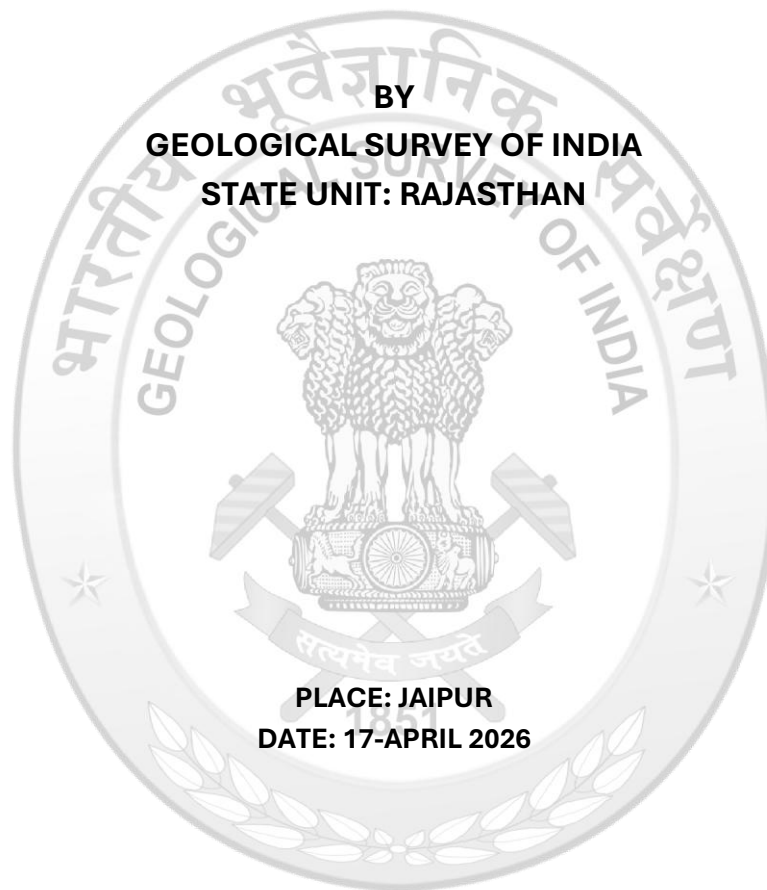


COMMODITY: RARE EARTH ELEMENTS (REE) AND ASSOCIATED MINERALS

**PROPOSAL FOR PRELIMINARY (G-3) EXPLORATION
FOR REE AND ASSOCIATED MINERALISATION
IN MUTHLI BLOCK, BALOTRA DISTRICT, RAJASTHAN**



Summary of the Block for G3 Level Exploration

GENERAL INFORMATION ABOUT THE BLOCK

Feature	Details
Block ID	Muthli Block, Balotra District, Rajasthan
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	3.8 sq. km
Completion Period	One year
Objectives	To establish subsurface continuity and estimate resource of REE and associated mineralisation.
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; Supervisory Officer: 10 days
Toposheet / Degree Sheet	45C/6
District / State	Balotra, Rajasthan

1. Location

BLOCK

Cardinal Points	Latitude	Longitude
A	25°41'43.80"N	72°17'11.89"E
B	25°42'54.47"N	72°18'52.23"E
C	25°42'27.18"N	72°19'16.00"E
D	25°41'16.45"N	72°17'35.60"E
Tehsil/Taluk	Siwana	
District	Balotra	
State	Rajasthan	

2. Area

Block Area	3.8 sq. km.
Forest Area	NIL
Government Land Area	Data not available
Private Land Area	Data not available

3. Accessibility

Nearest town	Siwana town, about 13 km to the southeast
District headquarters	Balotra, about 35 km northwest of Siwana area
Nearest Rail head	Balotra, about 35 km northwest of Siwana area
Nearest Airport	Jodhpur, 100 km

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 G3 level exploration

1. The block forms part of the Siwana Ring Complex of the Malani Igneous Suite, a recognised peralkaline igneous province with encouraging REE and associated rare metal potential.
2. Earlier GSI investigations in Siwana reported anomalous total REE+Y values in rhyolites, felsic dykes, granites and associated rock units, along with encouraging Zr, Nb, U, Th and Hf values.
3. Flow units and felsic dykes in the northern part of the complex, including the proposed area, have yielded strong surface geochemical anomalies and therefore warrant subsurface testing.

