

**GEOLOGICAL REPORT ON PRELIMINARY EXPLORATION (G3)
FOR LIMESTONE IN**

DONGARGAON-KASARA BLOCK

DISTRICT: YAVATMAL, MAHARASHTRA



MINERAL EXPLORATION AND CONSULTANCY LIMITED
(Formerly known as Mineral Exploration Corporation Limited)
A Government of India Enterprise
CORPORATE OFFICE, NAGPUR

AUGUST-2026

**GEOLOGICAL REPORT ON PRELIMINARY EXPLORATION (G3) FOR LIMESTONE IN
DONGARGAON-KASARA BLOCK, DISTRICT: YAVATMAL, MAHARASHTRA**

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SALIENT FEATURES

1.	Name of the block	Dongargaon-Kasara Block, Tahsil: Zari-Jamani, District: Yavatmal, State: Maharashtra																		
2.	Mineral	Limestone / Dolomite																		
3.	Total Area	6.06 sq.km.																		
4.	Area covered under present scheme	6.06 sq.km.																		
5.	Period of Exploration	July 2025 to June 2026																		
6.	Meterage drilled by MECL	Total 220 m																		
7.	No. of Boreholes drilled by MECL	Total 05 Nos																		
8.	Thickness of Different Grades of Limestone	Cement Grade Limestone - Thickness 8m (min.), 19m (Max.). Beneficial Grade Dolomite - Thickness 4m (min.), 49m (max.).																		
9.	Cut-off grade	As per end use grade classification recommended by Indian Bureau of Mines (IBM). <table><tr><th rowspan="2">Grade</th><th>CaO (Min.)</th><th>MgO (Max.)</th><th>SiO2 (Max.)</th></tr><tr><th>%</th><th>%</th><th>%</th></tr><tr><td>Cement Limestone</td><td>≥44</td><td>3.50</td><td>12</td></tr><tr><td>Beneficial Dolomite</td><td>>30</td><td>20.00</td><td>10</td></tr></table>				Grade	CaO (Min.)	MgO (Max.)	SiO2 (Max.)	%	%	%	Cement Limestone	≥44	3.50	12	Beneficial Dolomite	>30	20.00	10
Grade	CaO (Min.)	MgO (Max.)	SiO2 (Max.)																	
	%	%	%																	
Cement Limestone	≥44	3.50	12																	
Beneficial Dolomite	>30	20.00	10																	
10.	Resources	Cement Grade Limestone (333): 89.41 MT* with an average grade 46.21% CaO, 3.52% MgO, 6.79% SiO ₂ . Cement Grade Limestone (334): 43.27 MT* with an average grade 46.15% CaO, 3.53% MgO, 6.85% SiO ₂ . Beneficial Grade Dolomite (333): 193.02 MT* with an average grade 32.91% CaO, 16.75% MgO, 4.36% SiO ₂ . * MT – Million Tonnes																		
11.	Grade	Cement Grade Limestone and Beneficial Grade Dolomite.																		
12.	UNFC Category	Inferred Category (333) & Reconnaissance Category (334)																		
13.	Report Submission	August 2026																		

डोंगरगांव-कसारा ब्लॉक, जिला: यवतमाल, महाराष्ट्र में चूना पत्थर हेतु प्रारंभिक गवेषण (G3)

पर भूवैज्ञानिक रिपोर्ट

अध्याय 1

1.0.0 कार्यकारी सारांश

1.1.0 डोंगरगांव-कसारा का प्रस्ताव महाराष्ट्र राज्य सरकार द्वारा चिन्हित समाप्त/अवधिपूर्ण खनन पट्टा क्षेत्र (लीज़ एरिया) के आधार पर दिया गया है, जो मूल रूप से MMDR एक्ट, 2015 के सेक्शन 10A(2)(b) के तहत दिए गए थे। हालांकि, एक्ट में 2021 के संशोधन के बाद, ऐसी सभी प्रॉस्पेक्टिंग लाइसेंस (PL) रिपोर्ट को अयोग्य घोषित कर दिया गया, जिससे नीलामी के ज़रिए आवंटन ज़रूरी हो गया। इसके अलावा, मिनेरल्स (एविडेंस ऑफ़ मिनेरल कंटेंट्स) रूल्स, 2015 के नियमों के अनुसार मिनेरल एविडेंस (G4, G3, आदि) के लेवल की पुष्टि के लिए इन PL रिपोर्ट का मूल्यांकन किया जाना ज़रूरी है।

1.2.0 भूविज्ञान और खनन निदेशालय (डीजीएम), महाराष्ट्र सरकार ने एमईसीएल को पत्र संख्या टेक/1848/2023/260, दिनांक 23/01/2024 के माध्यम से समाप्त हो चुके 10ए(2)(बी) खनन पट्टा क्षेत्रों में गवेषण करने का अनुरोध किया।

1.3.0 एमईसीएल महाराष्ट्र के यवतमाल जिले के जरी-जमानी तहसील के डोंगरगांव-कसारा गांव और उसके आसपास के क्षेत्रों में गवेषण के जी-3 स्तर पर 09 बोरहोल में 450 मीटर वेधन को शामिल करते हुए गवेषण प्रस्ताव तैयार किया गया।

1.4.0 गवेषण प्रस्ताव(जी-3)के लिए डोंगरगांव-कसारा ब्लॉक (6.06 वर्ग किमी) था प्रस्तुत और 30 अप्रैल और 1 मई, 2025 को हुई 76 वीं TCC-1 मीटिंग में इस पर विचार-विमर्श किया गया। समिति ने 10A(2)(b) मामलों और महाराष्ट्र सरकार के अनुरोध पर ध्यान दिया कि एमईसीएल के ज़रिए इन PL एरिया में गवेषण की जाए। इसके अनुसार, 76 वीं TCC-1 समिति ने अनुशंसित परियोजना डोंगरगांव-कसारा ब्लॉक (6.06 वर्ग किमी) में चूना पत्थर के लिए प्रारंभिक गवेषण (जी-3 स्तर), जिला: यवतमाल, महाराष्ट्र" शीर्षक से प्रस्ताव कार्यकारी समिति (ईसी), एनएमईडीटी को भेजा गया।

1.5.0 76 वीं TCC-1 की सिफारिश पर, 42 वीं कार्यकारी समिति (ईसी), एनएमईडीटी की बैठक 2 जून, 2025 को हुई, जिसके पत्रांक-F.No. 23/623/2025-NMET/168, दि. 23 जून, 2025 के ज़रिए INR 122.58 लाख की लागत वाले प्रोजेक्ट को मंजूरी दी गई।

1.6.0 महाराष्ट्र के यवतमाल जिले में मौजूद डोंगरगांव-कसारा ब्लॉक 6.06 sq.km में

फैला है, जो देशांतर $78^{\circ}48'45.71537''\text{E}$ से $78^{\circ}51'26.31582''\text{E}$ और अक्षांश $19^{\circ}50'23.52630''\text{N}$ से $19^{\circ}51'19.01123''\text{N}$ तक फैला है और इसमें ज़ारी-जमानी तहसील के डोंगरगांव और कसारा गांव शामिल हैं, जो टोपोशीट नंबर 56I/13 में आते हैं।

1.7.0 NMEDT से अनुमोदन प्राप्त होने के उपरांत MECL ने डोंगरगाँव-कसारा ब्लॉक में G-3 स्तर का गवेषण कार्य संपादित किया। MECL ने 1:4000 स्केल पर भूवैज्ञानिक मानचित्रण एवं स्थलाकृतिक सर्वेक्षण किया तथा कुल 220 मीटर की मीटरज के साथ 5 ऊर्ध्वाधर बोरहोल ड्रिलिंग की। इस दौरान 211 नमूनों (191 कोर नमूने एवं 20 BRS) का विश्लेषण किया गया तथा 21 बाह्य जॉच नमूनों का परीक्षण किया गया। इन नमूनों का CaO , MgO , SiO_2 , Fe_2O_3 , Al_2O_3 , SO_3 , P_2O_5 , K_2O , Na_2O एवं LOI के लिए विश्लेषण किया गया, जो कोर ड्रिलिंग से प्राप्त हुए थे, ताकि अधस्तलीय सततता का निर्धारण किया जा सके एवं खनिज संसाधनों का आकलन किया जा सके।

1.8.0 क्षेत्रीय रूप से महाराष्ट्र के यवतमाल जिले में डेक्कन बेसाल्ट की प्रधानता वाले प्रकटित शैलखंड पाए जाते हैं, जिनके साथ गोंडवाना, लामेटा तथा पेंगंगा शैलस्तर भी विद्यमान हैं। इस क्षेत्र की चूना पत्थर संरचना पेंगंगा समूह की पुटनूर-मंगुरदा संरचना से संबंधित है। इसमें पतली परतदार चूना पत्थर एवं शेल सम्मिलित हैं, जिनकी उत्पत्ति उथले समुद्री से नदीय वातावरण में हुई है। शैलसमूह का क्षेत्रीय नतिलंब NW-SE दिशा में है तथा इसमें 5° से 10° तक का निम्न नति दक्षिण-पश्चिम की ओर पाया जाता है।

1.9.0 डोंगरगाँव-कसारा ब्लॉक एरिया पुटनूर-मंगुरदा फॉर्मेशन का हिस्सा है, जो पेंगंगा ग्रुप की कम जानी-मानी लेकिन जियोलॉजिकली दिलचस्प यूनिट है। इन फॉर्मेशन में आम तौर पर शेल, चूना पत्थर और डोलोमाइट जैसी प्रोटेरोज़ोइक सेडिमेंट्री चट्टानें होती हैं। बेड का नतिलंब $\text{N}51^{\circ}\text{W-S}51^{\circ}\text{E}$ है और नति NE की ओर 4° से 21° तक होता है।

1.10.0 जोन IBM ग्रेड कटऑफ के आधार पर तय किए गए:

श्रेणी	CaO (न्यूनतम) %	MgO (अधिकतम) %	SiO ₂ (अधिकतम) %
सीमेंट ग्रेड चूना पत्थर	≥44	3.5	12
लाभकारी ग्रेड डोलोमाइट	≥30	20	10

1.11.0 सीमेंट ग्रेड चूनापत्थर को बोरहोल नंबर MDK-04 और MDK-05 में इंटरसेक्ट किया गया, जिनकी कुल मोटाई क्रमशः 28m और 25m है। बेनिफिशियल ग्रेड डोलोमाइट को 4 बोरहोल यानी MDK-02, MDK-03, MDK-04 और MDK-05 में इंटरसेक्ट किया गया, जिनकी कुल मोटाई क्रमशः 44.50m, 49.00m, 20.50m और 25.00m है।

1.12.0 भूवैज्ञानिकीय तौर पर सकल स्व-स्थाने संसाधन का अनुमान मुख्य तरीके के तौर पर पॉलीगोनल तरीके से और चेक तरीके के तौर पर क्रॉस सेक्शनल तरीके से लगाया गया था। MEMC रूल्स 2015 (संशोधित 2021) के अनुसार, IBM ग्रेड कट-ऑफ के क्लासिफिकेशन के आधार पर सीमेंट ग्रेड चूना पत्थर और बेनिफिशियल ग्रेड डोलोमाइट के लिए। रिसोर्स के अनुमान के लिए चूना पत्थर के लिए 2.77 gm/cc तथा डोलोमाइट के लिए 2.81 gm/cc का बल्क डेंसिटी (Bulk Density), जो कैलिपर विधि (Caliper Method) द्वारा निर्धारित किया गया था, को आधार माना गया। चूना पत्थर और डोलोमाइट के अनुमानित भूवैज्ञानिकीय तौर पर सकल स्व-स्थाने संसाधन इस तरह हैं:

क्रम संख्या	संसाधनों का प्रकार	भूवैज्ञानिक सकल इन-सीटू संसाधन (एमटी*)	औसत गुणवत्ता		
			CaO %	MgO %	SiO ₂ %
1	सीमेंट ग्रेड चूना पत्थर (333)	89.41	46.21	3.52	6.79
2	सीमेंट ग्रेड चूना पत्थर (334)	43.27	46.15	3.53	6.85
3	लाभकारी ग्रेड डोलोमाइट (333)	193.02	32.91	16.75	4.36

*एमटी - मिलियन टन

1.13.0 सिफारिश: डोंगरगांव-कसारा ब्लॉक में एमईसीएल ने प्रारंभिक (G-3) की और सीमेंट ग्रेड चूना पत्थर और फायदेमंद ग्रेड डोलोमाइट रिसोर्स पाए, जिन्हें UNFC नाम के अनुसार 333 और 334 कैटेगरी में रखा गया है। यह रिपोर्ट महाराष्ट्र सरकार को ब्लॉक की नीलामी में मदद करेगी।

**GEOLOGICAL REPORT ON PRELIMINARY EXPLORATION (G3) FOR
LIMESTONE IN DONGARGAON-KASARA BLOCK, DISTRICT: YAVATMAL,
MAHARASHTRA**

CHAPTER-1

1.0.0 EXECUTIVE SUMMARY

- 1.1.0 The Dongargaon-Kasara has been proposed on the basis of lapsed lease areas identified by the State Government of Maharashtra, which were originally granted under Section 10A(2)(b) of the MMDR Act, 2015. However, following the 2021 amendment to the Act, all such Prospecting License (PL) reports were declared ineligible, mandating allocation through auction. Further, these PL reports are required to be evaluated to confirm the level of mineral evidence (G4, G3, etc.) as per the provisions of the Minerals (Evidence of Mineral Contents) Rules, 2015.
- 1.2.0 The Directorate of Geology and Mining (DGM), Government of Maharashtra requested MECL to take up the exploration in lapsed 10A(2)(b) mining lease areas vide letter no. Tech/1848/2023/260, Dated 23/01/2024.
- 1.3.0 MECL formulated exploration proposal involving 450m drilling in 09 boreholes at G3 level of exploration in and around Dongargaon and Kasara villages of Tehsil Zari-Jamani, District: Yavatmal, Maharashtra.
- 1.4.0 Exploration Proposal (G3) for Dongargaon-Kasara Block (6.06 sq.km.) was submitted and deliberated in 76th TCC-1 meeting held on 30th April & 1st May, 2025. Committee, noted 10A(2)(b) cases and request of Govt. of Maharashtra for exploration of these PL areas through MECL. Accordingly, 76th TCC-1 committee recommended the project proposal titled as “Preliminary Exploration (G3 Level) for Limestone in Dongargaon-Kasara Block (6.06 sq.km.), District: Yavatmal, Maharashtra” to EC, NMEDT.
- 1.5.0 On recommendation of 76th TCC-1, 42nd Executive committee (EC), NMEDT meeting held on 2nd June 2025, vide letter no F.No. 23/623/2025-NMET/168, Dated 23rd June, 2025 approved the project with cost of INR 122.58 lakhs.
- 1.6.0 The Dongargaon-Kasara Block, located in Yavatmal District of Maharashtra, spans 6.06 sq.km., is bounded by Longitude 78°48'45.71537"E to 78°51'26.31582"E and Latitude 19°50'23.52630"N to 19°51'19.01123"N and encompasses the villages of Dongargaon and Kasara in Tehsil Zari-Jamani, falling within Toposheet No. 56I/13.
- 1.7.0 After receipt of approval from NMEDT, The MECL has carried out G3 level exploration in Dongargaon-Kasara Block. MECL carried out geological mapping

and topographical survey on 1:4000 scale with drilling 5 vertical boreholes with total meterage of 220m and analysing 211 samples (191 core samples, 20 BRS) and 21 external check samples analysed for CaO, MgO, SiO₂, Fe₂O₃, Al₂O₃, SO₃, P₂O₅, K₂O, Na₂O & LOI generated from core drilling to delineate subsurface continuity and assess mineral resources.

- 1.8.0 Regionally, Yavatmal district in Maharashtra has exposures dominated by Deccan basalts along with presence of Gondwana, Lameta and Penganga beds. The limestone formation of the area belongs to Putnur-Mangurda formation of Penganga Group. It is comprising laminated limestones and shales of shallow marine to fluvial origin. The rocks, exhibit a regional strike of NW - SE with low dips ranging from 5° to 10° towards the southwest.
- 1.9.0 The Dongargaon-Kasara Block area belongs to the Putnur-Mangurda formation lesser-known but geologically intriguing unit of the Penganga Group. These formations typically consist of Proterozoic sedimentary rocks like shale, limestone and dolomite. The strike of the beds is N51°W-S51°E and dip varies from 4° to 21° towards NE.

- 1.10.0 Zones were demarcated based on IBM grade cutoff:

Grade	CaO (Min.) %	MgO (Max.) %	SiO₂ (Max.) %
Cement Grade Limestone	≥44	3.5	12
Beneficial Grade Dolomite	≥30	20.0	10

- 1.11.0 Cement Grade Limestone was intersected in the boreholes no MDK-04 & MDK-05, whose cumulative thickness are 28m and 25m respectively. Beneficial Grade Dolomite was intersected in 4 boreholes i.e. MDK-02, MDK-03, MDK-04 and MDK-05, whose cumulative thickness are 44.50m, 49.00m, 20.50m and 25.00m respectively.
- 1.12.0 Geological Gross In-Situ resources were estimated by polygonal method as principal method and cross sectional as check method as per MEMC Rules 2015 (Amended 2021) for Cement Grade Limestone and Beneficial Grade Dolomite based on classification of IBM grade cut-off. Bulk densities of 2.77 gm/cc for limestone and 2.81 g/cc for dolomite, determined by the caliper method, were

considered for resource estimation.

Estimated geological gross in-situ resources of limestone and dolomite are as follows:

Sl. No.	Type of Resources	Geological Gross In-Situ Resources (MT*)	Average Quality		
			CaO %	MgO %	SiO ₂ %
1	Cement Grade Limestone (333)	89.41	46.21	3.52	6.79
2	Cement Grade Limestone (334)	43.27	46.15	3.53	6.85
3	Beneficial Grade Dolomite (333)	193.02	32.91	16.75	4.36

*MT – Million Tonnes

1.13.0 Recommendation: Preliminary exploration (G3) was carried out by MECL in Dongargaon-Kasara Block and established Cement Grade Limestone and Beneficial Grade Dolomite resources, which are placed under 333 & 334 category as per UNFC nomenclature. This report will facilitate state Govt. of Maharashtra for auction of the block.

CHAPTER – 2

2.0.0 DETAILS OF THE QUALIFIED PERSON(S) / EXPLORATION AGENCY

2.1.0 INVESTIGATING AGENCY

MINERAL EXPLORATION & CONSULTANCY LIMITED

(A Govt. of India Enterprise Miniratna PSE)

Dr. Babasaheb Ambedkar Bhavan, High Land Drive Road,
Seminary Hills, Nagpur-440006.

PERSONNEL ASSOCIATED WITH PRELIMINARY EXPLORATION (G3 STAGE) FOR LIMESTONE IN DONGARGAON-KASARA BLOCK, DISTRICT: YAVATMAL, MAHARASHTRA.

1	Overall Guidance	Shri Shrikant Sharma, HoD (Exploration)
2	Overall Planning, Co-ordination & Supervision	Shri Shrikant Sharma, HoD (Exploration) Shri Naveen Kumar Pala, Dy. General Manager (Expl.) Shri Lakshmanarao Kaddala, Sr. Manager (Geology)
3	Project Management	Shri Asheesh Layer, Project Manager, Gondkhairi Project
4	Physical Execution of work	
	a) Geology	Shri Lakshmanarao Kaddala, Sr. Manager (Geology) Shri Manish Kumar Paswan, Geologist Shri D Praveen Kumar, Intern Geologist
	b) Survey	Shri Jawahar D. Chauvhan, Sr. Tech. (Survey)
	c) Drilling	Shri Ranjit Balu Kamble, Sr. Mechanic
5	Sample Processing	Shri Nasim Abdul Gaffar Sheikh, Sr. Tech. (Sampling)
		Shri Ankush Haridas Wagh, Sr. Tech. (Sampling)
		Shri Nagaraju Vaddi, Sr. Tech. (Sampling)
6	Chemical Laboratory	Shri Shrikant Sharma, HoD (Exploration)
		Shri Rohit Sharma, Sr. Manager (Chemistry)
		Dr. Deepti Rahangdale, Sr. Manager (Chemistry)
7	Petrographic Studies	Shri Sayantan Pal, Manager (Geology)
8	Documentation	Shri Naveen Kumar Pala, Dy. General Manager (Expl.)
		Shri Lakshmanarao Kaddala, Sr. Manager (Geology)
		Smt. Pooja Singh, Young Professional (Geology)
9	Non-Coal Geological Report Cell	Shri Uday Patil, Jr. Superintendent (IT)
		Shri Ashok Kumar, Jr. Superintendent (IT)
10	Hindi Translation	Shri Shreekant Rai, Sr. Hindi Translator
11	Reprography and Printing	Shri Pratap Singh Negi, Survey & Map Officer
		Shri Durgesh Devarshee, Assistant Survey & Map Officer

CHAPTER - 3

3.0.0 TITLE OF THE REPORT & OWNERSHIP

3.1.0 TITLE OF THE REPORT

3.1.1 Geological Report on Preliminary Exploration (G3) for Limestone in Dongargaon-Kasara Block, District: Yavatmal, Maharashtra.

