

COMMODITY: BAUXITE AND ASSOCIATED CRITICAL MINERAL

**PRELIMINARY EXPLORATION FOR BAUXITE AND ASSOCIATED CRITICAL
MINERAL IN ANGANEWADI BLOCK, SINDHUDURG DISTRICT, MAHARASHTRA.
(G3)**

**BY
GEOLOGICAL SURVEY OF INDIA
CENTRAL REGION
STATE UNIT: MAHARASHTRA, PUNE**

**PLACE: PUNE
DATE: JUNE 2026**

SUMMARY OF THE BLOCK FOR G3 LEVEL EXPLORATION

GENERAL INFORMATION ABOUT THE BLOCK

Feature	Details
Block ID	ANGANEWADI BLOCK
Exploration Agency	Geological Survey of India, Central Region, State Unit: Maharashtra, Pune
Commodity	Bauxite and associated critical mineral
Mineral Belt / Geological Domain	Western Ghats, Sindhudurg District, Maharashtra
Block Area	05 sq. km
Completion Period	One year
Objectives	To establish the subsurface continuity and to estimate the resource of bauxite and associated critical minerals.
Projected Outcome	Preliminary exploration data for resource appraisal and further advancement of the block.
Personnel	Two Geoscientists
Expected Field Days	Officer-1: 100 days; Officer-2: 100 days.
Toposheet / Degree Sheet	47H/8 & 47H/12.
District / State	Sindhudurg District, Maharashtra.

1. Location

Cardinal Points	Latitude	Longitude
A	16°07'49"N	73°29'47" E
B	16°09'25"N	73°30'08"E
C	16°09'23"N	73°31'01"E
D	16°07'40"N	73°30'41"E

2. Area

Block Area	05 sq. km.
Forest Area	NIL
Government Land Area	Data not available
Private Land Area	Data not available

3. Accessibility

Nearest town	Malvan town, about 14.6 km to the South West
District headquarters	Oros, about 31 km west of East of the Block
Nearest Rail head	• Sindhudurg Railway Station (SNDD): 30.9 km and 45–50 minutes by road. • Kankavali Railway Station (KKW): 36.2 km and 50 minutes via NH 66. • Kudal Railway Station (KUDL): 40.1 km and 1 hour 5 minutes via Kudal-Malvan Road.
Nearest Airport	• Sindhudurg Airport (SDW): 30–31 km and 1.5–2 hours. • Manohar International Airport (GOX): 80–90 km (approx.) and 1.5–2 hours. • Goa International Airport (GOI): 100–110 km and 2–2.5 hours

4. Hydrography: Gad River flowing N-S outside the eastern side of block boundary, small seasonal streams and under construction of dam near Anganewadi Temple.

5. Climate: Tropical

6. Topography: Plateau and Western Ghats.

7. Availability of baseline geoscience data

Geological map	Large-scale geological mapping and earlier G4 investigations by GSI in and around the block
Geochemical data	Yes
Geophysical data	NIL

8. Justification for taking up G3 level exploration

During FS 2024–25, Chourasia and Parida, carried out reconnaissance survey in the Anganewadi area and a total of 100 BRS, 50 PTS and 10 PCS samples were collected and

submitted to the Chemical Division, GSI, Pune. In addition, 40 REE samples and 5 Reactive Silica (RS) samples were submitted to the Chemical Division, GSI, Central Region, Nagpur. Further analytical work included submission of 10 XRD samples to the Mineral Geophysics Division, Nagpur, and 10 PS and 10 OM samples to the Petrology Division, GSI, Pune.

As per the Ministry of Mines notification dated 25 April 2018, the threshold values for classification are $\text{Al}_2\text{O}_3 \geq 30\%$ and SiO_2 (total) $\leq 7\%$ for bauxite, and $\text{Al}_2\text{O}_3 \geq 20\%$ for aluminous laterite. Based on these criteria, out of 100 BRS samples, 36 are classified as bauxite and 63 as aluminous laterite.

The 36 BRS samples classified as bauxite exhibit SiO_2 values ranging from 2.27% to 6.94% (avg. 4.95%) and Al_2O_3 from 36.67% to 53.83% (avg. 46.77%). TiO_2 varies between 1.92% and 4.72% (avg. 3.07%), while Gallium (Ga) ranges from 46 to 82 ppm (avg. 66 ppm) and Vanadium (V) from 299 to 1818 ppm (avg. ~670 ppm). In contrast, 63 aluminous laterite BRS samples show wider SiO_2 variation (7%–53.5%, avg. 14.7%) and Al_2O_3 ranging from 20.8% to 53.10% (avg. 38.6%), with TiO_2 averaging ~3.2%, Ga ~57 ppm, and V ~680 ppm.

