PROPOSAL FOR THE PRELIMINARY (G-3)

EXPLORATION FOR BAUXITE AND ASSOCIATED MINERALS IN

DHRANG BLOCK

(AREA: 4.86 sq km)

DISTRICT– KACHCHH, GUJARAT

COMMODITY: BAUXITE & ASSOCIATED MINERALS

By

MINERAL EXPLORATION AND COSULTANCY LIMITED

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SEMINARY HILLS

NAGPUR

Summary of the Block for Preliminary Exploration (G-3)

GENERAL INFORMATION ABOUT THE BLOCK

	Features	Details
	Block ID	Dhrang Block (4.86 sq km)
	Exploration Agency	Mineral Exploration & Consultancy Limited (MECL)
	Commodity	Bauxite & Associated Minerals (Titanium, Vanadium, Gallium, REE)
	Mineral Belt	Matanomadh Formation of Paleocene
	Completion period with entire Time schedule to Complete the project	14 months
	Objectives	The present exploration programme at G-3 stage has been formulated to fulfill the following objectives: i) Preparation of detailed Geological map at 1:4000 scale to demarcate various lithounits like Bauxite, laterite, basalt (deccan volcanics), shale, limestone etc. with their structural manifestation. ii) Collection of 80 bedrock/chip samples from bauxite/ aluminous Laterite bearing zones. iii) Pitting for delineating the bauxite/ aluminous Laterite zones prior to borehole drilling in 400mX400m interval. iv) Topographical survey at 1:4000 scale will be carried out. v) To prove the occurrences of Bauxite zone(s) and to delineate the depth continuity of it by planning systematic boreholes according to the MEMC norms i.e. 400mx400m interval. vi) Two boreholes will be drilled upto the basement i.e basalt (Deccan volcanic). vii) To assess the quality and the thickness of Bauxite horizons in order to delineate the Bauxite resources at G-3 (333) level in the block as per UNFC norms. viii) Along with Bauxite, resources of Titanium, Gallium, Vanadium and Associated Minerals will also be reported if

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ix) To carry out exploration as per Minerals (Evidence of Mineral Contents) Rules, 2015, Mineral Auction Rule–2015 and MMDR Act–2015 as to facilitate the Government of Gujarat for auctioning of the Bauxite Block.</td></tr>
<tr><td></td><td>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</td><td>Work will be carried out by MECL.</td></tr>
<tr><td></td><td>Name/Number of Geoscientists</td><td>Two Geoscientist (Field+HQ)</td></tr>
<tr><td></td><td>Expected Field days (Geology, surveyor)</td><td>Geologist Party days:180days
Survey Party days: 45days</td></tr>
<tr><td>1.</td><td>Location</td><td>The Dhrang Block area falls in the Survey of India Toposheet No.41A/14 and covers a total area of 4.86 sq.km.The block area falls in and around the villages Dhrang, Denma and Matanomadh in Lakhpat tehsil of Kachchh district, Gujarat.</td></tr>
<tr><td></td><td>Latitude and Longitude</td><td><u>Corner points of Dhrang G-3 Block (4.86sq.km)</u>
<table>
<tr><th>Points</th><th>Latitude (N)</th><th>Longitude (E)</th></tr>
<tr><td>A</td><td>23°31'0.43"</td><td>68°54'3.47"</td></tr>
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<tr><td></td><td>District</td><td>Kachchh</td></tr>
<tr><td></td><td>State</td><td>Gujarat</td></tr>
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2.	**Area (hectares/ sq.km)**	
	BlockArea	4.86 sq.km
	ForestArea	Area is devoid of any forests
	Government Land Area (Bilanam)	Data not available
	Charagaha	Data not available
	Private Land Area	Data not available
3.	**Accessibility**	
	Nearest Rail Head	Bhuj Railway Station (105 Kms).
	Road	NH-41 connecting Bhuj-Mandvi and Narayan Sarovar passes 15 km west of this block. NH-754K also passes 18 km east of the block connecting it all the way to Punjab via Bhuj-Jodhpur-Bikaner. The entire block area is well connected by motorable roads.
	Airport	Bhuj airport is around 103 kms from the block.
4.	**Hydrography**	
	Local Surface Drainage Pattern (Channels)	The overall drainage pattern is dendritic, particularly over the Deccan volcanics. Coarse trellis to sub-trellis pattern, suggestive of structural control, is prominent in the sedimentary terrain. Trellis pattern is seen on the back slopes of basaltic cuestas. The drainage density and the drainage frequency is high in this area, but due to scanty rainfall these streams are ephemeral in nature and remains mostly dry throughout the year and act as flood channels during the monsoon. The drainage is controlled by both lithology and structures in the area.
	Rivers/Streams	The Kali nadi and the Kotawadi nadi act as the major drainage outlets of the area, which shows a gentle slope towards north-west.
5.	**Climate**	
	Mean Annual Rainfall	The average annual rainfall ranges from 25 cm to 40 cm and is mostly received between July and September months.
	Temperatures (December) (Minimum)	Minimum temperatures is around 5-7^{O}C (Nov-Jan)

	Temperatures (June) (Maximum)	Maximum temperatures reaches upto 42-45^{O}C(March-June)
6.	**Topography**	
	Toposheet Number	41A/14
	Morphology of the Area	The area under toposheet No, 41 A/14 shows a high degree of physiographic variations with a number of hills and intermittent valleys. The hills are steep and flat topped with fine grained massive basalt. The ground level in the area is at about 80 m above MSL and the maximum elevation is at 157 m.
7.	**Availability of baseline Geoscience data**	
	Geological Map (1:50K/25K)	Regional Geological map, sourced from GSI (1:50000), available.
	Geochemical Map	Not applicable.
	Geophysical Map (Aeromagnetic, ground geophysical, Regional as well as local scale GP maps)	Not applicable.
8.	**Justification for taking up Preliminary Exploration**	i) The Commissioner of Geology and Mining (CGM), Gujarat has carried out exploration in Kachchh basin for bauxite and identified several blocks for exploration of Bauxite based on their previous works. They published the information of these blocks in Gujarat's Mineral Wealth booklet. CGM, Gujarat (via official email dated 14/11/2024) sent MECL a NOC approval to take up exploration investigation in those blocks. The proposed Dhrang Bauxite block (G-3 stage) is one of them. ii) The lithology of the area includes Bauxite/Laterite associated with Deccan Trap Volcanics. The bauxites of Matanomadh formation have been formed by supergene alteration of the pyroclastic facies of Deccan basalts. It consists of ferruginous laterite which rest on the Deccan traps and, in turn, are covered

		by the Eocene Gypseous shale beds. iii) In this area, the bauxite deposits are associated with the laterites of the Matanomadh formation of rocks. The area is explored by CGM through pitting and trenching. The chemical analysis results show a good percentage of Al_2O_3, averaging 50.40% with SiO_2 percentage of 1.90%. They reported a reserve of 17.8 m.t of bauxite in the area. In the vicinity of this block, there are leases of bauxite and thus the block is proposed for G3 level exploration. iv) Geological mapping of Mesozoic and Tertiary rocks of Kachchh (FSP- 1981-82 & 1984-85) of the area reveals presence of Bauxite. The rocks belonging to the supra-trappean formation is represented by oolitic and pisolitic, at times conglomeratic (re-worked) bauxite and laterites of varied colour along with ash/shale beds, lithomarge aluminous grit, felspathic sandstone and aluminous clays. The supra-trappean sediments form hard compact, low ridges and plateau above Deccan Trap Mesozoic rocks. It is suggested that in-situ lateritization and bauxitization of Deccan Traps and associated pyroclastic materials have resulted in the formation of these bauxite. v) The bauxite in the study area has formed by the in-situ alteration of underlying Deccan traps. Bauxite over basalt parent rock has higher titania compared to the bauxite from Khondalite-Charnockite. Based on that, prospecting of titania is also kept under the proposed exploration scheme. vi) MECL team also conducted field visit and identified bauxite associated with Laterite in and around the proposed block.