3.1.2 **Ownership:** Department of Geology and Mining, Government of Maharashtra.

3.2.0 DETAILS ABOUT PERIOD OF PROSPECTING

3.2.1 The exploratory work in the block commenced on 18.07.2025 with the surveying and geological mapping on 1:4,000 scale over 6.06 sq.km. area with completion of all field operations on 30.06.2026. The analytical / laboratory studies were also carried out simultaneously at laboratories of MECL in Nagpur and other NABL accredited laboratories.

3.3.0 DETAILS OF EXPLORATION AGENCY, QUALIFICATION, AND EXPERIENCE OF ASSOCIATED TECHNICAL PERSONS ENGAGED IN EXPLORATION

Exploration Agency	Mineral Exploration and Consultancy Limited (Formerly Mineral Exploration Corporation Limited) A Govt. of India Enterprise – Mini Ratna – 1 CPSE
Qualification	M.Sc. / M. Sc. Tech. (Geology)
Experience	Organization have more than 50 years of experience with inception of MECL Since 1972
Address of the Prospector	Dr. Babasaheb Ambedkar Bhavan, High Land Drive Road, Seminary Hills, Nagpur, Pin- 440006
Email	cmd@mecl.gov.in; gm-exploration@mecl.gov.in
Phone No	0712-2510289; 0712-2511829

Sl.No.	Name of the Person	Designation	Qualification	Experience
1	Shri Shrikant Sharma	HoD (Exploration)	M.Sc., Geology	25 Years
2	Shri Naveen Kumar Pala	Dy. General Manager (Exploration)	M.Sc. (Tech.), Applied Geology	21 Years
3	Shri Asheesh Layer	Project Manager, Gondkhairi Project / Manager (Drilling)	B.Tech, Mechanical Engineering	11 Years
4	Shri Lakshmanarao Kaddala	Sr. Manager (Geology)	M.Sc. (Tech.), Applied Geology	20 Years
5	Shri Rohit Kumar Sharma	Manager (Chemical Lab)	M.Sc., Chemistry	15 Years
6	Shri Manish Kumar Paswan	Geologist	M.Sc., Geology	5 Years

CHAPTER – 4

4.0.0 DETAILS OF THE AREA

4.1.0 LOCATION OF THE BLOCK

- 4.1.1 The Dongargaon-Kasara Block, located in Yavatmal District of Maharashtra, spans 6.06 sq.km. is bounded by Longitude 78°48'45.71537"E to 78°51'26.31582"E and Latitude 19°50'23.52630"N to 19°51'19.01123"N and encompasses the villages of Dongargaon and Kasara in Tehsil Zari-Jamani falling within Toposheet No.56 I/13.
- 4.1.2 The block area is well connected to district headquarters, Yavatmal, via State Highways 237 and 234 via. Ghatanji and Pandharkawada. The block also well connected with nearest town Wani.
- 4.1.3 The nearest railhead is Wani in Central Region which is about 35 km north of the block. The nearest airport is Dr. Babasaheb Ambedkar International Airport, Nagpur (Located about 230 km in northern direction of the block).

Table – 4.1

**Co-ordinates of Cardinal Points of the block boundary,
Dongargaon-Kasara Block, Dist - Yavatmal, Maharashtra**

UTM, ZONE-44N, WGS-84			GEOGRAPHIC (LAT/LONG), WGS-84	
POINTS	EASTING	NORTHING	LONGITUDE	LATITUDE
A	270945.382	2196952.068	78° 48' 45.71537"E	19° 51' 19.00341"N
B	274909.100	2196901.334	78° 51' 01.92735"E	19° 51' 19.01123"N
C	275598.129	2195266.086	78° 51' 26.31582"E	19° 50' 26.13482"N
D	272343.370	2195227.478	78° 49' 34.51218"E	19° 50' 23.52630"N

4.2.0 CADASTRAL DETAILS OF THE AREA WITH LAND USE

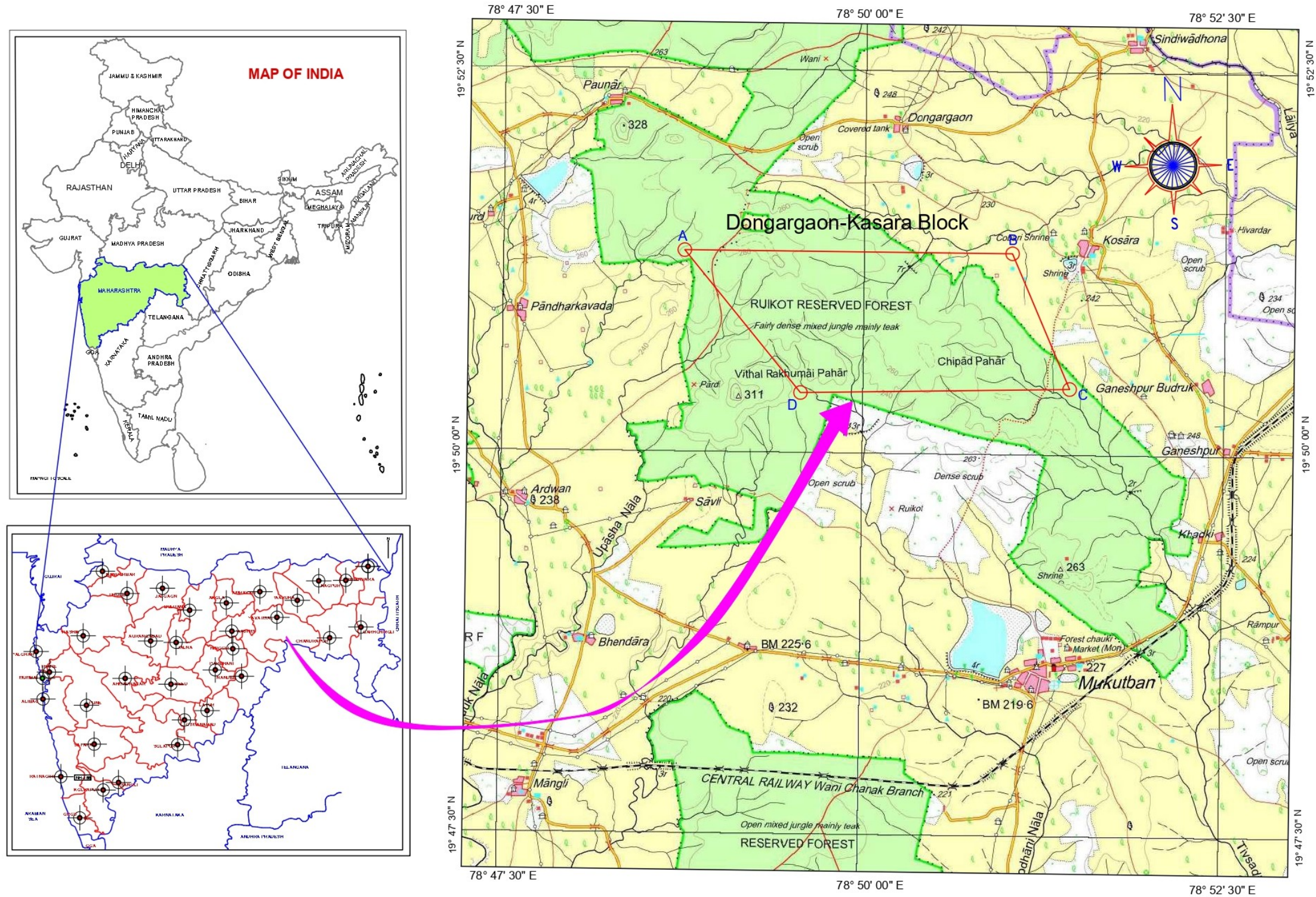
Cadastral details are not available for the study area, however indicative data collected from PM Gati shakti.

The western part of the Dongargaon-Kasara Block is covered by the Ruikot Reserved Forest under the Mukutban Range, Pandharkawada Forest Division, Yavatmal Circle. The remaining eastern part of the block comprises agricultural land, including both revenue land and private land.

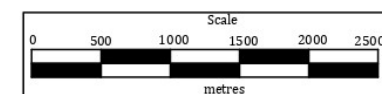
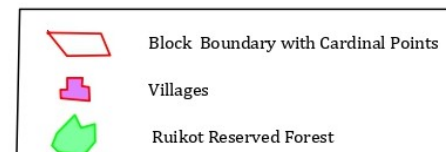
4.3.0 MINERAL(S) UNDER INVESTIGATION

LIMESTONE / DOLOMITE.

LOCATION MAP OF DONGARGAON-KASARA BLOCK (PART OF 56 I/13), OVER AN EXTENT OF 6.06 sq.km., DISTRICT: YAVATMAL, MAHARASHTRA



BLOCK BOUNDARY CO-ORDINATES OF DONGARGAON-KASARA BLOCK IN ZONE 48N (WGS 84), DIST: YAVATMAL, MAHARASHTRA						
S.NO.	BB ID	LATITUDE	LONGITUDE	EASTING	NORTHING	RL (m)
1	A	19° 51' 19.00341" N	78° 48' 45.71537" E	270945.382	2196952.068	258.074
2	B	19° 51' 19.01123" N	78° 51' 01.92735" E	274909.100	2196901.334	226.053
3	C	19° 50' 26.13482" N	78° 51' 26.31582" E	275598.129	2195266.086	224.931
4	D	19° 50' 23.52630" N	78° 49' 34.51218" E	272343.370	2195227.478	240.087



TEXT FIGURE-1

CHAPTER - 5

5.0.0 PHYSIOGRAPHY AND ENVIRONMENT

5.1.0 RELIEF OF THE AREA WITH MINIMUM AND MAXIMUM ELEVATION, DRAINAGE PATTERN, NATURAL WATER COURSES, RESERVOIRS ETC.

5.1.1 The proposed block area is characterized by undulating terrain, comprising both hilly and flat regions, with gentle slopes towards the north-east and west. The majority of the land within the block falls under the Ruikot Reserved Forest. The elevation ranges from 226 to 304 meters above mean sea level (MSL). The area exhibits a dendritic drainage pattern.

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

5.2.1 The exploration block is located in Zari-Jamani Tehsil of Yavatmal district. The block area is well connected to district headquarter Yavatmal by State Highway 237 and 234 via. Ghatanji and Pandharkawada.

5.2.2 The nearest railhead is Wani in Central Region which is about 35 km North of the block. The nearest airport is Dr. Babasaheb Ambedkar International Airport, Nagpur (located about 230 km in northern direction of the block).

5.2.3 There is no major electrical line passing through the block.

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

5.3.1 According to Census 2011, there are a total 2131 no. of people living in the villages, viz., Dongargaon and Kosara which are falling in and around the part of explored block. Out of the total population, 1087 numbers are Male and 1044 numbers are female. Apart from adults, children below 6 years are about 273 in around the explored area.

5.4.0 SOCIO DEMOGRAPHIC PROFILE OF THE AREA AND NEARBY

5.4.1 Out of the total population in villages lying as given in para no. 5.3.1, total 1390 number of people are working in agriculture as owner, co-owner and labourers, as the main occupation is agriculture.

Out of the total 2131 no. of populations 91 number belongs to Scheduled Caste and 449 number belongs to Scheduled Tribe community.

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

- 5.5.1 No Archaeology and ASI site present inside the block.
No National Park, Wildlife Sanctuary falls inside the block.
No Eco Sensitive Zone inside the block.
No Monument falls inside the block.
No Archaeological sites present inside the block.

5.6.0 FOREST, SANCTUARIES, NATIONAL PARK AND WILD LIFE SANCTUARY

91 percentage of the block area falls in Ruikot Reserved Forest towards Western direction, Mukutban Range, Pandharkawada Division, Yavatmal Circle, Maharashtra.

5.7.0 FLORA AND FAUNA

Yavatmal district in Maharashtra is rich in biodiversity, with a variety of plant and animal species thriving in its forests and landscapes. The district has about 23% forest cover, which supports a diverse range of flora and fauna.

The local vegetation primarily comprises native species such as Shal, Babul, and various thorny bushes and shrubs. In addition to this natural vegetation, agricultural lands are also present, where predominantly single-season (kharif) crops are cultivated.

The wildlife in the area includes species such as tiger, foxes, pigs, wolves, monkeys, hares (*Lepus nigricollis*), and a variety of snakes, both venomous and non-venomous. Domesticated animals commonly found in the villages surrounding the block include oxen, buffaloes, cows, sheep, and goats.

Avian observed in the region consists of bird species like mynas, parrots, sparrows, cuckoos, and owls.

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

Penganga and Vaidarbha are the two rivers flowing in the area. The southerly and south-easterly flowing drainages are merged into easterly flowing Penganga River. However, the easterly flowing drainages are merged into southerly flowing Vaidarbha River, which ultimately merged with Penganga River. The area has got

dendritic pattern of drainage.

5.9.0 CLIMATE

5.9.1 The area experiences a tropical monsoon climate with three distinct seasons: summer, monsoon, and winter. Summers (March to May) are hot and dry, with temperatures reaching up to 42°C. The monsoon arrives in June/July and continues till September, bringing the majority of annual rainfall, which ranges from 85 cm to 110 cm, mostly during July and August. Winters (November to February) are mild, with minimum temperatures occasionally dropping upto 5°C. The region has a moderately dry to wet climate overall. (Central Ground Water Board, Aquifer Mapping and Management of Ground Water Resources Yavatmal District, Maharashtra, 2021-22). Source: <https://yavatmal.gov.in/en/rainfall-and-weather/>

5.10.0 OTHER PHYSIOGRAPHIC, SOCIAL AND ENVIRONMENT FACTOR

5.10.1 The block is primarily situated on plain terrain, with a minor elevation located in the north-western part of the area. The general slope of the land is towards the northeast (NE). Surface drainage is influenced by a seasonal nalla that flows in the same direction. The drainage pattern observed in the area is dendritic, indicating a natural and well-integrated network of water flow paths.

5.10.2 Most of the block area has forest land.

5.10.3 Yavatmal district is endowed with three major economic resources, viz. agricultural land, mineral deposits and forest products. The chief major forest produces are timber and firewood and the chief minor produce is Tembhurani leaves and Hirda. Jowar and Cotton are the main crops of the district; other important cash crops are groundnut, pulses (Tur Dal), Cotton and soyabean. The chief export articles of the district are cotton and teakwood giving highest revenue to the district. In the vicinity there are several coal mines of M/s Western Coal Fields Limited and Limestone / Dolomite mines are catering for cement plants located in Chandrapur, Mukutban and Yavatmal districts.

CHAPTER - 6

6.0.0 INFRASTRUCTURE

6.1.0 LOCAL INFRASTRUCTURE DETAILS

6.1.1 Following public utilities available in the vicinity of the block which are listed below:

Following infrastructure facilities are available in the vicinity for the block area.

Facility	Location	Distance from the block (Appx.)
Police station	Mukutban	13 km
Bank facility	Mukutban	13 km
Hospital	Mukutban	13 km
Educational Institutes	Wani	35 km
High School	Kosara	1 km
Post Office	Dol. Dongargaon	5 km

6.1.2 The nearest railhead is Wani of Central Railways which is about 35 km south east of the block and nearest railway station is Wani, it is connected by a broad- gauge railway line. Specifically, it's part of the Wani-Adilabad broad gauge line, which links to Nagpur, Mumbai, and Chandrapur. The railway line serves as a crucial transportation route, including for transporting cement from a Birla/Adani group company's plant.

6.1.3 Yavatmal district is located in the southeastern part of Maharashtra, India. Yavatmal district in Maharashtra is known for its cotton and textile industries, with numerous cotton ginning, spinning and weaving units. It also has a significant agro-based industry, particularly for soybean processing and oil production. Additionally, the district has coal mines and cement factories. The district is known for its agricultural activities, particularly cotton cultivation, and is a major cotton market in the Vaidarbha region.

CHAPTER – 7

7.0.0 GEOLOGY OF THE AREA

7.1.0 REGIONAL GEOLOGY

Regionally, Yavatmal district in Maharashtra is predominantly underlain by Deccan basalts & Lameta formation, these formations belong to Gondwana and Penganga group. The limestone exposed in the area belongs to Putnur-Mangurda formation of Penganga group. It is comprised of laminated limestones and shales of shallow marine to fluvial origin. Generally, exhibit a regional strike of NW - SE with low dips ranging from 5° to 10° towards southwest.

The Stratigraphic succession around Yavatmal district, is given in Table-7.1.

Table No 7.1

**Stratigraphic succession of the Penganga Group around Adilabad, Yavatmal
Telangana and Maharashtra (Chaudhuri et al. 1989)**

Age	Supergroup	Group	Formation	Lithology
Quaternary				Alluvium
Cenozoic				Laterite
Upper Cretaceous to Palaeocene	Deccan Trap	Sahyadri	Karanja	Basalt
			Buldhana	Basalt
			Chikhli	Basalt
			Ajanta	Basalt, Cherty limestone
			Mahur	Cherty limestone, Basalt, Chert, Sandstone
Upper Cretaceous		Lameta		Limestone, Sandstone
Late Permian	Gondwana	Lower Gondwana	Kamthi	Sandstone, medium to coarse grained
Early Permian			Barakar	Sandstone, medium grained
Late Carboniferous to Early Permian			Talchir	Sandstone
Neoproterozoic	Penganga		Putnur-Mangurda	Limestone, laminated shale with limestone
			Takallapalli	
Archean to Palaeoproterozoic	Peninsular Gneissic Complex-II			Hornblende Biotite Gneiss

7.1.1 **Alluvium**

Alluvium is exposed along the banks of Wardha, Vaidarbha and Penganga Rivers. Vaidarbha River is located in east side of the block which flows towards South East direction and merges into the Penganga River. Penganga River is located south to the block, which flows towards east direction. Alluvium comprises of Sand, Gravels, Silt and clay. Alluvium is a geologically recent deposit of fine, loose sediments like sand, silt, clay, and gravel transported and deposited by flowing rivers of Wardha, Vaidarbha and Penganga Rivers.

7.1.2 **Basalt**

Regionally, basalt is found in five different formations viz., Karanja, Buldhana, Chikhli, Ajanta and Mahur belongs to Upper Cretaceous to Palaeocene age. Each formation represents a separate basalt flow, all of which are part of Sahyadri group of Deccan Traps.

Karanja basalt is exposed east of Yavatmal. These basalts are fine to medium grained texture. Rock is massive, hard and compact, dark grey in colour.

Buldhana basalt is exposed to the south and west of Yavatmal, as well as in southeast of Marawadi. This basalt is fine grained, sparsely to moderately porphyritic texture. Rock is hard and dark grey in colour.

Chikhli Basalt is exposed near Marawadi (V) extending South and East wards, west of Kalgaon village area and north of Karanji village. These basalts are fine to medium grained, hard, compact, massive, dark grey in colour, moderately porphyritic.

Ajanta Basalt is exposed near Marawadi (V) extending east and south east of Mahagaon. Cherty limestone is also exposed in the southeast part of Mahagaon (V). This basalt is fine to medium grained, sparse to highly porphyritic with inter-trappeans beds clay and cherty limestone which contain fossils gastropods. These are dark grey, massive, hard and compact.

