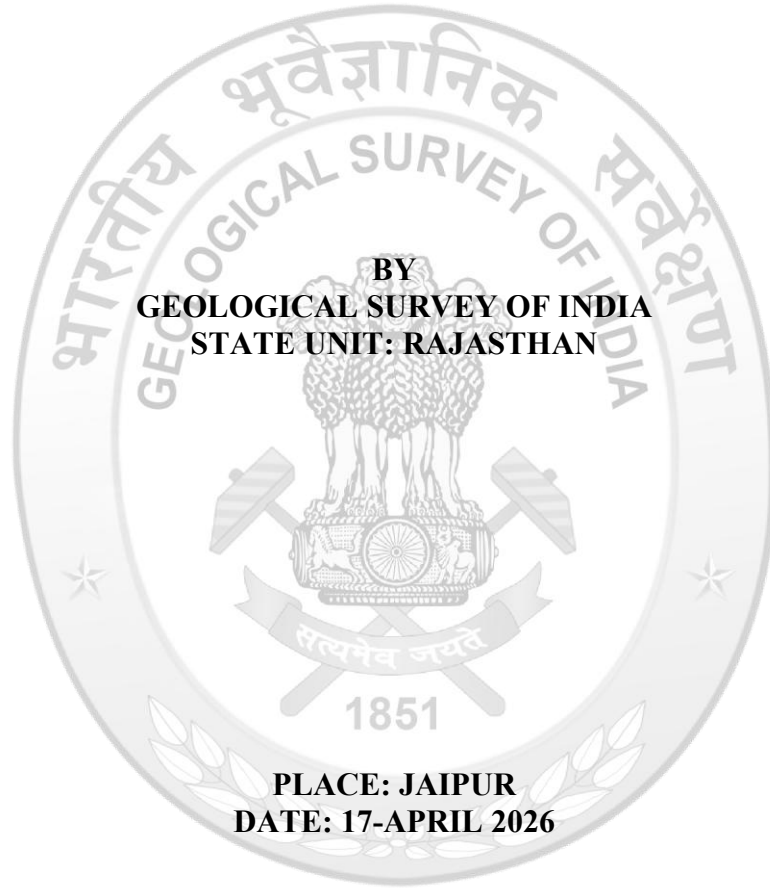


COMMODITY: RARE EARTH ELEMENTS (REE) AND ASSOCIATED MINERALS

**PROPOSAL FOR GENERAL EXPLORATION (G-2) FOR REE AND ASSOCIATED
MINERALISATION IN THE EAST OF GUGROT BLOCK, BALOTRA DISTRICT,
RAJASTHAN**



Summary of the Block for G2 Level Exploration

GENERAL INFORMATION ABOUT THE BLOCK

Feature	Details
Block ID	EAST OF GUGROT BLOCK
Exploration Agency	Geological Survey of India, Western Region, State Unit: Rajasthan
Commodity	Rare Earth Elements (REE) and associated minerals
Mineral Belt / Geological Domain	Siwana Ring Complex
Block Area	1.8 sq. km
Completion Period	One year
Objectives	To establish subsurface continuity and estimate resource of REE and associated mineralisation.
Projected Outcome	Exploration data will use for resource estimation and block will be handed over for auctioning for ML
Personnel	Two geoscientists
Expected Field Days	Officer-1: 100 days; Officer-2: 100 days; Supervisory Officer: 10 days
Toposheet / Degree Sheet	45C/6
District / State	Balotra, Rajasthan

1. Location

BLOCK

Cardinal Points	Latitude	Longitude
A	25°35'54.5" N	72°24'36" E
B	25°35'54.5" N	72°25'48" E
C	25°35'25.5" N	72°25'48" E
D	25°35'25.5" N	72°24'36" E
Tehsil/Taluk	Siwana	
District	Balotra	
State	Rajasthan	

2. Area

Block Area	1.8 sq. km.
Forest Area	19 Hect. 11 %
Government Land Area	Data not available
Private Land Area	Data not available

3. Accessibility

Nearest town	Siwana town, about 16 km to the north
District headquarters	Balotra, about 60 km northwest of the block
Nearest Rail head	Balotra, about 60 km northwest of the block
Nearest Airport	Jodhpur, 190 km northeast of the block

4. Hydrography: Small seasonal streams

5. Climate: Arid.

6. Topography: Flat aeolian sand covered area with small hills.

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	Surface chemical data from rhyolites, felsic dykes and channel samples in and around the block, NGCM
Geophysical data	NGPM & NAGMP

8. Justification for taking up G2 level exploration

- During FS 2023-24, GSI carried out G-3 stage investigation in this block and carried out 19 vertical boreholes of 125 m depth were drilled on a 400 m × 200 m grid over 1.8 sq km.
- Inferred resources: Σ REE+Y – 25.52 MT @ 0.29 % (cut-off 0.25 %), Nb – 27.51 MT @ 0.027 % (cut-off 0.02 %), Zr – 47.55 MT @ 0.43 % (cut-off 0.30 %).
- Based on G3 results, the block is proposed to be upgraded to G2 with a cumulative drilling target of 5,500 m using 44 vertical infill boreholes (125 m each) on a 200 m × 100 m grid, following MEMC rules for tabular, lithology-hosted (peralkaline granite/rhyolite) REE mineralisation under UNFC 332.