Among the 50 PTS samples, 23 qualify as bauxite and 27 as aluminous laterite. The bauxite-grade PTS samples show SiO_2 between 3.48% and 6.76% (avg. 4.45%) and Al_2O_3 between 34.17% and 58.68% (avg. 51.30%). Aluminous laterite PTS samples display SiO_2 ranging from 9.39% to 25.70% (avg. 11.64%) and Al_2O_3 from 32.50% to 45.24% (avg. 41.46%), with comparable TiO_2 (~3%), Ga (~61 ppm), and relatively higher V values (up to 2602 ppm).

Considering critical elements, 94 out of 100 BRS samples contain TiO_2 values exceeding 2%, with an overall range of 0.80% to 5.16% (avg. ~3.12%). Additionally, 87 samples record Gallium (Ga) values above 50 ppm, indicating significant enrichment of critical elements such as Ti, Ga and V, and highlighting the resource potential of the Anganewadi area.

Based on encouraging outcome of Anganewadi area (FS: 2024-25), the present item is proposed in northern part of Anganewadi area named as Anganewadi Block (G3) in part of toposheet no. 47 H/08 & 12. The area exposes bauxite and aluminous laterite. In the area bauxite occur as lensoidal and patchy capping over the aluminous laterite. The investigation will comprise DM on 1:4000 scale along with drilling on 400*400 m grid pattern with a proposed 26 vertical borehole up to 15 to 20m depth for assessment of bauxite and associated critical mineral resource in Anganewadi block.

PRELIMINARY EXPLORATION FOR BAUXITE AND ASSOCIATED CRITICAL MINERAL IN ANGANEWADI BLOCK, SINDHUDURG DISTRICT, MAHARASHTRA. (G3)

1.1.0 INTRODUCTION

This Anganewadi Block (FS 2026-27) is situated in the northern part of Anganewadi area (FS 2024-25), in Malvan Taluka, Sindhudurg District, Maharashtra. The Anganewadi Block (FS: 2026-27), bounded by latitudes bounded by latitudes 16°07'49"N, 16°09'25"N, 16°09'23"N & 16°07'40"N and longitudes 73°29'47" E, 73°30'08"E, 73°31'01"E, & 73°30'41"E, covers an area of 05 sq km and falls in parts of Survey of India toposheet No. 47 H/08 & 12.

The proposed programme is designed to achieve the objective of establishing the subsurface continuity and to estimate the resource of bauxite and associated critical minerals.

2.1.0 BACKGROUND INFORMATION

The Jawaharlal Nehru Aluminium Research Development and Design Centre (JNARDDC) in association with GSI, CR had carried out random sampling of bauxite horizons in low level and high-level laterites of Maharashtra in the past and reported encouraging Al_2O_3 values in their report (JNARDDC, 1999).

Following these preliminary findings, GSI carried out a number of investigations of G4 to G2 stages in parts of toposheet nos. 47H/6, 47H/07 & 47H/10 (Bhatia & Katti, 2008; Bhatia & Eshwara, 2010; Kishore, 2009; Bhatia, 2010; Saha & Eshwara, 2005; Fulzele et al. 12 and Bhatia et al. 2012) and established bauxite resources in Ghodepawadi, Hamdara, Nanar, Kumbhawade, Kalambewadi and Katta- Kalvi on the basis of analytical data of Al_2O_3 , Fe_2O_3 , TiO_2 , SiO_2 and LOI (in %). An item on mineral prognostication of laterite belt in degree sheet 47 H was carried out during FS 2015-17 (Tare et al. 2017). They had demarcated five favourable blocks for G4 stage investigation of bauxite. On the basis of the project, GSI carried out G4 investigations in degree sheet 47 H (Bhaise & Rahman, 2020, Vhatkar & Rahman, 2022, Vhatkar & Suryavanshi, 2023,

Gautam 2023, Rahman 2023), Tare and Panda 2024 and Gautam and Bhagat, 2024) and demarcated potential area for bauxite and associated critical minerals. Bhaise, et al., 2022, carried out G3 stage exploration in Kudopi block in collaboration with DGM Maharashtra.

During F.S. 2024-25, a G4 investigation for bauxite and associated critical mineral carried out by Chaurasia and Parida in Anganewadi block. Out of 100 BRS, 36 BRS are classified as bauxite which value of SiO_2 ranges from 2.27% to 6.94% with an average 4.95%, value of Al_2O_3 ranges from 36.67% to 53.83% with an average 46.77%, TiO_2 ranges from 1.92% to 4.72% with an average of 3.07%, Gallium (Ga) varies from 46 ppm to 82 ppm with an average of 66 ppm while Vanadium (V) content spans from 299 ppm to 1818 ppm with an average 669.87 ppm. Out of 50 PTS, 23 are classified as bauxite in which SiO_2 value ranging from 3.48% to 6.76% with an average 4.45 %, Al_2O_3 value ranging from 34.17% to 58.68% with an average 51.30%, TiO_2 value ranges from 2.37 % to 4.52 with an average 3.06 %, Gallium (Ga) ranges from 61 ppm and 77 ppm with an average 69 ppm and Vanadium (V) ranges from 171 ppm to 2288 ppm with an average 569 ppm. On the basis of above value, 25.93 sq km area has been demarcated potential for bauxite and associated critical minerals.