7.1.3 **Lameta Formation**

The Lameta Formation is exposed north of the Wani area and primarily comprises limestone and sandstone. It dates back to the Upper Cretaceous age. The limestone is white to grey in colour, hard, compact, and cherty. The sandstone is variegated, unconsolidated, and features clay bands and current bedding.

7.1.4 **Lower Gondwana**

The Lower Gondwana Group in the region is subdivided into three key

lithostratigraphic formations: Kamthi, Barakar and Talchir, each representing a distinct geological time span and depositional environment.

- **Kamthi Formation:** This unit belongs to the Late Permian age and is prominently exposed in the northern part of the block area, including around Mukutban. It typically comprises sandstones, shales, and occasional coal seams, deposited in a fluvial to deltaic environment. The sedimentary structures observed in the formation reflect high-energy river systems during its deposition.
- **Barakar Formation:** The Barakar Formation is characterized by coarse-grained sandstones interbedded with significant coal seams, Making it economically important. The sandstones are typically dirty white to grey in colour and often show cross-bedding, indicating deposition in a braided stream environment.
- **Talchir Formation:** Representing the oldest unit of the Lower Gondwana Group, the Talchir Formation ranges from the Late Carboniferous to Early Permian. It is distinguished by glacially influenced deposits, including pebbly beds, olive green shale, gritty yellow sandstone, thinly bedded soft rocks, and a basal conglomerate (boulder bed). These lithologies reflect deposition in glacio-fluvial and glaciolacustrine environments, marking the onset of Gondwana sedimentation following extensive glaciation.

7.1.5 Penganga Group

This formation is present in the eastern reaches of the district (near borders with Chandrapur dist), dating back to the Lower Cretaceous. Penganga Formation is characterized by alternating beds of limestone and red shale, prominently exposed along the Penganga and Khuni river sections in the southern part of Yavatmal district. In this region, the formation forms a large inlier within the Deccan basalt cover, extending further south into Adilabad district, Telangana. Stratigraphically, it comprises a lower limestone member and an upper shaly member. The limestone dominates exposures in the western and southwestern stretches along the Penganga River, whereas the shale member is more prevalent in the eastern and southeastern areas, particularly along the Penganga and Khuni rivers.

A notable outcrop of greenish-white dolomite, conformably overlying red shales between Piwardol and Matharjun - approximately 5 km southwest of Bori is interpreted as the uppermost horizon of this formation. The beds generally dip

gently (5° – 10°) towards the southwest and are relatively undisturbed. They are overlain by Deccan basalt flows on all sides, with the exception of the southern margin. Limestone/Dolomite exposed in Dongargaon-Kasara Block belongs to Putnur-Mangurda formation.

7.1.6 **Peninsular Gneissic Complex–II (PGC-II)**

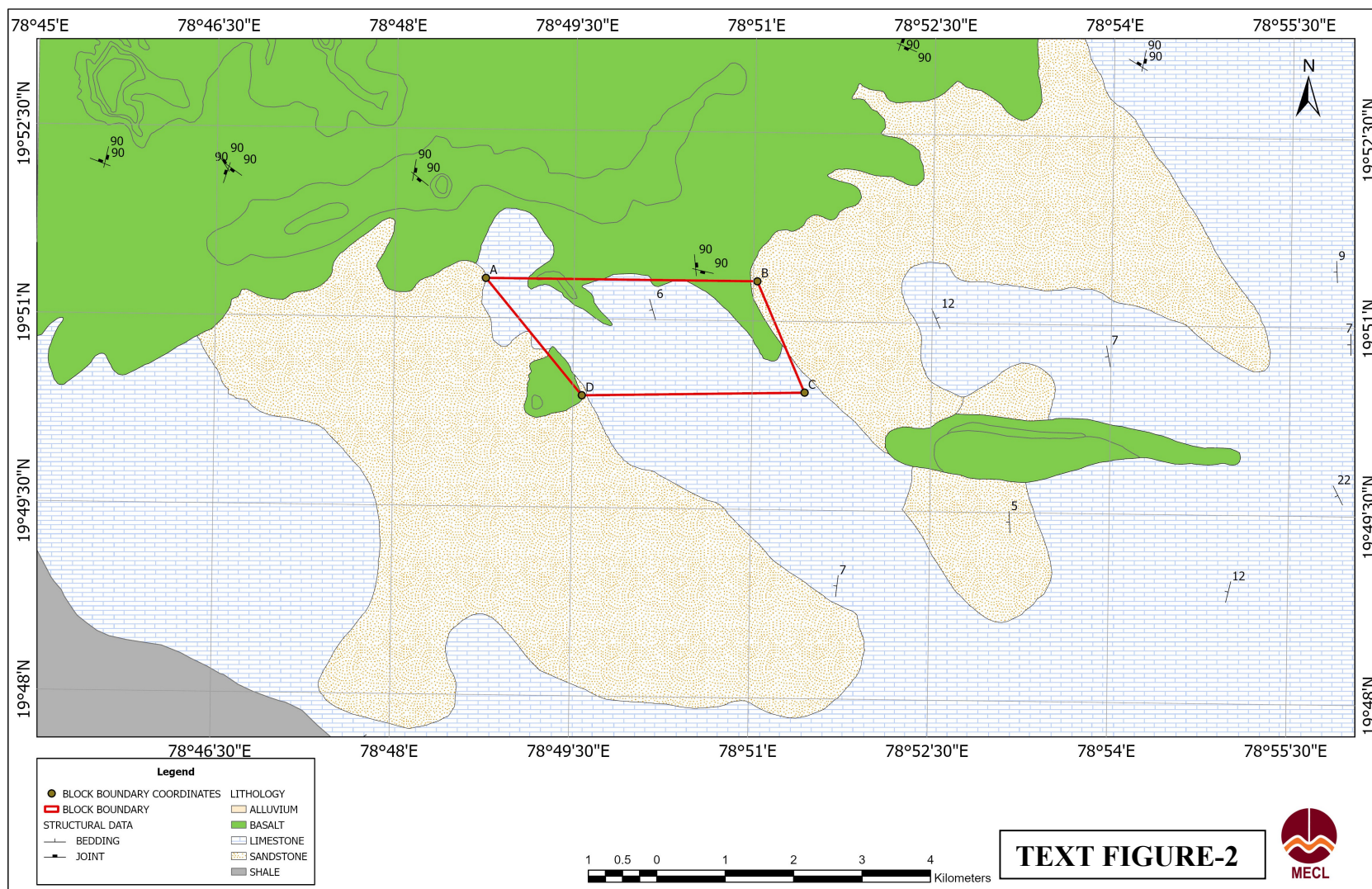
PGC-II represents some of the oldest crystalline basement rocks in the Indian subcontinent, dating back to the Archaean Eon (over 2.5 billion years ago). In the Yavatmal district, exposures of PGC-II are typically found in the eastern and southeastern parts, often forming the basement for younger sedimentary and volcanic sequences such as the Gondwana formations and Deccan Traps.

7.2.0 **REGIONAL STRUCTURE**

The Putnur–Mangurda Formation lies within the NW–SE trending Pranhita–Godavari Valley, a major tectonic corridor that preserves a thick sedimentary record spanning over 200 million years. The formation is often found in inliers windows of older rock exposed within younger cover sequences providing valuable insights into the basement architecture and early basin evolution.

In the Mangurda, Putnur area, these rocks are gently folded and exhibit low dips, indicating relatively mild tectonic deformation. Their preservation beneath the Deccan Traps and proximity to formations like the Penganga, Lameta and Gondwana sequences Makes them crucial for reconstructing the pre-volcanic stratigraphy of the region.

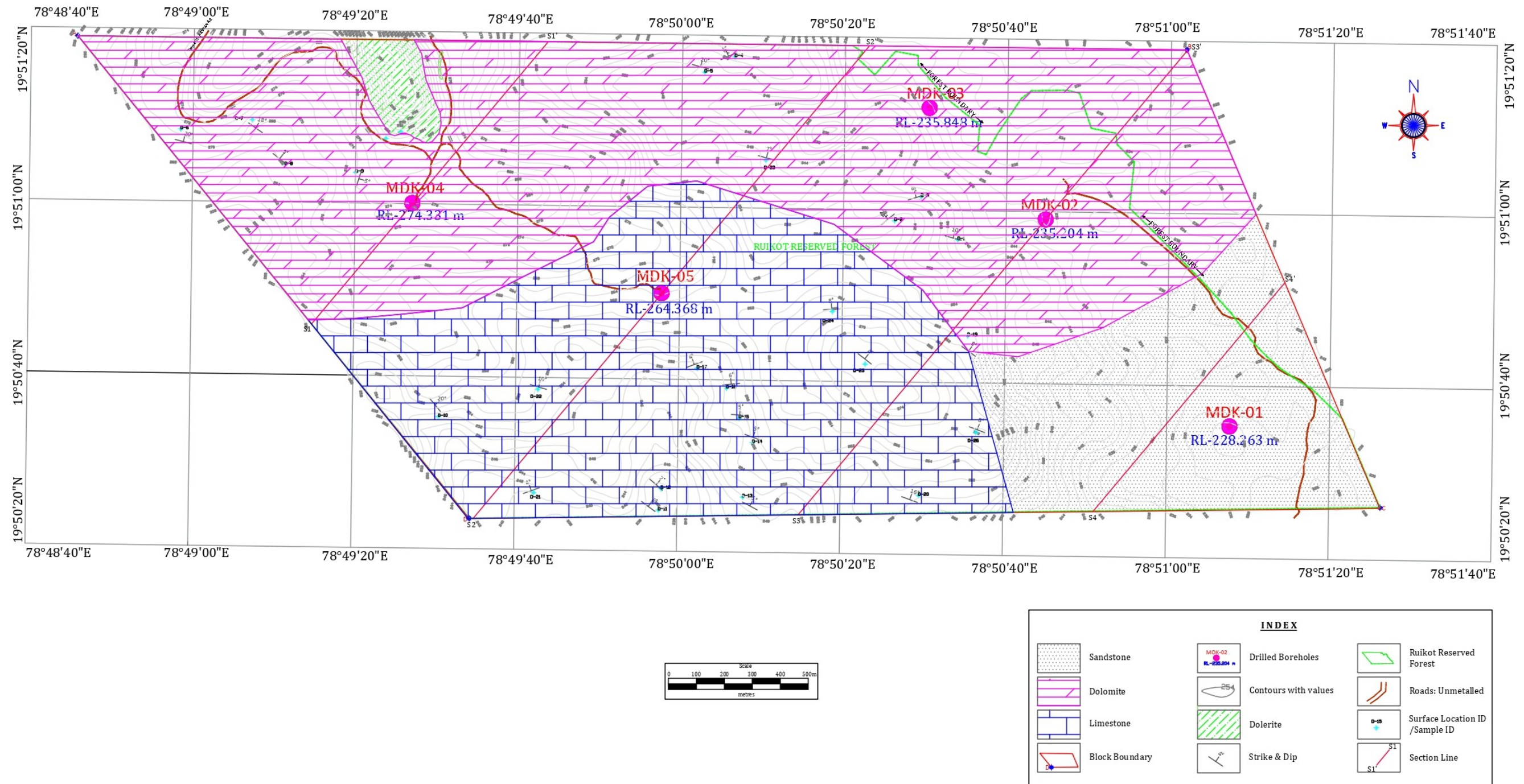
Regional Geological map of Dongargaon Kasara Block (Part of Pranhita Godavary Valley), Yavatmal District, Maharashtra



7.3.0 GEOLOGY OF THE BLOCK

- 7.3.1 The Dongargaon-Kasara Block, covering an area of 6.06 sq.km. was geologically mapped by MECL on 1:4000 scale, accompanied by a topographical survey. The majority of the area is blanketed by soil and with fewer exposures of limestone and dolomite, which belongs to Putnur-Mangurda formation.
- 7.3.2 Generalized stratigraphy of explored block (after GSI) is given in below table 7.2. Geological map on 1:4000 scale is submitted as Plate-III and Text -3.

TOPOGRAPHICAL AND GEOLOGICAL MAP OF DONGARGAON-KASARA BLOCK (OVER AN EXTENT OF 6.06 sq.km.), DISTRICT: YAVATMAL, MAHARASHTRA



TEXT FIGURE-3

Table-7.2
Generalized stratigraphy of Dongargaon-Kasara Block, Dist: Yavatmal,
Maharashtra.

Age	Supergroup	Group	Formation	Lithology
Quaternary				Alluvium
Upper Cretaceous to Palaeocene	Deccan Trap	Sahyadri	Karanja, Buldhana, Chikhli, Ajanta, Mahur	Basalt, Cherty limestone
Upper Cretaceous		Lameta		Limestone, Sandstone
Late Permian to Early Permian	Gondwana	Lower Gondwana	Kamthi, Barakar Talchir	Sandstone, medium to coarse grained
Neoproterozoic	Penganga		Putnur-Mangurda	Quartz vein, Shale
			Takallapalli	Limestone/Dolomite Conglomerate
Archean to Palaeoproterozoic	Peninsular Gneissic Complex-II			Hornblende Biotite Gneiss

7.4.0 DESCRIPTION OF ROCK TYPES

The Litho-units of Dongargaon-Kasara Block area is described below.

7.4.1 SOIL

About 50 percent of the block area is covered by soil. Soil cover within the block area varies in thickness from 0m to 5.50m, colour is light grey to black. The thickness of the soil is not uniform in entire block. A maximum thickness of 5.50m is observed in south eastern part and minimum thickness m in central part of the block. Thickness of soil as intersected is maximum 5.50m in borehole no. MDK-02 and minimum thickness 0m in the Borehole No. MDK-05.

PUTNUR-MANGURDA FORMATION

Exposures mapped in the block belongs to the Putnur-Mangurda formation lesser- known but geologically intriguing unit of the Penganga Group. These formations typically consist of Proterozoic to Lower Palaeozoic sedimentary rocks, including Shales, Limestone and Dolomite.

The Putnur-Mangurda sequence likely represents shallow marine to fluvial depositional environments and its exposures may be found in structurally controlled inliers or along river sections, particularly in areas like Mangurda village in Yavatmal district.

7.4.2 LIMESTONE

The limestone outcrops are available on the surface near the borehole no. MDK-05 and two limestone zones are intersected in the borehole no. MDK-04 and MDK-05 along with Dolomite and thicknesses of Limestone is from 8m to 19m. Limestone is greyish-white in colour and fine grained, bedded, fractured, hard and massive. When tested with dilute hydrochloric acid, it shows medium to high effervescence, indicating a significant carbonate content.

The regional geological trends and borehole correlations suggest a strike ranging from N51°W–S51°E to with a gentle Northeasterly dip of 4° - 21°. Subsurface data from boreholes MDK-04 & MDK-05 confirm the presence of limestone along with Dolomite.

Limestone intersected in the boreholes has analytical value ranging from 35.54% to 52.02% CaO, 0.77% to 11.36% MgO & 2.19% to 15.48% SiO₂.

A total 5 samples were collected from borehole cores (MDK-02, MDK-03, MDK-04 & MDK-05) were sent to petrology lab of MECL, Nagpur for petrological studies and confirmed that samples are Impure micritic limestone and Dolomite/Dolomite. Details are given below Table 7.3.

Table No. 7.3
Summary of the petrographic study done by Petrology Laboratory, MECL

No.	Sample No.	BH No.	From(m)	To (m)	Rock type Identification
1	DK-PET-01	MDK-02	18.60	18.65	Impure dolomite
2	DK-PET-02	MDK-03	45.21	45.26	Impure dolomite
3	DK-PET-03	MDK-04	4.75	4.85	Dolomite
4	DK-PET-04	MDK-04	9.21	9.28	Micritic limestone
5	DK-PET-05	MDK-05	44.60	44.65	Dolomite



Figure 1: Photograph showing outcrop of limestone in central part of the block



Figure 2: Photograph showing cores of limestone zone from 11.00m to 16.00m in Bh. MDK-04



Figure 3: Photograph showing cores of limestone zone from 21.00m to 26.00m in Bh. MDK-04



Figure 4: Photograph showing cores of limestone zone from 5.00m to 10.00m in Bh. MDK-05



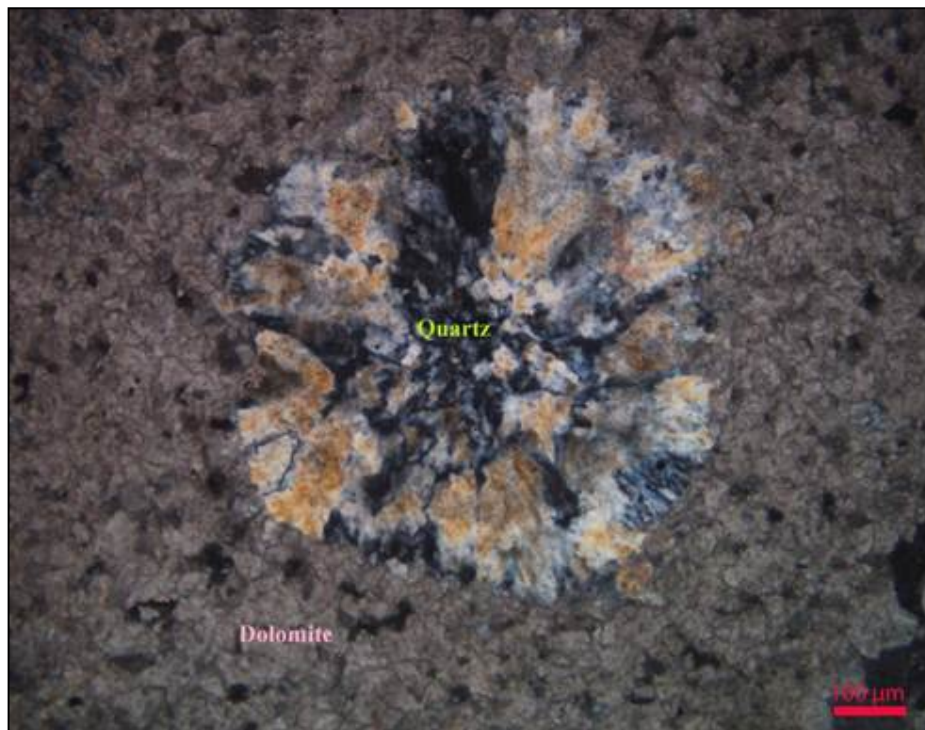
Figure 5: Photograph showing cores of limestone zone from 25.00m to 30.00m in Bh. MDK-05



Figure 6: Photograph showing cores of Dolomite zone from 31.00m to 36.00m in Bh. MDK-02



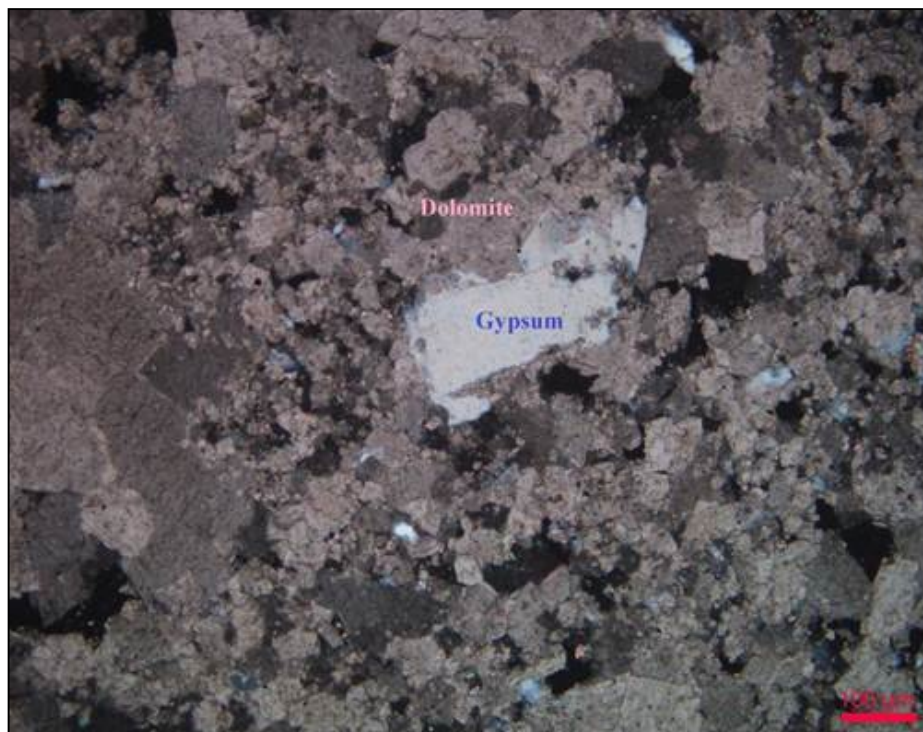
Figure 7: Photograph showing cores of Dolomite zone from 41.00m to 46.00m in Bh. MDK-03



Pmg - 1: Photomicrograph showing subrounded quartz filling within dolomite as seen under crossed nicols.