FOR GENERAL EXPLORATION (G-2) FOR REE AND ASSOCIATED MINERALISATION IN THE EAST OF GUGROT BLOCK, BALOTRA DISTRICT, RAJASTHAN

1.1.0 INTRODUCTION

Rare Earth Elements (REEs), including lanthanum, scandium, and yttrium, are strategically important for defence, electronics, and sustainable energy systems but are rarely concentrated enough for economic mining. GSI's earlier G4 studies indicate anomalous REE and rare metal mineralization in the Siwana Ring Complex (SRC). Mapping by Barman and Neog (2018) identified peralkaline–peraluminous granites and volcanic rocks from Mokalsar to Siner. FS 2018-19 reported $\Sigma\text{REE}+\text{Y}$ from 150 ppm to 1.27% in southern SRC. Integration of geological and geophysical data highlighted a magnetic high east of Gugrot, with adjoining Sukleswar Ka Mandir (G3) block showing $\Sigma\text{REE}+\text{Y}$ up to 2996 ppm. A G3 stage subsurface exploration in east Gugrot was thus undertaken during FS 2023-24 (Toposheet No. 45 C/06).

2.1.0 BACKGROUND INFORMATION

During FS 2023-24, 1.8 sq. km in the east of Gugrot block was detailed mapped at 1:2000 scale using Total Station, with block boundaries fixed and RL referenced from TBM-1 (SukleshwarKaMandir G3). Lithounits including extrusive, intrusive rocks, and younger dykes were mapped, and surface sampling was carried out using an unbiased approach.

Subsurface exploration used Inhouse drilling unit HY7100068 to assess REE and associated mineralization. About 20 vertical boreholes (125 m \pm 20%) were planned on a 400 m \times 200 m grid; by March 2024, 11 boreholes (RBGUT-1, 3, 4, 6, 8–12, 18–19) totaling 1376.3 m were drilled. During spillover (up to June 2024), 8 boreholes (RBGUT-2, 5, 7, 13–17) were drilled, achieving 1015 m of the remaining 1123.7 m target.

A total of 843 core samples were collected, physically logged, and submitted to the Chemical Lab, GSI WR Jaipur, for analysis.

3.1.0 LOCATION AND ACCESSIBILITY

East of Gugrot block lies in Balotra district, Rajasthan, in toposheet no. 45C/06, within the Siwana Ring Complex. The total proposed block area is 1.8 sq. km.

4.1.0 PHYSIOGRAPHY, DRAINAGE AND CLIMATE

The block lies within the volcanic terrain of the Siwana area, where local topography is controlled by rhyolitic hills, dykes, and intervening low-relief surfaces. Drainage is mainly seasonal. The climate is semi-arid to arid, with hot summers and a short monsoonal rainy season.

5.1.0 PREVIOUS WORK

GSI carried out G4 investigations in and around Siwana area to demarcate targets for REE and rare metals (RM). Rastogi & Mukherjee (2015) reported anomalous REE in rhyolites and tuffs of Bhimgoda Pahar and Koiliyasar-Ka-Pahar (1334–2692 ppm and 1075–3319 ppm, respectively). Bidwai et al. (2014) found high LREE, Zr, Nb, Th, U, and Ag in surface samples. Das et al. (2015) mapped eastern and central blocks adjacent to the proposed area.

Barman & Neog (2018) in northern plutonic SRC reported $\Sigma\text{REE}+\text{Y}$ of 142.3 ppm–0.85% in BRS samples. Kumar & Sharma (2020) in southern plutonic SRC reported $\Sigma\text{REE}+\text{Y}$ in granites (0.029–0.70%), younger intrusives (0.019–2.66%), felsic volcanics (0.015–0.96%), and enclaves/soils (0.022–1.27%), along with encouraging Zr, Nb, Ba, Zn, U, Th, and Hf.

Ahmad & Yadav (2021–23) in WNW Sukleswar Ka Mandir (2 sq km) estimated TREE 0.0349–0.046 MT, TREE+Y 0.170–0.179 MT, Nb 0.194 MT, Hf 0.351 MT, and Zr 0.274 MT at respective cut-offs. Bhatt & Kumar (2022–23) in SE Gugrot reported $\Sigma\text{REE}+\text{Y}$ 135–74,002 ppm in various lithounits, with channel samples up to 8060.9 ppm. Estimated resources: $\Sigma\text{REE}+\text{Y}$ 1.36–1.63 MT (0.30–0.35%), and Ta₂O₅+Nb₂O₅ 3.27–4.07 MT (0.034–0.035%) by cross-section and LVS methods, mainly in granites.

