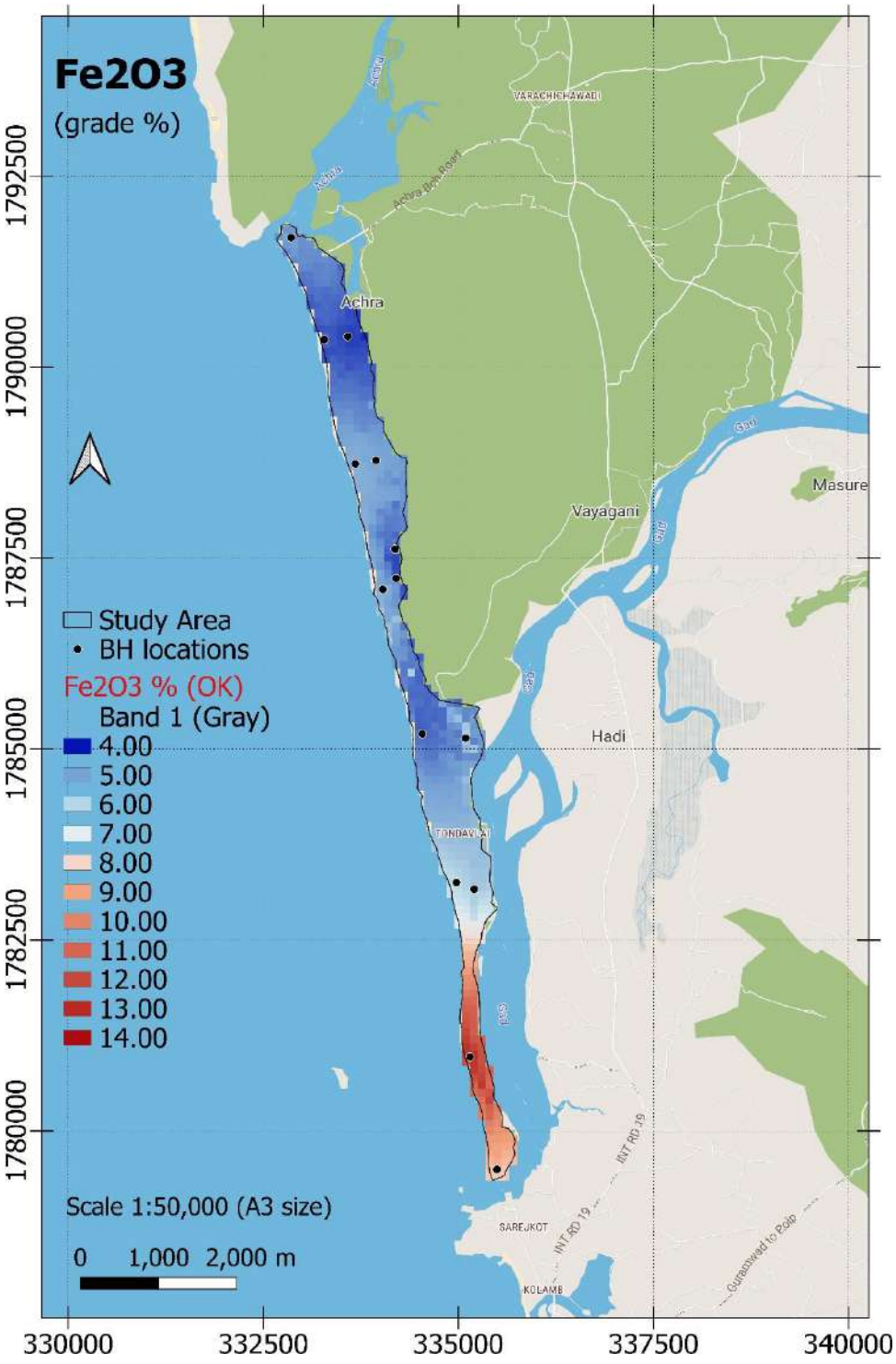


Figure 10.3-Spatial variability map of Fe2O3 grade (wt%) in sand body (Thickness of 6.0m)

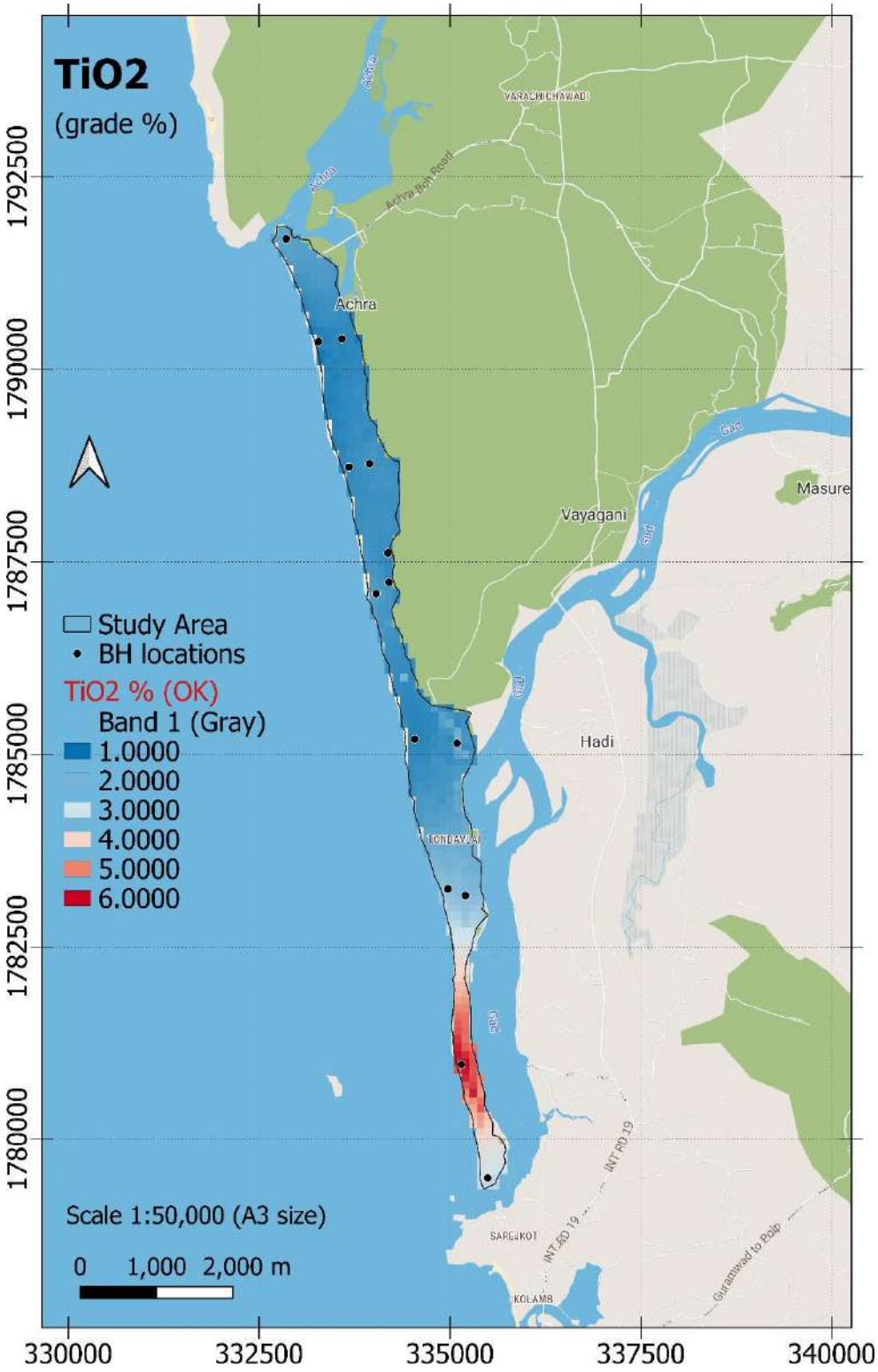


Figure 10.4. Spatial variability map of TiO2 grade (wt%) in sand body (Thickness of 6.0m)

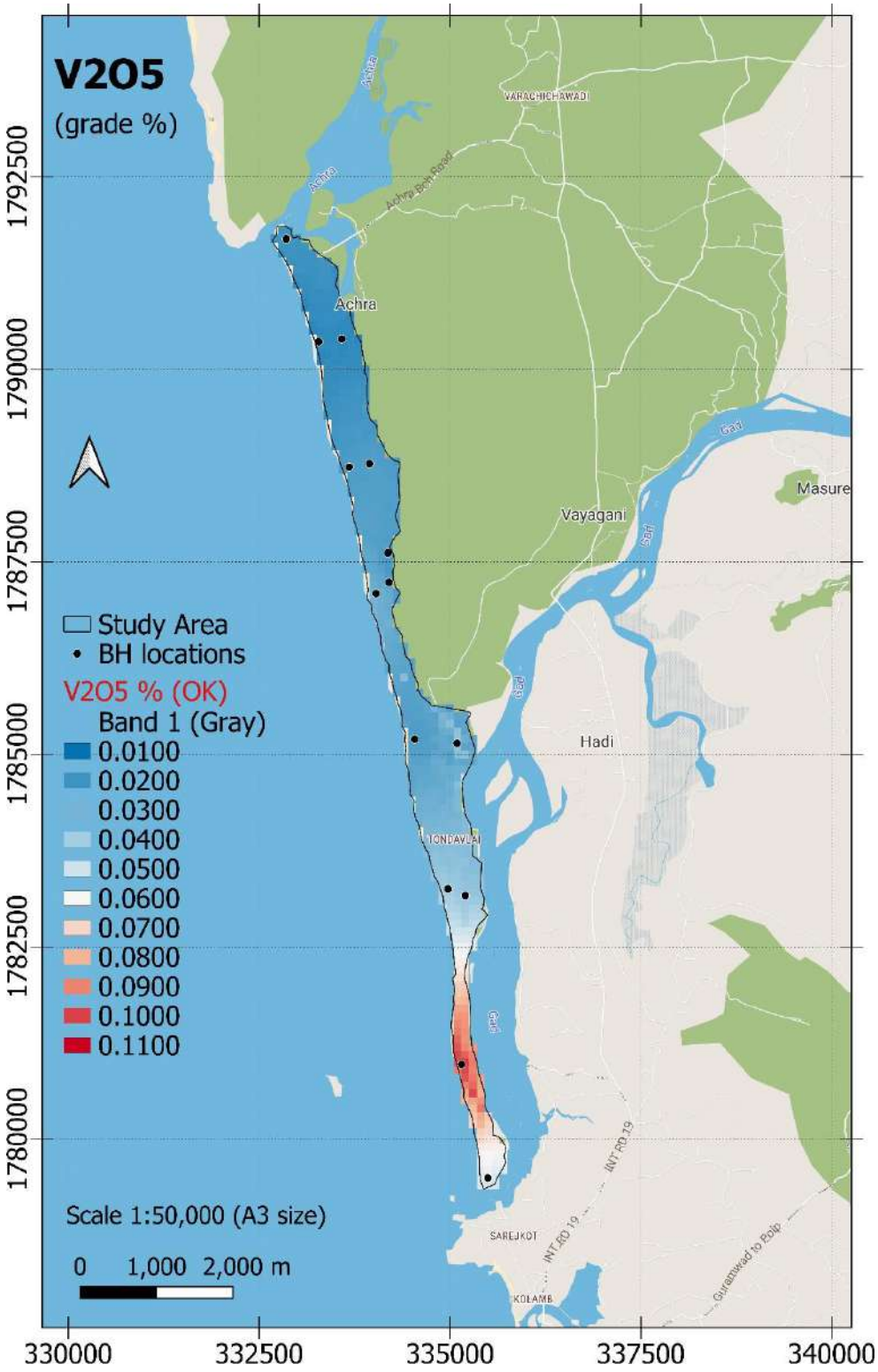


Figure 10.5. Spatial variability map of V2O5 grade (wt%) in sand body (Thickness of 6.0m)

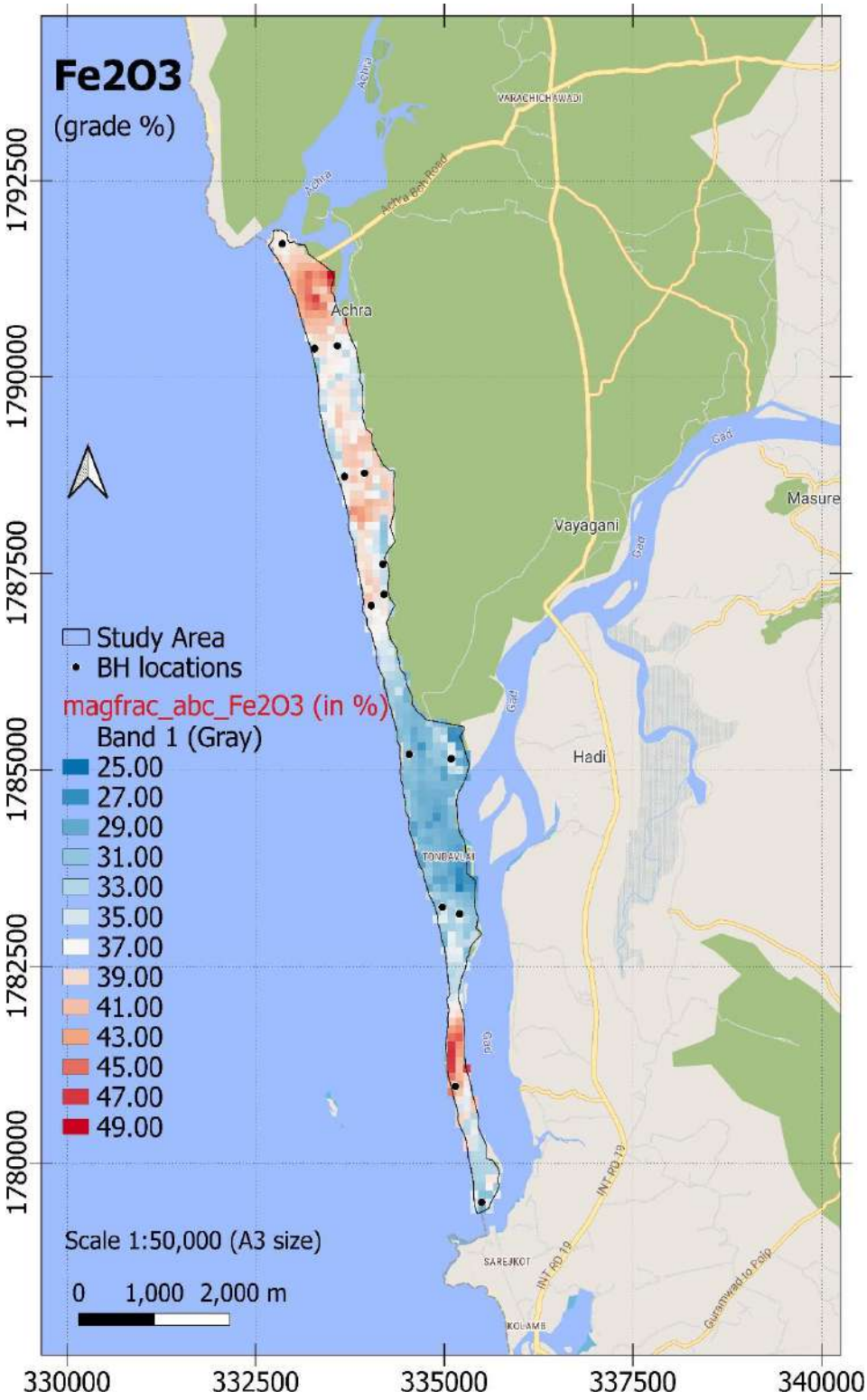


Figure 10.6-Spatial variability map of Fe2O3 grade (wt%) in Orebody (Thickness of 6.0m)

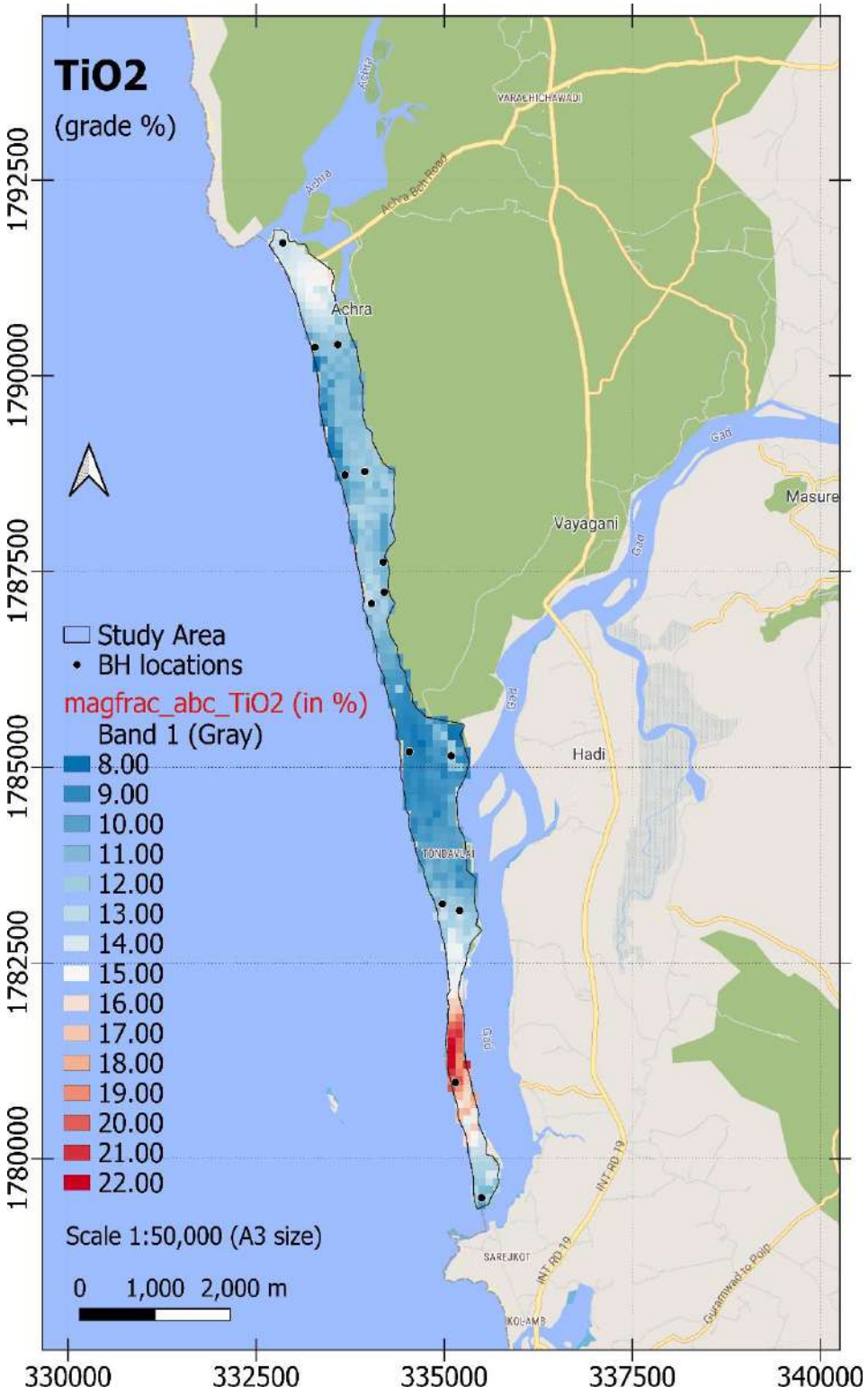


Figure 10.7-Spatial variability map of TiO2 grade (wt%) in Orebody (Thickness of 6.0m)

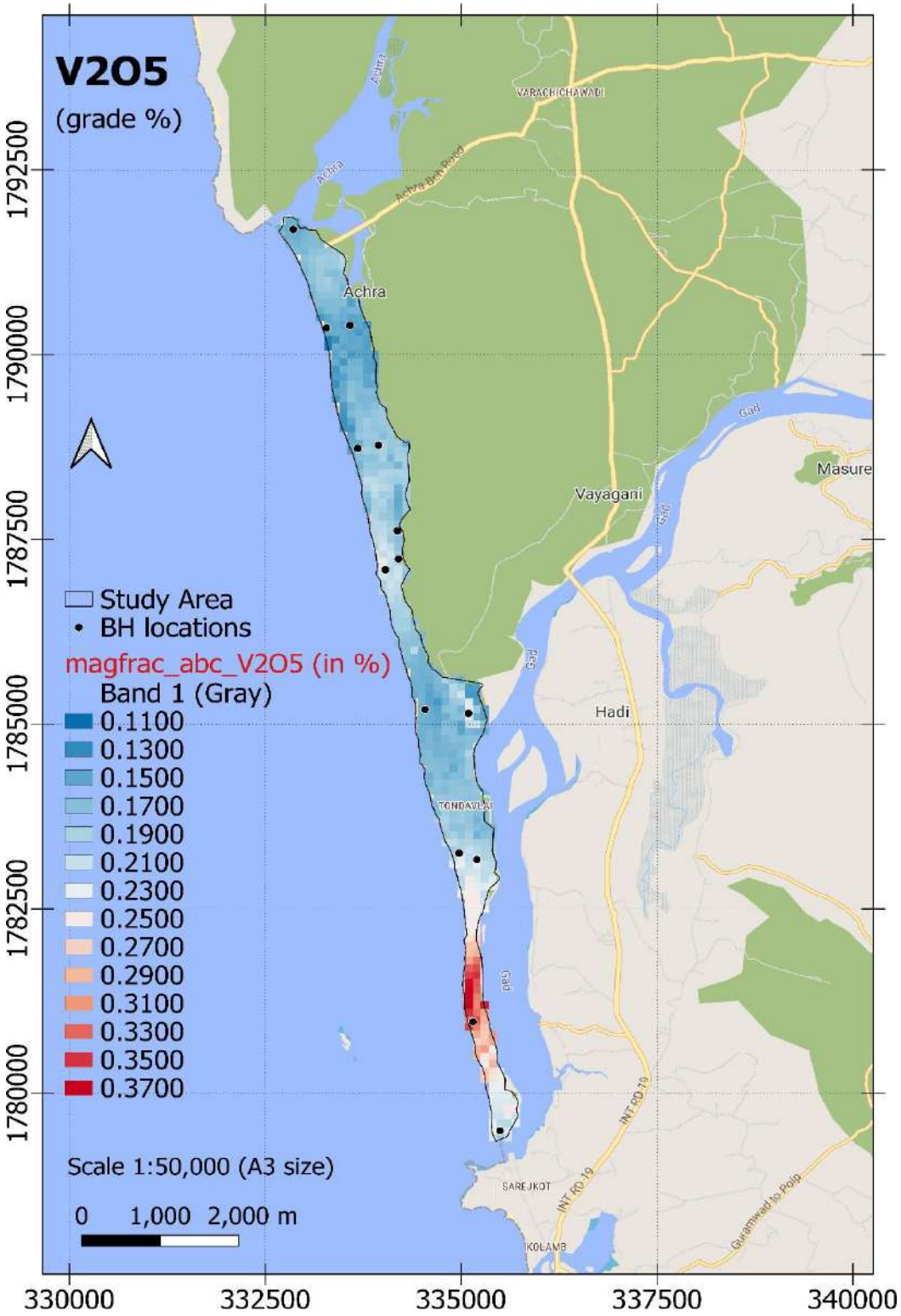


Figure 10.8. Spatial variability map of V2O5 grade (wt%) in Orebody (Thickness of 6.0m)

10.3 Cut-off grade

The chemical composition of titanomagnetite concentrate processed by industrial smelters in Highveld Steel, South Africa, contains 1.65 wt% V_2O_5 and 12.7 wt% TiO_2, in New Zealand Steel, New Zealand, the concentrate contains 0.56 wt% V_2O_5 and 7.8 wt% TiO_2 whereas in Panzhihua Steel, China, the titanomagnetite concentrate has 0.58 wt% V_2O_5 and 12.7 wt% TiO_2. In NTMK Steel, Russia, the concentrate contains between 0.57-0.66 wt% V_2O_5 and approximately 3 wt% TiO_2 (Geldenhuys et.al., 2020).

These details refer to magmatic iron-titanium deposits in layered gabbro except that of New Zealand Steel. In comparison, the Talashil block which occurs as placers, has average grades of 11.3% TiO_2 and 0.17% V_2O_5. Despite being lower-grade compared to other regions, it is technically possible to extract both titanium and vanadium from the ore.

10.4 Description and correlation of lodes

10.4.1 Univariate Statistics

The descriptive statistics based on the supplied borehole data is as follows.

Table10.5 Descriptive Statistics of Oxides (in wt. %).

Descriptive Statistics			
	Fe203wt.%	TiO2wt%	V2O5wt%
Mean	5.852	1.985	0.0329
Standard Error	0.383	0.198	0.00340
Median	4.944	1.561	0.0243
Standard Deviation	3.430	1.768	0.0304
Sample Variance	11.77	3.125	0.0009
Kurtosis	15.69	19.282	16.652
Skewness	3.455	3.9204	3.6316
Range	23.484	12.504	0.2071
Minimum	2.169	0.1900	0.004
Maximum	25.653	12.694	0.2111
Sum	468.100	158.751	2.6316
Confidence Level (95.0%)	0.7633	0.3934	0.0068

10.4.2 Bivariate Statistics

In geological or geochemical studies, the correlation between Fe_2O_3, and TiO_2, or TiO_2, and V_2O_5, or Fe_2O_3, and V_2O_5 can potentially reveal important information about the origin and processes affecting the sediments being analyzed. A strong positive correlation between the elements often suggests a common source or similar geochemical behavior during weathering, transportation, or deposition. The bivariate statistics show a very good correlation among pairs (bivariate scatterplots) for Fe_2O_3, TiO_2, and V_2O_5, showing a potentially common source. This indicates that iron, titanium, and vanadium-bearing minerals are being concentrated due to similar physical and/ or chemical conditions.

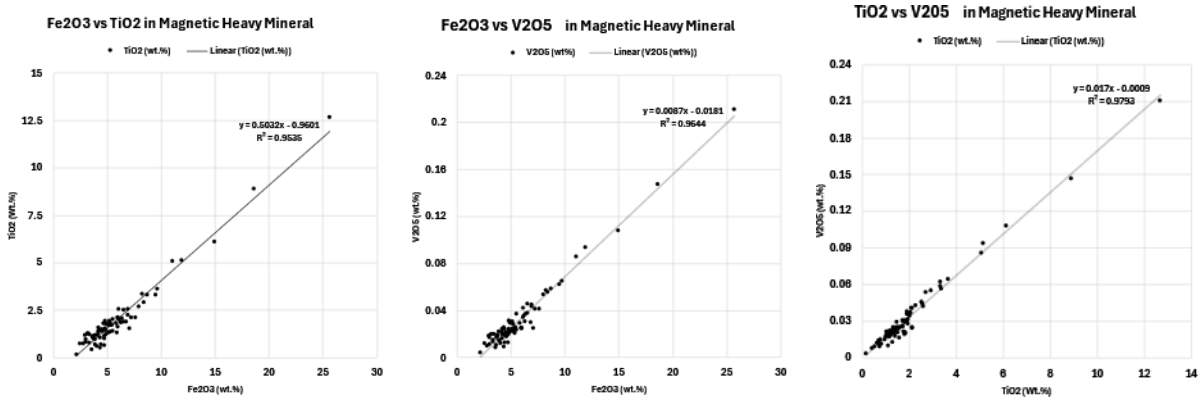


Figure 10.9 Bivariate scatter plots between pairs of Fe_2O_3, TiO_2, and V_2O_5.

10.5 Preparation of LV section and Level plan.

The Resource estimation was carried out using the Software packages. The LV section is given in the Figure 10.10

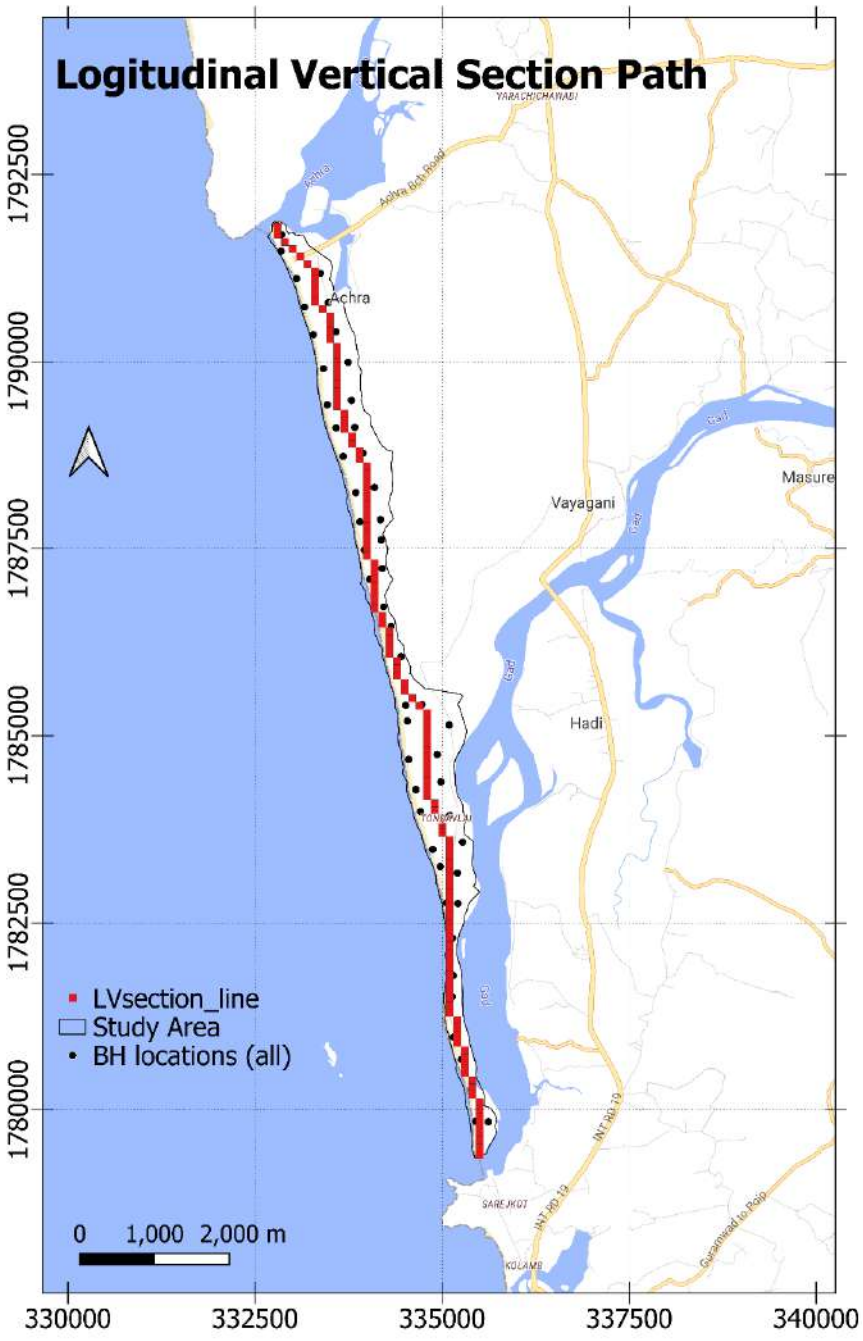


Figure 10.10 The path along which the longitudinal vertical section has been constructed is depicted as the red line.

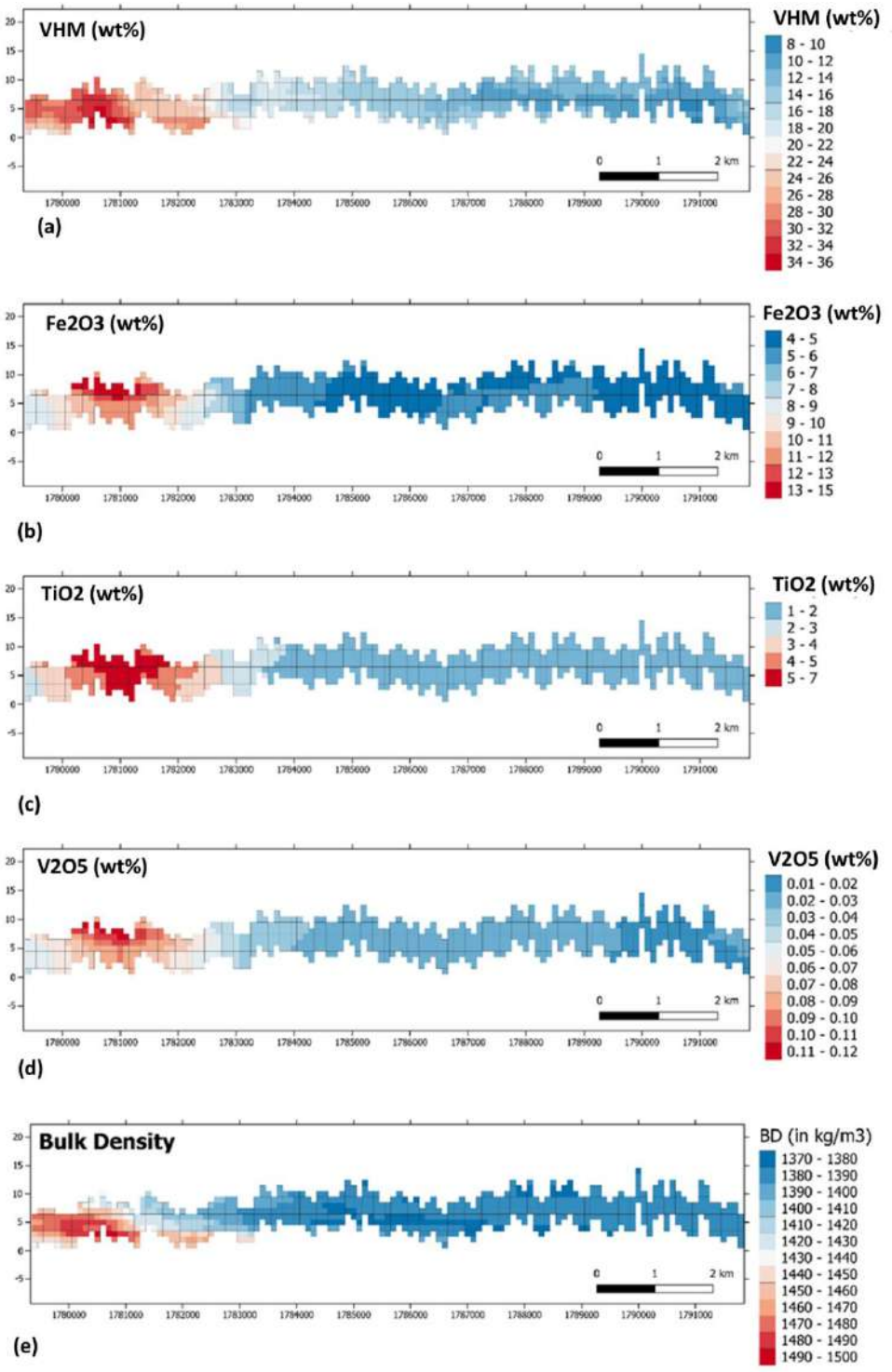


Figure 10.11 The longitudinal vertical (LV) section, along the path shown for (a) VHM (in %), (b) Fe2O3 (in %), (c) TiO2 (in %), (d) V2O5 (in %), and (e) Bulk Density (in kg/m3). (100x exaggeration.) The x-axis depicts south to north (left to right).

Figure 10.12 3D Side view (NW-SE) of the Sand body with potential and high potential zones (vertical exaggerated:10X)

Figure 10.13 3D view (N-S) of the Sand body with potential and high potential zones (vertical exaggerated:10X)

10.6 Specific gravity/bulk density calculation

The concentration of heavy minerals in the beach and dune sands varies along the coastal stretch and samples were selected to represent the entire mineralized body both horizontally and vertically. Subsequently, the dry bulk density was determined for the representative samples, which were selected based on the cumulative weight percentage of magnetic fractions A, B, and C. These fractions were isolated through a two-stage magnetic separation process.

To determine representative samples for calculating bulk density, the total weight percentage of magnetic fractions (A+B+C) across 309 samples was analyzed. The values ranged from 2.01% to 53.05%. To categorize these samples, six equal intervals were created: 2%-10.5%, 10.5%-19%, 19%-27.5%, 27.5%-37%, 37%-45.5%, and 45.5%-53% (Table 10.6). One sample from each interval, closest to the average value, was selected as a representative, resulting in a total of six representative samples. The details are provided in the table below. The dry bulk density of the representative samples were determined by following the standard procedure as per IS:1124-1074 by water displacement method at Matter Material Testing and Research Laboratory Pvt. Ltd, Calicut.

Table 10.6 Bulk density of representative samples

Sl no.	Sample no.	Range of VHM (%)		
		From	To	Bulk density (g/cc)
1	TL01/5-6	2	10.5	1.39
3	TL22/3-4	10.5	19	1.38
2	TL15/1-2	19	27.5	1.36
6	TL49/1-2	27.5	37	1.51
4	TL29/5-6	37	45.5	1.6
5	TL43/5-6	45.5	53	1.66

As per the Table 10.6, BD was applied to all 309 samples. This approach ensures that the bulk density of the selected samples is accurately applied to each mineralized zone during the resource estimation process. As part of the estimation, bulk density data was subjected to Block Kriging, allowing for the calculation of bulk density values for each block. These estimated bulk density values were then used

in tonnage calculations for individual blocks within the software. The range of Bulk density value with in the blocks are given in Figure 10.14.

