

**Proposal for Evaluation of Placer Xenotime Prospect
in the Ujol River Basin, Dahod, Chhota Udaipur and
Panchmahal Districts, Gujarat State (G4 stage
Reconnaissance Survey) under NMET**

**(Xenotime (HREE Phosphate), Florencite
(LREE Phosphate), Scheelite, Monazite,
Ilmenite, Zircon, Tin, Tungsten and Lithium)**

By

Geovale Services Private Limited

Place: Kolkata

Date: 20th June 2023

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Summary of the Block for Reconnaissance Survey (G4 Stage)

GENERAL INFORMATION ABOUT THE BLOCK

Sl. No	Features	Details
1	Block ID	GSPL/NMET/GUJARAT/2023/BLOCK-04
2	Exploration Agency	Geovale Services Private Limited
3	Block Name	Ujol Xenotime Prospect Block
4	Commodity	Xenotime (HREE Phosphate), Florencite (LREE Phosphate), Scheelite, Monazite, Ilmenite, Zircon, Tin, Tungsten and Lithium
5	Mineral Belt	Godhra Granite
6	Completion Period with entire Time schedule to complete the	18 months
7	Objectives	<ol style="list-style-type: none"> To assess the exploration target potential for placer deposit of Xenotime / Monazite / Florencite in the Ujol river basin. To find additional target areas for exploration for placer deposits of Xenotime / Monazite / Florencite.
8	Whether the work will be carried out by the proposed agency or through outsourcing and details thereof. Components to be outsourced and name of the outsource agency	The exploration will be carried out by the proposed agency. Only some elements of the exploration program like sample assay, drilling, etc. will be outsourced under supervision of Geovale's geoscientists. All the sample assays will be performed at GMRDS mineral laboratory under supervision of Geovale's geoscientists.
9	Name/ Number of Geoscientists	Max.10 and Min. 5 geologists
10	Expected Field days (Geology) Geological Party Days	Total man-days - 1634 man-days. Man-days for field work- 458 man-days No. of field days - approximately 270 days.
11.	Location	<i>Figure 1</i>
a.	Latitude	Between 22.5196° N to 22.7280° N
b.	Longitude	Between 73.6901° E to 74.2174° E
c.	Villages	Devghadh Baria, Rathva Muvada, Vanskod, Bhut Pagalan, Sadra, Kanjeta, Vav kulli
d.	Tehsil/ Taluk	Ghoghamba, Bodeli, Dahod

Sl. No	Features	Details
e.	District	Chhota Udaipur, Dahod and Panchmahal
f.	State	Gujarat
12.	Area (hectares/ square kilometers)	
a.	Block Area	570 sq. km
b.	Forest Area	Around 230 sq. km. (~40%) as per SOI toposheets and around 200 sq. km. (~35%) as per the LULC map (Figure 2). However, actual status of forest boundaries is not known.
c.	Government Land Area	Not available
d.	Private Land Area	Not available
13.	Protected area	Part of the proposed area comes under Ratanmahal Bear Sanctuary.
14.	Accessibility	
a.	Nearest Rail Head	Godhra Jn. (approximately 37 km away)
b.	Road	State Highway SH-62, SH-150 (Figure 3)
c.	Airport	Vadodara (BDQ) airport is approximately 80 km away.
15.	Hydrography	Figure 3
a.	Local Surface Drainage Pattern (Channels)	Dendritic to sub-dendritic type
b.	Rivers/ Streams	Ujol Nadi, Panam River
16.	Climate	
a.	Mean Annual Rainfall	~800 mm
b.	Temperatures (December) (Minimum) Temperatures (June) (Maximum)	Minimum - 11.9 °C Maximum - 40.1 °C
17.	Topography	
a.	Toposheet Number	46F/10, 46F14, 46J/2 (Figure 1)
b.	Morphology of the Area	Undulating topography with low hills and isolated tors
18.	Availability of baseline geoscience data	
a.	Geological Map (1:50K/ 25K)	Available (Figure 5)
b.	Geochemical Map	NGCMP data are available (Figure 6-12)
c.	Geophysical Map (Aeromagnetic, ground geophysical, Regional as well as local scale GP maps)	Not available

Block Description

There are three major streams (Panam river, Ujol river) and their tributaries present flowing through the area ([Figure-3](#)). Study of remote sensing data (Google Earth, SRTM, Sentinel, Landsat, Corona satellite image, etc.) reveal substantial presence of river terraces in the area. The thickness of which appears to be highly variable. From the study of the SRTM data, it appears that 324.81 sq. km area out of total 570 sq. km is covered by paleo-channels (alluvial cover) ([Figure-4](#)). These terraces constitute substantial alluvial sediments that could be potential exploration targets for REE minerals.

Boundary Coordinates

Figure 1

Block Boundary Corner Points	Latitude	Longitude	Block Boundary Corner Points	Latitude	Longitude
1	22.6389	73.6902	14	22.5512	74.075
2	22.6846	73.7698	15	22.5677	74.0412
3	22.6637	73.8063	16	22.5818	74.0035
4	22.7174	73.8429	17	22.5596	73.9861
5	22.728	73.8676	18	22.5597	73.9597
6	22.6575	73.9932	19	22.5514	73.9319
7	22.5804	74.2172	20	22.5198	73.9213
8	22.5646	74.2101	21	22.5243	73.9042
9	22.5662	74.1832	22	22.5502	73.8924
10	22.5474	74.1708	23	22.5451	73.8566
11	22.529	74.1504	24	22.5898	73.7835
12	22.5199	74.1339	25	22.5902	73.7542
13	22.5397	74.1118	26	22.6161	73.697

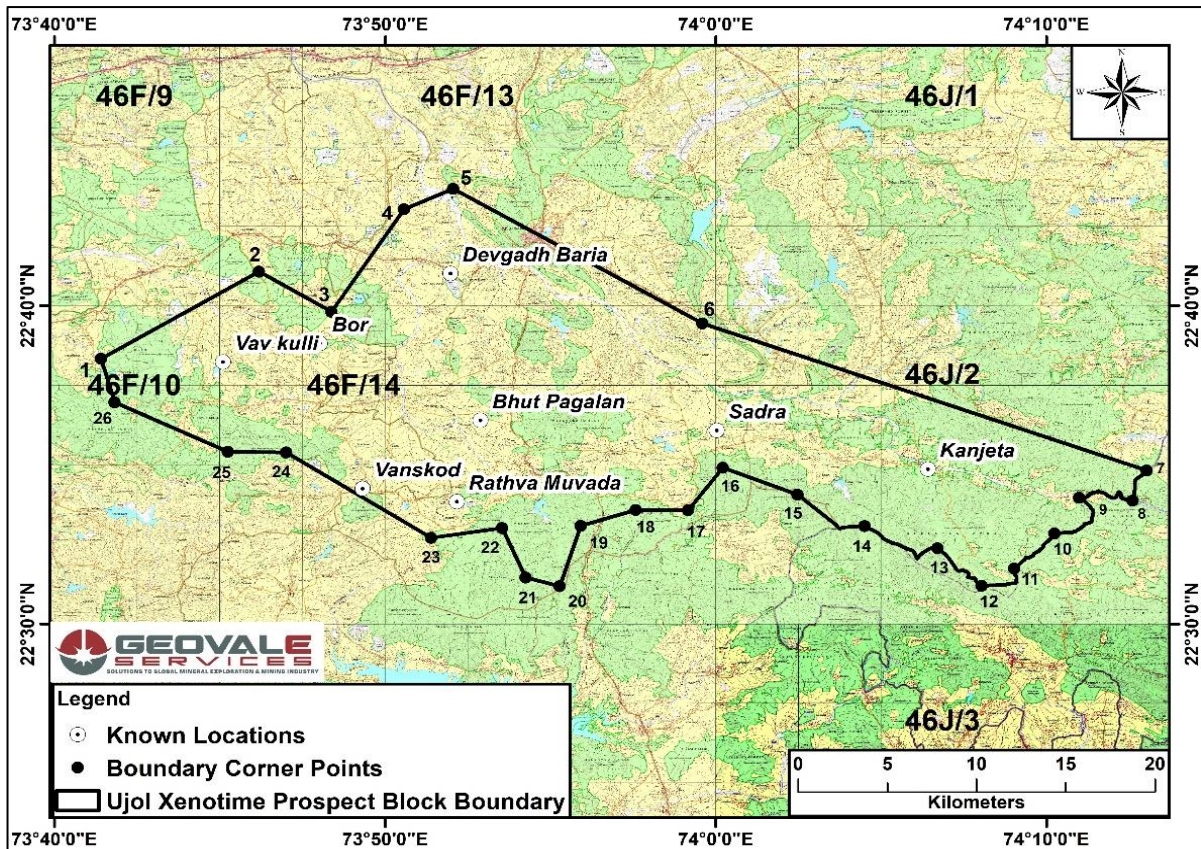


Figure 1 Spatial limit of the Ujol Xenotime Prospect Block.