6.1.0 GEOLOGY OF THE AREA

The Malani Igneous suite, Siwana area, Barmer district, Rajasthan is characterized by discontinuous, ring-shaped outcrops of Siwana rhyolite and Siwana peralkaline granite with minor outcrops of basalt. The study area shows no deformational features except for joints and fractures which are corresponding to the regional radial joints found in Siwana ring complex and some local faults. The primary features in the area are defined by the presence of vesicles and amygdules whereas the secondary features include joints and local fault. The rocks of area are unmetamorphosed.

Detailed mapping of 1.8 sq km area on 1:2000 scale has been carried out in East of Gugrot block, Siwana, Barmer District, Rajasthan and the study area is situated within the southern part of Siwana Ring Complex, characterized by the exposure of rocks of Malani Igneous Suite (MIS), dating back to the Neo-Proterozoic era.

7.1.0 OBJECTIVES OF THE PROPOSED EXPLORATION PROGRAMME

The present exploration programme has been formulated to fulfill the following objectives:

1. To establish subsurface continuity and estimate resource of REE and associated mineralization.
2. A G2 stage investigation by GSI in East of Gugrot block, Siwana, Balotra District, Rajasthan is proposed for enhancing the G3 level (inferred) to G2 level confidence (indicative resource) under UNFC 332.
3. Ore resource/reserve estimation in accordance with MEMC Rule-2015 and UNFC.

8.1.0 PROPOSED SCHEME OF EXPLORATION

The present work is taken up based on the G3 block exploration by GSI during FS: 2023-24 with detailed mapping of 1.8 sq.km, drilling of 2344.3 m over 400 m x 200 m grid pattern for REE & associated mineralisation. The outcome of previous G3 exploration the proposed block is upgraded to G2 block with a total target of 5500 m drilling on grid pattern 200 x 100 m with proposed tentative 44 nos. vertical infilling boreholes as per MEMC rules for REE exploration by considering the mineralisation as tabular, lithology hosted (peralkaline granite / rhyolite).

Hence, a cumulative drilling target of 5500 m in East of Gugrot block, Siwana, Balotra District, Rajasthan is proposed for enhancing the G3 level (inferred) to G2 level confidence (indicative resource) under UNFC 332 with planning of tentative 44 nos. of vertical infilling borehole planned as individual vertical depth of 125 m on 200 m x 100m grid pattern. The block lies 0.75 km east of Gugrot village and sandwiched between previously explored of E. Gugrot block (2023-24) and SE of Gugrot block (2022-23). It can be reached by road, 10 kms from Siwana town. Siwana is located 132 km east of district headquarters Barmer and 35 south east of Balotra, Barmer District. The details of different activities to be carried out are presented in subsequent paragraphs.

9.1.0 QUANTUM OF WORK

Item of Work	Unit	Proposed Quantum
Subsurface exploration: drilling	m	5500
Borehole geophysical logging	m	2750
PCS	nos.	10
Core samples (CS)	nos.	2200
PS	nos.	20
XRD	nos.	5
EPMA	nos.	5
Ore Beneficiation Study	Nos.	1
Chemical analyses	nos.	2210

10.1.0 COST

Summary of the Cost estimates

Sl. No.	Item	Total Estimated Cost (Rs.)	Funding
1	Geology and Survey	0	By GSI
2	Drilling	5,50,00,000.00/-	NMEDT
3	Survey work (Borehole fixation and demarcation)	0	By GSI
4	Laboratory studies	0	By GSI
5	Geologist at HQ	0	By GSI
	Sub Total (1to 4)	5,50,00,000.00/-	
6	Exploration Report Preparation	0	By GSI
7	Proposal Preparation	0	By GSI
8	Peer review charges	0	By GSI
9	Sub Total (1to8)	5,50,00,000.00/-	NMEDT
10	GST18%	99,00,000.00/-	NMEDT
	Total:	6,49,00,000.00/-	
	Say Rs. In Lakh	649.00/-	