In Anganewadi block, 5 BRS classified as bauxite in which SiO_2 ranges from 4.03% to 5.74%, Al_2O_3 value ranging from 44.68 % to 53.77%, TiO_2 value ranges from 2.55% to 4.72%, Gallium (Ga) varies from 61 ppm to 79 ppm while Vanadium (V) content spans from 412 ppm to 638 ppm.

Similarly, 10 PTS classified as aluminous laterite in which SiO_2 ranges from 9.39% to 9.75%, Al_2O_3 value ranging from 44.38% to 44.79%, TiO_2 value ranges from 2.93% to 2.97%, Gallium (Ga) varies from 63 ppm to 65 ppm while Vanadium (V) content spans from 633 ppm to 644 ppm.

3.1.0 LOCATION AND ACCESSIBILITY

The Anganewadi Block area is situated within Anganewadi village, Malvan Taluka of the Sindhudurg District, Maharashtra. The nearby surrounding key villages are Anganewadi, Masure, Chafekol, Kandalgaon Weral, Bilwas, Deulwada Mahan, Magvane Malgaon Chander, Hadi and Bhloglewadi, The block is located 14.6 km to the North West of Malvan Town within Anganewadi village, Malvan Tehsil of Sindhudurg District. The study area benefits from robust connectivity via road, rail, and air transport networks. Air travel is supported by the Sindhudurg Airport at Chipi, the nearest domestic airport at a distance of 27 kilometers. The Mopa International Airport in North Goa, approximately 90 kilometers southeast of the study area, provides international connectivity. Rail access is facilitated by the Kankavli Railway Station, situated 36 kilometers northeast, the Kudal Railway Station, 38 kilometers southeast, and the Sawantwadi Road Railway Station, 35 kilometers east, all of which are important stations on the Konkan Railway line. Furthermore, the Mumbai-Goa National Highway (NH-66, formerly NH-17) lies approximately 22 kilometers east of the study area's eastern boundary. Anganewadi village is connected to Malvan town via Major District Road 32 (MDR-32), which intersects State Highway 117 (SH 117) near the Malvan city limits. This junction provides a direct gateway for travelers arriving from Kankavali or the NH 66 highway to reach the Anganewadi village and its temple area. The nearest port is located in Malvan, situated about 15 kilometers southwest of the study block.

4.1.0 PHYSIOGRAPHY, DRAINAGE AND CLIMATE

Anganewadi Block, situated in Malvan Taluka of Sindhudurg district, forms part of the Konkan coastal plains, lying between the Western Ghats escarpment and the Arabian Sea. The physiography is characterized by lateritic plateaus, flat-topped hills, spurs, and intervening low-lying valleys. Elevation ranges from about 200 m above mean sea level near Ghartanwadi to nearly 10 m in the coastal plains towards Khervand, reflecting a general westward slope.

The drainage pattern is predominantly dendritic to sub-dendritic, governed by this regional gradient. Numerous seasonal streams and nallahs originate from the elevated plateaus and flow westward, ultimately draining into the Arabian Sea. The Gad River constitutes the principal drainage system of the area, receiving several local tributaries from the Anganewadi region.

Climatically, the area experiences a warm and moderately humid coastal regime. Temperatures generally range between 16°C and 33°C, while relative humidity varies from 69% to 98%. The region receives substantial annual rainfall of about 2275 mm, contributing to its lush vegetation and fertile conditions. The southwest monsoon dominates from June to September, followed by a retreating monsoon phase during October and November. Owing to maritime influence, temperature variations remain moderate throughout the year. December is the coolest month (mean ~18.7°C–32°C), whereas April is typically the hottest. Humidity is highest during the monsoon season, accompanied by strong westerly to south-westerly winds. Thunderstorms frequently occur during the post-monsoon period and towards the end of summer, contributing to short-duration intense rainfall events.

5.1.0 PREVIOUS WORK

The Jawaharlal Nehru Aluminium Research Development and Design Centre (JNARDDC) in association with GSI, CR had carried out random sampling of bauxite horizons in low level and high-level laterites of Maharashtra in the past and reported encouraging Al_2O_3 values in their report (JNARDDC, 1999).