PROPOSAL FOR PRELIMINARY (G-3) EXPLORATION FOR REE AND ASSOCIATED MINERALISATION IN NORTH EAST OF MUTHLI BLOCK, BALOTRA DISTRICT, RAJASTHAN

1.1.0 INTRODUCTION

Rare Earth Elements are critical minerals of strategic importance because of their applications in clean energy technologies, high-performance magnets, advanced electronics, batteries, defense systems and a range of high-technology manufacturing sectors.

Peralkaline igneous complexes are among the important geological environments for REE and associated rare metal mineralisation. The Siwana Ring Complex of western Rajasthan is one such province where earlier investigations have repeatedly indicated anomalous enrichment of REE and associated elements.

The proposed programme is designed to generate the geological, geochemical, and drilling data required for preliminary resource appraisal and to guide subsequent exploration.

2.1.0 BACKGROUND INFORMATION

Muthli block is situated within the Siwana Ring Complex of western Rajasthan, a part of the Neoproterozoic Malani Igneous Suite that has emerged as a promising REE- and rare-metal-fertile peralkaline igneous province.

GSI has already undertaken earlier regional and G4-stage work in the broader Siwana area, and the present proposal represents upgradation of a previously identified target to G3 stage for systematic subsurface testing.

Peralkaline granites, associated felsic volcanics, and younger intrusive phases in the Siwana area are known to host anomalous concentrations of REE together with associated elements such as Nb, Zr, Hf. The present proposal aims to test the subsurface continuity of indications identified in earlier studies and to advance the block to G3 level.

The proposal is linked with the annual plan of GSI and focuses on establishing grade, thickness, and continuity of REE and associated mineralisation within the Muthli block.

3.1.0 LOCATION AND ACCESSIBILITY

The Muthli block lies in Balotra district, Rajasthan, in toposheet no. 45C/06, within the Siwana Ring Complex. The total proposed block area is 3.8 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

Preliminary sampling of rhyolites and associated tuffs of the Siwana Ring Complex by GSI during 2013-14 indicated anomalous REE values, with total REE ranging from 1334 to 2692 ppm in Bhimgoda Pahar and 1075 to 3319 ppm in Koiliyasar-ka-Pahar.

Lal and Ghosh, 2021 carried out large scale geological mapping (1:12500 scale) at the norther periphery of the Siwana Ring Complex, stretching from Sainji ki Beri to Meli area. They marked 32nos. of rhyolitic flows along with several felsic dykes in the area. Several flows are found to be highly enriched in tREE concentration. Chemical analysis data from rhyolite samples of study area yielded $\Sigma\text{REE}+\text{Y}$ values ranging from 91.76ppm to 9764.68ppm, with average value of 1844.84ppm. $\Sigma\text{HREE}/\Sigma\text{LREE}$ ratio of the same is 0.15. 22 BRS samples from felsic/rhyolite dykes yielded $\Sigma\text{REE}+\text{Y}$ values ranging from 144.77ppm to 7678.75ppm, with average value of 1400.14ppm. $\Sigma\text{REE}+\text{Y}$ value in channel samples ranging from 261.73 to 6224.81ppm, with $\Sigma\text{HREE}/\Sigma\text{LREE}$ ratio of 0.19.

6.1.0 GEOLOGY OF THE AREA

Peralkaline igneous rocks and associated evolved units are well-known hosts for REE and HFSE mineralisation. In the Siwana area, earlier studies have shown that both plutonic and volcanic phases carry anomalous $\Sigma\text{REE}+\text{Y}$ concentrations, with the younger intrusive phases commonly showing higher enrichment.