Item of Work	Unit	SoC-Item -SI No. NMEDT	Rates as per NMET SoC 2025	Estimated Cost			
				Qty.	Total Amount (Rs)		
D. Drilling - OUT SOURCED							
18.a	DRILLING	Drilling in/ Drilling in Soft rock/ Strata: HQ size borehole up to 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	5,200.00	0	₹ 0.00
18.b		Drilling in/ Drilling in Hard rock/ Strata: HQ size borehole up to 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	2.2.1.1d	10,000.00	5500	₹ 5,50,00,000.00
18.c		Drilling in/ Drilling in Very Hard rock/ Strata: HQ size borehole up to 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	2.2.1.1e	12,650.00	0	₹ 0.00
18.d		Drilling for Lignite	m	2.2.1.1a	4,783.00	0	₹ 0.00
18.e		Drilling for Coal	m	2.2.1.1b	7,975.00	0	₹ 0.00
18.a		Mechanised Auger Drilling for soft strata up to 30m depth	m	2.2.2.1	4,760.00	0	₹ 0.00
18.b		Hand Auger drilling in soft strata up to 30 m depth	m	2.2.2.2	3,808.00	0	₹ 0.00
18.c		RC Drilling	m	2.2.3	8,870.00	0	₹ 0.00
18.d		Non coring drilling	m	2.2.4	4,000.00	0	₹ 0.00
19		DRILLING RELATED	Borehole Deviation Survey by Multishot survey tool (interval 6m; azimuth and inclination to be recorded)	per shot	2.2.5	330.00	916
20	Land / Crop Compensation (in		per BH	5.6	30,000.00	44	₹ 0.00

	case the BH falls in agricultural Land)							
21	Construction of concrete Pillar (12"x12"x30")	per borehole	2.2.7a		2,000.00	44	₹ 0.00	
22	Borehole plugging with cement	per borehole	2.2.8		10,000.00	44	₹ 0.00	
23	Miscellaneous Charges (Transportation of Drilling Rig, accommodation for Drilling Camp, Camp setting and winding, construction of approach road)	Lumpsum	0	2.2.9.4	For Drilling cost >2 Cr: 10 % of the Drilling Cost with a maximum ceiling of Rs.25 Lkh	2500000		
24	Drill Core Preservation- One complete BH plus mineralised cores of all the BHs of the block/ prospect to be preserved in boxes and subsequently transported to the notified core repository.	per m	X		1,590.00	2500	₹ 0.00	
Total Cost D- outsourced							₹	5,50,00,000.00
Total (Survey Work + Drilling)							₹	5,50,00,000.00
GST 18%								₹ 99,00,000.00
Total Fund Required inclusive of 18% GST							₹	6,49,00,000.00
								~ 6.49 Cr

11.1.0 TIME SCHEDULE

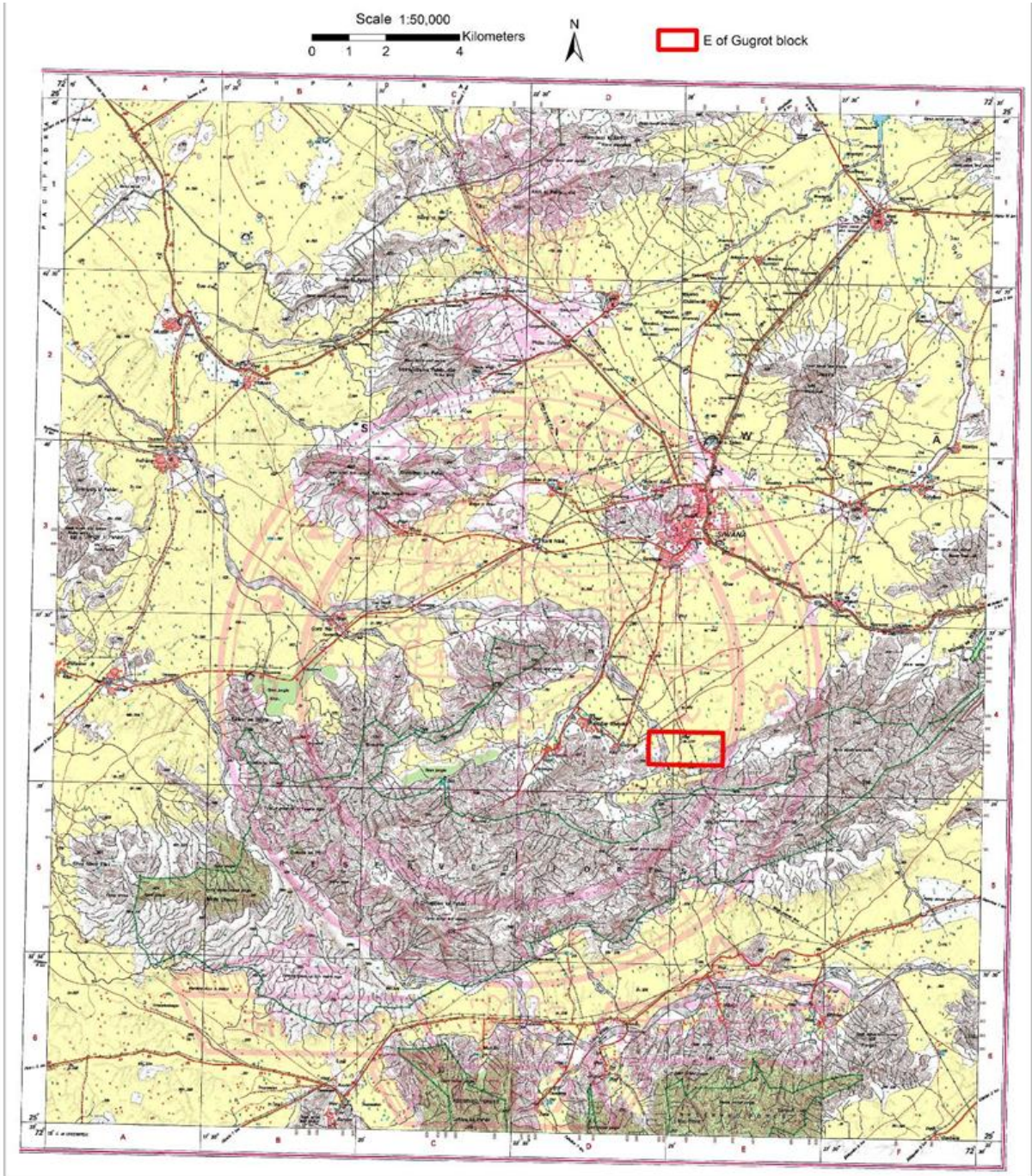
The work programme is proposed for FS 2026–27, with field, laboratory, reporting, and circulation milestones as summarised below.

