Dr. Dhaval Patel, IAS
Commissioner of Geology & Mining
Industries & Mines Department
Government of Gujarat

No: CGM/Expl./NMET-Khakharda/863/23-24/799

Date- 06/07/2023

To,
Director,
National Mineral Exploration Trust
Ministry of Mines,
F-114, Shastri Bhawan,
New Delhi-110001

Subject: **Allocation of funds ₹4,85,89,100.72 (Rupees Four crores Eighty-Five lakhs Eighty-Nine thousand One hundred only) for Bauxite in Khakharda-Kenedi Block, Devbhumi Dwarka District, Gujarat State for G3 Stage Mineral Exploration under NMET.**

Respected Sir,

With respect to above mentioned subject, we are submitting proposal for Bauxite in Khakharda-Kenedi Block, Devbhumi Dwarka District, Gujarat State for G3 Stage Mineral Exploration.

It is requested to NMET to allot the fund of Rs. 4,85,89,100.72 (Rupees Four crores Eighty-Five lakhs Eighty-Nine thousand One hundred only) for Bauxite in Khakharda-Kenedi Block, Devbhumi Dwarka District, Gujarat State for G3 Stage Mineral Exploration.

We would like to submit the same under sub-section 5 of section -9C of the MMDR Act-2021 for NMET funding.

Thank you.

Your Faithfully,

6/7/23

(Dr. Dhaval Patel, IAS)
Commissioner
Geology and mining,
Gujarat State, Gandhinagar

Enclosed: As above

Copy to: Joint secretory, Industry and mine department, New Sachivalay, Gandhinagar

Proposal for Bauxite in Khakharda-Kenedi Block, Devbhumi Dwarka District, Gujarat State for G3 Stage Mineral Exploration under NMET

Commodity: Bauxite

By

Commissioner of Geology and Mining
Gujarat

Place: Gandhinagar **Date: 05 July 2023**

Summary of the Block for G3 stage exploration

	Features	Details
	Block ID	CGM/NMET/BP/2023/05
	Current Exploration Agency	CGM, Gujarat
	Previous Exploration Agency	CGM, Gujarat
	G4 stage Geological Report (Previous stage Geological Report)	G4 stage
	Commodity	Bauxite
	Mineral Belt	Bhatiya Formation
	Completion Period with entire Time schedule to complete the project	6 months
	Objectives	To assess the mineral resource of Bauxite mineral at G3 stage in the proposed study area.
	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 work will be carried out through outsourcing.
	Name/ Number of Geoscientists	1 (Field) + 1 (HQ)
	Expected Field days (Geology, Geophysics, Surveyor)	HQ – 60 days Field – 260 days Surveyor-60 days
1.	**Location**	
	Latitude	22° 3'30.68"N to 22° 6'48.66"N
	Longitude	69°17'32.56"E to 69°22'11.32"E
	Villages	Khakharda, Kenedi
	Tehsil/ Taluk	Kalyanpur
	District	Devbhumi Dwarka
	State	Gujarat
2.	**Area (hectares/ square kilometres)**	
	Block Area	1913 hectares
	Forest Area	No forest area
	Government Land Area	NA
	Private Land Area	NA
3.	**Accessibility**	
	Nearest Rail Head	Bhatiya railway station – 1.27 km
	Road	NH 151A – 3 km
	Airport	Porbandar Airport – 57 km
4.	**Hydrography**	

	Local Surface Drainage Pattern (Channels)	Sub-dendritic drainage pattern.
	Rivers/ Streams	No river/stream present in the area.
5.	**Climate**	
	Mean Annual Rainfall	1002 mm
	Temperatures (December) (Minimum) Temperatures (June) (Maximum)	Minimum – 7° C Maximum – 44° C
6.	**Topography**	
	Toposheet Number	41F08
	Morphology of the Area	Gently rolling topography
7	**Availability of baseline geoscience data**	

	Geological Map	**Plate 1**
	Geochemical Map	**Not Available**
	Geophysical Map (Aero geophysical, Ground geophysical, Regional as well as local scale GP maps)	**Not Available**
8.	**Justification for taking up G3 stage mineral exploration**	The region was primarily investigated by CGM by means of pitting. It was found that the Bauxite occurs as pocket deposit in ferruginous Laterite in and around proposed block area. The drilling was carried out previously by CGM in the vicinity of the proposed block on a grid of 100 meters. 312 boreholes were drilled out of which 156 boreholes encountered Bauxite. The highest estimated resource of Bauxite was reported to be 0.37 MT and part of which falls within proposed block area. The chemical analysis of the samples yielded avg. Al_2O_3% to be 50.23 with SiO_2% to be 4.39. The proposed block is surrounded by the Bauxite leases and large scheme exploration blocks of Bauxite. Several working mines of Bauxite are also located near to this block, so it can be studied as an extension of the already existing mineable deposits. Thus, the block is suggested for G3 level of exploration.