The proposed Muthli block is situated within this REE-fertile peralkaline igneous environment and is therefore suitable for systematic G3 exploration. The proposed block has small outcrops of rhyolite with surface samples yielding $\Sigma\text{REE}+\text{Y}$ concentration ranging from 150ppm to 4681ppm. Only 8% of the area has outcrops, rest is under aeolian sand cover of variable thickness.

7.1.0 OBJECTIVES OF THE PROPOSED EXPLORATION PROGRAMME

The present exploration programme has been formulated with the following objectives:

1. To carry out detailed mapping on 1:2,000 scale and delineate REE and associated mineralised zones through bedrock and channel sampling.
2. To test the depth continuity, thickness, and grade of mineralised zones through systematic drilling and borehole logging.
3. To generate adequate geological, geochemical, and analytical data for preliminary resource appraisal of REE and associated mineralisation in the block.
4. To provide the basis for further stage advancement and focused exploration planning in the Muthli area.

8.1.0 PROPOSED SCHEME OF EXPLORATION

The proposed G3 exploration programme comprises detailed geological mapping, surface sampling, systematic drilling, borehole geophysical logging, sample processing, and laboratory studies. Detailed mapping on 1:2,000 scale will be carried out over 3.8 sq. km. to delineate lithological boundaries, structures, mineralised zones, and surface expressions of REE and associated mineralisation.

Surface sampling will include bedrock and channel samples from favourable lithologies and mineralised exposures. Drilling is proposed to test the vertical continuity of identified mineralised zones. The programme

envisages about 54 vertical boreholes of 100m depth on a grid of 400m x 200m, including a limited number of deeper boreholes, for an aggregate drilling of 5700 m.

Borehole logging, core sampling, and laboratory analyses will support interpretation and preliminary resource appraisal. Selected samples will also be subjected to XRD and EPMA studies.

9.1.0 QUANTUM OF WORK

Item of Work	Unit	Proposed Quantum
Detailed geological mapping (1:2,000)	sq. km	3.8
Subsurface exploration: drilling	m	5700
Borehole geophysical logging	m	2500
Bedrock samples (BRS)	nos.	25
Channel samples	nos.	50
PCS	nos.	15
Core samples (CS)	nos.	1650
PS	nos.	15
XRD	nos.	5
EPMA	nos.	10
Chemical analyses	nos.	1740

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	5,70,00,000.00/-	NMEDT
3	Survey work	20,39,720.00/-	NMEDT
4	Laboratory studies	0	By GSI
5	Geologist at HQ	0	By GSI
	Sub Total (1to 4)	5,90,39,720.00/-	
6	Exploration Report Preparation	0	By GSI
7	Proposal Preparation	0	By GSI
8	Peer review charges	0	By GSI
9	Sub Total (1to8)	5,90,39,720.00/-	By GSI
10	GST18%	1,06,27,149.60/-	
	Total:	6,96,66,869.60/-	
	Say Rs. In Lakh	696.67/-	