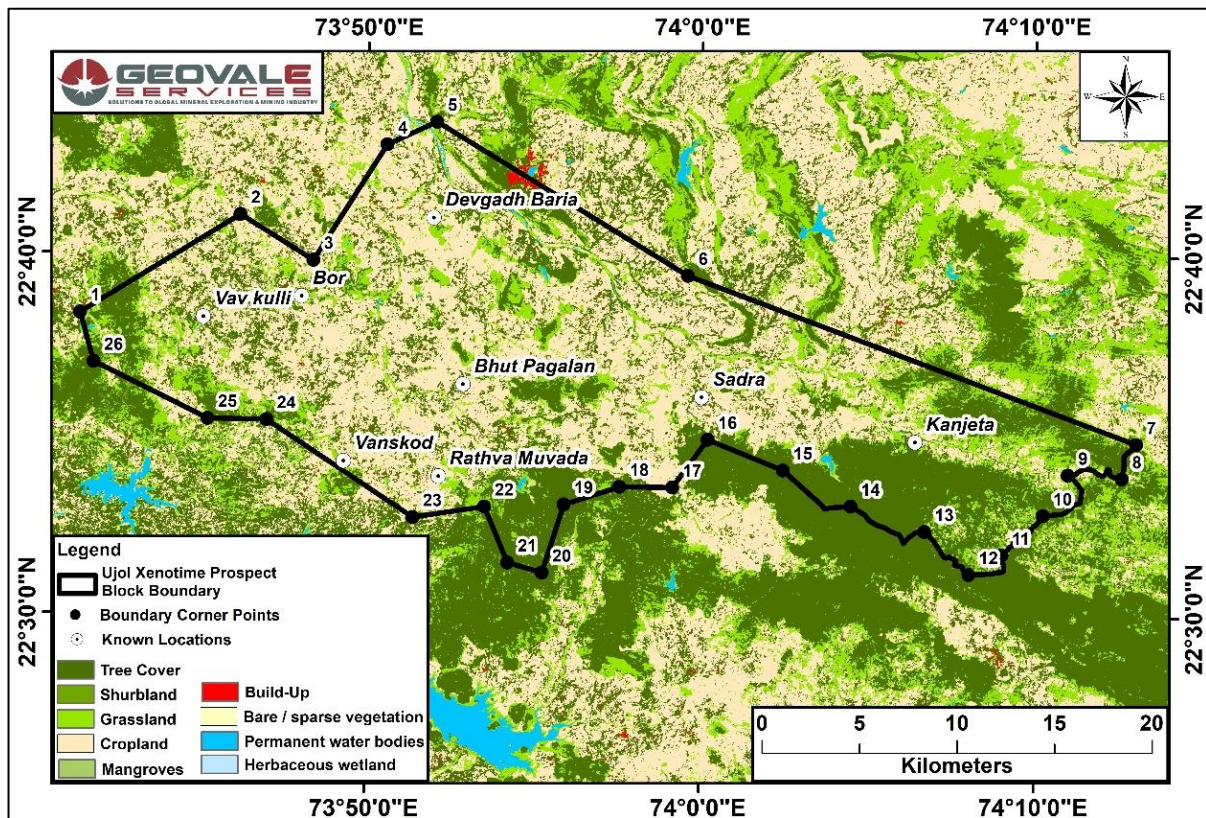


Figure 2 LULC map of the Ujol Xenotime Prospect Block.

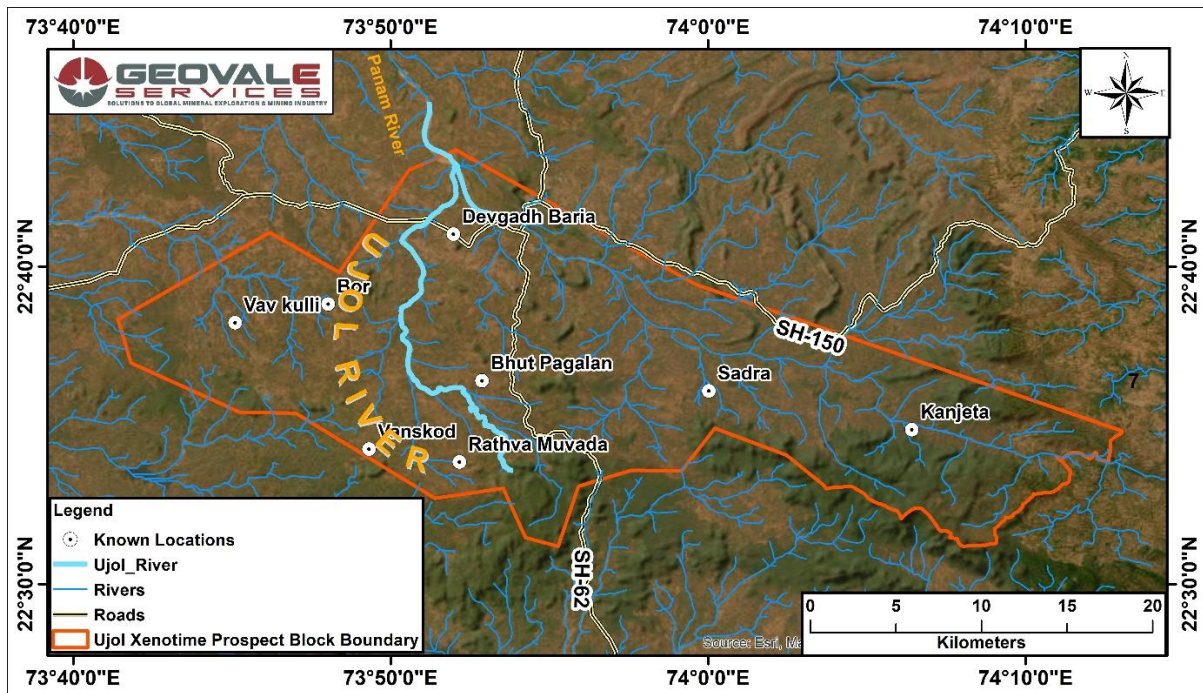


Figure 3 River and road distribution of the Ujol Xenotime Prospect Block.

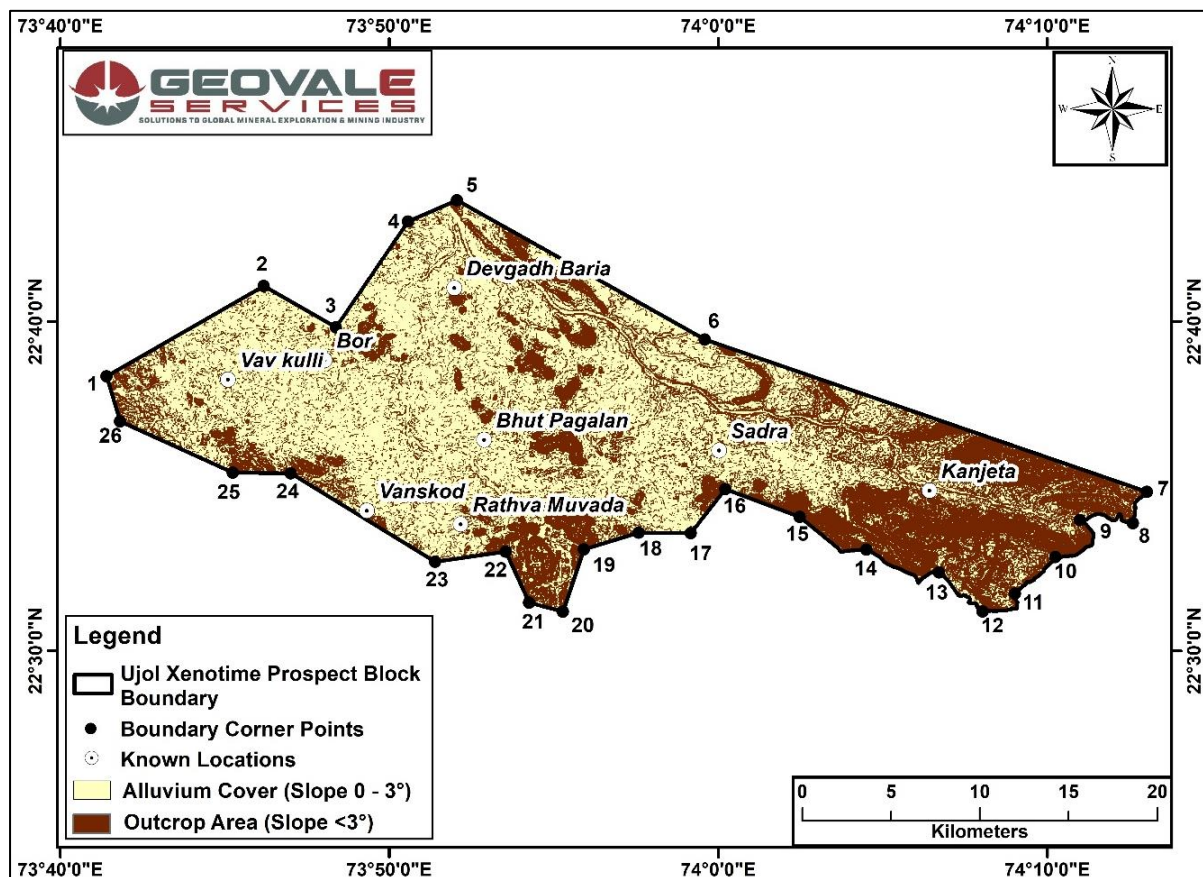


Figure 4 Outcrop and regolith map of the Ujol Xenotime Prospect Block.

DESCRIPTION ON THE UJOL XENOTIME PROSPECT BLOCK

1. Physiography

The mapped region has a lot of hills and a big valley. On the western side, a series of noticeable hills running NNW-SSE stick out, and on the eastern side, the Jhabu plateau is bordered by a wide raised peneplain with a NW-SE trend. The majority of the granite and granite gneiss that make up these hills, which are located in the south, trend in a WNW orientation. Quartzite hills have almost vertical sides and steep slopes, rarely broken by deep gorges. The primary drainage system is made up of the Panam river, which almost flows E-W through the center of the region. The Mote Alwa River, a major tributary of the Panam flowing NE. The drainage pattern of the region is influenced by a number of small nalas that reach the Panam from the north and south. The Panam and its tributaries appear to indicate that the overall drainage gradient is westward. (Figure 3, 4)

2. Background Geology (Regional Geology, Geology of the Block)

The catchment area of the Ujol rivers includes Godhra Granite (~50% of the area), high grade metasediments of Lunavada Group (~30% of the area) and pre-Champaner Granite Gneiss