Detailed description:

1. Block Summary

Physiography

The study area is located in the Kalyanpur taluka, Devbhumi Dwarka district in the western part of Gujarat. The area is characterized by more or less flat, undulating topography with very few mounds and ridges separated by cultivated plains rising 40 to 70 meters from the general level of the ground. The area is usually dry the whole year except during monsoon. The area is dissected by few nalahs which control the drainage of the area; which are all dry except during monsoon.

Background Geology (Regional Geology & Geology of the Block).

The formation of Sub-Recent and Recent age includes sand dunes, costal dunes, coastal terraces, consolidated shore sand with shelly material, ran clay, soil and alluvium.

Milliolitic Limestone (Porbandar Group – Late Pleistocene)
Very small and thin Milliolitic limestones have also been noticed overlying the gaj beds and laterite belt. Gastropod and lamellibranches are the main fossils noticed in the area.

Gaj Beds (Lower Miocene to Middle Miocene)
Gaj beds rest on the laterite and forms the eastern margin of the formations. At places they form small outliers resting on the laterite. The Gaj beds are almost horizontal and do not exceed four to six meter in thickness. They are represented by conglomerates, grits and fossiliferous limestones. The conglomerates are composed of rounded and sub-rounded pebbles of argillaceous material and bauxite set in ferruginous ground mass.

Laterite and Bauxite (Bhatiya Formation – Palaeocene to Eocene)
Laterite forms almost a continuous zone between the Gaj beds and the underlying traps. They have been subjected to a considerable amount of denudation prior to deposition of Gaj beds. There are scattered pockets of bauxite in the ferruginous laterite belt. Two varieties of bauxite can be made out in the areas. One the bouldary, nodular and the other earthy massive bauxite. The bouldary bauxite is hard and compact with shades of red and brown colour. The earthy bauxite is soft and friable in nature. Generally, it is pinkish to whitish in colour these earthy clays bauxite rests directly on the clay below. Clays are of different shade and colour. These are succeeded by the trap below there for these deposits are inferred to be insitu in nature.

Deccan Trap (Upper cretaceous to Lower Eocene)

The trap is the dominant country rock covering the major portion of the area. Traps (basalts) are medium to fine grained with voids filled with quartz, chalcedony and calcite. The bauxite deposits are invariably found associated with ferruginous laterite. It was observed that the bauxite horizon rest directly on the Deccan Trap and at place is found covered by the Gaj beds.

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

Mineralization potential of Bauxite

It was noted that bauxite occurs as small segregations in the ferruginous laterite. They are hard compact and ferruginous in nature and occur as boulders and nodules, having shade of pink and brown colour. This bouldary zone overlie the earthy clayey bauxite as the bauxite boulders are found embedded in clayey matrix. Several exposures of bauxite are noticed around Kenedi village. A pocket of bauxite was reported by Shri H. R. Vyas (1966-67) close to Bhatia-Kalyanpur road. The deposit was reported at a distance of about one kilometer north of village Kenedi. The bauxite is hard, compact bouldary, nodular and ferruginous in nature. The thickness of bauxite varies from 1.6 to 3.58 meters.

The deposits around Khakharda village shows that bauxite there is hard, stand out prominently at small humps in the plain terrain. There were four small pockets of bauxite reported. There are a number of old pits and quarries in the area which indicates that the area has been prospected in the past. The average thickness of the bauxite is 1.10 to 2.35 meter. The bauxite is hard compact, bouldary and nodular in nature. It is red to brown in colour and shows a glossy shine.

Several existing mines of bauxite are present surrounding the proposed block area which adds up to the mineral potential of bauxite in the proposed area. The bauxite deposits here have hardly any overburden and is easy to excavate them by quarrying.

N. V. Shah and J. V. Bhatt (1975) noted during drilling in their exploration that pocket of bauxite was conglomeratic in nature, while few boreholes showed pisolitic bauxite.

Scope for proposed exploration

1. Location: Khakharda, Kenedi villages of Kalyanpur Taluka, Devbhumi Dwarka Dist., Gujarat State
2. Quantum of work: The approximate core drilling work is 4,760 meters.
3. Rock formations to be drilled: Various types of soil, sub-soil, Bauxite, Laterite, Limestone, etc.