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6.1.0 GEOLOGY OF THE AREA

On a regional scale, geologically, the area represents four distinct litho units (Suryanarayana, 1967). These include metasedimentary rocks of Dharwar Supergroup, sedimentary rocks of Kaladgi Supergroup, basalts of Purandargarh Formation belonging to Sahyadri Group of Deccan Trap Supergroup and laterites of Cenozoic age (Figure 2). Most of the laterites have developed over the Deccan basalts as capping. The area also exposes thin layer of carbonaceous clay of Miocene to Pliocene. Quaternary alluvium is present in few isolated patches having limited areal extent found mainly along the estuarine plain.

7.1.0 OBJECTIVES OF THE PROPOSED EXPLORATION PROGRAMME.

To establish the subsurface continuity and to estimate the resource of bauxite and associated critical minerals.

8.1.0 PROPOSED SCHEME OF EXPLORATION

The present item is proposed in northern part of Anganewadi area in part of toposheet no. 47 H/08 & 12 (Figure 1 & 2). The area exposes bauxite and aluminous laterite. In the area bauxite occur as lensoidal and patchy capping over the aluminous laterite. The investigation will comprise DM on 1:4000 scale along with drilling on 400*400 m grid pattern with a proposed 26 vertical borehole up to 15 to 20m depth for assessment of bauxite and associated critical mineral resource in Anganewadi block. The number of boreholes is tentative and may be change after detailed mapping based on feasibility of the area. The area has Alphonso Mango plantation therefore consent of land owners will be required for drilling.

9.1.0 QUANTUM OF WORK

Item of Work	Unit	Proposed Quantum
1. Geological Survey		
DM (1:4000)	Sq km	05
2. Technological		
Drilling	m	400
SMPL		
Core Sampling (CS)	Nos.	400
Reactive Silica	Nos.	05
4. Petrographic/Minerographic Studies		
PS	Nos.	10

Item of Work	Unit	Proposed Quantum
PCS	Nos.	10
ORM/OM	Nos.	10
XRD	Nos.	10
5. Chemical analysis		
(i) Major oxides- Al ₂ O ₃ , SiO ₂ , Fe ₂ O ₃ , TiO ₂ , K ₂ O, CaO, MgO, Na ₂ O, P ₂ O ₅ , MnO, LOI Trace elements - V, Ga, Co, Cr, Sc, Ni & Zr		
CS	Nos.	400
PCS	Nos.	10
REE	Nos.	10

10.1.0 COST

Summary of the Cost estimates

Preliminary Exploration for Bauxite and Associated Critical Mineral in Anganewadi Block, Sindhudurg District, Maharashtra (G3)									
	1	Drilling	400 m	26 Vertical boreholes with 15/20 m depth for each borehole					
Item of Work			Unit	SoC-Item - SI No. NMEDT	Rates as per NMET SoC 2025	Estimated Cost		Remarks	
						Qty.	Total Amount (Rs)		
Drilling - OUT SOURCED									
DRILLING		Drilling in/ Drilling in Soft rock/ Strata: HQ size borehole upto 400m Depth and NQ Size beyond 400m depth in case of NQ size drilling is done before 400m depth, the rate shall decrease by 20%	m	2.2.1.1c		5,500.00	400	₹ 2,200,000.00	
Total Cost D- outsourced								₹ 2,200,000.00	
Total (Drilling)								₹ 2,200,000.00	
GST 18%								₹ 396,000.00	
Total Fund Required inclusive of 18% GST								₹ 2,596,000.00	
								25.96	Lakh

11.1.0 TIME SCHEDULE

The drilling work component of this programme will be carried out as per time schedule shown below:

Time Schedule/ Action Plan for Preliminary Exploration for Bauxite and Associated Critical Mineral in Anganewadi Block, Sindhudurg District, Maharashtra (G3)													
S. No.	Activities	Apr-26	May-26	Jun-26	Jul-26	Aug-26	Sep-26	Oct-26	Nov-26	Dec-26	Jan-27	Feb-27	Mar-27
		1	2	3	4	5	6	7	8	9	10	11	12
1	Sub-surface Exploration: Core Drilling (400 m)												