PROPOSAL FOR PRELIMINARY EXPLORATION (G-3 LEVEL) FOR BAUXITE & ASSOCIATED MINERALS IN DHRANG BLOCK, DISTRICT -KACHCHH, GUJARAT

1.0.0 Introduction

The importance of Bauxite is well known in the production of Alumina (Al_2O_3) and also in other industries viz. abrasives, refractory, chemical and cement. The properties like lightness of metal aluminum, its high resistance to atmospheric corrosion and good electrical conductivity make it a popular metal and is being used for making household utensils and therefore known as 'poorman's gold'. The aluminum metal being a good substitute for non-ferrous metals like copper, zinc which are scarce and costly metals has further necessitated development of aluminum industry throughout the world.

Reserves/Resources of Bauxite in the country as on 1.4.2015, as per NMI database, based on UNFC system have been placed at 3,896 million tonnes. These resources include 656 million tonnes reserves and 3,240 million tonnes remaining resources. By grades, about 77% resources are of Metallurgical grade. The resources of Refractory and Chemical grades are limited and together account for about 4%. By States, Odisha alone accounts for 51% of country's resources of Bauxite followed by Andhra Pradesh (16%), Gujarat (9%), Maharashtra (5%) and Madhya Pradesh & Chhattisgarh (4%each).

On enactment of MMDR Amendment Act-2015, Minerals (Evidence of Mineral Contents) Rule-2015 and Mineral Auction Rule-2015, Govt. of India directed State Governments to speed up exploration work for different Mineral Commodities in the respective states for auctioning of the blocks.

The Commissioner of Geology and Mining (CGM), Gujarat has identified several blocks for exploration of Bauxite based on their previous works. They published the information of these blocks in Gujarat's Mineral Wealth. CGM, Gujarat (via official email dated 14/11/2024) sent MECL a NOC approval to take up exploration investigation in those blocks. The proposed Dhrang Bauxite block (G-3 stage) is one of them.

The exploration in the block is to be carried out in G-3 stage. Boreholes will be drilled at 400m x 400m grid interval so that the resources can be estimated at G-3 level and the block can be auctioned by the Government of Gujarat.

2.0.0 Location and Communication

The Dhrang Bauxite block falls in Survey of India Toposheet No.41A/14 and is bounded by the following co-ordinates in Kachchh district of Gujarat.

Proposed Dhrang Block Boundary Coordinates

Points	Latitude (N)	Longitude (E)
A	23°31'0.43"	68°54'3.47"
B	23°32'22.20"	68°53'47.30"
C	23°32'29.04"	68°55'11.61"
D	23°31'17.02"	68°55'2.42"

The proposed block is located in the southern part of Toposheet 41A/14. Dhrang is located at a distance of 100 kms from the district headquarter Bhuj. The block is well connected by motorable roads. The nearest railway station and airport is at Bhuj which is well connected with the rest of the country.

3.0.0 Physiography & Drainage

Physiographically, the major part of Kachchh is plateau, formed due to Deccan volcanism. The extension of high hill range of basaltic lava flow is in the western and north western part. The lava pile is tilted 3°- 5° towards SSW. This tilt has resulted in the formation of cuesta with gentle south-southwesterly back slopes and steep north easterly facing escarpment. The ground level in the area is at about 80 m above MSL and the maximum elevation is at 157 m. The elevated area is mainly occupied by open scrub. The plateaus and low-lying area are used for cultivation and settlement purpose.

The overall drainage pattern is dendritic, particularly over the Deccan volcanics. Coarse trellis to sub-trellis pattern, suggestive of structural control, is prominent in the sedimentary terrain. Trellis pattern is seen on the back slopes of basaltic cuestas. The drainage density and the drainage frequency is high in this area, but due to scanty rainfall these streams are ephemeral in nature and remains mostly dry throughout the year and act as flood channels during the monsoon. The drainage is controlled by both lithology and structures in the area.4.0.0 Climate & Rainfall

Climate

The climatic conditions in this part of Kachchh are semi-arid with the peak summer temperatures recorded at 45˚C. The winters are moderate with the mercury dipping to minimum of around 5-7˚C. Although there is marked temperature fluctuation in the area, on account of the proximity to the coast, it is cooled by the evening sea breeze.

Rainfall

The average annual rainfall ranges from 25 cm to 40 cm and is mostly received between July and September months.

5.0.0 Previous Work

The Geology of the Kachchh Basin has been studied thoroughly by various workers and the research work on various topics is still going on. The works of some of the pioneer workers have been consulted to get a general idea of the geology and tectonics of the area. The first comprehensive account of the stratigraphy of Kachchh was given by Wynne (1872), in which the Jurassic beds were divided into lower marine and upper non marine formations.

Geological Survey of India carried out geological work in the Kachchh Basin, some of which include geological mapping of area covered under 41A/14 (Sarathi & Sabala, 1986 and Ghevariya, Sabale & Rakshit, 1984).

Investigation for Bentonite deposits in parts of Lakhpat Taluka of Kachchh district, Gujarat was undertaken by GSI during FSP 1979-80, 1980-81 and 1981-82 (Ghevariya, 1984).

Apart from GSI, CGM, Gujarat has done extensive work in the study area. CGM noted the bauxite deposits are associated with the laterites of the Matanomadh formation of rocks. The chemical analysis results show a good percentage of Al_2O_3, averaging 52.53% with SiO_2 percentage of 5.80%. Pitting and trenching has been done by CGM and the highest reported reserve is 17.8 m.t.

In the study area Deccan Basalt is successively overlain by sequence consist of bentonite, laterite and bauxite. At places laterite acts as a cap rock for the bauxite. Laterite is mainly a pitted red to brownish colored rock exhibiting conglomeratic appearance. Most of bauxite bands are under lease area of GMRDC. In an ideal profile of laterite and bauxite the bottom most part is lithomargic clay beyond which no bauxite can be expected. It is white in color and clayey. It is capped by laterite.

6.0.0 Regional Geology

The general geology of the Kachchh Peninsula comprises of rocks ranging in age from Jurassic to Recent with no basement rocks exposed in the area as observed. The Kachchh Basin is an East – West oriented peri-cratonic rift basin. To the North, the Precambrian basement rocks are exposed in Meruda Takkar and Nagar Parkar hills of Pakistan. To the east, the Precambrian rocks are covered under alluvium, to the west the basin extends across the continental shelf, while the South is occupied by the uplifted Saurashtra platform covered by Late Cretaceous sediments and Deccan Trap lava. The basin is an asymmetric rift which is bounded to the north by the Nagar Parkar Fault, and to the South by North Kathiawar Fault (Biswas, 1987). To the East the extension of the rift is limited by Radhanpur–Barmer Arc. The sediment fill of the basin has been defined as syn-rift in nature. The Mesozoic rocks of Kachchh consist of lithounits from middle Jurassic to Late Cretaceous and are overlain by the Deccan Trap and the Tertiaries. Based on fossil assemblage and petrographic character these rocks have been identified as near shore shallow marine deposits fluctuating from neritic lagoonal to littoral environment (Biswas, 1971), (GSI, 2001). The Tertiary

rocks of the Kachchh Basin have yielded good quality limestone, clay, lignite, and bauxite deposits. The Mesozoic rocks of Kachchh were subdivided into Patcham, Chari, Katrol, and Umia Groups (Waagen, 1875).