Specimen No.: DK-PET-01

Magnification: 100X



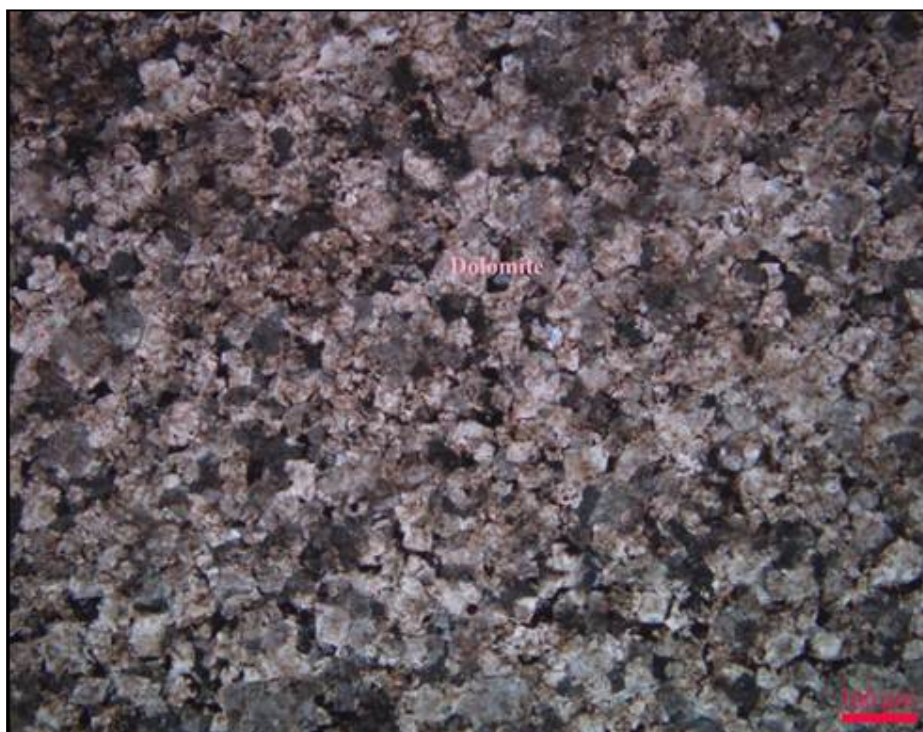
Pmg – 2: Photomicrograph showing gypsum prism replacing dolomite in dolomite as seen under crossed nicols.

Specimen No. : DK-PET-01

Magnification : 100X



Pmg – 3: Photomicrograph showing intrusion of opaque/ ferruginous fillings and calcite vein within micritic limestone as seen under crossed nicols.
Specimen No. : DK-PET-04 **Magnification: 100X**



Pmg – 4: Photomicrograph showing fine to very fine subhedral rhombic aggregates of dolomite as seen under crossed nicols.
Specimen No. : DK-PET-05 **Magnification: 100X**

7.4.3 DOLOMITE

Outcrops of dolomite are observed in North-western part of block area are predominantly Dolomite. One outcrop of dimensions 8 x 5m is located in the northwestern part of the block area. These dolomite beds exhibit the structural trend of N51°W-S51°E with a gentle dip angle ranging from 4° to 21° due northeasterly. The dolomite is typically fine-to medium-grained, with a white to light grey colour and characterized by Mottling structure with highly jointed nature.

Dolomite was intersected in the boreholes MDK-02, MDK-03, MDK-04 and MDK-05 with interception of the maximum thickness of 49m in MDK-03 and minimum thickness of 4m in MDK-05. The analytical value ranges from 26.16 to 37.16% CaO, 10.13 to 19.11% MgO and 0.66 to 14.84% SiO₂.



Figure 8: Dolomite exposures in the North-western part of the block area

7.4.4 DOLERITE

The Outcrops of Dolerite are observed in northwestern part of block area. One outcrop of dimensions 7m x 6m is located in the northwestern part of the block area. However, Dolerite was not intercepted in any borehole. It is medium-grained, massive and hard in texture, and it displays a characteristic light green coloration.



Figure 9: Dolerite exposures in the North-western part of the block area

7.4.5 SANDSTONE

There is no surface indication of the Sandstone in the block area. However, Sandstone was intercepted in borehole MDK-01 spans from 7.60 m to 20.00 m depth. The borehole was terminated at 20.00 m due to the absence of any

indication of limestone or dolomite mineralization. The intercepted sandstone is fine- to medium-grained in texture and exhibits a light grey to whitish colour.

7.5.0 BLOCK STRUCTURE AND MINERALIZATION

7.5.1 The Limestone and Dolomite beds in the block exhibit a consistent structural alignment with the associated units, maintaining a strike direction of N51°W-S51°E and dipping 4° to 21° towards northeasterly direction. This uniformity in orientation suggests that lithology was subjected to the same tectonic regime, likely during a regional phase of gentle folding or tilting.

7.6.0 BEDDING AND DIP CHARACTERISTICS

7.6.1 The gentle southwesterly dip indicates a monoclinical structure, where the strata have been tilted uniformly without significant folding or faulting.

7.6.2 The N51°W-S51°E strike aligns with regional structural trends observed in the surrounding sedimentary basins, possibly influenced by basement lineaments or paleostress orientations.

7.6.3 Fracturing and Jointing

7.6.3.1 Surface exposures of dolomite show well-developed joint sets, often orthogonal to the bedding planes.

7.6.3.2 The presence of Mottled structure (elephant skin weathering) - a characteristic surface pattern caused by differential weathering along microfractures - further supports the idea of intensive surface fracturing and prolonged subaerial exposure.

7.6.4 Structural Controls on Mineralization

7.6.4.1 The alignment of limestone/ dolomite beds, along with the presence of an abandoned limestone/dolomite mine to the east of the block highlights the economic potential and geological persistence of these carbonate formations across the area.

7.6.5 Tectonic Implications

7.6.5.1 The gentle dips and consistent strike direction imply that the area has experienced low-intensity tectonic deformation, possibly related to basin-wide subsidence or mild compressional forces during the Proterozoic or early Phanerozoic.

7.7.0 MINERALISATION IN THE BLOCK

The Dongargaon-Kasara Block comprises limestone and dolomite arranged in a simple bedded sedimentary succession. Drilling has demonstrated that the

carbonate horizons are laterally traceable between boreholes within the explored area and follow a uniform structural disposition with gentle north-easterly dips.

- 7.7.1 The limestone and dolomite units are intercalated with thin shale partings and argillaceous bands. Owing to this interlayering, the limestone frequently contains higher insoluble matter, particularly silica, which is reflected in the analytical results.
- 7.7.2 Despite local variations in thickness and quality, the overall deposit maintains a stratiform character without evidence of major structural disturbances. Dolomite bands generally show better persistence, while limestone horizons exhibit internal grade variability controlled by the proportion of shale admixture.
- 7.7.3 The mineralisation is therefore interpreted as strata bound within a simple and relatively undisturbed sedimentary package, consistent with the present G3 level of investigation.

CHAPTER 8

8.0.0 PREVIOUS WORK

8.1.0 DETAILS OF PREVIOUS EXPLORATION CARRIED OUT BY OTHER AGENCIES/PARTIES

8.1.1 The earliest mention of limestone is by Jenkin (1833) and Voysey (1833) dealing with the geology and mineralogy of the Yavatmal area, Central provinces. The geology of the area was first studied by T.W.H. Hughes, in the year 1877 who mapped the limestone bands as Penganga beds in south of Yavatmal district as Vindhyan. B.N. Sinha mapped the toposheet no 56 I/13. Later workers like A.K.R. Hemmady (1964) considered the Penganga beds to be representing transitional state between Vindhyan and Cuddapah. R.K. Agarwal and V Subba Rao of Geological Survey of India, carried out systematic geological mapping in parts of toposheet no 56 I /09, 56 I/13 and 56 I/14 in field season 1984-85 and mapped the limestone bands as Penganga beds.

8.1.2 M/s Taj Lime Industries and Shri Prabin Wamanrao Kasawar have been carried out prospecting in Dongargaon area over 30.70 Ha and 41.00 Ha area respectively. M/s Taj Lime Industries has analysed 5 samples for CaO, MgO and SiO₂ from 5 trial pits and established 3.75 mt limestone resource. The analysis ranges of the samples are given below.

Constituents	Grade (%)	
	From	To
CaO	31.18	57.07
MgO	0.77	23.13
SiO ₂	2.82	5.18

8.1.3 Shri Prabin Wamanrao Kasawar has analysed 4 samples for CaO, MgO and SiO₂ from 4 trial pits and established 4.25 mt limestone resource. The analysis ranges of the samples are given below.

Constituents	Grade (%)	
	From	To
CaO	32.62	54.16
MgO	0.19	18.58
SiO ₂	0.98	2.09

CHAPTER - 9

9.0.0 AERIAL GROUND GEOPHYSICAL, GEOCHEMICAL EXPLORATION

9.1.0 During present investigation no aerial ground geophysical, geochemical exploration has been carried out.

CHAPTER - 10

10.0.0 EXPLORATION UNDERTAKEN DURING CURRENT INVESTIGATION

10.1.0 INTRODUCTION

- 10.1.1 The Dongargaon-Kasara Block falls in Survey of India Toposheet No. 56 I/13., Dol Dongargaon and Kosara are villages in and around the block which belongs to Tehsil: Zari-Jamani, District: Yavatmal, State: Maharashtra.
- 10.1.2 The Dongargaon-Kasara has been proposed on the basis of lapsed lease areas identified by the State Government of Maharashtra, which were originally granted under Section 10A(2)(b) of the MMDR Act, 2015. However, following the 2021 amendment to the Act, all such Prospecting License (PL) reports were declared ineligible, mandating allocation through auction. Further, these PL reports are required to be evaluated to confirm the level of mineral evidence (G4, G3, etc.) as per the provisions of the Minerals (Evidence of Mineral Contents) Rules, 2015.
- 10.1.3 The Directorate of Geology and Mining (DGM), Government of Maharashtra, requested MECL to take up the exploration in lapsed 10A(2)(b) lease mining lease areas vide letter no. Tech/1848/2023/260, Dated 23/01/2024.
- 10.1.4 MECL formulated exploration proposal involving 450m drilling in 09 boreholes at G3 level of exploration in and around Dongargaon and Kasara villages of Tehsil: Zari-Jamani, District: Yavatmal Maharashtra.
- 10.1.5 Exploration Proposal (G3) for Dongargaon-Kasara Block (6.06 sq.km.) was submitted and deliberated in 76th TCC-1 meeting held on 30th April and 1st May, 2025. Committee, noted 10A(2)(b) cases and committee recommended (Annexure-7A & 7B) the project to EC with proposal titled as “Preliminary Exploration (G3 Level) for Limestone in Dongargaon-Kasara Block (6.06 sq.km.), District: Yavatmal, Maharashtra”.
- 10.1.6 On recommendation of 76th TCC-1, 42nd EC of NMEDT meeting held on 2nd June, 2025 approved this project with total cost of 122.58 lakhs. (Annexure-7A).

10.2.0 OBJECTIVES OF INVESTIGATION

- 10.2.1 The preliminary exploration was proposed with following objectives in Dongargaon-Kasara Block are as follows:

- (a) To carry out detailed Topographical Survey and Geological mapping on 1:4000 scale over an extent of 6.06 sq.km.
- (b) To delineate the strike and depth continuity of the limestone by drilling of vertical boreholes of 09 numbers on 800m strike interval.
- (c) To carry out exploration as per Minerals (Evidence of Mineral Contents) Rule-2015 (Amended 2021) & Mineral (Auction) Rules-2015 (Amendments).
- (d) The proposed exploration programme will demarcate limestone and dolomite zones of various grades, as per UNFC norms and estimation of limestone/dolomite resources which in turn will facilitate the State Govt. for auctioning of the block.

10.3.0 DETAILS OF WORK

10.3.1 After receipt of approval from NMEDT, MECL has carried out exploration activities in Dongargaon-Kasara Block. The details, nature and quantum of work proposed Vs achievement is given below

Table No. 10.1
Quantum of Work for Proposed Vs Achieved in Dongargaon-Kasara Block

Sl. No.	Item of Work	Unit	Target	Achieved
1	Topographic Survey & Geological Mapping on 1:4000 scale	sq.km.	6.06	6.06
2	Boundary and borehole demarcation with DGPS	Nos	13	9
3	Pitting & Trenching	cu.m.	30	0
4	Exploratory Drilling	m.	450	220
			09 Bhs	05 Bhs *
5	Laboratory Studies			
	i) Chemical Analysis: Primary samples for 10 radicals, CaO, MgO, SiO ₂ , Fe ₂ O ₃ , Al ₂ O ₃ , SO ₃ , P ₂ O ₅ , K ₂ O, Na ₂ O & LOI by XRF. (BRS & Core samples)	Nos.	430	211
	ii) External Check (NABL) samples: (10% of Primary samples) for analysis of for 10 radicals, CaO, MgO, SiO ₂ , Fe ₂ O ₃ , Al ₂ O ₃ , SO ₃ , P ₂ O ₅ , K ₂ O, Na ₂ O & LOI by XRF	Nos.	43	21
6	Physical Studies			
	a) Petrological Studies	Nos.	5	5
	b) Bulk Density Determinations	Nos.	2	2

Sl. No.	Item of Work	Unit	Target	Achieved
7	Report Preparation	Nos.	1	1
	(5 Hard copies with one soft copy)			
8	Preparation of Exploration Proposal (5 Hard copies with a soft copy)	Nos.	1	1

Note: * Out of 9 BH, 5 BH have been drilled. The remaining 4 BH are in a dense and non-accessible forest area. Hence, drilling of these 4 boreholes could not be taken up, Tree felling is not permitted in the forest clearance.

10.4.0 EXPLORATION ACTIVITIES TAKEN UP

10.4.1 Exploration activities viz., Geological Mapping, Topographical Survey on 1:4000 scale, exploratory drilling in 05 no. of boreholes were carried out along with associated analytical works.

10.4.2 MECL commenced exploration activities on 18.07.2025 and completed with all field activities on 30.06.2026.

10.4.3 Geological mapping was carried out at 1:4,000 scale for the entire area of 6.06 sq.km. depicting the lithologs, structure and surface mineralization. Broad lithological units and litho-contacts have been mapped with the help of handheld GPS. Attitude and structural features of rocks like bedding, folds and joints has been recorded by Brunton Compass. General Strike of the litho-units N51°W – S51°E with dip angle 4°- 21° due north-eastern. The readings recorded in the field were plotted in the geological map and submitted as (Plate III).

10.4.4 Topographical survey, exploratory drilling and borehole core sampling was carried out concurrently. The analytical / laboratory studies were carried out in laboratories of MECL and JNARDDC, Nagpur (NABL accredited laboratory).

10.4.5 Boreholes core was systematically logged as per geological characters i.e. grain size, rock type, structural, and mineralogical. Detailed lithologs and summarized lithologs are submitted as Annexure -II-A & II-B.

10.5.0 DETAILS OF SURFACE SAMPLING, DRILLING ETC.

10.5.1 During geological mapping about 20 number of surface samples are collected and analysed for 10 radicals i.e., CaO, MgO, SiO₂, Fe₂O₃, Al₂O₃, SO₃, P₂O₅, K₂O, Na₂O & LOI by XRF method, compiled as Annexure-III-A.

10.5.2 About 191 numbers of primary core samples are generated from the drilled boreholes, which were analysed for 10 radicals i.e., CaO, MgO, SiO₂, Fe₂O₃, Al₂O₃, SO₃, P₂O₅, K₂O, Na₂O & LOI by XRF method, compiled as Annexure -

III-B.

- 10.5.3 10% samples of primary drill core samples, about 21 nos. of external check samples were analysed at JNARDDC Lab, Nagpur for 10 radicals i.e. CaO, MgO, SiO₂, Fe₂O₃, Al₂O₃, SO₃, P₂O₅, K₂O, Na₂O & LOI by XRF, complied as Annexure-III-C.
- 10.5.4 A total of 5 no. of samples were studied for petrological study and 2 no. of samples for bulk density determination which is enclosed as Annexure-V and VI respectively.

CHAPTER - 11

11.0.0 LOCATION OF DATA POINTS

11.1.0 ACCURACY AND QUALITY OF SURVEY USED TO LOCATE BLOCK BOUNDARY AND DRILL HOLES

- 11.1.1 The entire survey work has been carried out with the help of DGPS (MDCe-Trimble DGPS, CATALYST DA). With the help of DGPS, Co-ordinates of surface features i.e. roads, village boundaries, water bodies, base station and block co-ordinates i.e. 4 nos. of block boundary cardinal points with R.L. has been determined (Annexure-I-A) and topography along with geological map is presented (Plate-III). Contour interval in topographical map is kept at 2m. The topographical survey was done in PPK (Post Precision Kinematics) mode. Positional (horizontal) accuracy of the survey is 3mm while the elevation accuracy is 2.5mm in PPK mode.
- 11.1.2 DGPS survey was carried out for boreholes drilled by MECL and block boundary cardinal points (Annexure-I-B). The base station was utilized for the fixing of the boreholes on the ground level. The coordinates of base station is given in Table-11.1.

Table No. 11.1
Co-ordinates of the base station for DGPS survey of
Dongargaon-Kasara Block

Point Name	UTM Zone-45North		Elevation (Meter)
	Easting (Meter)	Northing (Meter)	
GB-1	2194298.229	277365.508	229.101

11.2.0 QUALITY AND ADEQUACY OF TOPOGRAPHIC CONTROL

- 11.2.1 Block boundary co-ordinates, the surface features, contour points and borehole points were surveyed by DGPS. The topographical survey was done in PPK (Post Precision Kinematics) mode. Positional (horizontal) accuracy of the survey is 3mm while the elevation accuracy is 2.5mm in PPK mode.



Figure 10: Photographs showing determination of RL and coordinates of Borehole MDK-04 in Dongargaon-Kasara Block

CHAPTER - 12

12.0.0 SAMPLING TECHNIQUES

12.1.0 NATURE AND QUALITY OF SAMPLING AND MEASURES TAKEN TO ENSURE SAMPLE REPRESENTATIVITY

- 12.1.1 The present work has been formulated to undertake Preliminary Exploration (G3 stage) for limestone in the Dongargaon-Kasara Block. Given that nearly 50% of the block is soil covered with scanty outcrops, exploration was largely dependent on subsurface core drilling to evaluate lithology and mineralization. A total of five boreholes were drilled for 220 m cumulative depth, intersecting limestone, dolomite and sandstone. Dolomite is the dominant litho unit with localized limestone horizons. In addition, five core samples were collected from boreholes for petrographical studies.
- 12.1.2 A total of 211 (BRS 20 no. & 191 no. core) samples were generated, which are analysed at Chemical lab, MECL, Nagpur. 21 nos. external check samples are analysed at JNARDDC Lab, Nagpur for analysing of 10 radicals, CaO, MgO, SiO₂, Fe₂O₃, Al₂O₃, SO₃, P₂O₅, K₂O, Na₂O & LOI by XRF method. Further, 5 no. of samples were studied for petrography and 2 no. of core samples were studied for bulk density.
- 12.1.3 Borehole core sampling work has been carried out in the presence of qualified geologist and sampling technician. Geologist marked the limestone/dolomite zones for sample preparation and under supervision of sampling technician sample was drawn.