4. The boreholes shall be in depth range of approximately 40 m. However, this is indicative only and may vary as per actual geological conditions.
5. Type of Drilling: Core drilling by Hydraulic Drilling Rigs.
6. Borehole size: The holes shall be derived in NQ size.
7. The core recovery in all the formation should be at least 90% except in fault zone, weathered zone, soil, sand and structurally disturbed area
8. CGM will provide proposed borehole location plan of all the areas to be covered under exploration.
9. Sampling: There will be one mineral/rock sample for every 1-meter run. Each sample should be cut by core splitter. Each run shall be marked properly by plastic cards and the core boxes shall be numbered properly. Each sample shall be reduced to an approximate quantity by following the standard sampling procedures such as homogenizing, coning, quartering and pulverizing into 100/200 mesh and be prepared into two packets of 100-200 gm each. The final sample pockets shall be properly labelled with BH number, sample run.

Recommendations of G4 Stage Mineral Exploration Report.

Shri H. R. Vyas (1968) recommended the further prospecting by putting drill holes on the Gaj laterite margin as the deposit is of pocket type and samples recovered show good proportion of Al_2O_3 concentration.

N. V. Shah and J. V. Bhatt (1975) in their report on “The Concealed Bauxite Deposition Some of the villages of Kalyanpur Taluka, Jamnagar District Gujarat State" stated that their investigation had proved considerable quantity of good grade bauxite occurring below soil cover of tertiary. It was therefore suggested that investigation of concealed bauxite should be continued by drilling short bore holes of 8 to 10 meters.

Objectives of Exploration

- To know the continuity of the mineral body both along the strike and dip.
- To map the extent of the ore body.
- To ascertain the grade of bauxite deposit.
- Ore resource/reserve estimation in accordance with MEMC Rule-2015

2. Previous Work

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

N. V. Shah and J. V. Bhatt (1975) had carried out prospecting of concealed bauxite deposits with three drilling machines in Mewasa, Virpur, Nandana, Mota Asota, Khakharda, Bakudi, Kenedi and Hadmatia villages of Kalyanpur taluka. Laterite forms almost a continuous horizon underlying Gaj beds and overlying traps. The scattered bauxite pockets are encountered in laterite horizon. In all 312, bore holes were drilled on a grid pattern of 100 meters, out of which 156 bore holes encountered bauxite. In all 22 concealed pockets were demarcated. The pockets are mainly in the cultivated lands of the area of Kalyanpur taluka.

The pocket of bauxite is conglomeratic in nature near Khakharda and twenty-eight boreholes were drilled along the border of the exposures out of which few encountered pisolitic bauxite. The average Al_2O_3 concentration was 49.13 %. Near Kenedi village bauxite pockets four boreholes gave positive results with average Al_2O_3 concentration 47.26 %.

Previous Exploration details 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

In the proposed study area, the exploration was carried out by Shri H. R. Vyas (1968), N. V. Shah and J. V. Bhatt (1975). During the exploration programme out by Shri H. R. Vyas (1968), the mapping was carried out on scale of 1:15840, covering an area of about 300 km^2 and prospecting was done by pitting. Eighty pits were dug up, few of which were part of the proposed area varying in depth between 1 and 3 meters. The average analysis of Al_2O_3 concentration in the reserve was found to be 51.39 %.

3. Block description

Block corner points	Latitude	Longitude
1	22° 6'36.43"N	69°22'11.32"E
2	22° 6'48.66"N	69°20'41.97"E
3	22° 5'51.03"N	69°19'54.08"E
4	22° 5'51.30"N	69°19'15.62"E
5	22° 6'17.91"N	69°19'12.65"E
6	22° 6'7.82"N	69°18'42.99"E
7	22° 5'54.23"N	69°18'41.11"E
8	22° 5'57.36"N	69°18'18.02"E
9	22° 5'34.48"N	69°17'32.56"E

10	22° 5'26.65"N	69°18'21.09"E
11	22° 5'18.15"N	69°18'44.73"E
12	22° 4'55.02"N	69°18'32.23"E
13	22° 3'30.68"N	69°19'43.99"E

4. Planned Methodology

- The block boundary shall be surveyed by DGPS in WGS-84 datum for demarcation of block boundary points.
- The drilling for Bauxite is to be carried out on the grid pattern of 400 x 400 meters as the deposit is of irregular habit, for G3 stage as per MEMC, 2015.
- The drilling will be carried out with the help of hydraulic drilling rigs.
- The depth for each borehole is set to be 40 meters or depending on the encountered mineralized zone.
- As it is bedded deposit so the drilling will be vertical.
- Primary samples will be analysed by XRF method.
- Boreholes will be fixed on the ground whose RL's and co-ordinates of survey and exploration points will be determined.