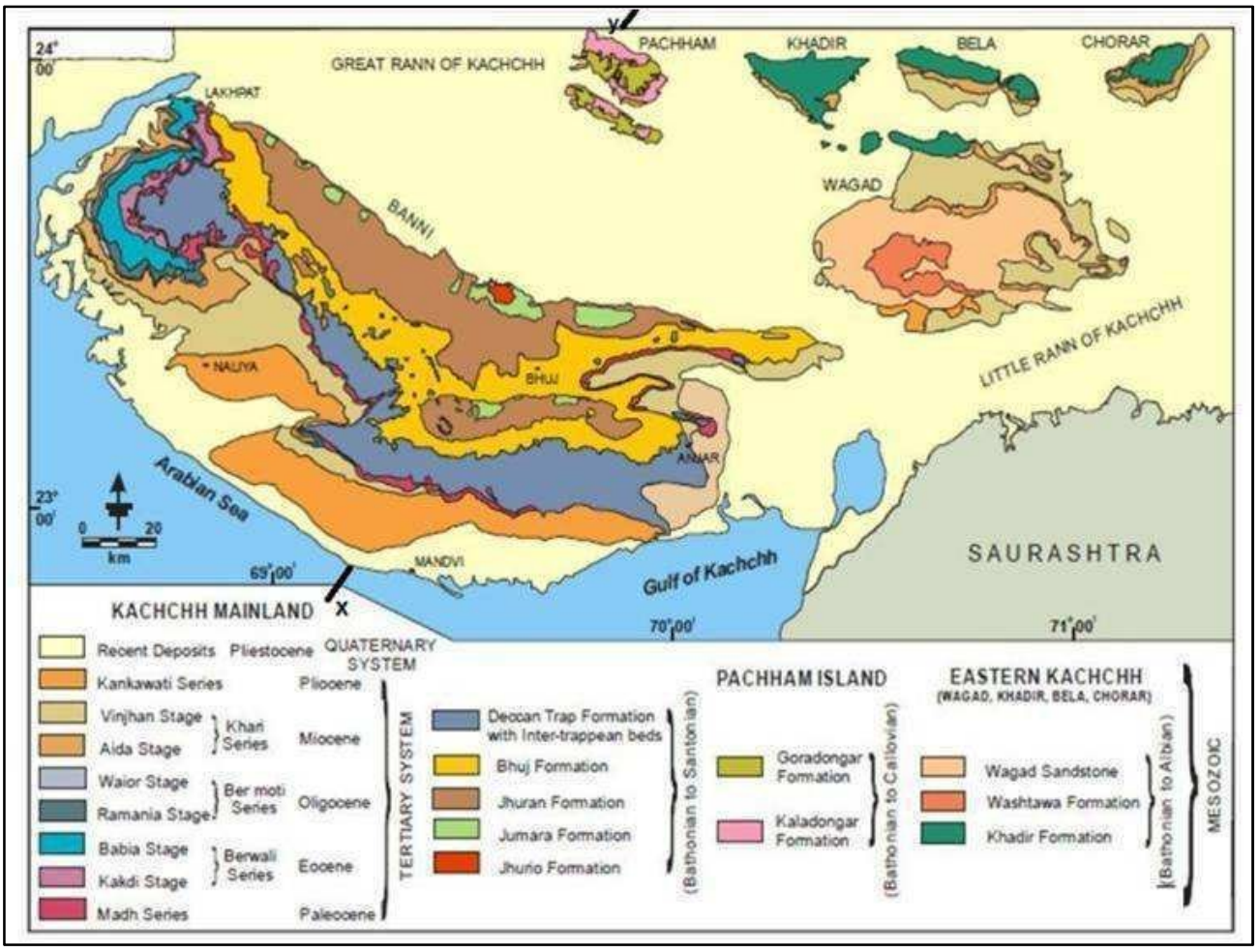


Fig: Regional Geological Map of Kachchh Basin (after Biswas and Despande,1970)

Table: Stratigraphy of Mesozoics of Kachchh (after GSI, 2001)

Age	**Formation**	
Cretaceous	Bhuj	
	Umia	Ukra beds-Marine calcareous shales
		Umia beds: Barren sandstones and shales
		Trigonia beds; Barren Sandstones
		Umia ammonite bed
		Up. Katrol Shales
Upper Jurassic to Lower Cretaceous	Katrol	Gajansar Beds
		Upper Katrol (Barren sandstone)
		Middle Katrol (red sandstones)
		Lower Katrol (Sandstone, shale, marl)

Age	Formation	
		Kantkote Sandstone
Upper Jurassic to Middle Jurassic	Chari	Dhosa oolite
		Athleta beds (marls and gypseous shales)
		Anceps beds (limestone and shales)
		Rehmanni beds (yellow limestone)
Middle Jurassic	Patcham	Macrocephalus beds
		Patcham coral bed
		Patcham shell limestone

Block Geology

The area mainly exposes Tertiary units represented by the Matanomadh and Kakri nadi Formation, basaltic lava flows of the Deccan Volcanics and the recent unclassified alluvium. Deccan Traps are represented by the lava flows of varied composition, basic intrusives and inter-trappean beds. The rocks belonging to the supra-trappean formation is represented by oolitic and pisolitic, at times conglomeratic (re-worked) bauxite and laterites of varied colour along with ash/shale beds, lithomarge aluminous grit, felspathic sandstone and aluminous clays. The supra-trappean sediments form hard compact, low ridges and plateau above Deccan Trap Mesozoic rocks. Rocks belonging to the Tertiary Group comprise lithomarge, gypseous clays, shales, limestone, lateritic clays etc. The lithounits trend in a general NW-SE direction, with southwesterly dips varying between 7°-30° occassionally dips range upto 50°.

Stratigraphic succession of the block area is given in the table below.

Table: Stratigraphic succession of the block area

Age	Formation	Lithology
Recent	-	Unclassified alluvium
Tertiary	Kakdi Nadi	Varigated Gypseous shale/ clay with limestone
Palaeocene	Matanomadh	Bauxite, aluminous laterite & clay
	Supra- trappean horizon	Green, purple and yellow bentonite clay with ferruginous and gypseous partings, sometimes passing gradually into spheroidally weathered Deccan basalt

Age	Formation	Lithology
Upper Cretaceous to Lower Eocene	Deccan Volcanics	Amygdaloidal basalt, fine-grained basalt with intertrappean beds, plugs & sills

Description of litho-units

Deccan volcanics

Fine to medium grained basalt is present having vesicles and fractures filled with secondary minerals like silica, zeolite and calcite. Exfoliation and spheroidal weathering are common in basalt and thick chilled margins helps in the identification of Deccan trap lava flow. The direction of flow of magma varies from place to place clearly indicate the different phases of volcanic eruption. Concentric rings of yellow, brown and cherry red colours in exfoliated and limonitized basalt is the indicator of intense weathering.

Supta-trappean horizon

The trap flows with inter-trappean sediments are overlain by a group of rocks comprising lithomarge, greyish and greenish bentonitic clays, ferruginous sandstone, aluminous clay (Kaolin) laterite bauxite, yellowish and red laminated shales, ash and gypseous partings. The laterite and bauxite contain interstratified, coarse, current bedded, gritty, ferruginous sandstone and micaceous siltstone and shale. The western flank also contains interstratified trap flows, immediately Below laterite bauxite.

Matanomadh Formation

The bauxite has formed due to the alteration of basalt followed by desilicification and silicification. Oolites and pisolites are common features observed in bauxite. Kaolinitisation, lateritisation and bauxitisation are observed together at most of the places in the NW-SE extended belt of bauxite. Microscopic study reveals the presence of alumina rich minerals like gibbsite and boehmite, titanium rich minerals like titanomagnetite and ilmenite, iron rich minerals like hematite, magnetite and goethite. Bauxite varies from light brown to pale pink and grey to white in colour with clayey appearance and found to occur towards the lower part of the bauxite zone. The bauxite zone also contains small lateritic patches and cavities filled with ferruginous materials. Due to the presence of ferruginous materials and laterite, the section of bauxite deposit gives patchy appearance with alternate cherry red, yellow, white and brown colours. These bauxite deposits are of pocket type as it is occurring in between laterite and clay. It is comparatively small, scattered deposits of bauxite/laterite that typically occurs as discontinuous bodies along the crests of flat hills and ridges. The madh formation also consists of variegated bentonitic clay.

Kakdi Nadi Formation

This formation consists of variegated to mottled silt-stones, gray to olive green shales, micaceous siltstone with intervening fossiliferous marlite bands. The common fossils reported from this horizon are Oysters, Turitella and few echinoids. The formation within this proposed block is represented by variegated gypseous shale/clay with limestone of Paleocene.