CHAPTER - 13

13.0.0 DRILLING TECHNIQUES AND DRILL SAMPLING EMPLOYED

13.1.0 DRILLING TYPES AND DETAILS

13.1.1 MECL has executed core drilling using RD-30 (MEC-333) coring drill rigs, a total 5 no. of vertical boreholes with a cumulative meterage of 220 were drilled. The details of coordinates of boreholes are given in Annexure-I-B and summary of boreholes is given in Table-13.1.

Table No. 13.1
Details of Co-ordinates (in WGS-84), Reduced Levels of boreholes drilled by
MECL, Dongargaon-Kasara Block

Sl. No.	Borehole No	Easting (m)	Northing (m)	Elevation (m)	Date of Commencement	Date of Closure	Total Depth (m)
1	MDK-01	275060.356	2195555.847	228.263	13.03.2026	17.03.2026	20.00
2	MDK-02	274403.425	2196295.447	235.204	27.03.2026	15.04.2026	50.00
3	MDK-03	273988.991	2196694.063	235.848	19.04.2026	05.05.2026	50.00
4	MDK-04	272140.202	2196354.230	274.331	12.05.2026	05.06.2026	50.00
5	MDK-05	273030.864	2196032.204	264.368	08.06.2026	19.06.2026	50.00
Total Drilling Meterage							220.00

13.1.2 Drilling was carried out using NQ size with single barrel wire line, wet core drilling method. In each borehole, as NW casing was set from initial 3.00m and up to 9.00m to stabilize the upper loose strata before advancing drilling in NQ size up to final depth.

13.1.3 Out of 9 proposed BH, 5 BH have been drilled. The remaining 4 BH are in a dense and non-accessible forest area. Hence, drilling of these 4 boreholes could not be taken up, Tree felling is not permitted in the forest clearance.

13.1.4 All boreholes were drilled vertically to the approved depths of 30 m to 50 m, as per the approved NQT of NMEDT. Since all boreholes were drilled vertically, no borehole deviation survey was carried out. Boreholes MDK-02 to MDK-05 were closed at a depth of 50 m, whereas MDK-01 was terminated at a depth of 20 m, as the absence of limestone/dolomite mineralization.



Figure 11: Picture showing Conventional drill rig MEC-333 (RD-30) at drill site for Bh. MDK-04

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

13.2.1 The core samples have been recorded properly and the detailed borehole wise run wise lithologs and summarized lithologs for boreholes are given in Annexure-II-A and Annexure-II-B respectively. The run wise lithologs of drilled core as well as the cuttings from boreholes have helped in discerning the physical characters like colour, shape, size and nature of the mineralisation as well as texture, structural features and identification of different litho units.

13.2.2 The mineralised zones /length recorded during the geological core logging have been sampled for Limestone/Dolomite and analysed for 10 radicals. The primary samples had been marked in the mineralized zones intersected in the borehole based on visual inspection/lithology and in general the sample length has been kept as 1.00m to 2.00 in the boreholes. The details of analysis of primary core samples are given in Annexure-III-B.

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

13.3.1 The entire core drilling has been done by NQ size diamond drill bit with single barrel wire line, wet core drilling method to optimize sample recovery. To stabilize the upper loose formation NW casing was set in each borehole ranging from 3.00m to 9.00m depending on lithological conditions. The polymer was used

as drilling fluid to flush out the cuttings and stabilize the borehole wall. The drilling fluid also works as a coolant to avoid burning of drill bits. Core recovery was consistently maintained in limestone/dolomite horizon, however in case of weathered, loose and fractured zone and in solution cavities, the core recovery was low. Whenever core recovery is less, the grade of the recovered portion has been extrapolated over the non-recovered section. However, all the precautions like modulated water pressure, proper liner, optimum head pressure and the hands of an expert drilling technician had been taken to maintain the quality of drilling.

13.4.0 ROCK QUALITY DESIGNATION STUDIES

13.4.1 Rock Quality designation (RQD) is a modified measure of the degree of jointing or fracture in a rock mass, measured as a percentage of the drill core in lengths of 10 cm or more. High- quality rock has an RQD of more than 75%, low quality of less than 50%. Rock quality designation (RQD) has several definitions. The most widely used definition was developed in 1964 by D.U. Deere. It is the borehole core recovery percentage incorporating only pieces of solid core longer than 100 mm in length measured along the centre line of the core.

13.4.2 Deere (1964) defined Rock Quality designation (RQD) as the sum of the length of all core pieces more than 10cm long as a percentage of the total core length.

$$\text{RQD}\% = (\text{Length (m) of core pieces} \geq 10 \text{ cm} / \text{Total length(m) core run}) \times 100$$

13.4.3 When calculating RQD, it is important to consider only naturally occurring discontinuities (bedding, fracture, faults, joints, shear zones etc.) in the rock mass. In weakened / addition, only sound bedrock is used in the calculation of RQD, excluding or weathered rock. It is specified that a minimum of NQ size core obtained with double tube core barrel for determination of RQD.

13.4.4 The basic classification comparing RQD with a qualitative rock quality and description of the rock is given in Table- 13.2.

Table 13.2:

Classification Comparing RQD with qualitative rock quality

Rock Quality	RQD (%)	Description of Rock
Excellent	90-100	Intact rock
Good	75-90	Massive
Fair	50-75	Blocky and foliated
Poor	25-50	Shattered, very blocky and foliated
Very Poor	0-25	Crushed

13.4.5 Total Core Recovery (TCR)

Total core recovery (TCR) is defined sum of all measurable core recovered over one drill run. The mensuration is given below:

$$\text{Recovery} = [\text{Measurable core recovered length (m)}/\text{Drill run length (m)}] \times 100$$

- 13.4.6 The RQD conducted on all 5 no. of boreholes, which has been given in Table 13.3. The average of RQD is falls in “Very Poor” category as per D.U.Deere classification.

Table 13.3:

Borehole wise RQD as per Deere classification

Sl. No.	Borehole No.	Soil thickness	Total Depth	Thickness of litho	RQD Thickness	RQD %	Category
1	MDK-01	4.00	20.00	16.00	1.51	9.44	Very Poor
2	MDK-02	5.50	50.00	44.50	0.57	1.28	Very Poor
3	MDK-03	1.00	50.00	49.00	2.13	4.35	Very Poor
4	MDK-04	1.50	50.00	48.50	25.61	52.80	Fair
5	MDK-05	0.00	50.00	50.00	35.66	71.32	Fair

13.5.0 WHETHER THE RELATIONSHIP EXISTS BETWEEN SAMPLE RECOVERY AND GRADE

- 13.5.1 Core recovery in limestone/dolomite horizon is >90%, hence grade analysed for Limestone/dolomite zone is reliable.

13.6.0 CORE LOGGING

- 13.6.1 The entire core recovered by drilling was logged systematically in detail lithological units that can be observed by visual inspection. The details of lithology, grain size, colour, texture, structural features, presence of intercalations and cavities have been recorded. Wherever the recovery is less, extrapolations of drilled depth were done on proportionate basis considering the physical characteristics of individual units recovered. All the cores were kept and preserved properly in the GI core boxes of specifications given by NMEDT following “Book Pattern”. The detailed run wise lithologs and summarized lithologs for boreholes are given in Annexure-II-A and Annexure-II-B respectively.

CHAPTER - 14

14.0.0 SUB SAMPLING TECHNIQUES AND SAMPLE PREPARATIONS

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

14.1.1 The core sampling has been carried out for entire mineralized limestone/dolomite zones/length intersected in the boreholes. Samples were marked and drawn from limestone/dolomite zones marked on the basis of visual basis. Then the core has been split into two equal halves by hydraulic core splitter in such a way that the core is uniformly split into two equal halves. The whole quantity of half portion of the sample as marked while logging is crushed to (-) 200 mesh size and about 500g representative sample of (-) 200 mesh was drawn by coning and quartering method of gradual size reduction with the help of crusher and pulveriser. Out of 500gm, 100gm each were drawn for Primary Chemical analysis of 10 radicals (CaO, MgO, Al₂O₃, SiO₂, Fe₂O₃, SO₃, P₂O₅, K₂O, Na₂O and LOI) at Chemical Laboratory, MECL Nagpur. The remaining 400g fraction was kept for external check sample analysis and future reference purpose.

14.1.2 During the present exploration, a total of 211 nos. of primary samples analysed at MECL Laboratory, Nagpur. 21 nos. of external check samples for limestone/dolomite mineralization were prepared. 21 numbers of external check samples for same 10 radicals have analysed at Jawaharlal Nehru Aluminium Research Development and Design Centre (JNARDDC), Nagpur (A NABL accredited Laboratory). The details of analysis of primary BRS and core samples are given in Annexure-III-A & III-B. The details of external check samples and its comparison with primary sample analysis are presented in Annexure-III-C & III-D.

14.2.0 NATURE, QUALITY AND APPROPRIATENESS OF THE SAMPLE PREPARATION TECHNIQUE

14.2.1 The details of sampling procedure for primary samples are described in para

14.2.2 Quality of the sample preparation is maintained by proper cleaning, maintenance of the equipment and proper crushing, sieving and coning and quartering of samples. For sample preparation, proper technique and expertise has been used.

14.2.3 The adopted methodology is consistent with standard exploration practices prescribed by NMEDT and international sampling protocols (e.g., UNFC). The combination of half-core sampling, controlled splitting, fine pulverization, and coning & quartering minimizes sampling bias and enhances reproducibility of

results. The inclusion of external check samples further strengthens the **QA/QC framework**, ensuring analytical accuracy and comparability.

14.3.0 QUALITY CONTROL PROCEDURES ADOPTED

14.3.1 Systematic quality control measures were implemented throughout the exploration program to ensure the reliability and accuracy of results. The primary core samples were collected from the entire mineralized zones intersected in the boreholes and prepared at a centralized mechanized sampling unit under the strict supervision of qualified sampling technicians, following standard sampling protocols. Similarly, all external check samples were generated under the same controlled conditions to maintain uniformity and minimize bias. Prior to sampling, all boreholes were thoroughly logged for lithology, texture, structure, and mineralization, and core samples were collected at controlled intervals of 1m to 2m or along lithological boundaries. Each sample was properly sealed, labeled, and documented with depth coordinates to establish a clear chain of custody.

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

14.4.1 All the primary samples have been marked and prepared from mineralised cores. During the preparation of primary samples, the mineralised cores have been studied meticulously and samples have been marked properly. These mineralised cores are subjected for preparation of primary samples as per the sampling procedure for primary samples are described in Para 14.1.1. The proper marking of primary samples from drilled cores and following standard procedure for sample preparation and >90% of core recovery shows the representative samples have been collected from the in-situ materials.

14.5.0 WHETHER SAMPLE SIZES ARE APPROPRIATE TO THE GRAIN SIZE OF THE MATERIAL BEING SAMPLED

14.5.1 The primary samples have been prepared (-) 200 mesh size and all the other samples have been prepared from primary samples. As per the previous studies in the area, (-) 200 mesh size is appropriate for the analysis of limestone/dolomite etc. mineralization in the block area.

CHAPTER - 15

15.0.0 QUALITY OF ASSAY DATA AND LABORATORY TESTS

15.1.0 THE NATURE, QUALITY AND APPROPRIATENESS OF THE ASSAYING AND LABORATORY PROCEDURES

15.1.1 20 no. of BRS samples were collected from outcrops of limestone/dolomite and analysed for 10 radicals i.e. CaO, MgO, Al₂O₃, SiO₂, Fe₂O₃, SO₃, P₂O₅, K₂O, Na₂O and LOI by XRF method at Chemical Laboratory, MECL, Nagpur.

15.1.2 191 primary samples from boreholes from limestone/dolomite mineralized zones have been analyzed for 10 radicals i.e. CaO, MgO, Al₂O₃, SiO₂, Fe₂O₃, SO₃, P₂O₅, K₂O, Na₂O and LOI by XRF method at, MECL, Nagpur And 21 External check samples for same 10 radicals have been analysed in Jawaharlal Nehru Aluminium Research Development and Design Centre (JNARDDC), A NABL accredited Laboratory, Nagpur.

15.2.0 PRIMARY AND CHECK SAMPLE STUDIES OF BOREHOLE SAMPLES

15.2.1 A total of 21 samples as external check samples are analysed at Jawaharlal Nehru Aluminium Research Development and Design Centre (JNARDDC), Nagpur for 10 radicals (CaO, MgO, Al₂O₃, SiO₂, Fe₂O₃, SO₃, P₂O₅, K₂O, Na₂O and LOI by XRF). Analytical results and comparison with primary samples are provided in the Annexure-III-C & III-D.

15.2.2 In order to assess the bias and inaccuracies in analytical determination as well as to check the repeatability of analysis, 19 borehole samples and 3 BRS were analysed for external check analysis out of 211 primary samples for limestone/dolomite. The comparative studies for CaO, MgO, SiO₂, Fe₂O₃ & Al₂O₃ external check samples along with primary samples are tabulated below.

15.2.3 The R² value of CaO is 0.987, which is very close to 1. This means that 98.70% of the variation in the check values can be explained by the primary values. It indicates a strong linear correlation between the two datasets. Since the slope is close to 1 and R² is high, the check samples are highly consistent with the primary values. The small deviation (slope slightly <1) suggests that the check values tend to be slightly lower than the primary values on average. This could indicate minor systematic differences between primary and check sample analyses, such as small lab measurement biases.

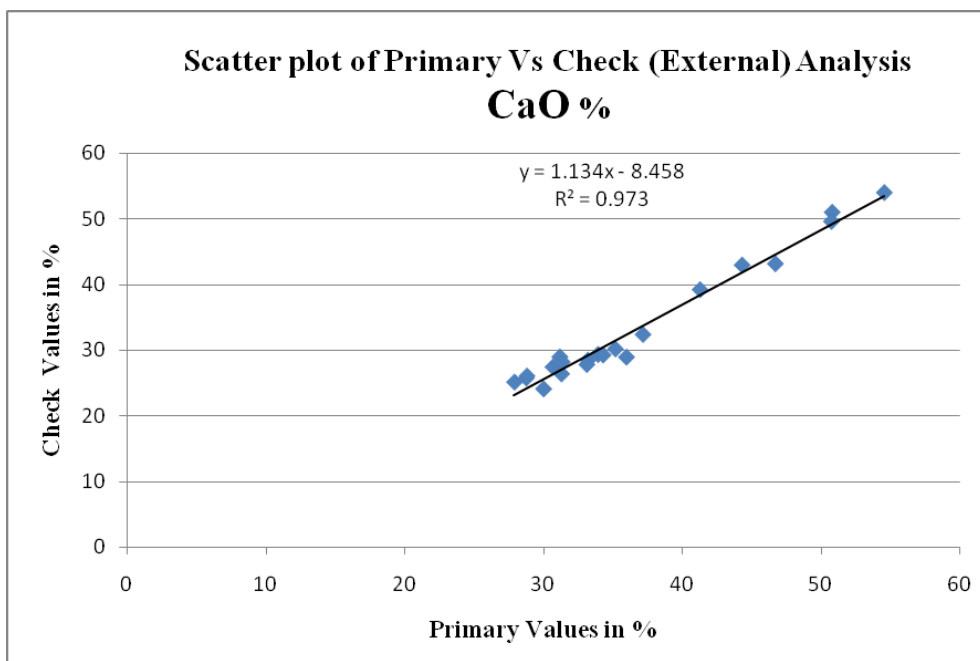
i) The scatter plots clearly show scatter of values along a band closely

following the bisector.

- ii) The arithmetic means of principal and check assays show an excellent agreement for all the radicals.
- iii) The correlation coefficient, which is an index assays showing value for CaO% 0.987, MgO% 0.992, Al₂O₃% 0.999, SiO₂% 0.998 and Fe₂O₃% 0.952, which implies excellent/agreement for the data set of primary and check analysis of radicals.
- iv) Comparison of primary vs. external check sample analysis for CaO, MgO, Al₂O₃, SiO₂ & Fe₂O₃ along with scatter plots for above analysis are presented below:

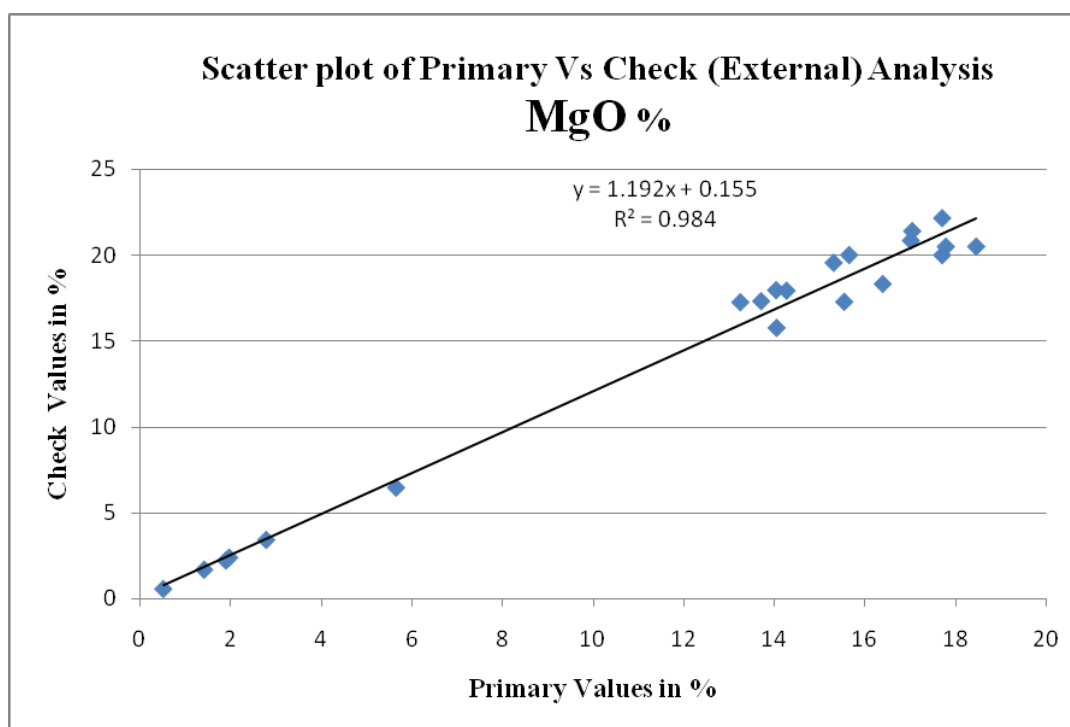
COMPARISON OF PRIMARY Vs. EXTERNAL CHECK ANALYSIS

COMPARISON INDEX	CaO %	
	Primary	Check
No. of Sample Pairs	21	
Arithmetic Mean	36.718	33.21
Standard Deviation	7.901	9.087
Std. Error of Mean	1.724	1.983
Variance	62.43	82.582
Mean of Deviation	3.508	
Standard Deviation (Error)	1.821	
Correlation Coefficient	0.987	
Mean Absolute Error	3.521	
Mean Relative Random Error	9.589%	
Paired T value	8.825	
F - test value	0.756	