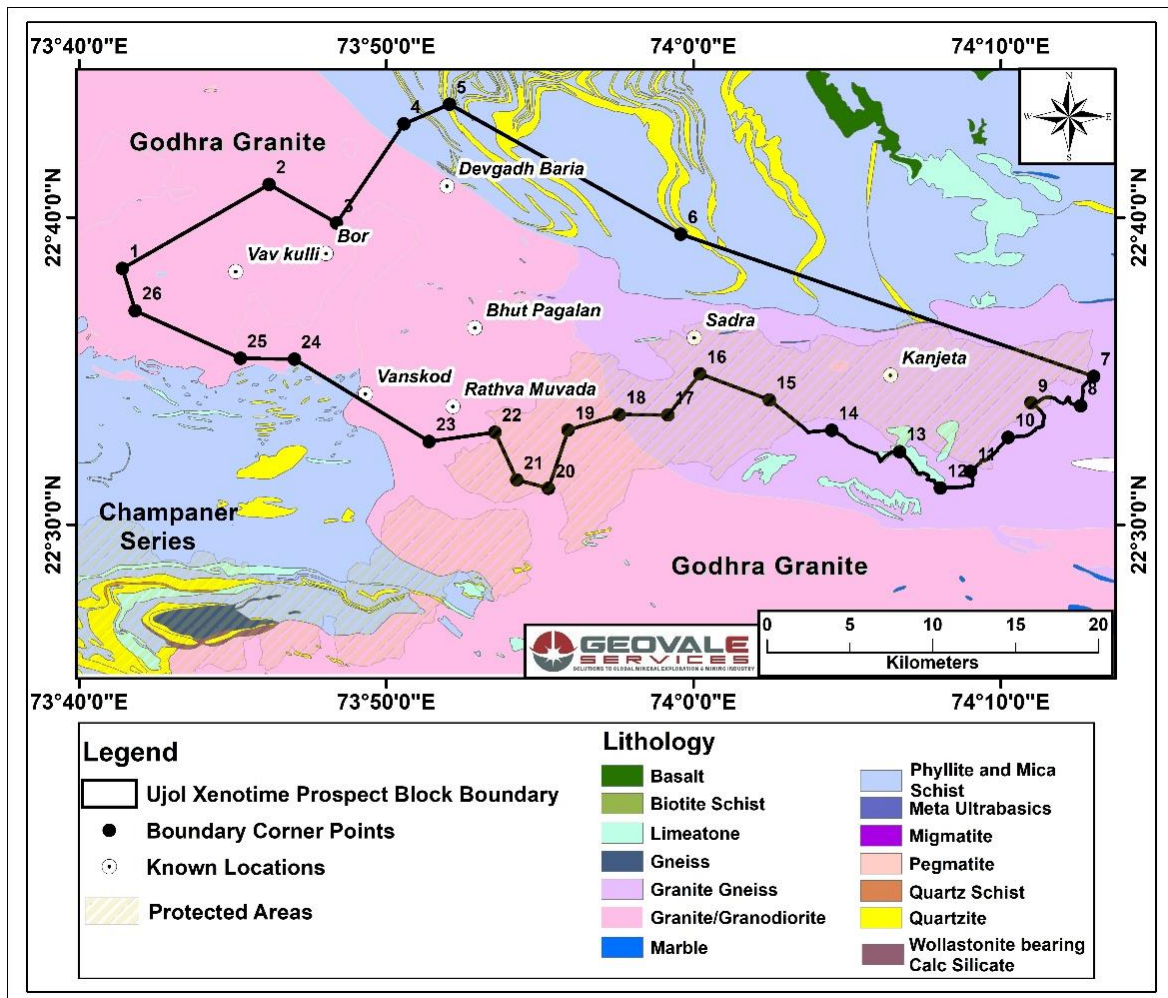


Figure 5 Map showing the Geology of the Ujol Xenotime Prospect Block.

(~20% of the area) (*Figure 5*). Pre-Champaner Group is dominated by granite paragneiss that originated from the partial melting of the Lunavada Group (*Barik and Bhattacheryya, 2020*).

Paragneiss of the Pre-Champaner Group includes a litho-package of granite gneiss, migmatites, pink granite, amphibolites, calcsilicate rocks, impure dolomite, thin quartzite, schists, feldspathised pelites with minor pegmatites and quartz veins.

Lunavada Group is made up of garnet-sillimanite, calc silicate, schists, phyllite and with rare bands of quartzite, calcsilicate and rare amphibolite bands in the basal part.

Godhra Granite includes different phases like massive grey granite, porphyritic grey granite, porphyritic pink granite, massive pink granite, biotite granite and quartz syenites. Grey Granite is composed of plagioclase, microcline, quartz and biotite with tourmaline and epidote occur as accessory mineral. Both porphyritic and massive variety are common with plagioclase feldspar commonly show rapakivi texture. Groundmass is composed of quartz, feldspar, mica and other accessory minerals. Similarly, the porphyritic pink granite has phenocrysts of pink feldspar and the groundmass is composed of quartz, feldspar, mica and other accessory minerals. The pink granites are mostly composed of pink feldspar and quartz. Some amount of sodic plagioclase with minor amount of biotite is also present in the pink granites. The biotite granite is made up of quartz, orthoclase, microcline and perthite with plagioclase, predominantly albite and a little oligoclase.

Godhra Granite is intrusive into both the Lunavada Group and the Pre Champaner-Group (*Figure 5*).

3. Mineral potentiality based on geology, geophysics, ground geochemistry etc.

The Ujol river west of Devgadh Baria area is known for alluvial placer deposits of xenotime, florencite, monazite, ilmenite, zircon, etc. in which xenotime content varies from 1% to 2.5% in the Ujol river (*Goyal and Varughese, 1995; Maithani et. al., 1995*). GSI NGCM survey indicate high HREE (>100 ppm) for about half of the samples for the Ujol river catchment areas (*GSI Bhukosh data, accessed on 10.10.2022*) (*Figure 6*). Heavy minerals content in stream sand varies from 2.94 to 11.29% by weight. Heavy minerals identified in the sand are xenotime, monazite, ilmenite, zircon, garnet and magnetite. Panned concentrates (n-8) have analyzed Y_2O_3 - 0.76 to 1.10%, Ce_2O_3 - 6.50 to 10.49%, Nb_2O_5 - 0.11 to 0.15% and Ta_2O_5 - <50 to 108 ppm (*Goyal and Varughese, 1995*). Xenotime content of these sand varies from 0.78 to 2.53%.

The detailed report of the AMD is not available in the public domain. However, the AMD publication mentions only about 5km stream length area along the Ujol river contain xenotime bearing placers. The publication does not mention how much area was scanned by them. So, the percent overlap of the AMD surveyed area with the proposed project is not possible to determine. The present project is formulated to find extension of xenotime bearing placers in different river terraces in the proposed area.

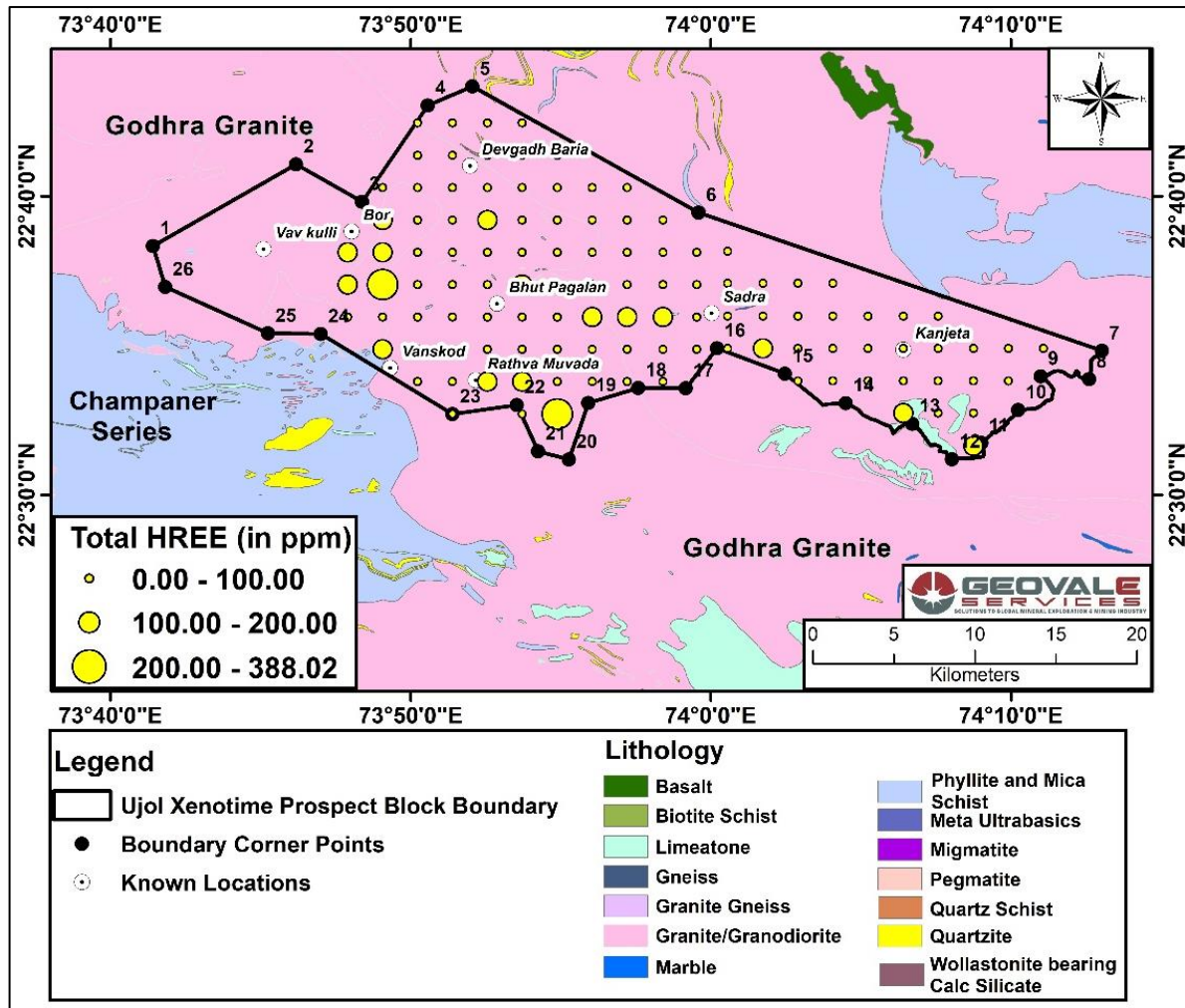


Figure 6 HREE concentration from the NGCM samples of the Ujol Xenotime Prospect Block.

GSI NGCM data include approximately 113 numbers of stream sediment samples within the proposed block. Out of which 15% of the samples has the HREE content more than 100 ppm (maximum is 388.02 ppm) (Figure-6) and almost 30% of the data has total REE > 500 ppm (maximum is 4631.07 ppm) (Figure-7).