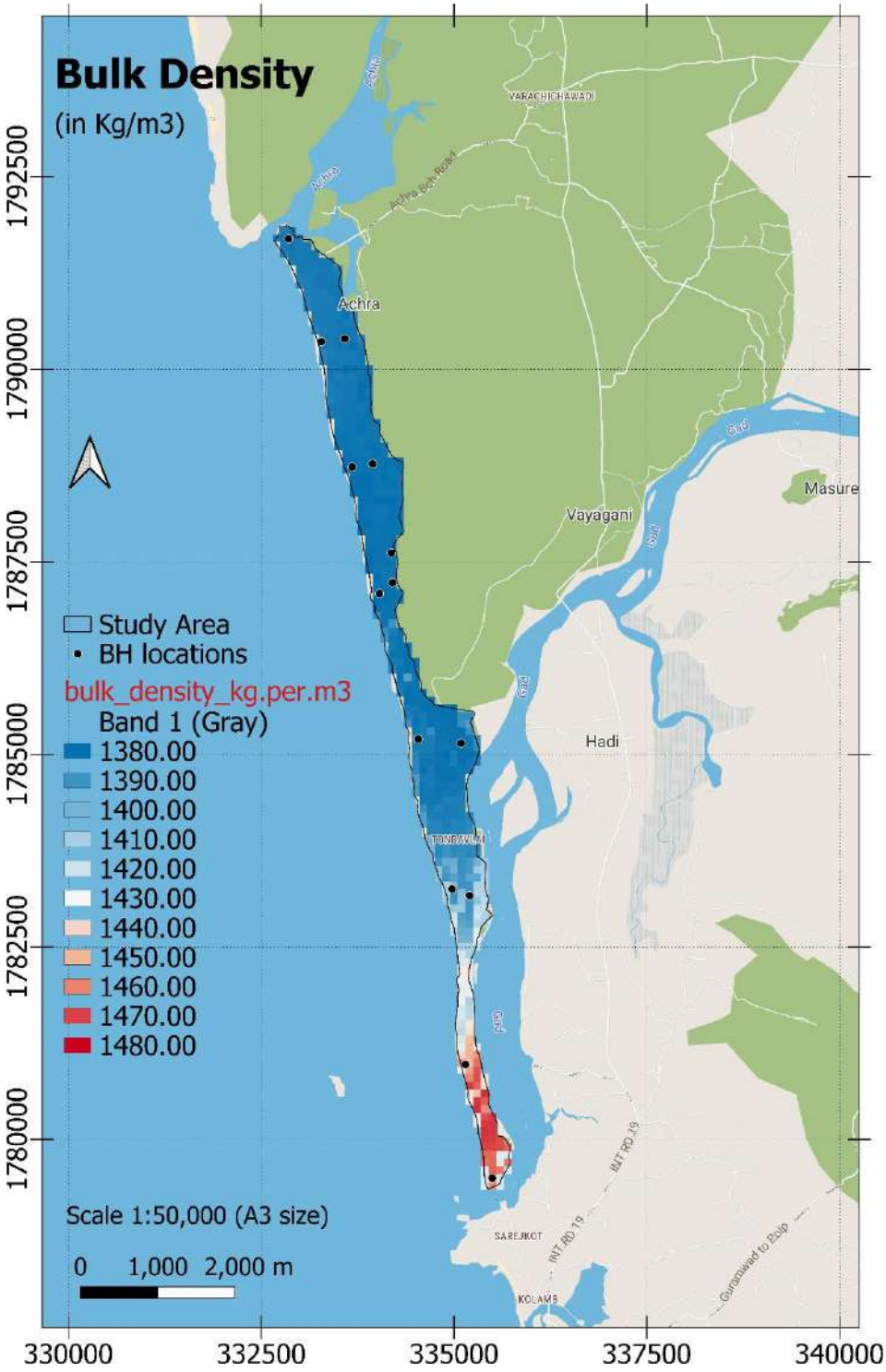


Figure10.14 Spatial variability map of Bulk Density (in sand body) in kg/m^3.

10.7 Assumption and limitations for resource estimation

As block kriging with an underlying spherical semivariogram model was used for estimating the kriged estimate, standard deviation, and variance of the given blocks for given variables. The key assumptions guided by the limitations of the available data are: (a) The spatial correlation structure seems to be consistent (stationarity), (b) relationship between data points is the same in all directions (isotropy, for omni directional model), (c) beyond a certain distance (the range), the spatial correlation between data points is non-existent (finite range), (d) non-negative data and normal distribution of variables. The omni directional spherical model considers the nugget effect, total variance (sill), and range on the kriged estimates.

10.8 Resource estimation by cross section and longitudinal vertical section methods

The Resource estimation was carried out using software packages.

10.9 Category of resources as per MEMC, 2015 along with UNFC classification.

The exploration has been carried out as per Mineral (Evidence of Mineral Contents) Rule-2015, mineral (Evidence of Mineral Contents) Rule-2021 and the Mineral Resources are estimated as per UNFC norms. Since this is preliminary exploration (G3) with no study on ‘E’ and ‘F’ axes, the resource has been classified under UNFC G3F3E3.

CHAPTER 11. CORE PRESERVATION

The samples are split into two equal halves using the coning and quartering method. One half is stored in the in-house repository (Geo Marine Solutions), while the other is used for analysis. Each representative samples were then stored in a polythene bag and labeled according to a standard numbering system. The samples are labeled with the following format: location - borehole number - depth range (e.g., TL-01-0 to 1.0m).

CHAPTER 12. CONCLUSION AND RECOMMENDATION

The exploration in the Talashil Block started in the month of March, 2024. Field components successfully completed as per the approved time schedule. Except chemical (XRF), XRD and Bulk density analyses, all lab works were carried out in-house. The enormous data generated from the field and laboratories were compiled, synthesized, and interpreted. Meticulous planning and execution helped us to achieve the target in the field and lab as well which is considered to be the success of the project. The data collected from the field and generated from labs were utilised to understand, model and estimated the resource by taking adequate care.

The data from the preliminary exploration (G3) carried out in an area of 5.84 sq.km shows the entire sand body of the explored block stretching 12.8 km along NNW-SSE parallel to the shore is anomalous and may be termed as titanomagnetite-ilmenite deposit with encouraging grades and tonnages of Fe2O3, TiO2 and V2O5. The total tonnage of the sand body in the block is estimated to be **53.04678 MMT,** in which **8.9076 MMT** is the ore body that constitutes about **16.84%.** Out of which A fraction (LIRMS-magnetics) represents about 6.01%, B fraction (REDMS-magnetics) 1.5% and C fraction (REDMS-middlings) represents 9.33%. The grade of Fe2O3 in the total sand is 5.866%, TiO2 2.039% and V2O5 0.034%. Whereas in the orebody, the grades increase considerably as 35.2% Fe2O3, 11.7% TiO2 and 0.18% V2O5. Since the ore minerals are already occurring as liberated in the sand, these grades are very significant. The total tonnage of Fe2O3 is estimated at 3.1118 MMT, TiO2 1.0818MMT and V2O5 0.0179MMT in the Talashil Block explored. However, an area of 2.3 sq.km marked as high potential in the southern part of the block having orebody grade between 16 and 34% and the remaining 3.54 sq.km area is marked as potential with orebody grade between 9 and 16%. Further, when the metal enrichment values among A, B and C fractions are determined, it is found that A and B fractions together holds 83% of vanadium and 76% of titanium in the high potential zone compared to 71% of vanadium and 60% of titanium in the potential zone. Since the A and B fractions constitute only about 45% of the total orebody (A+B+C), this information is vital during the beneficiation of magnetic minerals.

The low-grade titanium ores (titanomagnetite) are being utilised for iron, titanium, and vanadium many parts of the world as exemplified above. Regarding the importance of liberated ore minerals in placer deposits, it is significant because the liberation of ore minerals means that the valuable minerals are already separated from the surrounding rock. This makes the extraction process more efficient and cost-effective compared to deposits where the ore minerals are still locked within the host rock, like the titanomagnetite bands in layered gabbro deposits found in many parts of the world (ex: Bushveld complex, South Africa).

Hence, we recommend that the high potential area as mentioned in the report may be taken up first for further exploration (G2) so that close spaced and deep drilling would bring out the size and shape of the entire orebody. Since the Gad River acting as influx of heavy mineral to the coastal region, the area further south of the Talashil block may also potential. Therefore, after carrying out field check in the southern part of the present block, a suitable area may be proposed for further exploration.

The exploration has been carried out as per Mineral (Evidence of Mineral Contents) Rule-2015 and the mineral resources are estimated as per UNFC norms. Since this is preliminary exploration (G3) with no study on ‘E’ and ‘F’ axes, the resource has been classified under UNFC G3F3E3.

APPENDIX :1 REVIEWER'S COMMENTS.

Comment 1: *It is mentioned A, B and C fractions can be considered to be the ore for the purpose of resource estimation. In spite of poor concentration of V2O5 and TiO2 Why C fraction is considered to be part of ore may be elaborated*.

Explanation

The XRF data shows that the average V2O5 content in the C fraction is 0.08% (Table I), which is very significant, considering the resource of Radhpu vanadiferous graphite block, Arunachal Pradesh, proven by the Geological survey of India having an estimated resource of 18,008 tonnes of V2O5 with a minimum cutoff of 0.03%.

The present G3 exploration in the Talashil block, the resource estimated is 17910 tonnes of V2O5 resource (Table 10.4), out of which 4000 tonnes are contained in the C fraction.

The magnetic fractions are separated into LIRMS magnetics as A, REDMS magnetics as B and REDMS middlings as C fractions based on the magnetic susceptibility during the two-level magnetic separations. A, B and C fractions are combinedly termed as Valuable Heavy Minerals (VHM). The resource (A+B+C) estimated within the block is 8.908 MMT of VHM, which is 16.791% in 53.04678 MMT of total sand (Table 10.3). The C fraction constitutes of 9.33 % of total 53.04678 MMT of total sand (Section 9.2 & Table II).

As per the IBM year book of 2022, the total resource of V2O5 estimated in India is 64594 tonnes, which is in the hard rock. The importance of liberated ore minerals in placer deposits is significant because the liberation of ore minerals means that the valuable minerals are already separated from the surrounding rock. This makes the beneficiation process more easy, efficient and cost-effective compared to deposits where the ore minerals are locked within the host rock, like the titanomagnetite bands in layered gabbro deposits.

Table I. Overall statistics of XRF Analysis

Fraction	A Fraction			B Fraction			C Fraction			Avg in VHM (%)
	Min (%)	Max (%)	Avg (%)	Min (%)	Max (%)	Avg (%)	Min (%)	Max (%)	Avg (%)	
Al2O3	3.04	13.55	**6.38**	1.76	13.46	**7.42**	0.13	13.46	**9.75**	
BaO	0	0.04	**0.04**	0.04	0.04	**0.04**	0	0.04	**0.04**	
CaO	1.05	4.26	**2.33**	0.91	6.05	**3.35**	1.62	305	**7.49**	
Cr2O3	0.04	0.1	**0.05**	0.04	0.09	**0.04**	0.04	0.16	**0.06**	
Fe2O3	30.01	59.61	**45.74**	20.61	47.25	**33.53**	19.04	37.65	**29.56**	**35.889**
K2O	0.09	0.47	**0.26**	0.07	0.86	**0.4**	0.27	0.81	**0.44**	
MgO	1.73	5.57	**3.36**	2.01	6.53	**4.28**	3.42	7.23	**5.82**	
MnO	0.17	0.68	**0.49**	0.05	0.51	**0.29**	0.04	0.31	**0.18**	
Na2O	0.14	1.5	**0.51**	0.09	1.88	**0.67**	0.15	1.48	**0.59**	
P2O5	0.06	0.42	**0.19**	0.04	0.38	**0.22**	0.18	0.41	**0.31**	
SO3	0.04	26.82	**1.77**	0.04	31.73	**1.14**	0.04	39.47	**3.46**	
TiO2	5.54	25.98	**18.25**	2.89	41.41	**17.98**	1.47	15.32	**7**	**15.093**
SiO2	7.03	29.04	**17.95**	5.92	46.07	**26.07**	24.55	55.68	**34.45**	
V2O5	0.1	0.61	**0.39**	0.04	0.27	**0.13**	0.04	0.16	**0.08**	**0.202**

Table II. Overall Statistics of Two Level magnetic & Gravity separation

Magnetic Fractions		Min. (%)	Max. (%)	Avg. (%)
Magnetic Heavy Minerals	**LIRMS mag (A)**	0.23	31.76	**6.01**
	REDMS mag (B)	0.06	14.47	**1.50**
	REDMS mid. (C)	1.64	19.69	**9.33**
Non-Magnetic Heavy Minerals (NMHM)	**Non mag HM (D)**	0	3.13	**0.86**
Non-Magnetic Non-Heavy Minerals (NMLM)	**Non mag Lights (E)**	45.16	97.53	**81.82**

Comment 2. *It is suggested block under study can be marked on geological map (fig 4.1).*

Explanation:

The Geological map (1:50,000 scale) with Talashil block boundary is included in the report (Fig.4.1).

Comment 3. *In addition, if feasible G3 level exploration may be recommended in areas further south of present block after evaluation of available data and reconnaissance studies.*

Explanation:

Recommendation is updated and included in the report.

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Annexure 1

Boundary coordinates

Annexure-1: Boundary Coordinates of the Talashil Block

Sl no.	Longitude (E)	Latitude (N)		Sl no.	Longitude (E)	Latitude (N)		Sl no.	Longitude (E)	Latitude (N)
1	73.43613	16.20155		42	73.44292	16.17457		83	73.45149	16.13856
2	73.43604	16.20152		43	73.44315	16.17389		84	73.45186	16.13764
3	73.43575	16.20151		44	73.4436	16.17274		85	73.45188	16.13684
4	73.43571	16.20149		45	73.44385	16.17211		86	73.45212	16.1359
5	73.43563	16.20153		46	73.44418	16.17111		87	73.45203	16.13499
6	73.43544	16.20152		47	73.44437	16.17034		88	73.4526	16.13407
7	73.43523	16.20141		48	73.44461	16.16946		89	73.45252	16.1331
8	73.43522	16.20098		49	73.44483	16.16867		90	73.45272	16.13222
9	73.43517	16.20043		50	73.44477	16.16768		91	73.45314	16.13135
10	73.43468	16.19979		51	73.445	16.16677		92	73.45332	16.13056
11	73.43468	16.19974		52	73.44531	16.16602		93	73.45349	16.12969
12	73.43506	16.19913		53	73.44558	16.16489		94	73.45405	16.12842
13	73.43536	16.19877		54	73.44569	16.16429		95	73.45438	16.12798
14	73.4357	16.19837		55	73.44581	16.1633		96	73.45454	16.12708
15	73.43647	16.19717		56	73.44605	16.1624		97	73.45487	16.12614
16	73.43674	16.19664		57	73.44624	16.16177		98	73.4551	16.12531
17	73.43704	16.19605		58	73.44649	16.16062		99	73.45558	16.12453
18	73.43753	16.19488		59	73.44661	16.15975		100	73.45588	16.12382
19	73.43793	16.19409		60	73.44675	16.15885		101	73.45621	16.12281
20	73.43814	16.19361		61	73.44659	16.15789		102	73.45631	16.12175
21	73.43829	16.19315		62	73.44715	16.15709		103	73.45636	16.12165
22	73.43853	16.19219		63	73.44721	16.15619		104	73.45659	16.12099
23	73.4387	16.19152		64	73.44779	16.15527		105	73.45676	16.12008
24	73.43906	16.19051		65	73.44808	16.15402		106	73.45708	16.11923
25	73.43932	16.18978		66	73.44828	16.15359		107	73.45719	16.11836
26	73.43972	16.18873		67	73.44836	16.1526		108	73.45733	16.11747
27	73.43998	16.18802		68	73.44845	16.15184		109	73.45745	16.11683
28	73.44019	16.18724		69	73.44899	16.15061		110	73.45756	16.11566
29	73.44048	16.18633		70	73.44937	16.15007		111	73.4577	16.11469
30	73.44068	16.18535		71	73.44938	16.14921		112	73.45781	16.11386
31	73.44083	16.18456		72	73.44968	16.14837		113	73.45744	16.11328
32	73.44094	16.18357		73	73.44991	16.14736		114	73.4577	16.11203
33	73.44098	16.18269		74	73.45028	16.14651		115	73.45755	16.11105
34	73.44102	16.18179		75	73.45044	16.14571		116	73.45761	16.11024
35	73.44111	16.1809		76	73.45082	16.14475		117	73.45747	16.10944
36	73.44138	16.17986		77	73.45099	16.14396		118	73.45734	16.10829
37	73.44154	16.17909		78	73.451	16.14301		119	73.45731	16.10769
38	73.4417	16.17801		79	73.45142	16.14218		120	73.45754	16.1066
39	73.44187	16.17744		80	73.45137	16.14118		121	73.45754	16.10573
40	73.44223	16.17626		81	73.45152	16.14034		122	73.45763	16.10458
41	73.44247	16.1756		82	73.45143	16.1395		123	73.45789	16.1038

Sl no.	Longitude (E)	Latitude (N)		Sl no.	Longitude (E)	Latitude (N)		Sl no.	Longitude (E)	Latitude (N)
124	73.45806	16.10307		165	73.45979	16.10588		206	73.45854	16.13676
125	73.45839	16.10199		166	73.45971	16.1069		207	73.45955	16.1386
126	73.45864	16.10113		167	73.45968	16.10774		208	73.45999	16.1402
127	73.45892	16.10017		168	73.45969	16.10831		209	73.45924	16.14245
128	73.4589	16.09935		169	73.45965	16.10976		210	73.45901	16.14314
129	73.45931	16.09839		170	73.45958	16.11056		211	73.4588	16.14341
130	73.45973	16.09767		171	73.45949	16.11139		212	73.45943	16.14447
131	73.46003	16.09674		172	73.45926	16.11211		213	73.45918	16.14467
132	73.46013	16.09594		173	73.4589	16.11329		214	73.45457	16.14539
133	73.46021	16.09505		174	73.45895	16.11406		215	73.4544	16.14563
134	73.46053	16.09405		175	73.45895	16.11447		216	73.45337	16.14644
135	73.46069	16.09316		176	73.45925	16.11581		217	73.45303	16.14702
136	73.46085	16.09239		177	73.45967	16.11674		218	73.4528	16.14714
137	73.46089	16.09158		178	73.45985	16.1175		219	73.4529	16.14721
138	73.46092	16.09057		179	73.45986	16.11797		220	73.45293	16.14791
139	73.46103	16.08958		180	73.46018	16.11859		221	73.45234	16.14906
140	73.46143	16.08864		181	73.46019	16.11885		222	73.45216	16.14948
141	73.46281	16.08924		182	73.4603	16.11923		223	73.45198	16.15051
142	73.46305	16.08994		183	73.46046	16.11946		224	73.45135	16.15121
143	73.46368	16.09096		184	73.46064	16.11973		225	73.45125	16.15194
144	73.46404	16.09172		185	73.46165	16.12073		226	73.45104	16.15255
145	73.46404	16.09193		186	73.46157	16.121		227	73.45101	16.15291
146	73.46386	16.09256		187	73.46093	16.12151		228	73.45092	16.15356
147	73.46407	16.09321		188	73.46112	16.12174		229	73.45016	16.15456
148	73.46397	16.09376		189	73.4612	16.12279		230	73.44961	16.15653
149	73.46384	16.09396		190	73.46093	16.12346		231	73.45039	16.15815
150	73.46361	16.09434		191	73.46076	16.12412		232	73.45065	16.15849
151	73.46322	16.09479		192	73.46081	16.12503		233	73.45014	16.15914
152	73.46248	16.09497		193	73.46087	16.12691		234	73.44978	16.16014
153	73.4625	16.09628		194	73.45975	16.1278		235	73.44972	16.1611
154	73.4623	16.09681		195	73.45972	16.1287		236	73.44989	16.16168
155	73.46156	16.09827		196	73.45985	16.12934		237	73.44995	16.16222
156	73.46144	16.09857		197	73.45973	16.12992		238	73.44983	16.16256
157	73.4615	16.09971		198	73.4596	16.13043		239	73.44978	16.16307
158	73.46125	16.10055		199	73.45957	16.13093		240	73.44931	16.16391
159	73.4607	16.1023		200	73.45949	16.13147		241	73.44963	16.16467
160	73.46065	16.10246		201	73.45889	16.13242		242	73.45061	16.16582
161	73.46051	16.10335		202	73.45868	16.13331		243	73.45	16.16755
162	73.4603	16.10401		203	73.45856	16.13412		244	73.45025	16.16857
163	73.46024	16.10431		204	73.45853	16.13486		245	73.4505	16.16934
164	73.45993	16.10501		205	73.45841	16.13601		246	73.4503	16.1725

Sl no.	Longitude (E)	Latitude (N)		Sl no.	Longitude (E)	Latitude (N)		Sl no.	Longitude (E)	Latitude (N)
247	73.45048	16.17335		261	73.44615	16.18544		275	73.44277	16.19614
248	73.45043	16.17397		262	73.44595	16.18604		276	73.44247	16.19691
249	73.44979	16.17411		263	73.44559	16.18803		277	73.43969	16.1988
250	73.44901	16.17473		264	73.4454	16.18834		278	73.43914	16.19991
251	73.44771	16.17714		265	73.44514	16.18875		279	73.43811	16.19999
252	73.44764	16.17821		266	73.44466	16.18998		280	73.43777	16.20032
253	73.44692	16.17877		267	73.44439	16.19069		281	73.43765	16.20021
254	73.44645	16.1801		268	73.44426	16.19174		282	73.43724	16.20012
255	73.44657	16.18086		269	73.44376	16.19215		283	73.437	16.20052
256	73.4464	16.18129		270	73.44366	16.19228		284	73.43697	16.20108
257	73.44637	16.18293		271	73.44299	16.19324		285	73.43629	16.2015
258	73.44644	16.18336		272	73.44285	16.194		-	-	-
259	73.44643	16.18377		273	73.44267	16.19432				
260	73.44605	16.18441		274	73.44242	16.19462				

Annexure 2

Topographic Map (1:5000 scale)

Borehole Map of Talashil Block, Maharashtra (1:5000 Scale)

N

Achara Lighthouse

Achara Creek

Achara

Hirewadi

Tondavali Beach

Forest area

Talashil Beach

Vaad River

N 1791128
N 1789628
N 1788128
N 1786628
N 1785128
N 1783628
N 1782128
N 1780628

E 333789
E 335289
E 336789

TL01 TL02 TL03 TL04 TL05 TL06 TL07 TL08 TL09 TL10 TL11 TL12 TL13 TL14 TL15 TL16 TL17 TL18 TL19 TL20 TL21 TL22 TL23 TL24 TL25 TL26 TL27 TL28 TL29 TL30 TL31 TL32 TL33 TL34 TL35 TL36 TL37 TL38 TL39 TL40 TL41 TL42 TL43 TL44 TL45 TL46 TL47 TL48 TL49 TL50 TL51 TL52

Contour (m) (Datum MSL)

0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
22.00

Legend:

- Road
- Foreshore-Backshore boundary
- Backshore-Dune boundary
- Forest area
- Stream
- Boreholes

Client:

National Mineral Exploration Trust (NMET)
Ministry of Mines
Government of India

NPEA:

Geo Marine Solutions Private Limited
Door no.15-17-909/9,5th Cross Shivabagh,
Kadri,Mangluru-575005,
Karnataka.
E-mail: mail@geomarinesolutions.in
www.geomarine.in

-200m 0m 200m 400m 600m 800m

Annexure 3

Geological Map (1:5000 scale)

Geological Map of with borehole points Talashil Block,Maharashtra (1:5000 scale)

N

N 1791128

N 1789628

N 1788128

N 1786628

N 1785128

N 1783628

N 1782128

N 1780628

E 333789

E 335289

E 336789

TL01 TL02 TL03 TL04 TL05 TL06 TL07 TL08 TL09 TL10 TL11 TL12 TL13 TL14 TL15 TL16 TL17 TL18 TL19 TL20 TL21 TL22 TL23 TL24 TL25 TL26 TL27 TL28 TL29 TL30 TL31 TL32 TL33 TL34 TL35 TL36 TL37 TL38 TL39 TL40 TL41 TL42 TL43 TL44 TL45 TL46 TL47 TL48 TL49 TL50 TL51 TL52

Borehole points

Legend:

Morphology:

- Foreshore-Backshore boundary
- Backshore-Dune boundary

Geology:

- Alluvium :Beach sand (Recent)
- Alluvium :Dune sand (Recent)
- Laterite (Cenozoic)

Client:

National Mineral Exploration Trust (NMET)
Ministry of Mines
Government of India

NPEA:

Geo Marine Solutions Private Limited
Door no.15-17-909/9,5th Cross Shivabagh,
Kadri,Mangluru-575005,
Karnataka.
E-mail: mail@geomarinesolutions.in
www.geomarine.in

-200m 0m 200m 400m 600m 800m

Annexure 4
Magnetic Separation data

ANNEXURE-4: MAGNETIC SEPARATION DATA

Sl. no.	Sample No.	Depth From	Depth To	Initial Wt.	Magnetics (LIRMS)	Magnetics (REDMS)	Middling's (REDMS)	Non-magnetics (REDMS)	Gravity Separation (Nonmagnetic-heavy minerals)	Gravity Separation (Lights)	Total wt.% of fractions	Loss
				(gm)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)
1	TL-01/0-1m	0	1	1564	2.21	0.74	4.6	92.42	1.66	90.76	99.97	0.03
2	TL-01/1-2m	1	2	1303.5	2.57	1.23	4.14	91.94	2.11	89.83	99.88	0.12
3	TL-01/2-3m	2	3	1361	2.02	0.59	4.11	92.87	0.46	92.41	99.6	0.4
4	TL-01/3-4m	3	4	1883.5	2.04	0.77	3.74	92.54	0.37	92.17	99.1	0.9
5	TL-01/4-5m	4	5	1107	2.3	0.41	6.68	90.47	1.36	89.11	99.86	0.14
6	TL-01/5-6m	5	6	1993.5	1.61	0.68	3.76	93.8	0.56	93.24	99.85	0.15
7	TL-02/0-1m	0	1	876	3.54	5.25	12.21	79	0.87	78.13	100	0
8	TL-02/1-2m	1	2	971	3.71	0.41	11.53	84.14	1.01	83.13	99.79	0.21
9	TL-02/2-3m	2	3	1112	3.15	0.27	9.4	86.83	1.39	85.44	99.64	0.36
10	TL-02/3-4m	3	4	884.5	3.96	0.57	10.97	84.12	0.76	83.36	99.6	0.4
11	TL-02/4-5m	4	5	1029.5	3.79	0.58	9.76	85.67	0.94	84.73	99.81	0.19
12	TL-02/5-6m	5	6	1648	1.21	4.98	4.85	88.96	1.25	87.71	100	0
13	TL-03/0-1m	0	1	1678.5	4.65	0.42	12.39	82.16	0.49	81.66	99.61	0.39
14	TL-03/1-2m	1	2	990	2.02	0.35	6.57	90.96	0.64	90.32	99.9	0.1
15	TL-03/2-3m	2	3	1460	3.12	0.58	11.75	84.28	0.42	83.86	99.73	0.27
16	TL-03/3-4m	3	4	1355	2.1	0.37	4.98	92.44	1.29	91.14	99.89	0.11
17	TL-03/4-5m	4	5	1580	1.84	0.28	6.39	91.14	1	90.14	99.65	0.35
18	TL-03/5-6m	5	6	2789.5	1.74	0.23	3.76	94.14	0.19	93.95	99.87	0.13
19	TL-04/0-1m	0	1	1662.5	1.74	1.08	7.4	89.68	0.72	88.97	99.91	0.09
20	TL-04/1-2m	1	2	1468	1.26	1.91	4.87	91.89	0.83	91.07	99.93	0.07
21	TL-04/2-3m	2	3	1663.5	0.87	1.68	3.7	93.66	0.84	92.82	99.91	0.09
22	TL-04/3-4m	3	4	1267	0.83	1.1	3.83	94.12	0.85	93.27	99.88	0.12
23	TL-04/4-5m	4	5	1522.5	0.82	1.25	6.04	91.72	0.83	90.9	99.84	0.16
24	TL-04/5-6m	5	6	2929	0.31	0.31	2.92	96.33	0.29	96.04	99.86	0.14
25	TL-05/0-1m	0	1	1333	3.3	0.71	8.74	87.13	0.78	86.35	99.89	0.11
26	TL-05/1-2m	1	2	1637	2.02	0.64	4.58	92.67	0.37	92.3	99.91	0.09
27	TL-05/2-3m	2	3	1338.5	2.54	0.71	5.42	91.26	0.64	90.62	99.93	0.07
28	TL-05/3-4m	3	4	2069	2.39	0.51	8.39	88.26	0.18	88.08	99.54	0.46
29	TL-05/4-5m	4	5	2539	1.54	0.83	4.21	93.23	0.19	93.04	99.8	0.2
30	TL-05/5-6m	5	6	1967.5	1.47	0.66	3.28	94.51	0.28	94.23	99.92	0.08
31	TL-06/0-1m	0	1	1600	1.34	0.75	5.91	91.84	0.37	91.48	99.84	0.16
32	TL-06/1-2m	1	2	1374.5	0.69	0.65	5.42	93.12	0.47	92.66	99.89	0.11
33	TL-06/2-3m	2	3	2182.5	0.23	0.39	2.06	97.25	0.49	96.76	99.93	0.07
34	TL-06/3-4m	3	4	1587	0.25	0.32	2.08	96.66	0.39	96.27	99.31	0.69
35	TL-06/4-5m	4	5	1583	0.28	0.09	1.64	97.73	0.2	97.53	99.75	0.25
36	TL-06/5-6m	5	6	759.5	0.53	0.33	3.09	95.66	0.29	95.37	99.61	0.39
37	TL-07/0-1m	0	1	1551	4.67	0.52	12.25	82.11	0.57	81.53	99.55	0.45
38	TL-07/1-2m	1	2	1362	3.12	0.22	7.86	88.8	1.15	87.65	100	0
39	TL-07/2-3m	2	3	1610	2.05	0.28	10.93	86.4	0.26	86.14	99.66	0.34
40	TL-07/3-4m	3	4	3159	3.4	0.49	13.72	82.23	0.25	81.98	99.84	0.16
41	TL-07/4-5m	4	5	1556	2.99	0.45	13.85	82.46	0.41	82.04	99.74	0.26

Sl. no.	Sample No.	Depth From	Depth To	Initial Wt.	Magnetics (LIRMS)	Magnetics (REDMS)	Middling's (REDMS)	Non-magnetics (REDMS)	Gravity Separation (Nonmagnetic-heavy minerals)	Gravity Separation (Lights)	Total wt.% of fractions	Loss
				(gm)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)
42	TL-07/5-6m	5	6	2236.5	1.34	0.31	7.06	91.21	0.27	90.94	99.93	0.07
43	TL-08/0-1m	0	1	1255	2.79	0.68	9.56	86.06	0.6	85.45	99.08	0.92
44	TL-08/1-2m	1	2	1200	4.17	0.38	11.04	83.88	0.59	83.29	99.46	0.54
45	TL-08/2-3m	2	3	1202	2.2	0.46	8.49	88.23	0.44	87.79	99.38	0.62
46	TL-08/3-4m	3	4	1326	2.83	0.49	7.77	88.91	1.07	87.85	100	0
47	TL-08/4-5m	4	5	1096.5	1.78	0.23	6.48	91.47	0.73	90.74	99.95	0.05
48	TL-08/5-6m	5	6	1464.5	1.95	0.41	6.79	90.65	0.63	90.01	99.8	0.2
49	TL-09/0-1m	0	1	943.5	2.7	0.9	7.58	88.02	2.2	85.82	99.21	0.79
50	TL-09/1-2m	1	2	1075	3.81	0.84	9.26	85.58	1.03	84.55	99.49	0.51
51	TL-09/2-3m	2	3	1161	3.7	1.03	9.39	85.19	0.77	84.42	99.31	0.69
52	TL-09/3-4m	3	4	1431.5	9.99	4.65	12.22	72.72	1.96	70.76	99.58	0.42
53	TL-09/4-5m	4	5	2056.5	14.93	9.43	17.55	57.14	1.31	55.82	99.05	0.95
54	TL-09/5-6m	5	6	1800	5.58	3.72	10.28	79.61	1.35	78.26	99.19	0.81
55	TL-10/0-1m	0	1	1180	3.35	1.4	9.11	86.14	0.86	85.28	100	0
56	TL-10/1-2m	1	2	1397	2.9	0.32	12.17	83.75	0.34	83.42	99.14	0.86
57	TL-10/2-3m	2	3	1374	2	0.76	7.86	89.34	0.45	88.89	99.96	0.04
58	TL-10/3-4m	3	4	1554.5	0.58	0.19	5.02	94.05	0.28	93.77	99.84	0.16
59	TL-10/4-5m	4	5	1514	1.16	1.59	7.3	89.23	0.62	88.61	99.27	0.73
60	TL-10/5-6m	5	6	1630	2.3	0.15	13.25	83.44	1.33	82.1	99.14	0.86
61	TL-11/0-1m	0	1	1163	3.78	0.77	6.45	88.95	1.25	87.71	99.96	0.04
62	TL-11/1-2m	1	2	1205.5	3.53	1.24	7.55	87.27	1.13	86.13	99.59	0.41
63	TL-11/2-3m	2	3	1121	5.58	1.74	8.83	83.63	1.17	82.46	99.78	0.22
64	TL-11/3-4m	3	4	1227.5	3.87	0.41	12.02	82.73	0.91	81.82	99.02	0.98
65	TL-11/4-5m	4	5	1269	4.85	0.51	12.69	81.21	1.22	79.99	99.25	0.75
66	TL-11/5-6m	5	6	1037	8.87	3.23	15.91	71.6	0.57	71.03	99.61	0.39
67	TL-12/0-1m	0	1	1136.5	4.58	2.02	10.87	82.31	0.82	81.49	99.78	0.22
68	TL-12/1-2m	1	2	1134	3.48	1.81	7.94	86.42	0.86	85.56	99.65	0.35
69	TL-12/2-3m	2	3	1154.5	1.78	1.82	5.67	90.52	0.45	90.06	99.78	0.22
70	TL-12/3-4m	3	4	1507	1.86	2.29	4.48	91.21	0.91	90.3	99.83	0.17
71	TL-12/4-5m	4	5	1685.5	0.95	1.1	4.27	93.59	0.56	93.03	99.91	0.09
72	TL-12/5-6m	5	6	1705.5	0.82	1.38	4.4	93.17	0.65	92.52	99.77	0.23
73	TL-13/0-1m	0	1	1093.5	5.72	0.14	15.78	77.82	0.47	77.36	99.45	0.55
74	TL-13/1-2m	1	2	1064	7.33	0.42	16.49	75.05	0.6	74.45	99.3	0.7
75	TL-13/2-3m	2	3	1237	3.72	0.08	12.77	82.94	0.58	82.36	99.51	0.49
76	TL-13/3-4m	3	4	1028	4.04	0.29	14.11	80.45	0.4	80.05	98.88	1.12
77	TL-13/4-5m	4	5	688.5	6.03	0.58	14.09	78.14	0.16	77.98	98.84	1.16
78	TL-13/5-6m	5	6	2727.5	2.2	0.09	7.77	89.86	0.36	89.5	99.93	0.07
79	TL-14/0-1m	0	1	1115	2.56	1.26	7.89	88.16	0.18	87.99	99.87	0.13
80	TL-14/1-2m	1	2	1092.5	2.33	0.87	6.77	89.93	0.54	89.39	99.91	0.09
81	TL-14/2-3m	2	3	1606.5	3.17	1.37	7.81	86.93	0.78	86.15	99.28	0.72
82	TL-14/3-4m	3	4	1843	3.09	1.47	8.17	87.03	0.78	86.26	99.76	0.24
83	TL-14/4-5m	4	5	1590.5	3.14	0.88	7.64	87.99	1.06	86.94	99.65	0.35