5. Nature Quantum and Target

Nature and Quantum of work proposed

Components	G3
Geological Survey	NA
Scout drilling / Systematic drilling Only Systematic drilling	Refer below point no. 6
Petrographic and mineragraphic studies	Bulk density/Specific Gravity studies
Chemical Analysis	XRF analysis for the samples

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)
G3 Stage	Not applicable	400 m	Not applicable
	(Vertical depth of intersection of mineralised zone for different level boreholes should be specified, number of boreholes (first, second, third), borehole spacing, approximate length of different level of boreholes may also be specified)		

6. Exploratory Drilling

- The boreholes shall be in depth range of approximately 40 m. However, this is indicative only and may vary as per actual geological conditions.
- Type of Drilling: Core drilling by Hydraulic Drilling Rigs.
- Borehole size: The holes shall be derived in NQ size.
- While drilling, wherever water table is encountered, depth of the water table should be recorded and to be mentioned in the driller logs.
- The core recovery in all the formation should be at least 90% except in fault zone, weathered zone, soil, sand and structurally disturbed area.

7. Manpower deployment

Sl. No.	Activities	Unit	MONTHS					
			1	2	3	4	5	6
1	Camp Setting	Month						
2	Surface Drilling (3 rigs)	m.						
3	Survey Party days (1 Party)	day						
4	Geologist Party days in field (1 Party)	day						
5	Sampling Party days, Core Sampling (1 party)	day						
6	Laboratory Studies	Nos.						
7	Camp Winding	Month						
8	Geologist Party days in HQ (1 Party)	day						
9	Geological Report Writing with Peer Review	Month						

Note: 1. Commencement of project may be reckoned from the day the exploration acreage is available along with all statutory clearances.

2. Time loss on account of monsoon/agricultural activity/forest clearance/local law & order problem may be additional to above time line.

8. Break-up of expenditure

The cost has been estimated based on actual schedule of rates mandated in the circular OM No. 61/1/2018/NMET dated 31st March 2020 for NMET funded projects which is **Rs. 485.89 Lakhs.** The detailed cost sheet for G-3 exploration for Bauxite in proposed Khakharda-Kenedi Block is given below:

SL. NO.	Item	Estimated Cost (Rs.)
1	Drilling	25526920
2	Geology and Survey	3664000
3	Laboratory	9663560
	Sub Total (1 to 3)	**38854480**
4	Exploration Report	1942724
5	Proposal Preparation	3,80,000
	Total	**41177204**
	GST 18%	7411896.72
	Grand Total (including GST)	**4,85,89,100.72**
	Say Rs. In Lakhs	**485.89**

9. References

- "Report on the concealed Bauxite deposition some of the villages of Kalyanpur taluka, Jamnagar district Gujarat state" by N. V. Shah and J. V. Bhatt (1974-75), CGM, Gujarat State.
- "Report on the Bauxite deposits in some of the village of Kalyanpur Mahal Jamanagar district" by Shri H. R. Vyas (1966-67), CGM, Gujarat State.
- Bhukosh (https://bhukosh.gsi.gov.in)

List of Plates

Plate 1: Proposed block boundary over existing Geological map.
Plate 2: Proposed Borehole Location Map.
Plate 3: Proposed block boundary over topographic map.

Proposal for Bauxite in Khakharda - Kenedi Block, Devbhumi Dwarka District, Gujarat.

N

0 0.5 1 2 KM

1:30,000

530000 532000 534000 536000 538000 540000

2446000 2444000 2442000 2440000

22°6'40"N 22°5'50"N 22°4'10"N 22°3'20"N

69°16'40"E 69°17'30"E 69°18'20"E 69°19'10"E 69°20'0"E 69°20'50"E 69°21'40"E 69°22'30"E 69°23'20"E

Legend

Khakharda & Kanedi Block Area

GEOLOGY

- BASALT (UNCLASSIFIED)
- BASIC ROCK
- BAUXITE
- LATERITE

PLATE - 1

GEOLOGICAL PLAN

Proposal for Bauxite in Khakharda - Kenedi Block, Devbhumi Dwarka District, Gujarat.