The proposed G4 exploration block covers many isolated outcrops of highly fractionated pink variety of Godhra Granite. Pathak (2017) worked in the adjacent Idar area and interpreted the granites there as A-type granites. A-type granites are usually potential source of HREE. It also includes large tract of phosphorus rich meta-sediments. Interaction of HREE enriched granite with phosphorus rich sediments is a potential source of HREE phosphate mineralization (Nazari-Dehkordi et. al., 2018 and Li et. al., 2019). Godhra Granite itself as well as its contact zones with meta sediments are thus potential sources of xenotime.

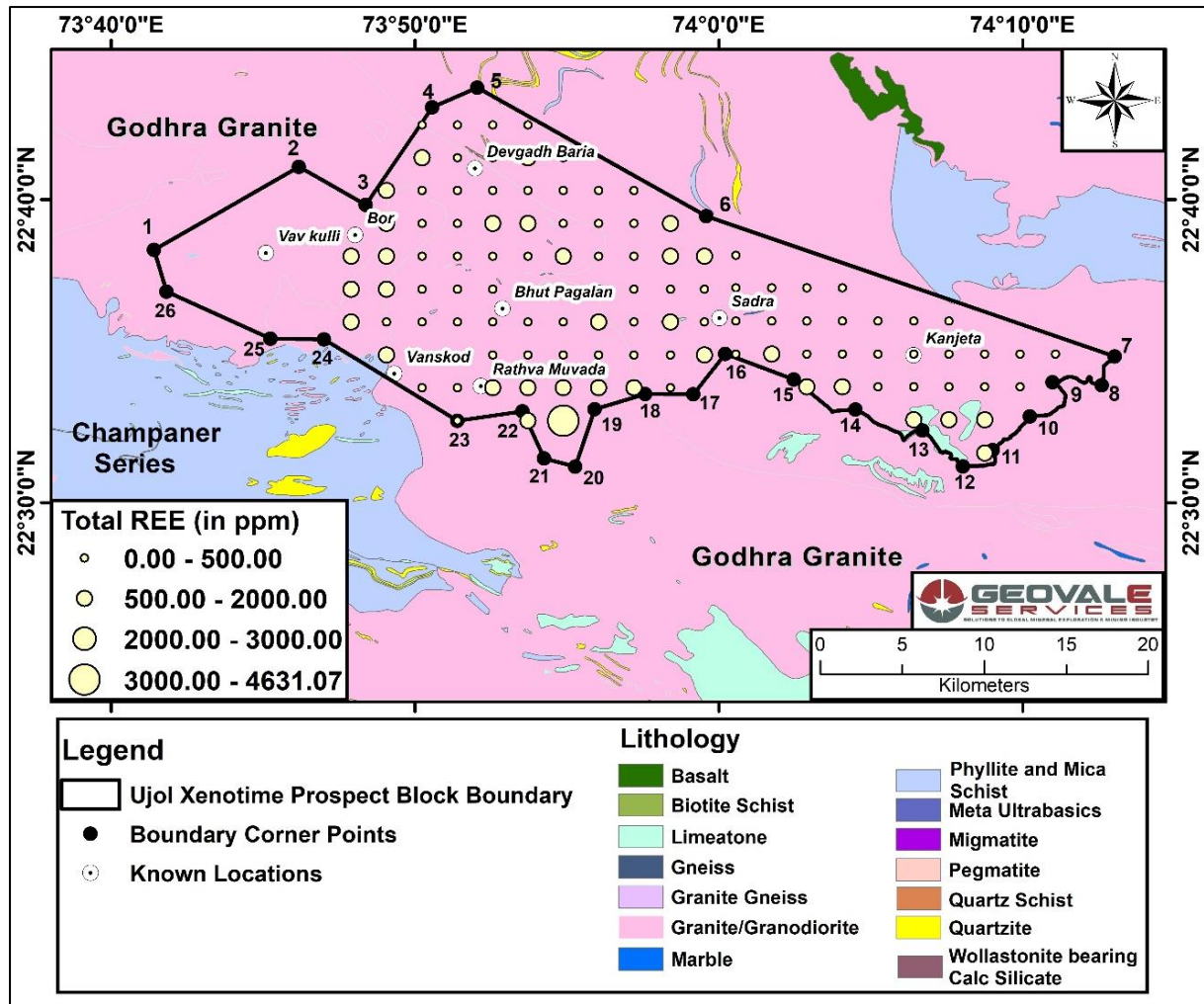


Figure 7 REE concentration from the NGCM samples of the Ujol Xenotime Prospect Block.

Even though placer sediments rich in xenotime (HREE phosphate), florencite (LREE phosphate) and monazite are known from the area, their sources are not known. Two possible sources are as below:

- HREE rich A type granite itself is the source. While the low CaO content of these granites is favorable for crystallization of xenotime over apatite, low P_2O_5 content of these granites is an uncertain parameter for granite hosted xenotime.
- Xenotime could have originated by interaction of HREE rich hydrothermal / flurithermal fluids with phosphate rich Pre-Champaner Formation. Because of such possibility, source of xenotime could be interaction zones of REE rich granites with phosphate rich metasediments (Nazari-Dehkordi et. al., 2018 and Li et. al., 2019).

The present exploration block includes much of the differentiated Godhra Granite as well as large part of the interaction zone between Godhra Granite and Metasediments. Thus, sources of placer xenotime include both these possible sources.

4. Mineral System Analyses (prospectivity analyses) and rationale for block selection:

REE is a strategic commodity for India. Especially HREE has greater criticality. Some previous work indicated placer HREE prospect in the proposed block. Previous work of [Maithani et. al. \(1995\)](#) reported very high concentration of xenotime, monazite, florencite as placer minerals in the Ujol river sediments. Xenotime content of the placer sands of the Ujol river basin is reported to be very high (0.78 - 2.53%). They reported that xenotime bearing bromoheavies contain 0.49 to 0.96% of Y_2O_3 that constitute 86% of the total Y_2O_3 in the river sediment. Also, [Goyal and Varughese \(1995\)](#) mentioned xenotime content in the Ujol river sand varies from 0.78 to 2.53%.

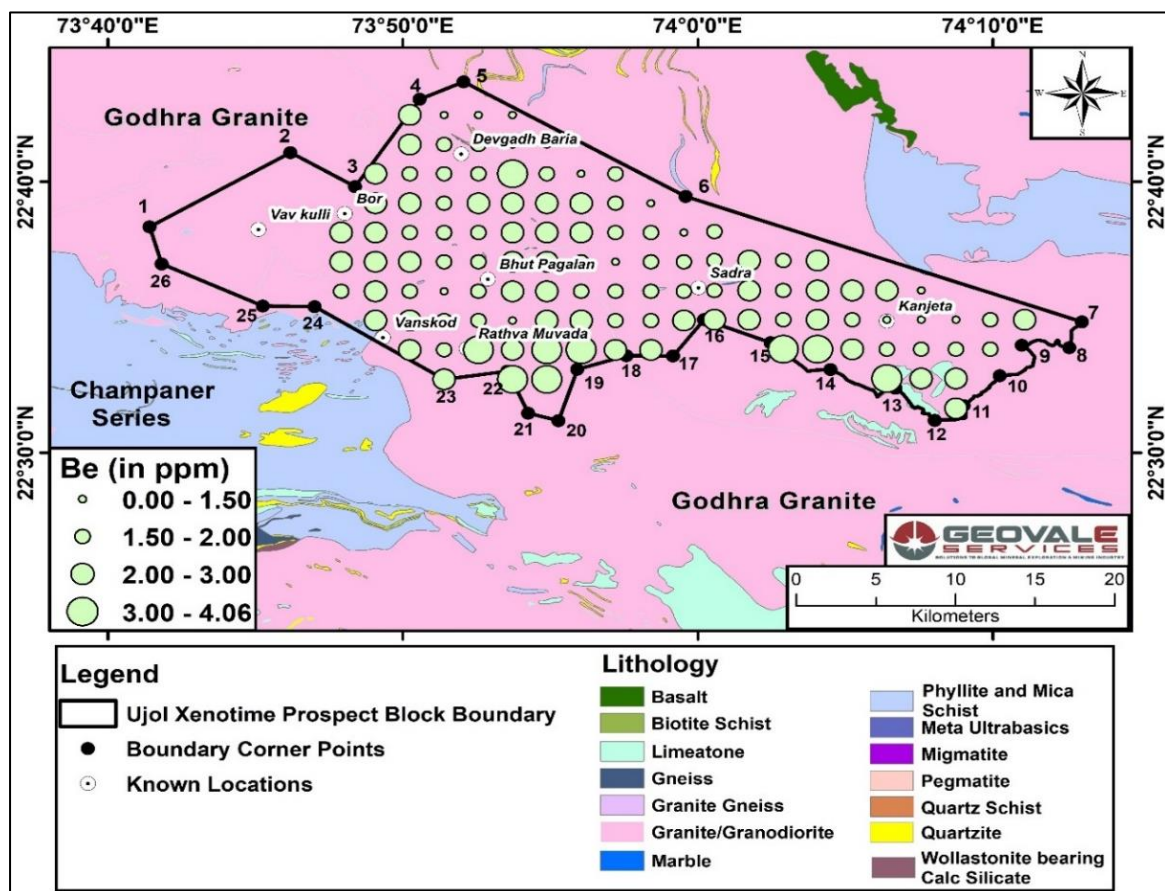


Figure 8 GSI NGCM data map showing Beryllium anomaly in the study area.

Importance of these findings are prominently mentioned in the GSI-AMD vision document on REE ([GSI-AMD, 2020](#)). National Geo-Chemical Mapping (NGCM) survey also brought out a high Σ HREE (up to 388 ppm) ([Figure-5](#)) and Σ REE (up to 4631 ppm) ([Figure-6](#)) concentration in the stream sediment samples of the area. NGCM data also shows in the anomalous high Be, Hf, Li, Zr and W values within the proposed block area. GSI's NGCM data in the block show anomalous high Be, Hf, Li, W and Zr values ([Figure No- 8, 9, 10, 11, 12](#)).