The proposed exploration programme is planned in such a way that all the activities like mapping, surface sampling, drilling, logging, core sampling and associated geological work and laboratory work will be completed within 10 months. Report writing will take 4 months with 2 months overlapping with laboratory analysis. Thus, the total duration of the project for completion of the above exploration will be 12 months from the date of commencement of the project.

SCHEDULED TIME FOR THE PROPOSED G-3 LEVEL EXPLORATION													
S.No	Activities	APR 2026	MAY 2026	JUN 2026	JUL 2026	AUG 2026	SEP 2026	OCT 2026	NOV 2026	DEC 2026	JAN 2027	FEB 2027	MAR 2027
		1	2	3	4	5	6	7	8	9	10	11	12
1	Surface sampling	■	■	■	■								
2	Geological Mapping (1:2000)		■	■	■								
3	Drone topographic Survey			■	■								
4	Laboratory studies		■	■	■	■		■	■	■	■	■	
5	Core drilling			■	■	■		■	■	■			
6	Geophysical borehole logging			■	■	■		■	■	■			
7	Core sampling			■	■	■		■	■	■	■		
8	Report writing/ Peer review										■	■	■

***Time loss on account of monsoon/agricultural activity/forest clearance/ local law & order problems will be addition to above time line.**





Location of proposed East of Gugrot block proposed for FS 2026-27 in T.S. No. 45C/06 around Siwana area, Balotra district, Rajasthan

Location of proposed East of Gugrot block proposed for FS 2026-27 over 1:50,000 scale map of TS 45 C/06, Siwana area, Balotra district, Rajasthan

**Regional Geological map
of the study area
(Compiled by M&C Division,
GSI WP Rajasthan)**



LITHOLOGY	FORMATION	GROUP	SUPERGROUP
Q2tb	Fine aeolian sand and silt with occasional kankar	Thar Desert	
yPt3msq	Quartz vein / reef	Malani Intrusive 20	Malani Igneous Suite I
APt3msr	Rhyolite	Malani Intrusive 35	
yPt3mspp	Granite porphyry	Malani Intrusive 50	
BPt3msd	Dolerite	Malani Intrusive 75	
yPt3mjs	Peralkaline granite	Siwana Granite	Jalore Plutonics
APt3mje	Rhyolite	Kailana Felsic Volcanics	Jodhpur volcanics

