

**GEOLOGICAL REPORT ON RECONNAISSANCE SURVEY (G-4) FOR
LIMESTONE IN BANKI-SALAIYA BLOCK (25 Sq.Km), CHHATTARPUR
DISTRICT, MADHYA PRADESH
(NATIONAL MINERAL EXPLORATION AND DEVELOPMENT TRUST)**

BANKI-SALAIYA BLOCK

TEHSIL: BIJAWAR, DISTRICT: CHHATTARPUR, MADHYA PRADESH



MADHYA PRADESH STATE MINING CORPORATION LIMITED

A GOVERNMENT OF MADHYA PRADESH UNDERTAKING

HEAD OFFICE, BHOPAL

(NOTIFIED EXPLORATION AGENCY)

JANUARY-2025

GEOLOGICAL REPORT ON RECONNAISSANCE SURVEY (G-4) FOR LIMESTONE IN BANKI-SALAIYA BLOCK (25 Sq.Km), CHHATTARPUR DISTRICT, MADHYA PRADESH

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कार्यकारी सारांश

पृष्ठभूमि और उद्देश्य: चूना पत्थर, जो मुख्य रूप से कैल्शियम कार्बोनेट (CaCO_3) से बना होता है, का व्यापक रूप से सीमेंट, स्टील, चीनी, कांच, उर्वरक और रसायन जैसे उद्योगों में उपयोग किया जाता है। जब मैग्नीशियम कार्बोनेट से समृद्ध होता है, तो इसे डोलोमाइटिक चूना पत्थर कहा जाता है। एमएमडीआर संशोधन अधिनियम 2015 और संबंधित नियमों के बाद, भारत सरकार ने राज्य सरकारों को खनिज अन्वेषण में तेजी लाने का निर्देश दिया। जवाब में, मध्य प्रदेश राज्य खनन निगम लिमिटेड (एमपीएसएमसीएल) ने छतरपुर जिले के 25 वर्ग किलोमीटर बांकी-सलैया ब्लॉक में चूना पत्थर के लिए जी-4 स्तर के पुनरीक्षण सर्वेक्षण का प्रस्ताव रखा। 58वीं टीसीसी (30-31 अक्टूबर, 2023) द्वारा अनुशंसित प्रस्ताव को 6 दिसंबर, 2023 को एनएमईटी की 32वीं कार्यकारी समिति (ईसी) की बैठक में मंजूरी दी गई। 23/406/2023-NMET/376 दिनांक 12 दिसंबर, 2023, 9 महीने की समय-सीमा के साथ। एमपीएसएमसीएल ने मार्च 2024 में भूवैज्ञानिक मानचित्रण और नमूना संग्रह शुरू किया और दिसंबर 2024 तक संबंधित गतिविधियों के साथ-साथ कार्य पूरा कर लिया। प्रस्तावित अन्वेषण के उद्देश्य निम्नलिखित हैं:

- i. 1:12,500 पैमाने पर ब्लॉक का भूवैज्ञानिक मानचित्रण।
- ii. छिपे हुए चूना पत्थर को उजागर करने और उथली गहराई पर CaO , Fe_2O_3 , Al_2O_3 , SiO_2 आदि का विश्लेषण करने के लिए ट्रेंचिंग/गड्ढा खोदना।
- iii. अंतराल क्षेत्रों और जमीन के नीचे चूना पत्थर के विस्तार का पता लगाने के लिए स्काउट बोरहोल की ड्रिलिंग।
- iv. यूएनएफसी और एमईएमसी-2015 के अनुसार पुनर्परीक्षा खनिज संसाधनों और ग्रेड का अनुमान।

स्थान: अन्वेषण क्षेत्र मध्य प्रदेश के छतरपुर जिले के बिजावर तहसील में बांकीगिरोली और सलैया गांवों के पास, भारतीय सर्वेक्षण विभाग की टोपोशीट 54P/10 और 54P/11 के अंतर्गत स्थित है। 25 वर्ग किमी में से 14.5 वर्ग किमी पन्ना टाइगर रिजर्व कॉरिडोर के अंतर्गत आता है, जिससे 10.5 वर्ग किमी अन्वेषण के लिए खुला रहता है। उष्णकटिबंधीय शुष्क पर्णपाती वनों से आच्छादित यह क्षेत्र विविध वनस्पतियों और जीवों का घर है। कनेक्टिविटी अच्छी है, राज्य राजमार्ग 43 पास के शहरों को जोड़ता है; छतरपुर रेलवे स्टेशन (70 किमी) और खजुराहो रेलवे स्टेशन (47 किमी) रेल पहुँच प्रदान करते हैं, जबकि जबलपुर हवाई अड्डा (200 किमी) व्यापक कनेक्टिविटी सुनिश्चित करता है।

सामाजिक-जनसांख्यिकीय स्थितियाँ: 2011 की जनगणना के अनुसार, बिजावर तहसील में प्रति 1,000 पुरुषों पर 886 महिलाओं का लिंगानुपात दर्ज किया गया है, जो जिले के औसत से अधिक है लेकिन राष्ट्रीय स्तर से नीचे है। छतरपुर जिले की साक्षरता दर 63.74% है, जो लैंगिक अंतर (72.66% पुरुष बनाम 53.59% महिला) से चिह्नित है, जो विशेष रूप से महिलाओं के

लिए शैक्षिक चुनौतियों को उजागर करता है। जनसंख्या मुख्यतः ग्रामीण और कृषि-आधारित है, जिसमें गेहूं, चना (चना), तिलहन (अलसी, सरसों) और सब्जियां मुख्य फसलें हैं। अर्थव्यवस्था मुख्यतः कृषि प्रधान है और औद्योगीकरण न्यूनतम है।

क्षेत्र का भूविज्ञान: यह ब्लॉक विंध्य सुपरग्रुप के प्रोटेरोज़ोइक भूभाग में स्थित है, जिसमें सेमरी और कैमूर समूह शामिल हैं। निचली स्तरीकृत संरचना बनाने वाले सेमरी समूह में बलुआ पत्थर, शेल और चूना पत्थर की रेतीली-कैल्केरियस-मिट्टीदार संलयन शामिल हैं। ब्लॉक के भूविज्ञान में सेमरी समूह के पल्कावन शेल संरचना का प्रभुत्व है लिथो-संरचना इकाई: इस क्षेत्र में संरचनाएं 8° - 10° के हल्के दक्षिणी ढलान के साथ ईएनई-डब्ल्यूएसडब्ल्यू की ओर प्रवृत्त हैं। डोलोमाइट के आसपास अंतर्निहित ब्लैक शेल और ऊपरी ऑलिव शेल दोनों दक्षिण-पूर्व की ओर समान ढलान दर्शाते हैं। विंध्य क्षेत्र का भूवैज्ञानिक ज्ञान दो शताब्दियों में विकसित हुआ है, जो व्यापक स्तरीकृत वर्गीकरण से लेकर विस्तृत मानचित्रण, खनिज अध्ययन और संसाधन अन्वेषण तक विकसित हुआ है। पिछले 11 अन्वेषणों में से किसी ने भी चूना पत्थर को लक्षित नहीं किया, जिससे केंद्रित अध्ययनों की आवश्यकता रेखांकित होती है।

भूवैज्ञानिक मानचित्रण, नमूनाकरण और गड्ढा: पूरे ब्लॉक में विस्तृत भूवैज्ञानिक मानचित्रण किया गया, जिसके परिणामस्वरूप कुल 41 सतह और आउटक्रॉप नमूने एकत्र किए गए। कुल मिलाकर, 10 आउटक्रॉप नमूनों और 6 गड्ढे के नमूनों का पाँच प्रमुख मूलकों: CaO , MgO , Al_2O_3 , SiO_2 , और Fe_2O_3 के लिए आर्द्र रासायनिक विश्लेषण किया गया।

विश्लेषणात्मक परिणाम: रासायनिक विश्लेषण से पता चलता है कि निक्षेप मुख्यतः डोलोमाइटिक हैं, जिनमें CaO 30-37.7%, MgO 8-20% और SiO_2 10% तक है। यह संरचना औद्योगिक-श्रेणी के डोलोमाइट अनुप्रयोगों के लिए उपयुक्त है, लेकिन सीमेंट-श्रेणी के चूना पत्थर के लिए नहीं, जिसके लिए $\text{CaO} > 44\%$ और $\text{MgO} < 3\%$ की आवश्यकता होती है। लगातार कम CaO और उच्च MgO के कारण नमूने सीमेंट निर्माण के लिए अनुपयुक्त हो जाते हैं।

निष्कर्ष और अनुशंसा: ब्लॉक के BRS और गड्ढे के नमूनों से प्राप्त संयुक्त CaO और MgO ग्रेड, जो अधिकतर 45-52% के बीच है, को ध्यान में रखते हुए, एक अधिक परिभाषित डेटाबेस स्थापित करने के लिए ब्लॉक का और अधिक अन्वेषण करने की अनुशंसा की जाती है। इसलिए, बांकी-सलैया ब्लॉक की क्षमता का पूरी तरह से आकलन करने के लिए, आगे के अन्वेषण में डोलोमाइट निक्षेपों की गहराई और सीमा को परिभाषित करने के लिए कुछ स्काउट ड्रिलिंग पर ध्यान केंद्रित किया जाना चाहिए। ब्लॉक भर में रासायनिक संरचना में परिवर्तनशीलता को बेहतर ढंग से समझने के लिए अतिरिक्त भू-रासायनिक विश्लेषण किया जाना चाहिए।

**GEOLOGICAL REPORT ON RECONNAISSANCE SURVEY (G-4) FOR LIMESTONE IN BANKI-SALAIYA
BLOCK (25 Sq.Km), CHHATTARPUR DISTRICT, MADHYA PRADESH**

EXECUTIVE SUMMARY

Back Ground and Objective: Limestone, primarily composed of calcium carbonate (CaCO_3), is widely used across industries such as cement, steel, sugar, glass, fertilizers, and chemicals. When rich in magnesium carbonate, it is termed dolomitic limestone. Following the MMDR Amendment Act 2015 and related rules, the Government of India directed state governments to accelerate mineral exploration. In response, Madhya Pradesh State Mining Corporation Ltd. (MPSMCL) proposed a G-4 level Reconnaissance Survey for limestone in the 25 sq. km Banki-Salaiya Block, Chhattarpur district. The proposal, recommended by the 58th TCC (Oct 30–31, 2023), was approved in the 32nd Executive Committee (EC) meeting of NMET on Dec 6, 2023. Formal approval was conveyed via NMET letter no. 23/406/2023-NMET/376 dated Dec 12, 2023, with a 9-month timeline. MPSMCL initiated geological mapping and sample collection in March 2024 and completed the work, along with related activities, by December 2024. The following are the objectives of proposed exploration:

- i. Geological mapping of the block on 1:12,500 scale.
- ii. Trenching/pitting to expose concealed limestone and analyze CaO , Fe_2O_3 , Al_2O_3 , SiO_2 , etc., at shallow depth.
- iii. Drilling of scout boreholes to trace limestone extension in gap areas and below ground.
- iv. Estimation of Reconnaissance Mineral Resources and grade as per UNFC and MEMC-2015.

Location: The exploration area lies near Bankigiroli and Salaiya villages in Bijawar Tehsil, Chhattarpur district, Madhya Pradesh, within Survey of India Toposheets 54P/10 and 54P/11. Out of 25 sq. km, 14.5 sq. km fall within the Panna Tiger Reserve Corridor, leaving 10.5 sq. km open for exploration. The region, covered by tropical dry deciduous forests, hosts diverse flora and fauna. Connectivity is good, with State Highway 43 linking nearby towns; Chhattarpur railway station (70 km) and Khajuraho railway station (47 km) provide rail access, while Jabalpur Airport (200 km) ensures wider connectivity.

Socio-Demographic conditions: As per Census 2011, Bijawar Tehsil records a sex ratio of 886 females per 1,000 males, higher than the district average but below the national level. Chhattarpur district has a literacy rate of 63.74%, marked by a gender gap (72.66% male vs. 53.59% female), highlighting educational challenges, especially for women. The population is largely rural and agriculture-based, with wheat, gram

(chickpeas), oilseeds (linseed, mustard), and vegetables as main crops. The economy remains predominantly agrarian with minimal industrialization.

Geology of the area: The block lies in the Proterozoic terrain of the Vindhyan Supergroup, comprising the Semri and Kaimur Groups. The Semri Group, forming the lower stratigraphy, features arenaceous-calcareous-argillaceous facies of sandstones, shales, and limestones. The block's geology is dominated by the Palkawan Shale Formation of the Semri Group, consisting of black shale interbedded with dolomites and chert breccias, grading upward into yellowish-green shale.