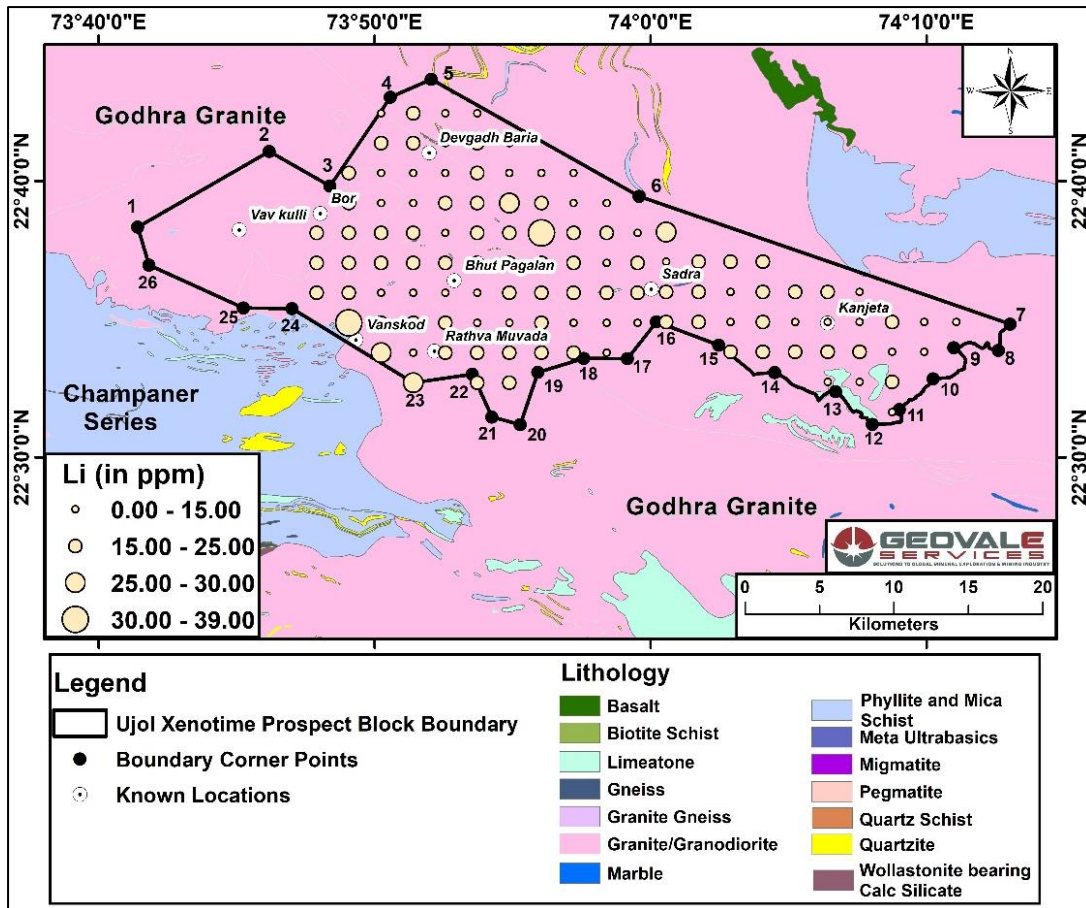


Figure 10 GSI NGCM data map showing Hafnium anomaly in the study area.

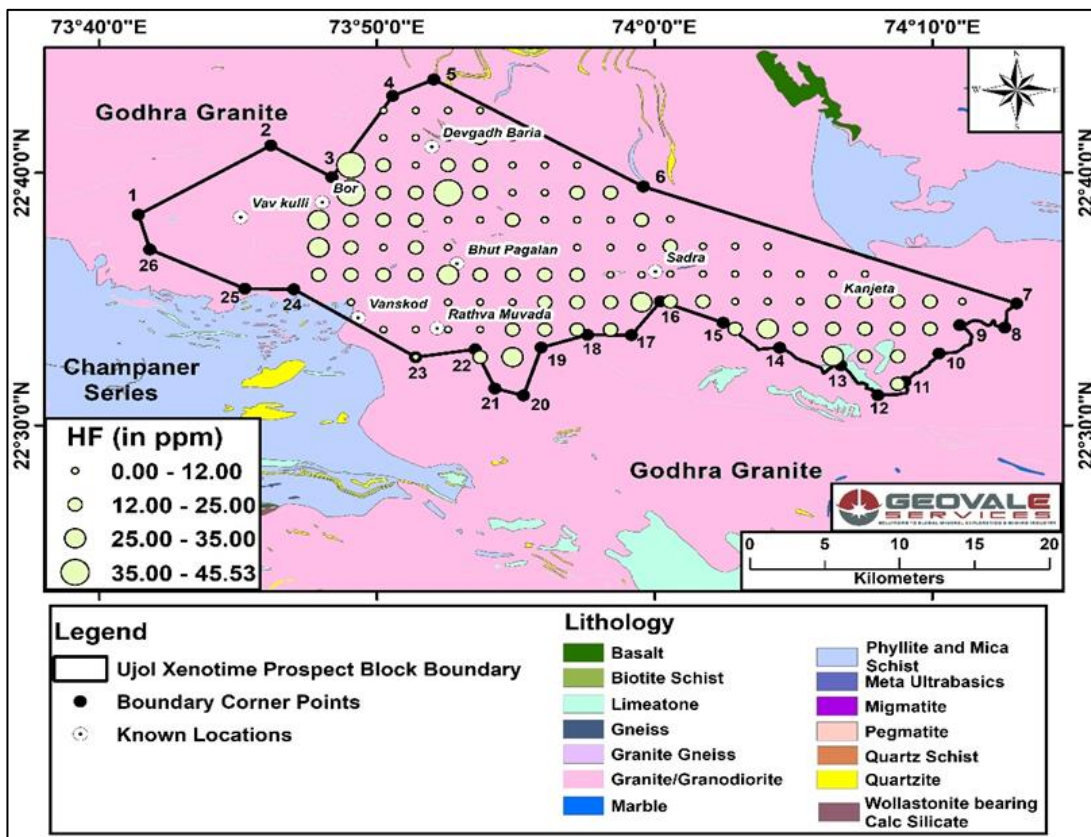


Figure 9 GSI NGCM data map showing Lithium anomaly in the study area.

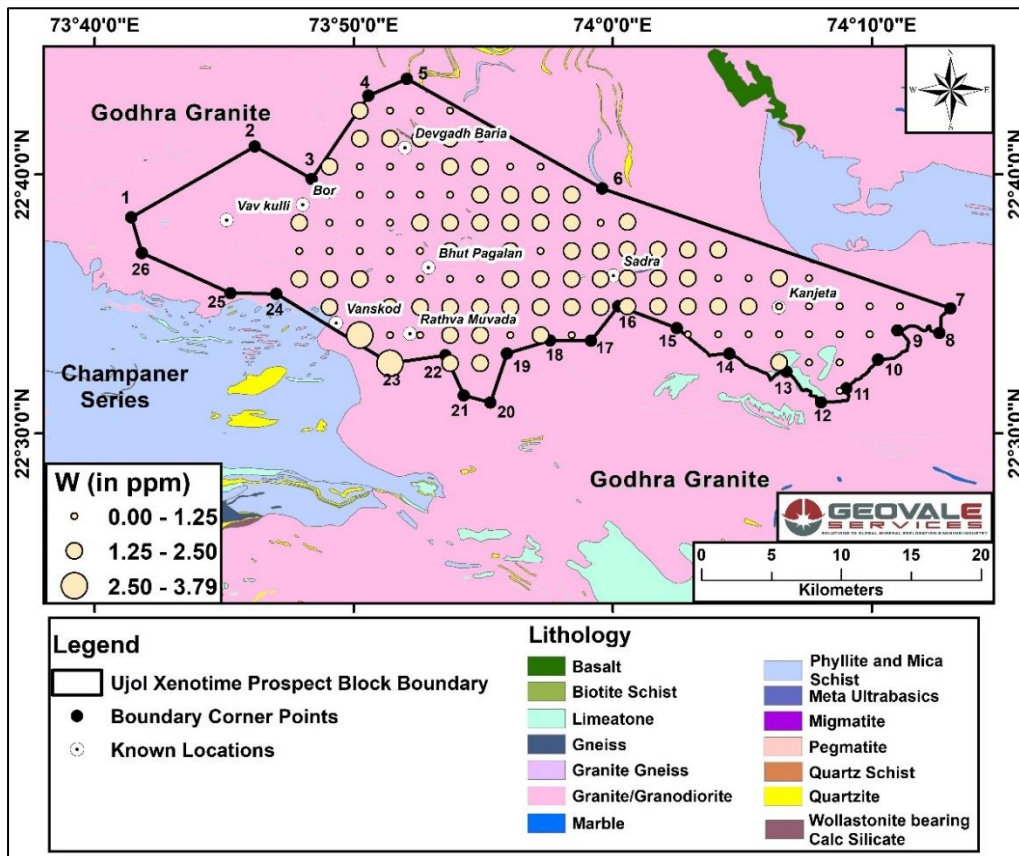


Figure 12 GSI NGCM data Map showing Tungsten anomaly in the study area.