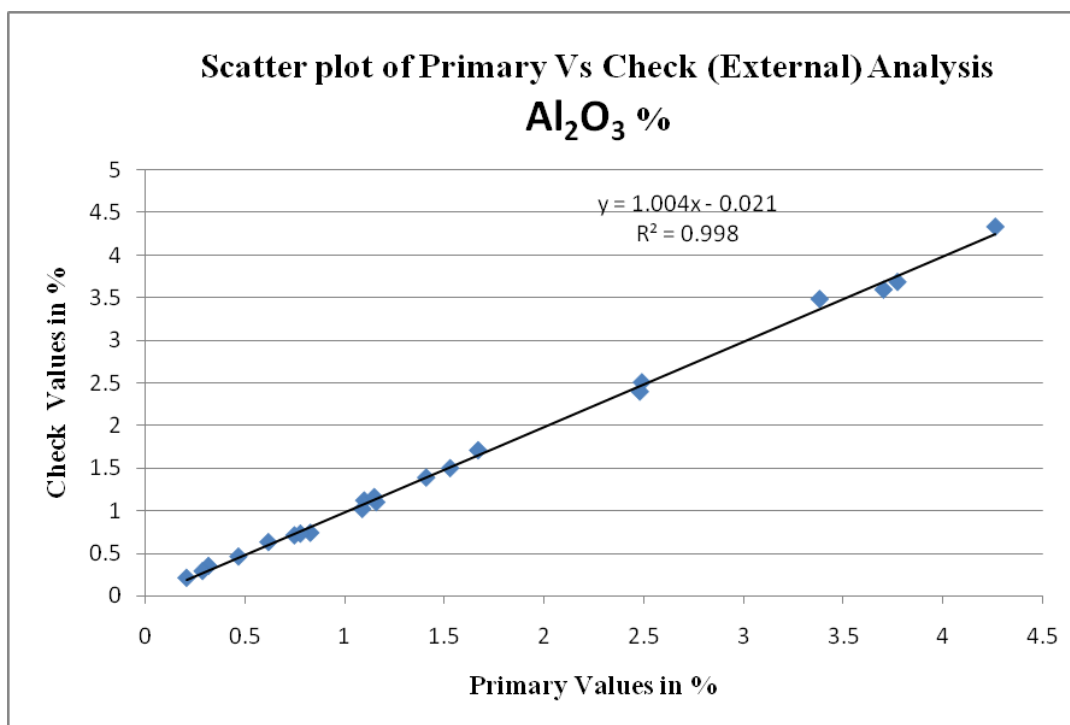
COMPARISON OF PRIMARY Vs. EXTERNAL CHECK ANALYSIS

COMPARISON INDEX	MgO %	
	Primary	Check
No. of Sample Pairs	21	
Arithmetic Mean	12.0	14.46
Standard Deviation	6.305	7.577
Std. Error of Mean	1.376	1.653
Variance	39.757	57.408
Mean of Deviation		-2.46
Standard Deviation (Error)		1.542
Correlation Coefficient		0.992
Mean Absolute Error		2.46
Mean Relative Random Error		20.501%
Paired T value		-7.31
F - test value		0.693



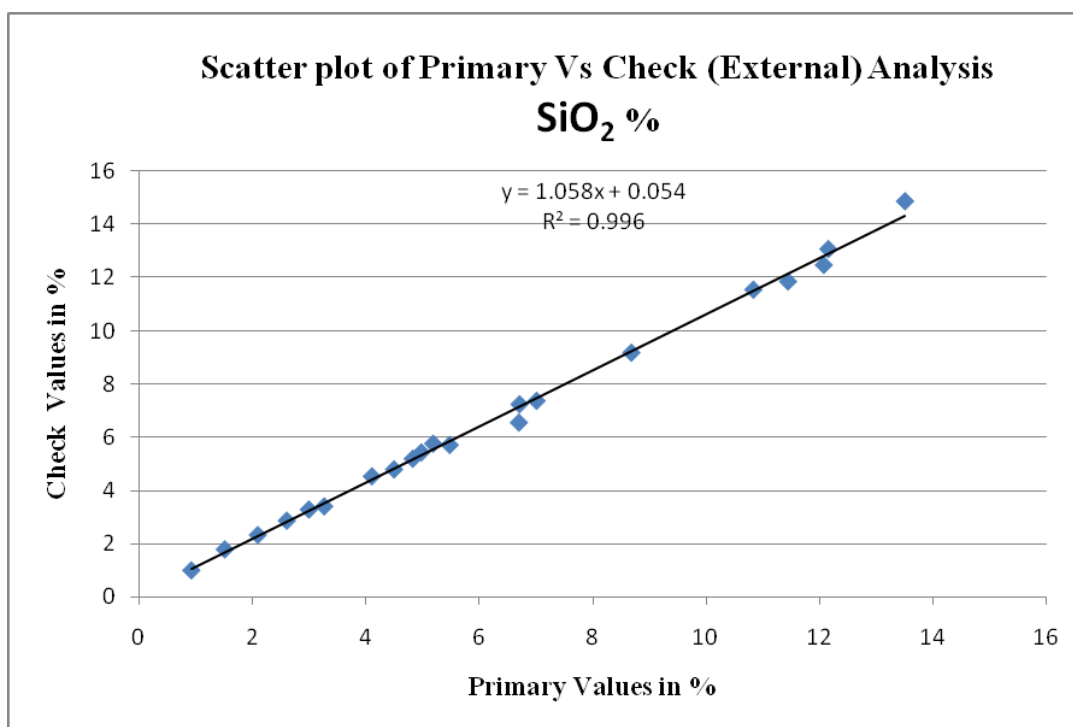
COMPARISON OF PRIMARY Vs. EXTERNAL CHECK ANALYSIS

COMPARISON INDEX	Al ₂ O ₃ %	
	Primary	Check
No. of Sample Pairs	21	
Arithmetic Mean	1.593	1.579
Standard Deviation	1.223	1.229
Std. Error of Mean	0.267	0.268
Variance	1.495	1.511
Mean of Deviation	0.015	
Standard Deviation (Error)	0.054	
Correlation Coefficient	0.999	
Mean Absolute Error	0.045	
Mean Relative Random Error	2.839%	
Paired T value	1.242	
F - test value	0.99	



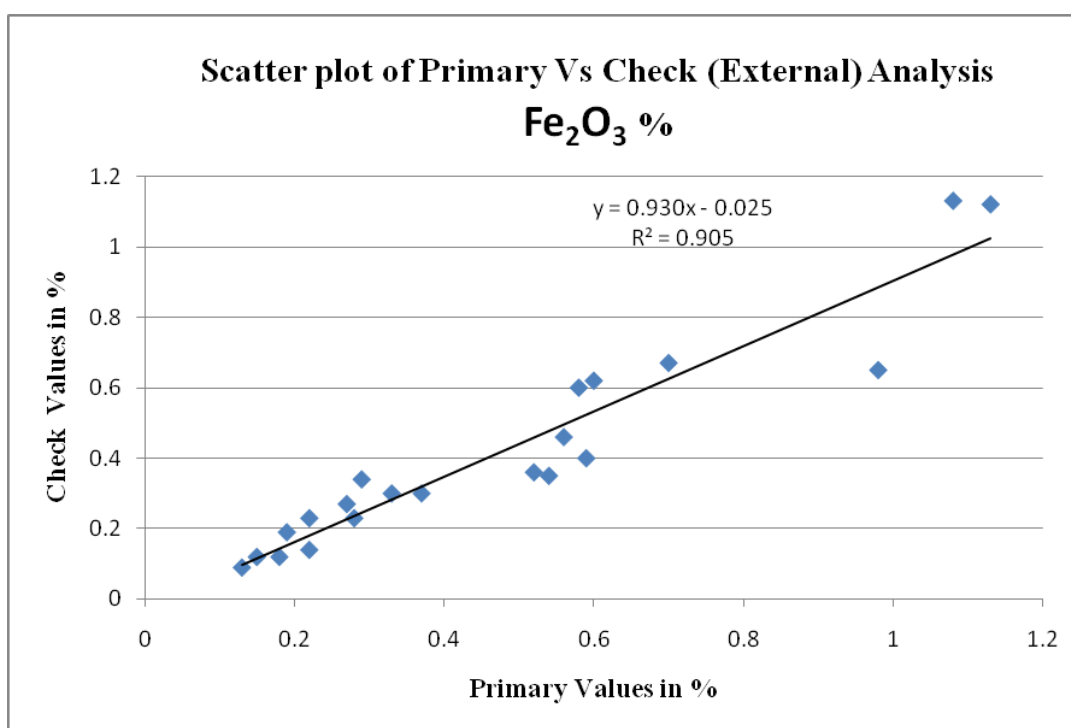
COMPARISON OF PRIMARY Vs. EXTERNAL CHECK ANALYSIS

COMPARISON INDEX	Primary	SiO ₂ % Check
No. of Sample Pairs	21	
Arithmetic Mean	6.267	6.688
Standard Deviation	3.714	3.937
Std. Error of Mean	0.81	0.859
Variance	13.792	15.501
Mean of Deviation	-0.42	
Standard Deviation (Error)	0.311	
Correlation Coefficient	0.998	
Mean Absolute Error	0.434	
Mean Relative Random Error	6.922%	
Paired T value	-6.206	
F - test value	0.89	



COMPARISON OF PRIMARY Vs. EXTERNAL CHECK ANALYSIS

COMPARISON INDEX	Fe ₂ O ₃ %	
	Primary	Check
No. of Sample Pairs	21	
Arithmetic Mean	0.472	0.414
Standard Deviation	0.295	0.288
Std. Error of Mean	0.064	0.063
Variance	0.087	0.083
Mean of Deviation	0.058	
Standard Deviation (Error)	0.091	
Correlation Coefficient	0.952	
Mean Absolute Error	0.072	
Mean Relative Random Error	15.338%	
Paired T value	2.929	
F - test value	1.047	



15.3.0 STANDARD OPERATING PROCEDURE (SOP) FOR THE ANALYSIS BY MECL LAB, NAGPUR

15.3.1 The assaying and laboratory procedures adopted in the present exploration program were designed to ensure accuracy, reliability and scientific appropriateness of results in line with standard mineral exploration practices.

SOP for Chemical analysis carried out by XRF pellet method.

- (a) Sample Particle Size: The Sample is ground to a particle size $<75\mu\text{m}$, but $<50\mu\text{m}$ is ideal.

- (b) Sample preparation: Pellets preparation - The process of Making pressed pellets for XRF analysis includes grinding the sample to fine particle size and pressing the sample at pressure of between 15 to 35 ton.
- (c) Instrumentation procedure
- (i) X-ray irradiates the sample, (ii) Sample emits secondary X-ray characteristic of a particular element. (iii) Analyzing sample rotates to accurately diffract each wavelength and satisfy Bragg's Law. (iv) Detector measures position and intensity of XRF peaks.



**Figure 12: Photograph of WD- XRF instrument (Rigaku, Japan)
at Chemical Lab, MECL, Nagpur.**

15.3.2 STANDARD OPERATING PROCEDURE (SOP) FOR THE DETERMINATION OF LOSS ON IGNITION (L.O.I.) AT MECL LAB.

Procedure:

1. Weigh 1 gm of dry sample in silica or platinum crucible.
2. Place this crucible in muffle furnace at a temperature below 300°C. Raise the temperature of the furnace to 1000°C. Keep this at this temperature for about 30 minutes.
3. Cool the crucible in desiccators and weigh the crucible.
4. Find the loss in weight.
5. $\% \text{ Loss on Ignition (LOI)} = (\text{Loss in weight} / \text{Weight of the sample}) \times 100.$

15.4.0 STANDARD OPERATING PROCEDURE (SOP) FOR THE ANALYSIS BY JNARDDC, NAGPUR

15.4.1 Following Procedure followed for XRF pellet method with preparation sample pellet from homogenized 100gm sample with hydraulic compressor, following are steps followed

1. XRF (Model- Axiosm Ax, MDCe-P analytical).
2. CRM used- NCSDC-16006.
3. Procedure for Preparation of Pellets by Hydraulic Press:
4. For XRF measurement a sample must be homogenized, pulverized to -200 mesh and pressed into pellet.
5. Weigh accurately 5 gm of sample and used 10 gm of boric acid as a binder.
6. Press the sample at a pressure of around 20-22 tons on a hydraulic press (Pallet Making Machine) with a diameter of 40 mm.
7. Calibrate the XRF equipment using known standards for elements present in limestone (Calcium, Magnesium etc.).
8. Ensure the instrument is set up correctly according to standard guidelines
9. Place the prepared pellet into the sample holder.
10. Ensure the sample cup is positioned correctly in the instrument for carrying out analysis.
11. Start the XRF analysis using software and initiate the analysis process automatically.
12. Allow the XRF instrument to scan the sample. It will emit X-rays onto the sample, causing the atoms to emit fluorescence.
13. Record the results in a report, including elemental concentrations and any relevant information about the analysis conditions.
14. Intermediate check also performed using bead with inbuilt software.

15.4.2 Procedure for determination of LOSS ON IGNITION (LOI).

Weighed quantity of sample (duly dried at 110°C) is placed in platinum crucible and heated to 1000°C for about an hour. Sample is again weighed after it is cooled. Difference in weight expressed in percentage as LOI.

15.5.0 NATURE OF QUALITY CONTROL PROCEDURES ADOPTED

- 15.5.1 In order to ensure the accuracy of the analysed samples, BCS-CRM No. 393 has been used as certified reference material (CRM) for limestone and NCS DC 28201 has been used as CRM for dolomite at Chemical lab, MECL. The Certified Reference Material (CRM) was processed under similar conditions as samples and run after every 20 samples.
- 15.5.2 Quality control (QC) ensures accuracy, precision, and reliability of analytical results in XRF Analysis. It involves systematic procedures to monitor and maintain data integrity. Running blanks, duplicates, and CRMs after every 20 samples ensures data quality, detects contamination, checks precision, and validates accuracy, which are critical for reliable XRF results.
- 15.5.3 A total 21 nos. of External Check samples have been analysed at JNARDDC, Nagpur for 10 radicals i.e. CaO, MgO, Al₂O₃, SiO₂, Fe₂O₃, SO₃, P₂O₅, K₂O, Na₂O and LOI analysis.
- 15.5.4 In order to assess the bias and inaccuracies in analytical determination as well as to check the repeatability of analysis, 19 borehole samples and 2 BRS were analysed for external check analysis out of 211 primary samples.

15.6.0 SECURITY AND CHAIN OF CONTROL OF SAMPLES SHOULD BE CLEARLY MENTIONED.

- 15.6.1 The samples have been prepared at centralized mechanized sampling unit with proper labelling and tag and sent to chemical laboratory in supervision of qualified sampling technician. At the sampling unit, standard procedure has been followed and all the precautionary measures have been taken to avoid the contamination. The MECL sampling unit in Nagpur is part of the chemical laboratory.
- 15.6.2 Sample collection – under supervision of qualified geologist

Type of sample collection	Supervision
Bedrock/Soil/Stream	Qualified Geologist
Pitting Sample	N/A
Drill Core Sample Marking	Qualified Geologist
Sample processing, Packing & labelling	Sample Technician
Analysis	Assistant Manager Chemical Lab
Sampling unit/Chemical Lab	Manager Chemical Lab

CHAPTER - 16

16.0.0 MOISTURE

16.1.0 All the analysis of borehole core samples has been carried out with in-situ moisture.

CHAPTER - 17

17.0.0 BULK DENSITY

17.1.0 BULK DENSITY ANALYSIS DETAILS

17.1.1 A total 2 no. of core samples are subjected to bulk density studies detailed procedure is given below:

- a. **Applicability:** This method shall be applicable in hard litho units, where regular solid cylindrical drill cores are obtained during the course of drilling. The drill core samples to be used for the study should be of NQ or larger diameter.
- b. **Sample Preparation:** Take a full cylindrical drill core sample of minimum fifteen (15) centimeters - length with both ends trimmed smoothly at right angle to the core axis using a mechanical core cutter to form a regular cylinder.
- c. **Procedure:** Measure the length of the sample, at-least at four locations along its axis by suitably rotating the sample. Measure the diameter of the sample using a Caliper scale, at least at four locations, preferably at regular interval. Weigh the air-dried sample in a platform balance.
- d. **Calculation:** Take mean average of all the readings for length and diameter. Divide the average mean value of diameter by two to arrive at the radius of the sample. The volume of a core sample is obtained by using formulae: $V = \pi r^2 h$ (where V = volume, r = radius and h = height or length of the cylindrical core). The bulk density of the sample is determined by using the formula: $B.D = M/V$ where $B. D$ = bulk density, M = mass (weight) of the sample and V = volume of the sample.

17.1.2 **Number of Samples studied:** Total 2 no. of core samples are studied, where a total of five observations are carried out for each sample. The average of these observations results for each sample may be taken as the final bulk density for the purpose of estimation of resources. Bulk density determination results are mentioned below:

Sl.No.	Sample No.	Rock Type	Bulk Density (gm/cc)
1	MDK-BD-01	Limestone	2.77
2	MDK-BD-02	Dolomite	2.81

17.1.0 Bulk density for limestone and dolomite calculated separately. Bulk density for limestone is 2.77 gm/cc and dolomite is 2.81 gm/cc (Caliper Method). These values have been considered for estimation of resource. The details of Bulk density determination results are given in Annexure-VI.

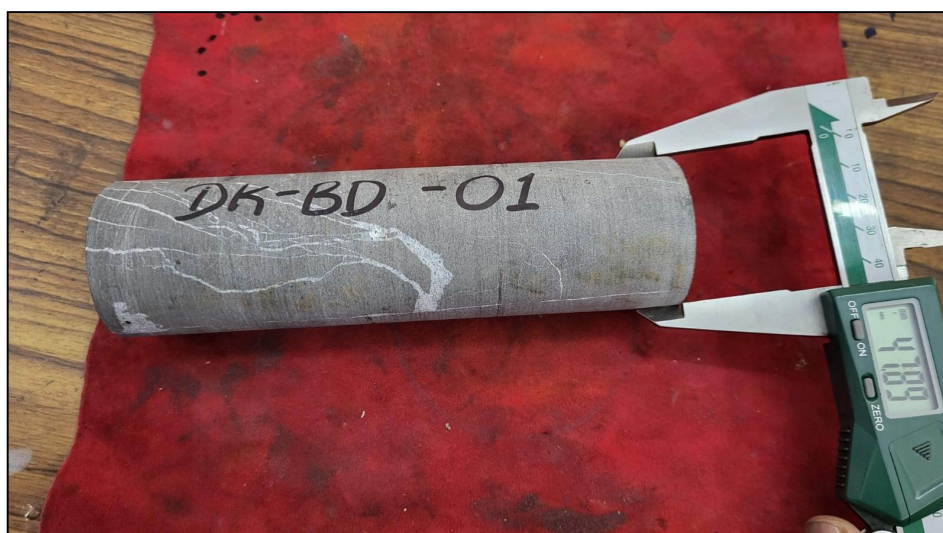
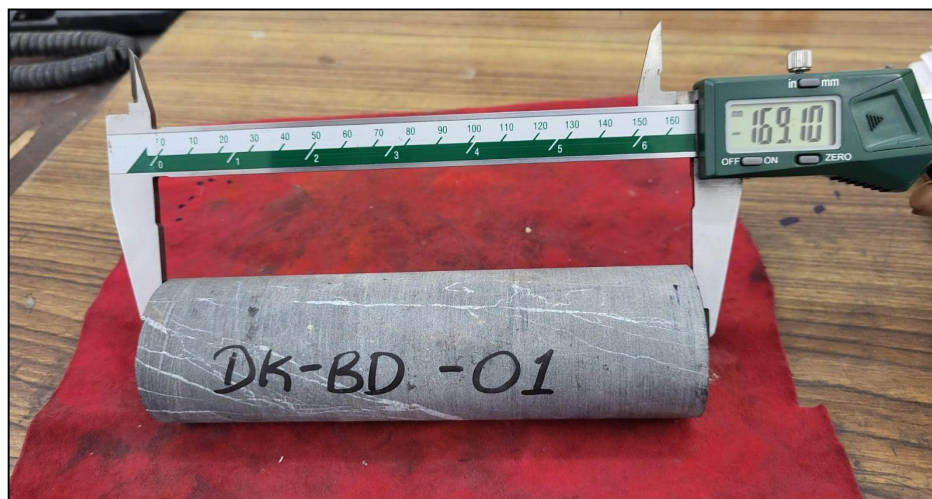




Figure 13: Photographs showing procedure of determination of length, diameter and weight of sample number MDK-BD-01 for bulk density calculation

CHAPTER – 18

18.0.0 BENEFICIATION STUDIES

18.1.0 Beneficiation studies have not been carried out in the present level of exploration.

CHAPTER – 19

19.0.0 RESOURCE ESTIMATION TECHNIQUE

19.1.0 GENERAL

19.1.1 Estimation of geological resources is the scientific and technical process of determining the quantity, quality and economic value. Following data was considered for resource estimation (1) Geological mapping (2) Exploratory drilling (3) Core logging (4) Chemical analysis and collating geological data of adjacent areas.

19.1.2 Grades and resources were categorized based on end-use grade classification given by IBM threshold in following categories for Limestone and Dolomite are presented in Annexure-IX-A & IX-B.