Economic mineral deposits in the Area

Bentonitic clays and bauxite are the major industrial minerals found in the area and these are associated with laterites of Matanomadh Formation. Limestone and traps are used locally for construction purposes. Bentonitic clay is identified by the presence of yellowish grey to black spongy clay in the laterites of Matanomadh Formation. Bauxite occurs in the form of pockets, capping the laterites of Matanomadh Formation. It is suggested that in-situ lateritization and bauxitization of Deccan Traps and associated pyroclastic materials have resulted in the formation of bauxite (Kulkarni &Thothatiri, 1965). The trend of the bauxite-laterite belt is NW-SE as shown in the geological map of the area mapped. The bauxite has formed due to the alteration of basalt followed by desilicification and silicification. Oolites and pisolites are common features observed inbauxite. Kaolinitisation, lateritisation and bauxitisation are observed together at most of the places in the NW-SE extended belt of bauxite. Microscopic study reveals the presence of alumina rich minerals like gibbsite and boehmite, titanium rich minerals like titanomagnetite and ilmenite, iron rich minerals like hematite, magnetite and goethite.

5.0.0 Proposed Exploration Programme

Objectives

The present exploration programme at G-3 stage has been formulated to fulfill the following objectives:

i) Preparation of detailed Geological map at 1:4000 scale to demarcate various lithounits like Bauxite, laterite, basalt (deccan volcanics), limestone etc. with their structural manifestation.

ii) Collection of 80 bedrock/chip samples from bauxite/ aluminous Laterite bearing zones.

iii) Pitting for delineating the bauxite/ aluminous Laterite zones prior to borehole drilling in 400mX400m interval.

iv) Topographical survey at 1:4000 scale will be carried out.

v) To prove the occurrences of Bauxite zone(s) and to delineate the depth continuity of it by planning systematic boreholes according to the MEMC norms i.e. 400mx400m interval.

vi) Two boreholes will be drilled upto the basement i.e. basalt (Deccan volcanics).

vii) To assess the quality and the thickness of Bauxite horizons in order to delineate the Bauxite resources at G-3 (333) level in the block as per UNFC norms.

viii) Along with Bauxite, resources of Titanium, Gallium, Vanadium and Associated Minerals

will also be reported if encouraging values are encountered.

ix) To carry out exploration as per Minerals (Evidence of Mineral Contents) Rules, 2015, Mineral Auction Rule–2015 and MMDR Act–2015 as to facilitate the Government of Gujarat for auctioning of the Bauxite Block.

6.0.0 Exploration Scheme

Topographic Survey:

The area under investigation, measuring 4.86 Sq Km will be surveyed with triangulation network in 1:4000 scale. Contouring is to be carried out at 2m interval. Reduced level of the boreholes and survey stations are to be determined with reference to the Survey of India Bench Mark as available. All the boreholes, important surface features, survey stations & Pits are to be marked and tied with the survey network.

The block boundary and the borehole points will be surveyed by DGPS & Total Station in WGS-84 datum.

Detailed Geological Mapping:

The total study area of 4.86 Sq km will be mapped on 1:4000 scale with the structural details marked on a plan before going for activities like drilling, sampling, pitting etc. A geological plan with topographical contours, borehole points, trenches, surface features etc. on 1:4000 scales is to be prepared and finalized before finally leaving the work site after completion of all exploratory activities.

Pitting and Trenching:

A provision of 150 cu.m of total pitting/trenching is kept. The pitting/trenching locations will be identified from mapping.

Drilling:

A provision of thirty vertical boreholes (coring) at 400mx400m grid are proposed for G-3 stage of exploration. In order to establish the continuity of ore body, taking into account the boulder/pocket nature of deposit, boreholes have been proposed to have better control on resource estimation. The boreholes will be drilled by core drilling methods up to lithomarge to estimate G-3 level Bauxite resources. The average depth of the boreholes is considered to be 40 m. Out of 15 boreholes, 02 boreholes are proposed to be drilled upto basement. Total 600.00 m of drilling is involved in the proposed G-3 stage of exploration. . For ease of exploration 04 numbers of boreholes will be drilled in first phase of exploration and the rest will be drilled subject to review by NMET committee. The actual location of proposed boreholes is subject to the geological mapping.

Geological Core Logging:

Geological core logging will be carried out carefully by recording minute details and lithological

characters of the rock formations including colour, texture, mineralogical composition, structural details, and lithological variations along with visual estimate in respect of Al_2O_3 content encountered in the boreholes. At this stage, the overburden, the roof and floor of the Laterite/Bauxite zones are to be marked as the deposit is of high alumina and low silica Bauxite type.

Core Sampling:

Borehole cuttings, the material which will be obtained by drilling, will be sampled for a uniform length of 1.00m so that each sample falls between fixed reduced levels in all the boreholes. But the top and the bottom samples will usually be less than 1.00m length as the R.L of the collar of the borehole and the floor of Bauxite zone will be in fraction of whole number. Later, keeping in view the boulder/ pocket nature of the deposit, the sampling will be carried out according to lithological changes. In Bauxite zone, the sample length will be reduced from 1m to 0.50m if required, while in the transition zone / Laterite and clay zone the length of sample may increase. Each sample thus obtained, will be crushed to (-) 60mesh size and its quantity will be further reduced to 500 grams by coning and quartering. The material will be further crushed to (-)120 mesh size. Representative samples weighing about 100grams each will be taken from this, one of which will be sent for primary analysis for seven radicals, i.e., Al_2O_3, SiO_2, Fe_2O_3, TiO_2,LOI, V & Ga and other part of the samples needs to be kept for the purpose of check analysis.

Check Samples:

10% of the total primary samples shall be analyzed for 7 radicals from NABL accredited laboratory as external checks to test the reliability of sampling and analytical data.

Bulk Density:

Bulk density will be carried out in 10 samples obtained from pitting.

Spectroscopic Studies:

50 drill core samples need to be studied for 34 elements distribution by Emission Spectroscope. Semi-quantitative analysis for sample package i.e. 16 other elements viz. Li, Ga, In, Be, Ge, Mo, Cr, Ta, W, Ba, Co, Rb, Sr, Zr, Nb, Ni ;16 REE viz. La, Ce,Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Sc, Y; 02 Actinides viz. U, Th, needs to be carried out by mass spectroscopic studies ICP-AES/ICP-MS (sequential technique). The samples will be taken from the lithomarge and bentonite clay horizons.

Mineragraphic and Petrographic Studies:

To know about the mineralogical composition and interrelation among the constituent minerals 10 rock specimens from the area will be taken up for Petrographic studies. 10 nos. of ore specimens from the Bauxite zones will also be studied in polished section to know about the constituent ore minerals, their mode of occurrence, textures and other mineragraphic characteristics of Bauxite.

X-Ray Diffraction Studies:

A total of 10 Nos Bauxite samples representing the deposit will be subjected to X-Ray Diffraction studies to know about the general distribution pattern of the constituent minerals of the ore.

Combined determination of Trihydrate Alumina (THA-140°C), Monohydrate Alumina (MHA-240°C) & Reactive Silica:

A total of 10 samples will be kept for determining reactive silica.

7.0.0 Quantum of Work:

The proposed quantum of exploratory work (G-3) in the Dhrang block is furnished in the table below.