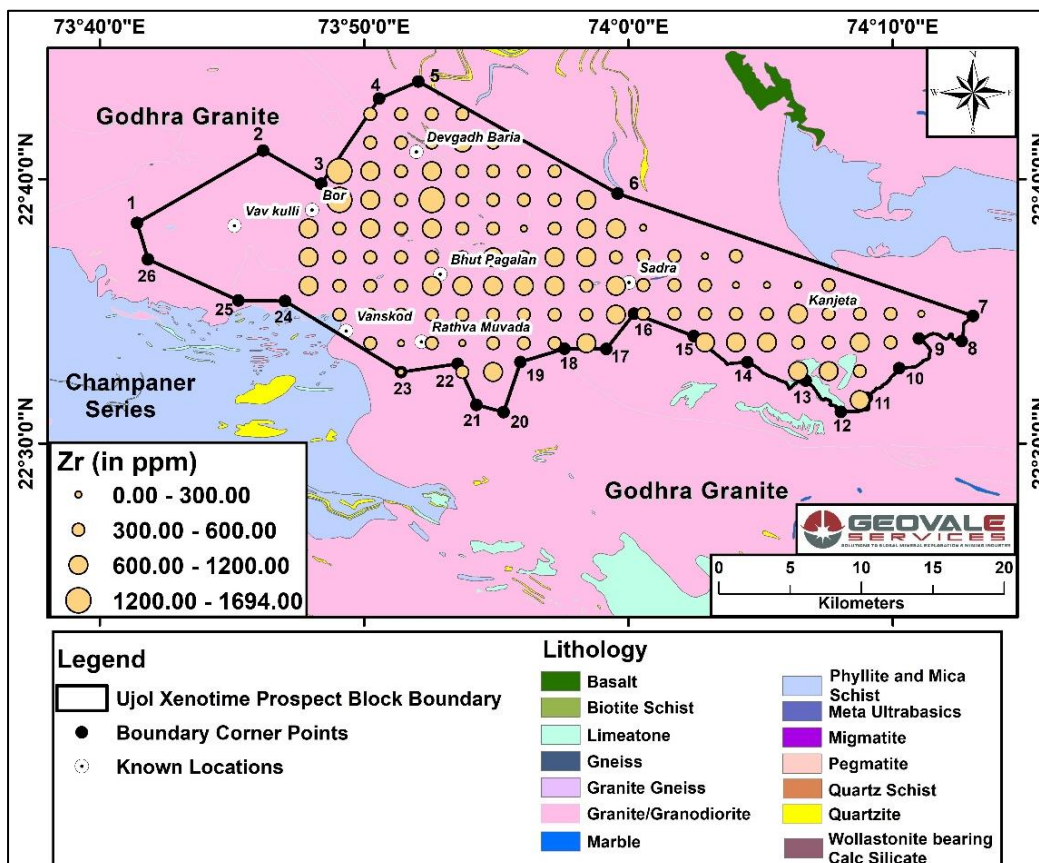


Figure 11 GSI NGCM data map showing Zirconium anomaly in the study area.

5. Previous Work

Maithani et. al. (1995) and Goyal and Varughese (1995) reported very high concentration of xenotime, monazite, etc. as placer minerals in Ujol river basins. The details are already mentioned in the above sections.

- i. **Previous Exploration in adjoining area (Regional area); All the sample (bed rock/trench/groove/soil), borehole location should be plotted on the geological map and analytical data should be discussed briefly:**

This area is mainly explored by AMD, whose highlights are available in public domain, but the full exploration reports are not available.

- ii. **Previous Exploration in the proposed block area: All the sample (bed rock/trench/groove/soil), borehole location should be plotted on the geological map and analytical data should be discussed briefly:**

This area is mainly explored by AMD, whose highlights are available in public domain, but the full exploration reports are not available.

6. Observation and Recommendations of previous work

Maithani et. al. (1995) had carried out an exploration program in and around the proposed area. They identified some anomalous high values of Xenotime and Monazite as placers in the Ujol river. The details of their reported values are mentioned in the above section. These workers have recommended detailed exploration for placer or primary xenotime in the area.

High xenotime content in alluvial placer sand warrants a systematic exploration for finding exploration target areas for placer xenotime in the alluvial sand in different terraces within the Ujol basin.

7. Scope for proposed exploration

Reports of xenotime, florencite, monazite, ilmenite, zircon by *Maithani et al. (1995) & Goyal and Varughese (1995)* from Ujol river sediments warrants further search for finding exploration targets for placer deposits of xenotime – florencite in the alluvial terraces of both these river basins. The present project would thus address potential for placer exploration targets in the alluvial of Ujol, and some other rivers flowing through the study area.

Geovale would carry out the proposed exploration program through three broad phases. The three phases are mentioned below:

Phase I (approximately ten months):

- a) Understanding the mineralization control and its characterization along with regional area identification for exploration.

- b) Characterization of the regolith profile of the study area (following RED - Residual Erosional and Depositional scheme).
- c) Characterization of the REE bearing minerals within the placer sediments and locate possible sources of placer xenotime / florencite / monazite minerals.

Phase II (approximately Four months):

- a) Determine the vertical extension of the regolith horizon and establishment of terrace structure for further exploration.
- b) Identification of the potential mineralized target areas for drilling.

Phase III (approximately six months):

- a) Testing, prioritization and characterization of the mineralized zones and targets to identify blocks for Geological Resource (G3) definition.

The **objective of the Phase I** activity would be to understand the distribution of placers (vertical and spatial) and characterization of the REE mineral distribution in the river terraces. A 3D regolith modelling following RED (Residual Erosional and Depositional) scheme using geophysics, remote sensing and field validation would be an important part to identify the paleo-channels and vertical extension of the alluvial placers. These would help to identify prospective areas for next phase of exploration.

In **Phase II**, the identified prospective areas would be subjected to detailed sampling (spatial and vertical) and analyses to identify mineralized zones and targets. The following tools would be used during this phase:

- i) Regolith mapping (1:25,000)
- ii) Vertical Electrical Sounding
- iii) Pitting
- iv) Geochemical analysis

During **Phase III**, the identified potential targets would be explored in further detail with shallow drilling for 3D distribution of the mineralized targets. Based on this phase of work, the targets would be prioritized for Geological Resource definition and assessment in the next part of the program.

Progressing from one phase to another would be a decision point for the exploration program based on the results of the ongoing phase. Geovale Services would engage the State of Gujarat to collaboratively decide about progressing through different phases of exploration program.

8. Planned Methodology

Even though the primary objective of these exploration program would be to delimitate the REE resource in the alluvium, it may be noted that *Maithani et. al., 1995*, reported high Ce, Nb, Ta in the placer sediment. They reported that heavy minerals constitute 3 – 11.3% of Ujol river sediments. Bromoheavies in the sediments contain Ce₂₀₃ - 6.50 to 10.49%, Nb₂₀₅ - 0.11 to 0.15% and Ta₂₀₅ - <50 to 108 ppm. Also, GSI's NGCM data in the block show anomalous high HREE, Be, Hf, Li, W and Zr values (> mean + 2*std. dev.) (*Figure No. 8, 9, 10, 11, 12*). The project would also look for anomalous distribution of rare metals in the sediments which might be used in targeting primary sources for these rare metals.

Broadly, the following approach would be adopted to assess the possibility of alluvial sediments as REE resource:

- I. Map out the distribution of different regolith types following RED scheme in 1:50,000 and 1: 25,000 scale.
- II. Assess the thickness variation of different types of regolith using scarp sections, Vertical Electrical Sounding, pitting and wide-spaced auger drilling.
- III. Build-up a working model for regolith evolution in the catchment area.
- IV. Assess the spatial and vertical variation in the concentration of different REE-bearing minerals in different regolith units.
- V. To assess resource potential of REE-minerals in the catchment area.

Figure 13 summarizes the exploration workflow to assess the possibility of alluvial sediments as REE resource.

Decision points

The detailed exploration plan has 11 stages and 121 tasks. The detailed exploration plan also incorporates the GO-NO GO milestones to be collaboratively decided between the Geovale Services and the State of Gujarat, based on results of the ongoing phases. The total duration of the work plan is 18 months and consists of two decision points, first at the end of 9th month and second at the end of 13th month.

Exploration strategy to assess alluvial sediments in Ujol river catchment as REE resource

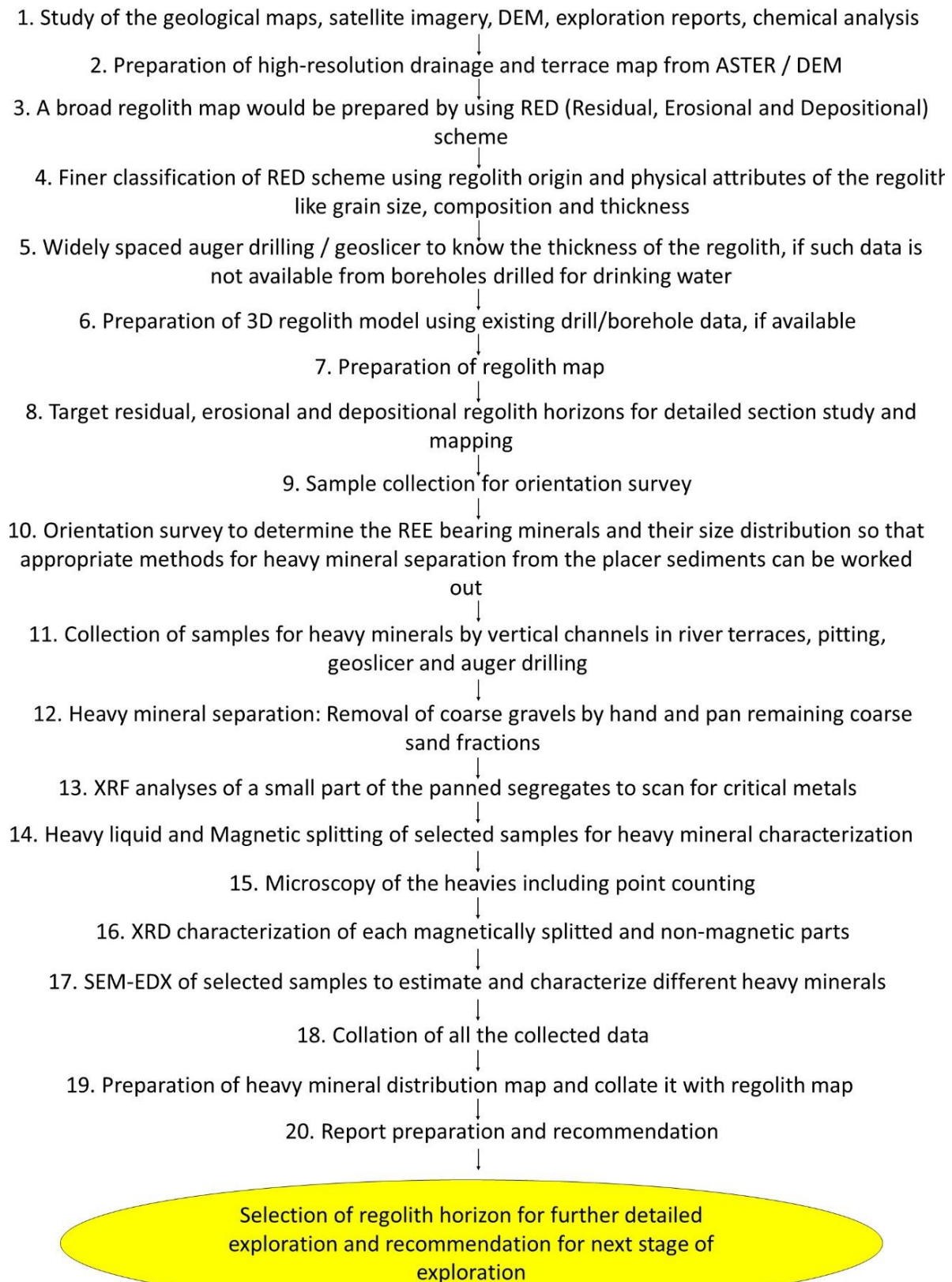


Figure 13 Summary of planned exploration activity in the Ujol river catchment areas. Yellow ellipses indicate expected output of the exploration program.