Proposed Study area A: 25°35'54.5"N / 72°24'36" E

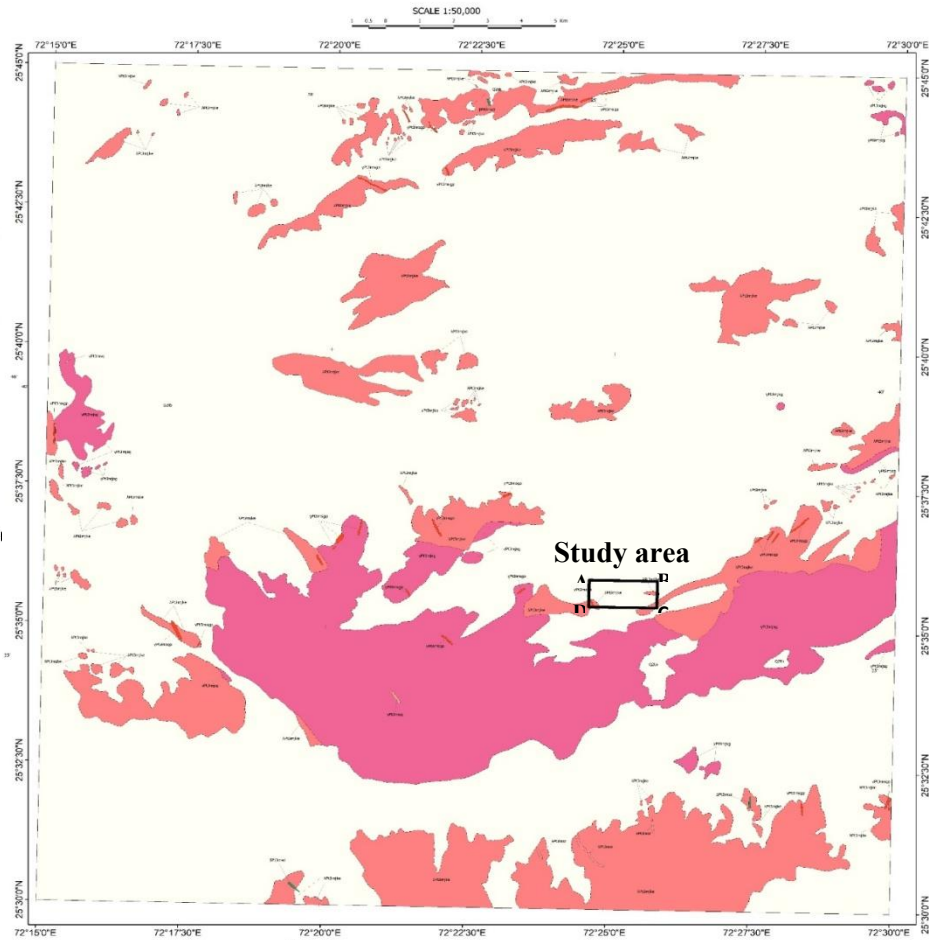


B: 25°35'54.5"N / 72°25'48" E

C: 25°35'25.5"N / 72°25'48" E

D: 25°35'25.5"N / 72°24'36" E

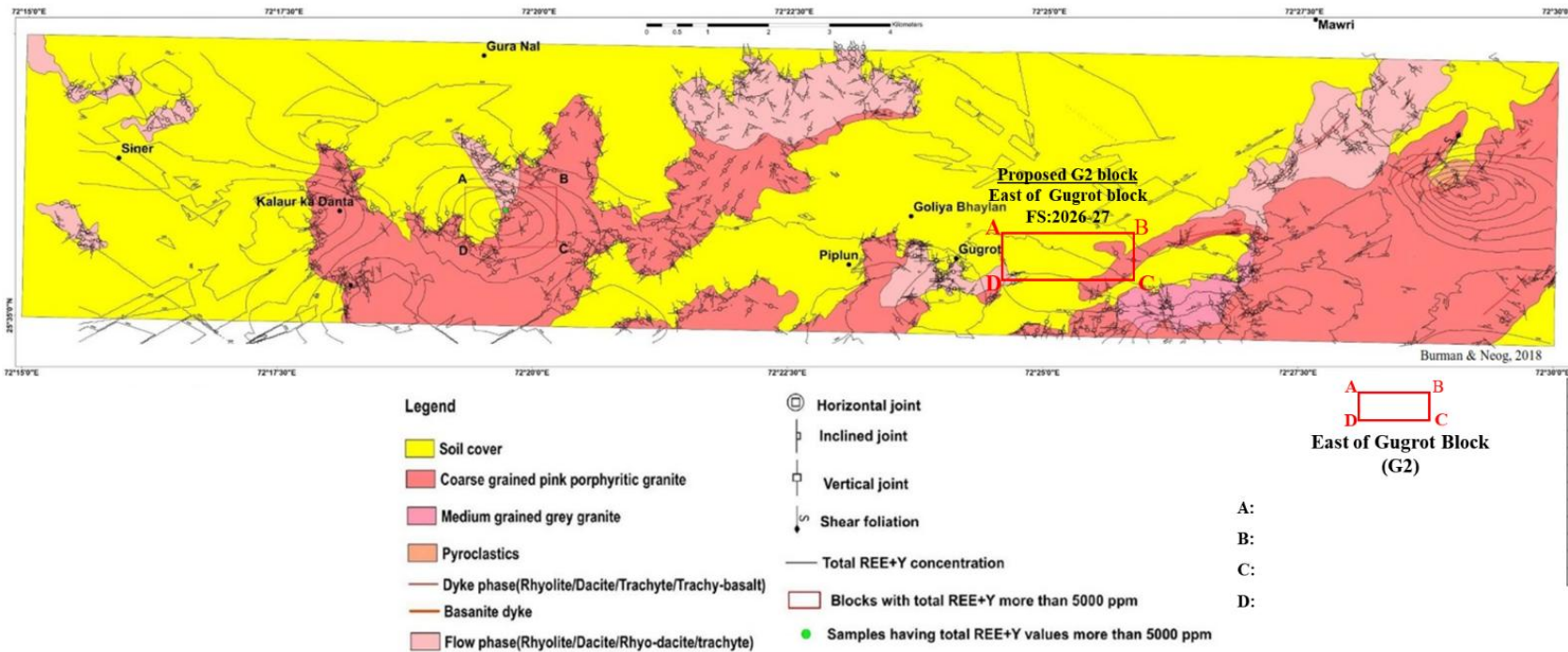
East of Gugrot block (G3) on Geological Map of Toposheet 45C/06