Sl. no.	Sample No.	Depth From	Depth To	Initial Wt.	Magnetics (LIRMS)	Magnetics (REDMS)	Middling's (REDMS)	Non-magnetics (REDMS)	Gravity Separation (Nonmagnetic-heavy minerals)	Gravity Separation (Lights)	Total wt.% of fractions	Loss
				(gm)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)
84	TL-14/5-6m	5	6	1616.5	1.42	1.05	5.2	92.02	0.46	91.56	99.69	0.31
85	TL-15/0-1m	0	1	1098.5	3.05	0.5	10.33	85.89	0.09	80.65	99.77	0.23
86	TL-15/1-2m	1	2	1221.5	4.26	0.74	19.48	74.83	0.67	74.15	99.3	0.7
87	TL-15/2-3m	2	3	1176.5	5.18	0.51	14.24	79.52	0	79.52	99.45	0.55
88	TL-15/3-4m	3	4	1769	5.94	0.68	11.11	81.54	1.47	80.08	99.27	0.73
89	TL-15/4-5m	4	5	1483.5	4.31	0.84	11.86	80.99	0.49	80.5	98.01	1.99
90	TL-15/5-6m	5	6	1592.5	3.61	0.47	7.97	86.91	1.13	85.78	98.96	1.04
91	TL-16/0-1m	0	1	985	4.57	0.36	14.26	80.2	0.56	79.64	99.39	0.61
92	TL-16/1-2m	1	2	1247.5	4.61	1	8.62	85.49	1.45	84.04	99.72	0.28
93	TL-16/2-3m	2	3	1197	4.47	0.63	9.86	84.88	1.1	83.78	99.83	0.17
94	TL-16/3-4m	3	4	1381.5	4.81	0.83	7.93	86.03	2.32	83.71	99.6	0.4
95	TL-16/4-5m	4	5	1492.5	4.12	0.57	8.84	86.16	1.72	84.44	99.7	0.3
96	TL-16/5-6m	5	6	1530	3.82	0.65	8.56	86.54	1.38	85.15	99.58	0.42
97	TL-17/0-1m	0	1	1002	3.04	0.95	6.69	89.12	0.62	88.5	99.8	0.2
98	TL-17/1-2m	1	2	965	2.64	0.83	6.99	89.07	0.53	88.53	99.53	0.47
99	TL-17/2-3m	2	3	1183.5	1.61	0.42	4.22	93.66	0.56	93.1	99.92	0.08
100	TL-17/3-4m	3	4	1253.5	1.95	0.56	5.07	92.3	0.37	91.93	99.88	0.12
101	TL-17/4-5m	4	5	968.5	2.43	0.57	4.54	92.41	0.83	91.58	99.95	0.05
102	TL-17/5-6m	5	6	935	4.01	1.02	8.29	86.42	1.12	85.29	99.73	0.27
103	TL-18/0-1m	0	1	1365.5	6.92	4.69	8.42	79.68	1.67	78	99.71	0.29
104	TL-18/1-2m	1	2	952	4.1	3.15	6.46	85.71	0.69	85.03	99.42	0.58
105	TL-18/2-3m	2	3	1041.5	1.34	0.82	4.9	92.65	0.65	92.01	99.71	0.29
106	TL-18/3-4m	3	4	1810	1.16	0.72	5.14	92.68	0.56	92.12	99.7	0.3
107	TL-18/4-5m	4	5	1287	0.78	0.31	3.73	95.03	0.38	94.65	99.84	0.16
108	TL-18/5-6m	5	6	1839.5	0.68	0.3	3.26	95.65	0.38	95.27	99.89	0.11
109	TL-19/0-1m	0	1	1198	3.51	0.92	8.89	86.44	0.26	86.18	99.75	0.25
110	TL-19/1-2m	1	2	1265.5	2.61	0.36	8.38	88.58	0.09	88.49	99.92	0.08
111	TL-19/2-3m	2	3	1326	4.52	1.17	12.41	81.33	0.08	81.25	99.43	0.57
112	TL-19/3-4m	3	4	1311	6.41	1.87	14.42	76.74	0.54	76.2	99.43	0.57
113	TL-19/4-5m	4	5	1357	9.29	2.84	14.41	73.36	0.88	72.48	99.89	0.11
114	TL-19/5-6m	5	6	1160.5	4.22	1.12	10.43	83.58	1	82.58	99.35	0.65
115	TL-20/0-1m	0	1	1227.5	4.52	0.2	13.77	81.26	0.49	80.78	99.76	0.24
116	TL-20/1-2m	1	2	1408	5.15	0.28	14.99	78.76	0.39	78.37	99.18	0.82
117	TL-20/2-3m	2	3	1398	4.54	0.11	13.7	81.37	0.57	80.8	99.71	0.29
118	TL-20/3-4m	3	4	1553.5	3.77	0.19	12.46	83.13	0.42	82.72	99.55	0.45
119	TL-20/4-5m	4	5	1512.5	2.71	0.1	9.72	86.94	0.35	86.59	99.47	0.53
120	TL-20/5-6m	5	6	1699.5	3.71	0.21	10.86	84.52	0.76	83.76	99.29	0.71
121	TL-21/0-1m	0	1	779	3.79	1.28	6.48	88.06	1.06	87	99.61	0.39
122	TL-21/1-2m	1	2	1026.5	2.05	0.88	5.46	90.4	0.45	89.95	98.78	1.22
123	TL-21/2-3m	2	3	1121	2.81	1.2	7.45	87.47	0.26	87.2	98.93	1.07
124	TL-21/3-4m	3	4	1272.5	2.99	1.06	8.61	86.33	0.35	85.98	98.98	1.02
125	TL-21/4-5m	4	5	1583	4.83	1.26	11.02	82.06	0.49	81.57	99.18	0.82

Sl. no.	Sample No.	Depth From	Depth To	Initial Wt.	Magnetics (LIRMS)	Magnetics (REDMS)	Middling's (REDMS)	Non-magnetics (REDMS)	Gravity Separation (Nonmagnetic-heavy minerals)	Gravity Separation (Lights)	Total wt.% of fractions	Loss
				(gm)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)
126	TL-21/5-6m	5	6	1508	3.08	0.33	13.36	82.16	0.25	81.92	98.94	1.06
127	TL-22/0-1m	0	1	924	2.81	3.57	4.65	88.96	1.16	87.8	100	0
128	TL-22/1-2m	1	2	997	3.51	0.25	9.13	86.61	0.87	85.74	99.5	0.5
129	TL-22/2-3m	2	3	1008.5	2.73	0.5	6.59	90.08	0.81	89.27	99.9	0.1
130	TL-22/3-4m	3	4	1582	4.39	0.35	9.04	85.9	1.37	84.53	99.68	0.32
131	TL-22/4-5m	4	5	1614	3.07	0.37	6.01	90.15	1.62	88.53	99.6	0.4
132	TL-22/5-6m	5	6	1495	3.08	3.88	4.95	88.09	1.32	86.77	100	0
133	TL-23/5-6m	5	6	1340	3.73	0.22	12.31	83.73	0.84	82.89	100	0
134	TL-23/1-2m	1	2	1364	8.14	0.22	12.68	78.15	0.86	77.29	99.19	0.81
135	TL-23/0-1m	0	1	652	4.45	0.08	4.75	90.41	1.45	88.97	99.69	0.31
136	TL-23/3-4m	3	4	1270	12.36	0.2	6.77	80.47	0.64	79.83	99.8	0.2
137	TL-23/2-3m	2	3	1440	8.68	0.21	12.85	77.36	1.01	76.36	99.1	0.9
138	TL-23/4-5m	4	5	1532.5	4.96	0.33	11.35	82.28	0.08	82.2	98.92	1.08
139	TL-24/0-1m	0	1	972	5.97	0.1	9.26	84.47	1.01	83.45	99.79	0.21
140	TL-24/1-2m	1	2	1138.5	4.08	0.09	3.78	91.52	2.11	89.42	99.47	0.53
141	TL-24/2-3m	2	3	1442.5	3.26	1.01	8.11	87.14	0.61	85.75	99.51	0.49
142	TL-24/3-4m	3	4	1582	2.84	0.06	4.11	91.97	1.47	91.33	98.99	1.01
143	TL-24/4-5m	4	5	1422.5	3.55	0.21	12.44	83.59	0.25	83.33	99.79	0.21
144	TL-24/5-6m	5	6	1536	3.19	0.26	9.11	86.65	0.26	86.39	99.22	0.78
145	TL-25/0-1m	0	1	982.5	3.97	0.61	9.72	85.55	0.26	85.29	99.85	0.15
146	TL-25/1-2m	1	2	1124	3.38	1.02	7.78	87.46	0.35	87.11	99.64	0.36
147	TL-25/2-3m	2	3	1135.5	3.26	1.06	8.06	87.1	0.44	86.66	99.47	0.53
148	TL-25/3-4m	3	4	1570	5.48	0.38	10.8	82.52	0.5	82.02	99.17	0.83
149	TL-25/4-5m	4	5	1963.5	1.53	0.28	4.02	93.94	0.38	93.56	99.77	0.23
150	TL-26/0-1m	0	1	1069.5	2.99	1.12	7.62	87.66	0.35	87.31	99.39	0.61
151	TL-26/1-2m	1	2	976.5	2.15	2.3	11.11	82.95	0.58	82.37	98.52	1.48
152	TL-26/2-3m	2	3	1148.5	12.71	6.62	10.84	68.05	1.29	66.75	98.22	1.78
153	TL-26/3-4m	3	4	1053	4.13	0.9	14.67	78.73	2.6	76.13	98.43	1.57
154	TL-27/0-1m	0	1	1080.5	5.6	2.08	7.96	83.9	1.26	82.64	99.54	0.46
155	TL-27/1-2m	1	2	1067	4.26	1.73	9.23	84.35	0.42	83.93	99.58	0.42
156	TL-27/2-3m	2	3	967	6.62	1.6	9.51	82.16	0.74	81.42	99.9	0.1
157	TL-27/3-4m	3	4	1247	3.81	0.84	6.94	88.13	0.79	87.34	99.72	0.28
158	TL-27/4-5m	4	5	1330.5	3.98	1.24	8	85.98	0.52	85.47	99.21	0.79
159	TL-27/5-6m	5	6	1550.5	3.42	2.19	7.77	85.55	0.68	84.87	98.94	1.06
160	TL-28/0-1m	0	1	1269	5.44	1.54	8.16	84.75	0.42	84.33	99.88	0.12
161	TL-28/1-2m	1	2	1093.5	6.95	2.19	9.19	81.3	0.57	80.73	99.63	0.37
162	TL-28/2-3m	2	3	930.5	3.49	0.38	6.77	89.04	0.36	88.68	99.68	0.32
163	TL-28/3-4m	3	4	1024	4.64	1.51	6.4	87.35	0.52	81.59	99.9	0.1
164	TL-28/4-5m	4	5	1430	3.43	1.43	8.18	86.19	0.34	85.84	99.23	0.77
165	TL-28/5-6m	5	6	1557.5	3.15	1.16	8.44	86.2	0.26	85.94	98.94	1.06
166	TL-29/0-1m	0	1	979.5	3.78	1.23	10.52	84.02	0.25	83.77	99.54	0.46
167	TL-29/1-2m	1	2	1369.5	3.61	1.5	8.87	85.07	0.43	84.64	99.05	0.95

Sl. no.	Sample No.	Depth From	Depth To	Initial Wt.	Magnetics (LIRMS)	Magnetics (REDMS)	Middling's (REDMS)	Non-magnetics (REDMS)	Gravity Separation (Nonmagnetic-heavy minerals)	Gravity Separation (Lights)	Total wt.% of fractions	Loss
				(gm)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)
168	TL-29/2-3m	2	3	1572.5	4.77	1.91	9.63	83.02	0.42	82.61	99.33	0.67
169	TL-29/3-4m	3	4	1629	3.56	1.6	7.4	87.08	0.52	86.56	99.63	0.37
170	TL-29/4-5m	4	5	1699	12.12	5.3	8.86	73.13	1.39	71.74	99.41	0.59
171	TL-29/5-6m	5	6	1692	21.75	10.14	11.05	56.47	1.41	55.06	99.41	0.59
172	TL-30/0-1m	0	1	1120	4.73	0.22	7.63	87.05	1.04	86.01	99.64	0.36
173	TL-30/1-2m	1	2	1008	3.47	0.2	7.64	88.24	0.18	88.07	99.55	0.45
174	TL-30/2-3m	2	3	1001.8	4.79	0.3	10.18	83.85	0.25	83.6	99.12	0.88
175	TL-30/3-4m	3	4	1028	5.01	0.39	9.14	84.63	0.17	84.46	99.17	0.83
176	TL-30/4-5m	4	5	982	4.79	0.41	5.5	89.1	1.43	87.68	99.8	0.2
177	TL-30/5-6m	5	6	1613	4.46	0.99	12.28	80.84	0.97	79.87	98.57	1.43
178	TL-31/0-1m	0	1	1043	6.14	0.1	11.6	81.59	0.65	80.94	99.42	0.58
179	TL-31/1-2m	1	2	1327.5	6.48	0.15	8.66	84.37	1.86	82.51	99.66	0.34
180	TL-31/2-3m	2	3	1217	5.59	0.16	7.64	86.61	1.56	85.05	100	0
181	TL-31/3-4m	3	4	1505	5.32	0.4	13.89	79.14	0.24	78.9	98.74	1.26
182	TL-31/4-5m	4	5	1229	4.6	1.46	7.89	85.52	0.68	84.83	99.47	0.53
183	TL-31/5-6m	5	6	1460	4.73	0.14	7.74	86.92	0.87	86.05	99.52	0.48
184	TL-32/0-1m	0	1	668	4.49	0.3	11.51	83.08	0.25	82.83	99.39	0.61
185	TL-32/1-2m	1	2	951	2.94	0.16	7.62	88.85	0.44	88.41	99.58	0.42
186	TL-32/2-3m	2	3	1094	8.23	0.55	13.8	76.78	1	75.78	99.36	0.64
187	TL-32/3-4m	3	4	1185.5	8.44	0.51	9.49	81.27	2.68	78.59	99.7	0.3
188	TL-32/4-5m	4	5	5250	2.42	0.37	8.91	88.06	0.35	87.7	99.76	0.24
189	TL-32/5-6m	5	6	1829	2.35	0.27	2.3	94.97	1.14	93.83	99.89	0.11
190	TL-33/0-1m	0	1	1142.5	5.47	2.71	8.71	82.98	0.83	82.15	99.87	0.13
191	TL-33/1-2m	1	2	1482.5	5.36	2.46	8.6	83.44	0.75	77.68	99.87	0.13
192	TL-33/2-3m	2	3	1419.5	5.99	2.4	11.06	80.06	0.64	79.42	99.51	0.49
193	TL-33/3-4m	3	4	1189	4.88	2.1	7.49	85.16	0.85	84.3	99.62	0.38
194	TL-33/4-5m	4	5	994.5	4.88	2.31	8.09	84.46	0.93	83.54	99.75	0.25
195	TL-33/5-6m	5	6	1573.5	4.42	2.29	7.5	85.32	0.77	84.55	99.52	0.48
196	TL-34/0-1m	0	1	1157	4.67	1.6	7.13	86.56	0.52	86.04	99.96	0.04
197	TL-34/1-2m	1	2	1613	9.11	3.07	8.25	79.42	1.27	78.15	99.85	0.15
198	TL-34/2-3m	2	3	1330.5	11.69	3.91	11.09	72.94	0.58	72.36	99.62	0.38
199	TL-34/3-4m	3	4	1451	5.03	1.9	9.13	83.67	0.5	83.16	99.72	0.28
200	TL-34/4-5m	4	5	1450	4.38	1.93	10.45	82.31	0.82	81.49	99.07	0.93
201	TL-34/5-6m	5	6	1463	2.63	1.4	7.14	88.59	0.44	88.14	99.75	0.25
202	TL-35/0-1m	0	1	1076	10.41	4.65	9.71	74.91	0.9	74.01	99.67	0.33
203	TL-35/1-2m	1	2	1264.5	6.17	3.04	7.28	83.27	1	82.27	99.76	0.24
204	TL-35/2-3m	2	3	1563.5	14.49	7.2	11.13	66.26	1.26	65	99.07	0.93
205	TL-35/3-4m	3	4	1459	3.56	1.13	6.07	88.86	1.16	87.71	99.62	0.38
206	TL-35/4-5m	4	5	1440.5	11	4.51	13.19	70.95	0.78	70.17	99.65	0.35
207	TL-35/5-6m	5	6	1329	3.2	1.47	8.2	86.72	0.52	86.2	99.59	0.41
208	TL-36/0-1m	0	1	1013	5.03	1.23	8.49	84.8	0.34	84.46	99.56	0.44
209	TL-36/1-2m	1	2	1068.5	7.16	2.71	7.44	82.5	0.91	81.59	99.81	0.19

Sl. no.	Sample No.	Depth From	Depth To	Initial Wt.	Magnetics (LIRMS)	Magnetics (REDMS)	Middling's (REDMS)	Non-magnetics (REDMS)	Gravity Separation (Nonmagnetic-heavy minerals)	Gravity Separation (Lights)	Total wt.% of fractions	Loss
				(gm)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)
210	TL-36/2-3m	2	3	973.5	6.88	2.41	11.56	78.89	0.55	78.34	99.74	0.26
211	TL-36/3-4m	3	4	1255	6.45	2.39	10.68	80.16	0.96	79.2	99.68	0.32
212	TL-36/4-5m	4	5	1367.5	3.69	1.32	7.57	86.95	1.04	85.9	99.52	0.48
213	TL-36/5-6m	5	6	2094.5	2.6	1.34	7.28	87.85	0.44	87.41	99.07	0.93
214	TL-37/0-1m	0	1	930	5.65	0.27	12.2	81.02	0.49	80.54	99.14	0.86
215	TL-37/1-2m	1	2	1180.5	4.15	0.13	9.19	85.68	0.43	85.26	99.15	0.85
216	TL-37/2-3m	2	3	1247.5	5.57	0.28	12.59	80.64	0.48	80.16	99.08	0.92
217	TL-37/3-4m	3	4	683	5.86	0.37	15.59	77.6	0.47	77.13	99.41	0.59
218	TL-37/4-5m	4	5	871	9.93	0.23	18.66	70.44	0.49	69.94	99.25	0.75
219	TL-37/5-6m	5	6	914.5	13.83	0.49	17.17	67.14	0.74	66.4	98.63	1.37
220	TL-38/0-1m	0	1	959.5	5.84	2.45	8.23	83.22	0.58	82.64	99.74	0.26
221	TL-38/1-2m	1	2	1108	15.43	5.32	11.19	67.6	0.95	66.65	99.55	0.45
222	TL-38/2-3m	2	3	1036.5	12.11	4.1	11.34	72.31	1.16	71.15	99.86	0.14
223	TL-38/3-4m	3	4	1204.5	9.96	3.03	12.08	74.47	0.67	73.8	99.54	0.46
224	TL-38/4-5m	4	5	2599	2.94	1.12	6.21	89.65	0.63	89.02	99.92	0.08
225	TL-38/5-6m	5	6	2296	3.22	1	6.1	89.63	0.63	89.01	99.96	0.04
226	TL-39/0-1m	0	1	1049.5	10.91	0.19	17.06	70.56	0.42	70.13	98.71	1.29
227	TL-39/1-2m	1	2	1251	8.91	1.72	12.55	76.38	0.92	75.46	99.56	0.44
228	TL-39/2-3m	2	3	1113	6.47	0.27	12.4	80.01	0.48	79.53	99.15	0.85
229	TL-39/3-4m	3	4	1352	6.8	1.52	12.65	78.25	0.31	77.94	99.22	0.78
230	TL-39/4-5m	4	5	1550	9.58	0.55	16.06	72.29	0.58	71.71	98.48	1.52
231	TL-39/5-6m	5	6	1697.5	9.57	0.82	17.26	70.84	0.57	70.27	98.5	1.5
232	TL-40/0-1m	0	1	924.5	4.16	0.11	7.95	86.86	0.35	86.51	99.08	0.92
233	TL-40/1-2m	1	2	1133.5	7.01	1.1	10.9	80.41	0.64	79.77	99.43	0.57
234	TL-40/3-4m	3	4	1298.5	9.7	0.39	14.79	73.74	0.44	73.3	98.61	1.39
235	TL-40/2-3m	2	3	1190.5	9.37	0.25	12.56	76.94	0.62	76.33	99.12	0.88
236	TL-40/4-5m	4	5	1196	5.89	0.21	11.79	81.02	0.57	80.45	98.91	1.09
237	TL-40/5-6m	5	6	1324.5	4.04	0.3	10.72	84.18	0.42	83.76	99.24	0.76
238	TL-41/0-1m	0	1	1196.5	6.56	0.25	7.35	85.37	2.56	82.81	99.54	0.46
239	TL-41/1-2m	1	2	1132	3.27	0.57	3.53	92.4	2.22	90.19	99.78	0.22
240	TL-41/2-3m	2	3	1360.5	3.27	0.29	5.73	90.3	1.08	89.21	99.6	0.4
241	TL-41/3-4m	3	4	1578.5	4.94	0.48	6.43	87.61	1.49	86.13	99.46	0.54
242	TL-41/4-5m	4	5	1352	4.84	0.55	6.88	87.46	1.75	85.71	99.74	0.26
243	TL-41/5-6m	5	6	1724	4.06	0.44	7.45	87.44	1.14	86.31	99.39	0.61
244	TL-42/0-1m	0	1	1499.5	18.64	5.14	13.37	62.75	0.44	62.31	99.9	0.1
245	TL-42/1-2m	1	2	1190	26.85	6.18	14.03	52.69	0.84	51.85	99.75	0.25
246	TL-42/2-3m	2	3	1000	5.8	1.9	7.95	84.3	1.35	82.95	99.95	0.05
247	TL-42/3-4m	3	4	1019.5	4.76	1.37	8.24	85.48	0.26	85.23	99.85	0.15
248	TL-42/4-5m	4	5	1121.5	4.41	1.34	9.36	84.75	0.34	84.41	99.87	0.13
249	TL-42/5-6m	5	6	989	3.29	1.21	5.56	89.69	0.45	89.24	99.75	0.25
250	TL-43/0-1m	0	1	1037	6.75	0.92	10.46	81.39	0.65	80.74	99.52	0.48
251	TL-43/1-2m	1	2	976	6.61	2.1	8.71	82.43	0.66	81.77	99.85	0.15

Sl. no.	Sample No.	Depth From	Depth To	Initial Wt.	Magnetics (LIRMS)	Magnetics (REDMS)	Middling's (REDMS)	Non-magnetics (REDMS)	Gravity Separation (Nonmagnetic-heavy minerals)	Gravity Separation (Lights)	Total wt.% of fractions	Loss
				(gm)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)
252	TL-43/2-3m	2	3	1114.5	7.31	2.69	8.79	81.07	0.89	80.18	99.87	0.13
253	TL-43/3-4m	3	4	1212.5	5.48	2.1	8.49	83.46	0.92	82.55	99.55	0.45
254	TL-43/4-5m	4	5	1376	12.28	4.07	11.3	71.88	1.22	70.65	99.53	0.47
255	TL-43/5-6m	5	6	1874.5	27.13	6.54	13.9	51.96	1.3	50.66	99.52	0.48
256	TL-44/0-1m	0	1	974	15.4	5.18	11.04	68.17	0.89	67.29	99.79	0.21
257	TL-44/1-2m	1	2	1137.5	11.03	3.69	10.42	74.73	0.97	73.75	99.87	0.13
258	TL-44/2-3m	2	3	1130	6.99	3.27	7.83	81.37	0.73	80.64	99.47	0.53
259	TL-44/3-4m	3	4	1293.5	9.01	2.55	11.17	77	0.62	76.38	99.73	0.27
260	TL-44/4-5m	4	5	1585.5	31.76	7.35	13.94	46.8	1.64	45.16	99.84	0.16
261	TL-44/5-6m	5	6	1378.5	5.73	1.81	6.75	85.24	0.94	84.3	99.53	0.47
262	TL-45/0-1m	0	1	1085	14.24	0.51	14.47	70.6	1.34	69.26	99.82	0.18
263	TL-45/1-2m	1	2	982	12.98	0.87	12.37	73.32	1.98	71.34	99.54	0.46
264	TL-45/2-3m	2	3	1039	17.76	1.54	17.85	62.27	1.81	60.47	99.42	0.58
265	TL-45/3-4m	3	4	1399.5	5.47	1.61	9.97	82.35	0.66	81.69	99.39	0.61
266	TL-45/4-5m	4	5	2470	3.56	0.77	4.39	91.17	1.28	89.9	99.9	0.1
267	TL-45/5-6m	5	6	2733.5	4.83	1.13	6.55	87.42	1.14	86.28	99.93	0.07
268	TL-46/0-1m	0	1	1002	11.63	2.84	9.28	76.05	0.84	75.21	99.8	0.2
269	TL-46/1-2m	1	2	1279	9.62	0.47	12.78	76.54	0.69	75.86	99.41	0.59
270	TL-46/2-3m	2	3	1149.5	10.05	5	7.18	77.51	1.47	76.04	99.74	0.26
271	TL-46/3-4m	3	4	1431.5	10.41	0.59	13.62	74.82	2.02	72.8	99.44	0.56
272	TL-46/4-5m	4	5	1243.5	10.78	0.68	14.31	73.46	1.47	71.99	99.24	0.76
273	TL-46/5-6m	5	6	1252	9.66	0.36	11.26	78.31	2.04	76.28	99.6	0.4
274	TL-47/0-1m	0	1	1146	13.26	5.76	5.24	75.74	2.2	73.55	100	0
275	TL-47/1-2m	1	2	1192	12.42	6.38	8.22	72.99	2.12	70.87	100	0
276	TL-47/2-3m	2	3	1201	19.82	10.99	7.66	61.53	2.77	58.76	100	0
277	TL-47/3-4m	3	4	1673	26.96	14.47	7.29	51.29	3.13	48.16	100	0
278	TL-47/4-5m	4	5	968	8.88	4.55	6.3	80.27	1.36	78.9	100	0
279	TL-47/5-6m	5	6	929	4.52	3.34	4.41	87.73	1.93	85.8	100	0
280	TL-48/0-1m	0	1	978	26.48	0.26	19.43	53.48	0.59	52.89	99.64	0.36
281	TL-48/1-2m	1	2	936	19.66	0.32	16.45	63.46	0	63.46	99.89	0.11
282	TL-48/2-3m	2	3	1215	23.37	0.49	18.93	56.71	1.3	55.4	99.51	0.49
283	TL-48/3-4m	3	4	1280	17.97	0.31	19.69	61.33	0.86	60.47	99.3	0.7
284	TL-48/4-5m	4	5	1365	15.97	0.22	19.41	63.66	0.45	63.22	99.27	0.73
285	TL-48/5-6m	5	6	1186	10.46	0.25	14.63	73.48	0.66	72.82	98.82	1.18
286	TL-49/0-1m	0	1	1079	16.27	4.45	13.25	65.85	1.32	64.53	99.81	0.19
287	TL-49/1-2m	1	2	1093.5	16.64	4.07	10.93	68.31	1.16	67.15	99.95	0.05
288	TL-49/2-3m	2	3	1107	9.98	2.94	10.07	76.92	1.08	75.84	99.91	0.09
289	TL-49/3-4m	3	4	1394	17.75	4.63	13.31	63.74	1.4	62.34	99.43	0.57
290	TL-49/4-5m	4	5	2023.5	6.8	2	8.62	82.43	0.99	81.44	99.85	0.15
291	TL-49/5-6m	5	6	3107	5.28	1.34	9.01	84.37	0.67	83.7	100	0
292	TL-50/0-1m	0	1	1028.5	14	2.58	12.64	70.78	1.49	69.3	100	0
293	TL-50/1-2m	1	2	1191	17.09	3.82	12.55	65.87	1.25	64.62	99.33	0.67

Sl. no.	Sample No.	Depth From	Depth To	Initial Wt.	Magnetics (LIRMS)	Magnetics (REDMS)	Middling's (REDMS)	Non-magnetics (REDMS)	Gravity Separation (Nonmagnetic-heavy minerals)	Gravity Separation (Lights)	Total wt.% of fractions	Loss
				(gm)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)	Weight (%)
294	TL-50/2-3m	2	3	1228	6.31	1.26	8.63	83.18	1.25	81.94	99.39	0.61
295	TL-50/3-4m	3	4	3887	7.42	2.21	6.28	83.9	1.93	81.97	99.81	0.19
296	TL-50/4-5m	4	5	3081.5	8.92	0.41	8.45	82.15	1.56	80.59	99.94	0.06
297	TL-50/5-6m	5	6	1474	8.11	1.87	9.6	80.39	1.21	79.19	99.97	0.03
298	TL-51/0-1m	0	1	933	7.18	1.71	8.9	81.56	1.31	80.26	99.36	0.64
299	TL-51/1-2m	1	2	1703	6.93	1.59	8.07	83.12	1.33	81.79	99.71	0.29
300	TL-51/2-3m	2	3	2134.5	8.76	3	7.19	81	2.03	78.98	99.95	0.05
301	TL-51/3-4m	3	4	1257	13.05	3.66	10.06	73.15	1.83	71.32	99.92	0.08
302	TL-51/4-5m	4	5	1187.5	10.82	3.37	12.63	73.18	0.8	72.37	100	0
303	TL-51/5-6m	5	6	1251.5	9.83	1.56	9.71	78.83	1.42	77.41	99.92	0.08
304	TL-52/0-1m	0	1	1006.5	16.29	1.19	17.09	65.03	0.91	64.12	99.6	0.4
305	TL-52/1-2m	1	2	1252	10.62	0.32	12.66	75.88	1.37	74.51	99.48	0.52
306	TL-52/2-3m	2	3	1138	3.95	0.7	9.05	85.5	0.68	84.82	99.21	0.79
307	TL-52/3-4m	3	4	1353	5.99	0.37	9.28	83.67	1	82.66	99.3	0.7
308	TL-52/4-5m	4	5	4627	8.92	1.52	9.94	79.41	1.99	77.43	99.79	0.21
309	TL-52/5-6m	5	6	1452	6.34	0.55	9.78	83.26	1.25	82.02	99.93	0.07

Annexure 5
Chemical analysis assay data.

Annexure 5. Chemical Analysis Data

Sl. No.	Sample No.	Borehole	Depth from (m)	Depth To (m)	Fraction	Al2O3	BaO	CaO	Cr2O3	Fe2O3	K2O	MgO	MnO	Na2O	P2O5	SO3	TiO2	SiO2	V2O5	LOI
						%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
1	**TL-02/0-1/A**	TL02	0	1	A	6.23	<0.05	1.78	0.1	48.37	0.21	2.51	0.52	0.23	0.2	0.36	19.6	15.02	0.41	4.18
2	**TL-02/0-1/B**	TL02	0	1	B	6.64	<0.05	1.69	0.08	36.82	0.29	3.37	0.31	0.25	0.21	0.17	22.31	23.6	0.11	3.95
3	**TL-02/0-1/C**	TL02	0	1	C	9.32	<0.05	1.62	0.05	19.04	0.66	3.69	<0.05	0.52	0.27	<0.05	2.4	55.68	<0.05	6.52
4	**TL-02/5-6/A**	TL02	5	6	A	6.34	<0.05	1.29	0.09	42.64	0.27	2.29	0.45	0.55	0.19	0.08	18.56	22.23	0.38	4.37
5	**TL-02/5-6/B**	TL02	5	6	B	6.16	<0.05	1.63	0.06	32.44	0.37	2.89	0.26	0.6	0.18	0.06	17.9	33.16	0.11	3.99
6	**TL-02/5-6/C**	TL02	5	6	C	9.23	<0.05	1.79	0.07	23.76	0.51	3.42	0.06	0.83	0.28	0.07	3.55	49.15	0.06	7.1
7	**TL/02/1-2/A**	TL02	1	2	A	6.68	<0.05	1.49	<0.05	47.52	0.18	2.83	0.48	0.22	0.21	0.07	20.44	14.26	0.37	4.89
8	**TL/02/1-2/B**	TL02	1	2	B	5.84	<0.05	1.56	<0.05	40.8	0.21	3.13	0.38	0.27	0.18	<0.05	28.15	14.67	0.16	4.36
9	**TL/02/1-2/C**	TL02	1	2	C	10.09	<0.05	2.11	0.06	34.97	0.33	5.08	0.17	0.27	0.34	0.13	11.09	26.74	0.09	8.37
10	**TL/02/2-3/A**	TL02	2	3	A	6.25	<0.05	1.68	<0.05	46.65	0.24	2.74	0.45	0.26	0.21	<0.05	19.71	16.09	0.34	4.98
11	**TL/02/2-3/B**	TL02	2	3	B	7.21	<0.05	2.67	<0.05	35.35	0.39	3.67	0.31	0.58	0.23	0.07	19.9	22.84	0.14	6.45
12	**TL/02/2-3/C**	TL02	2	3	C	9.26	<0.05	2.27	0.06	33.41	0.34	4.52	0.18	0.31	0.32	0.05	12.14	29.36	0.09	7.52
13	**TL/02/3-4/A**	TL02	3	4	A	6.79	<0.05	1.82	<0.05	43.07	0.3	3.11	0.42	0.69	0.21	0.1	18.31	18.67	0.31	5.86
14	**TL/02/3-4/B**	TL02	3	4	B	5.84	<0.05	1.8	<0.05	37.32	0.3	3.3	0.35	0.65	0.18	0.08	24.91	19.29	0.17	5.58
15	**TL/02/3-4/C**	TL02	3	4	C	10.28	<0.05	2.34	0.06	31.05	0.43	5.23	0.15	0.82	0.33	0.09	9.13	31.6	0.07	8.22
16	**TL/02/4-5/A**	TL02	4	5	A	6.45	<0.05	1.42	<0.05	39.69	0.34	2.61	0.37	1.11	0.2	0.12	17.65	23.77	0.3	5.63
17	**TL/02/4-5/B**	TL02	4	5	B	6.31	<0.05	1.83	<0.05	36.34	0.35	3.04	0.33	1.07	0.19	0.24	24.15	19.71	0.15	6.04
18	**TL/02/4-5/C**	TL02	4	5	C	9.44	<0.05	1.83	0.08	31.96	0.44	4.18	0.16	1.23	0.31	0.09	10.59	31.66	0.09	7.74
19	**TL/07/0-1/A**	TL07	0	1	A	7.06	<0.05	2.24	<0.05	43.97	0.26	4.03	0.48	0.59	0.21	0.07	17.15	18.02	0.35	5.3
20	**TL/07/0-1/B**	TL07	0	1	B	7.92	<0.05	2.63	<0.05	35.27	0.34	5.13	0.3	0.66	0.25	0.07	17.14	22.4	0.12	7.59
21	**TL/07/0-1/C**	TL07	0	1	C	10.96	<0.05	2.87	<0.05	30.6	0.37	7.05	0.17	0.51	0.37	0.1	6.11	31.52	0.07	9.14
22	**TL/07/1-2/A**	TL07	1	2	A	6.63	<0.05	1.62	<0.05	48.1	0.2	3.5	0.51	0.24	0.22	<0.05	18.81	14.49	0.4	4.97
23	**TL/07/1-2/B**	TL07	1	2	B	6.24	<0.05	1.47	<0.05	41.3	0.21	3.76	0.36	0.2	0.2	<0.05	25.6	15.24	0.17	5.02
24	**TL/07/1-2/C**	TL07	1	2	C	10	<0.05	1.77	0.06	37.24	0.28	5.68	0.18	0.15	0.36	<0.05	11.17	24.55	0.1	8.26
25	**TL/07/2-3/A**	TL07	2	3	A	10.96	<0.05	2.23	<0.05	36.11	0.35	5.22	0.3	0.36	0.35	<0.05	9.93	24.79	0.18	8.98
26	**TL/07/2-3/B**	TL07	2	3	B	11.5	<0.05	2.62	<0.05	28.8	0.44	5.74	0.19	0.47	0.35	<0.05	8.96	30.32	0.07	10.35
27	**TL/07/2-3/C**	TL07	2	3	C	12.68	<0.05	2.03	<0.05	25.27	0.53	6.56	0.08	0.33	0.41	0.05	1.94	39.45	<0.05	10.51
28	**TL/07/3-4/A**	TL07	3	4	A	10.92	<0.05	2.58	<0.05	34.28	0.46	5.57	0.33	1.31	0.32	0.17	9.53	24.74	0.21	9.43
29	**TL/07/3-4/B**	TL07	3	4	B	12.07	<0.05	3.48	<0.05	26.93	0.46	5.33	0.19	1.42	0.34	0.18	8.3	28.5	0.06	12.58
30	**TL/07/3-4/C**	TL07	3	4	C	13.18	<0.05	3.06	<0.05	24.91	0.6	6.89	0.07	1.24	0.39	0.19	2.27	35.38	<0.05	11.65
31	**TL/07/4-5/A**	TL07	4	5	A	12.11	<0.05	2.76	<0.05	31.83	0.41	5.09	0.25	1.04	0.36	0.14	8.16	26.28	0.14	11.25
32	**TL/07/4-5/B**	TL07	4	5	B	12.26	<0.05	4.46	<0.05	24.64	0.49	5.07	0.13	1.05	0.33	0.15	6.83	30.99	0.05	13.42
33	**TL/07/4-5/C**	TL07	4	5	C	13.46	<0.05	3.81	<0.05	23.86	0.66	6.68	0.07	0.94	0.39	0.16	1.86	35.2	<0.05	12.76
34	**TL/07/5-6/A**	TL07	5	6	A	13.55	<0.05	2.78	<0.05	30.01	0.47	5.55	0.17	1.05	0.42	0.15	5.54	28.24	0.1	11.8
35	**TL/07/5-6/B**	TL07	5	6	B	13.22	<0.05	5.07	<0.05	23.91	0.49	5.41	0.08	1.1	0.38	0.15	3.9	30.24	<0.05	15.87
36	**TL/07/5-6/C**	TL07	5	6	C	13.32	<0.05	4.52	<0.05	23.97	0.66	6.77	0.06	0.91	0.41	0.17	1.47	33.95	<0.05	13.65
37	**TL/08/0-1/A**	TL08	0	1	A	6.69	<0.05	1.79	0.05	45.8	0.23	3.32	0.48	0.26	0.23	<0.05	19.81	16.11	0.38	4.58
38	**TL/08/0-1/B**	TL08	0	1	B	6.05	<0.05	2.02	<0.05	39.38	0.26	3.66	0.32	0.25	0.21	<0.05	24.97	17.66	0.12	4.88
39	**TL/08/0-1/C**	TL08	0	1	C	10.57	<0.05	2.67	<0.05	31.68	0.33	5.84	0.14	0.21	0.38	<0.05	7.27	31.05	0.07	9.57
40	**TL/08/1-2/A**	TL08	1	2	A	6.38	<0.05	1.71	0.05	42.34	0.28	3.22	0.46	0.26	0.21	<0.05	18.83	21.69	0.32	3.98
41	**TL/08/1-2/B**	TL08	1	2	B	5.7	<0.05	2.19	<0.05	37.01	0.3	3.64	0.37	0.35	0.19	<0.05	26.05	19.66	0.17	4.11