Litho- Structure unit: The formations in the area trend ENE–WSW with a gentle southerly dip of 8°–10°. Both the underlying Black Shale and overlying Olive Shale around the dolomite show similar dips toward the southeast. Geological knowledge of the Vindhyan region has evolved over two centuries, progressing from broad stratigraphic classification to detailed mapping, mineralogical studies, and resource investigations. Of 11 previous explorations, none targeted limestone, underscoring the need for focused studies.

Geological mapping, Sampling & Pitting: Detailed geological mapping was carried out across the block, resulting in the collection of a total of 41 surface and outcrop samples. In total, 10 outcrop samples and 6 pit samples were subjected to wet chemical analysis for five key radicals: CaO, MgO, Al₂O₃, SiO₂, and Fe₂O₃.

Analytical results : Chemical analysis shows the deposits are mainly dolomitic, with CaO ranging from 30–37.7%, MgO 8–20%, and SiO₂ up to 10%. This composition suits industrial-grade dolomite applications but not cement-grade limestone, which requires CaO >44% and MgO <3%. The consistently low CaO and high MgO make the samples unsuitable for cement manufacturing.

Conclusion and Recommendation: Considering the combined CaO and MgO grades obtained from the BRS and pit samples of the block, which mostly ranges between 45-52%, it is recommended to



further explore the block to establish a more defined database. So, to fully assess the potential of the Banki-Salaiya block, further exploration should focus on some scout drilling to define the depth and extent of the dolomite deposits. Additional geochemical analysis should be conducted to better understand the variability in chemical composition across the block.

CHAPTER-I

INTRODUCTION

1.1.0 General

Limestone, a sedimentary rock predominantly composed of calcium carbonate (CaCO_3), is extensively utilized across various industries. When it contains significant amounts of magnesium carbonate, it is referred to as dolomitic limestone. Lime, produced through the calcination of limestone, is essential in numerous industrial applications, including cement production, iron and steel manufacturing, and various chemical processes. Additionally, limestone is employed in the sugar, glass, and fertilizer industries.

India possesses substantial limestone resources, ranking second globally after China in annual cement production capacity. As of April 1, 2022, the total resources of limestone in India were estimated at approximately 210,000 million tonnes, with 18,000 million tonnes categorized as reserves and the remaining resources distributed across various grades (*Indian Mineral Yearbook 2022*). Major limestone-bearing states include Karnataka (28%), Andhra Pradesh (20%), Rajasthan (12%), and Gujarat (11%). Cement-grade limestone constitutes the largest share of resources at 69%, followed by SMS and BF grades at 12%, and chemical-grade limestone at 3%. The demand for high-grade limestone, particularly SMS and BF grades, has been rising due to increased steel production, prompting efforts to locate these grades alongside cement-grade limestone to reduce import dependency.

In the fiscal year 2021-22, India produced approximately 393 million tonnes of limestone, marking a 12.5% increase from the previous year (*Indian Mineral Yearbook 2022*). Of this, 97% was cement-grade limestone, with the remainder comprising iron and steel grades and chemical grades. Cement remains the largest consumer of limestone, accounting for 93% of total consumption, followed by iron and steel industries (4%) and chemical industries (1%). Rajasthan was the leading producer, contributing 22.32% of total production, followed by Andhra Pradesh (12.80%), Madhya Pradesh (12.77%), and Chhattisgarh (10.66%) (*Indian Mineral Yearbook 2022*).

Trade in limestone remains significant, with imports increasing to 23.45 million tonnes in 2021-22, primarily sourced from the UAE (72%) and Oman (18%) (*Indian Mineral Yearbook 2022*). Exports, mainly to Bangladesh, stood at 3.5 million tonnes during the same period (*Indian Mineral Yearbook 2022*). To meet growing domestic demand, especially with the rising demand for cement and steel industries, India continues to focus on expanding limestone exploration and production.

1.2.0 Background

On enactment of MMDR Amendment Act 2015, Mineral (Evidence of Mineral Contents) Rule 2015 and Mineral Auction Rule 2015, Govt. of India directed State Governments to speed up exploration work for different Mineral Commodities in their respective states.

Accordingly, the Madhya Pradesh State Mining Corporation Ltd. (MPSMCL) has prepared a proposal for a G-4 level exploration aimed at conducting a Reconnaissance Survey for limestone in the Banki-Salaiya Block, situated in the Chhattarpur district of Madhya Pradesh. The proposed survey covers an area of 25 square kilometers.

This proposal was reviewed and subsequently approved by the Executive Committee (EC) of the National Mineral Exploration Trust (NMET) during their 32nd meeting, which was held on December 6, 2023. The approval was granted based on the recommendation of the Technical-cum-Cost Committee (TCC) of NMET.

Madhya Pradesh State Mining Corporation Ltd. (MPSMC Ltd.) has been entrusted with the execution of this exploration project, as per the approved plan.

CHAPTER-II

DETAILS OF THE QUALIFIED PERSON(S) / EXPLORATION AGENCY

- (a) **Name of the Qualified Person:** Sunil Kumar Pandey
- (b) **Name of the Exploration Agency:** MADHYA PRADESH STATE MINING CORPORATION LIMITED
- (c) **Address:** Paryawas Bhawan
Block 'A', 2 nd floor, Jail Road,
Arera Hills,
Bhopal, Madhya Pradesh
Pin Code- 46207
- (d) **Contact Number:** 07552763341
- (e) **E-mail ID** : info.mpsmc@mp.gov.in
- (f) **Qualification** : M.Sc. Geology
- (g) **Experience** : 63 years for the organization
5 years as for the QP as Field Geologist
- (h) **Affiliation** : Madhya Pradesh State Mining Corporation Limited,
Notified Exploration Agency

CHAPTER-III

TITLE AND OWNERSHIP

(a) **Title:** "GEOLOGICAL REPORT ON REGIONAL EXPLORATION (G-4 STAGE) FOR LIMESTONE IN BANKI-SALIYA BLOCK, DISTRICT-CHATTARPUR, MADHYA PRADESH"

(b) **Name of the Owner:** Madhya Pradesh State Government, (Director) Directorate of Geology and Mining

(c) **Address:** 29-A, Khanij Bhavan,
Area Hills, Bhopal
Madhya Pradesh
Pin code: 462027

(d) **Contact Number:** 07552551795

(e) **Email ID:** dirgeomn@nic.in

(f) **Details about period of prospecting:**

The Regional Exploration Survey for Limestone in Banki-Saliya block, Madhya Pradesh was recommended in 58th TCC held on 30-31 October, 2023 and was subsequently approved in 32nd EC on 06.12.2023. MPSMCL has received approval from the 32nd Executive Committee of NMET through letter no. 23/406/2023-NMET/376, dated 12th December 2023, with the designated time duration of 09 months. MPSMCL commenced geological mapping and sample collection work in the month of March-2024 and completed in December 2024 along with other activities.

CHAPTER-IV

DETAILS OF THE AREA

4.1.0 Location and Communication

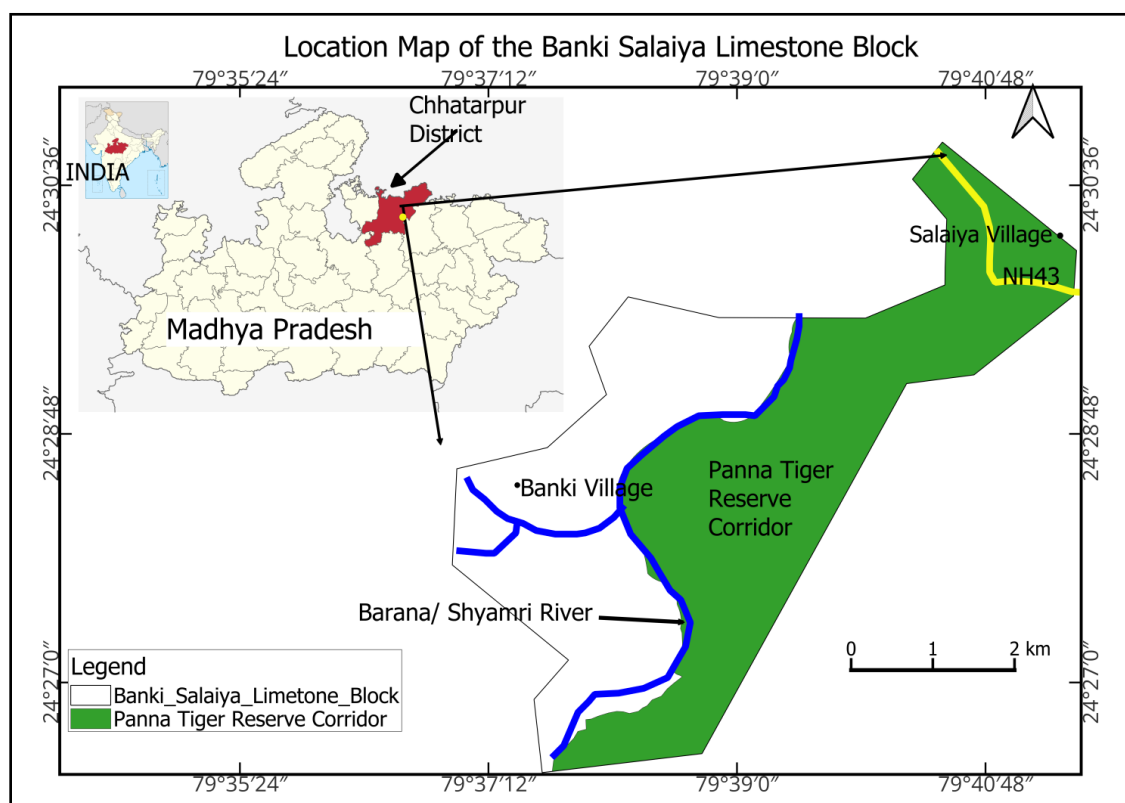
The area near Bankigiroli and Salaiya villages in Bijawar Tehsil, Chhattarpur district, Madhya Pradesh, is situated within the administrative jurisdiction of Bijawar Tehsil and Chhattarpur District. The local governance is carried out by Gram Panchayats bodies, with public services such as healthcare, law enforcement, and education managed at the district and tehsil levels. The described area is located within the boundaries of the Survey of India Toposheets Nos. 54P/10 and 54P/11. This region encompasses a total area of 25 square kilometers.

Table-4.1: Coordinates of the boundary pillar points of the Banki Salaiya area

| Sl No | Longitude | Latitude |
|-------|--------------------|--------------------|
| BP-1 | 79° 40" 43.000 " E | 24° 29' 13.615 " N |
| BP-2 | 79° 41" 26.261 " E | 24° 29' 47.911 " N |
| BP-3 | 79° 41" 27.874 " E | 24° 30" 7.255 " N |
| BP-4 | 79° 40" 28.272 " E | 24° 30" 55.249 " N |
| BP-5 | 79° 40" 16.605 " E | 24° 30" 38.229 " N |
| BP-6 | 79° 40" 30.678 " E | 24° 30" 24.359 " N |
| BP-7 | 79° 40" 30.382 " E | 24° 29' 52.684 " N |
| BP-8 | 79° 39" 55.875 " E | 24° 29' 38.307 " N |
| BP-9 | 79° 38" 52.194 " E | 24° 29' 38.500 " N |
| BP-10 | 79° 38" 12.705 " E | 24° 29' 47.502 " N |
| BP-11 | 79° 37" 55.731 " E | 24° 29' 26.060 " N |
| BP-12 | 79° 38" 3.281 " E | 24° 29' 5.053 " N |
| BP-13 | 79° 37" 37.552 " E | 24° 28" 42.019 " N |
| BP-14 | 79° 36" 58.251 " E | 24° 28" 32.848 " N |
| BP-15 | 79° 36" 56.301 " E | 24° 27" 51.022 " N |
| BP-16 | 79° 37" 46.779 " E | 24° 27" 9.727 " N |

| | | |
|-------|--------------------|--------------------|
| BP-17 | 79° 37" 31.794 " E | 24° 26" 52.636 " N |
| BP-18 | 79° 37" 35.343 " E | 24° 26" 20.834 " N |
| BP-19 | 79° 38" 44.804 " E | 24° 26" 29.072 " N |
| BP-20 | 79° 40" 13.736 " E | 24° 29' 9.843 " N |

Of the total area, 14.5 square kilometers fall under the Panna Tiger Reserve Corridor, a protected zone where exploration activities are strictly prohibited due to conservation regulations. Consequently, only 10.5 square kilometers of the area remain available for permissible exploration and related activities.