9. Nature Quantum and Target

Phase	Stages	Milestones	Activities	Nature	Quantum	Timeline (in weeks)
Phase I (Fertility Assessment)	Stage 1	Understanding mineralization control & to identify area for regional exploration	Literature Survey	Analysis of previous data	Radius= 20 km	3
	Stage 2	Identify river terraces, outcrops, covered areas & insitu regolith	Remote Sensing and Geomorphic Analysis	Aerial Reconnaissance Survey	570 sq. km.	5
	Stage 3	Camp setup for field work	Infrastructure / Logistics, Camp setup, permissions, SOP-protocol preparation and Stake holder Communication for the complete field season	Desktop + Camp		5 + Week 5-55 for community management
	Stage 4	Determining vertical extension of regolith horizon	Regional Geophysical Survey	VES	~324 sq. km, 60 soundings	4
	Stage 5	Characterization of the REE hosting phases	Orientation survey (Field validation of the geomorphic analysis), sampling, geochemical analysis and data interpretation	Fieldwork (1:50000)	~570 sq.km, 10 samples (~10 kg)	3
				XRF	40 samples	7
				Fluorine Analysis	20 samples	
				XRD	20 samples	
				Petrography	5 samples	
				SEM-EDX	5 samples	
	Stage 6	District scale target identification for next stage of exploration	Regional scale mapping, sampling, geochemical analysis and data interpretation	Fieldwork	570 sq. km/ 200 samples	11
				Pitting/Trenching	300 cubic m	10
				XRF	200 samples	
				Fluorine Analysis	60 samples	
XRD				60 samples		
Petrography				15 samples		
SEM-EDX				15 samples		
Decision point 1: Go - No Go to the next stage (2 weeks)						

Phase	Stages	Milestones	Activities	Nature	Quantum	Timeline (in weeks)
Phase II (Identification of the fertile block)	Stage 7	Determine vertical extension of regolith horizon & establishing terrace structure for further exploration	District scale geophysical survey	VES	~80 sq. km ,50 soundings	4
	Stage 8	Identification of the potential mineralized target areas for drilling	District scale mapping, sampling, geochemical analysis and data interpretation	Fieldwork (1:25000)	80 sq. km/ 160 samples	7
				Pitting/Trenching	200 Cubic meters	
				XRF	160 samples	11
				Fluorine Analysis	40 samples	
				XRD	80 samples	
				Petrography	40 samples	
	SEM-EDX	20 samples				
Decision point 2: Go - No Go to the next stage (2 weeks)						
Phase III (Target testing)	Stage 9	Completion of field work and identification and characterization of the potential mineralized zone	Target testing through test drilling, logging, sampling, geochemical analysis and data interpretation	Auger drilling	25 BH (250 meter)	7
				XRF	200 samples	12
				Fluorine Analysis	200 samples	
				XRD	200 samples	
				Petrography	40 samples	
				SEM-EDX	25 samples	
	Stage 10	Preparation of the draft report and submission	Data analysis, Draft report preparation-submission, Monthly progress report for project duration	Desktop	13 monthly progress reports + Draft report	9 + week 5-56 for monthly progress reports
	Stage 11	Final report submission; recommendation for next level of exploration & project conclusion	Final report preparation-submission & discussion with State authorities	Desktop + Travel	Final report	3

Borehole Spacing (As per MEMC, 2015)

Type of deposit	Bedded Stratiform and Tabular deposit of regular habit minerals to be identified	Bedded stratiform and tabular deposits of irregular habit (Minerals to be identified)	Lenticular bodies occurring En-echelon Lenses, pockets. (Different minerals)
G4 Stage	Not Applicable	Approximately 50 boreholes (Auger drilling), each approximately 10 m depth planned in geochemically positive profiles (Total drilling = approximately 500.00 m)	Not Applicable
Remarks		Decision on the number of boreholes and depth of drilling may vary depending on the nature and disposition of the ore minerals in the area.	
(Vertical depth of intersection of mineralized zone should be specified (first level), number of boreholes, approximate borehole spacing, approximate length of boreholes may be specified)			

10. Geophysical Studies

Vertical Electrical Sounding with Schlumberger method will be used to determine the thickness of the regolith and alluvium. In phase 1 and phase 2, Vertical Electrical Sounding (VES) is incorporated to determine the depth extension of the alluvium. This would help to plan the pits & drill holes. In Phase 1 and Phase 2, a total 110 (Phase 1= 60, Phase 2= 50) no of VES points have been planned to cover the prospecting area.

Other geophysical tools may also be introduced at the later stage based on the reconnaitory studies carried out in the area depending of the outcome of different stages of work.

11. Manpower deployment (includes both field and non-field deployment)

Attached in Appendix I.

12. Summary expenditure

Summary Cost Sheet					
Exploration for Placer Xenotime Prospect in Ujol River Basin	Phase I	Manpower	77,70,806		
		Lab Analysis (Geochemical studies and petrography)	24,52,100		
		Drilling			
		Total project cost for Phase I	1,02,22,906		
	Go-No Go				
	Phase II	Manpower		41,59,949	
		Lab Analysis (Geochemical studies and petrography)		20,45,240	
		Drilling			
		Total project cost for Phase II	-	62,05,189	
	Go-No Go				
	Phase II	Manpower			6540700
		Lab Analysis (Geochemical studies and petrography)			5436520
		Drilling			1190000
		Total project cost for Phase III			1,31,67,220
	Total project cost (INR)				2,95,95,315

13. Lease area

The proposed block includes 48 minor mineral leases (*Figure 14*). The details of the minor mineral leases within the proposed block are listed below.

Table 1: Existing leases of minor minerals in the proposed study area

Sl. No	Mine Name	Village	Taluka	District	Mine Code	Commodity	Area (Ha)
1	Shree Dineshbhai Balvantbhai Patel	Baina	Devghad Baria	Dahod	QL2304003014	Ordinary sand	2

Sl. No	Mine Name	Village	Taluka	District	Mine Code	Commodity	Area (Ha)
2	Arjunbhai Pratapbhai Baria	Chenpur	Devgadh Baria	Dahod	QL2304011814	Ordinary sand	1.32
3	Mavsingbhai Pratapbhai Baria	Chenpur	Devgadh Baria	Dahod	QL2304006114	Ordinary sand	1.5
4	Punabhai Sanabhai Patel	Chenpur	Devgadh Baria	Dahod	QL2304005914	Ordinary sand	1
5	Arjunbhai Pratapbhai Baria	Chenpur	Devgadh Baria	Dahod	QL2304006014	Ordinary sand	0.6
6	Arvindbhai Mangabhai Patel	Chenpur	Devgadh Baria	Dahod	QL2304005814	Ordinary sand	0.6
7	Chandrasinh Navalbhai Nayak	Junabaria	Devgadh Baria	Dahod	QL2304005714	Ordinary sand	3
8	Shree Chandubhai Ranchodbhai Koli	Junabaria	Devgadh Baria	Dahod	QL2304003214	Ordinary sand	2
9	Chimanbhai Rayjibhai Patel	Kalidungari	Devgadh Baria	Dahod	QL2304007614	Ordinary sand	3
10	Chimanbhai Rayjibhai Patel	Kalidungari	Devgadh Baria	Dahod	QL2304007614	Ordinary sand	3
11	Raysingbhai Dolabhai Baria	Singor	Devgadh Baria	Dahod	QL2304007714	Ordinary sand	2.5
12	Manabhai Somabhai Patel	Kalidungari	Devgadh Baria	Dahod	QL2304007814	Ordinary sand	9
13	Shree Ranchodbhai Mulabhai Guujar	Mendra	Devgadh Baria	Dahod	QL2304003714	Ordinary sand	0.7
14	Parvatbhai Bhurabhai Nayak	Virol	Devgadh Baria	Dahod	QL2304011314	Ordinary sand	3
15	Shree Bhavanbhai Patel	Uchavan	Devgadh Baria	Dahod	QL2304003614	Ordinary sand	2
16	Shree Ishwarbhai Mulabhai Bhil	Uchavan	Devgadh Baria	Dahod	QL2304004014	Ordinary sand	1
17	Raisingbhai Dolabhai Baria	Singor	Devgadh Baria	Dahod	QL2304007014	Ordinary sand	2
18	Raysingbhai Dolabhai Baria	Singor	Devgadh Baria	Dahod	QL2304007714	Ordinary sand	2.5
19	Chimanbhai Rayjibhai Patel	Kalidungari	Devgadh Baria	Dahod	QL2304007614	Ordinary sand	3
20	Raysingbhai Dolabhai Baria	Singor	Devgadh Baria	Dahod	QL2304007714	Ordinary sand	2.5
21	Rajeshbhai Hirabhai Vankar	Singor	Devgadh Baria	Dahod	QL2304008214	Ordinary sand	1
22	Batukbhai Fatesinhbhai Savaya	Ratadiya	Devgadh Baria	Dahod	QL2304012614	Ordinary sand	2
23	Mavsingbhai Pratapbhai Baria	Ratadiya	Devgadh Baria	Dahod	QL2304011114	Ordinary sand	1.05
24	Ravindrabhai Parvat Bhai Savaya	Ratadiya	Devgadh Baria	Dahod	QL2304006714	Ordinary sand	1.5
25	Ravindrabhai Parvat Bhai Savaya	Ratadiya	Devgadh Baria	Dahod	QL2304009514	Ordinary sand	0.9