Item of Work	Unit	SoC-Item -SI No. NMEDT	Rates as per NMET SoC 2025	Estimated Cost			
				Qty.	Total Amount (Rs)		
B. SURVEY WORK							
9	a	Demarcation of lease boundary, Fixation of boreholes and determination of coordinates and reduced level (RL) of the boreholes by DGPS (including charges of labourers deployed for the work)- use of CORS Network system for all DGPS is compulsory	Per Point of observation	1.3.2	24,000.00	58	₹ 13,92,000.00
9	b	Charges of one qualified surveyor with Total station for carrying out topographical survey in different RF and surface contouring at different interval, fixation of borehole and determination of co-ordinates and reduced Level (RL) of the boreholes with total station etc. a) Charges of one surveyor per day (without labour) (Up to 4 labourers will be allowed per surveyor)	one surveyor per day	1.3.1	10,500.00	30	₹ 3,15,000.00
	c	Labour Charges for Survey work	Per day	As per Govt rates	556.00	120	₹ 66,720.00
9	d	Drone Topographic Survey	per sq.km	7b	70,000.00	3.8	₹ 2,66,000.00
Total Cost B (in case of out sourcing)							₹ 20,39,720.00
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	5,500.00	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	5700	₹ 5,70,00,000.00
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 EXPENDITURE ITEMS	Borehole Deviation Survey by Multishot survey tool (interval 6m; azimuth and inclination to be recorded)	per shot	2.2.5	330.00	950
20	Land / Crop Compensation (in case the BH falls in agricultural Land)		per BH	5.6	30,000.00	54	₹ 0.00
21	Construction of concrete Pillar (12"x12"x30")		per borehole	2.2.7a	2,000.00	54	₹ 0.00
22	Borehole plugging with cement		per borehole	2.2.8	10,000.00	54	₹ 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	₹ 0.00
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							₹ 5,70,00,000.00
Total (Survey Work + Drilling)							₹ 5,90,39,720.00
GST 18%							₹ 1,06,27,149.60
Total Fund Required inclusive of 18% GST							₹ 6,96,66,869.60
							~ 6.97 Cr

11.1.0 TIME SCHEDULE

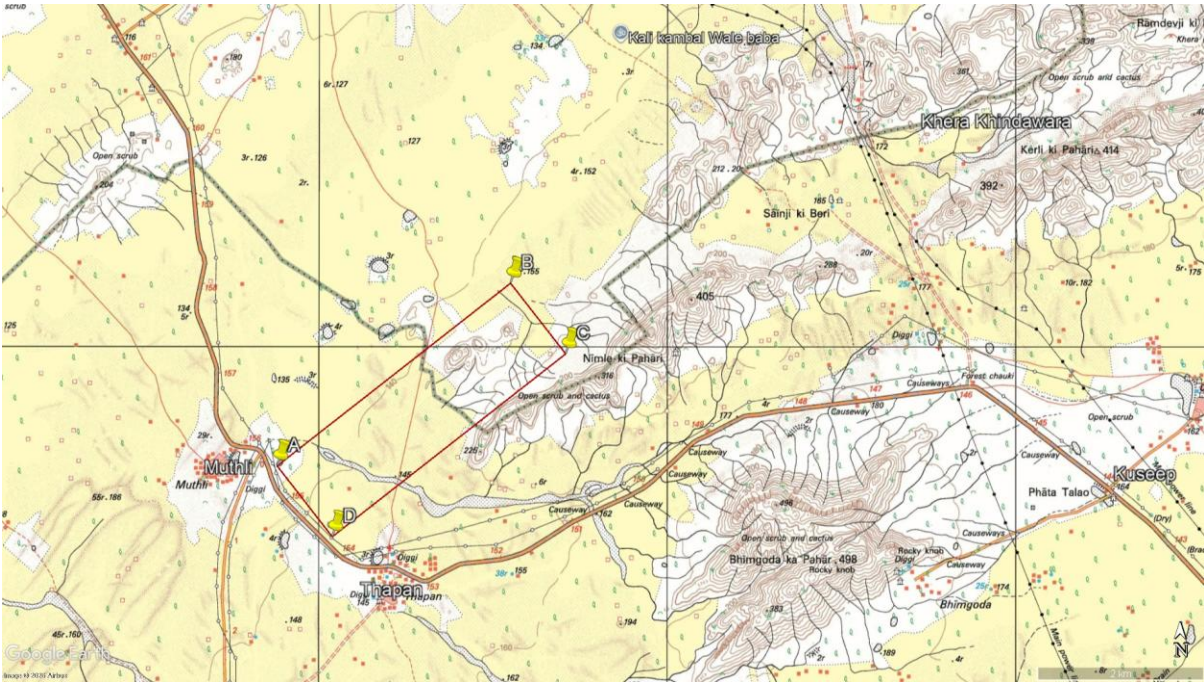
The work programme is proposed for FS 2026–27, with field, laboratory, reporting, and circulation milestones as summarized below.