Text Figure -4.1: Location Map of Banki Salaiya Limestone Block. Dist.- Chhatarpur (Madhyapradesh)

CHAPTER-V

PHYSIOGRAPHY AND ENVIRONMENT

5.1.0 Physiography and Drainage

The block area spans 25 square kilometers, characterized by a diverse topography that includes both hills and valleys. The central portion of the block is marked by a valley that is primarily traversed by the Baran River and its tributaries, which flow in a southwest to northeast direction. The Baran River, a perennial watercourse, serves as the major drainage feature of the region. It is a tributary of the Ken River, which in turn is part of the Ganga drainage basin. The river plays a crucial role in shaping the landscape and hydrology of the area.

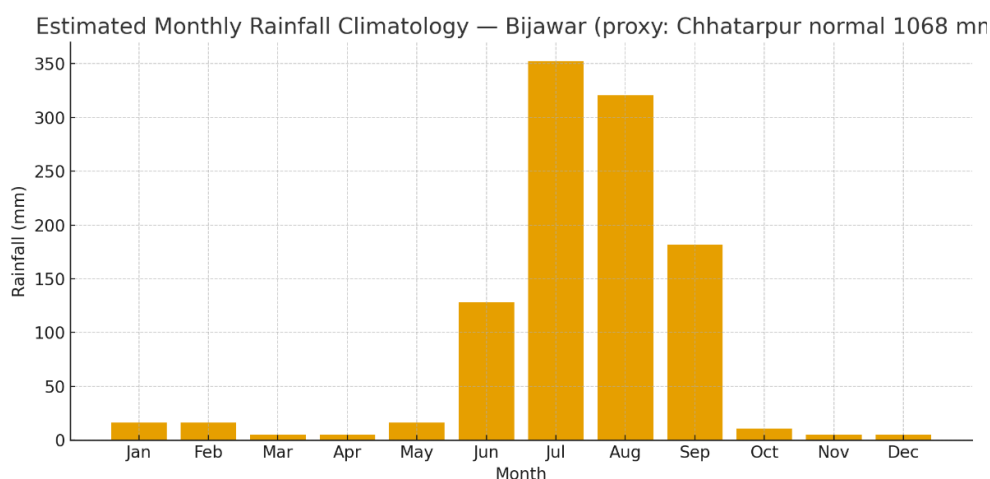
The peripheral boundaries of the block are defined by linear hills that encircle the area, stretching from the southeast to the northwest and southwest directions. These hills contribute to the distinct geographical separation of the block from surrounding regions. The area is further drained by several smaller streams, or "nala," that feed into the Barana River. A notable nala originates from the northwest near the Bankigiroli village, flowing toward the Barana River to join it. In the northern part of the block, another nala flows from the southeast near Salaiya village, ultimately meeting the Baran River as well.

The drainage pattern of the block " exhibits a dendritic structure, which is indicative of a relatively uniform underlying geology that facilitates the branching out of tributary streams. This pattern, which resembles the structure of a tree with its branching streams, plays an important role in the region's hydrological dynamics. Overall, the combination of the river systems, topographical features, and drainage patterns provides a comprehensive view of the block's environmental characteristics.

5.2.0 Climate

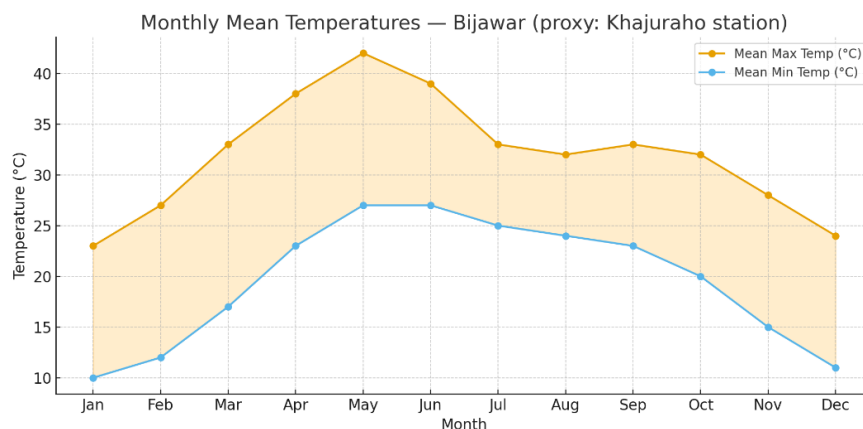
The area experiences a tropical climate with distinct summer, monsoon, and winter seasons. Summers, from March to June, are hot and dry, with temperatures ranging between 30°C and 45°C, peaking in May. The

monsoon season, from July to September, brings relief with moderate to heavy rainfall, averaging 800 to 1000 mm annually, though occasional heavy rains may cause localized flooding. Winters, spanning November to February, are mild and pleasant, with temperatures ranging from 8°C to 25°C, making it the most favorable season for outdoor activities. The district's semi-arid climate sees significant seasonal variations, with agriculture and water resources heavily dependent on the monsoon rains.



Text Figure -5.1: Graphical representation of Monthly rainfall in Bijawar area, Dist.- Chhatarpur (Madhyapradesh)

Source: India Meteorological Department (IMD) district rainfall normal for **Chhatarpur** (annual normal \approx 1068 mm, \sim 90% from June–September)



Text Figure -5.2: Graphical representation of Monthly mean temperature in Bijawar area, Dist.- Chhatarpur (Madhyapradesh)

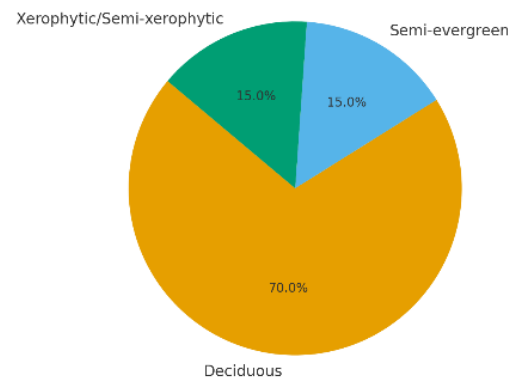
Source: Khajuraho IMD station climatology (nearest long-term station to Bijawar tehsil), reporting mean monthly max/min values (Jan ~23/10 °C; May ~42/27 °C).

5.3.0 Flora & Fauna

The area is classified under tropical dry deciduous forests, featuring a rich diversity of flora and fauna. Vegetation includes a mix of deciduous, evergreen, semi-evergreen, and xerophytic to semi-xerophytic species. Common plant species include Bahera, Tendu, Jamun, Dhaora, Mahua, Teak, Rohan, Palas, Khair, Lendra, Kurlu, Papro, Ghont, Aonia, Achar, Ber, Bel, Kaintha, Karonda, Bilsena, and Maker.

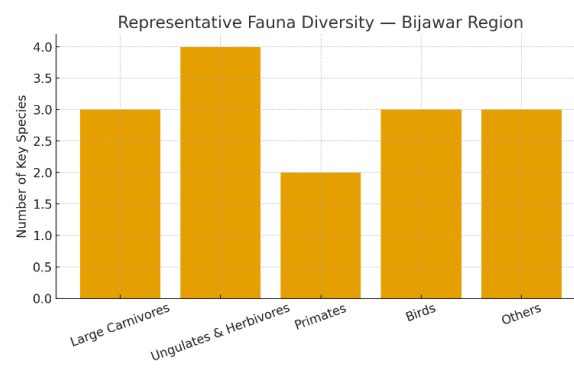
The fauna in the region is equally diverse, including large predators like tigers (*Panthera tigris*), panthers (*Panthera pardus*), and leopards (*Panthera bengalensis*). Other mammals include jungle cats (*Felis chaus*), wild dogs (*Cuon alpinus*), Indian bears (*Melursus ursinus*), sambars (*Rusa unicolor*), nilgai, four-horned antelopes (*Tetracerus quadricornis*), monkeys (*Macaca mulatta*), and langurs (*Semnopithecus entellus*). Birdlife is abundant, with various types of pigeons and peacocks being particularly common.

Vegetation Composition — Bijawar (Tropical Dry Deciduous Zone)



Text Figure -5.3: Graphical representation of Vegetation Composition in Bijawar area, Dist.- Chhatarpur (Madhyapradesh)

Source: Madhya Pradesh forest type distribution — tropical dry deciduous forests cover ~88.65% of MP's forest area (Testbook, MP Forest Dept., vegetation classification)



Text Figure -5.4: Graphical representation of Fauna Diversity in Bijawar area, Dist.- Chhatarpur (Madhyapradesh)

Source: Verified species presence from *Flora & Fauna of Madhya Pradesh* (incl. Panna Tiger Reserve and Bundelkhand dry deciduous zone).

CHAPTER-VI

INFRASTRUCTURE AND ENVIRONMENT

6.1.0 Connectivity and Communication

Connectivity to this region is good, with State Highway 43 providing a direct link to surrounding towns. The Chhattarpur Railway Station, about 70 km away, connects the area to regional and national rail networks, linking it to cities like Jhansi and Bhopal. The nearest Khajuraho railway station (approximately 47 km away) , Jabalpur Airport (roughly 200 km away) is the nearby airport caters to broader connectivity options.

Telecommunication services are well-established, with good mobile network coverage from leading telecom providers ensuring reliable communication. Additionally, internet services are available, though speeds may vary across rural areas.

6.2.0 Nearby Mines

There is one mine near to the western boundary of the block. The details are as under:-

Table-6.1: Mine details near the Banki Salaiya area

| Sl No | Mine Owner | Village/ Tehsil | Mineral | Area (Hect) | District |
|-------|--------------------------|------------------|----------------------|-------------|----------|
| 1 | M/S Sharda Mineral Works | Chauraiya/ Hatta | Limestone & Antimony | 48.69 | Damoh |

6.3.0 Demographic Profile

According to the Census of India (2011), Bijawar Tehsil has a sex ratio of approximately 886 females per 1,000 males, which is slightly higher than the district average but below the national average. The overall literacy rate for Chhattarpur district is 63.74%, with a significant gender gap (72.66% for males vs. 53.59% for females). This indicates substantial educational challenges, particularly for women. The population is predominantly rural and relies heavily on agriculture for its livelihood.

6.4.0 Economic Structure and Livelihood

Agriculture is the economic mainstay of the region. The primary crops include wheat, gram (chickpeas), oilseeds like alsin (linseed) and mustard, and various vegetables. The economy is primarily agrarian with limited industrialization.

The district is classified as backward and is one of the 24 districts in Madhya Pradesh receiving funds from the Backward Regions Grant Fund Programme (BRGF). This classification is a key indicator of the area's socio-economic status, highlighting its need for developmental support.

While large-scale industry is scarce, the district is rich in granite resources, and several granite mining and processing industries operate there, providing some local employment opportunities. The per capita income in the district remains low compared to state and national averages.

CHAPTER-VII

GENERAL GEOLOGY

7.1.0 Regional Geology of the Area

The block lies within the Proterozoic Terrain of the Vindhyan Supergroup, comprising the Semri Group and Kaimur Group. These geological units are essential for understanding mineralization in the area. The Semri Group, representing the lower stratigraphic units of the Vindhyan Supergroup, is characterized by an arenaceous-calcareous-argillaceous facies, including sandstones, shales, and limestones. Among these, the arenaceous and argillaceous formations are most persistent, while calcareous rocks occur as discontinuous lenses within the shales, pinching and swelling laterally. Notably, the Palkawan Formation, as described by earlier researchers like G. Mani (1971), consists of porcellanite with black carbonaceous shale at the base, dolomitic limestone with chert breccias, and Imlichouk Shale (yellow-green shale). However, these have been classified as members of the Palkawan Shale Formation in the present area due to their localized and inconsistent nature.

The overlying Kaimur Group is predominantly rudaceous-arenaceous in composition, consisting of sandstones, shales, and conglomerates. The conglomerates, which occur near the base of the group, exhibit lateral variations in thickness, pinching and swelling across the area. This group is significant for its sedimentological features and previous studies conducted in this area have highlighted the potential for hosting secondary mineral like Manganese. The interplay between the Semri and Kaimur Groups, their structural settings, and associated lithologies forms the basis for mineral exploration in the block. A detailed understanding of these geological units is crucial for identifying mineralization zones and assessing their economic potential.