Table- Proposed Quantum of work

S. No	Item details	Unit	Proposed Quantum
1	Geological Mapping (1:4000 scale)	Sq. Km.	4.86
2	Topographic Survey (Contour interval 2m) at 1:4000 scale	Sq. Km.	4.86
3	Bedrock samples	Nos.	80
4	Pitting/Trenching	cu. m	150
5	Bore Hole Fixation and determination of co-ordinates & Reduced Level (RL) of the boreholes and demarcation of lease hold boundary points by DGPS	Nos.	15+4=19
6	Core drilling (400m x 400m grid).	m	600
7	**Sampling & Chemical Analysis**		
A)	Primary samples to be analyzed for 7 radicals viz. Al_2O_3, SiO_2, Fe_2O_3, TiO_2 , V, Ga & LOI		
i.	Bedrock samples	Nos.	80
ii.	Trench/ Pit samples	Nos.	100
iii.	Borehole Core samples	Nos.	450
iv.	Check samples (10% external)	Nos.	63
8	Physical Studies		
a)	ICP-AES/ICPMS (sequential technique) for 34 elements i.e. 16 other elements viz. Li, Ga, In, Be, Ge, Mo, Ni, Cr, Ta, W, Ba, Co, Rb, Sr, Zr, Nb ;16 REE viz. La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Sc, Y; 02 Actinides viz. U, Th.	Nos.	50

S. No	Item details	Unit	Proposed Quantum
b)	X-RD studies for mineral identification	Nos.	10
9	Petrographic Studies	Nos.	10
10	Mineragraphic Studies	Nos.	10
11	Preparation of Polished Section & Thin Section (05+05)	Nos.	10
12	Bulk density	Nos.	10
13	Combined determination of Trihydrate Alumina (THA-140°C), Monohydrate Alumina (MHA-240°C) & Reactive Silica	Nos.	10
14	Geological Report Preparation {As per Mineral (Evidence of mineral contents) Rule-2015}	Nos.	1

8.0.0 Time Schedule and Cost Estimates

Time Schedule:

The total duration of the project proposed is of 15 months.

Estimated timeline for Preliminary Exploration (G-3) for Bauxite and associated minerals in Dhrang Block, Districts: Kachchh, State: Gujarat
[Block area- 4.86 sq. km; Schedule timeline- 14 months]

S. No.	Particulars	Months/ Days	1	2	3	4	5	6	Review	7	8	9	10	11	12	13	14
1	Camp Setting	months															
2	Geological Mapping & BR sampling	months															
3	Survey days (Topographic survey & BH/BB survey)	days															
5	Trenching/Pitting	cu.m															
6	Drilling (2 rigs)	m															
7	Geologist days	days															
8	Sampling days, BRS, Pit & Core Sampling	days															
9	Camp winding	months															
10	Laboratory Studies	months															
11	Geologist days, HQ	days															
12	Report Writing with Peer Review	months															

Cost Estimates:

Tentative cost has been estimated based on Schedule of Charges (SoC) of projects funded by National Exploration Trust (NMET). The total cost estimate of **Rs. 196.64 Lakhs** is being proposed for completion of exploratory work up to G-3 level. Activity wise break-ups of the same are furnished below:

Sl. No.	Item	Total
1	Geological Work	38,73,900

Sl. No.	Item	Total
2	Pitting & Trenching	5,70,000
3	Laboratory Studies	39,82,800
4	Drilling	71,46,318
	Sub total	**1,55,73,018**
5	Report	7,50,000
6	Peer Review	30,000
7	Proposal Preparation	3,11,460
	Total	1,66,64,478
8	GST (18%)	29,99,606
Total cost including 18% GST		**1,96,64,084**
SAY, in Lakhs		**196.64**

9.0.0 Justifications

i)The Commissioner of Geology and Mining (CGM), Gujarat has carried out exploration in Kachchh basin for bauxite and identified several blocks for exploration of Bauxite based on their previous works. They published the information of these blocks in Gujarat's Mineral Wealth booklet. CGM, Gujarat (via official email dated 14/11/2024) sent MECL a NOC approval to take up exploration investigation in those blocks. The proposed Dhrang Bauxite block (G-3 stage) is one of them.

ii) The lithology of the area includes Bauxite/Laterite associated with Deccan Trap Volcanics. The bauxites of Matanomadh formation have been formed by supergene alteration of the pyroclastic facies of Deccan basalts. It consists of ferruginous laterite which rest on the Deccan traps and, in turn, are covered by the Eocene Gypseous shale beds.

iii) In this area, the bauxite deposits are associated with the laterites of the Matanomadh formation of rocks. The area is explored by CGM through pitting and trenching. The chemical analysis results show a good percentage of Al_2O_3, averaging 50.40% with SiO_2 percentage of 1.90%. They reported a reserve of 17.8 m.t of bauxite in the area. In the vicinity of this block, there are leases of bauxite and thus the block is proposed for G3 level exploration.

iv) Geological mapping of Mesozoic and Tertiary rocks of Kachchh (FSP- 1981-82 & 1984-85) of the area reveals presence of Bauxite. The rocks belonging to the supra-trappean formation is represented by oolitic and pisolitic, at times conglomeratic (re-worked) bauxite and laterites of varied colour along with ash/shale beds, lithomarge aluminous grit, felspathic sandstone and

aluminous clays. The supra-trappean sediments form hard compact, low ridges and plateau above Deccan Trap Mesozoic rocks. It is suggested that in-situ lateritization and bauxitization of Deccan Traps and associated pyroclastic materials have resulted in the formation of these bauxite.

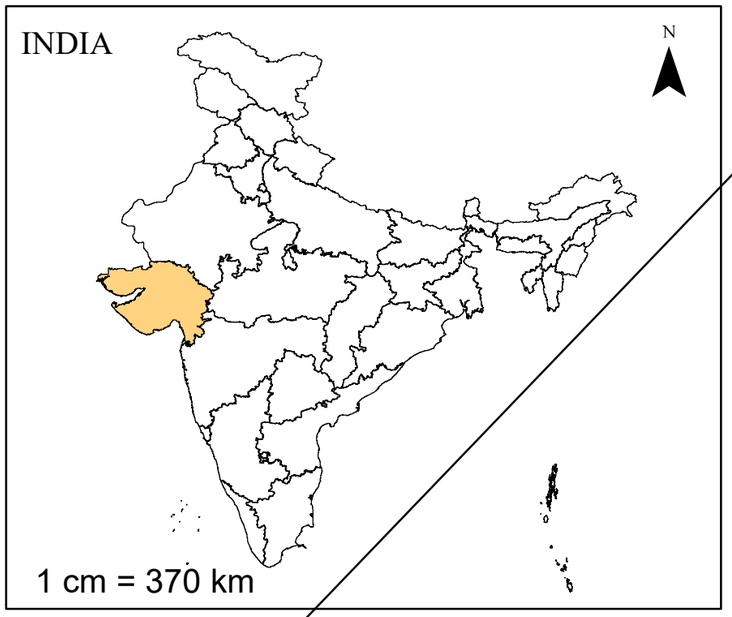
v) The bauxite in the study area has formed by the in-situ alteration of underlying Deccan traps. Bauxite over basalt parent rock has higher titania compared to the bauxite from Khondalite-Charnockite. Based on that, prospecting of titania is also kept under the proposed exploration scheme.

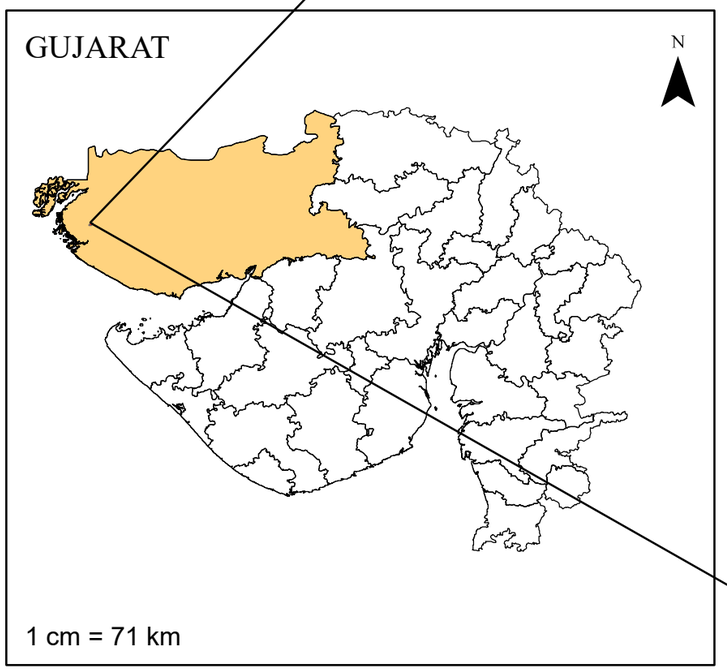
vi) MECL team also conducted field visit and identified bauxite associated with Laterite in and around the proposed block.