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.

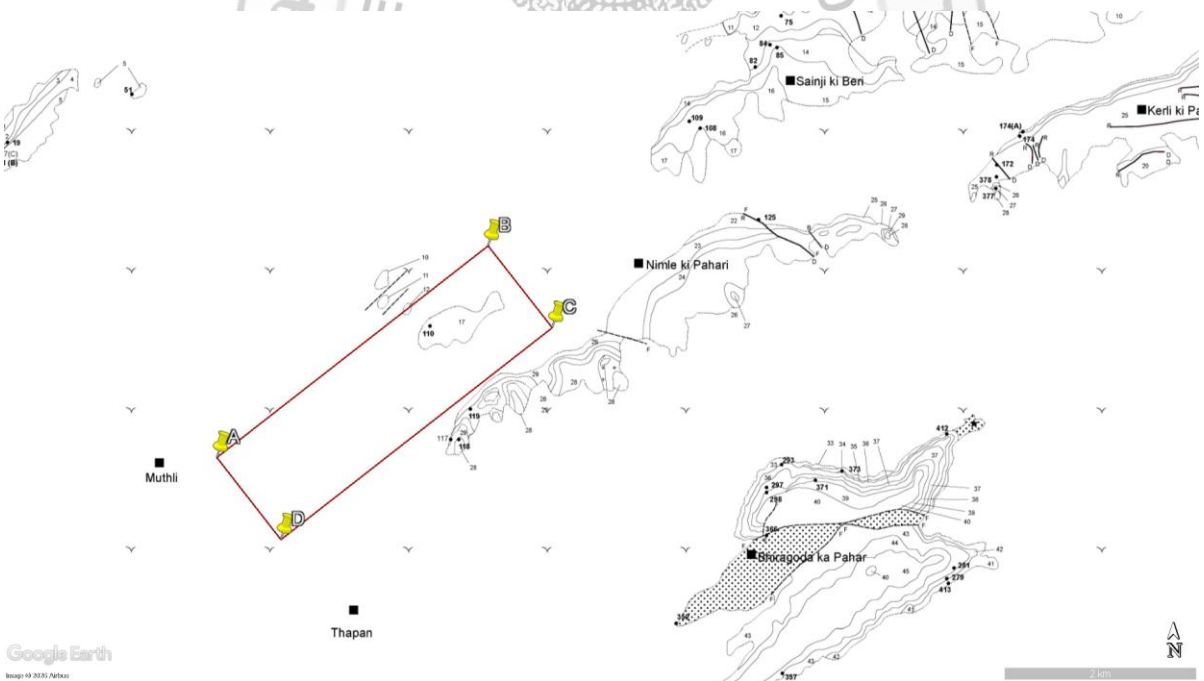
SCHEDULED TIME FOR THE PROPOSED G-3 LEVEL EXPLORATION													
S.No.	Activities	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
		2026	2026	2026	2026	2026	2026	2026	2026	2026	2026	2027	2027
		1	2	3	4	5	6	7	8	9	10	11	12
1	Surface sampling												
2	Geological Mapping (1:2000)												
3	Drone 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.**





The proposed Muthli block for shown on the 1:50K toposheet 45C/6



- | | | | |
|-------|-----------------|------|---|
| ● 15 | Sample Location | + | Granite |
| — F — | Fault | ••• | Pyroclastics (tuff, breccia etc.) |
| Y | Soil Cover | (00) | Rhyolitic / Basaltic Flows with flow number |
| ▭ | Rhyolitic dyke | ▭ | Flow Boundary / inferred |
| ▭ | Basic Dyke | ▭ | Outcrop Boundary |

The proposed Muthli block for shown on the 1:25K STM Map