N

0 0.5 1 2 KM

1:30,000

530000 532000 534000 536000 538000 540000

2446000 2444000 2442000 2440000

22°6'40"N 22°5'50"N 22°4'10"N 22°3'20"N

69°16'40"E 69°17'30"E 69°18'20"E 69°19'10"E 69°20'0"E 69°20'50"E 69°21'40"E 69°22'30"E

Legend

- Borehole
- Khakharda & Kanedi Block Area

Proposed Area :- 1913 Ha.
Praposed BH :- 119

PLATE - 2

BOREHOLE PLAN

Proposal for Bauxite in Khakharda - Kenedi Block, Devbhumi Dwarka District, Gujarat.

N

0 0.5 1 2 KM

1:30,000

530000 532000 534000 536000 538000 540000

2446000 2444000 2442000 2440000

22°6'40"N 22°5'50"N 22°4'10"N 22°3'20"N

69°16'40"E 69°17'30"E 69°18'20"E 69°19'10"E 69°20'0"E 69°20'50"E 69°21'40"E 69°22'30"E

Bhopalka R.S

Open scrub

Main power line

Stone

3r

2r

4r

Bhātiya

R.S

Lime

Khākharda

MUMBAI

CHENN

Open scrub

Kenedi

Open scrub

Open scrub

7r

Y

Ā

3r

power line

Hanumāngadh

Track follows bed

Stony waste

Legend

Khakharda & Kanedi Block Area

PLATE - 3

TOPOSHEET PLAN

	Cost Estimate for Exploration of Bauxite in Khakharda-Kenedi Block										
SL. N0.	Item of Work	Unit	Base	Financial Year (2023-24)			Financial Year (24-25)			Total	
			Rate	Esc.Rate	Qty.	Amount	Esc.Rate	Qty.	Amount	Qty	Amount
			1.4.90	(Rs)		(Rs)					(Rs)
A	**DRILLING**										
1	Surface Drilling (3 Rigs)	m.		5242	4760	24951920	0	0	0	4760	**24951920**
2	Transportation	Km.		36	0	0	0	0	0	0	**0**
3	Accomodation	One time / Drill		75000	1	75000	0	0	0	1	**75000**
4	Camp Setting / Winding	Drill/ month		500000	1	500000	0	0	0	1	**500000**
5	Road Making (Hilly Terrain)	Km		22020	0	0	0	0	0	0	**0**
	Sub Total A					**25526920**			**0**		**25526920**
B	**GEOLOGICAL WORK**										
1	Survey Party Days (1 party)	day		8300	60	498000	0	0	0	60	**498000**
2	Geologist Party days (1 party)	day		11000	260	2860000	0	0	0	260	**2860000**
3	Core Sampling Party days(1 party)	day		5100	60	306000	0	0	0	60	**306000**
	Sub-Total B					**3664000**			**0**		**3664000**
C	**LABORATORY STUDIES**										
a	**Chemical Analysis**										
1	Primary + Check Samples										
	i) for 6 radicals (CaO,MgO,Al_2O_3,SiO_2,Fe_2O_3 & LOI)	Nos		2841	1800	5113800	2831	0	0	1800	**5113800**
	ii) External Check Samples for 6 radicals (CaO,MgO,Al2 O3,SiO2,Fe2O3 & LOI)	Nos		2841	60	170460	2831	0	0	60	**170460**
	iii) For additional 2 Radicals SO3 & P2O5	Nos		670	0	0	1067	0	0	0	**0**
2	Composite Samples										
	i) for 12 radicals (CaO, MgO, Al_2O_3, SiO_2, Fe_2O_3, SO_3, P_2O_5, Mn_2O_3, TiO_2, K_2O, Na_2O & LOI,)	Nos		4851	300	1455300	5304	0	0	300	**1455300**
b	**Physical Analysis**										
1	X-RD Studies on composite	Nos		4000	80	320000	6184	0	0	80	**320000**
2	Spectroscopic Studies	Nos		24360	80	1948800	6568	0	0	80	**1948800**
3	Preparation of thin section	Nos		2353	80	188240	588	0	0	80	**188240**
4	Petrographic Studies	Nos		4232	80	338560	1552	0	0	80	**338560**
5	Specific Gravity determination	Nos		1605	80	128400	206	0	0	80	**128400**
	Sub-Total C					**9663560**			**0**		**9663560**
	Total A+B+C					**38854480**			**0**		**38854480**
D	**EXPLORATION REPORT - 5% of**								**1942724**		**1942724**
E	**PROPOSAL PREPARATION - 2% of approved project cost or 3.8 lakh whichever is lower**					**380000**			**380000**		**380000**
	GRAND TOTAL A to D					**38854480**			**1942724**		**41177204**
						Total				**Say 411.77 Lakhs**	