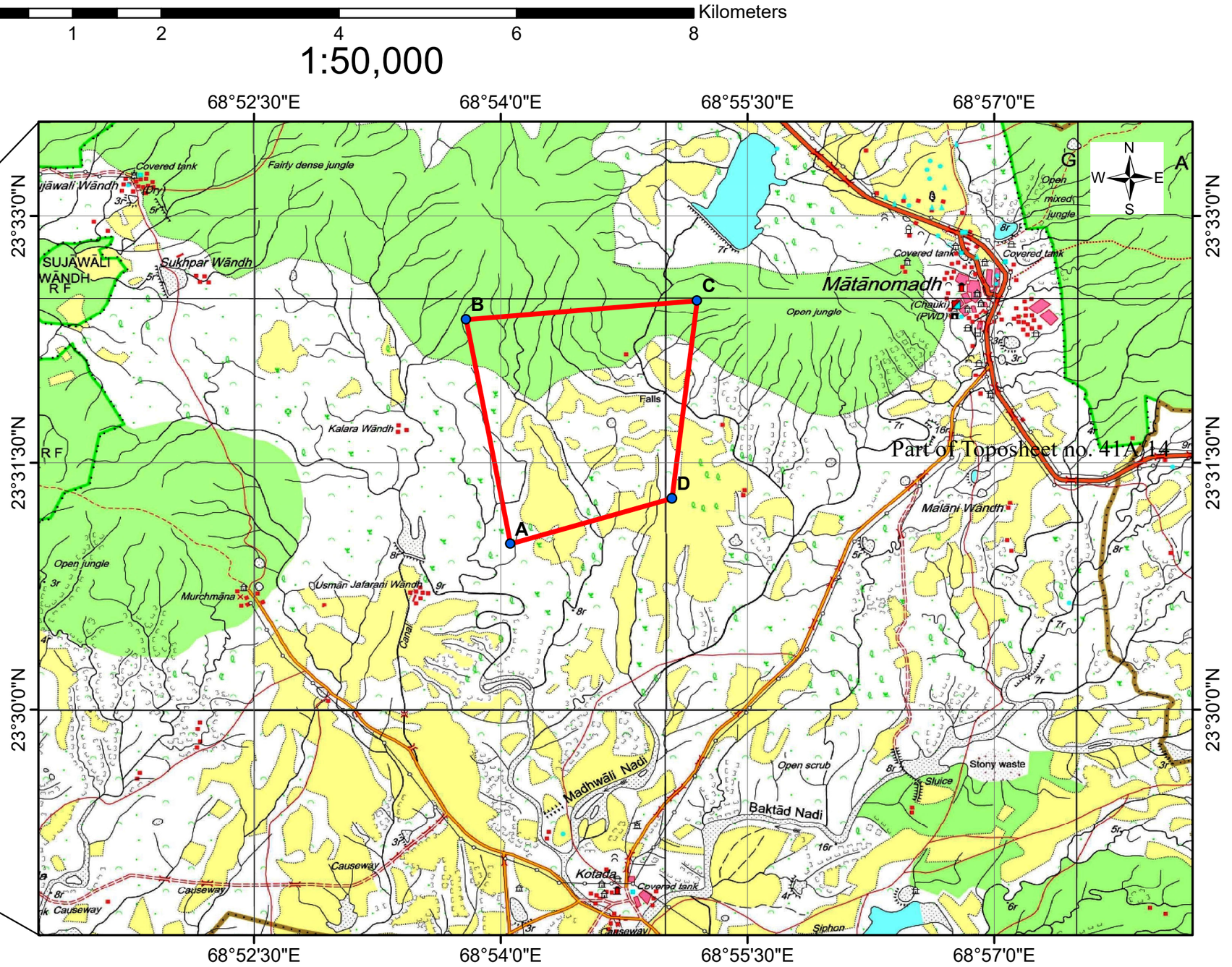
List of Plates:

1. Location Plan (1:50000).
2. Geological Map (1:50000).

Geological Map for the proposed Preliminary Explorationy (G-3) for Bauxite & associated minerals in Dhrang Block (4.86 sq km)
District: Kachchh, State: Gujarat (Part of Toposheet no. 41A/14)







Legend

- BLOCK BOUNDARY POINTS
- DHRANG

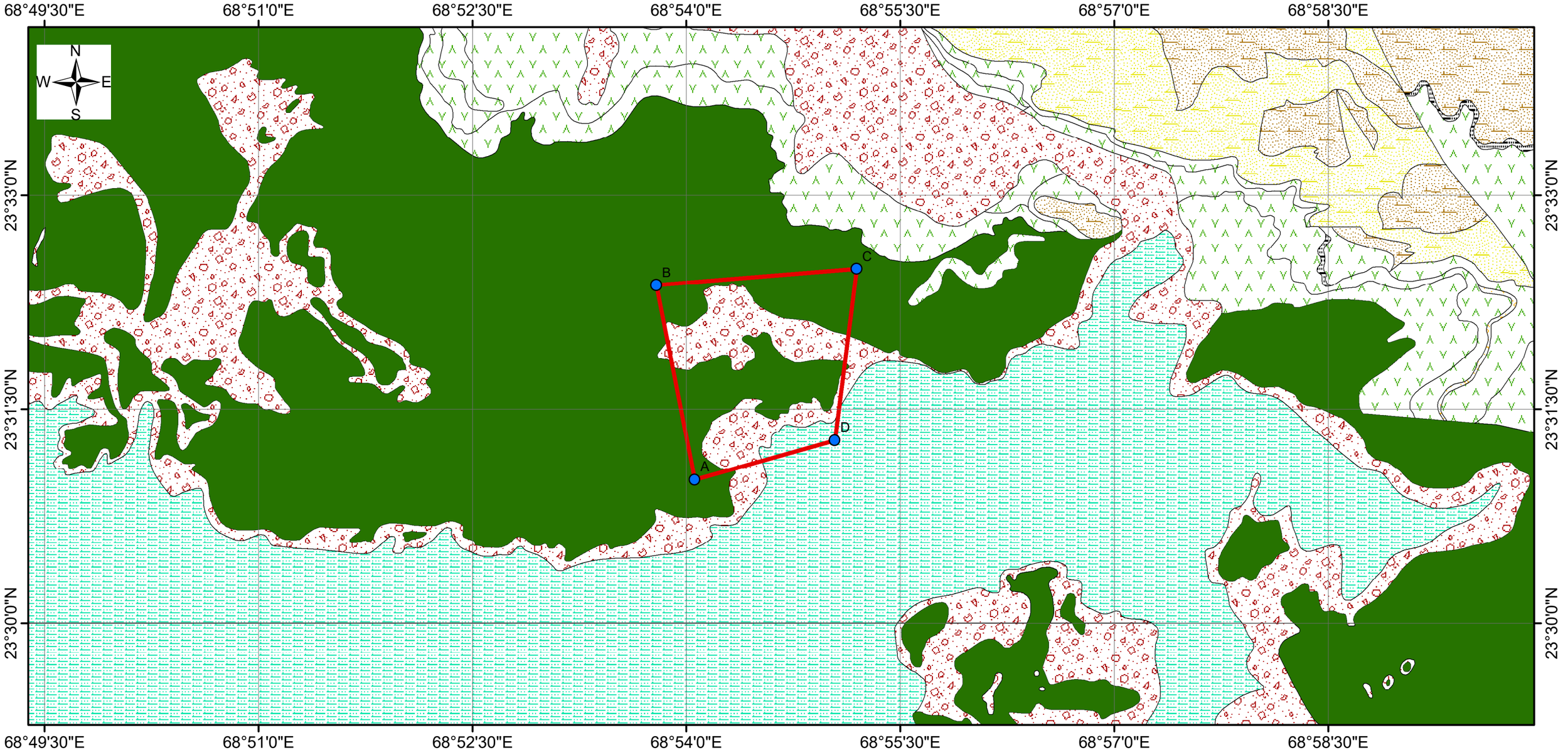
Coordinates of Proposed Dhrang Block for Bauxite & associated minerals