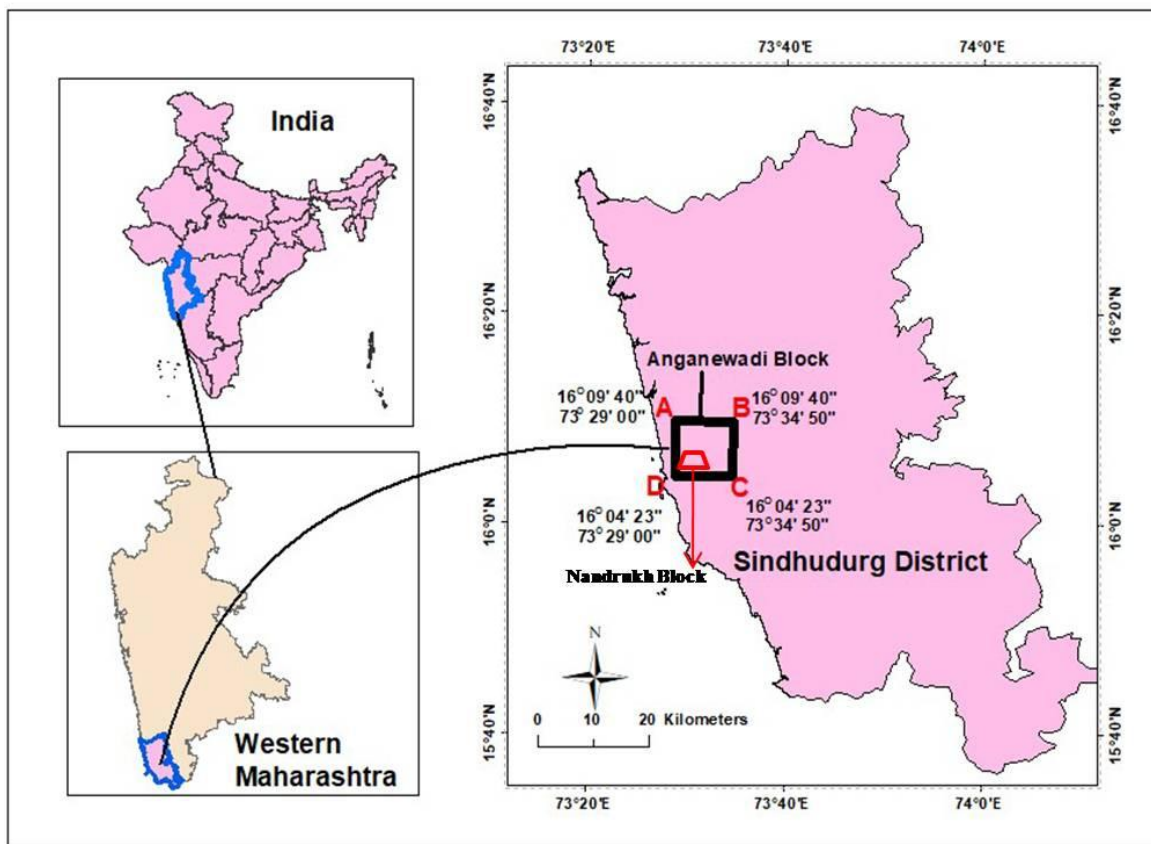


Figure.1 Location map of Anganewadi Block

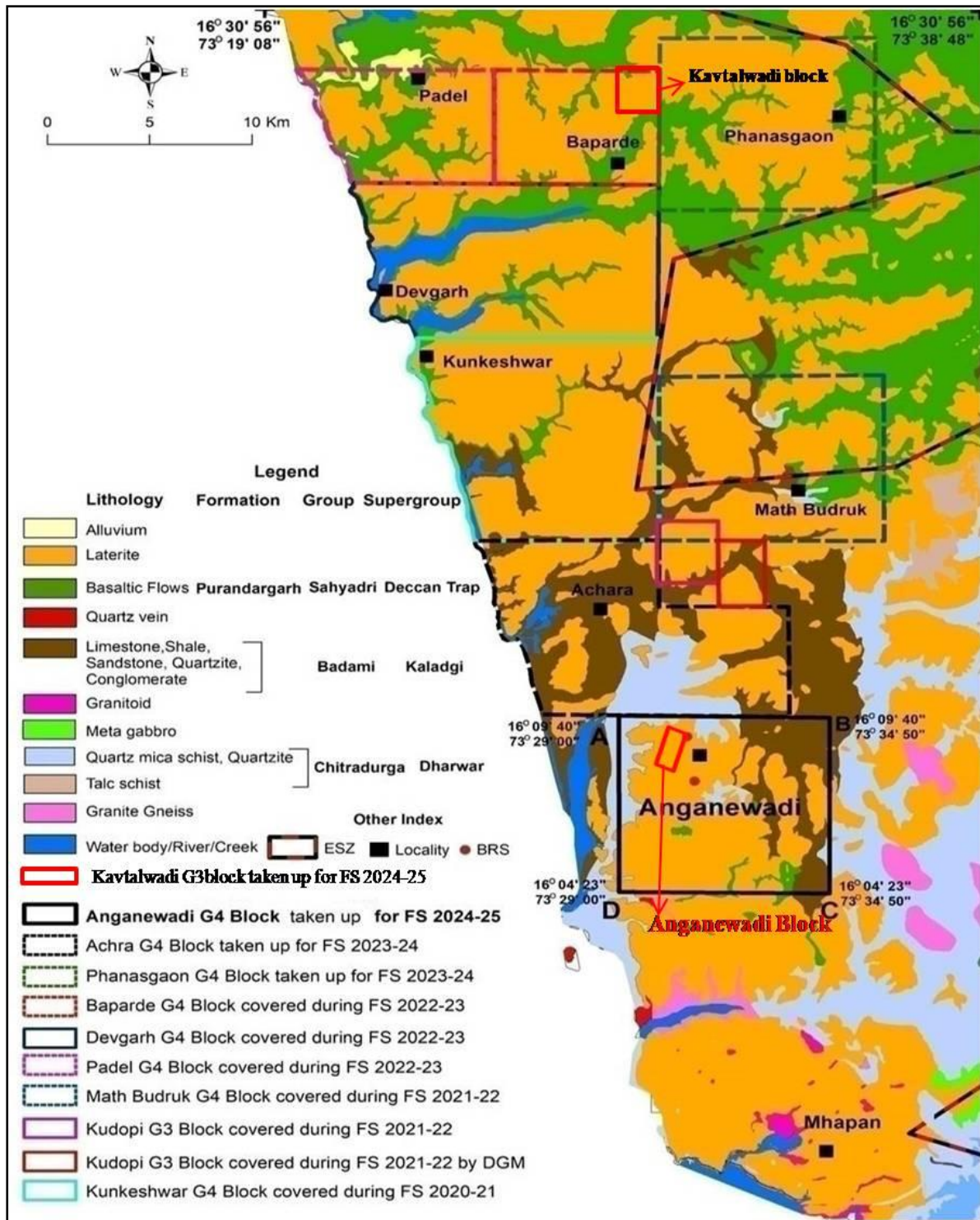


Figure.2 Regional Geological map shows different G4 stage Bauxite blocks along with Anganewadi Block