Table 19.1
Threshold limits of different grades of Limestone/Dolomite for resource classification as per MEMC 2015 (Amended in 2021)

Grade	CaO	MgO (max.)	SiO ₂ (max.)
	%	%	%
Cement Grade Limestone	≥44	3.5	12
Beneficial Grade Dolomite	≥30	20	10

Resources have been estimated by polygonal method as per MEMC Rules 2015 (Amended 2021) and placed under Inferred and Reconnaissance Resources category (333 & 334).

19.2.0 EVALUATION OF MINERALISATION ZONES

19.2.1 The evaluation of mineralization zones in the Dongargaon-Kasara has been carried out on the basis of core logging, systematic sampling and subsequent laboratory analysis. The lithological units intersected in the boreholes confirm the presence of limestone and dolomite horizons with significant mineralisation potential. Core recovery exceeding 90% in most boreholes has ensured reliability of the dataset. It is noted that Cement Grade Limestone is interbedded with Beneficial Grade Dolomite, whose cumulative thickness are varies from 25m to 28m in boreholes MDK-04 & MDK-05. Limestone is established in central part of the block area, however in eastern part subsurface drilling has not established the Limestone.

19.2.2 A total 211 samples were generated from 220m of drilling of 5 no. of exploratory boreholes and BRS, out of which two boreholes i.e. MDK-04 & 05

have intersected Cement Grade Limestone (thickness 8m to 19m) and Beneficial Grade Dolomite intersected in 4 boreholes i.e MDK-02 to MDK-05 (thickness 4m to 49m).

19.2.3 Cement Grade Limestone was intersected in exploratory borehole MDK-04 & MDK-05 drilled by MECL in the block. 1m zones are considered in Cement Grade Limestone owing to shale intercalation. The cumulative thicknesses of MDK-04 & MDK-05 are 28m and 25m respectively. The details are given below in Table no. 19.2.

Table 19.2
Cement Grade Limestone demarcated as per IBM threshold for entire primary sample analysis of exploratory boreholes drilled in Dongargaon-Kasara Block, District: Yavatmal, Maharashtra

BH. No.	From (m)	To (m)	Thickness (m)	CaO %	MgO %	Al ₂ O ₃ %	SiO ₂ %	Fe ₂ O ₃ %	GRADE
MDK-04	9.00	28.00	19.00	45.01	3.02	2.71	9.11	0.74	CEMENT GRADE LIMESTONE
MDK-04	36.00	45.00	9.00	45.95	4.94	1.31	4.93	0.35	
MDK-05	0.00	17.00	17.00	47.13	2.86	1.96	6.52	0.56	
MDK-05	21.00	29.00	8.00	47.10	4.58	1.15	4.25	0.29	

19.2.4 Beneficial Grade Dolomite was intersected in exploratory borehole 4 BH i.e. MDK-02, MDK-03, MDK-04 and MDK-05 drilled by MECL in the block. The cumulative thicknesses of MDK-02, MDK-03, MDK-04 & MDK-05 are 5.50m, 49m, 15.50m & 25m respectively. The details are given below in Table no 19.3.

Table 19.3
Beneficial Grade Dolomite demarcated as per IBM threshold for entire primary sample analysis of exploratory boreholes drilled in Dongargaon-Kasara Block, District: Yavatmal, Maharashtra

BH. No.	From (m)	To (m)	Thickness (m)	CaO %	MgO %	Al ₂ O ₃ %	SiO ₂ %	Fe ₂ O ₃ %	GRADE
MDK-02	5.50	50.00	44.50	33.31	16.36	0.89	4.22	0.41	BENEFICIAL GRADE DOLOMITE
MDK-03	1.00	50.00	49.00	34.85	16.93	0.41	2.31	0.29	
MDK-04	1.50	9.00	7.50	29.66	17.13	1.76	8.10	0.48	
MDK-04	28.00	36.00	8.00	30.27	16.59	1.89	7.39	0.46	
MDK-04	45.00	50.00	5.00	33.34	16.71	1.07	3.96	0.68	
MDK-05	17.00	21.00	4.00	30.06	17.18	1.85	6.62	0.39	
MDK-05	29.00	50.00	21.00	31.77	16.93	1.47	5.12	0.34	

19.3.0 RESOURCES ESTIMATION METHODS

Limestone and Dolomite occur as a gently dipping body in the block area, strike in direction of N51°W – S51°E and dip varies from 4° to 21° towards northeasterly, all the boreholes were drilled vertically to estimate Limestone and dolomite resources up to a vertical depth of 50mRL. Limestone and Dolomite resources were estimated by Polygonal method and validated with cross sectional method (check method).

19.4.0 ASSUMPTIONS FOR RESOURCE ESTIMATION

- 19.4.1 Resource was computed by “Polygonal Method” as per MEMC Rule, 2015 (Amended 2021). Certain axiomatic assumptions are inherently involved in estimating overall grade and resource of a deposit, are given below:
- 19.4.2 For Limestone resource, Cement Grade Limestone are considered.
- 19.4.3 For Dolomite resource, Beneficial Grade Dolomite is taken for consideration.
- 19.4.4 Minimum thickness of 1m of the demarcated grade was considered for resource estimation.
- 19.4.5 The area up to 400 m has been classified under the UNFC 333 category, while the area beyond 400 m has been considered under the UNFC 334 category.
- 19.4.6 The average bulk density of limestone/dolomite has been taken as 2.79 gm/cc.

19.5.0 PARAMETERS OF RESOURCE ESTIMATION

19.5.1 CUT-OFF GRADE

Resources estimated for Cement Grade Limestone and Beneficial Grade Dolomite intersected are calculated as per IBM threshold grade classification as given in Table no 19.1.

19.5.2 BULK DENSITY

A total of 2 nos. of limestone and dolomite core samples from MECL boreholes were subjected to bulk density determination by **Caliper Method** in Petrology laboratory, MECL, Nagpur. Bulk densities of 2.77 gm/cc for limestone and 2.81 gm/cc for dolomite, determined by the caliper method, were considered for resource estimation. The results of bulk density determination are presented in Annexure-VI. The procedure of determining the bulk density discussed in Chapter-17.

19.5.3 OVER BURDEN/SOIL

Soil cover varies from 0m to 5.50m in thickness in all the boreholes. The average thickness of the soil cover in the block is around 2.40m.

Minimum (m)	Maximum (m)
0 (MDK-05)	5.50 (MDK-02)

19.6.0 METHODOLOGY

The resources of limestone and dolomite have been estimated by polygonal method as per MEMC rules, 2015 (Amended 2021). The methodology adopted, keeping the above assumptions in view, for resource estimation are described further.

19.7.0 METHODOLOGY ADOPTED IN POLYGONAL METHOD (PRINCIPAL METHOD) FOR RESOURCE ESTIMATION

The main objective of this method is to demarcate the area of influence of the dolomite intersected by a particular borehole. The influence area has been obtained by constructing polygons by drawing perpendicular bisector of triangles, rectangles that connect the adjoining boreholes. The area of the influence of zones has been ascertained by Auto-Cad software. The area of non-development of respective zones is shown on the geological plan. The height of polygons is the cumulative thickness of limestone/dolomite horizon/bands encountered by the corresponding borehole. The entire limestone/dolomite body in block is divided into 5 number of polygons. The grade wise borehole wise resource estimation by Polygonal method for possible Cement Grade Limestone, Threshold Grade Limestone and Beneficial Grade Dolomite of this block are calculated. The grade assigned to the polygon blocks is same as the weighted average grade of the corresponding boreholes. The area of non- development of particular grade in borehole has been deducted.

The formula of resource estimation is as follows:

$$R = P_A \times Th \times \text{Bulk Density}$$

Where, P_A = Area of Polygon

Th = Thickness of Limestone/Dolomite

- 19.7.1 The resources are estimated grade wise, borehole wise and presented as Annexures-VII-A, VII-B, VII-C.
- 19.7.2 The weighted average grades for 10 radicals i.e. CaO, MgO, SiO₂, Al₂O₃, Fe₂O₃, SO₃, P₂O₅, K₂O, Na₂O & LOI has been calculated. Thus, average grade of the block is calculated for Cement Grade Limestone and Beneficial Grade Dolomite.

19.8.0 METHODOLOGY ADOPTED IN CROSS SECTIONAL METHOD (CHECK METHOD) FOR RESOURCE ESTIMATION

19.8.1 Resources has estimated with cross sectional method (check method) for Cement Grade Limestone and Beneficial Grade Dolomite, the resources are presented in Annexures-VII-D, VII-E & VII-F.

A total 5 no. of boreholes which are falling in 4 parallel cross section lines S1-S1', S2-S2', S3-S3' and S4-S4' in Dongargaon-Kasara Block, have been drawn along S 39°W/ N 39°E direction, which is marked on Plate No.III.

19.8.2 The limestone intersected in two boreholes (MDK-04 & MDK-05) and Dolomite intersected in four boreholes (MDK-02 to MDK-05). Efforts were made to pass these sections through drilled borehole locations wherever possible. The boreholes which have not fallen on section lines are projected on to the nearest section line. Since the beds are generally low dip of 5° to 20° due NE direction and boreholes drilled are all vertical hence true thickness will be the same as thickness intersected in the exploratory boreholes. Geological cross sections are generated by GDM software. Cross sectional area on each section has been measured with the help of Auto CAD map 2025 software and recorded systematically. Strike influence between two section lines and boreholes has been taken up-to half way distance. However, the influence is up to block boundary has been taken in section S1-S1' up to 400m. The area up to 400 m has been classified under the UNFC 333 category, while the area beyond 400 m has been considered under the UNFC 334 category. Each of these areas has been multiplied with sectional influence / strike influence of the section lines to give volume. The volume is then multiplied with average bulk density, to estimate geological gross in-situ resources.

$$R = Sv (X) T (X) \text{ Avg Bulk Density}$$

Where in,

R = Resource / Tonnage

Sv = Sectional area of limestone

T = Influence between successive section lines

B. D. = Bulk Density of limestone / Dolomite

19.8.3 Resources are estimated by cross sectional method (check method) and borehole wise resources presented as Annexures- VII-D, VII-E, VII-F.

CHAPTER - 20

20.0.0 REPORTING OF RESOURCES

20.1.0 RESOURCE ESTIMATION

20.1.1 Resources are estimated by polygon method.

20.1.2 The grade assigned to the polygon blocks is same as the weighted average grade of the corresponding boreholes. The area of non-development of particular grade in borehole has been deducted.

Block	Polygon No.	Borehole No.	Polygonal Area
			(m ²)
DONGARGOAN-KASARA	P1	MDK-01	854828.8560
	P2	MDK-02	1209553.5930
	P3	MDK-03	654547.7984
	P4	MDK-05	1801675.1085
	P5	MDK-04	1540828.2844

20.1.3 A total 89.41 MT of Cement Grade Limestone resources (333) estimated by polygonal method with an average grade of 46.21% CaO, 3.52% MgO, 6.79% SiO₂. The Polygon-wise, grade wise, borehole-wise resource estimation by Polygonal method for Cement Grade Limestone are given in Table number 20.2. (Annexure-VII-A).

20.1.4 A total 43.27 MT of Cement Grade Limestone resources (334) estimated by polygonal method with an average grade of 46.15% CaO, 3.53% MgO, 6.85% SiO₂. The Polygon-wise, grade-wise, borehole-wise resource estimation by Polygonal method for Threshold Grade Limestone is given in Table number 20.3. (Annexure-VII-B).

20.1.5 A total 193.02 MT of Beneficial Grade Dolomite resources (333) estimated by polygonal method with an average grade of 32.91% CaO, 16.75% MgO, 4.36% SiO₂. The Polygon-wise, grade wise, borehole-wise resource estimation by Polygonal method for Beneficial Grade Dolomite is given in Table number 20.4. (Annexure-VII-C).

20.2.0 RELIABILITY OF RESOURCE

Geological resources estimated for Cement Grade Limestone and Beneficial

Grade Dolomite classification by the polygonal method and cross-sectional methods were compared to ascertain the confidence level of estimation by relative difference method. The relative difference in Geological Resources by two methods comes to 4.92%. As per the industrial requirements the relative difference for geological resource falls in the category of “Excellent”. Comparison of resources with both the methods i.e. Polygonal Method (Principal Method) and Cross-Sectional Method (Check Method) is presented at Table number 20.1.

Table 20.1
Comparison of Geological Gross In-situ Resources: Polygonal Method
(Principal Method) with Cross Sectional Method (Check Method) in
Dongargaon-Kasara Block, District: Yavatmal, Maharashtra

Sl.No.	Category of Resources	Polygonal Method (MT)	Cross Sectional Method (MT)	Relative Difference %
1	Cement Grade Limestone (333)	89.41	86.60	3.19
2	Cement Grade Limestone (334)	43.27	40.32	7.06
3	Beneficial Grade Dolomite (333)	193.02	201.92	4.51

Table 20.2
Polygon wise, Borehole wise Geological Gross In-Situ Resources (333) estimated for Cement Grade Limestone by Polygonal Method for
Dongargaon-Kasara Block, Dist. Yavatmal, Maharashtra

Bulk Density: 2.77 gm/cc

Polygon No.	BH No.	Polygonal Area (m ²)	From (m)	To (m)	Thick. (m)	Volume (m ³)	Geological Gross in-situ Resources (tonnes)	Average Quality									
								CaO %	MgO %	Al ₂ O ₃ %	SiO ₂ %	Fe ₂ O ₃ %	SO ₃ %	P ₂ O ₅ %	K ₂ O %	Na ₂ O %	LOI %
P5	MDK-04	581995.57	9.00	28.00	19.00	11057915.83	30630426.85	45.01	3.02	2.71	9.11	0.74	0.14	0.05	0.56	0.05	38.31
P5	MDK-04	581995.57	36.00	45.00	9.00	5237960.13	14509149.56	45.95	4.94	1.31	4.93	0.35	0.32	0.02	0.26	0.04	41.67
P4	MDK-05	639260.88	0.00	17.00	17.00	10867434.96	30102794.84	47.13	2.86	1.96	6.52	0.56	0.29	0.05	0.43	0.04	39.87
P4	MDK-05	639260.88	21.00	29.00	8.00	5114087.04	14166021.10	47.10	4.58	1.15	4.25	0.29	0.44	0.02	0.23	0.05	41.66
Total Geological Gross in-situ Resources of Cement Grade Limestone in Tonnes							89408392.35	46.21	3.52	1.98	6.79	0.54	0.27	0.04	0.42	0.05	39.91
Total Geological Gross in-situ Resources of Cement Grade Limestone in Million Tonnes							89.41										

Table 20.3
Polygon wise, Borehole wise Geological Gross In-Situ Resources (334) estimated for Cement Grade Limestone by Polygonal Method for
Dongargaon-Kasara Block, Dist. Yavatmal, Maharashtra

Bulk Density: 2.77 gm/cc

Polygon No.	BH No.	Polygonal Area (m ²)	From (m)	To (m)	Thick. (m)	Volume (m ³)	Geological Gross in-situ Resources (tonnes)	Average Quality									
								CaO %	MgO %	Al ₂ O ₃ %	SiO ₂ %	Fe ₂ O ₃ %	SO ₃ %	P ₂ O ₅ %	K ₂ O %	Na ₂ O %	LOI %
P5	MDK-04	298088.03	9.00	28.00	19.00	5663672.57	15688373.02	45.01	3.02	2.71	9.11	0.74	0.14	0.05	0.56	0.05	38.31
P5	MDK-04	298088.03	36.00	45.00	9.00	2682792.27	7431334.59	45.95	4.94	1.31	4.93	0.35	0.32	0.02	0.26	0.04	41.67
P4	MDK-05	290912.48	0.00	17.00	17.00	4945512.16	13699068.68	47.13	2.86	1.96	6.52	0.56	0.29	0.05	0.43	0.04	39.87
P4	MDK-05	290912.48	21.00	29.00	8.00	2327299.84	6446620.56	47.10	4.58	1.15	4.25	0.29	0.44	0.02	0.23	0.05	41.66
Total Geological Gross in-situ Resources of Cement Grade Limestone in Tonnes							43265396.85	46.15	3.53	2.00	6.85	0.55	0.26	0.04	0.42	0.05	39.88
Total Geological Gross in-situ Resources of Cement Grade Limestone in Million Tonnes							43.27										

Table 20.4
Polygon wise, Borehole wise Geological Gross In-Situ Resources (333) estimated for Beneficial Grade Dolomite by Polygonal Method for
Dongargaon-Kasara Block, Dist. Yavatmal, Maharashtra

Bulk Density: 2.81 gm/cc

Polygon No.	BH No.	Polygonal Area (m ²)	From (m)	To (m)	Thick. (m)	Volume (m ³)	Geological Gross in-situ Resources (tonnes)	Average Quality									
								CaO %	MgO %	Al ₂ O ₃ %	SiO ₂ %	Fe ₂ O ₃ %	SO ₃ %	P ₂ O ₅ %	K ₂ O %	Na ₂ O %	LOI %
P2	MDK-02	453265.41	5.50	50.00	44.50	20170310.75	56678573.19	33.31	16.36	0.89	4.22	0.41	0.06	0.02	0.16	0.04	44.35
P3	MDK-03	420585.30	1.00	50.00	49.00	20608679.70	57910389.96	34.85	16.93	0.41	2.31	0.29	0.04	0.06	0.07	0.04	44.84
P5	MDK-04	581995.57	1.50	9.00	7.50	4364966.78	12265556.64	29.66	17.13	1.76	8.10	0.48	0.07	0.03	0.29	0.16	42.09
P5	MDK-04	581995.57	28.00	36.00	8.00	4655964.56	13083260.41	30.27	16.59	1.89	7.39	0.46	0.15	0.06	0.32	0.13	42.50
P5	MDK-04	581995.57	45.00	50.00	5.00	2909977.85	8177037.759	33.34	16.71	1.07	3.96	0.68	0.13	0.02	0.18	0.13	43.30
P4	MDK-05	639260.88	17.00	21.00	4.00	2557043.52	7185292.291	30.06	17.18	1.85	6.62	0.39	0.55	0.07	0.29	0.15	42.63
P4	MDK-05	639260.88	29.00	50.00	21.00	13424478.48	37722784.53	31.77	16.93	1.47	5.12	0.34	0.54	0.03	0.25	0.14	43.19
Total Geological Gross in-situ Resources of Beneficial Grade Dolomite in Tonnes							193022894.78										
Total Geological Gross in-situ Resources of Beneficial Grade Dolomite in Million Tonnes							193.02	32.91	16.75	1.03	4.36	0.38	0.18	0.04	0.17	0.08	43.89

Table 20.5

Geological Gross In-Situ Resources (333) estimated for Cement Grade Limestone by Cross Sectional Method for Dongargaon-Kasara Block,

Dist: Yavatmal, Maharashtra

Bulk Density: 2.77 gm/cc

BH.No.	Section Line	Sectional Area (m ²)	Strike Influence (m)	Volume (m ³)	Geological Gross In-situ Resources (tonnes)	Average Quality									
						CaO %	MgO %	Al ₂ O ₃ %	SiO ₂ %	Fe ₂ O ₃ %	SO ₃ %	P ₂ O ₅ %	K ₂ O %	Na ₂ O %	LOI %
MDK-04	S1-S1'	13200.00	800	10560000.00	29251200.00	45.01	3.02	2.71	9.11	0.74	0.14	0.05	0.56	0.05	38.31
MDK-04	S1-S1'	7530.26	800	6024207.04	16687053.50	45.95	4.94	1.31	4.93	0.35	0.32	0.02	0.26	0.04	41.67
MDK-05	S2-S2'	10740.00	800	8592000.00	23799840.00	47.13	2.86	1.96	6.52	0.56	0.29	0.05	0.43	0.04	39.87
MDK-05	S2-S2'	7609.11	800	6087288.24	16861788.42	47.10	4.58	1.15	4.25	0.29	0.44	0.02	0.23	0.05	41.66
Total Geological Gross In-situ Resources of Cement Grade Limestone in Tonnes					86599881.93	45.96	3.42	2.12	7.23	0.59	0.23	0.04	0.44	0.04	39.65
Total Geological Gross In-situ Resources of Cement Grade Limestone in Million Tonnes (MT)					86.60										