Points	Latitude (N)	Longitude (E)
A	23°31'0.43"	68°54'3.47"
B	23°32'22.20"	68°53'47.30"
C	23°32'29.04"	68°55'11.61"
D	23°31'17.02"	68°55'2.42"

MECL

Geological Map for the proposed Preliminary Exploration (G-3) for Bauxite & associated minerals in Dhrang Block (4.86 sq km)
District: Kachchh, State: Gujarat

Kilometers
0 1 2 4 6 8
1:50,000



Map Source: NGDR Portal

Legend

- Block Boundary Points
- DHRANG BLOCK

Lithology

- VARIEGATED GYPSEOUS SHALE / CLAY WITH LIMESTONE
- LATERITE/BAUXITE WITH CLAY
- BASALT
- BASALT (UNCLASSIFIED)
- SHALE, SST, GLAUCONTIC SHALE, PEBBLES
- SANDY CLAY WITH CALCAREOUS NODULES
- SST, SHALE,CLAY,TRIGONIA FOSSIL & CONGLOMARATE
- SANDSTONE, SHALE, CLAY, CONGLOMERATE

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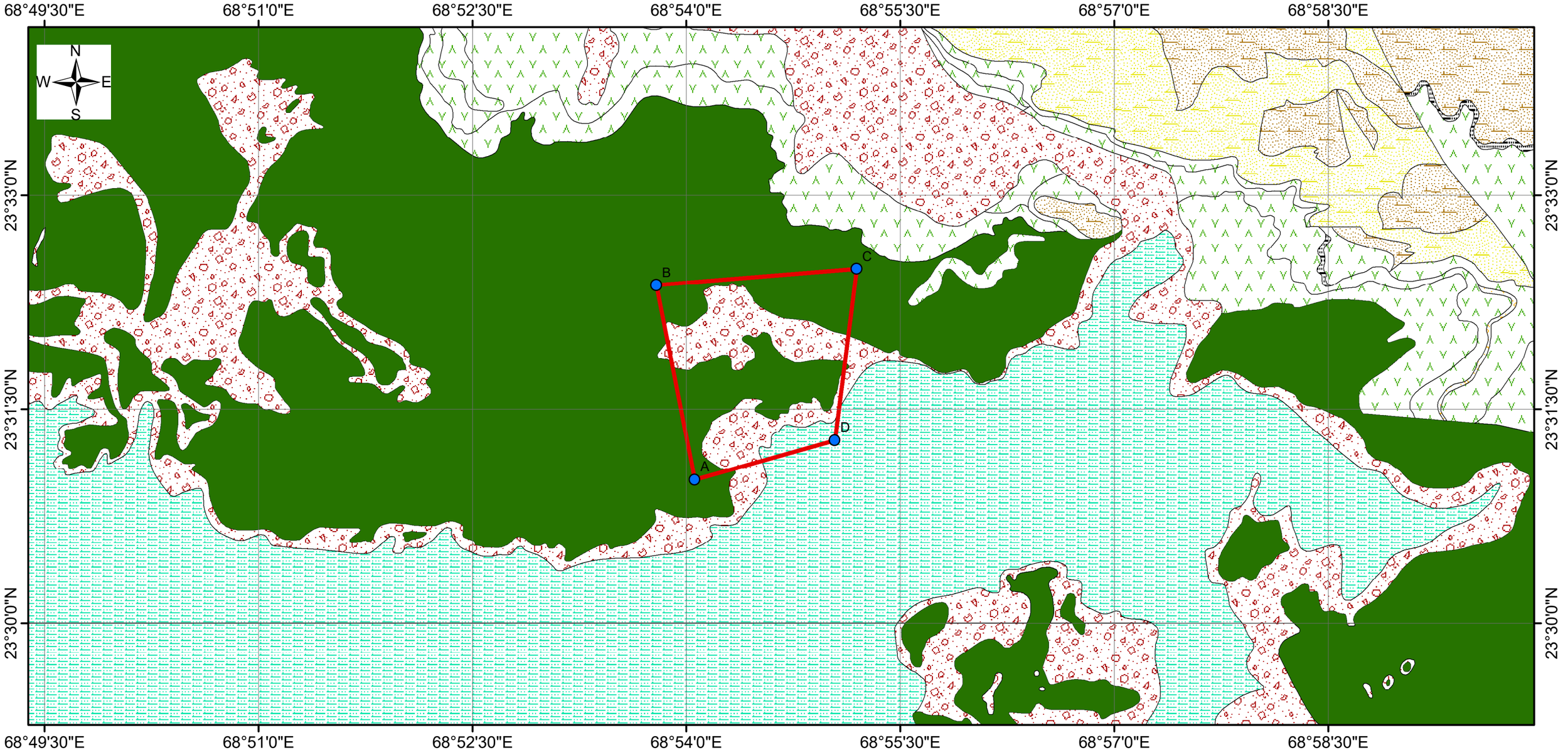

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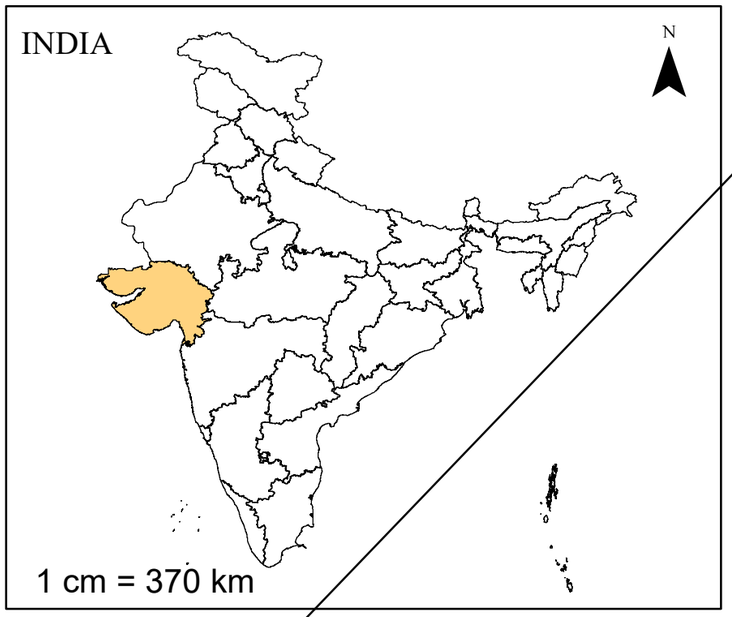