Annexure 5. Chemical Analysis Data

Sl. No.	Sample No.	Borehole	Depth from (m)	Depth To (m)	Fraction	Al2O3	BaO	CaO	Cr2O3	Fe2O3	K2O	MgO	MnO	Na2O	P2O5	SO3	TiO2	SiO2	V2O5	LOI
						%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
42	**TL/08/1-2/C**	TL08	1	2	C	10.2	<0.05	2.68	<0.05	30.22	0.4	5.69	0.17	0.27	0.35	<0.05	8.14	33.54	0.07	8.06
43	**TL/08/2-3/A**	TL08	2	3	A	4.95	<0.05	1.55	<0.05	51.37	0.19	2.59	0.61	0.19	0.18	<0.05	21.74	11.74	0.47	4.04
44	**TL/08/2-3/B**	TL08	2	3	B	6.96	<0.05	2.96	<0.05	36.62	0.33	4.23	0.32	0.34	0.25	<0.05	20.35	21.19	0.17	6
45	**TL/08/2-3/C**	TL08	2	3	C	10.16	<0.05	3.7	0.05	27.89	0.45	5.44	0.13	0.35	0.33	<0.05	6.93	36.39	0.07	7.88
46	**TL/08/3-4/A**	TL08	3	4	A	6.29	<0.05	1.7	<0.05	46.11	0.21	3.15	0.47	0.18	0.23	<0.05	21.38	15.11	0.34	4.54
47	**TL/08/3-4/B**	TL08	3	4	B	5.44	<0.05	1.68	<0.05	40.41	0.22	3.35	0.38	0.2	0.21	<0.05	26.88	16.38	0.12	4.54
48	**TL/08/3-4/C**	TL08	3	4	C	9.4	<0.05	2.98	0.06	34.49	0.29	5.48	0.21	0.2	0.35	<0.05	11.09	27.69	0.09	7.5
49	**TL/08/4-5/A**	TL08	4	5	A	7.76	<0.05	2.19	<0.05	41.43	0.28	3.72	0.43	0.28	0.3	<0.05	17.14	19.61	0.29	6.29
50	**TL/08/4-5/B**	TL08	4	5	B	8.5	<0.05	2.3	<0.05	33.2	0.31	4.34	0.26	0.26	0.32	<0.05	16.7	25.25	0.12	8.23
51	**TL/08/4-5/C**	TL08	4	5	C	10.78	<0.05	2.92	0.06	30.49	0.37	5.55	0.15	0.24	0.39	<0.05	6.28	34.18	0.07	8.39
52	**TL/08/5-6/A**	TL08	5	6	A	6.82	<0.05	1.91	<0.05	44.04	0.26	3.3	0.43	0.24	0.25	<0.05	19.08	17.43	0.3	5.64
53	**TL/08/5-6/B**	TL08	5	6	B	6.94	<0.05	2.05	<0.05	44.18	0.29	3.54	0.42	0.27	0.27	<0.05	17.44	17.72	0.27	6.28
54	**TL/08/5-6/C**	TL08	5	6	C	10.67	<0.05	2.88	<0.05	29.16	0.47	5.41	0.14	0.35	0.38	<0.05	5.79	35.69	0.07	8.8
55	**TL/15/0-1/A**	TL15	0	1	A	8.83	<0.05	3.39	<0.05	37.03	0.39	5.1	0.38	1.14	0.28	0.08	11.83	23.38	0.24	7.69
56	**TL/15/0-1/B**	TL15	0	1	B	11.13	<0.05	3.48	<0.05	26.08	0.46	5.6	0.18	1.11	0.33	0.06	7.69	33.4	0.05	10.28
57	**TL/15/0-1/C**	TL15	0	1	C	12.1	<0.05	3.7	<0.05	26.78	0.51	7.18	0.11	1.01	0.39	0.09	2.27	35.75	<0.05	9.91
58	**TL/15/1-2/A**	TL15	1	2	A	7.02	<0.05	2.87	<0.05	43.02	0.29	4.16	0.47	0.49	0.2	<0.05	17.02	19.74	0.35	4.07
59	**TL/15/1-2/B**	TL15	1	2	B	7.79	<0.05	3.71	<0.05	25.99	0.65	4.71	0.18	0.87	0.21	<0.05	10.4	39.49	0.06	5.73
60	**TL/15/1-2/C**	TL15	1	2	C	10.94	<0.05	4.32	0.05	25.93	0.5	7.14	0.12	0.64	0.32	0.05	3.91	38.2	0.05	7.72
61	**TL/15/2-3/A**	TL15	2	3	A	6.71	<0.05	2.74	<0.05	42.56	0.31	4.2	0.46	0.9	0.2	0.09	16.75	19.93	0.34	4.55
62	**TL/15/2-3/B**	TL15	2	3	B	8.57	<0.05	3.42	<0.05	20.61	0.62	4.53	0.15	1.32	0.24	0.11	6.91	46.07	0.05	7.28
63	**TL/15/2-3/C**	TL15	2	3	C	10.89	<0.05	3.62	<0.05	25.47	0.49	6.95	0.12	0.94	0.35	0.13	3	38.76	0.05	9.09
64	**TL/15/3-4/A**	TL15	3	4	A	6.3	<0.05	2.22	<0.05	46.47	0.24	3.78	0.51	0.32	0.19	<0.05	18.53	17.06	0.39	3.65
65	**TL/15/3-4/B**	TL15	3	4	B	8.16	<0.05	3.05	0.06	25.1	0.5	4.73	0.2	0.5	0.23	<0.05	10.1	41.86	0.07	5.27
66	**TL/15/3-4/C**	TL15	3	4	C	10.39	<0.05	3.54	<0.05	30.02	0.39	7.18	0.17	0.34	0.34	<0.05	6.24	32.77	0.06	8.33
67	**TL/15/4-5/A**	TL15	4	5	A	7.39	<0.05	2.5	<0.05	44.54	0.27	3.77	0.47	0.26	0.22	<0.05	17.06	17.67	0.36	5.15
68	**TL/15/4-5/B**	TL15	4	5	B	9.3	<0.05	6.05	<0.05	29.08	0.51	4.93	0.22	0.51	0.25	0.07	13.65	26	0.08	9.12
69	**TL/15/4-5/C**	TL15	4	5	C	10.79	<0.05	5.8	<0.05	28.37	0.57	7.23	0.18	0.36	0.34	0.08	5.05	29.49	0.06	11.49
70	**TL/15/5-6/A**	TL15	5	6	A	8.32	<0.05	2.92	<0.05	40.71	0.37	4.28	0.41	0.39	0.25	<0.05	14.11	21.82	0.28	5.81
71	**TL/15/5-6/B**	TL15	5	6	B	10.58	<0.05	6.02	<0.05	26.98	0.68	5.34	0.2	0.64	0.28	0.08	9.56	28.74	0.08	10.62
72	**TL/15/5-6/C**	TL15	5	6	C	11.25	<0.05	5.01	<0.05	28.29	0.53	6.9	0.15	0.39	0.35	0.08	5.54	30.81	0.06	10.46
73	**TL/16/0-1/A**	TL16	0	1	A	5.67	<0.05	1.83	<0.05	48.72	0.2	3.15	0.51	0.18	0.19	<0.05	20.25	14.66	0.41	3.88
74	**TL/16/0-1/B**	TL16	0	1	B	6.71	<0.05	2.94	<0.05	36.21	0.29	4.57	0.32	0.31	0.22	<0.05	20.48	22.48	0.14	5.08
75	**TL/16/0-1/C**	TL16	0	1	C	9.5	<0.05	3.29	<0.05	31.09	0.37	6.5	0.17	0.26	0.35	<0.05	6.52	33.3	0.08	8.36
76	**TL/16/1-2/A**	TL16	1	2	A	5.98	<0.05	2.16	0.05	47.33	0.23	3.57	0.49	0.21	0.2	<0.05	19.38	16.39	0.39	3.33
77	**TL/16/1-2/B**	TL16	1	2	B	6.33	<0.05	2.7	<0.05	38.41	0.29	4.41	0.32	0.3	0.21	<0.05	23.04	19.54	0.11	4.1
78	**TL/16/1-2/C**	TL16	1	2	C	9.37	<0.05	4.03	0.05	32.06	0.33	7.16	0.19	0.25	0.33	<0.05	7.05	30.59	0.08	8.14
79	**TL/16/2-3/A**	TL16	2	3	A	5.87	<0.05	1.92	<0.05	46.53	0.22	3.36	0.53	0.2	0.2	<0.05	19.37	17.95	0.4	3.12
80	**TL/16/2-3/B**	TL16	2	3	B	5.69	<0.05	2.54	<0.05	39.57	0.26	4.36	0.36	0.29	0.2	<0.05	25.01	17.67	0.17	3.66
81	**TL/16/2-3/C**	TL16	2	3	C	9.99	<0.05	3.57	0.05	31.57	0.33	6.89	0.16	0.22	0.36	<0.05	7.15	31.84	0.07	7.66
82	**TL/16/3-4/A**	TL16	3	4	A	5.5	<0.05	1.93	<0.05	48.48	0.22	3.16	0.52	0.2	0.18	<0.05	20.17	15.58	0.41	3.28

Annexure 5. Chemical Analysis Data

Sl. No.	Sample No.	Borehole	Depth from (m)	Depth To (m)	Fraction	Al2O3	BaO	CaO	Cr2O3	Fe2O3	K2O	MgO	MnO	Na2O	P2O5	SO3	TiO2	SiO2	V2O5	LOI
						%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
83	**TL/16/3-4/B**	TL16	3	4	B	6.82	<0.05	2.91	<0.05	36.12	0.34	4.49	0.32	0.31	0.22	<0.05	20.78	22.52	0.13	4.79
84	**TL/16/3-4/C**	TL16	3	4	C	8.61	<0.05	3.75	<0.05	32.47	0.34	6.2	0.22	0.23	0.29	<0.05	10.4	31.01	0.09	6.14
85	**TL/16/4-5/A**	TL16	4	5	A	6.11	<0.05	2.17	0.05	46.09	0.25	3.45	0.52	0.26	0.2	<0.05	19.15	17.47	0.4	3.56
86	**TL/16/4-5/B**	TL16	4	5	B	7.26	<0.05	3.34	<0.05	34.58	0.4	4.7	0.31	0.4	0.22	<0.05	18.68	24.87	0.11	4.88
87	**TL/16/4-5/C**	TL16	4	5	C	9.42	<0.05	3.95	0.05	30.9	0.37	6.72	0.21	0.27	0.33	<0.05	7.5	33.11	0.08	6.92
88	**TL/16/5-6/A**	TL16	5	6	A	5.93	<0.05	2.09	<0.05	47.26	0.23	3.38	0.53	0.21	0.2	<0.05	19.06	17.06	0.38	3.33
89	**TL/16/5-6/B**	TL16	5	6	B	7.3	<0.05	3.35	<0.05	33.63	0.39	4.74	0.31	0.4	0.23	<0.05	18.51	25.92	0.13	4.83
90	**TL/16/5-6/C**	TL16	5	6	C	9.89	<0.05	3.8	<0.05	29.98	0.37	6.63	0.18	0.27	0.34	<0.05	6.75	34.14	0.07	7.35
91	**TL-23/0-1/A**	TL23	0	1	A	6.76	<0.05	3.29	<0.05	37.3	0.4	3.83	0.4	1.28	0.2	26.82	14.03	26.82	0.29	5.05
92	**TL-23/0-1/B**	TL23	0	1	B	6.92	<0.05	4.44	<0.05	30.12	0.55	4.03	0.05	1.39	0.17	31.73	16.05	31.73	0.16	4.01
93	**TL-23/0-1/C**	TL23	0	1	C	8.01	<0.05	5.43	<0.05	27.83	0.46	6.66	0.23	1.35	0.23	34.53	7.76	34.53	0.1	7.2
94	**TL-23/1-2/A**	TL23	1	2	A	4.7	<0.05	2.02	<0.05	50.27	0.2	2.87	0.56	0.34	0.13	14.93	20.7	14.93	0.5	2.47
95	**TL-23/1-2/B**	TL23	1	2	B	7.09	<0.05	4.1	<0.05	32.27	0.45	4.61	0.31	0.64	0.19	28.65	17.04	28.65	0.19	4.22
96	**TL-23/1-2/C**	TL23	1	2	C	0.13	<0.05	3.96	<0.05	30.03	0.39	6.94	0.22	0.53	0.29	32.18	7.83	32.18	0.1	8.18
97	**TL-23/2-3/A**	TL23	2	3	A	4.82	<0.05	2.03	<0.05	50.27	0.17	3.01	0.59	0.24	0.13	13.81	21.55	13.81	0.49	2.55
98	**TL-23/2-3/B**	TL23	2	3	B	6.41	<0.05	3.68	<0.05	35.38	0.41	4.34	0.34	0.51	0.17	23.64	20.61	23.64	0.19	4.12
99	**TL-23/2-3/C**	TL23	2	3	C	9.2	<0.05	3.81	<0.05	30.78	0.32	6.75	0.2	0.69	0.3	30.95	7.92	30.95	0.1	8.81
100	**TL-23/3-4/A**	TL23	3	4	A	7.79	<0.05	2.54	<0.05	42.25	0.29	3.98	0.41	0.54	0.24	0.06	14.66	20.78	0.3	5.89
101	**TL-23/3-4/B**	TL23	3	4	B	8.29	<0.05	3.45	<0.05	28.54	0.53	4.42	0.24	0.7	0.23	0.08	13.14	33.06	0.1	7.05
102	**TL-23/3-4/C**	TL23	3	4	C	11.25	<0.05	2.95	<0.05	28.43	0.39	6.52	0.13	0.52	0.36	0.08	4.47	33.27	0.06	11.42
103	**TL-23/4-5/A**	TL23	4	5	A	5.84	<0.05	1.98	<0.05	47.62	0.25	3.12	0.53	0.23	0.17	<0.05	19.69	16.2	0.43	3.59
104	**TL-23/4-5/B**	TL23	4	5	B	7.81	<0.05	4.42	<0.05	31.96	0.63	5.18	0.28	0.61	0.21	<0.05	14.67	28.25	0.12	5.61
105	**TL-23/4-5/C**	TL23	4	5	C	9.98	<0.05	3.66	<0.05	29.68	0.49	6.75	0.2	0.39	0.32	<0.05	7.27	31.45	0.07	9.55
106	**TL-23/5-6/A**	TL23	5	6	A	9.4	<0.05	2.86	<0.05	35.11	0.4	4.71	0.31	1.41	0.29	0.1	11.35	24.09	0.21	9.55
107	**TL-23/5-6/B**	TL23	5	6	B	9.19	<0.05	3.63	<0.05	30.73	0.41	4.86	0.25	1.38	0.27	0.11	14.3	24.79	0.08	9.82
108	**TL-23/5-6/C**	TL23	5	6	C	12.26	<0.05	3.11	0.08	24.83	0.56	6.6	0.1	1.29	0.36	0.1	2.22	35.87	<0.05	12.49
109	**TL/24/0-1/A**	TL24	0	1	A	5.36	<0.05	1.63	<0.05	50.52	0.18	2.58	0.56	0.17	0.18	<0.05	21.05	13.03	0.46	3.95
110	**TL/24/0-1/B**	TL24	0	1	B	5.82	<0.05	1.9	<0.05	35.11	0.3	2.92	0.34	0.27	0.19	<0.05	22.49	24.14	0.12	6.15
111	**TL/24/0-1/C**	TL24	0	1	C	9.74	<0.05	3.35	<0.05	32.92	0.28	5.53	0.18	0.17	0.37	<0.05	8.25	28.75	0.08	10.2
112	**TL/24/1-2/A**	TL24	1	2	A	5.77	<0.05	2.26	<0.05	45.57	0.26	3.16	0.49	0.32	0.19	<0.05	19.59	18.21	0.39	3.48
113	**TL/24/1-2/B**	TL24	1	2	B	7.37	<0.05	3.93	<0.05	31.87	0.53	4.46	0.29	0.61	0.21	<0.05	15.4	29.43	0.12	5.5
114	**TL/24/1-2/C**	TL24	1	2	C	7.84	<0.05	4.04	0.06	34.3	0.35	5.68	0.31	0.61	0.25	0.05	12.45	28.44	0.11	5.34
115	**TL/24/2-3/A**	TL24	2	3	A	5.69	<0.05	2.34	<0.05	37.8	0.27	3.81	0.36	0.33	0.19	<0.05	25.98	19.9	0.16	2.95
116	**TL/24/2-3/B**	TL24	2	3	B	10.84	<0.05	3.69	0.09	26.65	0.43	6.53	0.13	0.41	0.37	<0.05	2.89	38.58	0.06	9.21
117	**TL/24/2-3/C**	TL24	2	3	C	10.4	<0.05	3.71	<0.05	26.35	0.43	6.39	0.1	0.37	0.36	<0.05	3.02	38.61	0.06	10.03
118	**TL/24/3-4/A**	TL24	3	4	A	7.01	<0.05	2.7	<0.05	43.03	0.29	3.78	0.44	0.4	0.24	<0.05	16.32	20.12	0.31	5.07
119	**TL/24/3-4/B**	TL24	3	4	B	6.34	<0.05	3.21	<0.05	32.2	0.5	3.93	0.27	0.58	0.18	<0.05	18.2	29.35	0.1	4.92
120	**TL/24/3-4/C**	TL24	3	4	C	9.73	<0.05	4.17	0.06	30.68	0.35	6.51	0.19	0.33	0.34	<0.05	6.85	32.65	0.07	7.92
121	**TL/24/4-5/A**	TL24	4	5	A	6.4	<0.05	2.35	<0.05	45.87	0.25	3.58	0.51	0.33	0.22	<0.05	18.05	18.07	0.37	3.67
122	**TL/24/4-5/B**	TL24	4	5	B	7.01	<0.05	2.52	<0.05	35.03	0.33	3.85	0.3	0.4	0.24	<0.05	20.79	24.24	0.14	4.96
123	**TL/24/4-5/C**	TL24	4	5	C	10.08	<0.05	2.91	0.06	27.3	0.41	5.27	0.14	0.38	0.34	<0.05	5.29	39.48	0.09	8.13

Annexure 5. Chemical Analysis Data

Sl. No.	Sample No.	Borehole	Depth from (m)	Depth To (m)	Fraction	Al2O3	BaO	CaO	Cr2O3	Fe2O3	K2O	MgO	MnO	Na2O	P2O5	SO3	TiO2	SiO2	V2O5	LOI
						%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
124	**TL/24/5-6/A**	TL24	5	6	A	5.65	<0.05	2.11	0.05	47.96	0.22	3.12	0.51	0.26	0.2	<0.05	19.82	16.22	0.41	3.19
125	**TL/24/5-6/B**	TL24	5	6	B	7.72	<0.05	2.59	0.07	34.7	0.36	4.3	0.3	0.4	0.27	<0.05	17.66	28.17	0.14	3.12
126	**TL/24/5-6/C**	TL24	5	6	C	10.21	<0.05	3.44	0.07	27.78	0.39	5.83	0.17	0.35	0.34	<0.05	5.66	36.96	0.07	8.58
127	**TL/30/0-1/A**	TL30	0	1	A	6.14	<0.05	3.14	<0.05	45.64	0.25	3.43	0.5	0.45	0.19	<0.05	18.12	18.84	0.39	2.58
128	**TL/30/0-1/B**	TL30	0	1	B	6.39	<0.05	3.69	<0.05	36.22	0.29	4	0.35	0.56	0.2	<0.05	22.25	22.67	0.14	2.98
129	**TL/30/0-1/C**	TL30	0	1	C	9.34	<0.05	5.08	0.06	28.92	0.36	6.17	0.23	0.48	0.31	<0.05	7.57	35.4	0.08	5.84
130	**TL/30/1-2/A**	TL30	1	2	A	7.21	<0.05	3.48	<0.05	39.67	0.36	3.9	0.46	1.28	0.21	0.09	14.74	23.79	0.31	4.25
131	**TL/30/1-2/B**	TL30	1	2	B	7.72	<0.05	3.83	<0.05	27.47	0.52	4.17	0.26	1.53	0.2	0.12	13.81	35.11	0.11	4.97
132	**TL/30/1-2/C**	TL30	1	2	C	10.62	<0.05	3.9	0.08	25.1	0.54	5.82	0.12	1.48	0.32	0.09	3.47	40.86	0.06	7.45
133	**TL/30/2-3/A**	TL30	2	3	A	6.91	<0.05	3.24	<0.05	41.71	0.3	3.79	0.45	1.1	0.19	0.06	16.04	21.39	0.33	4.19
134	**TL/30/2-3/B**	TL30	2	3	B	8.19	<0.05	4.45	<0.05	28.29	0.47	4.7	0.24	1.42	0.24	0.08	11.58	33.45	0.08	6.62
135	**TL/30/2-3/C**	TL30	2	3	C	11.08	<0.05	3.86	0.08	26.06	0.47	6.37	0.11	1.24	0.33	0.06	3.62	38.01	0.05	8.56
136	**TL/30/3-4/A**	TL30	3	4	A	6.87	<0.05	3.15	0.06	38.23	0.35	3.81	0.4	1.16	0.19	0.06	14.23	26.71	0.29	4.26
137	**TL/30/3-4/B**	TL30	3	4	B	7.56	<0.05	3.93	<0.05	30.23	0.39	4.33	0.28	1.32	0.21	0.08	14.8	28.44	0.12	8.14
138	**TL/30/3-4/C**	TL30	3	4	C	10.95	<0.05	3.18	<0.05	25.01	0.47	6.01	0.12	1.22	0.34	0.06	3.17	39.98	<0.05	9.29
139	**TL/30/4-5/A**	TL30	4	5	A	6.71	<0.05	2.75	<0.05	43.91	0.27	3.53	0.44	0.85	0.19	<0.05	16.48	19.86	0.36	4.3
140	**TL/30/4-5/B**	TL30	4	5	B	8.75	<0.05	3.96	<0.05	30.81	0.38	5	0.28	1.08	0.28	<0.05	13.12	28.7	0.12	7.31
141	**TL/30/4-5/C**	TL30	4	5	C	10.3	<0.05	3.2	<0.05	30.01	0.38	5.82	0.2	0.97	0.34	<0.05	6.71	32.11	0.08	9.67
142	**TL/30/5-6/A**	TL30	5	6	A	6.42	<0.05	2.57	0.05	46.06	0.3	3.37	0.5	0.4	0.18	<0.05	17.39	18.62	0.38	3.47
143	**TL/30/5-6/B**	TL30	5	6	B	7.56	<0.05	3.4	<0.05	33.08	0.39	4.41	0.28	0.46	0.22	<0.05	17.08	27.03	0.11	5.75
144	**TL/30/5-6/C**	TL30	5	6	C	10.46	<0.05	3.27	0.05	23.89	0.56	5.59	0.11	0.46	0.3	<0.05	3.6	43.74	0.05	7.79
145	**TL-31/0-1/A**	TL31	0	1	A	4.78	0.02	1.57	0.05	52.53	0.17	2.28	0.58	0.17	0.17	11.79	21.93	11.79	0.51	3.18
146	**TL-31/0-1/B**	TL31	0	1	B	6.18	<0.05	3.89	<0.05	31.69	0.45	4.15	0.28	0.45	0.19	0.05	18	26.45	0.1	7.91
147	**TL-31/0-1/C**	TL31	0	1	C	9.41	0	3.45	0.05	31.74	0.38	5.34	0.2	0.29	0.37	30.94	7.95	30.94	0.1	9.64
148	**TL-31/1-2/A**	TL31	1	2	A	4.36	0.02	1.36	0.04	54.74	0.17	2.26	0.64	0.15	0.13	10.81	22.38	10.81	0.54	2.12
149	**TL-31/1-2/B**	TL31	1	2	B	7.69	<0.05	3.93	<0.05	31.67	0.55	4.48	0.3	0.59	0.2	<0.05	15.39	29.56	0.15	5.25
150	**TL-31/1-2/C**	TL31	1	2	C	8.12	0.02	305	0.04	33.61	0.34	4.96	0.22	0.26	0.26	29.64	12.14	29.64	0.13	7.1
151	**TL-31/2-3/A**	TL31	2	3	A	4.96	0.02	1.74	0.04	51.56	0.19	2.74	0.58	0.17	0.15	13.38	21.17	13.38	0.49	2.58
152	**TL-31/2-3/B**	TL31	2	3	B	7.23	<0.05	4.1	<0.05	32.65	0.53	4.67	0.33	0.57	0.2	<0.05	17.48	28.16	0.16	3.69
153	**TL-31/2-3/C**	TL31	2	3	C	8.54	0	3.53	0.05	34	0.33	5.53	0.23	0.28	0.28	28.43	11.05	28.43	0.13	7.52
154	**TL-31/3-4/A**	TL31	3	4	A	5.45	0.02	1.74	0.04	51.44	0.18	2.76	0.59	0.21	0.16	13.25	20.67	13.25	0.49	2.75
155	**TL-31/3-4/B**	TL31	3	4	B	6.26	<0.05	2.57	<0.05	36.03	0.33	3.82	0.32	0.36	0.19	<0.05	22.03	23.98	0.17	3.72
156	**TL-31/3-4/C**	TL31	3	4	C	10.12	0	3.07	0.04	26.3	0.43	5.45	0.13	0.36	0.32	39.47	5.22	39.47	0.08	8.9
157	**TL-31/4-5/A**	TL31	4	5	A	5.6	0	1.99	0.04	49.45	0.2	2.9	0.55	0.25	0.17	14.9	20.48	14.9	0.47	2.77
158	**TL-31/4-5/B**	TL31	4	5	B	3.17	<0.05	1.72	<0.05	44.41	0.13	3.01	0.46	0.14	0.1	<0.05	35.13	11.31	0.19	<0.1
159	**TL-31/4-5/C**	TL31	4	5	C	10.61	0	3.98	0.05	28.05	0.36	6.61	0.15	0.3	0.35	35.64	3.72	35.64	0.09	10.01
160	**TL-31/5-6/A**	TL31	5	6	A	5	0.02	2.06	0.04	50.75	0.21	3.02	0.56	0.26	0.16	14.18	20.45	14.18	0.46	2.58
161	**TL-31/5-6/B**	TL31	5	6	B	7.45	<0.05	2.99	<0.05	34.74	0.34	4.24	0.32	0.46	0.24	<0.05	19.14	24.56	0.13	5.12
162	**TL-31/5-6/C**	TL31	5	6	C	9.75	0	3.74	0.05	31. 64	0.36	6.61	0.18	0.28	0.32	31. 23	6.34	31.23	0.1	9.31
163	**TL/40/0-1/A**	TL40	0	1	A	5.49	<0.05	3.14	<0.05	47.72	0.25	3.17	0.54	0.54	0.17	<0.05	18.76	17.38	0.42	2.06
164	**TL/40/0-1/B**	TL40	0	1	B	7.72	<0.05	4.97	<0.05	27.76	0.59	4.51	0.25	0.97	0.19	<0.05	14.44	33.35	0.11	4.89

Annexure 5. Chemical Analysis Data

Sl. No.	Sample No.	Borehole	Depth from (m)	Depth To (m)	Fraction	Al2O3	BaO	CaO	Cr2O3	Fe2O3	K2O	MgO	MnO	Na2O	P2O5	SO3	TiO2	SiO2	V2O5	LOI
						%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
165	**TL/40/0-1/C**	TL40	0	1	C	9.21	<0.05	5.3	0.07	27.01	0.43	5.72	0.21	0.73	0.25	<0.05	7.88	37.17	0.08	5.75
166	**TL/40/1-2/A**	TL40	1	2	A	5.15	<0.05	2.47	0.06	49.27	0.21	2.93	0.58	0.38	0.13	<0.05	20.01	16.42	0.48	1.6
167	**TL/40/1-2/B**	TL40	1	2	B	1.76	<0.05	0.91	<0.05	46.82	0.07	2.01	0.46	0.09	<0.05	<0.05	41.41	5.92	0.23	<0.1
168	**TL/40/1-2/C**	TL40	1	2	C	9.13	<0.05	4.27	0.07	27.18	0.44	5.13	0.17	0.56	0.25	<0.05	6.49	39.82	0.08	6.19
169	**TL/40/2-3/A**	TL40	2	3	A	4.59	<0.05	2.22	0.05	51.14	0.2	2.78	0.59	0.33	0.12	<0.05	21.61	14.35	0.48	1.23
170	**TL/40/2-3/B**	TL40	2	3	B	6.38	<0.05	4.28	<0.05	34.05	0.54	4.46	0.33	0.68	0.15	<0.05	19.39	27.1	0.17	2.25
171	**TL/40/2-3/C**	TL40	2	3	C	8.32	<0.05	4.5	0.08	30.42	0.43	5.66	0.22	0.52	0.22	<0.05	10.14	34.69	0.1	4.52
172	**TL/40/3-4/A**	TL40	3	4	A	4.68	<0.05	2.12	<0.05	51.72	0.2	2.76	0.6	0.33	0.12	<0.05	21.75	13.79	0.5	1.09
173	**TL/40/3-4/B**	TL40	3	4	B	6.56	<0.05	3.92	<0.05	33.25	0.59	4.27	0.3	0.7	0.15	<0.05	18.75	28.33	0.14	2.78
174	**TL/40/3-4/C**	TL40	3	4	C	8.56	<0.05	3.67	0.06	30.69	0.45	5.13	0.22	0.52	0.24	<0.05	9.94	34.75	0.11	5.43
175	**TL/40/4-5/A**	TL40	4	5	A	5.03	<0.05	2.57	<0.05	49.44	0.2	3.19	0.56	0.36	0.15	<0.05	20.54	15.55	0.47	1.58
176	**TL/40/4-5/B**	TL40	4	5	B	6.43	<0.05	4.82	<0.05	32.79	0.61	4.98	0.34	0.72	0.15	<0.05	17.88	28.54	0.13	2.39
177	**TL/40/4-5/C**	TL40	4	5	C	9.29	<0.05	4.35	0.06	28.73	0.42	6.15	0.2	0.51	0.27	<0.05	7.05	36.25	0.08	6.46
178	**TL/40/5-6/A**	TL40	5	6	A	6.29	<0.05	3.21	<0.05	45.33	0.27	3.75	0.48	0.49	0.19	<0.05	17.02	19.83	0.39	2.43
179	**TL/40/5-6/B**	TL40	5	6	B	8.5	<0.05	4.8	<0.05	27.42	0.86	4.86	0.26	0.9	0.2	<0.05	11.73	36.03	0.09	4.14
180	**TL/40/5-6/C**	TL40	5	6	C	10.25	<0.05	3.59	0.06	28.22	0.52	5.61	0.13	0.49	0.31	<0.05	4.94	37.91	0.06	7.76
181	**TL/41/0-1/A**	TL41	0	1	A	4.77	<0.05	2	<0.05	52.12	0.18	2.52	0.6	0.26	0.14	<0.05	21.89	13.04	0.51	1.59
182	**TL/41/0-1/B**	TL41	0	1	B	7.01	<0.05	3.96	<0.05	31.83	0.39	4.13	0.29	0.5	0.23	<0.05	16.73	26.08	0.12	8.46
183	**TL/41/0-1/C**	TL41	0	1	C	7.47	<0.05	3.86	0.06	35.49	0.3	4.85	0.29	0.31	0.22	<0.05	15.32	26.31	0.12	5.17
184	**TL/41/1-2/A**	TL41	1	2	A	5.56	<0.05	2.94	<0.05	47.78	0.24	3.3	0.55	0.42	0.17	<0.05	18.72	17.3	0.42	2.26
185	**TL/41/1-2/B**	TL41	1	2	B	6.27	<0.05	3.98	<0.05	35.4	0.36	4.43	0.35	0.53	0.17	0.08	22.34	23.38	0.16	2.33
186	**TL/41/1-2/C**	TL41	1	2	C	7.45	<0.05	4.87	<0.05	33.54	0.38	5.59	0.3	0.51	0.19	<0.05	13.34	29.04	0.11	4.43
187	**TL/41/2-3/A**	TL41	2	3	A	5.34	<0.05	2.86	<0.05	48.04	0.25	3.33	0.55	0.4	0.15	<0.05	19.24	17.1	0.43	2
188	**TL/41/2-3/B**	TL41	2	3	B	6.85	<0.05	4.49	<0.05	34.17	0.48	4.74	0.31	0.73	0.19	<0.05	18.44	26.24	0.13	3.01
189	**TL/41/2-3/C**	TL41	2	3	C	8.72	<0.05	4.92	0.06	29.76	0.5	5.98	0.25	0.59	0.22	<0.05	9.68	34.48	0.1	4.57
190	**TL/41/3-4/A**	TL41	3	4	A	5.19	<0.05	2.23	0.05	49.74	0.22	3.07	0.55	0.25	0.14	<0.05	20.64	15.41	0.48	1.73
191	**TL/41/3-4/B**	TL41	3	4	B	6.13	<0.05	3.69	<0.05	36.15	0.43	4.31	0.33	0.56	0.17	<0.05	21.41	23.68	0.15	2.75
192	**TL/41/3-4/C**	TL41	3	4	C	8.04	<0.05	4.14	0.06	33.94	0.43	5.51	0.28	0.43	0.22	<0.05	12.98	29.18	0.11	4.48
193	**TL/41/4-5/A**	TL41	4	5	A	5.01	<0.05	2.43	<0.05	50.43	0.21	3.12	0.56	0.33	0.15	<0.05	20.27	15.01	0.48	1.69
194	**TL/41/4-5/B**	TL41	4	5	B	6.88	<0.05	3.69	<0.05	34.3	0.34	4.52	0.32	0.5	0.22	<0.05	18.62	26.13	0.15	4.12
195	**TL/41/4-5/C**	TL41	4	5	C	8.47	<0.05	4.35	0.06	33.72	0.38	5.91	0.23	0.39	0.25	<0.05	10.22	30.25	0.08	5.52
196	**TL/41/5-6/A**	TL41	5	6	A	5.39	<0.05	2.57	<0.05	48.59	0.25	3.07	0.52	0.38	0.16	<0.05	19.43	17.24	0.44	1.63
197	**TL/41/5-6/B**	TL41	5	6	B	7.88	<0.05	4.44	<0.05	32.17	0.56	4.63	0.3	0.77	0.22	<0.05	15.19	29.36	0.12	4.12
198	**TL/41/5-6/C**	TL41	5	6	C	8.89	<0.05	4.34	0.07	29.26	0.55	5.67	0.24	0.56	0.25	<0.05	8.29	36.44	0.1	5.21
199	**TL-47/0-1/A**	TL47	0	1	A	4.23	<0.05	1.91	0.06	53.05	0.16	2.33	0.62	0.65	0.11	0.06	22.77	12.61	0.53	0.62
200	**TL-47/0-1/B**	TL47	0	1	B	4.18	<0.05	2.51	0.06	42.88	0.18	3.22	0.45	0.6	0.11	<0.05	29.59	15.67	0.18	0.1
201	**TL-47/0-1/C**	TL47	0	1	C	7.87	<0.05	4.76	0.12	29.92	0.4	5.15	0.22	0.97	0.23	0.06	7.11	38.55	0.11	4.31
202	**TL-47/1-2/A**	TL47	1	2	A	3.84	<0.05	1.72	0.05	55.82	0.13	2.19	0.66	0.28	0.1	<0.05	23.33	10.64	0.59	0.31
203	**TL-47/1-2/B**	TL47	1	2	B	4.21	<0.05	2.74	0.06	41.02	0.19	3.4	0.43	0.36	0.11	<0.05	27.44	19.39	0.18	0.24
204	**TL-47/1-2/C**	TL47	1	2	C	7.49	<0.05	4.25	0.11	28.29	0.41	4.73	0.18	0.55	0.21	<0.05	6.11	42.91	0.1	4.42
205	**TL-47/2-3/A**	TL47	2	3	A	3.5	<0.05	1.4	0.05	56.89	0.1	1.99	0.66	0.16	0.07	<0.05	24.73	9.55	0.58	<0.1