7.2.0 Stratigraphy of the Vindhyan System in the Area

The Vindhyan System of rocks represents one of the most significant geological successions in central India, characterized by its thickness, persistence, and diversity of lithological units. In the studied area, the sequence commences with the Dulchipur Sandstone and terminates with the Karauli Quartzite, passing through several transitional horizons. Each unit provides valuable insights into sedimentary processes, tectonic activity, and mineralization during deposition.

| VINDHYAN SUPERGROUP (Meso-Neoproterozoic) | |
|--|---|
| Bhander Group (1300-1500 m) | |
| Maihar Sandstone | Upper Bhander Sst. |
| Sirbu Shale | |
| Bundi Hill Sandstone | Lower Bhander Sst. |
| Lakheri Limestone | Bhander Lst., Nagod Lst. |
| Ganurgarh Shale | Sirnawal Shale |
| -----Unconformity/Gradational contact----- | |
| Rewa Group (100-300 m) | |
| Govindgarh Sandstone | Upper Rewa Sst. |
| Drummondganj Sandstone | |
| Jhiri Shale | Variegated Shale |
| Asan Sandstone | Upper Rewa Sst. |
| Panna Shale | |
| -----Normal contact/Facies change----- | |
| Kaimur Group (400 m) | |
| Dhandraul Quartzite | Upper Kaimur Sst. |
| Mangesar Formation | Scarp Sandstone |
| Bijagarh Shale | |
| Markundi Sandstone | Ghaghar Sandstone |
| Ghurma Shale | Susnai Breccia |
| Sasaram Sandstone | Lower Kaimur Sst. |
| -----Unconformity/Normal contact----- | |
| Semri Group (3000-4000 m) | |
| Suket Shale | Baghwar Shale |
| Rohtas Limestone | Nimbahera Lst. |
| Chorhat Sandstone | Glauconitic bed, Rampur Sst., Basuhari Sst. |
| Bargawan Limestone | Salkhan Lst., Fawn Lst., Chorhat Lst. |
| Kheinjua Shale | Olive Shale, Binota Shale, Koladha Shale |
| Chopan Porcellanite | Deonar Porcellanite |
| Kajrahat Limestone | Kuteshwar Lst., Tirohan Lst. |
| Arangi Shale | |
| Deoland Sandstone | Khardeola Sst., Pandwalfal Sst. |
| -----Angular Unconformity/Non-conformity----- | |
| Gneisses and supracrustals | |

Table-7.1: Regional Stratigraphy of the area

7.2.1 Dulchipur Sandstone

The Dulchipur Sandstone constitutes the lowermost bed of the Vindhyan System in the region, resting unconformably upon the older Bijawar Group. This sandstone is thickly bedded, massive, and locally cross-bedded, indicating active depositional environments with strong current action. It is greyish white to white, medium to fine-grained, and occasionally glauconitic and calcareous, particularly south of Dilari. These features suggest a shallow marine or deltaic depositional environment with intermittent chemical precipitation.

7.2.2 Baragaon Dolomite

Overlying the basal sandstone is the Baragaon Dolomite, a relatively thin (less than three metres) bed of greyish yellow, fine-grained, argillaceous dolomite. It occurs prominently in the Bhonrkhoa–Imlichauk–Baragaon–Amarpura belt. Microscopically, it is dominated by altered calcite with accessory quartz, chlorite, and magnetite. Thin calcite veins indicate diagenetic processes. Its argillaceous character suggests deposition in a calm, restricted marine setting with limited circulation.

7.2.3 Palkua Shale / Porcellanite

Above the dolomite lies the Palkua Shale–Porcellanite sequence, representing a marked lithological change. The black carbonaceous shale forms the base, overlain gradationally by porcellanite. The shale is thinly bedded, closely jointed, and often pyrite-bearing, especially between Dilari and Shabgarh. The overlying porcellanite is dark to greyish black, reflecting silicification of fine sediments. The shale typically fills valleys, while porcellanite occurs on higher ground. Thickness varies from a few to ten metres. This unit indicates reducing conditions during shale deposition, followed by silica enrichment.

7.2.4 Tirohan Limestone / Dolomite

The Tirohan Limestone, light to dark grey and highly siliceous, overlies the Palkua sequence. It is thinly bedded at the base but becomes massive, brecciated, and dolomitic higher up. Faulting has disrupted its continuity, with brecciated beds common between Raichor and Chauraiya. In Chauraiya, the dolomite carries galena, and exploratory pitting was carried out by the State Department of Geology and Mining (1970–71). Mineralogically, it comprises calcite with minor quartz. The brecciation points to tectonic disturbances post-deposition, while galena mineralization indicates hydrothermal activity.

7.2.5 Imlichauk Shale

Described as Kaimur Shale by earlier workers, the Imlichauk Shale overlies the Tirohan Dolomite and forms the topmost bed of the Semri Group. This yellowish green, soft, and brittle shale is generally 8–10 metres thick but is impersistent in the western region. Its position beneath the Pipartola Conglomerate supports its inclusion in the Semri succession. Its softness and coloration suggest deposition in a low-energy environment with clay dominance.

7.2.6 Pipartola Conglomerate

The Pipartola Conglomerate represents a major lithological break, forming the basal bed of the Kaimur Group. It directly overlies the Imlichauk Shale or, in its absence, the Tirohan Dolomite. This conglomerate comprises subangular to rounded pebbles of red jasper, quartzite, sandstone, chert, porcellanite, and haematite, set in a siliceous matrix. Its wide distribution along strike and polymict composition indicate deposition under strong current regimes on an uneven, eroded surface, marking a significant stratigraphic unconformity.

7.2.7 Dhandraul Quartzite

Above the conglomerate lies the Dhandraul Quartzite, which forms vast stretches of the Kaimur tableland. The rock is white to pink, fine-grained, thickly bedded, with well-developed cross-bedding and ripple marks, including oscillation and interference ripples. These sedimentary structures clearly point to shallow-water, high-energy conditions such as beach or tidal environments.

7.2.8 Jhiri Shale

The Rewa Group begins with the Jhiri Shale, a green to chocolate brown, compact but weathering-soft shale. Intercalated with thin sandstone and siltstone beds, its basal portion contains discontinuous conglomerate lenses, often resting directly on eroded Dhandraul Quartzite. This discontinuity suggests localized erosion before deposition. The Jhiri Shale represents quieter depositional phases in contrast to the energy conditions of underlying quartzite.

7.2.9 Karauli Quartzite

Capping the sequence is the Karauli Quartzite, the uppermost Vindhyan unit in the region. Exposed south of Kishangarh, this quartzite is greyish white to pale pink, medium to fine-grained, and prominently cross-bedded. Its thickness varies between two to eight metres. The cross-bedding and fine grain size indicate deposition under strong current action in shallow water, consistent with regressive sedimentary conditions.

7.3.0 Geology of the Block

The geology of the block area is primarily composed of the Palkawan Shale Formation of the Semri Group, which occupies the valley region at the base. This formation consists of black shale interbedded with dolomites containing chert breccias, transitioning into yellowish-green shale in its upper portions.

The Pipartola Conglomerate and the Dhandraul Quartzite of Kaimur group, overlies the Semri group. These formations occupy the hilly portions along the borders of the area. The Pipartola Conglomerate is characterized by conglomerates interbedded with grit and coarse ferruginous sandstone, showcasing distinct sedimentological features. In contrast, the Dhandraul Quartzite is composed of thickly bedded quartzite, ranging in color from dirty white to pure white. Together, these formations define the stratigraphic and lithological framework of the block area.

Table-7.2: The local stratigraphy observed in Banki-Saliaya Area.

| | | | |
|---------------------|--------------|--------------------------|--|
| Vindhyan Supergroup | Kaimur Group | Baghain Quartzite | Dirty white to pure white, thickly bedded quartzite. |
| | | Pipartola Conglomerate | Conglomerate with interbeds of grit and coarse ferruginous sandstone. |
| | Semri Group | Palkawan Shale Formation | Black Shale with interbeds of Dolomites with Chert breccias and yellowish green Shale in its top portions. |

7.4.0 Description of different Formations:

7.4.1 Palkawan Shale with dolomites and associated chert breccias : 'This is the most prominent and persistent Formation in the area and has three Members

(a) **The Black Shale Member:** it forms a few meters of the lowermost part of the Formation and occupy the area in Barna river bed and in western side of Bankigiroli Village. It is fissile and closely jointed so that it easily breaks into polygonal slabs. Paper thin partings are very well developed in this rock. The shales show a general dip varying from 6° to 10° towards southeast. The rock is greyish black, fine-grained shale.

(b) **Porcellanites :** The black carbonaceous shale is overlain by greyish, cream coloured and dull yellow porcellanite, highly siliceous shale that breaks with conchoidal fracture. It occurs in the eastern bank of Barana river and its Channelbed at some places. The Porcellanites along with black shale show anticlines and synclines in the lower portions on the Channel bed of Barana river, which is around 3 km east of Bankigiroli Village. These folds do not exceed 50 cm x 2m and have the axis trending NE-SW. But the formation overlying and underlying are almost horizontal. It appears that these folds might have been due to penecontemporaneous deformation.

7.4.2 Dolomite discontinuous lensoidal bodies with Chert Breccia: These lenses occur within the shale body. The best development of dolomites has been noticed in the area between south east of Bankigiroli and Barana river . Dolomites are generally of two colours, brownish yellow to dark brown, and greyish with chert bands. Grey dolomite occurs over a large part of the area and is associated with bands of chert at the top. Elephant skin weathering is common.

Chert breccia occurs towards the top of the dolomite bodies with thickness range between 3 to 10 meters. It is smoky grey and dirty white in colour. It shows primary brecciation. It occurs at the contact of the Palkawan Shale Formation with the Pipartola Conglomerate. The brecciation is restricted to the chert bands; the dolomite bands even when alternating with brecciated chert band do not show any brecciation.

7.4.3 Pipartola Conglomerate generally rests on the yellowish-green shale member of the Palkawan Formation. However, where yellowish green shale is absent it rests directly on the dolomites. It is in contact with the overlying Dhandhrol Quartzite. It occurs as a number of bands ranging from boulder conglomerate at the base to grit at the top separated by thin bands of coarse ferruginous sandstone and yellowish-green siltstone. In general the rock is composed of sub angular to sub rounded of a few mm to 10 mm diameter. In its upper part, the formation contains abundant jasper pebbles, while the lower sections are predominantly composed of quartzite and vein quartz pebbles, along with pebbles of sandstone and porcellanite.

7.4.4 Baghain Quartzite: Overlying the Pipartola Conglomerate this formation is persistent throughout the area mapped. This is thickly bedded in its lower parts and thinly in upper parts. This quartzite is white to purple in color, medium to fine grained, massive and compact.

7.5.0 Litho-Structure of the Block

Broadly, the formations in the area trend ENE-WSW, with a gentle southerly dip ranging from 8° to 10°. The Black Shale, which underlies the dolomite, and the Olive Shale, which overlies the dolomite, both exhibit dips of 8° to 10° towards the southeast direction.

Rectilinear joints are commonly observed in the Black Shale exposed along the channel bed of the Barana River.

CHAPTER-VIII

PREVIOUS WORK

The geological understanding of the Vindhyan region has developed gradually through the pioneering efforts of several scholars and geologists over nearly two centuries. The first reference to the Vindhyan area was made by Captain Dangerfield in 1823, followed by contributions from Capt. Franklin (1828), Dr. Jaequemont (1941), and Dr. T. Oldham (1956). Dr. Oldham was the first to propose the name “Vindhyan” for the entire formation, dividing it into three major groups: Bundair Sandstone and Shales (with limestone), Rewah Sandstone and Shales, and Kymore Sandstone and grits or Shales.

H.B. Medlicott (1860) further refined this classification by identifying a new series underlying the Kymore groups, which he termed the “Semri Series.” His observations were based on the strong lithological resemblance between these beds and similar occurrences in the Sone Valley.

Mallet (1869) advanced this classification by subdividing the Vindhyan into Lower and Upper divisions, incorporating the Semri Series into the Lower group. W.L. Wilson (1873–1877) conducted detailed mapping of the region, although his reports are unfortunately not preserved. Despite these limitations, these early efforts laid the foundation for systematic geological investigations of the Vindhyan range.

The Bundelkhand Vindhyan, in particular, became a subject of further study between 1873–1877, when W.C. Willson undertook the first mapping efforts. Although his maps remain a significant source of information, his original reports are unavailable. In 1958, S.M. Mathur reviewed geological

studies up to 1956, emphasizing the Panna Diamond Deposits, thereby bringing attention to the economic potential of the region.