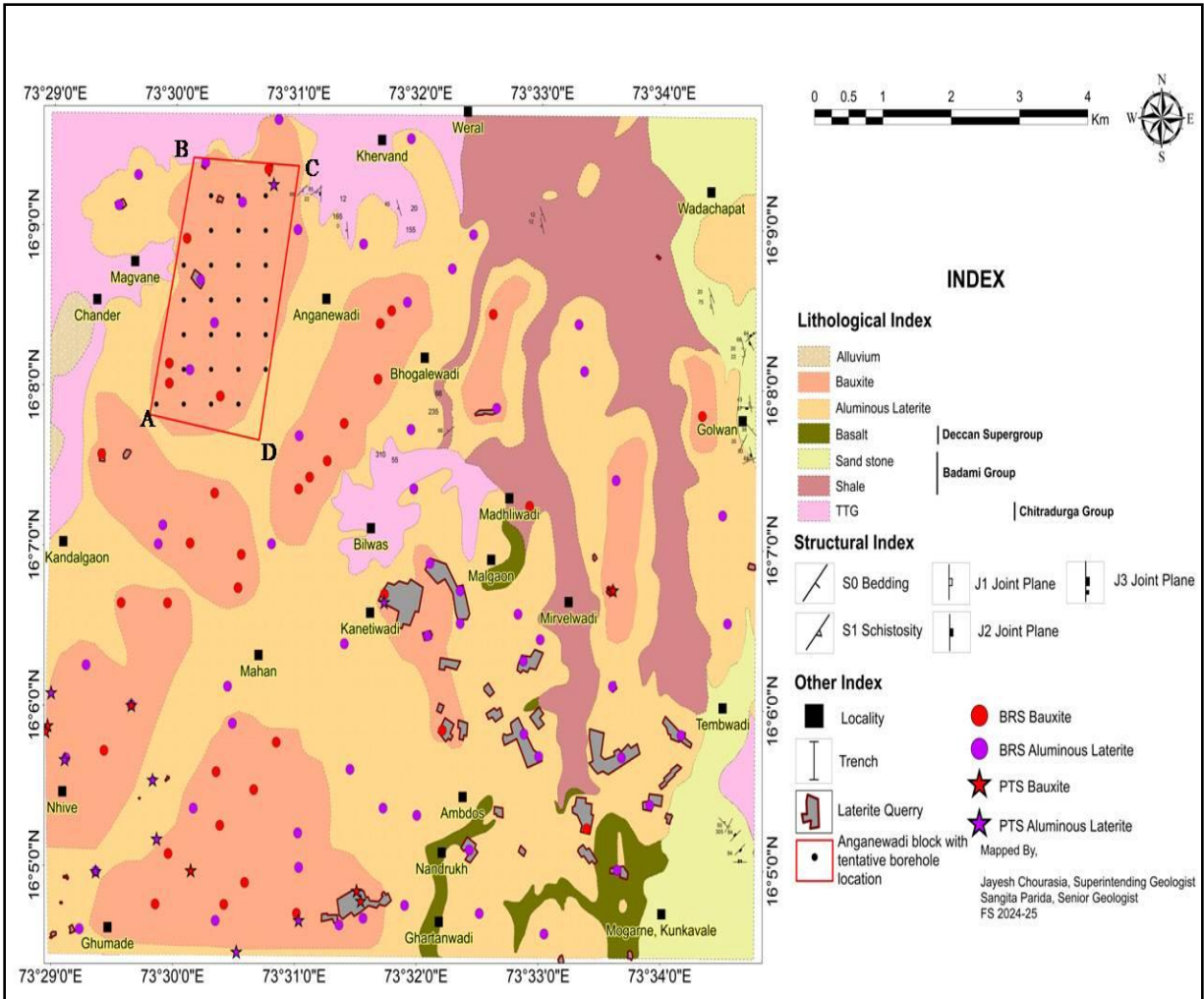


Figure.3 Large Scale Geological Map of Anganewadi area showing Anganewadi Block with tentative borehole location