Annexure 5. Chemical Analysis Data

Sl. No.	Sample No.	Borehole	Depth from (m)	Depth To (m)	Fraction	Al2O3	BaO	CaO	Cr2O3	Fe2O3	K2O	MgO	MnO	Na2O	P2O5	SO3	TiO2	SiO2	V2O5	LOI
						%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
206	**TL-47/2-3/B**	TL47	2	3	B	3.44	<0.05	2.17	0.05	43.86	0.14	3.07	0.42	0.18	0.08	<0.05	30.86	15.32	0.2	<0.1
207	**TL-47/2-3/C**	TL47	2	3	C	7.18	<0.05	4.17	0.12	32.6	0.32	4.88	0.24	0.35	0.19	<0.05	8.04	37.29	0.13	4.21
208	**TL-47/3-4/A**	TL47	3	4	A	3.04	<0.05	1.05	0.07	59.61	0.09	1.73	0.68	0.14	0.06	<0.05	25.59	7.03	0.61	<0.1
209	**TL-47/3-4/B**	TL47	3	4	B	2.62	<0.05	1.46	0.07	47.25	0.09	2.48	0.51	0.12	0.06	<0.05	34.81	10.04	0.25	<0.1
210	**TL-47/3-4/C**	TL47	3	4	C	7.02	<0.05	3.58	0.16	37.65	0.27	4.56	0.26	0.35	0.19	<0.05	10.39	30.7	0.16	4.36
211	**TL-47/4-5/A**	TL47	4	5	A	4.71	<0.05	1.91	0.06	51.57	0.22	2.6	0.57	0.42	0.11	<0.05	21.88	14.21	0.49	0.94
212	**TL-47/4-5/B**	TL47	4	5	B	5.36	<0.05	2.18	0.07	40.4	0.27	3.41	0.41	0.39	0.13	<0.05	25.09	20.24	0.17	1.65
213	**TL-47/4-5/C**	TL47	4	5	C	9.09	<0.05	2.95	0.09	28.72	0.56	4.72	0.14	0.69	0.26	<0.05	4.7	41.5	0.09	6.26
214	**TL-47/5-6/A**	TL47	5	6	A	7.91	<0.05	3.46	0.06	37.85	0.41	3.74	0.43	1.4	0.22	0.13	13.12	27.53	0.3	3.25
215	**TL-47/5-6/B**	TL47	5	6	B	10.02	<0.05	4.08	0.06	29.35	0.5	4.68	0.25	1.55	0.27	0.15	10.04	33.33	0.09	5.51
216	**TL-47/5-6/C**	TL47	5	6	C	10.76	<0.05	3.65	0.07	22.95	0.7	4.86	0.13	1.47	0.27	0.16	2.69	45.35	0.06	6.78
217	**TL/52/0-1/A**	TL52	0	1	A	4.25	<0.05	2.18	0.05	51.52	0.17	2.61	0.6	0.57	0.1	<0.05	21.22	14.92	0.5	0.99
218	**TL/52/0-1/B**	TL52	0	1	B	5.16	<0.05	3.3	<0.05	37.49	0.24	3.76	0.37	0.78	0.14	0.06	24.93	20.97	0.18	2.41
219	**TL/52/0-1/C**	TL52	0	1	C	7.08	<0.05	4.17	0.08	35.82	0.32	5.09	0.31	0.75	0.18	<0.05	13.96	27.85	0.14	3.98
220	**TL/52/1-2/A**	TL52	1	2	A	5.3	<0.05	2.55	<0.05	49.81	0.21	2.96	0.55	0.44	0.13	<0.05	19.23	16.52	0.47	1.47
221	**TL/52/1-2/B**	TL52	1	2	B	8.22	<0.05	4.41	<0.05	32.23	0.41	4.6	0.3	0.86	0.21	<0.05	14.57	29.72	0.17	4.07
222	**TL/52/1-2/C**	TL52	1	2	C	9.35	<0.05	4	0.07	32.27	0.42	5.35	0.26	0.63	0.23	<0.05	9.9	31.9	0.1	5.31
223	**TL/52/2-3/A**	TL52	2	3	A	9.9	<0.05	4.26	<0.05	35.37	0.39	4.52	0.36	0.8	0.26	<0.05	10.27	29.04	0.22	4.34
224	**TL/52/2-3/B**	TL52	2	3	B	12.42	<0.05	4.93	<0.05	24.46	0.72	5.01	0.22	1.04	0.28	<0.05	5.94	37.27	0.07	7.45
225	**TL/52/2-3/C**	TL52	2	3	C	13.27	<0.05	3.67	<0.05	25.9	0.81	5.13	0.16	0.82	0.29	<0.05	3.2	39.61	0.06	6.89
226	**TL/52/3-4/A**	TL52	3	4	A	9.94	<0.05	3.72	<0.05	36.52	0.37	4.05	0.36	1.5	0.24	0.11	10.73	26.27	0.26	5.69
227	**TL/52/3-4/B**	TL52	3	4	B	13.46	<0.05	4.9	<0.05	25.11	0.44	4.67	0.16	1.88	0.33	0.11	3.97	33.86	0.07	10.9
228	**TL/52/3-4/C**	TL52	3	4	C	13.01	<0.05	3.63	<0.05	26.7	0.6	5.28	0.13	1.48	0.28	0.11	4.15	34.99	0.06	9.44
229	**TL/52/4-5/A**	TL52	4	5	A	7.5	<0.05	3.51	0.07	42.38	0.31	3.63	0.45	1.18	0.19	0.09	14.23	22.9	0.35	2.99
230	**TL/52/4-5/B**	TL52	4	5	B	10.87	<0.05	4.89	0.06	30.34	0.4	4.75	0.25	1.62	0.28	0.11	9.5	30.89	0.13	5.78
231	**TL/52/4-5/C**	TL52	4	5	C	11.06	<0.05	3.54	0.09	33.76	0.46	4.95	0.18	1.23	0.27	0.12	7.13	29.14	0.08	7.86
232	**TL/52/5-6/A**	TL52	5	6	A	6.57	<0.05	3.01	<0.05	44.38	0.3	3.56	0.46	1.32	0.17	0.12	15.98	20.05	0.4	3.41
233	**TL/52/5-6/B**	TL52	5	6	B	9.2	<0.05	4.47	<0.05	29.53	0.45	4.73	0.23	1.78	0.26	0.14	11.06	31.61	0.11	6.27
234	**TL/52/5-6/C**	TL52	5	6	C	9.53	<0.05	3.44	0.07	33.13	0.43	5.17	0.23	1.38	0.28	0.17	8.56	29.98	0.1	7.42

Annexure 6
Granulometric analysis data

Annexure 6. Granulometric Analysis results

Sl no.	Sample No.	Median	Mean	SD	Skewness	Kurtosis	Sorting Type	Skewness Type	Kurtosis Type	Granule	Sand	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt	Clay	Sediment Type (Folk)GSM
		Φ	Φ							%	%	%	%	%	%	%	%	%	
1	**TL-01(0-1m)**	2.302	2.280	0.466	-0.107	1.170	Well Sorted	Coarse Skewed	Leptokurtic	0.000	99.911	0.000	1.291	22.198	71.734	4.687	0.089	0.000	Sand
2	**TL-01(1-2m)**	2.405	2.402	0.458	-0.005	1.140	Well Sorted	Symmetrical	Leptokurtic	0.000	99.587	0.000	0.364	16.854	74.391	7.977	0.413	0.000	Sand
3	**TL-01(2-3m)**	2.268	2.202	0.718	-0.164	1.198	Moderately Sorted	Coarse Skewed	Leptokurtic	0.254	99.220	1.371	4.988	25.217	57.783	9.861	0.526	0.000	Sand
4	**TL-01(3-4m)**	2.056	1.664	1.235	-0.450	1.141	Poorly Sorted	Very Coarse Skewed	Leptokurtic	3.777	95.897	10.513	9.275	22.762	45.447	7.900	0.326	0.000	slightly gravelly Sand
5	**TL-01(4-5m)**	2.312	2.235	0.753	-0.210	1.323	Moderately Sorted	Coarse Skewed	Leptokurtic	0.674	98.829	2.034	4.513	21.951	59.288	11.045	0.497	0.000	Sand
6	**TL-01(5-6m)**	2.127	1.952	0.905	-0.303	1.071	Moderately Sorted	Very Coarse Skewed	Mesokurtic	0.240	99.564	3.775	12.492	24.868	50.196	8.233	0.197	0.000	Sand
7	**TL-02 (0-1 m)**	2.606	2.606	0.354	0.070	1.164	Well Sorted	Symmetrical	Leptokurtic	0.000	99.524	0.000	0.000	3.386	85.024	11.114	0.476	0.000	Sand
8	**TL-02 (1-2 m)**	2.521	2.520	0.406	0.045	1.133	Well Sorted	Symmetrical	Leptokurtic	0.000	99.497	0.000	0.007	8.855	80.564	10.071	0.503	0.000	Sand
9	**TL-02 (2-3 m)**	2.482	2.481	0.368	0.009	1.067	Well Sorted	Symmetrical	Mesokurtic	0.002	99.895	0.000	0.012	9.054	83.435	7.394	0.102	0.000	Sand
10	**TL-02 (3-4 m)**	2.503	2.502	0.378	0.045	1.152	Well Sorted	Symmetrical	Leptokurtic	0.000	99.288	0.000	0.013	7.915	83.960	7.400	0.712	0.000	Sand
11	**TL-02 (4-5 m)**	2.459	2.459	0.374	0.027	1.094	Well Sorted	Symmetrical	Mesokurtic	0.000	99.429	0.000	0.004	10.129	83.138	6.159	0.571	0.000	Sand
12	**TL-02 (5-6m)**	2.407	2.406	0.409	0.007	1.112	Well Sorted	Symmetrical	Leptokurtic	0.000	99.355	0.008	0.097	14.779	78.617	5.853	0.645	0.000	Sand
13	**TL-03(0-1m)**	2.338	2.335	0.424	-0.015	1.038	Well Sorted	Symmetrical	Mesokurtic	0.100	99.849	0.000	0.055	20.751	73.423	5.620	0.052	0.000	Sand
14	**TL-03(1-2m)**	2.216	2.230	0.431	0.061	0.968	Well Sorted	Symmetrical	Mesokurtic	0.000	99.691	0.000	0.095	31.368	64.084	4.144	0.309	0.000	Sand
15	**TL-03(2-3m)**	2.304	2.227	0.621	-0.285	1.591	Moderately Well Sorted	Coarse Skewed	Very Leptokurtic	0.428	99.494	1.707	4.380	17.744	70.098	5.565	0.078	0.000	Sand
16	**TL-03(3-4m)**	2.033	1.937	0.718	-0.265	1.160	Moderately Sorted	Coarse Skewed	Leptokurtic	0.542	99.383	2.596	7.275	36.789	49.368	3.355	0.076	0.000	Sand
17	**TL-03(4-5m)**	2.157	2.076	0.653	-0.226	1.140	Moderately Well Sorted	Coarse Skewed	Leptokurtic	0.462	99.429	1.139	5.524	30.116	57.885	4.766	0.109	0.000	Sand
18	**TL-03(5-6m)**	2.284	2.251	0.528	-0.119	1.182	Moderately Well Sorted	Coarse Skewed	Leptokurtic	0.000	99.802	0.012	2.403	24.179	67.395	5.813	0.198	0.000	Sand
19	**TL-04(0-1m)**	2.451	2.451	0.381	0.003	1.073	Well Sorted	Symmetrical	Mesokurtic	0.000	99.861	0.000	0.037	11.127	81.905	6.792	0.139	0.000	Sand
20	**TL-04(1-2m)**	2.402	2.401	0.424	-0.040	1.153	Well Sorted	Symmetrical	Leptokurtic	0.000	99.851	0.012	0.510	15.029	77.811	6.489	0.149	0.000	Sand
21	**TL-04(2-3m)**	2.407	2.407	0.427	-0.002	1.128	Well Sorted	Symmetrical	Leptokurtic	0.000	99.582	0.000	0.220	15.457	77.156	6.750	0.418	0.000	Sand
22	**TL-04(3-4m)**	2.325	2.312	0.438	-0.082	1.144	Well Sorted	Symmetrical	Leptokurtic	0.000	99.790	0.043	0.722	20.159	74.361	4.506	0.210	0.000	Sand
23	**TL-04(4-5m)**	2.296	2.269	0.517	-0.100	1.158	Moderately Well Sorted	Coarse Skewed	Leptokurtic	0.000	99.891	0.161	1.712	23.998	67.725	6.295	0.109	0.000	Sand
24	**TL-04(5-6m)**	1.895	1.854	0.659	-0.137	1.078	Moderately Well Sorted	Coarse Skewed	Mesokurtic	0.067	99.758	1.677	8.313	46.487	40.890	2.392	0.175	0.000	Sand
25	**TL-05(0-1m)**	2.491	2.491	0.451	0.022	1.161	Well Sorted	Symmetrical	Leptokurtic	0.000	99.445	0.035	0.158	11.895	76.562	10.795	0.555	0.000	Sand
26	**TL-05(1-2m)**	2.219	2.171	0.529	-0.162	1.135	Moderately Well Sorted	Coarse Skewed	Leptokurtic	0.000	99.857	0.053	3.189	27.583	65.157	3.875	0.143	0.000	Sand
27	**TL-05(2-3m)**	2.338	2.306	0.537	-0.127	1.280	Moderately Well Sorted	Coarse Skewed	Leptokurtic	0.186	99.539	0.674	1.924	19.955	69.957	7.030	0.275	0.000	Sand
28	**TL-05(3-4m)**	2.247	2.162	0.680	-0.182	1.114	Moderately Well Sorted	Coarse Skewed	Leptokurtic	0.000	99.753	0.000	7.639	24.484	59.367	8.264	0.247	0.000	Sand
29	**TL-05(4-5m)**	2.072	2.012	0.729	-0.075	0.979	Moderately Sorted	Symmetrical	Mesokurtic	0.000	99.275	0.000	10.094	35.081	46.940	7.160	0.725	0.000	Sand
30	**TL-05(5-6m)**	2.052	1.910	0.808	-0.187	0.876	Moderately Sorted	Coarse Skewed	Platykurtic	0.000	99.726	0.185	16.805	29.390	46.266	7.080	0.274	0.000	Sand
31	**TL-06(0-1m)**	2.390	2.390	0.358	-0.013	1.031	Well Sorted	Symmetrical	Mesokurtic	0.000	99.869	0.000	0.026	13.499	82.124	4.220	0.131	0.000	Sand
32	**TL-06(1-2m)**	2.180	2.187	0.442	0.030	0.992	Well Sorted	Symmetrical	Mesokurtic	0.000	99.884	0.012	0.288	33.855	62.101	3.628	0.116	0.000	Sand
33	**TL-06(2-3m)**	1.638	1.619	0.729	-0.078	1.082	Moderately Sorted	Symmetrical	Mesokurtic	0.195	99.708	2.772	15.330	51.501	28.159	1.947	0.097	0.000	Sand

Annexure 6. Granulometric Analysis results

Sl no.	Sample No.	Median	Mean	SD	Skewness	Kurtosis	Sorting Type	Skewness Type	Kurtosis Type	Granule	Sand	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt	Clay	Sediment Type (Folk)GSM
		Φ	Φ							%	%	%	%	%	%	%	%	%	
34	**TL-06(3-4m)**	1.214	1.236	1.029	0.007	0.858	Poorly Sorted	Symmetrical	Platykurtic	1.340	98.098	10.589	31.030	29.626	24.280	2.574	0.562	0.000	slightly gravelly Sand
35	**TL-06(4-5m)**	1.710	1.467	1.081	-0.356	0.968	Poorly Sorted	Very Coarse Skewed	Mesokurtic	3.371	96.417	9.074	17.300	29.409	38.420	2.215	0.212	0.000	slightly gravelly Sand
36	**TL-06(5-6m)**	2.082	1.955	0.791	-0.301	1.165	Moderately Sorted	Very Coarse Skewed	Leptokurtic	0.431	99.359	3.378	8.771	31.015	51.534	4.661	0.210	0.000	Sand
37	**TL-07(0-1m)**	2.498	2.498	0.405	0.016	1.158	Well Sorted	Symmetrical	Leptokurtic	0.061	99.532	0.042	0.046	9.316	81.283	8.845	0.407	0.000	Sand
38	**TL-07(1-2m)**	2.376	2.376	0.408	0.023	1.014	Well Sorted	Symmetrical	Mesokurtic	0.000	99.855	0.000	0.022	17.851	75.662	6.320	0.145	0.000	Sand
39	**TL-07(2-3m)**	2.327	2.333	0.412	0.056	0.974	Well Sorted	Symmetrical	Mesokurtic	0.000	99.506	0.000	0.000	22.163	72.075	5.268	0.494	0.000	Sand
40	**TL-07(3-4m)**	2.457	2.457	0.453	-0.037	1.220	Well Sorted	Symmetrical	Leptokurtic	0.000	99.742	0.161	0.740	12.353	77.360	9.128	0.258	0.000	Sand
41	**TL-07(4-5m)**	2.307	2.256	0.605	-0.162	1.232	Moderately Well Sorted	Coarse Skewed	Leptokurtic	0.667	99.222	0.540	3.178	22.467	64.726	8.311	0.111	0.000	Sand
42	**TL-07(5-6m)**	2.036	1.968	0.633	-0.187	1.068	Moderately Well Sorted	Coarse Skewed	Mesokurtic	0.103	99.836	1.136	6.508	39.190	49.875	3.127	0.061	0.000	Sand
43	**TL-08(0-1m)**	2.653	2.654	0.359	0.096	1.238	Well Sorted	Symmetrical	Leptokurtic	0.000	99.169	0.000	0.001	2.212	83.694	13.262	0.831	0.000	Sand
44	**TL-08(1-2m)**	2.704	2.723	0.413	0.156	1.315	Well Sorted	Fine Skewed	Leptokurtic	0.000	98.263	0.000	0.002	2.167	78.382	17.713	1.737	0.000	Sand
45	**TL-08(2-3m)**	2.593	2.593	0.442	0.070	1.231	Well Sorted	Symmetrical	Leptokurtic	0.000	98.745	0.000	0.100	6.855	77.683	14.107	1.255	0.000	Sand
46	**TL-08(3-4m)**	2.684	2.685	0.334	0.104	1.264	Very Well Sorted	Fine Skewed	Leptokurtic	0.000	99.238	0.000	0.002	1.094	84.501	13.641	0.762	0.000	Sand
47	**TL-08(4-5m)**	2.625	2.626	0.367	0.138	1.385	Well Sorted	Fine Skewed	Leptokurtic	0.000	97.963	0.000	0.000	2.244	86.412	9.308	2.037	0.000	Sand
48	**TL-08(5-6m)**	2.637	2.636	0.367	0.106	1.278	Well Sorted	Fine Skewed	Leptokurtic	0.000	98.766	0.000	0.001	2.573	84.409	11.784	1.234	0.000	Sand
49	**TL-09(0-1m)**	2.518	2.518	0.416	0.013	1.175	Well Sorted	Symmetrical	Leptokurtic	0.000	99.595	0.084	0.184	8.730	80.469	10.127	0.405	0.000	Sand
50	**TL-09(1-2m)**	2.647	2.647	0.331	0.084	1.209	Very Well Sorted	Symmetrical	Leptokurtic	0.000	99.459	0.030	0.031	1.591	86.255	11.552	0.541	0.000	Sand
51	**TL-09(2-3m)**	2.658	2.661	0.388	0.083	1.188	Well Sorted	Symmetrical	Leptokurtic	0.000	99.319	0.000	0.012	3.296	79.924	16.087	0.681	0.000	Sand
52	**TL-09(3-4m)**	2.774	2.798	0.378	0.138	1.218	Well Sorted	Fine Skewed	Leptokurtic	0.000	99.300	0.037	0.039	0.840	74.658	23.725	0.700	0.000	Sand
53	**TL-09(4-5m)**	2.882	2.901	0.425	0.075	1.036	Well Sorted	Symmetrical	Mesokurtic	0.000	99.135	0.000	0.025	1.283	61.280	36.547	0.865	0.000	Sand
54	**TL-09(5-6m)**	2.684	2.694	0.396	0.121	1.259	Well Sorted	Fine Skewed	Leptokurtic	0.000	98.802	0.017	0.053	2.441	79.517	16.773	1.198	0.000	Sand
55	**TL-10(0-1m)**	2.713	2.726	0.368	0.133	1.277	Well Sorted	Fine Skewed	Leptokurtic	0.000	99.027	0.000	0.012	1.269	80.395	17.351	0.973	0.000	Sand
56	**TL-10(1-2m)**	2.651	2.661	0.432	0.129	1.289	Well Sorted	Fine Skewed	Leptokurtic	0.000	98.174	0.000	0.022	4.104	78.399	15.649	1.826	0.000	Sand
57	**TL-10(2-3m)**	2.565	2.565	0.402	0.071	1.194	Well Sorted	Symmetrical	Leptokurtic	0.000	99.148	0.000	0.018	6.325	81.750	11.055	0.852	0.000	Sand
58	**TL-10(3-4m)**	2.423	2.423	0.341	-0.015	1.034	Very Well Sorted	Symmetrical	Mesokurtic	0.000	99.700	0.000	0.019	10.481	85.064	4.135	0.300	0.000	Sand
59	**TL-10(4-5m)**	2.451	2.451	0.442	0.049	1.183	Well Sorted	Symmetrical	Leptokurtic	0.000	98.885	0.014	0.072	13.280	77.675	7.844	1.115	0.000	Sand
60	**TL-10(5-6m)**	2.485	2.486	0.548	0.081	1.133	Moderately Well Sorted	Symmetrical	Leptokurtic	0.000	98.105	0.002	0.093	17.326	66.644	14.039	1.895	0.000	Sand
61	**TL-11(0-1m)**	2.671	2.671	0.312	0.069	1.172	Very Well Sorted	Symmetrical	Leptokurtic	0.000	99.732	0.023	0.077	0.958	86.247	12.426	0.268	0.000	Sand
62	**TL-11(1-2m)**	2.712	2.719	0.355	0.116	1.256	Well Sorted	Fine Skewed	Leptokurtic	0.000	99.239	0.025	0.013	1.122	81.234	16.845	0.761	0.000	Sand
63	**TL-11(2-3m)**	2.744	2.761	0.371	0.114	1.195	Well Sorted	Fine Skewed	Leptokurtic	0.000	99.456	0.032	0.034	1.153	76.888	21.350	0.544	0.000	Sand
64	**TL-11(3-4m)**	2.730	2.751	0.403	0.129	1.220	Well Sorted	Fine Skewed	Leptokurtic	0.050	98.999	0.136	0.156	1.586	75.992	21.128	0.952	0.000	Sand
65	**TL-11(4-5m)**	2.705	2.709	0.343	0.104	1.243	Very Well Sorted	Fine Skewed	Leptokurtic	0.313	99.041	0.207	0.145	0.411	82.198	16.081	0.645	0.000	Sand
66	**TL-11(5-6m)**	2.776	2.794	0.400	0.091	1.115	Well Sorted	Symmetrical	Leptokurtic	0.014	99.456	0.188	0.046	1.475	71.595	26.152	0.530	0.000	Sand
67	**TL-12(0-1m)**	2.681	2.681	0.333	0.086	1.217	Very Well Sorted	Symmetrical	Leptokurtic	0.000	99.480	0.000	0.001	1.275	84.183	14.021	0.520	0.000	Sand
68	**TL-12(1-2m)**	2.633	2.634	0.361	0.085	1.209	Well Sorted	Symmetrical	Leptokurtic	0.000	99.314	0.000	0.007	2.810	83.902	12.595	0.686	0.000	Sand
69	**TL-12(2-3m)**	2.567	2.566	0.344	0.049	1.119	Very Well Sorted	Symmetrical	Leptokurtic	0.000	99.650	0.000	0.017	4.218	86.535	8.880	0.350	0.000	Sand

Annexure 6. Granulometric Analysis results

Sl no.	Sample No.	Median	Mean	SD	Skewness	Kurtosis	Sorting Type	Skewness Type	Kurtosis Type	Granule	Sand	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt	Clay	Sediment Type (Folk)GSM
		Φ	Φ							%	%	%	%	%	%	%	%	%	
70	**TL-12(3-4m)**	2.591	2.590	0.340	0.053	1.131	Very Well Sorted	Symmetrical	Leptokurtic	0.000	99.695	0.000	0.012	3.391	86.438	9.854	0.305	0.000	Sand
71	**TL-12(4-5m)**	2.465	2.465	0.322	-0.015	1.032	Very Well Sorted	Symmetrical	Mesokurtic	0.000	99.840	0.000	0.027	7.320	87.932	4.561	0.160	0.000	Sand
72	**TL-12(5-6m)**	2.444	2.444	0.359	-0.021	1.095	Well Sorted	Symmetrical	Mesokurtic	0.000	99.591	0.000	0.121	9.787	84.638	5.045	0.409	0.000	Sand
73	**TL-13(0-1m)**	2.697	2.702	0.364	0.124	1.305	Well Sorted	Fine Skewed	Leptokurtic	0.000	98.813	0.024	0.052	1.335	81.825	15.577	1.187	0.000	Sand
74	**TL-13(1-2m)**	2.740	2.755	0.364	0.115	1.202	Well Sorted	Fine Skewed	Leptokurtic	0.000	99.451	0.015	0.026	1.082	77.970	20.358	0.549	0.000	Sand
75	**TL-13(2-3m)**	2.655	2.655	0.353	0.103	1.268	Well Sorted	Fine Skewed	Leptokurtic	0.031	98.993	0.009	0.013	1.849	84.549	12.573	0.976	0.000	Sand
76	**TL-13(3-4m)**	2.661	2.662	0.339	0.091	1.221	Very Well Sorted	Symmetrical	Leptokurtic	0.000	99.378	0.081	0.109	1.404	84.925	12.859	0.622	0.000	Sand
77	**TL-13(4-5m)**	2.426	2.421	0.506	-0.035	1.210	Moderately Well Sorted	Symmetrical	Leptokurtic	0.038	99.522	0.169	0.943	16.353	71.978	10.079	0.440	0.000	Sand
78	**TL-13(5-6m)**	2.343	2.297	0.626	-0.138	1.254	Moderately Well Sorted	Coarse Skewed	Leptokurtic	0.000	99.685	0.614	3.638	21.356	63.846	10.230	0.315	0.000	Sand
79	**TL-14(0-1m)**	2.493	2.493	0.336	-0.009	1.054	Very Well Sorted	Symmetrical	Mesokurtic	0.000	99.989	0.004	0.054	6.786	86.799	6.346	0.011	0.000	Sand
80	**TL-14(1-2m)**	2.344	2.345	0.386	0.000	1.010	Well Sorted	Symmetrical	Mesokurtic	0.000	99.905	0.000	0.034	18.505	76.865	4.501	0.095	0.000	Sand
81	**TL-14(2-3m)**	2.376	2.376	0.371	-0.011	1.029	Well Sorted	Symmetrical	Mesokurtic	0.000	99.863	0.000	0.034	15.334	80.032	4.463	0.137	0.000	Sand
82	**TL-14(3-4m)**	2.482	2.481	0.397	0.036	1.111	Well Sorted	Symmetrical	Leptokurtic	0.000	99.529	0.000	0.012	10.225	81.119	8.173	0.471	0.000	Sand
83	**TL-14(4-5m)**	2.395	2.396	0.367	-0.014	1.039	Well Sorted	Symmetrical	Mesokurtic	0.000	99.864	0.000	0.040	13.670	81.475	4.680	0.136	0.000	Sand
84	**TL-14(5-6m)**	2.183	2.196	0.398	0.055	0.976	Well Sorted	Symmetrical	Mesokurtic	0.000	99.725	0.004	0.061	32.803	64.388	2.469	0.275	0.000	Sand
85	**TL-15(0-1m)**	2.593	2.592	0.326	0.066	1.168	Very Well Sorted	Symmetrical	Leptokurtic	0.000	99.455	0.000	0.013	2.644	88.316	8.482	0.545	0.000	Sand
86	**TL-15(1-2m)**	2.696	2.695	0.329	0.110	1.298	Very Well Sorted	Fine Skewed	Leptokurtic	0.000	99.134	0.000	0.024	0.789	84.728	13.593	0.866	0.000	Sand
87	**TL-15(2-3m)**	2.558	2.559	0.361	0.060	1.144	Well Sorted	Symmetrical	Leptokurtic	0.000	99.508	0.007	0.138	4.901	85.183	9.279	0.492	0.000	Sand
88	**TL-15(3-4m)**	2.571	2.571	0.437	0.063	1.233	Well Sorted	Symmetrical	Leptokurtic	0.000	98.856	0.000	0.139	7.297	78.788	12.632	1.144	0.000	Sand
89	**TL-15(4-5m)**	2.475	2.476	0.466	0.020	1.264	Well Sorted	Symmetrical	Leptokurtic	0.000	98.942	0.016	0.498	12.071	77.033	9.324	1.058	0.000	Sand
90	**TL-15(5-6m)**	2.526	2.525	0.435	0.006	1.214	Well Sorted	Symmetrical	Leptokurtic	0.000	99.487	0.008	0.472	8.804	79.250	10.954	0.513	0.000	Sand
91	**TL-16(0-1m)**	2.668	2.668	0.352	0.116	1.308	Well Sorted	Fine Skewed	Leptokurtic	0.000	98.781	0.000	0.010	1.525	84.497	12.748	1.219	0.000	Sand
92	**TL-16(1-2m)**	2.723	2.742	0.384	0.182	1.398	Well Sorted	Fine Skewed	Leptokurtic	0.000	98.089	0.000	0.004	1.033	80.362	16.691	1.911	0.000	Sand
93	**TL-16(2-3m)**	2.687	2.696	0.389	0.144	1.341	Well Sorted	Fine Skewed	Leptokurtic	0.000	98.299	0.000	0.004	1.869	81.010	15.416	1.701	0.000	Sand
94	**TL-16(3-4m)**	2.740	2.768	0.396	0.215	1.453	Well Sorted	Fine Skewed	Leptokurtic	0.000	97.584	0.000	0.014	0.819	79.339	17.412	2.416	0.000	Sand
95	**TL-16(4-5m)**	2.709	2.715	0.361	0.149	1.372	Well Sorted	Fine Skewed	Leptokurtic	0.000	98.433	0.000	0.014	0.968	82.198	15.253	1.567	0.000	Sand
96	**TL-16(5-6m)**	2.681	2.682	0.379	0.134	1.360	Well Sorted	Fine Skewed	Leptokurtic	0.005	98.194	0.014	0.030	1.743	82.096	14.311	1.801	0.000	Sand
97	**TL-17(0-1m)**	2.666	2.666	0.328	0.064	1.151	Very Well Sorted	Symmetrical	Leptokurtic	0.000	99.753	0.007	0.022	1.522	84.611	13.591	0.247	0.000	Sand
98	**TL-17(1-2m)**	2.583	2.583	0.337	0.054	1.130	Very Well Sorted	Symmetrical	Leptokurtic	0.000	99.675	0.000	0.005	3.502	86.871	9.297	0.325	0.000	Sand
99	**TL-17(2-3m)**	2.609	2.609	0.295	0.053	1.123	Very Well Sorted	Symmetrical	Leptokurtic	0.000	99.699	0.000	0.000	1.502	90.376	7.821	0.301	0.000	Sand
100	**TL-17(3-4m)**	2.382	2.383	0.359	-0.010	1.030	Well Sorted	Symmetrical	Mesokurtic	0.000	99.778	0.008	0.018	14.022	81.727	4.002	0.222	0.000	Sand
101	**TL-17(4-5m)**	2.655	2.655	0.329	0.061	1.148	Very Well Sorted	Symmetrical	Leptokurtic	0.000	99.753	0.000	0.018	1.730	85.140	12.865	0.247	0.000	Sand
102	**TL-17(5-6m)**	2.581	2.581	0.387	0.083	1.208	Well Sorted	Symmetrical	Leptokurtic	0.000	99.054	0.021	0.044	4.963	83.239	10.787	0.946	0.000	Sand
103	**TL-18(0-1m)**	2.593	2.593	0.428	0.088	1.248	Well Sorted	Symmetrical	Leptokurtic	0.000	98.603	0.001	0.042	6.120	79.452	12.988	1.397	0.000	Sand
104	**TL-18(1-2m)**	2.349	2.346	0.425	-0.014	1.076	Well Sorted	Symmetrical	Mesokurtic	0.000	99.635	0.004	0.190	19.431	74.624	5.386	0.365	0.000	Sand

Annexure 6. Granulometric Analysis results

Sl no.	Sample No.	Median	Mean	SD	Skewness	Kurtosis	Sorting Type	Skewness Type	Kurtosis Type	Granule	Sand	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt	Clay	Sediment Type (Folk)GSM
		Φ	Φ							%	%	%	%	%	%	%	%	%	
105	**TL-18(2-3m)**	2.390	2.390	0.402	-0.044	1.141	Well Sorted	Symmetrical	Leptokurtic	0.000	99.489	0.000	0.424	14.640	79.554	4.872	0.511	0.000	Sand
106	**TL-18(3-4m)**	2.237	2.213	0.492	-0.088	1.084	Well Sorted	Symmetrical	Mesokurtic	0.000	99.752	0.062	1.432	28.179	65.726	4.353	0.248	0.000	Sand
107	**TL-18(4-5m)**	2.245	2.167	0.571	-0.276	1.389	Moderately Well Sorted	Coarse Skewed	Leptokurtic	0.178	99.585	1.544	3.909	21.777	69.142	3.213	0.237	0.000	Sand
108	**TL-18(5-6m)**	2.003	1.861	0.774	-0.357	1.193	Moderately Sorted	Very Coarse Skewed	Leptokurtic	0.664	99.243	4.104	9.110	35.855	47.967	2.207	0.093	0.000	Sand
109	**TL-19(0-1m)**	2.423	2.422	0.393	0.002	1.109	Well Sorted	Symmetrical	Mesokurtic	0.003	99.422	0.041	0.041	12.920	80.716	5.704	0.576	0.000	Sand
110	**TL-19(1-2m)**	2.581	2.581	0.390	0.071	1.182	Well Sorted	Symmetrical	Leptokurtic	0.000	99.267	0.007	0.031	5.330	82.428	11.471	0.733	0.000	Sand
111	**TL-19(2-3m)**	2.462	2.463	0.456	0.036	1.176	Well Sorted	Symmetrical	Leptokurtic	0.000	99.172	0.080	0.088	13.405	76.287	9.311	0.828	0.000	Sand
112	**TL-19(3-4m)**	2.478	2.479	0.405	0.036	1.153	Well Sorted	Symmetrical	Leptokurtic	0.011	99.330	0.005	0.041	10.295	81.097	7.892	0.659	0.000	Sand
113	**TL-19(4-5m)**	2.540	2.541	0.337	0.049	1.108	Very Well Sorted	Symmetrical	Mesokurtic	0.006	99.568	0.078	0.277	4.336	87.517	7.360	0.426	0.000	Sand
114	**TL-19(5-6m)**	2.400	2.401	0.417	0.009	1.127	Well Sorted	Symmetrical	Leptokurtic	0.000	99.246	0.065	0.083	15.345	77.969	5.784	0.754	0.000	Sand
115	**TL-20(0-1m)**	2.602	2.602	0.402	0.097	1.247	Well Sorted	Symmetrical	Leptokurtic	0.000	98.685	0.001	0.003	4.763	81.836	12.081	1.315	0.000	Sand
116	**TL-20(1-2m)**	2.490	2.489	0.377	0.033	1.126	Well Sorted	Symmetrical	Leptokurtic	0.000	99.441	0.000	0.019	8.625	83.611	7.187	0.559	0.000	Sand
117	**TL-20(2-3m)**	2.614	2.614	0.386	0.101	1.264	Well Sorted	Fine Skewed	Leptokurtic	0.000	98.723	0.000	0.027	3.774	83.216	11.705	1.277	0.000	Sand
118	**TL-20(3-4m)**	2.565	2.564	0.314	0.040	1.094	Very Well Sorted	Symmetrical	Mesokurtic	0.000	99.707	0.000	0.009	3.158	89.309	7.232	0.293	0.000	Sand
119	**TL-20(4-5m)**	2.521	2.521	0.339	0.039	1.108	Very Well Sorted	Symmetrical	Mesokurtic	0.000	99.465	0.001	0.013	5.447	87.526	6.478	0.535	0.000	Sand
120	**TL-20(5-6m)**	2.545	2.546	0.354	0.068	1.164	Well Sorted	Symmetrical	Leptokurtic	0.000	99.230	0.012	0.042	4.893	86.545	7.738	0.770	0.000	Sand
121	**TL-21(0-1m)**	2.653	2.654	0.308	0.086	1.207	Very Well Sorted	Symmetrical	Leptokurtic	0.000	99.511	0.024	0.026	0.965	88.169	10.327	0.489	0.000	Sand
122	**TL-21(1-2m)**	2.452	2.453	0.351	0.008	1.066	Well Sorted	Symmetrical	Mesokurtic	0.000	99.298	0.000	0.009	9.338	85.081	4.869	0.702	0.000	Sand
123	**TL-21(2-3m)**	2.573	2.574	0.380	0.083	1.204	Well Sorted	Symmetrical	Leptokurtic	0.000	99.082	0.000	0.013	4.943	84.095	10.030	0.918	0.000	Sand
124	**TL-21(3-4m)**	2.219	2.244	0.446	0.110	0.969	Well Sorted	Fine Skewed	Mesokurtic	0.000	99.114	0.014	0.039	32.225	62.237	4.599	0.886	0.000	Sand
125	**TL-21(4-5m)**	2.542	2.542	0.406	0.044	1.193	Well Sorted	Symmetrical	Leptokurtic	0.000	99.328	0.006	0.130	7.264	81.605	10.323	0.672	0.000	Sand
126	**TL-21(5-6m)**	2.496	2.496	0.424	0.030	1.273	Well Sorted	Symmetrical	Leptokurtic	0.000	98.833	0.060	0.337	8.985	81.543	7.909	1.167	0.000	Sand
127	**TL-22(0-1m)**	2.650	2.650	0.393	0.127	1.353	Well Sorted	Fine Skewed	Leptokurtic	0.000	98.092	0.001	0.004	2.762	82.394	12.931	1.908	0.000	Sand
128	**TL-22(1-2m)**	2.567	2.567	0.388	0.082	1.217	Well Sorted	Symmetrical	Leptokurtic	0.000	98.943	0.000	0.000	5.491	83.574	9.878	1.057	0.000	Sand