From 1969 to 1971, S.R. Srivastava and H.H. Khan mapped the Vindhyan east of Panna to Kohari, identifying sulphur mineralization in the chert breccia and limestone of the Semri Group. Concurrently, Seva Dass and S.A.H. Jaffry of the Geological Survey of India (GSI) mapped the Vindhyan area west of Panna to Ganjau. G. Mani of GSI also contributed by mapping the Bijawars and Lower Vindhyan in northern and northwestern Bundelkhand. During the same period, the Directorate of Geology and Mining, Government of Madhya Pradesh, initiated investigations into Galena occurrences in the Chourai area (1969–1970).

Between 1971 and 1972, systematic mapping was extended further by Seva Dass and Ajit Kumar of GSI, who reported the presence of Galena and Sphalerite within dolomites of the Semri Group in the Jhinjhi Chowk area. These findings enriched the collective understanding of the region's complex geological framework and resource potential.

In summary, the geological work on the Vindhyan region reflects a cumulative progression of knowledge beginning with broad stratigraphic classifications, gradually advancing toward detailed mapping, mineralogical studies, and economic resource investigations. Notably, out of 11 explorations previously conducted, none specifically focused on limestone, highlighting the need for further dedicated exploration in this direction.

**Table-8.1:** Previous exploration work done in and near to Banki-Saliaya Area.

| Sr | Organization | Accession No | Report Title | Author | Mission | Theme | Toposheet Numbers | From | To |
|----|--------------|--------------|---|------------------------------|---|-------------------------------|--|------|------|
| 1 | GSI | CR-014841 | An Interim Report On Assessment Of Phosphorite Occurrences In Bijawar Group, District Sagar & Chhatarpur, Mp. | Arun Sonakia, Binod Kumar | Mineral Assessment-Stra | Fertiliser Mineral | 54P03, 54P06, 54P07, 54P10 | 1977 | 1982 |
| 2 | GSI | CR-013128 | Report On The Preliminary Investigation Of Base Metalmineralisation In Silon-Saliaya Pungawan Area, Chhatarpur Districts, Mp. | P.C. Mathur, Mohd. Iqbal | Mineral Assessment-Ferrous Group And Base Metal | Base Metal | 54P10, 54P14 | 1974 | 1975 |
| 3 | GSI | CR-008483 | Basemetal Mineralisation In Lower Vindhya In Chhatarpur & Damoh Districts, Mp. | M.K. Balasoopalan, M.K. Soni | Mineral Assessment-Ferrous Group & Base Metal | Base Metal | 54P07, 54P11, 54P10, 54P14 | 1972 | 1973 |
| 4 | GSI | CR-017555 | Report On Geological Mapping Around Bijawar And Barhi Areas In Sagar-Chhatarpur & Satna-Jabalpur Districts Respectively, Mp. | R.N. Galdar, R.N. Ghosh | Geological And Geophysical Mapping | Systematic Geological Mapping | 64A09, 64A10, 64A13, 54P14, 54P03, 54P06, 54P07, 54P10, 64E01, 54P02 | 1984 | 1985 |
| 5 | GSI | CR-006822 | Report On The Systematic Mapping And Investigation Of Base Metal Mineralisation In Chhatarpur, Sagar & Tikamganj Districts, Mp. | S. Mani | Geological And Geophysical Mapping | Systematic Geological Mapping | 54P11, 54P14, 54P15, 54P06, 54P07, 54P10 | 1971 | 1972 |
| 6 | GSI | CR-013073 | Report On The Distribution And Petrography Of The Bijawar Formation In The Kaneri Gangau-Amronia Section, Panna & Chhatarpur Districts, Mp. | R.N. Galdar, R.N. Ghosh | Geological And Geophysical Mapping | Systematic Geological Mapping | 54P14, 54P10 | 1976 | 1977 |



| | | | | | | | | | |
|----|-----|-----------|--|--------------------------------|------------------------------------|-------------------------------|---------------------|------|------|
| 7 | GSI | CR-013327 | A Report On The Distribution And Petrography Of The Bijawar Formation And A Mafic - Ultramafic Suite In The Bundelkhand Region, Chhatarpur District, Madhya Pradesh. | M.I. Ghosh | Geological And Geophysical Mapping | Systematic Geological Mapping | 54P06, 54P07, 54P10 | 1977 | 1978 |
| 8 | GSI | 22968 | Geochemical Mapping In Toposheets 54p/6 and 54p/10 In Chhatarpur & Tikamgarh Districts, Mp. | Ashok Kumar Saha, Suresh Kumar | Geochemical Survey | Geochemical Mapping | 54P/10 & 54P/6 | 2013 | 2014 |
| 9 | GSI | 22974 | Geochemical Mapping In Toposheet Nos. 54p/9, 54p/10 And 54p/13 In Chhatarpur Districts, Mp. | Chanuppathi Kongim, Deepu | Geochemical Survey | Geochemical Mapping | 54P09, 54P10, 54P13 | 2013 | 2014 |
| 10 | DGM | | Exploration for Galena | | | | | 1970 | 1971 |

CHAPTER-IX

EXPLORATION UNDERTAKEN DURING THE CURRENT INVESTIGATION

9.1.0 Objectives of Exploration

MPSMCL commenced geological mapping and sample collection work in the month of March-2024 and completed in December 2024 along with other activities.

The following are the objectives of proposed exploration:

- i. Geological mapping in the said block in 1:12500 scale.
- ii. To expose the concealed limestone and check the CaO, Fe₂O₃, Al₂O₃, SiO₂, etc content at shallow depth, trenching/pitting will be done.
- iii. To check the extension of limestone in the Gap area as well as below ground level, by drilling scout boreholes.
- iv. To estimate the Reconnaissance Mineral Resources and grade for limestone in the block as per UNFC and MEMC-2015.

9.2.0 Exploration Overview

The **Technical Committee of NMET**, considering the non-availability of prior exploration inputs, approved the **Banki-Salaiya block** for **G-4 level exploration**. This included geological mapping at a **1:12,500 scale** and the collection of surface samples.

During the course of regional exploration (G-4) the following quantum of work was carried out by MPSMCL as given in Table No. 9-1.

Table-9.1: Quantity of work done by MPSMCL in Banki-Salaiya Area.

| | Item of Work | Unit | Quantum | Achievement |
|---|--|-------------|----------------|--------------------|
| 1 | Geological Mapping on 1:12500 scale | Sq.Km. | 25 | 10.5 |
| 2 | Surface / Outcrop sampling | Nos. | 125 | 41 |
| 3 | Laboratory Studies | Nos | | |
| | For 5 radicals i.e. CaO, MgO, Al ₂ O ₃ , SiO ₂ , and Fe ₂ O ₃ | | | |
| | 1. Surface / Outcrop Samples + Check Samples | | 125 | 12 |
| | 2. Pits Samples + Check Samples | | 20 | 7 |
| 4 | Pit | Cu. m | 20 | 8 |
| 6 | Report Preparation (Digital format) | Nos. | 1 | 1 |

9.3.0 Limitations

As per the proposal, geological mapping of a 25 sq km area was planned, along with the collection of 125 surface samples and pitting over 20 sq. m. However, due to restrictions in the Panna Tiger Reserve Corridor,

which covers 14.5 sq km (approximately 60% of the block area), exploration activities were limited to the remaining 10.5 sq km. Consequently, geological mapping was carried out over this reduced area, with 47 surface samples collected and pitting completed over 8 sq km.

9.4.0 Acknowledgement

Madhya Pradesh State Mining Corporation Limited (MPSMCL) expresses its sincere gratitude to the Ministry of Mines, National Mineral Exploration Trust (NMET), Govt. of India, Geological Survey of India (GSI) and Directorate of Geology and Mining (DGM) Madhya Pradesh whose behest the exploration work in Banki- Salaiya Block has been executed. The local administration / authorities at Chhatarpur district, Madhya Pradesh also deserves a special mention with thanks for extending all necessary help and guidance in completing the exploration work successfully.



Photograph-9.1: Dolomite outcrop observed in field area



Photograph-9.2: Large scale Dolomite outcrop observed in field survey



Photograph-9.3: Field Observation of a massive dolomite outcrops



Photograph-9.4: Field Observation showing elephant skin weathering in Dolomitic outcrops



Photograph-9.5: Field Observation showing elephant skin weathering in Dolomitic outcrops near to Banki Nala



Photograph-9.6: Chert banded Dolomite exposure observed in the field area



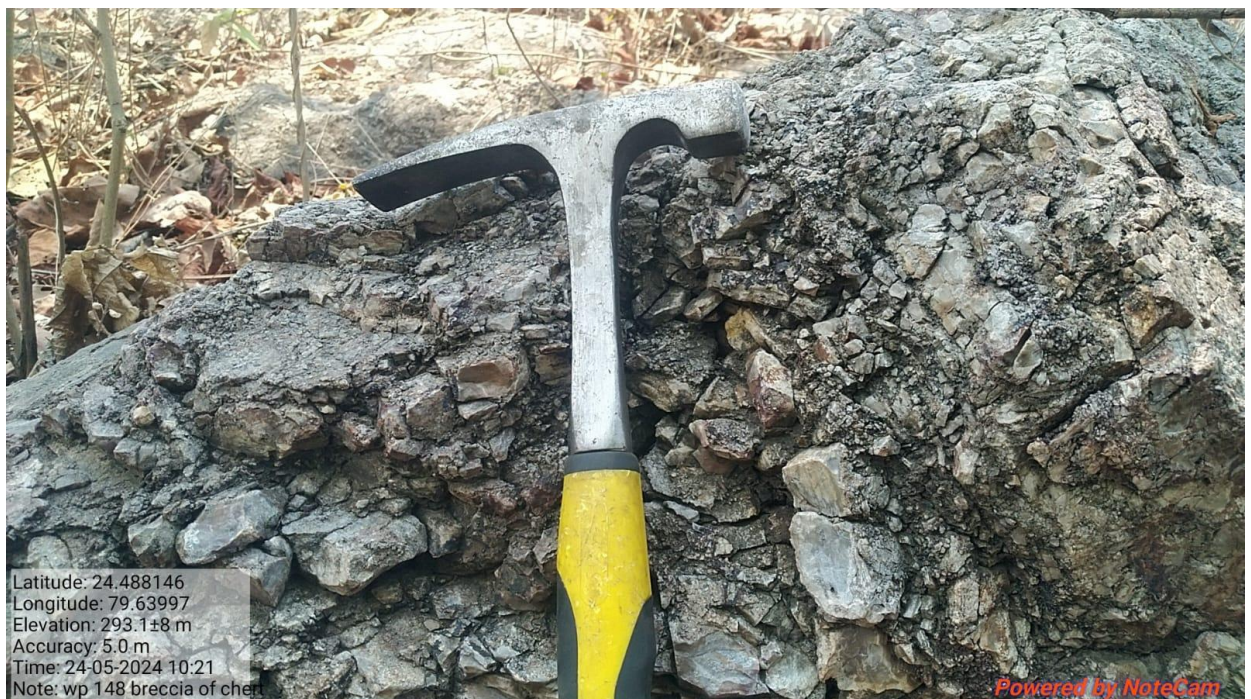
Photograph-9.7: Folding in Porcelanite bed exposed in the field area



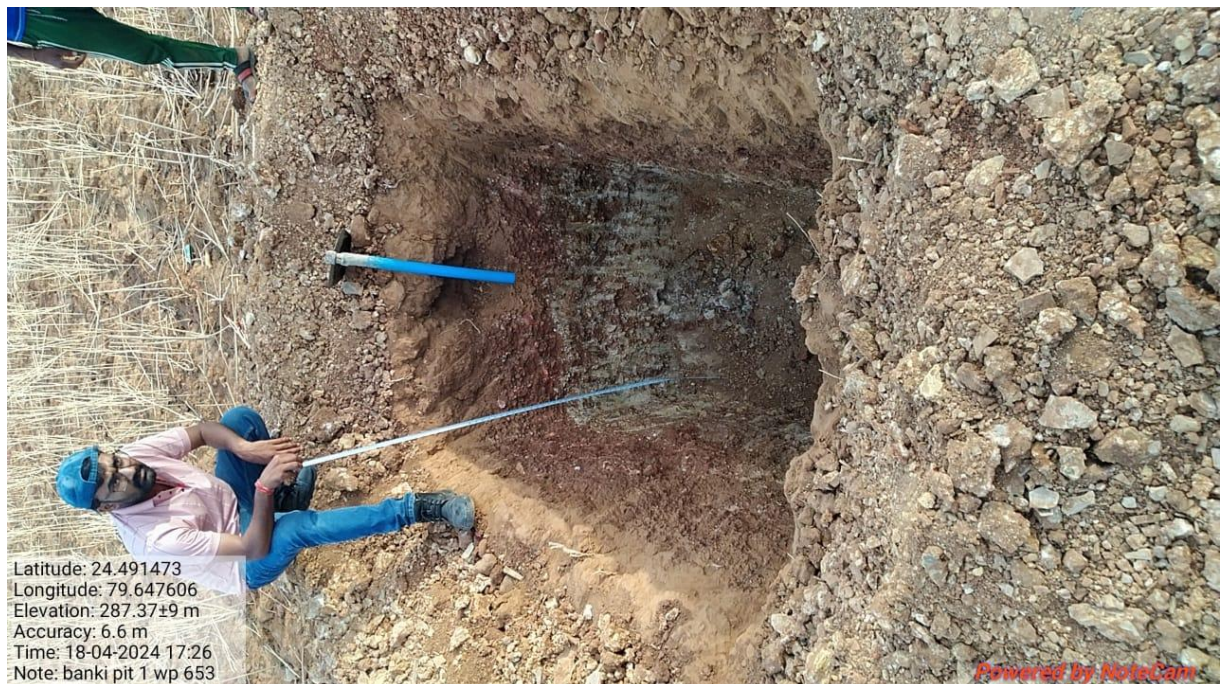
Photograph-9.8: Porcelenite bed exposure observed in the field area



Photograph-9.9: Porcelenite bedding exposure observed in the field area



Photograph-9.10: Conglomerate bed observed beneath the shale exposure.