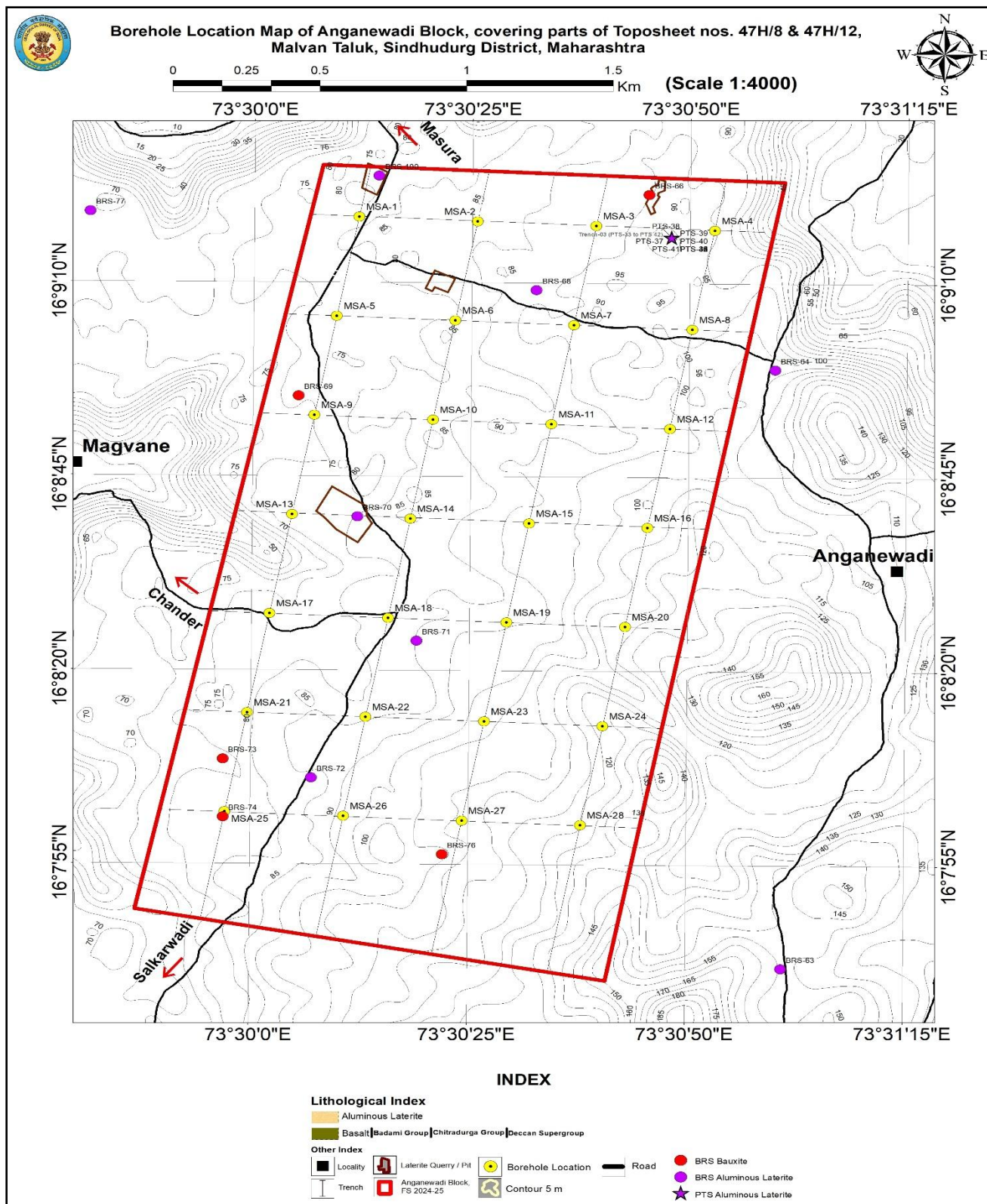


Figure. 4 Tentative proposed borehole location of Anganewadi Block, Malvan Tehsil, Sindhudurg District, Maharashtra