Sl. No	Mine Name	Village	Taluka	District	Mine Code	Commodity	Area (Ha)
26	Arvinbhai Mangabhai Patel	Ranipura	Devghad Baria	Dahod	QL2304010714	Ordinary sand	0.39
27	Punabhai Sanabhai Patel	Ranipura	Devghad Baria	Dahod	QL2304010814	Ordinary sand	0.39
28	Arvinbhai Mangabhai Patel	Ranipura	Devghad Baria	Dahod	QL2304011214	Ordinary sand	0.39
29	Nilambhai Bharatkumar Sheth	Nanimangoi	Devghad Baria	Dahod	QL2304008314	Ordinary sand	1.75
30	Hemantkumar Omprakash Pandiya	Nanimangoi	Devghad Baria	Dahod	QL2304008414	Ordinary sand	1.75
31	Shree Bhikhabhai Madanbhai Ravat	Mendra	Devghad Baria	Dahod	QL2304002114	Ordinary sand	1.2
32	Shree Bhupatbhai Bhariabhai Patel	Kalidungari	Devghad Baria	Dahod	QL2304002514	Ordinary sand	2
33	Balvantbhai Dalsukhbhai Patel	Kalidungari	Devghad Baria	Dahod	QL2304006214	Ordinary sand	1
34	Shree Rupsinh Somabhai Patel	Kalidungari	Devghad Baria	Dahod	QL2304003314	Ordinary sand	1
35	Artbhai Somabhai Patel	Kalidungari	Devghad Baria	Dahod	QL2304006414	Ordinary sand	0.5
36	Ranchodbhai Nagabhai Patel	Kalidungari	Devghad Baria	Dahod	QL2304010114	Ordinary sand	1
37	Prathambhai Ramsingbhai Patel	Bhadbha	Devghad Baria	Dahod	QL2304007514	Ordinary sand	2.75
38	Kalyansinh Kanubhai Patel	Bhadbha	Devghad Baria	Dahod	QL2304007914	Ordinary sand	1.75
39	Batukbhai Fatesinhbhai Savaya	Ratadiya	Devghad Baria	Dahod	QL2304012914		1.05
40	Shree Dineshbhai Somabhai Gohil	Junabaria	Devghad Baria	Dahod	QL2304001914	Ordinary sand	1
41	Maheshbhai Madhubhai Koli	Kalidungari	Devghad Baria	Dahod	QL2304007414	Ordinary sand	1.75
42	Patel Balvantsinh Ramsinh	Abhlod	Devghad Baria	Dahod	QL2304012714	Ordinary sand	0.65
43	Abdul Majid Abdul Rahim Bakkar	Taramkach	Dhanpur	Dahod	ML2306000506	Quartz	4.95
44	Govindbhai Kanuji Vanzara	Padardi	Ghoghamba	Panchmahal	QL1407027114	Ordinary sand	Not applicable
45	Rajeshkumar Vajesinh Chauhan	Padardi	Ghoghamba	Panchmahal	QL1407026814	Ordinary sand	Not applicable
46	Mehbub Ishak Bakkar	Sajora	Ghoghamba	Panchmahal	QL1407026014	Ordinary sand	1
47	Jiyaben Hamidhusain Shikari	Khanpatla	Ghoghamba	Panchmahal	QL1407027014	Ordinary sand	Not applicable

Sl. No	Mine Name	Village	Taluka	District	Mine Code	Commodity	Area (Ha)
48	Shri Mohamdkhanlid Abdul Sattar Gheri	Malu	Ghoghamba	Panchmahal	Not Code	Limstone, flosper	0.493

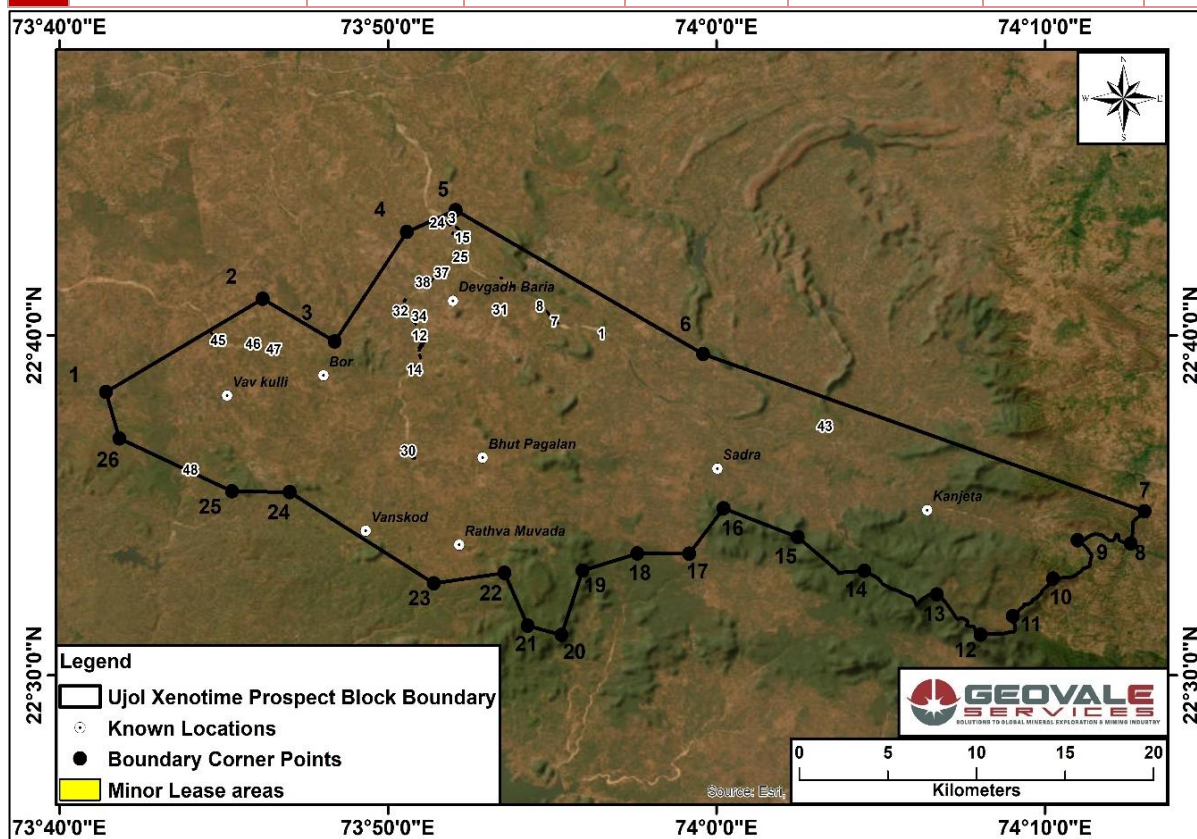


Figure 14 Map showing Existing leases in the proposed block boundary.

14. References

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Appendix I

Phases	Stages	Activities	Total Geologist (Mandays)	Total Labour (Mandays)	Total Sampler (Mandays)	Time Line																	
						M 1	M 2	M 3	M 4	M 5	M 6	M 7	M 8	M 9	M 10	M 11	M 12	M 13	M 14	M 15	M 16	M 17	M 18
Phase I (Fertility Assessment)	Stage 1	Literature Survey: Analysis of previous data	29	0	0																		
	Stage 2	Remote Sensing and Geomorphic Analysis	78	0	0																		
	Stage 3	Infrastructure / Logistics, Camp setup and Stake holder Communication for the complete field season	133	12	0																		
	Stage 4	Regional Geophysical Survey for vertical extension of the regolith horizon	72	100	0																		
	Stage 5A	Orientation survey & sampling for characterization of the REE hosting phases: Field validation of the geomorphic analysis and sampling	41	24	10																		
	Stage 5B	Orientation survey & sampling for characterization of the REE hosting phases: Geochemical Analysis and data interpretation	58	0	2																		
	Stage 6A	Regional scale exploration for district scale target identification: Mapping and sampling (~570 sq. km)	209	204	204																		
	Stage 6B	Regional scale exploration for district scale target identification: Geochemical analysis and data interpretation	101	0	29																		
Milestone I: Fertility assessment of the proposed area and identify the fertile areas with REE value																							
Go-No Go Decision Point 1: Proceed for Phase II (Stage 7) in the areas with high REE value and close the program in other areas (Decision will be taken after discussion and on agreement of both NMET and Geovale team depending on the results of Phase I)																							
Phase II (Identification of the fertile block)	Stage 7	District scale geophysical survey to determine the vertical extension of the regolith horizon and establishment of terrace structure for further exploration	61	78	0																		
	Stage 8A	District scale regolith mapping for identification of the potential mineralized target areas for drilling: Mapping (including pitting/trenching) and sampling from ~80 sq. km	136	103	60																		
	Stage 8B	District scale regolith mapping for identification of the potential mineralized target areas for drilling: Geochemical analysis and data interpretation	116	0	19																		
Milestone II: Identification of the fertile block with high REE value for target testing																							
Go-No Go Decision Point 2: Proceed for Phase III (Stage 9) in the areas with high REE values as potential mineralized targets and close the program in other areas (Decision will be taken after discussion NMET and Geovale team depending on the results of Phase II)																							
Phase III (Target testing)	Stage 9A	Target testing for identification and characterization of the potential mineralized zone: Test drilling, logging, sampling	141	100	80																		
	Stage 9B	Target testing for identification and characterization of the potential mineralized zone: geochemical analysis, data integration and interpretation	94	0	28																		
	Stage 10	Data analysis, Draft report preparation-submission, Monthly progress report for project duration	280	0	0																		
	Stage 11	Final report preparation, submission, recommendation for next level of exploration, discussion with State authorities & project conclusion	55	0	0																		
Milestone III: Identification and characterization of the potential mineralized zone for next level of exploration																							
Total (Mandays)			1634	621	432																		