Photograph-9.11: Pit Shows hard rock Exposer in the bottom.



Photograph-9.12: Pit showing soil and loose materiel .



Photograph-9.13: Pit Shows hard rock exposer at the bottom.



Photograph-9.14: Pit showing hard rock exposer along with water.

9.5.0 Scheme of Exploration

To achieve the objectives of **G-4 level exploration** in the **Banki-Salaiya block**, the following scheme of physical work was planned and executed:

9.6.0 Geological Mapping and Surface Sampling

Detailed geological mapping was undertaken on a scale of 1:12,500, covering an area of approximately 10.5 sq. km (excluding the PTR regions). The work was carried out through systematic traverses, guided and recorded with the aid of handheld GPS devices to ensure accuracy in positioning. The mapped block is predominantly blanketed by soil, alluvium, and forest cover, which restricts bedrock exposure. Nevertheless, wherever exposures of dolomite and other lithological units were available, they were carefully examined, documented, and plotted on the geological map.

All observable geological features, including lithological contacts, surface variations, and geomorphological expressions, were systematically recorded and represented on the final geological map. The dolomite in the area is highly weathered and exhibits karstic topography, which restricted the measurement of structural parameters such as dip and strike of the dolomite beds. However, fresh shale exposures encountered within the block provided reliable surfaces for recording rock attitudes, contributing to the structural understanding of the area.

Random representative outcrop samples were also collected during the course of mapping, from available exposures, to further support lithological characterization and laboratory analysis. The precise geographic coordinates of these outcrop sample locations have been documented for reference and validation. This integration of field observations, lithological sampling, and spatial mapping provides a comprehensive geological framework for evaluating the subsurface characteristics of the block.

9.7.0 Pitting Investigation

Pitting was carried out at four different locations to verify the subsurface occurrence and extent of dolomite within the demarcated area. Out of the four pits, dolomite was encountered in three, while the fourth pit revealed only soil and loose overburden material without any dolomite. Each pit was excavated to dimensions of 1 meter by 1 meter, with a depth of 2 meters. The locations for pitting were carefully selected based on the results of bedrock sample analysis and supported by geological mapping data. This combined approach ensured that the pits were positioned in geologically significant zones, thereby providing reliable information on the lateral and vertical continuity of the dolomite body. The presence of dolomite in three pits confirms its widespread subsurface distribution, while the absence in one pit indicates local variability, which is typical in heterogeneous geological formations.

9.8.0 Geophysical Survey

No geophysical survey was conducted in the Banki-Salaiya area, as basic mapping and pitting were sufficient at this stage to meet objectives while minimizing costs.

9.9.0 Drilling Activities

No drilling activities were carried out in the Banki-Salaiya area, as basic mapping and pitting were considered sufficient at this stage to achieve the objectives while reducing costs.

9.10.0 Laboratory Study/Chemical Analysis

A total of 10 surface/outcrop samples and 2 check samples were analyzed for five chemical radicals: **CaO**, **MgO**, **Al₂O₃**, **SiO₂**, **Fe₂O₃**, through wet chemical analysis. The analytical results are presented in **Annexure I & V**. Additionally, six samples collected

from three pits were analyzed for the same five radicals. The analysis have been carried out in BSS Lab Private Limited, First floor, 1338, Vijay Nagar, Kachnar city road , Jabalpur-482002 (M.P.) The laboratory employed standard procedures in accordance with IS:1760 to determine the chemical composition of the samples. Parameters analyzed included silica (SiO_2), calcium oxide (CaO), magnesium oxide (MgO), ferric oxide (Fe_2O_3), and aluminium oxide (Al_2O_3).

Accordingly, detailed geological mapping was carried out across the block, resulting in the collection of a total of 41 surface and outcrop samples, with their precise geographic coordinates documented. As part of the exploration program, pitting was conducted at four selected locations to verify subsurface lithologies. Hard rock was encountered in three of these pits, while the fourth revealed only soil and loose overburden material. From these pits, six representative rock samples were collected for laboratory testing. In total, 10 outcrop samples and 6 pit samples were subjected to wet chemical analysis for five key radicals: CaO , MgO , Al_2O_3 , SiO_2 , and Fe_2O_3 , in accordance with standard analytical procedures. The complete set of analytical results is presented in **Annexure I**.

The chemical data indicate that the deposits are predominantly dolomitic in nature, with marked variation in composition. The dolomite samples show CaO values ranging from 30% to 37.7%, MgO from 8% to 20%, and SiO_2 up to 10%. Such compositions confirm their suitability for industrial-grade dolomite applications. However, they fall short of the requirements for cement-grade limestone, which typically demands CaO content exceeding 44% and MgO below 3%. The analyzed samples consistently fail to meet these thresholds due to their relatively low CaO and high MgO content, rendering them unsuitable for cement manufacturing purposes.

A more detailed breakdown shows that the BRS dolomite samples display CaO concentrations between 30% and 32.76%, MgO values ranging from 17% to 20%, and SiO_2 between 0.3% and 3.9%. These values correspond well with standard industrial

dolomite specifications, which generally require CaO between 28% and 32%, MgO between 18% and 22%, and silica content below 4%. Similarly, the pit samples yielded CaO concentrations between 30.8% and 37.7% and MgO values ranging from 8% to 20%, confirming their classification as industrial-grade dolomite. Notably, three pit samples displayed distinct characteristics, with CaO above 35%, MgO less than or equal to 10%, and SiO₂ around 10%. These compositions represent high-silica dolomite, a specialized material that holds potential for niche industries such as glass manufacturing and refractory applications.

The Fe₂O₃ content in the analyzed dolomite samples, ranging from 0.3% to 1.5%, falls within acceptable limits for most industrial applications, further supporting their usability in various sectors. In contrast, other lithologies encountered in the study area — including shale, chert-breccia, conglomerate, and weathered clay — exhibited very low CaO concentrations (<2%), making them unsuitable for either limestone or dolomite-based industrial use. These lithologies have limited economic potential and are not viable for cement-grade raw material production.

In conclusion, the deposits in the studied block are more appropriate for industrial-grade dolomite applications than for cement-grade limestone production. Their chemical composition aligns with the requirements of industries such as steelmaking, refractories, and glass manufacturing. However, the observed variability in silica and magnesium content across different sample sets underscores the need for further targeted exploration. Detailed subsurface investigations aimed at identifying localized zones with higher CaO and lower MgO content could enhance the economic viability of the deposit. Such focused exploration would not only improve resource utilization but also broaden the scope of industrial applications, ensuring optimal exploitation of the available dolomite resources.

CHAPTER-X

LOCATION OF DATA POINTS

The samples collected during both geological mapping and pitting were systematically documented and georeferenced using handheld GPS devices to ensure positional accuracy. Each sample location was marked with precise latitude and longitude coordinates, allowing for reliable correlation with the mapped lithological units and structural features. This spatial control not only enhances the credibility of the dataset but also facilitates reproducibility in future studies, enabling other investigators to revisit and verify the exact sampling sites. By integrating GPS-based location data with geological observations, the sampling program provides a robust framework for correlating surface geology with subsurface information, thereby strengthening the overall interpretation of lithological variations and mineral potential within the block.

Table-10.1: Coordinates of the Bed rock sample points of the Banki Salaiya area

| Sl.No. | Chem. Analyzed Samp. Id | Bed Rock Sample selected for Analysis | Dairy sample id | Latitude (Degree decimal) | Longitude (Degree decimal) | Elevation |
|--------|-------------------------|---------------------------------------|-----------------|---------------------------|----------------------------|-----------|
| 1 | S-8 | BRS-8 | B11/3/1 | 24.475535 | 79.63436597 | 295.1 |
| 2 | | | B11/3/2 | 24.475166 | 79.63195299 | 305.9 |
| 3 | | | B11/3/3 | 24.474907 | 79.63141202 | 307.5 |
| 4 | | | B12/3/1 | 24.491634 | 79.64545799 | 316.6 |
| 5 | | | B12/3/2 | 24.491511 | 79.644985 | 322.4 |
| 6 | | | B12/3/3 | 24.488889 | 79.64239097 | 317 |
| 7 | | | B12/3/4 | 24.489158 | 79.64243498 | 319.1 |
| 8 | S-10 | BRS-9 | B15/3/1 | 24.6249269 | 79.49754272 | 358.2 |
| 9 | | | B15/3/2 | 24.6249837 | 79.49752562 | 358.7 |
| 10 | S-11 | BRS-10 | B15/3/3 | 24.472514 | 79.62682201 | 320.3 |
| 11 | | | B15/3/A | 24.6249726 | 79.49752838 | 357.8 |
| 12 | | | B15/3/5 | 24.6249072 | 79.49752185 | 360.1 |
| 13 | | | B20/3/1P | 24.491393 | 79.64783904 | 309.7 |
| 14 | | | B20/3/2P | 24.49139 | 79.65759499 | 292.6 |
| 15 | | | B20/3/3P | 24.4909 | 79.65777696 | 291.7 |
| 16 | | | B20/3/4P | 24.488489 | 79.65746096 | 289.4 |
| 17 | | | B20/3/1T | 24.48061 | 79.64204203 | 289.3 |
| 18 | | | B28/3/1P | 24.444308 | 79.63060602 | 307 |
| 19 | | | BL1 | 24.4913858 | 79.64789871 | 309.8 |
| 20 | | | BL2 | 24.4916567 | 79.64789556 | 309.5 |
| 21 | | | BL3 | 24.491896 | 79.647905 | 309.7 |

| | | | | | | |
|----|-----|-------|-----|------------|-------------|-------|
| 22 | | | BL4 | 24.4910425 | 79.64794595 | 309.8 |
| 23 | | | BL5 | 24.4911685 | 79.64815066 | 309.8 |
| 24 | | | BL6 | 24.4915968 | 79.64804988 | 309.7 |
| 25 | | | L1 | 24.4906866 | 79.64788296 | 309.7 |
| 26 | | | L2 | 24.4911685 | 79.64802783 | 309.7 |
| 27 | | | L3 | 24.4899875 | 79.64695074 | 309.8 |
| 28 | | | L4 | 24.4896096 | 79.64728458 | 309.1 |
| 29 | | | L5 | 24.4895025 | 79.64772234 | 309.8 |
| 30 | | | L6 | 24.4917401 | 79.64805932 | 309.4 |
| 31 | | | BL7 | 24.4913559 | 79.64806247 | 309 |
| 32 | S-5 | BRS-5 | B7 | 24.492708 | 79.64692198 | 300.2 |
| 33 | S-6 | BRS-6 | B8 | 24.491868 | 79.64537803 | 304 |
| 34 | | | B9 | 24.491108 | 79.64438201 | 326.7 |
| 35 | S-7 | BRS-7 | B10 | 24.493535 | 79.63648198 | 346.4 |
| 36 | | | B11 | 24.488095 | 79.63996902 | 325.4 |
| 37 | S-4 | BRS-4 | B12 | 24.464271 | 79.62944102 | 335.4 |
| 38 | S-2 | BRS-2 | B13 | 24.460115 | 79.62690096 | 354.7 |
| 39 | S-3 | BRS-3 | B14 | 24.458315 | 79.62356304 | 340.8 |
| 40 | S-1 | BRS-1 | B15 | 24.448337 | 79.63124597 | 317.3 |
| 41 | | | B16 | 24.449214 | 79.63516401 | 304.5 |