Location of proposed East of Gugrot block proposed for FS 2026-27 Over 1:12,500 scale LSM map of part of TS 45 C/06, Siwana area, Balotra district, Rajasthan



Large Scale Geological map (LSM) of South of Siwana area, Barmer Rajasthan (part of T.S no. 45 C/06)
FS: 2017-18



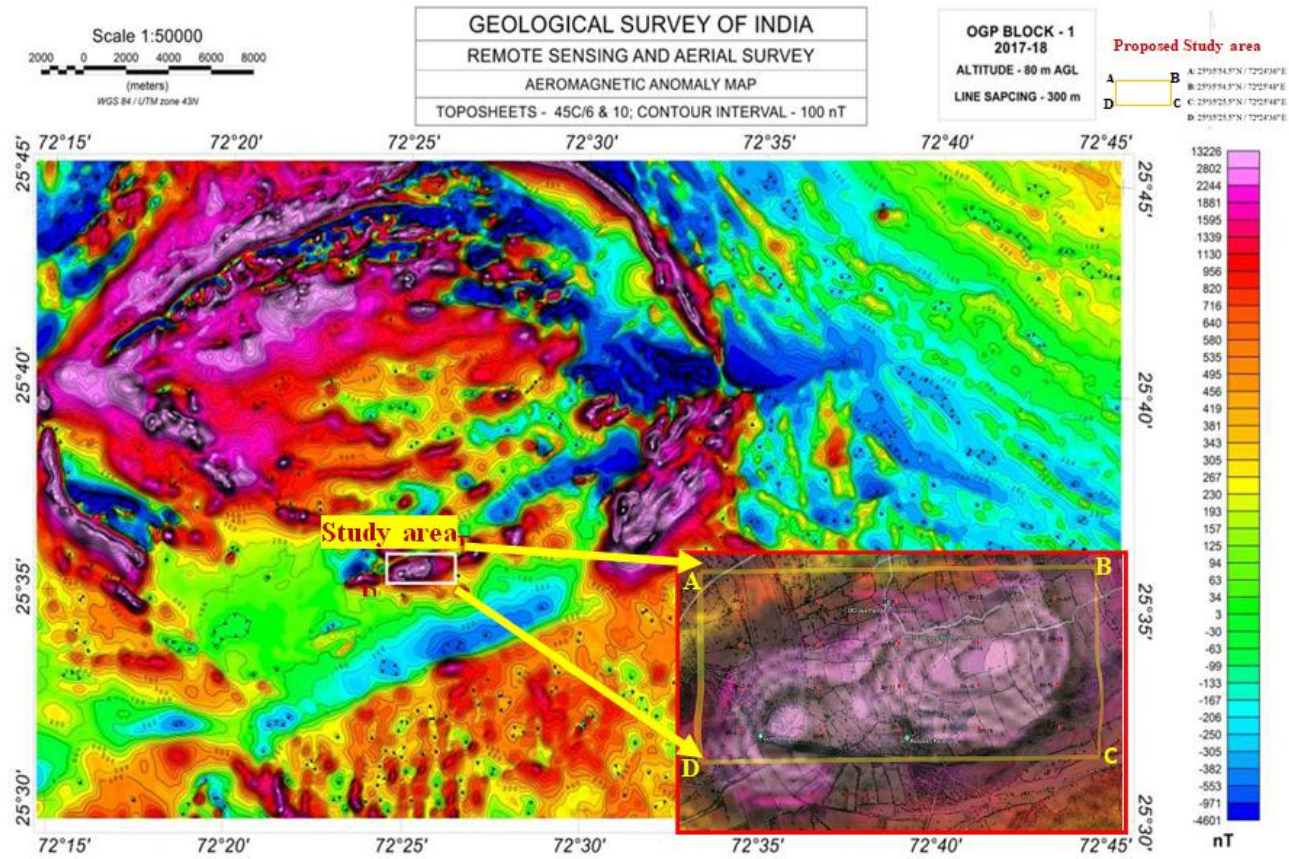
A:

B:

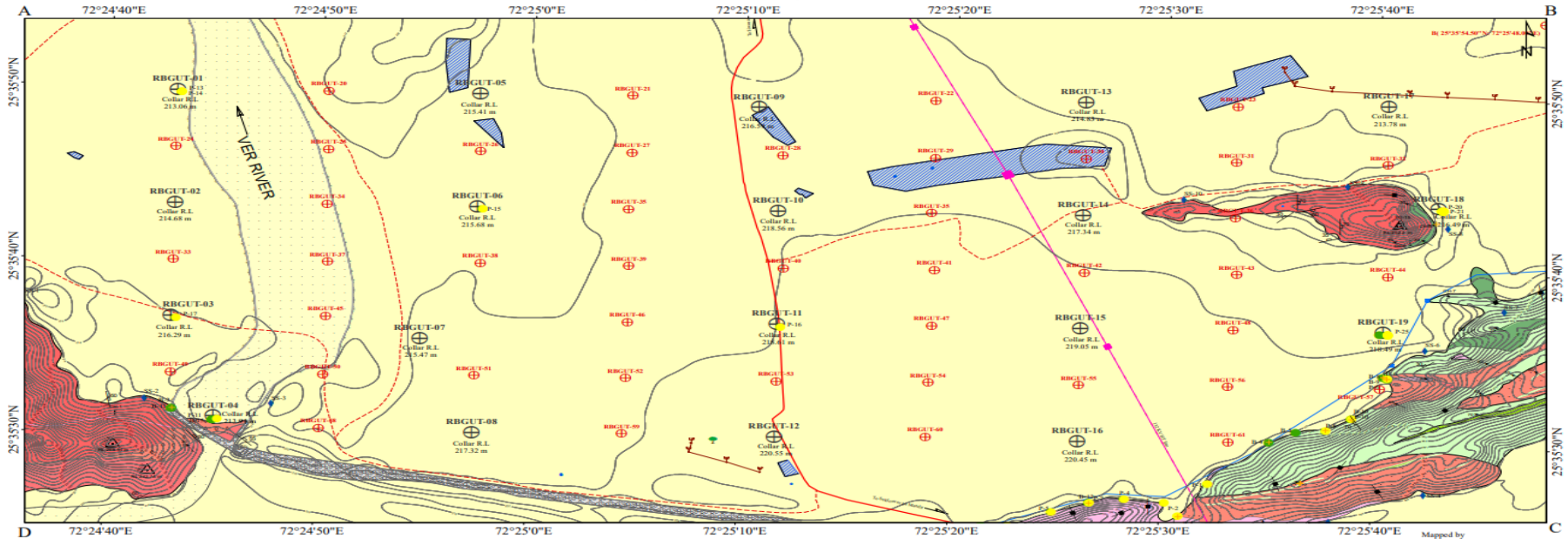
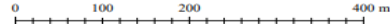
C:

D:

Location of proposed East of Gugrot block proposed for FS 2026-27 over Aeromagnetic anomaly map of TS 45 C/06& 10, Rajasthan



Proposed G2 block with tentative borehole locations on the Detailed geological map of East of Gugrot block, Barmer District, Rajasthan (In parts of Toposheet no. 45C/6) (Scale- 1:2000)



LEGENDS

<p>Labelage</p> <ul style="list-style-type: none"> Aeolian / Sand cover Mafic dykes Microgranite dyke Basalt / trachy basalt Dacite / trachy dacite Granite Pyroclast (rhyolitic) Rhyolite II Porphyrhy rhyolite Rhyolite I 	<p>Mode of Magmatism</p> <ul style="list-style-type: none"> Volcanic Phase (Phase III) Plutonic Phase (Phase II) Volcanic Phase (Phase III) 	<p>Group</p> <ul style="list-style-type: none"> Thar Desert (Recent) Siwana Ring Complex 	<p>Supergroup</p> <ul style="list-style-type: none"> Malani Igneous Suite (Neo Proterozoic)
<p>RBGUT-1 Borehole location</p> <p> Flow direction</p> <p> Inclined joints</p> <p> Vertical joints</p> <p>RBGUT-61 Tentative Borehole location (on grid pattern 200 m x 100 m)</p>	<p>B-12 BRS</p> <p>P-6 PCS</p> <p>+ TPS</p> <p>REC-10 Soil sample</p> <p>CH-1 Channel samples</p>	<p> Survey station</p> <p> Contour lines (CI- 3 m)</p> <p> Surveyed tree</p> <p> Metalled road</p> <p> Kuccha road</p> <p> Dugwell</p>	<p> River (Seasonal)</p> <p> River channel (lined)</p> <p> Embankment</p> <p> Electric pole/line</p> <p> 132 KV HT line</p> <p> Settlement</p> <p> Forest boundary</p>

Mapped by
Sh. Shanki Yadav, Sr. Geologist
Smt. Sakuntala Sahoo, Geologist
Surveyed & drawn by:
Sh. Sakumar Das, survey Officer
FS-2023-24

Location of proposed East of Gugrot block proposed for FS 2026-27 over Google imagery with tentative borehole location in part of TS 45 C/06, Siwana area Balotra district, Rajasthan