Table 20.6

Geological Gross In-Situ Resources (334) estimated for Cement Grade Limestone by Cross Sectional Method for Dongargaon-Kasara Block,

Dist: Yavatmal, Maharashtra

Bulk Density: 2.77 gm/cc

BH.No.	Section Line	Sectional Area (m ²)	Strike Influence (m)	Volume (m ³)	Geological Gross In-situ Resources (tonnes)	Average Quality									
						CaO %	MgO %	Al ₂ O ₃ %	SiO ₂ %	Fe ₂ O ₃ %	SO ₃ %	P ₂ O ₅ %	K ₂ O %	Na ₂ O %	LOI %
MDK-04	S1-S1'	5067.55	366	1854723.30	5137583.54	45.01	3.02	2.71	9.11	0.74	0.14	0.05	0.56	0.05	38.31
MDK-04	S1-S1'	2693.02	366	985645.32	2730237.54	45.95	4.94	1.31	4.93	0.35	0.32	0.02	0.26	0.04	41.67
MDK-04	S1-S1'	15200.00	366	5563200.00	15410064.00	45.01	3.02	2.71	9.11	0.74	0.14	0.05	0.56	0.05	38.31
MDK-04	S1-S1'	7530.26	366	2756074.72	7634326.98	45.95	4.94	1.31	4.93	0.35	0.32	0.02	0.26	0.04	41.67
MDK-05	S2-S2'	11070.4	85	940984.00	2606525.68	47.13	2.86	1.96	6.52	0.56	0.29	0.05	0.43	0.04	39.87
MDK-05	S2-S2'	5209.60	85	442816.00	1226600.32	47.10	4.58	1.15	4.25	0.29	0.44	0.02	0.23	0.05	41.66
MDK-05	S2-S2'	16065.53	85	1365569.87	3782628.54	47.13	2.86	1.96	6.52	0.56	0.29	0.05	0.43	0.04	39.87
MDK-05	S2-S2'	7609.11	85	646774.38	1791565.02	47.10	4.58	1.15	4.25	0.29	0.44	0.02	0.23	0.05	41.66
Total Geological Gross In-situ Resources of Cement Grade Limestone in Tonnes					40319531.62	45.74	3.60	2.11	7.26	0.58	0.23	0.04	0.44	0.05	39.67
Total Geological Gross In-situ Resources of Cement Grade Limestone in Million Tonnes (MT)					40.32										

Table 20.7

**Geological Gross In-Situ Resources (333) estimated for Beneficial Grade Dolomite by Cross Sectional Method for Dongargaon-Kasara Block,
Dist: Yavatmal, Maharashtra**

Bulk Density: 2.81 gm/cc

BH.No.	Section Line	Sectional Area (m ²)	Strike Influence (m)	Volume (m ³)	Geological Gross In-situ Resources (tonnes)	Average Quality								
						CaO %	MgO %	SiO ₂ %	Fe ₂ O ₃ %	SO ₃ %	P ₂ O ₅ %	K ₂ O %	Na ₂ O %	LOI %
MDK-02	S3-S3'	34573.46	800	27658767.84	77721137.63	33.31	16.36	4.22	0.41	0.06	0.02	0.16	0.04	44.35
MDK-03	S2-S2'	20099.40	800	16079516.48	45183441.31	34.85	16.93	2.31	0.29	0.04	0.06	0.07	0.04	44.84
MDK-04	S1-S1'	6000.00	800	4800000.00	13488000.00	29.66	17.13	8.10	0.48	0.07	0.03	0.29	0.16	42.09
MDK-04	S1-S1'	6400.00	800	5120000.00	14387200.00	30.27	16.59	7.39	0.46	0.15	0.06	0.32	0.13	42.50
MDK-04	S1-S1'	3959.80	800	3167842.88	8901638.49	33.34	16.71	3.96	0.68	0.13	0.02	0.18	0.13	43.30
MDK-05	S2-S2'	3200.01	800	2560006.00	7193616.86	30.06	17.18	6.62	0.39	0.55	0.07	0.29	0.15	42.63
MDK-05	S2-S2'	15589.37	800	12471495.60	35044902.64	31.77	16.93	5.12	0.34	0.54	0.03	0.25	0.14	43.19
Total Geological Gross In-situ Resources of Beneficial Grade Dolomite in Tonnes					201919936.93	32.81	16.70	4.51	0.39	0.17	0.04	0.18	0.08	43.87
Total Geological Gross In-situ Resources of Beneficial Grade Dolomite in Million Tonnes (MT)					201.92									

20.3.0 COMPUTATION OF AVERAGE GRADE

All calculations for grade estimation are made by weighted average method. Since the sample interval was maintained at 1m interval with the exception of minor variations or structural implications, the weighted average method of calculation is made by the following formula.

$$\text{Weighted average grade} = \frac{V_1XG_1 + V_2XG_2 + V_3XG_3 + \dots + V_nXG_n}{V_1 + V_2 + V_3 + \dots + V_n}$$

Where 'V' = Volume of Limestone/Dolomite in individual borehole

'G' = Grade of the respective Limestone/Dolomite in the corresponding borehole.

CHAPTER – 21

21.0.0 SUMMARY AND RECOMMENDATIONS

21.1.0 SUMMARY

- 21.1.1 Dongargaon-Kasara Block over an area of 6.06 sq.km., is bounded by Longitude 78°48'45.71537"E to 78°51'26.31582"E and Latitude 19°50'23.52630"N to 19°51'19.01123"N located in Toposheet No. 56 I/13 in Dongargaon and Kasara villages of Tehsil: Zari-Jamani, District: Yavatmal, State: Maharashtra.
- 21.1.2 Dongargaon-Kasara Block is proposed on the basis of lapsed lease areas by State Government of Maharashtra which was granted as per section 10A(2)(b) of the MMDR Act-15. In Year 2021 amendment to MMDR Act with a stipulation stated that all such PL reports stand ineligible and to conduct auction and PL Reports required to be evaluated to confirm mineral contents (G4, G3 etc. stages of exploration) as per the stipulations under Minerals (Evidence of Mineral Contents) Rules, 2015.
- 21.1.3 The Directorate of Geology and Mining (DGM), Government of Maharashtra, requested MECL to take up the exploration in lapsed 10A(2)(b) lease mining lease areas vide letter no. Tech/1848/2023/260, dated 23-01-2024.
- 21.1.4 Exploration Proposal (G3) was submitted and discussed in 76th TCC-1 meeting held on 30th April & 1st May, 2025 and committee recommended to EC as project proposal titled as "Preliminary Exploration (G3 Level) for Limestone in Dongargaon-Kasara Block, District: Yavatmal, Maharashtra".
- 21.1.5 On recommendation of 76th TCC-1, 42nd Executive committee (EC), NMEDT meeting held on 2nd June, 2025 approved the project with cost of INR 122.58 lakhs.
- 21.1.6 MECL carried out exploration with objective to establish sub surface continuity of limestone / dolomite by drilling 5 no. of exploratory boreholes and to estimate geological resource under (333 & 334) category under UNFC nomenclature as per MEMC rules, 2015 (Amended up to 2021).
- 21.1.7 Yavatmal district is situated in central part of Maharashtra. Yavatmal district in Maharashtra has exposures dominated by Deccan basalts with other formations like Gondwana, Lameta and Penganga beds also present. The limestone formation of the area belongs to Putnur-Mangurda formation.

- 21.1.8 Exposures mapped in the block belong to the Putnur-Mangurda formation lesser-known but geologically intriguing unit of the Penganga Group. These formations typically consist of Proterozoic to Lower Palaeozoic sedimentary rocks, including Shale, Limestone, Dolomite. The Putnur–Mangurda sequence likely represents shallow marine to fluvial depositional environments, and its exposures may be found in structurally controlled inliers or along river sections, particularly in areas like Mangurda village in Yavatmal district.
- 21.1.9 The strike of the limestone / dolomite beds is N51°W-S51°E and dip varies from 4° to 21° towards Northeasterly.
- 21.1.10 A total of 211 nos. of samples are generated in 5 no. of drilled boreholes and BRS in Dongargaon-Kasara Block, which were analysed 10 radicals.
- 21.1.11 Limestone and Dolomite zones are demarcated based on End use classification of IBM.
- 21.1.12 A total of 2 nos. of limestone and dolomite core samples from drilled boreholes were subjected to bulk density determination by **Caliper Method**. The bulk density for limestone is 2.77 gm/cc and dolomite is 2.81 gm/cc have been considered for estimation of resource.
- 21.1.13 Average soil cover in the block is 2.40m.
- 21.1.14 Geological Gross In-situ resources were estimated by polygonal method.
- 21.1.15 A total of **89.41 Million Tonnes (MT) of Cement Grade Limestone under 333 category** has been estimated as Gross Geological in-situ resources, with an average grade of 46.21% CaO, 3.52% MgO & 6.79% SiO₂. In addition, 43.27 MT of Cement Grade Limestone under 334 category has been estimated with average grade 46.15% CaO, 3.53% MgO & 6.85% SiO₂.
- 21.1.16 A total of **193.02 MT of Beneficial Grade Dolomite under 333 category** has been estimated as Gross Geological in-situ resources with an average grade of 32.91% CaO, 16.75% MgO & 4.36% SiO₂.

21.2.0 RECOMMENDATIONS

- 21.2.1 MECL has undertaken Preliminary Exploration (G3 level) over an area of 6.06 sq.km in the Dongargaon-Kasara Block. The exploration programme has established the presence of Cement Grade Limestone and Beneficial Grade Dolomite. Based on lithological characteristics and preliminary quality

assessment, these litho-units are considered amenable to upgradation through appropriate beneficiation techniques, making them suitable for potential utilization in the cement industry.

- 21.2.2 The estimated mineral resources have been classified under the 333 & 334 category of the United Nations Framework Classification (UNFC) system. The findings of this geological Report provide a sound technical basis for the Government of Maharashtra to proceed with auctioning of the block for grant of a Mining Lease.

CHAPTER - 22

22.0.0 LIST OF PLATES

- 22.1.0 Location Map of Dongargaon-Kasara Block, District: Yavatmal, Maharashtra in 1:50000 Scale (Plate-I-A).
- 22.2.0 Google Map showing Proposed and Drilled Boreholes of Dongargaon-Kasara Block, District: Yavatmal, Maharashtra, Not to Scale (Plate-I-B).
- 22.3.0 Regional Geological Map of Dongargaon-Kasara Block (Part of Pranhita-Godavari Valley), District: Yavatmal, Maharashtra in 1:50000 scale (Plate-II).
- 22.4.0 Topographical and Geological Map of Dongargaon-Kasara Block, District: Yavatmal, Maharashtra in 1:4000 scale (Plate-III).
- 22.5.0 Graphic lithologs of all the boreholes showing Limestone and Dolomite on 1:1000 scale (Plate-IV).
- 22.6.0 Polygonal map with area of polygon and thickness of intersected zones of all Grade of Limestone and Dolomite on 1:10000 scale (Plate-V).
- 22.7.0 Geological Cross Sections along section lines S1-S1', S2-S2', S3-S3' and S4-S4' along N39°E – S39°W direction with quality data on 1:2000 scale (Plate-VI).

CHAPTER - 23

23.0.0 ANNEXURES / ENCLOSURES TO THE REPORT

23.1.0 The report includes all the relevant annexures, maps/ plans, sections, photographs & photomicrograph etc. List of annexures, tables, maps/plans/ sections, photographs, Text s & photomicrograph etc. are provided before the start of the text part of the Geological Report.

CHAPTER - 24

24.0.0 UTILISATION ASPECTS AND MINEABILITY (AS PER NATIONAL COUNCIL FOR CEMENT AND BUILDING MATERIALS)

24.1.0 The specifications of limestone for various industrial used are as follows

1. CEMENT INDUSTRY SPECIFICATION

Table 24.1

Cement Industry Specification for Limestone

CaO	:	44% (min.) to 46%
MgO	:	3.50% (max.)
SiO ₂	:	16% (max.)
Al ₂ O ₃	:	2 (max.)
Fe ₂ O ₃	:	2% (max.)
SO ₃	:	1.75% (max.)

$$\text{Lime Saturation Factor (LSF)} = \frac{\text{CaO}}{2.8 (\text{SiO}_2) + 1.2 (\text{Al}_2\text{O}_3) + 0.65 (\text{Fe}_2\text{O}_3)}$$

(ideal to be at 0.66 to 1.02)

$$\text{Silica Modules} = \frac{\text{SiO}_2}{\text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3} = \text{ideal at (1.2 to 4.0)}$$

$$\text{Iron Modules} = \frac{\text{SiO}_2 + \text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3}{\text{Al}_2\text{O}_3} = \text{ideal at (1.7 to 2.4)}$$

$$\text{Hydraulic Modules} = \frac{\text{Al}_2\text{O}_3}{\text{Fe}_2\text{O}_3} = \text{ideal at (0.65 (min.))}$$

2. B. I. S. (BUREAU OF INDIAN STANDARDS) SPECIFICATION

Table 24.2

B. I. S. (Bureau of Indian Standards) Specification for Limestone

CaO (Min)	42%
MgO (Max.)	2.5%
SiO ₂ (Max.)	15%
P ₂ O ₅ (Max.)	1.5 %
FeS ₂ (Max.)	2%

3. IRON AND STEEL INDUSTRY:

Table 24.3

Iron and Steel Industry for Specification for Limestone

Elements	BF Grade	SMS Grade	LD Grade
CaO	42% (Min.)	48% (Min.)	52% (Min.)
MgO	4% (Max.)	3% (Max.)	2% (Max.)
SiO ₂	9% (Max.)	4% (Max.)	1% (Max.)
SiO ₂ + Al ₂ O ₃	11.5% (Max.)	-	-
Total Insoluble	12%	-	-
Acid Insoluble	-	6.5% (Max.)	-

4. CHEMICAL INDUSTRY SPECIFICATION

BIS Specifications (1S:3204-1978, Reaffirmed-2003)

Table 24.4

Chemical Industry Specification for Limestone

Characteristics	Requirement in percent by mass for			
	Calcium carbide	Bleaching Powder	Caustic soda	Sugar
CaO (Min.)	54.0	54.0	53.0	50.0
MgO (Max.)	0.8	2.0	1.0	1.0
SiO ₂ (Max.)	1.0	0.75	-	2.0
Fe ₂ O ₃ (Max.)	0.25	0.15	-	-
Mn ₂ O ₃ (Min.)	-	0.06	-	-
CO ₂ (Min.)	42.00	42.00	42.00	41.00
Loss on Ignition (LOI)	46.00	46.00	46.00	44.00
S (Max.)	0.10	-	-	-
P (Max.)	0.01	-	-	-
Al ₂ O ₃ + Fe ₂ O ₃ (Max.)	0.50	-	-	1.5
SiO ₂ + Al ₂ O ₃ + Fe ₂ O ₃ (Max.)	-	-	3.0	-

5. FERTILIZER INDUSTRY SPECIFICATION

CaCO₃+ MgCO₃: 85% (Min)

SiO₂ : 5% (Max.)

6. GLASS INDUSTRY SPECIFICATION

CaCO₃ : 94.5 %

CaCO₃+ MgCO₃ : 97.5 %

Fe₂O₃ : 0.20 % (Max.)

BIS Specifications (1S:997-1973, Reaffirmed-1998)

CaO : 53.0 %

SiO₂ : 2.5 %

Fe₂O₃ : 0.10 %

CaO + MgO : 54.50 %

7. FOUNDRY INDUSTRY SPECIFICATION

BIS Specifications (1S:4149-1978, Re-affirmed-2008)

Table No: 24.5

Foundry Industry Specification for Limestone

Characteristics	Grade-1	Grade-2	Grade-3
CaO (Min.)	52 %	50 %	45 %
SiO ₂ (Max)	1.5 %	3 %	5 %
R ₂ O ₃ (Al ₂ O ₃ + Fe ₂ O ₃) Max.	1 %	1 %	2 %
MgO	2 %	3 %	5 %
Insoluble matter	0.5	1	2
Sulphur and Phosphorus	Traces	Traces	Traces

8. CEMENT, IRON AND STEEL AND CHEMICAL INDUSTRY SPECIFICATION

Table No: 24.6

Cement, Iron and Steel and Chemical Industry Specification for Limestone

Constituents	Cement Industry (Specification)	Iron and Steel Industry (Specification)			Chemical Industry BIS Specifications (1S:3204-1978, Reaffirmed-2003)			
					Requirement in percent by mass for			
		BF Grade	SMS- OH Grade	SMS- LD	Calcium carbide	Bleaching Powder	Caustic soda	Sugar
CaO (Min.)	44% (Min.) to 48% (Max)	42% (Min.)	48% (Min.)	52% (Min.)	54.0	54.0	53.0	50.0
MgO	3.50% (Max.)	4%	3%	2%	0.8	2.0	1.0	1.0
SiO ₂ (Max.)	16 % (Max.)	9%	4%	1%	1.0	0.75	-	2.0
Fe ₂ O ₃	2% (Max.)				0.25	0.15	-	-
Mn ₂ O ₃	--	--	--	--	-	0.06	-	-
CO ₂ (Min.)	--	--	--	--	42.00	42.00	42.00	41.00
Loss on Ignition	--	--	--	--	46.00	46.00	46.00	44.00
S (Max.)	--	--	--	--	0.10	-	-	-
P (Max.)	--				0.01	-	-	-
Al ₂ O ₃ + Fe ₂ O ₃	2%				0.50	-	-	1.5
SiO ₂ + Al ₂ O ₃ + Fe ₂ O ₃	--	11.5% (Max.)			-	-	3.0	-
Acid Insoluble			6.5% (Max.)					

**CERTIFICATE FROM THE QUALIFIED PERSON WITH NAME, DATE AND
SIGNATURE**

This is to certify that Geological Report on “Preliminary exploration (G3 level) for Limestone in Dongargaon-Kasara Block, District: Yavatmal, Maharashtra” has been prepared by Mineral Exploration and Consultancy Limited (MECL) on behalf of National Mineral Exploration and Development Trust (NMEDT). The report has been prepared in accordance with the Minerals (Evidence of Mineral Contents) Rule 2015 specified under Mineral Auction Rule, 2015 and amended up to 2021.

NAME: **SHRIKANT SHARMA**

DESIGNATION: **HOD (EXPLORATION)**

DATE: 31-08-2026

ABBREVIATIONS USED

SL. No.	Abbreviation	Full form
1	MECL	Mineral Exploration and Consultancy Limited
2	GSI	Geological Survey of India
3	CGWB	Central Ground Water Board
4	CPSE	Central Public Sector Enterprise
5	NMEDT	National Mineral Exploration and Development Trust
6	TCC-1	Technical cum Cost Committee - One
7	EC	Executive Committee
8	DGM, MH	Directorate of Geology and Mining, Maharashtra
9	UNFC	United Nation Framework Classification
10	NMI	National Mineral Inventory
11	DGCO	Directorate General Camp Office
12	NABL	National Accreditation Board for Testing and Calibration Laboratories
13	JNARDDC	Jawaharlal Nehru Aluminium Research Development and Design Centre
14	F.S.P.	Field Season Programme
15	MEMC	Minerals (Evidence of Mineral Contents)
16	MMDR	Mines & Minerals (Development and Regulation)
23	NH	National Highway
18	WGS-84	World Geodetic System-84
19	UTM	Universal Transverse Mercator
20	RL	Reduced Level
21	cu m	Cubic Meter
22	DGPS	Differential Global Positioning System
23	DMS	Degree Minute Second
24	M / m	Meter
25	mt / MT	Million Tonnes
26	Sq. km/sq.km.	Square Kilometer
27	M. Sc.	Master of Science
28	M. Sc. Tech	Master of Science Technology
29	NDDP	Net District Domestic Product
30	mRL	Reduced Level in metre
31	XRF	X-ray Fluorescence
32	ML	Mining Lease
33	CRM	Certified Reference Material
34	CL	Composite License
35	SMS (LD)	Steel Melting Shops (Linz-Donawitz)
36	R.F.	Representative Fraction
37	OM	Office Memorandum

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