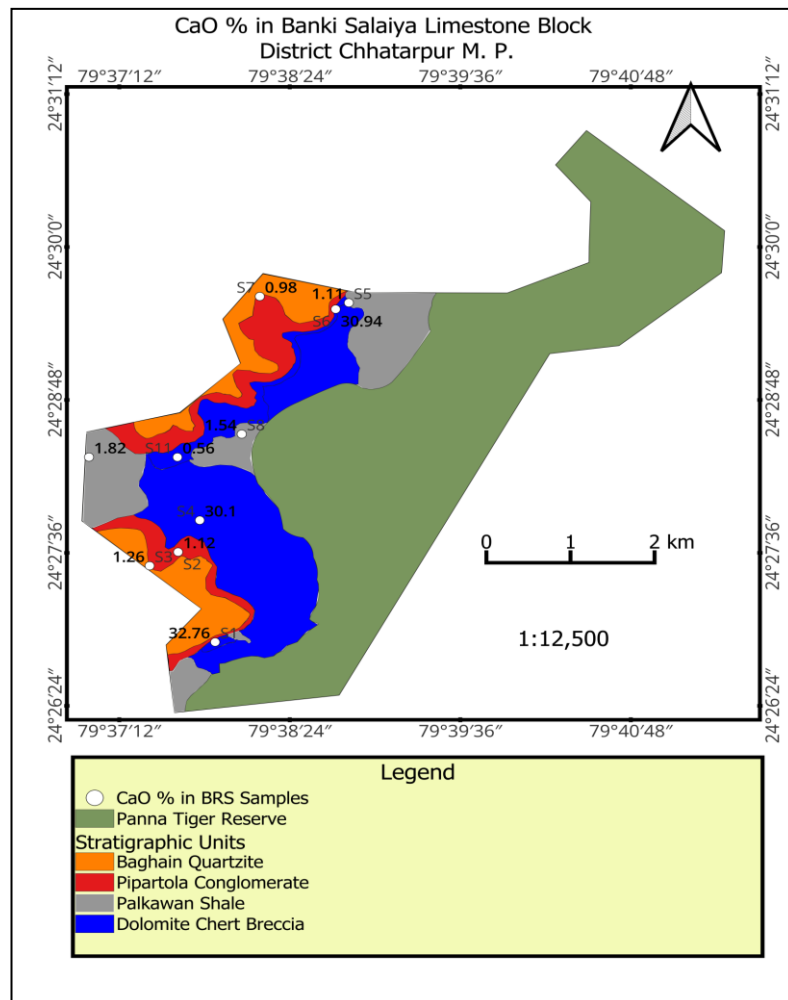
Table-10.2: Coordinates of the Pit Samples of the Banki Salaiya area

| Sl No. | Pit No. | Sample Id | Depth | CaO% | Latitude (Degree decimal) | Longitude (Degree decimal) |
|--------|---------|-----------|--------|-------|------------------------------|-------------------------------|
| P1 | P1 | S-20 | 0-1m | 34.8 | 24.49128309 | 79.64765618 |
| P1 | P1 | S-21 | 1 - 2m | 37.73 | 24.49128309 | 79.64765618 |
| P3 | P3 | S-15 | 0-1m | 32.3 | 24.45685001 | 79.63715396 |
| P3 | P3 | S-16 | 1-2 m | 32.72 | 24.45685001 | 79.63715396 |
| P4 | P4 | S-17 | 0-1m | 30.89 | 24.44950696 | 79.63752503 |
| P4 | P4 | S-18 | 1-2m | 31.17 | 24.44950696 | 79.63752503 |

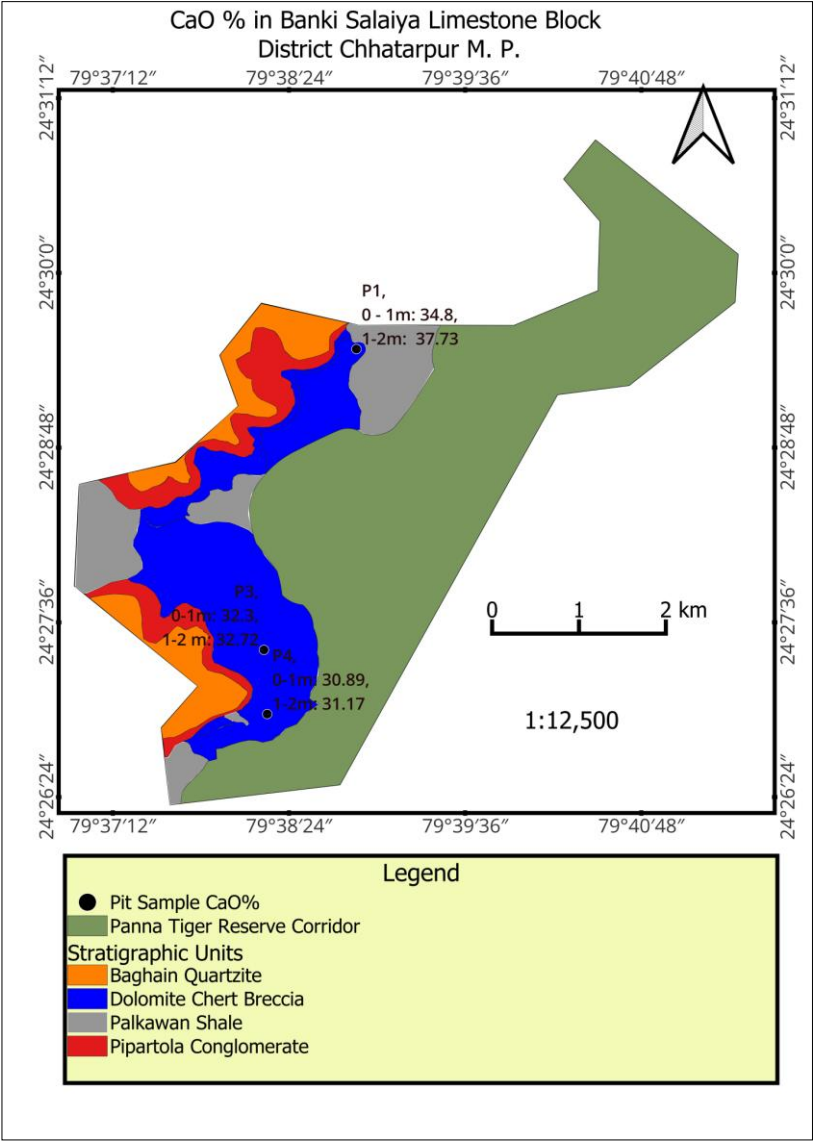
Table-10.3: Coordinates of the check samples of the Banki Salaiya area

| Sl No | Sample ID Type | CHECK SAMPLE ID | Bed Rock Sample selected for Analysis | Latitude (Degree decimal) | Longitude (Degree decimal) |
|-------|----------------|-----------------|---------------------------------------|---------------------------|----------------------------|
| 1 | BRS SAMPLE | S-9 | BRS-5 | 24.492708 | 79.64692198 |
| 2 | BRS SAMPLE | S-12 | BRS-10 | 24.472514 | 79.62682201 |
| 3 | PIT SAMPLE | S-19 | P-4/S-18 | 24.44950696 | 79.63752503 |

Text Figure-10.1: CaO% of BRS samples collected from Banki Saliya Area



Text Figure-10.2: CaO% of Pit samples collected from Banki Saliya Area.



CHAPTER-XI

CONCLUSIONS AND RECOMMENDATIONS

11.1.0 Conclusion:

The exploration of the Banki-Salaiya block has revealed significant **Dolomite** deposits with industrial-grade potential, but not cement-grade limestone. The chemical analysis indicates CaO values ranging from 30% to 37.7% and MgO from 8% to 20%, making the deposits suitable for industrial applications such as steelmaking, refractories, and glass manufacturing. However, due to the relatively high levels of silica (SiO_2) and magnesium (MgO), these deposits are not viable for cement production.

However, the exploration faced limitations due to the presence of the **Panna Tiger Reserve Corridor**, which covers approximately 14.5 sq km (about 60% of the block area). As a result, the planned geological mapping over 25 sq km was restricted to 10.5 sq km. The number of surface samples collected was reduced to 41, and pitting was carried out only over 8 Cum instead of the planned 20 sq m. These limitations impacted the completeness of the study, particularly in areas covered by the tiger reserve, where access was restricted for conservation purposes.

Despite these challenges, the exploration provides a clear indication of the potential for industrial-grade dolomite in the area. Further exploration is needed to optimize resource utilization and define the extent of the deposits.

11.2.0 Recommendations for Further Exploration:

Dolomite is widely used in various industries, including iron ore beneficiation and the putty industry, due to its composition and properties. Dolomite is used as a fluxing agent in the iron ore beneficiation process. It helps in removing impurities such as silica and phosphorus from iron ore during the smelting process. The CaO (calcium oxide) and MgO (magnesium oxide) combined content is crucial for this purpose, and it generally needs to be over 60% to provide effective fluxing. The silica content should be kept low,

usually under 2%, because high silica content can interfere with the smelting process and decrease the quality of the final product.

In the putty industry, dolomite is used primarily as a filler material in the production of wall putty, which is a paste used to fill in cracks and smooth out surfaces for painting. Dolomite with less than 5% silica content is preferred in the putty industry because a higher silica content can reduce the smoothness and quality of the final product. The CaO and MgO combined content, which also plays a role in the putty industry, needs to be high (above 60%) to ensure good consistency and durability of the putty.

Considering the combined CaO and MgO grades obtained from the BRS and pit samples of the block, which mostly ranges between 45-52%, it is recommended to further explore the block to establish a more defined database. So, to fully assess the potential of the Banki-Salaiya block, further exploration should focus on some scout drilling to define the depth and extent of the dolomite deposits. Additional geochemical analysis should be conducted to better understand the variability in chemical composition across the block. Lastly, environmental and feasibility studies should be undertaken to evaluate the sustainability and economic viability of mining the dolomite, taking into account conservation restrictions in the tiger reserve corridor.

CHAPTER-XII

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ANNEXURES

Annexure-I

Chemical Analysis of Bedrock Sample of Banki Salaiya area

| Sl.No. | BRS ID | CaO% | MgO% | SiO ₂ % | Al ₂ O ₃ % | Fe ₂ O ₃ % |
|--------|---------|-------|-------|--------------------|----------------------------------|----------------------------------|
| 1 | BRS1 | 32.76 | 17.31 | 3.99 | 0.5 | 1.19 |
| 2 | BRS2 | 1.12 | 0.7 | 82.29 | 5.7 | 1.59 |
| 3 | BRS3 | 1.26 | 0.9 | 70.07 | 9.69 | 3.98 |
| 4 | BRS4 | 30.1 | 20.12 | 2.04 | 0.25 | 0.99 |
| 5 | BRS5 | 1.11 | 0.9 | 84.23 | 3.93 | 6.77 |
| 6 | BRS-5 © | 0.98 | 0.6 | 81.17 | 3.19 | 5.19 |
| 7 | BRS6 | 30.94 | 20.43 | 0.34 | 0.76 | 1.59 |
| 8 | BRS7 | 0.98 | 0.2 | 94.1 | 2.02 | 2.39 |
| 9 | BRS8 | 1.54 | 0.6 | 82.16 | 4.69 | 3.19 |
| 10 | BRS9 | 1.82 | 1 | 69.65 | 9.13 | 2.79 |
| 11 | BRS10 | 0.56 | 0.8 | 93.67 | 2.53 | 1.99 |
| 12 | BRS-10© | 1.39 | 1.20 | 93.11 | 2.15 | 1.59 |

©- Check Sample

Annexure-II

Chemical analysis result of the Pit Samples of Banki Salaiya area

| Sl.No. | Pit No | Sample ID | From | To | CaO% | MgO% | SiO ₂ % | Al ₂ O ₃ % | Fe ₂ O ₃ % |
|--------|--------|-----------|------|----|-------|-------|--------------------|----------------------------------|----------------------------------|
| 1 | 1 | S-20 | 0 | 1 | 34.8 | 10.75 | 10.24 | 0.88 | 1.59 |
| 2 | | S-21 | 1 | 2 | 37.73 | 8.13 | 10.3 | 1.13 | 1.39 |
| 3 | | S-19© | 1 | 2 | 36.24 | 10.26 | 11.53 | 1.39 | 1.59 |
| 4 | 3 | S-15 | 0 | 1 | 32.3 | 19.7 | 0.01 | 0.76 | 0.39 |
| 5 | | S-16 | 1 | 2 | 32.72 | 19.3 | 0.18 | 0.76 | 0.39 |
| 6 | 4 | S-17 | 0 | 1 | 30.89 | 19.89 | 1.68 | 0.37 | 0.79 |
| 7 | | S-18 | 1 | 2 | 31.17 | 20.09 | 0.72 | 0.76 | 0.79 |