Annexure 6. Granulometric Analysis results

Sl no.	Sample No.	Median	Mean	SD	Skewness	Kurtosis	Sorting Type	Skewness Type	Kurtosis Type	Granule	Sand	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt	Clay	Sediment Type (Folk)GSM
		Φ	Φ							%	%	%	%	%	%	%	%	%	
129	**TL-22(2-3m)**	2.540	2.540	0.328	0.044	1.105	Very Well Sorted	Symmetrical	Mesokurtic	0.047	99.482	0.026	0.012	4.277	88.411	6.756	0.471	0.000	Sand
130	**TL-22(3-4m)**	2.682	2.682	0.342	0.104	1.273	Very Well Sorted	Fine Skewed	Leptokurtic	0.000	99.144	0.000	0.000	1.254	84.138	13.751	0.856	0.000	Sand
131	**TL-22(4-5m)**	2.699	2.698	0.354	0.129	1.364	Well Sorted	Fine Skewed	Leptokurtic	0.000	98.484	0.000	0.002	1.063	83.133	14.286	1.516	0.000	Sand
132	**TL-22(5-6m)**	2.643	2.643	0.346	0.104	1.273	Very Well Sorted	Fine Skewed	Leptokurtic	0.000	98.993	0.000	0.003	1.844	85.914	11.232	1.007	0.000	Sand
133	**TL-23(0-1m)**	2.627	2.627	0.370	0.103	1.270	Well Sorted	Fine Skewed	Leptokurtic	0.000	98.806	0.038	0.071	2.806	84.322	11.570	1.194	0.000	Sand
134	**TL-23(1-2m)**	2.617	2.624	0.462	0.109	1.279	Well Sorted	Fine Skewed	Leptokurtic	0.000	98.030	0.016	0.038	6.317	76.574	15.084	1.970	0.000	Sand
135	**TL-23(2-3m)**	2.598	2.600	0.460	0.080	1.222	Well Sorted	Symmetrical	Leptokurtic	0.000	98.546	0.009	0.028	7.591	75.828	15.090	1.454	0.000	Sand
136	**TL-23(3-4m)**	2.393	2.393	0.429	0.004	1.139	Well Sorted	Symmetrical	Leptokurtic	0.000	99.210	0.074	0.138	16.180	76.919	5.898	0.790	0.000	Sand
137	**TL-23(4-5m)**	2.459	2.459	0.522	0.071	1.263	Moderately Well Sorted	Symmetrical	Leptokurtic	0.000	97.835	0.055	0.230	15.828	71.742	9.980	2.165	0.000	Sand
138	**TL-23(5-6m)**	2.358	2.345	0.483	-0.057	1.175	Well Sorted	Symmetrical	Leptokurtic	0.028	99.676	0.195	0.762	19.770	72.020	6.929	0.296	0.000	Sand
139	**TL-24(0-1m)**	2.576	2.577	0.305	0.033	1.072	Very Well Sorted	Symmetrical	Mesokurtic	0.000	99.903	0.010	0.034	2.640	89.519	7.700	0.097	0.000	Sand
140	**TL-24(1-2m)**	2.568	2.569	0.354	0.057	1.133	Well Sorted	Symmetrical	Leptokurtic	0.000	99.615	0.000	0.007	4.557	85.485	9.566	0.385	0.000	Sand
141	**TL-24(2-3m)**	2.619	2.619	0.344	0.070	1.172	Very Well Sorted	Symmetrical	Leptokurtic	0.000	99.534	0.014	0.015	2.684	85.753	11.069	0.466	0.000	Sand
142	**TL-24(3-4m)**	2.664	2.664	0.306	0.079	1.197	Very Well Sorted	Symmetrical	Leptokurtic	0.000	99.596	0.000	0.008	0.901	87.593	11.095	0.404	0.000	Sand
143	**TL-24(4-5m)**	2.655	2.654	0.329	0.090	1.227	Very Well Sorted	Symmetrical	Leptokurtic	0.000	99.352	0.000	0.022	1.407	86.405	11.519	0.648	0.000	Sand
144	**TL-24(5-6m)**	2.491	2.492	0.373	0.028	1.131	Well Sorted	Symmetrical	Leptokurtic	0.000	99.488	0.000	0.039	8.213	84.185	7.052	0.512	0.000	Sand
145	**TL-25(0-1m)**	2.395	2.395	0.382	-0.046	1.105	Well Sorted	Symmetrical	Mesokurtic	0.000	99.953	0.109	0.158	13.720	81.086	4.881	0.047	0.000	Sand
146	**TL-25(1-2m)**	2.264	2.260	0.419	-0.018	1.026	Well Sorted	Symmetrical	Mesokurtic	0.000	99.789	0.142	0.064	25.785	70.155	3.643	0.211	0.000	Sand
147	**TL-25(2-3m)**	2.490	2.490	0.397	0.041	1.162	Well Sorted	Symmetrical	Leptokurtic	0.000	99.274	0.007	0.036	9.256	82.220	7.756	0.726	0.000	Sand
148	**TL-25(3-4m)**	2.413	2.408	0.515	0.011	1.169	Moderately Well Sorted	Symmetrical	Leptokurtic	0.017	99.141	0.142	0.414	18.469	70.128	9.988	0.842	0.000	Sand
149	**TL-25(4-5m)**	1.998	1.519	1.155	-0.538	1.017	Poorly Sorted	Very Coarse Skewed	Mesokurtic	2.247	97.625	13.464	9.909	24.439	46.906	2.907	0.128	0.000	slightly gravelly Sand
150	**TL-26(0-1m)**	2.691	2.692	0.364	0.127	1.335	Well Sorted	Fine Skewed	Leptokurtic	0.000	98.553	0.000	0.013	1.399	82.437	14.703	1.447	0.000	Sand
151	**TL-26(1-2m)**	2.694	2.694	0.336	0.110	1.289	Very Well Sorted	Fine Skewed	Leptokurtic	0.000	99.120	0.000	0.023	0.944	84.033	14.120	0.880	0.000	Sand
152	**TL-26(2-3m)**	2.604	2.604	0.368	0.090	1.226	Well Sorted	Symmetrical	Leptokurtic	0.000	99.062	0.000	0.008	3.590	84.667	10.797	0.938	0.000	Sand

Annexure 6. Granulometric Analysis results

Sl no.	Sample No.	Median	Mean	SD	Skewness	Kurtosis	Sorting Type	Skewness Type	Kurtosis Type	Granule	Sand	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt	Clay	Sediment Type (Folk)GSM
		Φ	Φ							%	%	%	%	%	%	%	%	%	
153	**TL-26(3-4m)**	2.630	2.630	0.332	0.085	1.207	Very Well Sorted	Symmetrical	Leptokurtic	0.742	98.621	0.000	0.022	1.153	86.985	10.461	0.637	0.000	Sand
154	**TL-27(0-1m)**	2.588	2.588	0.405	0.087	1.252	Well Sorted	Symmetrical	Leptokurtic	0.000	98.741	0.263	0.196	4.849	81.937	11.497	1.259	0.000	Sand
155	**TL-27(1-2m)**	2.589	2.589	0.334	0.057	1.143	Very Well Sorted	Symmetrical	Leptokurtic	0.000	99.630	0.055	0.052	3.036	87.214	9.273	0.370	0.000	Sand
156	**TL-27(2-3m)**	2.609	2.609	0.406	0.085	1.213	Well Sorted	Symmetrical	Leptokurtic	0.000	98.951	0.009	0.012	5.009	80.497	13.425	1.049	0.000	Sand
157	**TL-27(3-4m)**	2.478	2.479	0.362	0.014	1.099	Well Sorted	Symmetrical	Mesokurtic	0.000	99.688	0.018	0.018	8.443	84.754	6.455	0.312	0.000	Sand
158	**TL-27(4-5m)**	2.449	2.450	0.419	0.053	1.120	Well Sorted	Symmetrical	Leptokurtic	0.000	99.216	0.000	0.015	12.867	78.692	7.642	0.784	0.000	Sand
159	**TL-27(5-6m)**	2.598	2.598	0.396	0.097	1.247	Well Sorted	Symmetrical	Leptokurtic	0.000	98.700	0.160	0.263	4.238	82.571	11.468	1.300	0.000	Sand
160	**TL-28(0-1m)**	2.469	2.469	0.395	0.028	1.088	Well Sorted	Symmetrical	Mesokurtic	0.000	99.698	0.002	0.016	10.874	80.872	7.934	0.302	0.000	Sand
161	**TL-28(1-2m)**	2.522	2.522	0.417	0.036	1.112	Well Sorted	Symmetrical	Leptokurtic	0.000	99.613	0.000	0.024	9.471	79.072	11.045	0.387	0.000	Sand
162	**TL-28(2-3m)**	2.420	2.420	0.384	0.004	1.066	Well Sorted	Symmetrical	Mesokurtic	0.000	99.741	0.000	0.038	13.046	80.735	5.922	0.259	0.000	Sand
163	**TL-28(3-4m)**	2.451	2.451	0.378	0.006	1.086	Well Sorted	Symmetrical	Mesokurtic	0.000	99.755	0.008	0.030	10.828	82.416	6.474	0.245	0.000	Sand
164	**TL-28(4-5m)**	2.487	2.487	0.410	0.047	1.179	Well Sorted	Symmetrical	Leptokurtic	0.000	99.136	0.000	0.052	9.887	81.216	7.981	0.864	0.000	Sand
165	**TL-28(5-6m)**	2.380	2.381	0.478	0.069	1.147	Well Sorted	Symmetrical	Leptokurtic	0.000	98.452	0.000	0.088	19.758	71.693	6.914	1.548	0.000	Sand
166	**TL-29(0-1m)**	2.469	2.469	0.430	0.044	1.195	Well Sorted	Symmetrical	Leptokurtic	0.000	98.946	0.044	0.047	11.602	79.370	7.882	1.054	0.000	Sand
167	**TL-29(1-2m)**	2.509	2.509	0.421	0.058	1.196	Well Sorted	Symmetrical	Leptokurtic	0.000	98.995	0.014	0.031	9.376	80.369	9.205	1.005	0.000	Sand
168	**TL-29(2-3m)**	2.519	2.519	0.466	0.097	1.295	Well Sorted	Symmetrical	Leptokurtic	0.000	97.813	0.014	0.030	10.210	77.801	9.757	2.187	0.000	Sand
169	**TL-29(3-4m)**	2.478	2.478	0.402	0.027	1.162	Well Sorted	Symmetrical	Leptokurtic	0.000	99.377	0.016	0.064	10.050	81.555	7.693	0.623	0.000	Sand
170	**TL-29(4-5m)**	2.684	2.715	0.491	0.157	1.277	Well Sorted	Fine Skewed	Leptokurtic	0.000	97.488	0.028	0.065	4.863	72.816	19.717	2.512	0.000	Sand
171	**TL-29(5-6m)**	2.797	2.799	0.613	-0.050	1.138	Moderately Well Sorted	Symmetrical	Leptokurtic	0.000	97.999	0.109	1.914	6.341	56.134	33.500	2.001	0.000	Sand
172	**TL-30(0-1m)**	2.567	2.567	0.371	0.055	1.140	Well Sorted	Symmetrical	Leptokurtic	0.000	99.581	0.004	0.016	5.297	83.871	10.393	0.419	0.000	Sand
173	**TL-30(1-2m)**	2.358	2.358	0.365	-0.017	1.047	Well Sorted	Symmetrical	Mesokurtic	0.000	99.859	0.008	0.045	15.821	80.339	3.645	0.141	0.000	Sand
174	**TL-30(2-3m)**	2.405	2.405	0.449	0.027	1.085	Well Sorted	Symmetrical	Mesokurtic	0.000	99.554	0.000	0.095	17.386	73.926	8.148	0.446	0.000	Sand
175	**TL-30(3-4m)**	2.387	2.386	0.425	-0.005	1.090	Well Sorted	Symmetrical	Mesokurtic	0.000	99.730	0.000	0.166	16.984	76.083	6.496	0.270	0.000	Sand
176	**TL-30(4-5m)**	2.263	2.281	0.476	0.090	0.997	Well Sorted	Symmetrical	Mesokurtic	0.000	99.461	0.000	0.106	29.507	63.318	6.530	0.539	0.000	Sand

Annexure 6. Granulometric Analysis results

Sl no.	Sample No.	Median	Mean	SD	Skewness	Kurtosis	Sorting Type	Skewness Type	Kurtosis Type	Granule	Sand	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt	Clay	Sediment Type (Folk)GSM
		Φ	Φ							%	%	%	%	%	%	%	%	%	
177	**TL-30(5-6m)**	2.490	2.490	0.494	0.059	1.200	Well Sorted	Symmetrical	Leptokurtic	0.000	98.574	0.000	0.151	13.729	73.229	11.465	1.426	0.000	Sand
178	**TL-31(0-1m)**	2.588	2.588	0.459	0.093	1.286	Well Sorted	Symmetrical	Leptokurtic	0.000	98.063	0.005	0.053	7.315	77.264	13.426	1.937	0.000	Sand
179	**TL-31(1-2m)**	2.599	2.599	0.412	0.085	1.223	Well Sorted	Symmetrical	Leptokurtic	0.000	98.850	0.000	0.031	5.456	80.404	12.960	1.150	0.000	Sand
180	**TL-31(2-3m)**	2.478	2.478	0.430	0.050	1.161	Well Sorted	Symmetrical	Leptokurtic	0.027	99.127	0.000	0.017	11.575	78.646	8.890	0.846	0.000	Sand
181	**TL-31(3-4m)**	2.542	2.543	0.390	0.042	1.132	Well Sorted	Symmetrical	Leptokurtic	0.000	99.619	0.000	0.024	7.138	82.091	10.365	0.381	0.000	Sand
182	**TL-31(4-5m)**	2.521	2.520	0.403	0.051	1.149	Well Sorted	Symmetrical	Leptokurtic	0.000	99.356	0.000	0.010	8.496	81.291	9.559	0.644	0.000	Sand
183	**TL-31(5-6m)**	2.560	2.560	0.395	0.052	1.151	Well Sorted	Symmetrical	Leptokurtic	0.000	99.469	0.000	0.023	6.558	81.776	11.112	0.531	0.000	Sand
184	**TL-32(0-1m)**	2.452	2.452	0.445	-0.015	1.301	Well Sorted	Symmetrical	Leptokurtic	0.000	99.045	0.651	0.244	11.360	79.667	7.123	0.955	0.000	Sand
185	**TL-32(1-2m)**	2.243	2.214	0.484	-0.113	1.120	Well Sorted	Coarse Skewed	Leptokurtic	0.000	99.453	0.021	1.632	26.687	67.632	3.479	0.547	0.000	Sand
186	**TL-32(2-3m)**	2.380	2.384	0.498	0.073	1.082	Well Sorted	Symmetrical	Mesokurtic	0.000	98.961	0.000	0.089	21.597	68.251	9.025	1.039	0.000	Sand
187	**TL-32(3-4m)**	2.398	2.393	0.503	0.005	1.166	Moderately Well Sorted	Symmetrical	Leptokurtic	0.000	99.231	0.000	0.555	18.919	70.761	8.997	0.769	0.000	Sand
188	**TL-32(4-5m)**	2.101	2.102	0.471	0.002	1.007	Well Sorted	Symmetrical	Mesokurtic	0.000	99.769	0.000	1.005	39.776	56.271	2.716	0.231	0.000	Sand
189	**TL-32(5-6m)**	2.095	2.027	0.606	-0.162	1.016	Moderately Well Sorted	Coarse Skewed	Mesokurtic	0.000	99.772	0.000	6.716	35.343	54.054	3.658	0.228	0.000	Sand
190	**TL-33(0-1m)**	2.580	2.580	0.392	0.073	1.192	Well Sorted	Symmetrical	Leptokurtic	0.000	99.206	0.000	0.023	5.425	82.415	11.344	0.794	0.000	Sand
191	**TL-33(1-2m)**	2.547	2.547	0.406	0.056	1.166	Well Sorted	Symmetrical	Leptokurtic	0.000	99.338	0.000	0.019	7.445	81.040	10.834	0.662	0.000	Sand
192	**TL-33(2-3m)**	2.568	2.569	0.434	0.063	1.163	Well Sorted	Symmetrical	Leptokurtic	0.000	99.168	0.000	0.016	8.016	77.729	13.408	0.832	0.000	Sand
193	**TL-33(3-4m)**	2.580	2.579	0.413	0.067	1.197	Well Sorted	Symmetrical	Leptokurtic	0.000	99.121	0.000	0.033	6.347	80.401	12.341	0.879	0.000	Sand
194	**TL-33(4-5m)**	2.617	2.618	0.356	0.074	1.179	Well Sorted	Symmetrical	Leptokurtic	0.000	99.465	0.000	0.033	3.104	84.599	11.730	0.535	0.000	Sand
195	**TL-33(5-6m)**	2.567	2.566	0.413	0.075	1.224	Well Sorted	Symmetrical	Leptokurtic	0.000	98.877	0.000	0.030	6.549	81.198	11.099	1.123	0.000	Sand
196	**TL-34(0-1m)**	2.413	2.413	0.402	-0.022	1.136	Well Sorted	Symmetrical	Leptokurtic	0.000	99.575	0.034	0.225	13.527	80.060	5.729	0.425	0.000	Sand
197	**TL-34(1-2m)**	2.433	2.436	0.525	0.083	1.109	Moderately Well Sorted	Symmetrical	Mesokurtic	0.000	98.535	0.015	0.066	19.351	67.619	11.483	1.465	0.000	Sand
198	**TL-34(2-3m)**	2.428	2.443	0.591	0.101	1.038	Moderately Well Sorted	Fine Skewed	Mesokurtic	0.000	98.207	0.024	0.154	23.316	59.860	14.853	1.793	0.000	Sand
199	**TL-34(3-4m)**	2.266	2.268	0.507	0.031	1.052	Moderately Well Sorted	Symmetrical	Mesokurtic	0.000	99.362	0.041	0.472	28.949	63.353	6.547	0.638	0.000	Sand
200	**TL-34(4-5m)**	2.304	2.310	0.534	0.086	1.126	Moderately Well Sorted	Symmetrical	Leptokurtic	0.000	98.173	0.035	0.300	27.087	63.847	6.903	1.827	0.000	Sand

Annexure 6. Granulometric Analysis results

Sl no.	Sample No.	Median	Mean	SD	Skewness	Kurtosis	Sorting Type	Skewness Type	Kurtosis Type	Granule	Sand	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt	Clay	Sediment Type (Folk)GSM
		Φ	Φ							%	%	%	%	%	%	%	%	%	
201	**TL-34(5-6m)**	2.065	1.934	0.740	-0.282	1.060	Moderately Sorted	Coarse Skewed	Mesokurtic	0.000	99.836	1.936	10.772	31.898	51.326	3.903	0.164	0.000	Sand
202	**TL-35(0-1m)**	2.457	2.457	0.437	0.048	1.121	Well Sorted	Symmetrical	Leptokurtic	0.000	99.299	0.001	0.029	13.506	76.879	8.885	0.701	0.000	Sand
203	**TL-35(1-2m)**	2.537	2.537	0.383	0.063	1.193	Well Sorted	Symmetrical	Leptokurtic	0.000	99.129	0.008	0.030	6.361	84.148	8.582	0.871	0.000	Sand
204	**TL-35(2-3m)**	2.477	2.475	0.536	-0.010	1.218	Moderately Well Sorted	Symmetrical	Leptokurtic	0.000	99.145	0.038	1.074	15.243	69.632	13.159	0.855	0.000	Sand
205	**TL-35(3-4m)**	1.947	1.980	0.583	0.087	1.014	Moderately Well Sorted	Symmetrical	Mesokurtic	0.000	99.156	0.012	3.880	50.568	40.557	4.140	0.844	0.000	Sand
206	**TL-35(4-5m)**	2.310	2.297	0.511	-0.026	1.140	Moderately Well Sorted	Symmetrical	Leptokurtic	0.000	99.342	0.101	0.852	24.417	67.350	6.623	0.658	0.000	Sand
207	**TL-35(5-6m)**	2.108	2.072	0.555	-0.102	1.031	Moderately Well Sorted	Coarse Skewed	Mesokurtic	0.066	99.268	0.584	3.168	36.891	55.485	3.141	0.666	0.000	Sand
208	**TL-36(0-1m)**	2.238	2.255	0.420	0.073	0.949	Well Sorted	Symmetrical	Mesokurtic	0.000	99.715	0.000	0.038	29.571	65.736	4.370	0.285	0.000	Sand
209	**TL-36(1-2m)**	2.482	2.482	0.418	0.033	1.162	Well Sorted	Symmetrical	Leptokurtic	0.000	99.357	0.000	0.079	10.748	79.947	8.583	0.643	0.000	Sand
210	**TL-36(2-3m)**	2.264	2.278	0.477	0.072	1.007	Well Sorted	Symmetrical	Mesokurtic	0.000	99.447	0.000	0.157	29.073	63.906	6.310	0.553	0.000	Sand
211	**TL-36(3-4m)**	2.212	2.229	0.481	0.073	0.997	Well Sorted	Symmetrical	Mesokurtic	0.000	99.537	0.000	0.276	32.916	60.777	5.567	0.464	0.000	Sand
212	**TL-36(4-5m)**	2.207	2.224	0.468	0.077	0.998	Well Sorted	Symmetrical	Mesokurtic	0.000	98.841	0.000	0.200	32.986	61.337	4.318	1.159	0.000	Sand
213	**TL-36(5-6m)**	2.104	2.104	0.598	0.023	1.061	Moderately Well Sorted	Symmetrical	Mesokurtic	0.000	98.537	0.195	2.854	39.181	51.468	4.838	1.463	0.000	Sand
214	**TL-37(0-1m)**	**2.487**	**2.487**	**0.422**	0.050	1.159	Well Sorted	Symmetrical	Leptokurtic	0.000	99.217	0.000	0.032	10.772	79.483	8.929	0.783	0.000	Sand
215	**TL-37(1-2m)**	**2.495**	**2.495**	**0.405**	0.046	1.153	Well Sorted	Symmetrical	Leptokurtic	0.000	99.325	0.000	0.025	9.619	81.102	8.579	0.675	0.000	Sand
216	**TL-37(2-3m)**	**2.464**	**2.464**	**0.467**	0.084	1.225	Well Sorted	Symmetrical	Leptokurtic	0.000	98.208	0.000	0.046	13.507	76.199	8.456	1.792	0.000	Sand
217	**TL-37(3-4m)**	**2.425**	**2.421**	**0.52**	0.026	1.277	Moderately Well Sorted	Symmetrical	Leptokurtic	0.000	98.329	0.015	0.698	16.818	72.004	8.794	1.671	0.000	Sand
218	**TL-37(4-5m)**	**2.491**	**2.489**	**0.578**	0.066	1.273	Moderately Well Sorted	Symmetrical	Leptokurtic	0.000	97.246	0.000	0.530	16.291	67.235	13.165	2.754	0.000	Sand
219	**TL-37(5-6m)**	**2.538**	**2.552**	**0.584**	0.086	1.244	Moderately Well Sorted	Symmetrical	Leptokurtic	0.000	97.317	0.000	0.409	14.316	66.944	15.622	2.683	0.000	Sand
220	**TL-38(0-1m)**	2.491	2.492	0.421	0.032	1.235	Well Sorted	Symmetrical	Leptokurtic	0.000	99.015	0.073	0.182	9.505	81.169	8.086	0.985	0.000	Sand
221	**TL-38(1-2m)**	2.519	2.522	0.532	0.046	1.095	Moderately Well Sorted	Symmetrical	Mesokurtic	0.000	98.984	0.035	0.113	15.215	67.456	16.164	1.016	0.000	Sand
222	**TL-38(2-3m)**	2.465	2.465	0.495	0.051	1.101	Well Sorted	Symmetrical	Mesokurtic	0.000	99.167	0.004	0.078	16.241	70.749	12.096	0.833	0.000	Sand
223	**TL-38(3-4m)**	2.397	2.396	0.506	0.041	1.093	Moderately Well Sorted	Symmetrical	Mesokurtic	0.000	99.243	0.022	0.196	20.577	68.471	9.976	0.757	0.000	Sand
224	**TL-38(4-5m)**	2.041	2.042	0.441	0.003	1.007	Well Sorted	Symmetrical	Mesokurtic	0.000	99.897	0.000	0.931	45.029	52.466	1.471	0.103	0.000	Sand

Annexure 6. Granulometric Analysis results

Sl no.	Sample No.	Median	Mean	SD	Skewness	Kurtosis	Sorting Type	Skewness Type	Kurtosis Type	Granule	Sand	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt	Clay	Sediment Type (Folk)GSM
		Φ	Φ							%	%	%	%	%	%	%	%	%	
225	**TL-38(5-6m)**	2.165	2.115	0.519	-0.163	1.093	Moderately Well Sorted	Coarse Skewed	Mesokurtic	0.000	99.907	0.000	3.343	31.317	62.488	2.759	0.093	0.000	Sand
226	**TL-39(0-1m)**	2.596	2.597	0.452	0.078	1.222	Well Sorted	Symmetrical	Leptokurtic	0.000	98.619	0.000	0.037	7.328	76.478	14.776	1.381	0.000	Sand
227	**TL-39(1-2m)**	2.589	2.589	0.452	0.083	1.232	Well Sorted	Symmetrical	Leptokurtic	0.000	98.478	0.000	0.023	7.472	76.823	14.160	1.522	0.000	Sand
228	**TL-39(2-3m)**	2.555	2.555	0.412	0.065	1.189	Well Sorted	Symmetrical	Leptokurtic	0.000	99.136	0.000	0.024	7.187	80.837	11.089	0.864	0.000	Sand
229	**TL-39(3-4m)**	2.573	2.573	0.415	0.071	1.192	Well Sorted	Symmetrical	Leptokurtic	0.000	99.090	0.000	0.005	6.740	80.133	12.211	0.910	0.000	Sand
230	**TL-39(4-5m)**	2.537	2.537	0.515	0.074	1.249	Moderately Well Sorted	Symmetrical	Leptokurtic	0.000	97.864	0.000	0.163	12.018	72.083	13.600	2.136	0.000	Sand
231	**TL-39(5-6m)**	2.540	2.540	0.505	0.081	1.235	Moderately Well Sorted	Symmetrical	Leptokurtic	0.000	97.996	0.000	0.083	11.629	72.671	13.613	2.004	0.000	Sand
232	**TL-40(0-1m)**	2.465	2.466	0.369	0.012	1.142	Well Sorted	Symmetrical	Leptokurtic	0.000	99.160	0.036	0.054	8.952	84.671	5.447	0.840	0.000	Sand
233	**TL-40(1-2m)**	2.380	2.380	0.444	0.025	1.081	Well Sorted	Symmetrical	Mesokurtic	0.000	99.463	0.000	0.096	18.565	73.822	6.980	0.537	0.000	Sand
234	**TL-40(2-3m)**	2.493	2.494	0.492	0.087	1.236	Well Sorted	Symmetrical	Leptokurtic	0.000	98.052	0.039	0.028	13.168	74.163	10.654	1.948	0.000	Sand
235	**TL-40(3-4m)**	2.496	2.496	0.497	0.061	1.215	Well Sorted	Symmetrical	Leptokurtic	0.000	98.449	0.000	0.170	13.394	73.211	11.674	1.551	0.000	Sand
236	**TL-40(4-5m)**	2.436	2.436	0.475	0.084	1.169	Well Sorted	Symmetrical	Leptokurtic	0.000	98.376	0.000	0.032	16.146	73.769	8.430	1.624	0.000	Sand
237	**TL-40(5-6m)**	2.292	2.296	0.437	0.033	1.003	Well Sorted	Symmetrical	Mesokurtic	0.000	99.247	0.000	0.093	25.308	69.031	4.814	0.753	0.000	Sand
238	**TL-41(0-1m)**	2.514	2.515	0.425	0.048	1.230	Well Sorted	Symmetrical	Leptokurtic	0.000	98.979	0.055	0.100	8.925	80.583	9.317	1.021	0.000	Sand
239	**TL-41(1-2m)**	2.438	2.438	0.367	0.008	1.074	Well Sorted	Symmetrical	Mesokurtic	0.000	99.359	0.005	0.020	10.854	83.338	5.142	0.641	0.000	Sand
240	**TL-41(2-3m)**	2.469	2.468	0.386	0.030	1.143	Well Sorted	Symmetrical	Leptokurtic	0.000	99.219	0.003	0.034	9.833	82.920	6.429	0.782	0.000	Sand
241	**TL-41(3-4m)**	2.434	2.434	0.415	0.038	1.133	Well Sorted	Symmetrical	Leptokurtic	0.000	99.127	0.000	0.040	13.337	79.106	6.644	0.873	0.000	Sand
242	**TL-41(4-5m)**	2.470	2.470	0.369	0.022	1.120	Well Sorted	Symmetrical	Leptokurtic	0.000	99.320	0.015	0.018	9.046	84.309	5.933	0.680	0.000	Sand
243	**TL-41(5-6m)**	2.415	2.415	0.428	-0.044	1.261	Well Sorted	Symmetrical	Leptokurtic	0.000	99.139	0.150	0.793	12.897	79.809	5.490	0.861	0.000	Sand
244	**TL-42(0-1m)**	2.456	2.456	0.342	-0.009	1.043	Very Well Sorted	Symmetrical	Mesokurtic	0.000	99.848	0.000	0.016	8.905	85.736	5.191	0.152	0.000	Sand
245	**TL-42(1-2m)**	2.547	2.547	0.355	0.054	1.133	Well Sorted	Symmetrical	Leptokurtic	0.000	99.515	0.000	0.026	5.168	85.878	8.443	0.485	0.000	Sand
246	**TL-42(2-3m)**	2.506	2.506	0.369	0.042	1.143	Well Sorted	Symmetrical	Leptokurtic	0.000	99.339	0.000	0.014	7.356	84.817	7.153	0.661	0.000	Sand
247	**TL-42(3-4m)**	2.336	2.336	0.348	-0.018	1.043	Very Well Sorted	Symmetrical	Mesokurtic	0.000	99.903	0.000	0.034	16.315	80.913	2.641	0.097	0.000	Sand
248	**TL-42(4-5m)**	2.307	2.308	0.383	0.007	0.994	Well Sorted	Symmetrical	Mesokurtic	0.000	99.766	0.001	0.028	21.465	74.723	3.549	0.234	0.000	Sand

Annexure 6. Granulometric Analysis results

Sl no.	Sample No.	Median	Mean	SD	Skewness	Kurtosis	Sorting Type	Skewness Type	Kurtosis Type	Granule	Sand	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt	Clay	Sediment Type (Folk)GSM
		Φ	Φ							%	%	%	%	%	%	%	%	%	
249	**TL-42(5-6m)**	2.230	2.209	0.432	-0.094	1.103	Well Sorted	Symmetrical	Mesokurtic	0.000	99.871	0.000	0.805	26.830	69.778	2.458	0.129	0.000	Sand
250	**TL-43(0-1m)**	2.405	2.405	0.406	0.004	1.073	Well Sorted	Symmetrical	Mesokurtic	0.000	99.768	0.001	0.072	15.077	78.184	6.435	0.232	0.000	Sand
251	**TL-43(1-2m)**	2.278	2.301	0.467	0.114	0.962	Well Sorted	Fine Skewed	Mesokurtic	0.000	99.650	0.000	0.032	28.891	63.368	7.360	0.350	0.000	Sand
252	**TL-43(2-3m)**	2.269	2.280	0.440	0.054	0.971	Well Sorted	Symmetrical	Mesokurtic	0.000	99.833	0.000	0.072	27.726	66.469	5.565	0.167	0.000	Sand
253	**TL-43(3-4m)**	2.335	2.334	0.408	-0.005	1.025	Well Sorted	Symmetrical	Mesokurtic	0.000	99.190	0.023	0.061	20.325	74.506	4.275	0.810	0.000	Sand
254	**TL-43(4-5m)**	2.467	2.467	0.469	0.051	1.168	Well Sorted	Symmetrical	Leptokurtic	0.000	98.972	0.001	0.097	14.082	74.750	10.043	1.028	0.000	Sand
255	**TL-43(5-6m)**	2.606	2.621	0.505	0.117	1.286	Moderately Well Sorted	Fine Skewed	Leptokurtic	0.000	97.516	0.032	0.043	8.242	73.504	15.695	2.484	0.000	Sand
256	**TL-44(0-1m)**	2.500	2.500	0.471	0.022	1.172	Well Sorted	Symmetrical	Leptokurtic	0.117	99.215	0.082	0.071	12.336	74.845	11.881	0.669	0.000	Sand
257	**TL-44(1-2m)**	2.411	2.415	0.479	0.061	1.036	Well Sorted	Symmetrical	Mesokurtic	0.000	99.459	0.000	0.039	19.282	69.847	10.291	0.541	0.000	Sand
258	**TL-44(2-3m)**	2.439	2.439	0.452	0.062	1.134	Well Sorted	Symmetrical	Leptokurtic	0.000	98.941	0.000	0.032	15.127	75.372	8.409	1.059	0.000	Sand
259	**TL-44(3-4m)**	2.313	2.320	0.523	0.060	1.055	Moderately Well Sorted	Symmetrical	Mesokurtic	0.000	99.215	0.012	0.331	26.704	63.594	8.574	0.785	0.000	Sand
260	**TL-44(4-5m)**	2.567	2.584	0.589	0.085	1.122	Moderately Well Sorted	Symmetrical	Leptokurtic	0.000	97.775	0.019	0.132	14.803	63.698	19.124	2.225	0.000	Sand
261	**TL-44(5-6m)**	2.024	2.098	0.507	0.229	1.017	Moderately Well Sorted	Fine Skewed	Mesokurtic	0.000	99.291	0.039	0.407	47.792	46.045	5.008	0.709	0.000	Sand
262	**TL-45(0-1m)**	2.506	2.506	0.479	0.045	1.118	Well Sorted	Symmetrical	Leptokurtic	0.000	99.254	0.019	0.052	13.223	72.814	13.146	0.746	0.000	Sand
263	**TL-45(1-2m)**	2.534	2.534	0.481	0.032	1.201	Well Sorted	Symmetrical	Leptokurtic	0.020	99.036	0.140	0.129	10.987	74.262	13.517	0.944	0.000	Sand
264	**TL-45(2-3m)**	2.622	2.628	0.444	0.084	1.202	Well Sorted	Symmetrical	Leptokurtic	0.000	98.813	0.007	0.023	6.191	76.500	16.092	1.187	0.000	Sand
265	**TL-45(3-4m)**	2.333	2.325	0.480	-0.008	1.144	Well Sorted	Symmetrical	Leptokurtic	0.000	98.966	0.170	0.349	22.176	70.551	5.721	1.034	0.000	Sand
266	**TL-45(4-5m)**	2.087	2.040	0.596	-0.129	1.041	Moderately Well Sorted	Coarse Skewed	Mesokurtic	0.362	99.158	0.913	4.076	37.494	53.079	3.596	0.481	0.000	Sand
267	**TL-45(5-6m)**	2.124	2.081	0.509	-0.136	1.050	Moderately Well Sorted	Coarse Skewed	Mesokurtic	0.114	99.690	0.546	2.358	35.134	59.407	2.245	0.196	0.000	Sand
268	**TL-46(0-1m)**	2.542	2.541	0.486	0.078	1.210	Well Sorted	Symmetrical	Leptokurtic	0.000	98.307	0.000	0.043	10.993	73.969	13.302	1.693	0.000	Sand
269	**TL-46(1-2m)**	2.456	2.456	0.461	0.059	1.152	Well Sorted	Symmetrical	Leptokurtic	0.000	98.981	0.016	0.044	14.440	75.084	9.398	1.019	0.000	Sand
270	**TL-46(2-3m)**	2.545	2.545	0.465	0.062	1.176	Well Sorted	Symmetrical	Leptokurtic	0.000	98.892	0.010	0.037	10.254	75.158	13.434	1.108	0.000	Sand
271	**TL-46(3-4m)**	2.552	2.552	0.411	0.077	1.234	Well Sorted	Symmetrical	Leptokurtic	0.000	98.802	0.023	0.025	6.841	81.752	10.161	1.198	0.000	Sand
272	**TL-46(4-5m)**	2.532	2.532	0.458	0.061	1.220	Well Sorted	Symmetrical	Leptokurtic	0.000	98.725	0.016	0.074	9.955	76.972	11.708	1.275	0.000	Sand