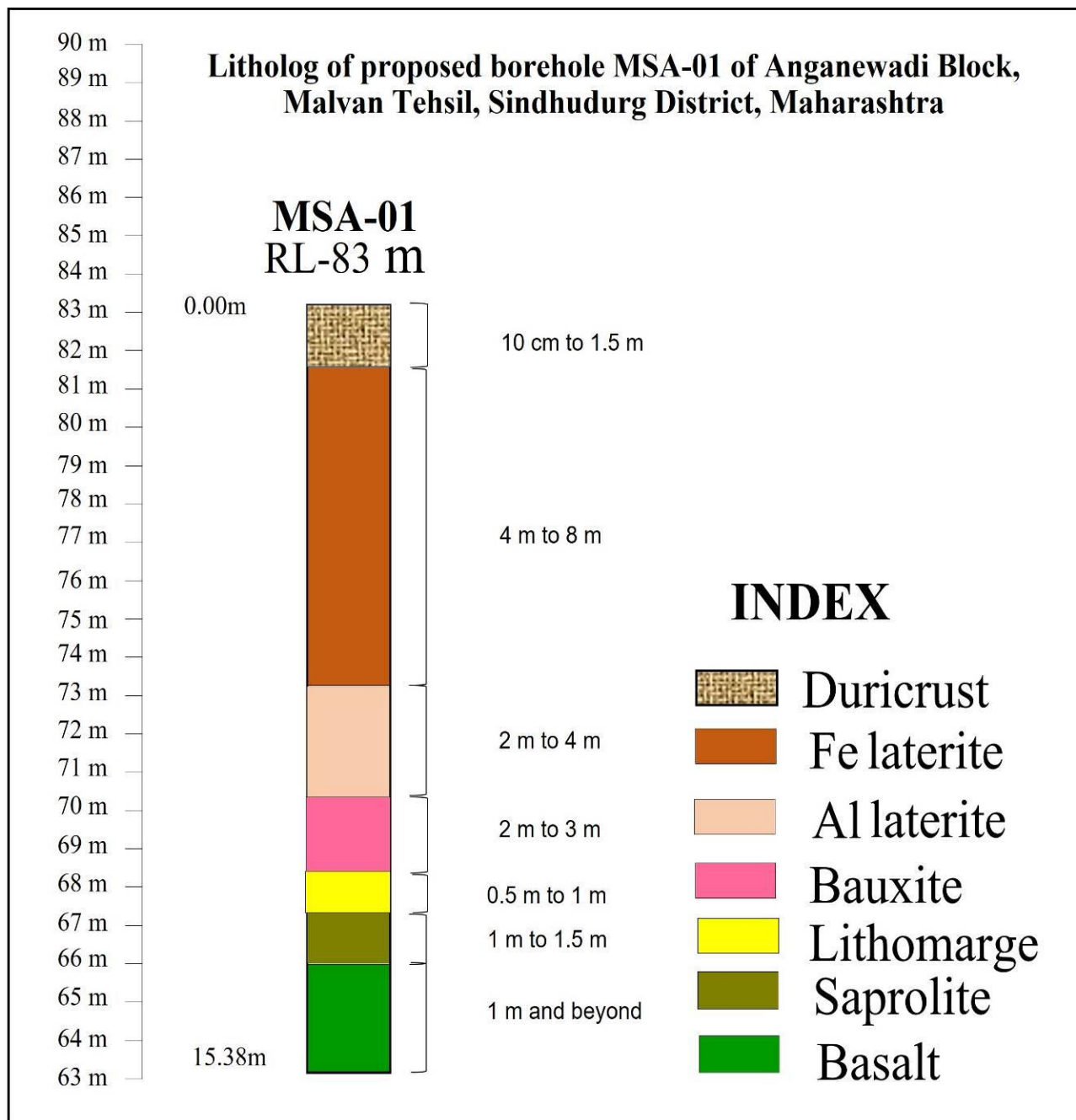


Figure. 5 Graphic lithology of proposed borehole MSA-01 of Anganewadi Block, Malvan Tehsil, Sindhudurg District, Maharashtra