©- Check Sample

Annexure-III

Expenditure

| Sl. No. | Item of Work | Unit | Qty | (Inhouse) Rate | Outsourced Rate | Amount (Rs) |
|----------|---|------------|-----|----------------|-----------------|------------------|
| (a) | (b) | (c) | | | | |
| 1 | LARGE SCALE GEOLOGICAL MAPPING WORKS (1:12,500 scale & 25 Sq.Km. Area) | | | | | |
| 1.1 | Geologist Party days - Field | days | 46 | 11,000 | | 506,000 |
| 1.2 | Geologist Party days - HQ | | 13 | 9,000 | | 117,000 |
| 1.3 | Labour charges for geological | | 91 | 504 | | 45,864 |
| 2 | PITTING & TRENCHING WORKS | | | | | |
| 2.1 | Pitting | cum | 20 | 3,800 | | 76,000 |
| 6 | Laboratory Studies | | | | | |
| 6.1 | Complete analysis of dolomite or | per sample | 19 | 1,400 | | 26,600 |
| | | | | | | 771,464 |
| | Peer Review | | | | | 30,000 |
| | Geological Report Preparation | | | | | 150,000 |
| | Subtotal | | | | | 951,464 |
| | GST @ 18% | | | | | 171,264 |
| | Total Cost | | | | | 1,122,728 |
| | Rs. in lacs | | | | | 11.23 |

Annexure-IV

NMET Sanction Order

Government of India
Ministry of Mines
National Mineral Exploration Trust

F.No.23/406/2023-NMET/ 376

New Delhi, 12th December, 2023

Subject: Approval of mineral exploration project and release of 1st Advance of Grant-in-Aid (General) for "Reconnaissance Survey (G-4) for Limestone in Banki-Salaiya Block (25 sq.km.), Chhhattarpur district, Madhya Pradesh."

On the recommendation of Technical-cum-Cost Committee (TCC) of NMET, the Executive Committee (EC) in its 32nd EC meeting held on 06th December, 2023 approved mineral exploration project to be executed by Madhya Pradesh State Mining Corporation Ltd. (MPSMC Ltd.). The details of the block are given below:

| S. No. | Project/Block Name | Commodity | Stage | Duration (Months) | Approved Cost (Including GST). |
|--------|--|-----------|-------|-------------------|--------------------------------|
| 1 | Reconnaissance Survey (G-4) for Limestone in Banki-Salaiya Block (25 sq.km.), Chhhattarpur district, Madhya Pradesh. | Limestone | G4 | 09 | ₹48,07,691/- |

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

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

4. Sanction is also hereby conveyed for release of the 1st instalment of 40% of the estimated project cost i.e. ₹ 19,23,076/- (**₹Nineteen lakh twenty three thousand and seventy six only**) as an advance in terms of conditions stipulated in this office letter no. 42/1/2017-NMET/176 dated 16th December 2021 and letter no. 42/1/2017-NMET/217 dated 19th January 2022 regarding "Release of funds to State Government / NEAs for mineral exploration".

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

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

TEST REPORT



Quality Leads ...

CHEMICAL ANALYSIS OF MINERALS & ORES

POLLUTION & ENVIRONMENT PARAMETERS

TEST REPORT

| | | | |
|-------------------------------------|---|---------------------------------------|--|
| TEST REPORT NO. BSS/619/2027-2032 | | Date of Issue Test Report: 10.12.2024 | |
| Date of Sample Received: 06.12.2024 | | Date of Test Start: 07.12.2024 | Date of Test End: 10.12.2024 |
| Name of Customer And Address | THE MADHYA PRADESH STATE MINING CORPORATION LTD. PARYAWAS BHAWAN, BLOCK 'A', II ND FLOOR, JAIL ROAD, ARERA HILLS, BHOPAL (M.P.) 462011 | | Attention: Contact No.: |
| Name of Sample | LIMESTONE/DOLOMITE/ALLIED MINERAL | | Received Form and Quantity of Sample |
| Sample is Representative of | BANKI-SALAIYA LIMESTONE BLOCK, CHHATARPUR (M.P.) | | Powder Form 06 No. & 100gm Each SiO ₂ , CaO, MgO, Fe ₂ O ₃ & Al ₂ O ₃ |
| Packing of Sample | Paper Pouch | | Sample collected and prepared by By Customer |

DETAILS OF TEST

| Sr. No. | REPRESENTATIVE SAMPLE ID | PARAMETERS → TEST METHOD → | RESULT IN % | | | | |
|---------|--------------------------|-------------------------------|------------------|-------|-------|--------------------------------|--------------------------------|
| | | | SiO ₂ | CaO | MgO | Fe ₂ O ₃ | Al ₂ O ₃ |
| 1. | S-01 | IS:1760 | 3.99 | 32.76 | 17.31 | 1.19 | 0.50 |
| 2. | S-02 | IS:1760 | 82.29 | 1.12 | 0.70 | 1.59 | 5.70 |
| 3. | S-03 | IS:1760 | 70.07 | 1.26 | 0.90 | 3.98 | 9.69 |
| 4. | S-04 | IS:1760 | 2.04 | 30.10 | 20.12 | 0.99 | 0.25 |
| 5. | S-05 | IS:1760 | 84.23 | 1.11 | 0.90 | 6.77 | 3.93 |
| 6. | S-06 | IS:1760 | 0.34 | 30.94 | 20.42 | 1.59 | 0.76 |

Remarks:

- Please see and refer original test for the authenticity of this report.
- Location of samples as per given information by the Customer.
- Sample identification explanations given by the customer.


INDRANEEL DAWANDE
AUTHORIZED SIGNATORY

END OF REPORT



NOTE: 1. Sample(s) not drawn by us. 2. Sampling & analysis carried as per specification of Bureau of Indian Standard Institution. 3. The results are for the tested samples only. 4. Sample material is destroyed after reporting & sample is stored on the party's written request only. 5. Authenticity of this report must be matched with the original report. 6. Report cannot be produced as a witness in a court of law (subject to Jabalpur jurisdiction).

Office: BSS Lab Private Limited, 1338, First Floor, Vijay Nagar, Kachnar City Road, Jabalpur - 482002 (M.P.), India
Telephone/ Fax No. 0761-3581305, Mobile: 09424973438, 08989771405 Email: bsslab.jbp@gmail.com
Web site: www.bsslabjabalpur.com



Quality Leads...

CHEMICAL ANALYSIS OF MINERALS & ORES

POLLUTION & ENVIRONMENT PARAMETERS

TEST REPORT

| | | | |
|-------------------------------------|---|---------------------------------------|--------------------------------------|
| TEST REPORT NO. BSS/620/2033-2038 | | Date of Issue Test Report: 10.12.2024 | |
| Date of Sample Received: 06.12.2024 | | Date of Test Start: 07.12.2024 | Date of Test End: 10.12.2024 |
| Name of Customer And Address | THE MADHYA PRADESH STATE MINING CORPORATION LTD. PARYAWAS BHAWAN, BLOCK 'A', II ND FLOOR, JAIL ROAD, ARERA HILLS, BHOPAL (M.P.) 462011 | | Attention: Contact No.: |
| Name of Sample | LIMESTONE/DOLOMITE/ALLIED MINERAL | | Received Form and Quantity of Sample |
| Sample is Representative of | BANKI-SALAIYA LIMESTONE BLOCK, CHHATARPUR (M.P.) | | Powder Form 06 No. & 100gm Each |
| Packing of Sample | Paper Pouch | | Test Required |
| | | Sample collected and prepared by | By Customer |

DETAILS OF TEST

| Sr. No. | REPRESENTATIVE SAMPLE ID | RESULT IN % | | | | |
|---------|--------------------------|---------------|------------------|---------|---------|--------------------------------|
| | | PARAMETERS → | SiO ₂ | CaO | MgO | Fe ₂ O ₃ |
| | | TEST METHOD → | IS:1760 | IS:1760 | IS:1760 | IS:1760 |
| 1. | S-07 | | 94.10 | 0.98 | 0.20 | 2.39 |
| 2. | S-08 | | 82.16 | 1.54 | 0.60 | 3.19 |
| 3. | S-09 | | 81.17 | 0.98 | 0.60 | 3.19 |
| 4. | S-10 | | 69.65 | 1.82 | 1.00 | 2.79 |
| 5. | S-11 | | 93.67 | 0.56 | 0.80 | 1.99 |
| 6. | S-12 | | 93.11 | 1.39 | 1.20 | 1.59 |

Remarks:

1. Please see and refer original test for the authenticity of this report.
2. Location of samples as per given information by the Customer.
3. Sample identification explanations given by the customer.


INDRANEEL DAWANDE
AUTHORIZED SIGNATORY


END OF REPORT



NOTE: 1. Sample(s) not drawn by us. 2. Sampling & analysis carried as per specification of Bureau of Indian Standard Institution. 3. The results are for the tested samples only. 4. Sample material is destroyed after reporting & sample is stored on the party's written request only. 5. Authenticity of this report must be matched with the original report. 6. Report cannot be produced as a witness in a court of law (subject to Jabalpur jurisdiction).

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Web site: www.bsslabjabalpur.com

Annexure-V/C



Quality Leads...

POLLUTION & ENVIRONMENT PARAMETERS

CHEMICAL ANALYSIS OF MINERALS & ORES

TEST REPORT

| | | | |
|-------------------------------------|---|---------------------------------------|---|
| TEST REPORT NO. BSS/595/1945-1951 | | Date of Issue Test Report: 28.11.2024 | |
| Date of Sample Received: 25.11.2024 | | Date of Test Start: 25.11.2024 | Date of Test End: 27.11.2024 |
| Name of Customer And Address | THE MADHYA PRADESH STATE MINING CORPORATION LTD. PARYAWAS BHAWAN, BLOCK 'A', II ND FLOOR, JAIL ROAD, ARERA HILLS, BHOPAL (M.P.) 462011 | | Attention: Contact No.: |
| Name of Sample | LIMESTONE/DOLOMITE | | Received Form and Quantity of Sample |
| Sample is Representative of | BANKI-SALAIYA LIMESTONE BLOCK, CHHATARPUR (M.P.) | | Powder Form 07 No. & 100gm Each |
| Packing of Sample | Paper Pouch | | Test Required SiO ₂ , Fe ₂ O ₃ , Al ₂ O ₃ & MgO |
| | | | Sample collected and prepared by By Customer |

DETAILS OF TEST

| Sr. No. | REPRESENTATIVE SAMPLE ID | PARAMETERS → TEST METHOD → | RESULT IN % | | | | |
|---------|--------------------------|-------------------------------|------------------|---------|---------|--------------------------------|--------------------------------|
| | | | SiO ₂ | CaO | MgO | Fe ₂ O ₃ | Al ₂ O ₃ |
| | | | IS:1760 | IS:1760 | IS:1760 | IS:1760 | IS:1760 |
| 1. | S-15 | | 0.01 | 32.30 | 19.70 | 0.39 | 0.76 |
| 2. | S-16 | | 0.18 | 32.72 | 19.30 | 0.39 | 0.76 |
| 3. | S-17 | | 1.68 | 30.89 | 19.89 | 0.79 | 0.37 |
| 4. | S-18 | | 0.71 | 31.17 | 20.09 | 0.79 | 0.76 |
| 5. | S-19 | | 11.53 | 36.24 | 10.26 | 1.59 | 1.39 |
| 6. | S-20 | | 10.24 | 34.80 | 10.75 | 1.59 | 0.88 |
| 7. | S-21 | | 10.30 | 37.73 | 8.13 | 1.39 | 1.13 |

Remarks:

- Please see and refer original test for the authenticity of this report.
- Location of samples as per given information by the Customer.
- Sample identification explanations given by the customer.


For INDRANEEL DAWANDE
 AUTHORIZED SIGNATORY

END OF REPORT



NOTE: 1. Sample(s) not drawn by us. 2. Sampling & analysis carried as per specification of Bureau of Indian Standard Institution. 3. The results are for the tested samples only. 4. Sample material is destroyed after reporting & sample is stored on the party's written request only. 5. Authenticity of this report must be matched with the original report. 6. Report cannot be produced as a witness in a court of law (subject to Jabalpur jurisdiction).

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