Annexure 6. Granulometric Analysis results

Sl no.	Sample No.	Median	Mean	SD	Skewness	Kurtosis	Sorting Type	Skewness Type	Kurtosis Type	Granule	Sand	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt	Clay	Sediment Type (Folk)GSM
		Φ	Φ							%	%	%	%	%	%	%	%	%	
273	**TL-46(5-6m)**	2.358	2.333	0.621	-0.033	1.245	Moderately Well Sorted	Symmetrical	Leptokurtic	0.000	98.509	0.099	2.376	22.816	63.037	10.183	1.491	0.000	Sand
274	**TL-47 (0-1 m)**	2.227	2.267	0.460	0.175	0.961	Well Sorted	Fine Skewed	Mesokurtic	0.000	99.460	0.000	0.007	32.739	60.222	6.491	0.540	0.000	Sand
275	**TL-47 (1-2 m)**	2.366	2.395	0.537	0.153	0.964	Moderately Well Sorted	Fine Skewed	Mesokurtic	0.000	98.825	0.000	0.012	26.120	60.364	12.329	1.175	0.000	Sand
276	**TL-47 (2-3 m)**	2.518	2.537	0.581	0.120	1.030	Moderately Well Sorted	Fine Skewed	Mesokurtic	0.000	97.967	0.000	0.008	18.113	61.951	17.896	2.033	0.000	Sand
277	**TL-47 (3-4 m)**	2.614	2.630	0.505	0.111	1.203	Moderately Well Sorted	Fine Skewed	Leptokurtic	0.000	98.056	0.000	0.013	8.698	71.823	17.522	1.944	0.000	Sand
278	**TL-47 (4-5 m)**	2.318	2.340	0.486	0.143	1.013	Well Sorted	Fine Skewed	Mesokurtic	0.000	98.761	0.000	0.009	26.316	64.733	7.704	1.239	0.000	Sand
279	**TL-47 (5-6 m)**	1.833	1.796	0.710	-0.143	1.125	Moderately Sorted	Coarse Skewed	Leptokurtic	1.444	98.311	1.553	9.430	47.464	37.464	2.400	0.245	0.000	slightly gravelly Sand
280	**TL-48(0-1m)**	2.472	2.482	0.566	0.056	0.981	Moderately Well Sorted	Symmetrical	Mesokurtic	0.000	99.239	0.014	0.133	20.582	61.241	17.269	0.761	0.000	Sand
281	**TL-48(1-2m)**	2.506	2.514	0.564	0.069	1.085	Moderately Well Sorted	Symmetrical	Mesokurtic	0.000	98.492	0.054	0.097	17.196	64.679	16.466	1.508	0.000	Sand
282	**TL-48(2-3m)**	2.612	2.635	0.591	0.100	1.104	Moderately Well Sorted	Fine Skewed	Mesokurtic	0.000	97.461	0.006	0.048	13.163	62.868	21.375	2.539	0.000	Sand
283	**TL-48(3-4m)**	2.488	2.503	0.590	0.080	1.019	Moderately Well Sorted	Symmetrical	Mesokurtic	0.000	98.525	0.025	0.121	20.168	60.546	17.666	1.475	0.000	Sand
284	**TL-48(4-5m)**	2.302	2.341	0.548	0.186	1.023	Moderately Well Sorted	Fine Skewed	Mesokurtic	0.000	98.328	0.000	0.039	30.063	58.127	10.100	1.672	0.000	Sand
285	**TL-48(5-6m)**	2.325	2.339	0.575	0.117	1.116	Moderately Well Sorted	Fine Skewed	Leptokurtic	0.000	97.865	0.008	0.308	27.556	60.706	9.286	2.135	0.000	Sand
286	**TL-49(0-1m)**	2.229	2.248	0.507	0.077	0.990	Moderately Well Sorted	Symmetrical	Mesokurtic	0.000	99.766	0.027	0.321	32.715	59.276	7.426	0.234	0.000	Sand
287	**TL-49(1-2m)**	2.184	2.217	0.519	0.113	0.984	Moderately Well Sorted	Fine Skewed	Mesokurtic	0.028	99.712	0.021	0.349	36.214	55.636	7.492	0.260	0.000	Sand
288	**TL-49(2-3m)**	1.909	1.929	0.544	0.057	1.017	Moderately Well Sorted	Symmetrical	Mesokurtic	0.000	99.665	0.082	3.881	53.619	39.325	2.757	0.335	0.000	Sand
289	**TL-49(3-4m)**	2.436	2.439	0.551	0.079	1.127	Moderately Well Sorted	Symmetrical	Leptokurtic	0.000	98.262	0.035	0.151	20.034	65.704	12.339	1.738	0.000	Sand
290	**TL-49(4-5m)**	2.059	2.024	0.561	-0.095	1.018	Moderately Well Sorted	Symmetrical	Mesokurtic	0.038	99.736	0.085	4.314	40.504	51.734	3.098	0.226	0.000	Sand
291	**TL-49(5-6m)**	1.865	1.872	0.478	0.021	1.014	Well Sorted	Symmetrical	Mesokurtic	0.028	99.920	0.163	3.197	58.629	36.872	1.058	0.053	0.000	Sand
292	**TL-50(0-1m)**	2.287	2.300	0.469	0.063	0.983	Well Sorted	Symmetrical	Mesokurtic	0.000	99.787	0.000	0.112	27.489	65.079	7.108	0.213	0.000	Sand
293	**TL-50(1-2m)**	2.168	2.177	0.527	0.040	1.018	Moderately Well Sorted	Symmetrical	Mesokurtic	0.000	99.524	0.035	0.999	36.064	56.718	5.708	0.476	0.000	Sand
294	**TL-50(2-3m)**	1.967	2.034	0.564	0.208	1.071	Moderately Well Sorted	Fine Skewed	Mesokurtic	0.000	98.190	0.000	1.597	51.732	40.769	4.092	1.810	0.000	Sand
295	**TL-50(3-4m)**	1.851	1.877	0.534	0.081	1.037	Moderately Well Sorted	Symmetrical	Mesokurtic	0.000	99.889	0.032	4.259	58.319	34.717	2.563	0.111	0.000	Sand
296	**TL-50(4-5m)**	2.067	2.060	0.539	-0.021	1.010	Moderately Well Sorted	Symmetrical	Mesokurtic	0.000	99.664	0.000	2.753	41.717	51.543	3.652	0.336	0.000	Sand

Annexure 6. Granulometric Analysis results

Sl no.	Sample No.	Median	Mean	SD	Skewness	Kurtosis	Sorting Type	Skewness Type	Kurtosis Type	Granule	Sand	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt	Clay	Sediment Type (Folk)GSM
		Φ	Φ							%	%	%	%	%	%	%	%	%	
297	**TL-50(5-6m)**	2.051	2.016	0.556	-0.096	1.014	Moderately Well Sorted	Symmetrical	Mesokurtic	0.000	99.815	0.226	4.225	41.086	51.392	2.886	0.185	0.000	Sand
298	**TL-51(0-1m)**	2.198	2.205	0.435	0.032	0.988	Well Sorted	Symmetrical	Mesokurtic	0.000	99.591	0.012	0.193	32.367	63.600	3.419	0.409	0.000	Sand
299	**TL-51(1-2m)**	2.113	2.120	0.569	0.043	1.049	Moderately Well Sorted	Symmetrical	Mesokurtic	0.042	98.593	0.196	1.868	39.439	52.388	4.702	1.366	0.000	Sand
300	**TL-51(2-3m)**	2.165	2.160	0.573	-0.004	1.034	Moderately Well Sorted	Symmetrical	Mesokurtic	0.135	99.498	0.171	1.961	35.499	55.353	6.514	0.366	0.000	Sand
301	**TL-51(3-4m)**	2.362	2.357	0.509	0.009	1.131	Moderately Well Sorted	Symmetrical	Leptokurtic	0.000	99.277	0.034	0.493	21.795	68.559	8.396	0.723	0.000	Sand
302	**TL-51(4-5m)**	2.003	1.990	0.573	-0.035	1.006	Moderately Well Sorted	Symmetrical	Mesokurtic	0.000	99.660	0.303	4.379	44.986	46.598	3.394	0.340	0.000	Sand
303	**TL-51(5-6m)**	1.655	1.661	0.569	-0.011	1.105	Moderately Well Sorted	Symmetrical	Mesokurtic	0.023	99.892	0.797	10.364	62.834	24.980	0.917	0.084	0.000	Sand
304	**TL-52(0-1m)**	2.504	2.504	0.460	0.073	1.193	Well Sorted	Symmetrical	Leptokurtic	0.000	98.645	0.000	0.035	11.559	76.416	10.635	1.355	0.000	Sand
305	**TL-52(1-2m)**	2.382	2.384	0.466	0.059	1.070	Well Sorted	Symmetrical	Mesokurtic	0.000	99.273	0.000	0.057	19.948	71.172	8.096	0.727	0.000	Sand
306	**TL-52(2-3m)**	1.999	2.061	0.490	0.191	1.005	Well Sorted	Fine Skewed	Mesokurtic	0.000	98.761	0.000	0.632	49.410	45.480	3.239	1.239	0.000	Sand
307	**TL-52(3-4m)**	1.939	1.945	0.512	0.020	1.011	Moderately Well Sorted	Symmetrical	Mesokurtic	0.000	99.880	0.000	3.227	52.145	42.378	2.129	0.120	0.000	Sand
308	**TL-52(4-5m)**	2.008	1.998	0.542	-0.029	1.008	Moderately Well Sorted	Symmetrical	Mesokurtic	0.000	99.686	0.000	3.702	45.534	47.661	2.790	0.314	0.000	Sand
309	**TL-52(5-6m)**	2.080	2.051	0.509	-0.088	1.024	Moderately Well Sorted	Symmetrical	Mesokurtic	0.000	99.831	0.000	2.794	39.848	54.845	2.344	0.169	0.000	Sand

Annexure 7

Borehole log sheet

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-01
Azimuth	----------
Inclination	Vertical
RL-Collar	2.296 m MSL
Total depth of BH	6.0m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Achara
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	332846.718 N
Longitude (E)	1791474.493 E
Date of Commencement	13/05/2024
Date of Completion	13/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained dry sand with presence of Heavy Mineral (HM).		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained sand and presence of HM. Water table encountered at 2.0m		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained sand. HM presence is identified.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine grained sand.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine grained sand is present.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine grained sand with HM presence.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-02
Azimuth	----------
Inclination	Vertical
RL-Collar	6.399
Total depth of BH	6.0m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Achara
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	332854.919
Longitude (E)	1791695.331
Date of Commencement	29/05/2024
Date of Completion	29/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Very fine grained dry loose sand. Very less presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Very fine grained dry loose sand. HM presence is identified.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine to medium grained sand. HM presence is identified.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Medium grained dry sand, HM presence is less.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Medium grained wet sand.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Medium grained wet sand and HM presence is identified.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-03
Azimuth	----------
Inclination	Vertical
RL-Collar	2.531
Total depth of BH	6.0m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Achara
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	333054.086
Longitude (E)	1791108.392
Date of Commencement	13/05/2024
Date of Completion	13/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine Grained sand and presence of HM is identified.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine Grained sand and presence of HM is identified.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine Grained sand and presence of HM is identified.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine Grained sand and presence of wet HM is identified.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine Grained sand and presence of wet HM is identified.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine Grained sand and presence of wet HM is identified.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-04
Azimuth	----------
Inclination	Vertical
RL-Collar	7.11
Total depth of BH	6.0m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Achara
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	333372.118
Longitude (E)	1791178.686
Date of Commencement	15/05/2024
Date of Completion	15/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained with heavy HM presence.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained with heavy HM presence.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained with heavy HM presence.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine grained with heavy HM presence.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine grained with heavy HM presence.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine grained with heavy HM presence.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-05
Azimuth	----------
Inclination	Vertical
RL-Collar	1.74
Total depth of BH	6.0m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Achara
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	333161.406
Longitude (E)	1790727.81
Date of Commencement	14/05/2024
Date of Completion	14/05/2024

S.No	Bore Hole Log Details (Runwise)									Core details	
	From (m)	To (m)	Length (m)	Recovered Length (m)	True Length (m)	Recovery %	RQD	Litho Code	Lithological description		Box/Pack No
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained sand with the presence of HM.Water table encountered at 1.5m.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained sand		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine ti Medium grained sand		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine sand with HM presence		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine grained sand		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine to Medium sand with HM presence.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-06
Azimuth	----------
Inclination	Vertical
RL-Collar	3.759
Total depth of BH	6.0m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Achara
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	333481.412
Longitude (E)	1790788.544
Date of Commencement	15/05/2024
Date of Completion	15/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained sand with presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained sand with comparatively less HM presence.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine to medium grained sand with presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Medium grained sand , presence of HM is less towards the down core.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Coarse grained sand, Gravels are present. Water table encountered at 4.2m depth.Presence of clay shell is identified.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Medium to coarse grained sand with presence of granule. HM presence is less.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-07
Azimuth	----------
Inclination	Vertical
RL-Collar	2.583
Total depth of BH	6.0m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Achara
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	333280.094
Longitude (E)	1790360.778
Date of Commencement	14/05/2024
Date of Completion	14/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine to medium grained sand with presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained sand with HM presence is identified.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained sand with presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine grained sand with HM presence.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine grained sand with HM presence.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine grained sand with HM presence.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-08
Azimuth	----------
Inclination	Vertical
RL-Collar	11.518
Total depth of BH	6.0m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Achara
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	333944.322
Longitude (E)	1788775.827
Date of Commencement	16/05/2024
Date of Completion	16/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained sand with presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained sand with HM presence is identified.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained sand with presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine grained sand with HM presence.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine grained sand with HM presence.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine grained sand with HM presence.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-09
Azimuth	----------
Inclination	Vertical
RL-Collar	5.387
Total depth of BH	6.0m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Achara
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	333414.24
Longitude (E)	1789905.284
Date of Commencement	25/05/2024
Date of Completion	25/05/2024

S.No	Bore Hole Log Details (Runwise)									Core details	
	From (m)	To (m)	Length (m)	Recovered Length (m)	True Length (m)	Recovery %	RQD	Litho Code	Lithological description		Box/Pack No
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained loose dry sand with presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained loose dry sand with presence of HM.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained loose dry sand with less amount of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Heavy presence of HM and organic matter is identified.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine to medium grained sand with heavy presence of HM and organic matter is identified.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine grained wet sand with heavy presence of HM. Water table encountered at 5.5m.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-10
Azimuth	----------
Inclination	Vertical
RL-Collar	7.63
Total depth of BH	6.0m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Achara
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	333744.835
Longitude (E)	1789989.562
Date of Commencement	16/05/2024
Date of Completion	16/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained sand with presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained sand with HM presence is identified.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained sand with presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine grained sand with HM presence.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine grained sand with HM presence. Yellowish to reddish sand.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine grained sand reddish yellow colour with HM presence.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-11
Azimuth	----------
Inclination	Vertical
RL-Collar	5.203
Total depth of BH	6.0m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Achara
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	333744.835
Longitude (E)	1789989.562
Date of Commencement	25/05/2024
Date of Completion	25/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery (%)**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained sand with presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained sand with HM presence is identified.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained sand with presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine grained sand with HM presence.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine grained sand with HM presence. Yellowish to reddish sand.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine grained sand reddish yellow colour with HM presence.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-12
Azimuth	----------
Inclination	Vertical
RL-Collar	7.976
Total depth of BH	6.0m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Achara
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	333789.687
Longitude (E)	1789480.837
Date of Commencement	18/05/2024
Date of Completion	18/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained sand with organic content and presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained sand with HM presence is identified.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained sand with presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine grained sand with HM presence.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine grained sand with HM presence is less.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine grained sand with HM presence		1

Borehole log sheet_Talashil block_Maharashtra

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Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-13
Azimuth	----------
Inclination	Vertical
RL-Collar	4.062
Total depth of BH	6.0m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Achara
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	333584.104
Longitude (E)	1789112.266
Date of Commencement	25/05/2024
Date of Completion	25/05/2024

S.No	Bore Hole Log Details (Runwise)									Core details	
	From (m)	To (m)	Length (m)	Recovered Length (m)	True Length (m)	Recovery %	RQD	Litho Code	Lithological description		Box/Pack No
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained sand with organic content and presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained sand with HM presence is identified.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained sand with presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine grained sand with HM presence.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine grained sand with HM presence is less.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine grained sand with HM presence		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-14
Azimuth	----------
Inclination	Vertical
RL-Collar	10.205
Total depth of BH	6.0m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Vayangani
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	333833.863
Longitude (E)	1789120.164
Date of Commencement	18/05/2024
Date of Completion	18/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained loose and dry sand with presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained sand with HM presence is identified.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained sand with presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine grained sand with HM presence.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine grained sand with HM presence.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine grained sand with HM presence.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-15
Azimuth	----------
Inclination	Vertical
RL-Collar	4.335
Total depth of BH	6.0m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Vayangani
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	333678.478
Longitude (E)	1788732.248
Date of Commencement	25/05/2024
Date of Completion	25/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained loose and dry sand with presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained loose and dry sand with presence of HM.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained loose and dry sand with presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine to medium grained sand with HM presence.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine to medium grained sand with HM presence.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine to medium grained wet sand with HM presence.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-16
Azimuth	----------
Inclination	Vertical
RL-Collar	11.74
Total depth of BH	6.0m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Vayangani
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	333944.322
Longitude (E)	1788775.827
Date of Commencement	17/05/2024
Date of Completion	17/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained dry sand with presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained dry sand with presence of HM.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained dry sand with presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine grained dry sand with presence of HM.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine grained dry sand with presence of HM.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine grained dry sand with presence of HM.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-17
Azimuth	----------
Inclination	Vertical
RL-Collar	7.766
Total depth of BH	6.0m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Vayangani
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	333846.522
Longitude (E)	1788248.411
Date of Commencement	26/05/2024
Date of Completion	26/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained loose sand with presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained dry sand with presence of HM.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained dry sand with presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine grained loose dry sand with presence of HM.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine to medium grained loose dry sand with presence of HM.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine to medium grained loose dry sand with presence of HM.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-18
Azimuth	----------
Inclination	Vertical
RL-Collar	3.093
Total depth of BH	6.0m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Vayangani
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	334097.679
Longitude (E)	1788317.406
Date of Commencement	17/05/2024
Date of Completion	17/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained dry sand with presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained dry sand with presence of HM.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Very fine grained to fine grained dry sand with presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine grained wet sand with presence of HM. Water table encountered at 3.5m.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Medium to fine grained sand with the presence of granules. Soft clay is present.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine grained sand with presence of HM		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-19
Azimuth	----------
Inclination	Vertical
RL-Collar	6.755
Total depth of BH	6.0m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Vayangani
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	333901.265
Longitude (E)	1787858.261
Date of Commencement	17/05/2024
Date of Completion	17/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained very dry and very loose sand with presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained loose dry sand with presence of HM.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained sand with presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine to medium grained sand with presence of HM.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine to medium grained wet sand.Water table encountered at 4.7m.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Medium grained wet sand with presence of HM.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-20
Azimuth	----------
Inclination	Vertical
RL-Collar	14.934
Total depth of BH	6.0m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Vayangani
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	334178.322
Longitude (E)	1787887.102
Date of Commencement	19/05/2024
Date of Completion	19/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained sand with presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained sand with presence of HM.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained sand with presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine grained sand with presence of HM.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine grained sand with presence of HM.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine grained sand with presence of HM.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-21
Azimuth	----------
Inclination	Vertical
RL-Collar	7.39
Total depth of BH	6.0m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Vayangani
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	333958.489
Longitude (E)	1787481.426
Date of Commencement	27/05/2024
Date of Completion	27/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained dry sand with presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained dry sand with presence of HM.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained dry sand with presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine to medium grained sand with presence of HM.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Medium grained sand with heavy presence of HM.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Medium grained sand with heavy presence of HM.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-22
Azimuth	----------
Inclination	Vertical
RL-Collar	14.614
Total depth of BH	6.0m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Vayangani
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	334186.981
Longitude (E)	1787617.454
Date of Commencement	19/05/2024
Date of Completion	19/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained dry sand with presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained loose sand with presence of HM.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained sand with presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine grained sand with comparatively higher concentration of HM.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine grained sand with presence of HM.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine grained sand with presence of HM.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-23
Azimuth	----------
Inclination	Vertical
RL-Collar	5.804
Total depth of BH	6.0m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Vayangani
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	334032.598
Longitude (E)	1787089.362
Date of Commencement	27/05/2024
Date of Completion	27/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained very loose dry sand with less amount of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained loose dry sand with less amount of HM.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained sand with presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine to medium grained sand with the presence of HM.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Medium grained wet sand with presence of HM.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Medium grained wet sand with presence of HM.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-24
Azimuth	----------
Inclination	Vertical
RL-Collar	9.785
Total depth of BH	6.0m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Vayangani
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	334200.712
Longitude (E)	1787234.848
Date of Commencement	20/05/2024
Date of Completion	20/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Very fine grained loose sand is identified.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine grained sand with the presence of HM.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-25
Azimuth	----------
Inclination	Vertical
RL-Collar	5.543
Total depth of BH	5.0m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Thondavali
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	334217.713
Longitude (E)	1786720.574
Date of Commencement	27/05/2024
Date of Completion	27/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**	**Size**	**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained dry loose sand with the presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained dry loose sand with the presence of HM.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Medium to fine grained sand. Black coloured clayey sand sample		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Medium grained sand with shells of 5mm to 8mm diameter.		1
									Sample not received, further sampling towards depth is not possible. Bore Hole closed at 5m depth due to the presence of layer of shell granule.		

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-26
Azimuth	----------
Inclination	Vertical
RL-Collar	3.271
Total depth of BH	4.0m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Thondavali
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	334319.189
Longitude (E)	1786464.335
Date of Commencement	26/05/2024
Date of Completion	26/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained dry loose sand with the presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Very fine grained sand with a thin band of lateritic clay at a width of 10-20 cm which is reddish yellow in color is present.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained reddish yellow sand is present.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine grained sand with clay content and granules are also present.A thin layer of granule bed is present at the end. Water table encountered at 4m.Granule bed encountered below 4m where quartz river granules and laterite granules are present.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-27
Azimuth	----------
Inclination	Vertical
RL-Collar	7.705
Total depth of BH	6.0 m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Thondavali
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	334453.363
Longitude (E)	1786056.886
Date of Commencement	26/05/2024
Date of Completion	26/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained sand and presence of HM		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained sand and presence of HM		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained loose dry sand with presence of HM		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine grained sand with presence of HM		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine grained sand with presence of HM		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine grained sand with presence of HM		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-28
Azimuth	----------
Inclination	Vertical
RL-Collar	8.034
Total depth of BH	6.0 m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Thondavali
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	334514.557
Longitude (E)	1785407.268
Date of Commencement	28/05/2024
Date of Completion	28/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained sand and presence of HM		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained sand and presence of HM		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained loose dry sand with presence of HM		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine grained sand with presence of HM		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine grained sand with presence of HM		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine grained sand with presence of HM		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-29
Azimuth	----------
Inclination	Vertical
RL-Collar	8.333
Total depth of BH	6.0 m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Thondavali
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	334734.022
Longitude (E)	1785417.692
Date of Commencement	21/05/2024
Date of Completion	21/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Dry and very loose sand is present.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained dry very loose sand is present.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained dry loose sand is present.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine grained dry loose sand is present.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine grained loose sand with presence of organic matter and HM.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine grained sand with presence of higher concentration of HM.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-30
Azimuth	----------
Inclination	Vertical
RL-Collar	7.192
Total depth of BH	6.0 m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Thondavali
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	334537.342
Longitude (E)	1785197.555
Date of Commencement	27/05/2024
Date of Completion	27/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained Dry loose sand with the presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained Dry loose sand with the presence of HM.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine grained sand with the presence of HM.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-31
Azimuth	----------
Inclination	Vertical
RL-Collar	19.265
Total depth of BH	6.0 m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Thondavali
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	335091.739
Longitude (E)	1785143.268
Date of Commencement	21/05/2024
Date of Completion	21/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Very fine grained Dry loose sand is present.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained Dry sand is present.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine grained sand with the presence of HM.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-32
Azimuth	----------
Inclination	Vertical
RL-Collar	4.031
Total depth of BH	6.0 m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Thondavali
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	334553.409
Longitude (E)	1784683.745
Date of Commencement	28/05/2024
Date of Completion	28/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained sand with humus with the presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained sand with the presence of HM which contains comparatively higher concentration of black minerals.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine grained sand with the presence of HM. Water table encountered at 4m.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine grained sand with the presence of HM.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-33
Azimuth	----------
Inclination	Vertical
RL-Collar	9.074
Total depth of BH	6.0 m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Thondavali
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	334932.412
Longitude (E)	1784749.789
Date of Commencement	21/05/2024
Date of Completion	21/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Very fine grained sand with the presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Very fine grained sand with the presence of HM.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained loose dry sand with the presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine grained loose dry sand with the presence of HM.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine to medium dry grained sand with less presence of HM.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Medium grained sand with the presence of HM.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-34
Azimuth	----------
Inclination	Vertical
RL-Collar	4.733
Total depth of BH	6.0 m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Thondavali
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	334650.151
Longitude (E)	1784280.503
Date of Commencement	28/05/2024
Date of Completion	28/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Very fine grained very loose and very dry sand with less/no presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Very fine grained very loose and very dry sand with the presence of HM.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained loose dry sand with the presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine to medium grained sand with the presence of HM.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Medium grained wet sand with the presence of HM. Water table encountered at 4.5m.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Medium grained sand with the presence of HM.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-35
Azimuth	----------
Inclination	Vertical
RL-Collar	4.979
Total depth of BH	6.0 m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Thondavali
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	334980.906
Longitude (E)	1784383.605
Date of Commencement	21/05/2024
Date of Completion	21/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained very loose dry sand with presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained very loose and dry sand with the presence of HM.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained very loose sand with the presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine to medium grained sand with the presence of HM.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Medium grained sand with heavy HM presence.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Medium grained sand with heavy HM presence.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-36
Azimuth	----------
Inclination	Vertical
RL-Collar	4.575
Total depth of BH	6.0 m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Thondavali
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	334712.841
Longitude (E)	1783986.27
Date of Commencement	29/05/2024
Date of Completion	29/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained loose dry sand with less presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained sand with less presence of HM.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine to medium grained dry sand with less presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine to medium grained sand with less presence of HM.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Medium grained wet sand with HM presence. Water table encountered at 5m.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Medium grained wet sand with HM presence.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-37
Azimuth	----------
Inclination	Vertical
RL-Collar	6.564m
Total depth of BH	6.0m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Achara
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	16°7'48.16"
Longitude (E)	73°27'28.52"
Date of Commencement	18/11/2024
Date of Completion	18/11/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Yellowish-brown, fine-grained sand with presence of H.M		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Yellowish-brown, fine-grained sand with presence of H.M		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Yellowish-brown, fine-grained sand with presence of H.M		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Yellowish-brown, fine-grained sand with presence of H.M		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Yellowish-brown, fine-grained sand with presence of H.M		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Yellowish-brown, fine-grained sand with presence of H.M		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-38
Azimuth	----------
Inclination	Vertical
RL-Collar	4.503
Total depth of BH	6.0 m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Thondavali
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	334873.757
Longitude (E)	1783481.356
Date of Commencement	30/05/2024
Date of Completion	30/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained dry loose sand with the presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained dry sand with the presence of HM and organic matter.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine to medium grained dry sand with less presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine to medium grained sand with higher concentration of HM along with organic matter. Water table encountered at 4m.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Medium grained wet sand with the presence of HM.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Medium grained wet sand with the presence of HM.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-39
Azimuth	----------
Inclination	Vertical
RL-Collar	12.155
Total depth of BH	6.0 m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Thondavali
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	335271.173
Longitude (E)	1783577.54
Date of Commencement	22/05/2024
Date of Completion	22/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained dry sand with the presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine to medium grained dry sand with the presence of HM.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Medium grained sand with the presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Medium grained sand with the presence of HM.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Medium grained sand with the presence of HM.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine grained sand with the presence of HM.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-40
Azimuth	----------
Inclination	Vertical
RL-Collar	6.727
Total depth of BH	6.0 m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Thondavali
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	334973.478
Longitude (E)	1783251.883
Date of Commencement	28/05/2024
Date of Completion	28/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine grained sand with the presence of HM.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-41
Azimuth	----------
Inclination	Vertical
RL-Collar	6.363
Total depth of BH	6.0 m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Thondavali
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	335201.273
Longitude (E)	1783165.782
Date of Commencement	22/05/2024
Date of Completion	22/05/2024

S.No	Bore Hole Log Details (Runwise)									Core details	
	From (m)	To (m)	Length (m)	Recovered Length (m)	True Length (m)	Recovery %	RQD	Litho Code	Lithological description		Box/Pack No
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Very fine grained sand with the presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained dry sand with low presence of HM.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained dry sand with low presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine to medium grained sand with the presence of HM.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine to medium grained sand with the presence of HM.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine to medium grained sand with less presence of HM.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-42
Azimuth	----------
Inclination	Vertical
RL-Collar	3.278
Total depth of BH	6.0 m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Thondavali
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	335056.127
Longitude (E)	1782766.597
Date of Commencement	22/05/2024
Date of Completion	22/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained sand with the presence of HM.Water table encountered at 3m.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine to medium grained sand with the presence of HM.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine to medium grained sand with the presence of HM.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Medium grained sand with the presence of HM.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-43
Azimuth	----------
Inclination	Vertical
RL-Collar	6.768
Total depth of BH	6.0 m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Thondavali
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	335209.277
Longitude (E)	1782759.174
Date of Commencement	22/05/2024
Date of Completion	22/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained dry sand with the presence of HM.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained dry sand with the presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine grained dry sand with the presence of HM.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine grained dry sand with the presence of HM.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine to medium grained sand with higher concentration of HM.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-44
Azimuth	----------
Inclination	Vertical
RL-Collar	5.961
Total depth of BH	6.0 m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Thondavali
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	335135.738
Longitude (E)	1782294.17
Date of Commencement	30/05/2024
Date of Completion	30/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine to medium grained sand with the presence of HM, comparatively concentration of black minerals are high.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine grained sand with the presence of HM.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-45
Azimuth	----------
Inclination	Vertical
RL-Collar	3.721
Total depth of BH	6.0 m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Thondavali
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	335146.376
Longitude (E)	1781796.593
Date of Commencement	30/05/2024
Date of Completion	30/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained black sand is present.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained black sand is present.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained sand with heavy presence of organic matter and HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine to medium grained sand with moderate presence of HM. Water table encountered at 3.8m.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Medium grained wet sand with the presence of HM, remains of shell is also identified.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Medium grained wet sand with the presence of HM, remains of shell is also identified.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-46
Azimuth	----------
Inclination	Vertical
RL-Collar	6.208
Total depth of BH	6.0 m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Thondavali
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	335131.968
Longitude (E)	1781510.684
Date of Commencement	30/05/2024
Date of Completion	30/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Blackish fine grained black sand with the presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine grained sand with the presence of HM, with higher concentration of heavy minerals.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine grained sand with the presence of HM, with higher concentration of heavy minerals.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine grained sand with the presence of HM, with higher concentration of heavy minerals.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-47
Azimuth	----------
Inclination	Vertical
RL-Collar	4.562
Total depth of BH	6.0 m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Thondavali
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	335149.121
Longitude (E)	1780971.669
Date of Commencement	31/05/2024
Date of Completion	31/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained loose dry sand with less presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine to medium grained dry sand with the presence of HM, with higher concentration of heavy minerals.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine to medium grained sand with the presence of HM. Water table encountered at 5m.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Medium grained sand with the presence of HM and shell fragments with higher concentration of heavy minerals.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-48
Azimuth	----------
Inclination	Vertical
RL-Collar	5.479
Total depth of BH	6.0 m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Thondavali
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	335258.758
Longitude (E)	1780675.53
Date of Commencement	31/05/2024
Date of Completion	31/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Blackish sand with concentration of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Blackish sand with concentration of HM.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained sand with the presence of HM.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine to medium grained sand with the presence of HM.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Blackish fine grained sand with the presence of HM.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Blackish fine grained sand with the presence of HM. Water table encountered at 6.0 m.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-49
Azimuth	----------
Inclination	Vertical
RL-Collar	3.638
Total depth of BH	6.0 m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Thondavali
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	335387.175
Longitude (E)	1780269.762
Date of Commencement	01/06/2024
Date of Completion	01/06/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine to medium grained sand with the presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine to medium grained sand with the presence of HM.Water table encountered at 2m.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine to medium grained sand with the presence of HM also sand shells are identified.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine to medium grained sand with the presence of HM.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine to medium grained sand with the presence of HM.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine to medium grained sand with the presence of HM.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-50
Azimuth	----------
Inclination	Vertical
RL-Collar	2.568
Total depth of BH	6.0 m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Thondavali
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	335446.481
Longitude (E)	1779847.155
Date of Commencement	31/05/2024
Date of Completion	31/05/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Very fine grained dry loose sand with less presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained sand with moderate presence of HM.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine to medium grained wet sand with moderate presence of HM. Water table encountered at 2.60m		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Medium grained wet sand with moderate presence of HM.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Medium grained wet sand with moderate presence of HM.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Medium grained sand with high presence of HM.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-51
Azimuth	----------
Inclination	Vertical
RL-Collar	0.626
Total depth of BH	6.0 m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Thondavali
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	335615.896
Longitude (E)	1779841.545
Date of Commencement	01/06/2024
Date of Completion	01/06/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Fine grained sand with HM presence.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Fine grained sand with HM presence. Water table encountered at 2m.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Fine grained sand with HM presence.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Fine grained sand with HM presence.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine grained sand with HM presence.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine grained sand with HM presence.		1

Borehole log sheet_Talashil block_Maharashtra

Block	Talashil
Commodity	Heavy mineral
Exploration level	G3
Bore Hole ID	TL-52
Azimuth	----------
Inclination	Vertical
RL-Collar	2.155
Total depth of BH	6.0 m
Type & Make of Rig	Manual Auger Drilling

Location- Village	Thondavali
Taluk	Malvan
District & State	Sindhudurg,Maharashtra
S.O.I. Toposheet	E43T/8
Latitude (N)	335494.61
Longitude (E)	1779495.967
Date of Commencement	31/05/2024
Date of Completion	01/06/2024

S.No	**Bore Hole Log Details (Runwise)**									**Core details**	
	From (m)	**To (m)**	**Length (m)**	**Recovered Length (m)**	**True Length (m)**	**Recovery %**	**RQD**	**Litho Code**	**Lithological description**		**Box/Pack No**
1	0.00	1.00	1.00	1.00	1.00	100	NA	SAND	Blackish fine grained sand with the presence of HM.		1
2	1.00	2.00	1.00	1.00	2.00	100	NA	SAND	Blackish fine to medium grained sand with the presence of HM.		1
3	2.00	3.00	1.00	1.00	3.00	100	NA	SAND	Blackish fine to medium grained sand with the presence of HM. Water encountered at 3m.		1
4	3.00	4.00	1.00	1.00	4.00	100	NA	SAND	Medium to fine grained sand with the presence of HM and sand shells.		1
5	4.00	5.00	1.00	1.00	5.00	100	NA	SAND	Fine to medium grained sand with the presence of HM.		1
6	5.00	6.00	1.00	1.00	6.00	100	NA	SAND	Fine to medium grained sand with the presence of HM.		1

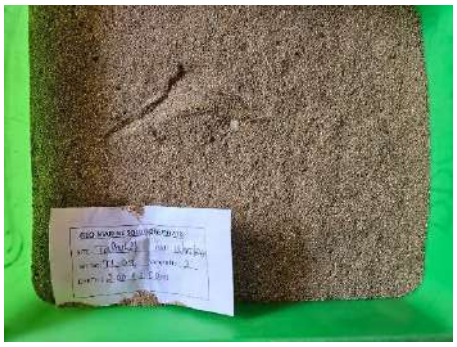
Annexure 8
Sample photographs

TL-01

TL-02

TL-03



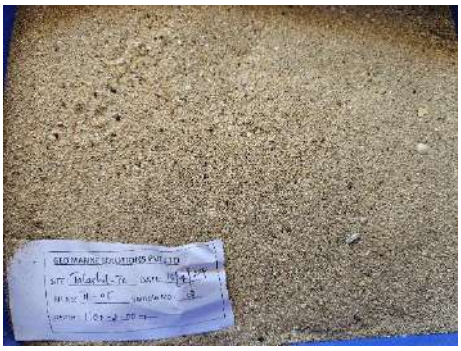
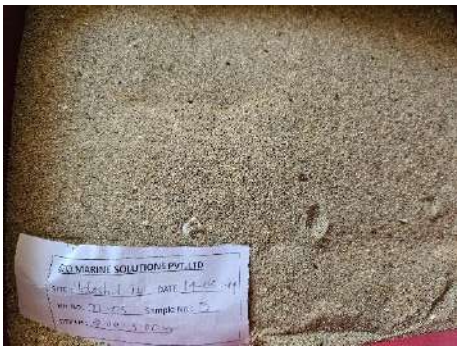
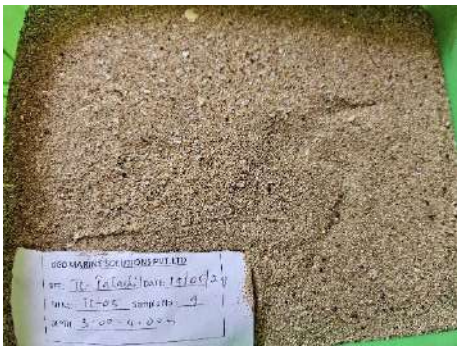
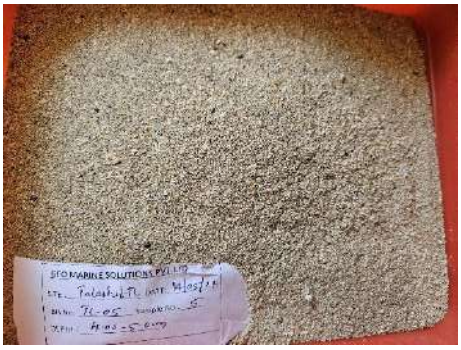
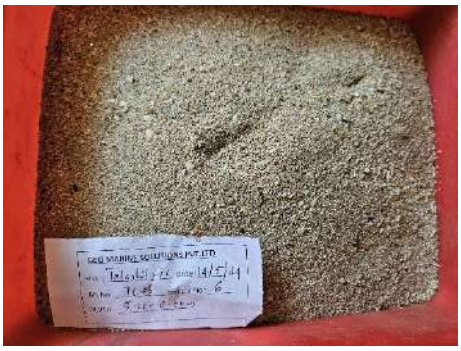



TL-04






TL-05

TL-06



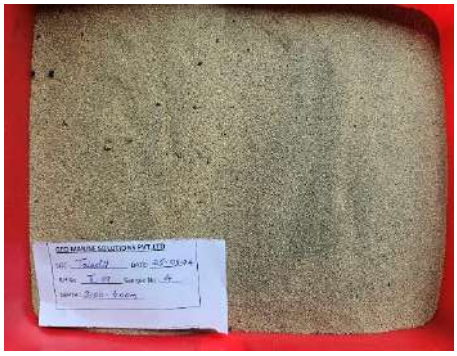
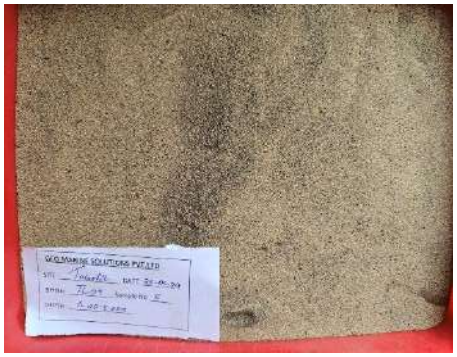
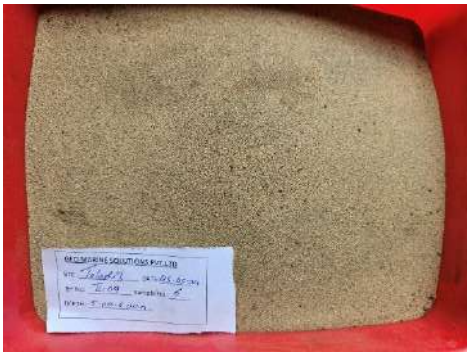



TL-07

TL-08

TL-09



TL-10

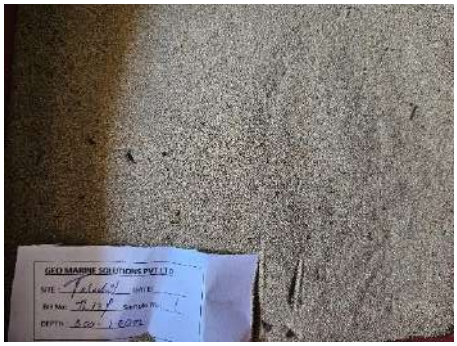


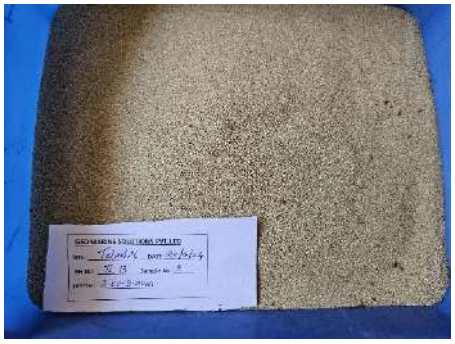
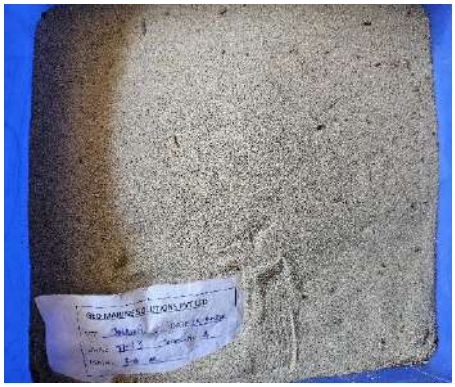


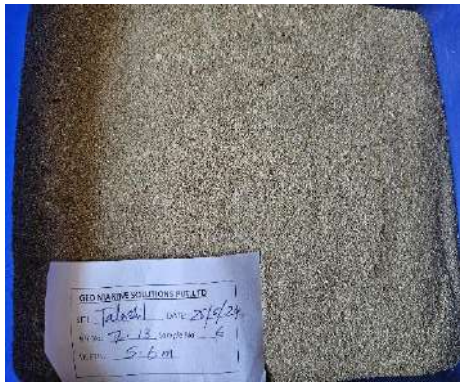

TL-11

TL-12

TL-13





TL-14

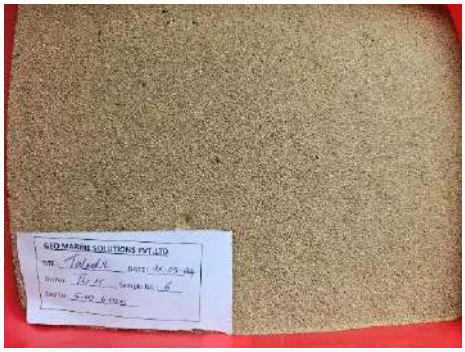





TL-15





TL-16






TL-17

TL-18

TL-19

TL-20

TL-21

TL-22

TL-23






TL-24






TL-25





TL-26

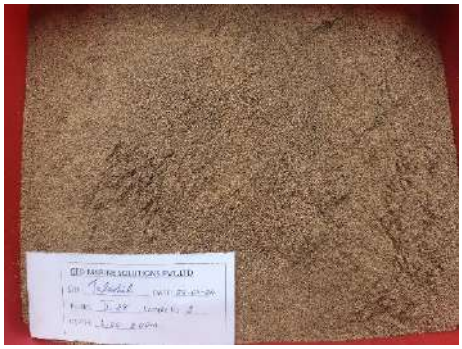



TL-27






TL-28



TL-29



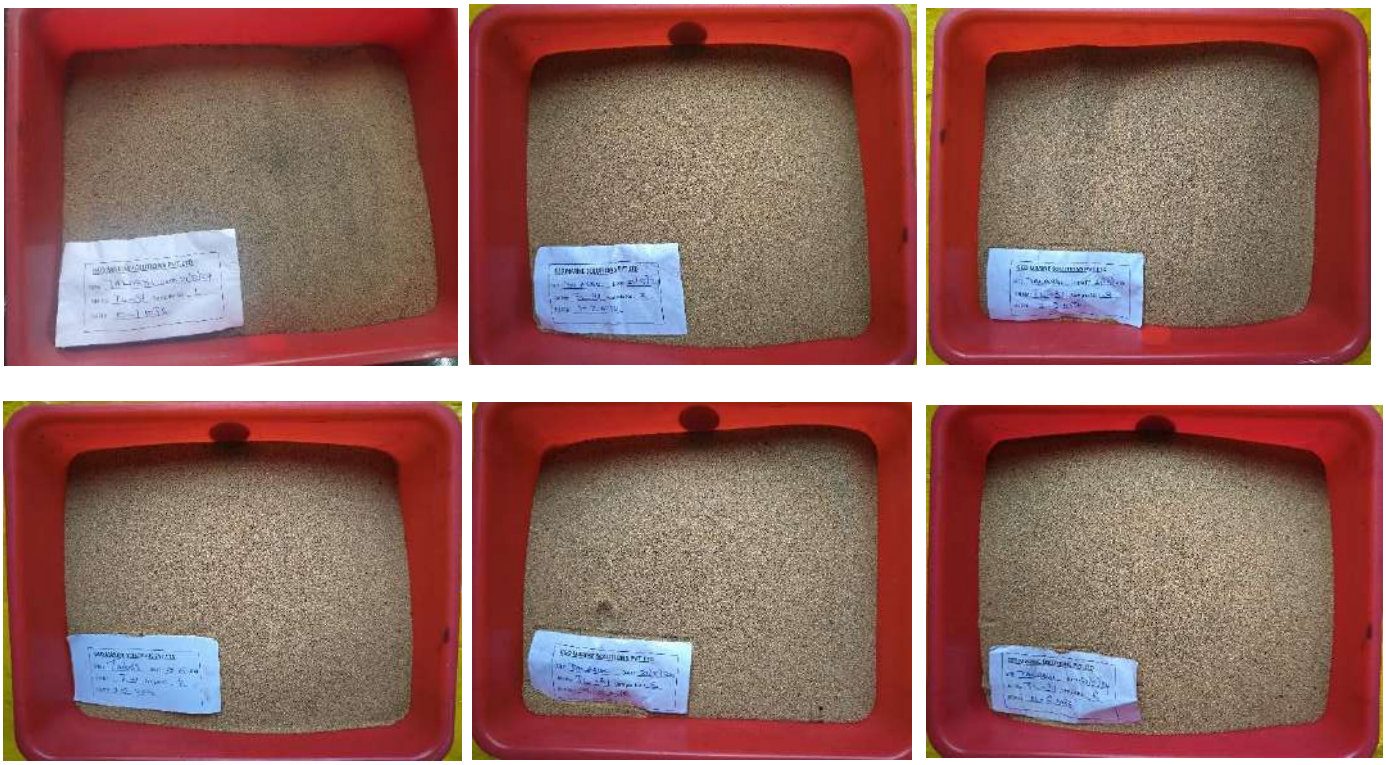



TL-30






TL-31



TL-32

TL-33






TL-34






TL-35






TL-36






TL-37

TL-38

TL-39

TL-40

TL-41

TL-42

TL-43






TL-44






TL-45

TL-46

TL-47






TL-48






TL-49

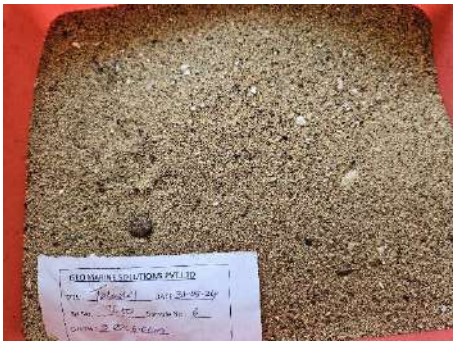





TL-50





TL-51

TL-52

Annexure 9

Field photographs

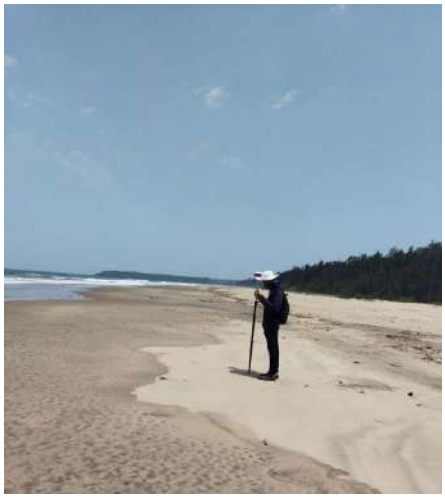
Topographic Survey and Geological Mapping



Carrying out the Level transferring near Achara light house


TBM fixing and observation at Achara beach





Field photos during Geological mapping

Mapping around Achara in the north of the exploration area

Enriched HM layers in Gad river Section in the south of the exploration area

Borehole fixing

Auger sampling

Sampling along beach area

Auger sampling

Sampling team

Retrieving sample

Sampling along dune area

Site Photographs

View of Dune complex

View of Dune

Seasonal drainage along the beach area

Thick column of sand deposit in dune area

Annexure 10
Check sample results.

Inspectorate Griffith India Pvt. Ltd
Gandhidham. Laboratory
Industrial Shed No. 1A & 1B, Plot No. 8, Sector-12/B,
Gandhidham-Kutch, Gujarat (370201), INDIA

TEST REPORT

TC-14678

Test Report No.IGI/GDM./TR/2024/E00311 **ULR No.:** ULR - TC146782400000292FE **Report Issue Date:** 09/12/2024

***NAME & ADDRESS OF CUSTOMER :**	M/S.GEO MARINE SOLUTIONS PVT LTD 15-17-909/9, 5th CROSS SHIVABAGH KADRI, MANGALORE - 575005, KARNATAKA, INDIA		
Customer's Reference:	AS PER LETTER DATED - 28.11.2024	**Customer Ref. Date:**	28/11/2024
Chemical Testing:	Ores & Minerals	**Sample Particulars:**	Geological Rock Soil Stream Sediments
Condition Of Sample:	75 MICRON	**Sample Receipt Date:**	04/12/2024
Analysis Commencement Date:	04/12/2024	***Sample Description:**	BEACH SAND SAMPLES
Analysis Completion Date:	09/12/2024	**No. Of Samples:**	30

TEST RESULT

SAMPLE CODE	*SAMPLE REF/ID (Customer)	Aluminium Oxide as Al2O3	Calcium Oxide (CaO)	Magnesium Oxide (MgO)	Chromium (III) Oxide as Cr2O3	Ferric Oxide (Fe2O3)	Potassium Oxide as K2O	Sodium Oxide as Na2O	Silicon Dioxide as SiO2
		TPM IGI/GDM/LAB/TPM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)	TPM IGI/GDM/LAB/TPM/48 (Fusion Bead); Issue 01:2022 (DB) (mg/kg)	TPM IGI/GDM/LAB/TPM/48;Issue#01 2022 (Fusion Bead) (DB) (mg/kg)	TPM IGI/GDM/LAB/TPM/48;Issue#01 2022 (Fusion Bead) (DB) (mg/kg)	TPM IGI/GDM/LAB/TPM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)	TPM IGI/GDM/LAB/TPM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)	TPM IGI/GDM/LAB/TPM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)	TPM IGI/GDM/LAB/TPM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)
2024 - E014822	TL/02/0-1/A	56000	17500	24310	380	469630	2240	2690	153700
2024 - E014823	TL/02/0-1/B	60740	16130	33480	550	344950	2910	2700	241400
2024 - E014824	TL/02/0-1/C	85680	16640	34850	--	180570	6150	4930	562000
2024 - E014825	TL/07/1-2/C	92070	19170	58730	520	360590	2650	2470	254930
2024 - E014826	TL/07/3-4/B	111140	37460	55900	--	267940	4760	13740	291900
2024 - E014827	TL/08/1-2/A	58120	16400	31450	--	405700	2920	2960	227000
2024 - E014828	TL/15/1-2/A	67020	27580	41750	--	419740	3030	5270	206800
2024 - E014829	TL/15/3-4/A	60480	21490	38500	--	447200	2470	3620	180210
2024 - E014830	TL/15/3-4/B	74620	29470	46430	--	241100	4920	5240	427010
2024 - E014831	TL/23/4-5/A	58670	18880	32720	--	471950	2590	2860	160710
2024 - E014832	TL/24/0-1/A	64440	15660	25900	--	488280	1820	2370	135700
2024 - E014833	TL/24/2-3/B	63060	21260	39380	--	358500	2720	3690	210530
2024 - E014834	TL/24/5-6/A	62710	20330	33670	540	467950	2250	3270	164280
2024 - E014835	TL/24/5-6/B	75980	24110	42680	550	330530	3650	4570	290490
2024 - E014836	TL/30/5-6/A	65560	24610	35020	530	441900	3020	4190	194630
2024 - E014837	TL/31/4-5/B	32640	15250	30970	--	430730	1360	1830	112350
2024 - E014838	TL/47/1-2/A	40400	15700	21220	600	542400	1390	3110	111720
2024 - E014839	TL/47/1-2/B	41910	23480	33840	--	390150	1900	3980	200470
2024 - E014840	TL/47/1-2/C	77100	40150	46650	910	267940	3840	6060	433130
2024 - E014841	TL/52/0-1/C	66150	36470	46170	690	302320	2790	7090	270870
2024 - E014842	TL/52/1-2/A	56600	23820	30960	540	480600	2200	4800	170820
2024 - E014843	TL/52/4-5/A	81270	32890	38950	610	403430	3140	11460	233930
2024 - E014844	TL/52/4-5/B	110750	46950	49980	--	290030	3950	15470	314060

INSPECTORATE
Industrial Shed 1A & 1B
Plot No. 8, Sector 12-B

Inspectorate Griffith India Pvt. Ltd
Gandhidham, Laboratory
Industrial Shed No. 1A & 1B, Plot No. 8, Sector-12/B,
Gandhidham-Kutch, Gujarat (370201), INDIA

TEST REPORT

TC-14678

BUREAU VERITAS

Test Report No.IGI/GDM./TR/2024/E00311 **ULR No.:** ULR - TC1467824000000292FE **Report Issue Date:** 09/12/2024

SAMPLE CODE	*SAMPLE REF/ID (Customer)	Aluminium Oxide as Al2O3	Calcium Oxide (CaO)	Magnesium Oxide (MgO)	Chromium (III) Oxide as Cr2O3	Ferric Oxide (Fe2O3)	Potassium Oxide as K2O	Sodium Oxide as Na2O	Silicon Dioxide as SiO2
		TPM IGI/GDM/LAB/T PM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)	TPM IGI/GDM/LAB/T PM/48 (Fusion Bead); Issue 01:2022 (DB) (mg/kg)	TPM IGI/GDM/LAB/T PM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)	TPM IGI/GDM/LAB/T PM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)	TPM IGI/GDM/LAB/T PM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)	TPM IGI/GDM/LAB/T PM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)	TPM IGI/GDM/LAB/T PM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)	TPM IGI/GDM/LAB/T PM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)
2024 - E014845	TL/52/4-5/C	114750	35120	52910	760	315300	4450	12210	300260
2024 - E014846	TL/09/3-4A/MT	45270	9740	18810	520	573480	990	1280	72040
2024 - E014847	TL/09/3-4ANMT	66420	21570	39970	--	405190	2100	3190	180340
2024 - E014848	TL/40/3-4A/MT	45830	11960	19280	560	574600	1170	2480	80620
2024 - E014849	TL/40/3-4A/NMT	76390	37370	48720	--	340190	3700	7150	264550
2024 - E014850	TL/52/4-5A/MT	55080	15490	22560	580	551700	1470	6450	102570
2024 - E014851	TL/52/4-5ANMT	97050	48260	49080	--	278850	4490	15300	347200

SAMPLE CODE	*SAMPLE REF/ID (Customer)	Manganese Oxide (MnO)	Titanium Oxide as TiO2	Vanadium Pentoxide as V2O5	Barium Oxide (BaO)	Phosphorus Pentoxide (P2O5)	Loss on Ignition (LOI)	Zirconium Oxide as ZrO2
		TPM IGI/GDM/LAB/T PM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)	TPM IGI/GDM/LAB/T PM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)	TPM IGI/GDM/LAB/T PM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)	TPM IGI/GDM/LAB/T PM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)	TPM IGI/GDM/LAB/T PM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)	IBM Manual (Pages 24 to 26): 2012 (DB) (%)	TPM IGI/GDM/LAB/T PM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)
2024 - E014822	TL/02/0-1/A	5060	206200	5230	910	2530	4.30	--
2024 - E014823	TL/02/0-1/B	3070	238900	2990	1010	2580	4.33	520
2024 - E014824	TL/02/0-1/C	910	26700	600	--	3080	7.42	680
2024 - E014825	TL/07/1-2/C	2430	113140	2120	--	4030	8.37	--
2024 - E014826	TL/07/3-4/B	2450	90210	1530	--	3810	11.32	--
2024 - E014827	TL/08/1-2/A	4360	201520	4280	880	2640	3.68	--
2024 - E014828	TL/15/1-2/A	4720	174020	4330	700	2610	3.88	--
2024 - E014829	TL/15/3-4/A	5000	190530	4820	810	2490	3.81	--
2024 - E014830	TL/15/3-4/B	2140	114030	1550	--	2720	5.02	590
2024 - E014831	TL/23/4-5/A	5290	203300	5310	940	2250	2.99	--
2024 - E014832	TL/24/0-1/A	5510	213300	5460	950	2420	3.44	--
2024 - E014833	TL/24/2-3/B	3440	261430	3150	1200	2480	2.67	--
2024 - E014834	TL/24/5-6/A	5180	201400	5160	840	2520	2.73	--
2024 - E014835	TL/24/5-6/B	3060	185670	2680	720	3110	2.97	--
2024 - E014836	TL/30/5-6/A	5050	181390	4790	720	2460	3.30	--
2024 - E014837	TL/31/4-5/B	4110	357170	4070	1850	1570	--	570
2024 - E014838	TL/47/1-2/A	6090	241410	6600	1080	1590	--	--

INSPECTORATE
Industrial Shed 1A & 1B
Plot No. 8, Sector 12-B
Gandhidham, Gujarat-37020

Inspectorate Griffith India Pvt. Ltd
Gandhidham, Laboratory
Industrial Shed No. 1A & 1B, Plot No. 8, Sector-12/B,
Gandhidham-Kutch, Gujarat (370201), INDIA

TEST REPORT

TC-14678

Test Report No.IGI/GDM./TR/2024/E00311 **ULR No.:** ULR - TC146782400000292FE **Report Issue Date:** 09/12/2024

SAMPLE CODE	*SAMPLE REF/ID (Customer)	Manganese Oxide (MnO)	Titanium Oxide as TiO2	Vanadium Pentoxide as V2O5	Barium Oxide (BaO)	Phosphorus Pentoxide (P2O5)	Loss on Ignition (LOI)	Zirconium Oxide as ZrO2
		TPM IGI/GDM/LAB/TPM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)	TPM IGI/GDM/LAB/TPM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)	TPM IGI/GDM/LAB/TPM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)	TPM IGI/GDM/LAB/TPM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)	TPM IGI/GDM/LAB/TPM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)	IBM Manual (Pages 24 to 26): 2012 (DB) (%)	TPM IGI/GDM/LAB/TPM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)
2024 - E014839	TL/47/1-2/B	3850	286330	3550	1320	1710	--	--
2024 - E014840	TL/47/1-2/C	2270	67970	1440	--	2630	4.59	570
2024 - E014841	TL/52/0-1/C	2920	130620	2220	--	2170	12.55	--
2024 - E014842	TL/52/1-2/A	5520	197080	5540	800	1890	1.39	--
2024 - E014843	TL/52/4-5/A	4550	147450	4210	--	2460	3.16	--
2024 - E014844	TL/52/4-5/B	2820	97550	1990	--	3250	5.88	--
2024 - E014845	TL/52/4-5/C	2420	72380	1530	--	3190	8.17	--
2024 - E014846	TL/09/3-4A/MT	6620	246630	7030	1240	1650	1.12	--
2024 - E014847	TL/09/3-4ANMT	3970	235050	4120	1060	2370	3.05	--
2024 - E014848	TL/40/3-4A/MT	6790	240320	7250	1160	1480	--	--
2024 - E014849	TL/40/3-4A/NMT	3250	184150	2970	710	2390	2.46	--
2024 - E014850	TL/52/4-5A/MT	6440	210470	6730	900	1640	1.21	--
2024 - E014851	TL/52/4-5ANMT	2760	94220	2020	--	2980	5.24	--

REMARKS:

-

Authorised Signatory

AKSHAY NATH
(Lab Manager)

INSPECTORATE
Industrial Shed 1A & 1B
Plot No. 8, Sector 12-B
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gandhidham@bureauveritas.com
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Date 01/10/2018

Inspectorate Griffith India Pvt. Ltd
Gandhidham, Laboratory
Industrial Shed No. 1A & 1B, Plot No. 8, Sector-12/B,
Gandhidham-Kutch, Gujarat (370201), INDIA

TEST REPORT

Test Report No.IGI/GDM./TR/2024/E00311/1

Report Issue Date: 09/12/2024

***NAME & ADDRESS OF CUSTOMER :**	M/S.GEO MARINE SOLUTIONS PVT LTD 15-17-909/9, 5th CROSS SHIVABAGH KADRI, MANGALORE - 575005, KARNATAKA, INDIA		
Customer's Reference:	AS PER LETTER DATED - 28.11.2024	**Customer Ref. Date:**	28/11/2024
Chemical Testing:	Ores & Minerals	**Sample Particulars:**	Geological Rock Soil Stream Sediments
Condition Of Sample:	75 MICRON	**Sample Receipt Date:**	04/12/2024
Analysis Commencement Date:	04/12/2024	***Sample Description:**	BEACH SAND SAMPLES
Analysis Completion Date:	09/12/2024	**No. Of Samples:**	30

TEST RESULT

SAMPLE CODE	*SAMPLE REF/ID (Customer)	Chromium (III) Oxide as Cr2O3	Barium Oxide (BaO)	Loss on Ignition (LOI)	SO3	Zirconium Oxide as ZrO2
		TPM IGI/GDM/LAB/TPM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)	TPM IGI/GDM/LAB/TPM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)	IBM Manual (Pages 24 to 26): 2012 (DB) (%)	TPM IGI/GDM/LAB/TPM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)	TPM IGI/GDM/LAB/TPM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)
2024 - E014822	TL/02/0-1/A	--	--	--	3740	<500
2024 - E014823	TL/02/0-1/B	--	--	--	2000	--
2024 - E014824	TL/02/0-1/C	<500	<500	--	610	--
2024 - E014825	TL/07/1-2/C	--	<500	--	740	<500
2024 - E014826	TL/07/3-4/B	<500	<500	--	1920	<500
2024 - E014827	TL/08/1-2/A	<500	--	--	510	<500
2024 - E014828	TL/15/1-2/A	<500	--	--	690	<500
2024 - E014829	TL/15/3-4/A	<500	--	--	620	<500
2024 - E014830	TL/15/3-4/B	<500	<500	--	670	--
2024 - E014831	TL/23/4-5/A	<500	--	--	530	<500
2024 - E014832	TL/24/0-1/A	<500	--	--	560	<500
2024 - E014833	TL/24/2-3/B	<500	--	--	570	<500
2024 - E014834	TL/24/5-6/A	--	--	--	520	<500
2024 - E014835	TL/24/5-6/B	--	--	--	620	<500
2024 - E014836	TL/30/5-6/A	--	--	--	570	<500
2024 - E014837	TL/31/4-5/B	<500	--	0.34	510	--
2024 - E014838	TL/47/1-2/A	--	--	0.31	680	<500
2024 - E014839	TL/47/1-2/B	<500	--	0.31	630	<500
2024 - E014840	TL/47/1-2/C	--	<500	--	670	--
2024 - E014841	TL/52/0-1/C	--	<500	--	660	<500
2024 - E014842	TL/52/1-2/A	-	--	--	670	<500
2024 - E014843	TL/52/4-5/A	--	<500	--	1240	<500
2024 - E014844	TL/52/4-5/B	<500	<500	--	1320	<500

INSPECTORATE
Industrial Shed 1A & 1B
Plot No. 8, Sector 12-B
Gandhidham, Gujarat-370201

Inspectorate Griffith India Pvt. Ltd
Gandhidham, Laboratory
Industrial Shed No. 1A & 1B, Plot No. 8, Sector-12/B,
Gandhidham-Kutch, Gujarat (370201), INDIA

TEST REPORT

Test Report No.IGI/GDM./TR/2024/E00311/1

Report Issue Date: 09/12/2024

SAMPLE CODE	*SAMPLE REF/ID (Customer)	Chromium (III) Oxide as Cr2O3	Barium Oxide (BaO)	Loss on Ignition (LOI)	SO3	Zirconium Oxide as ZrO2
		TPM IGI/GDM/LAB/TPM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)	TPM IGI/GDM/LAB/TPM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)	IBM Manual (Pages 24 to 26): 2012 (DB) (%)	TPM IGI/GDM/LAB/TPM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)	TPM IGI/GDM/LAB/TPM/48;Issue#01: 2022 (Fusion Bead) (DB) (mg/kg)
2024 - E014845	TL/52/4-5/C	--	<500	--	1400	<500
2024 - E014846	TL/09/3-4A/MT	--	--	--	550	<500
2024 - E014847	TL/09/3-4ANMT	<500	--	--	650	<500
2024 - E014848	TL/40/3-4A/MT	--	--	0.27	630	<500
2024 - E014849	TL/40/3-4A/NMT	<500	--	--	670	<500
2024 - E014850	TL/52/4-5A/MT	--	--	--	1080	<500
2024 - E014851	TL/52/4-5ANMT	<500	<500	--	1640	<500

REMARKS:

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Authorised Signatory

AKSHAY NATH
(Lab Manager)

INSPECTORATE
Industrial Shed 1A & 1B
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Annexure 11
XRD Results

GOVERNMENT OF INDIA
GEOLOGICAL SURVEY OF INDIA

National Centre of Excellence in Geoscience Research
Mineral Physics Division, 15 A&B Kyd Street, Kolkata

Report of XRD analysis of samples received from: A.C.Dinesh, Chief Technology Officer, GeoMarine Solutions Pvt.Ltd.,15-17-909/9, 5th Cross ShivaBagh, Kadri, Mangalore -575005, Karnataka.
No. of samples: 10 **CHQ Lab. No.** MPHD/COM/13/10

SL. No.	Sample No.	Mineral Phases detected			Remarks
		Good/Considerable.amount	Trace amount	Likely Phases	
1	TL-31/A	Spinel (mainly magnetite type), Ilmenite, Hematite	Quartz Pyroxene	K feldspar	
2	TL-02/A	Spinel (mainly magnetite type), Hematite, Ilmenite	Quartz Pyroxene	K feldspar	
3	TL-02/B	Ilmenite, Hematite, Pyroxene, Quartz	Plagioclase	Amphibole K feldspar Magnetite	
4	TL-31/B	Ilmenite, Hematite, Quartz, Plagioclase, Pyroxene		Amphibole K feldspar	
5	TL-47A	Spinel (mainly magnetite type), Ilmenite, Hematite	Quartz Pyroxene	K feldspar	
6	TL-47B	Ilmenite, Hematite, Pyroxenes	Quartz Plagioclase Amphibole	K feldspar	

Analysed by: Dr. Deepthy R., Mineralogist (Sr.).... 18/12/2024

Supervised by: Sri J. Mukherjee, Director (Min.Phy.)..... 18/12/2024

SL. No.	Sample No.	Mineral Phases detected			Remarks
		Good / Considerable amount	Trace amount	Likely Phases	
7	TL-31/C	Pyroxenes, Amphibole, Plagioclase, Quartz, Ilmenite	Hematite	Clay minerals Magnetite	
8	TAL/NMHM/N	Amphibole, Pyroxenes	Zircon Plagioclase	Chlorite Quartz	
9	TAL/NMHM/S	Amphibole, Pyroxene	Plagioclase Zircon	Chlorite Quartz Epidote	
10	TAL/NMLM	Quartz, Plagioclase, K feldspar			

Note:

1. Samples were analysed in PANalytical X'Pert PRO powder diffractometer having an X-ray tube with Copper target. Analyzing iron-rich samples using XRD with copper radiation results in a high background level due to fluorescence, which affects the quality of the diffractogram. Also the samples are fractions separated by magnetic separator/bromoform. However, mineral phase analysis was carried out with best suitable experimental setup for the submitted samples.

2. Spinel minerals such as magnetite, titanomagnetite and magnesioferrite etc. have similar spinel crystal structure and comparable lattice parameters and their X-ray diffraction (XRD) patterns are quite similar making distinction between these types of minerals challenging in polymineralic samples. For more details, analytical method like Electron Probe Micro-Analysis (EPMA) is recommended.

Analysed by: Dr. Deepthy R., Mineralogist (Sr.)..... 18/12/2024

Supervised by: Sri J. Mukherjee, Director (Min.Phy.)..... 18/12/2024

Annexure 12
Radiometric Analysis result

भारत सरकार Government of India
परमाणु ऊर्जा विभाग Department of Atomic Energy
परमाणु खनिज अन्वेषण एवं अनुसंधान निदेशालय
Atomic Minerals Directorate for Exploration and Research

1-10-153/156, पखनि परिसर AMD Complex,
बेगमपेट, हैदराबाद Begumpet, Hyderabad
Telephone No.040-277637024, 27776204
Fax No.040-27762940
E-mail:amdhyd@ap.nic.in

संNo.AMD-75(1)/2025-PMSG

जनवरी January 10, 2025

सेवा में To,
A.C. Dinesh
Chief Technology officer
Geo marine Solutions Pvt. Ltd
15-17-909/9, Leslie Haven, 5th Cross road
Shivabagh, Kadri, Mangalore
KARNATAKA– 575 005

E-mail : oed@geomarinesolutions.in

विषय Sub : Analysis of sediment sample – Results - Regarding
संदर्भ Ref : Letter no. GEMS/NMET/AMD/AMD/2024/1 dated 03.12.2024 and E-mail dated 10.12.2024 & 12.12.2024

***

महोदय Sir,

Please refer to the above letter on the subject. The radiometric analysis report for monazite equivalent of the bulk samples (10 Nos.) is enclosed herewith.

Kindly acknowledge the receipt of the same.

This communication is issued with approval of Director, AMD.

भवदीय Yours faithfully,

संलग्न : उपरोक्तानुसार
Encl : As above

10/01/2025

(निरोज कुमार पंडा Niroj Kumar Panda)
प्रधान Head
योजना एवं प्रबंधन सेवा वर्ग Planning and Management Services Group

भारत सरकार Government of India
परमाणु ऊर्जा विभाग Department of Atomic Energy
परमाणु खनिज अन्वेषण एवं अनुसंधान निदेशालय
Atomic Minerals Directorate for Exploration and Research

1-10-153/156, पखनि परिसर AMD Complex,
बेगमपेट, हैदराबाद Begumpet, Hyderabad
Telephone No.040-277637024, 27776204
Fax No.040-27762940
E-mail:amdhyd@ap.nic.in

संNo.AMD-75(1)/2025-PMSG

जनवरी January 10, 2025

ANALYSIS REPORT

Samples received from : A.C. Dinesh,
Chief Technology officer,
Geo marine Solutions Pvt. Ltd,
15-17-909/9, Leslie Haven, 5th Cross road,
Shivabagh, Kadri, Mangalore,
Karnataka – 575 005

Reference Letter No. : Letter no. GEMS/NMET/AMD/AMD/2024/1 dated 03.12.2024 and E-mail dated 10.12.2024 &12.12.2024

Nature of samples : Bulk sample

Analysed at : Physics Laboratory, AMD, Hyderabad

RADIOMETRIC ANALYSIS REPORT

S. No.	Sample No.	Monazite equivalent (ppm)
1.	TL-02	74±3
2.	TL-47	75±3
3.	TL-31	74±4
4.	TL-16	99±2
5.	TL-52	97±3
6.	TL-30	92±3
7.	TL-41	80±3
8.	TL-08	76±3
9.	TL-07	75±3
10.	TL-24	76±3

10/01/2025

(निरोज कुमार पंडा Niroj Kumar Panda)
प्रधान Head
योजना एवं प्रबंधन सेवा वर्ग Planning and Management Services Group