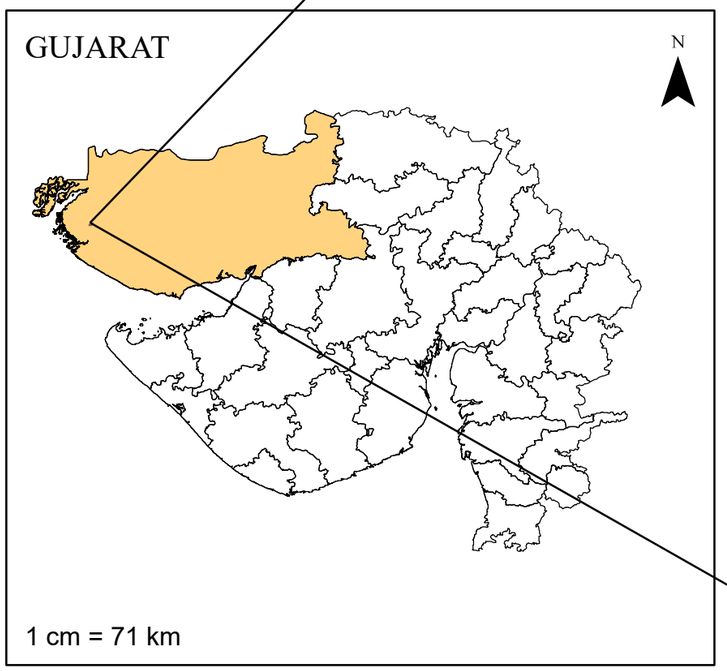

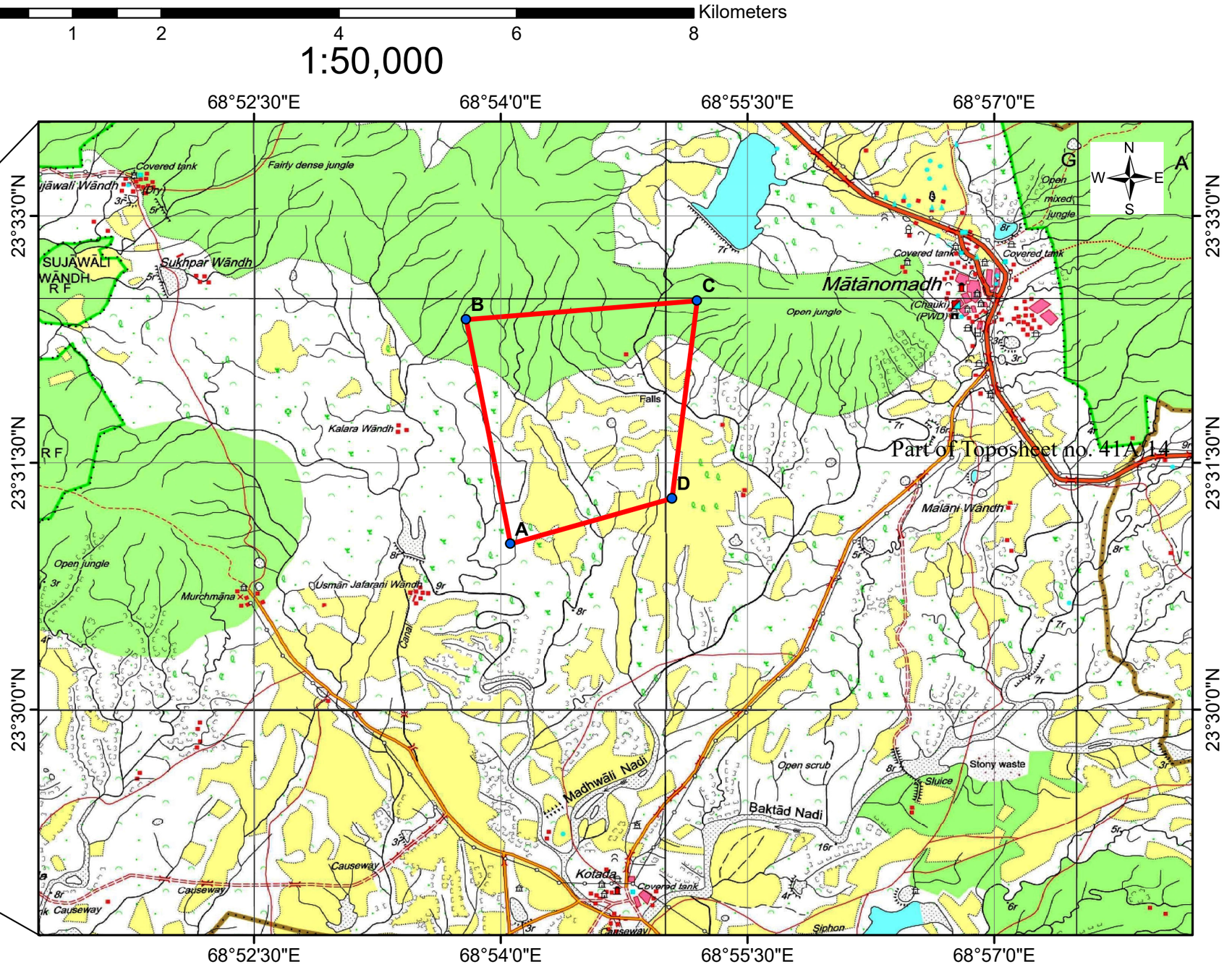

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D	23°31'17.02"	68°55'2.42"

MECL

Estimated cost for Preliminary Exploration (G-3) for Bauxite and associated minerals in Dhrang Block, Districts: Kachchh, State: Gujarat
[Block area- 4.86 sq. km; Schedule timeline- 14 months; BH-15 nos; Drilling- 600m; Review- After 6 months]

S. No.	Item of Work	Unit	Rates as per NMET SoC 2020-21		Estimated Cost of the Proposal		Remarks
			SoC-Item -Sl No.	Rates as per SoC	Qty.	Amount (Rs)	
A	**GEOLOGICAL WORK (1:4000 scale) & TOPOGRAPHICAL SURVEY (1:4000 scale)**						
i	Charges for one Geologist- Field	day	1.3	11,000	180	19,80,000	
ii	Charges for one Geologist per- HQ	day	1.3	9,000	60	5,40,000	
iii	2 labours/ party (As per rates of Central Labour Commissioner)	day	5.7	526	360	1,89,360	Amount will be reimburse as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher
iv	Sampling party days-1 Samplers Labour charge not included	day	1.5.2	5,100	75	3,82,500	
v	4 labours/ party (As per rates of Central Labour Commissioner)	day	5.7	526	300	1,57,800	Amount will be reimburse as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher
vi	Survey Party Days for topographical contour survey, block boundary and borehole points fixation	day	1.6. 1a	8,300	60	4,98,000	
vii	4 labours for surveyor	day	5.7	526	240	1,26,240	
					Sub Total- A	**38,73,900**	
B	**PITTING AND TRENCHING**						
i	Pitting	Cu m	2.1.2	3800	150	5,70,000	
					Sub Total- B	**5,70,000**	
C	**LABORATORY STUDIES**						
1	**Chemical Analysis**						
i	**Primary & Check samples for Bauxite BRS/Chip/Channel/Trench/BH samples)**						
	a. Primary Samples for 5 radicals i.e. Al2O3, SiO2, Fe2O3, TiO2 & LOI	Nos	4.1.15a	4,200	630	26,46,000	BH-450, BRS-80, Trench-100
	b. For each additional trace elements viz. V & Ga	Nos	4.1.15b	842	450	3,78,900	From BH primary samples
	c.External (10%) Check samples for 5 radicals i.e. Al2O3, SiO2, Fe2O3, TiO2 & LOI	Nos	4.1.15a	4,200	63	2,64,600	
	d. External (10%) Check samples for each additional trace elements viz. V & Ga	Nos	4.1.15b	842	45	37,890	
2	**Physical,Petrological, Mineralogical Studies**						
i	Preparation of thin section	Nos	4.3.1	2,353	10	23,530	
ii	Complete petrographic study report	Nos	4.3.4	4,232	10	42,320	
iii	Preparation of polished section	Nos	4.3.2	1,549	10	15,490	
iv	Complete mineragraphic study report	Nos	4.3.4	4,232	10	42,320	
v	Digital Photographs	Nos	4.3.7	280	10	2,800	
vi	X-RD studies for mineral identification	Nos	4.5.1	4,000	10	40,000	
vii	ICP-AES/ICPMS (sequential technique) for 34 elements i.e. 16 other elements viz. Li, Ga, In, Be, Ge, Mo, Ni, Cr, Ta, W, Ba, Co, Rb, Sr, Zr, Nb ;16 REE viz. La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Sc, Y; 02 Actinides viz. U, Th.	Nos	4.1.14	7,731	50	3,86,550	Samples to be taken from the lithomerge & Bentonite clay horizons
viii	Bulk density determination	Nos	4.10	3540	10	35,400	
ix	Combined determination of Trihydrate Alumina (THA-140°C), Monohydrate Alumina (MHA-240°C) & Reactive Silica	Nos	4.1.17a	6700	10	67,000	
					Sub Total- C	**39,82,800**	
D	**DRILLING**						
i	Drilling upto 300m (Soft Rock) (1 rigs)	m	2.2.1.1b	7,168	600	43,00,800	First 4 boreholes will be taken up during the 1st phase of exploration. Rest 11 bhs will be taken up after review by NMET committee.
ii	Land / Crop Compansation	per BH	5.6	20,000	15	3,00,000	
iii	Construction of concrete Pillar (12"x12"x30")	per borehole	2.2.7a	2,000	15	30,000	
iv	Transportation of Drill Rig & Truck associated per drill	Km	2.2.8	36	4,648	1,67,328	Certification in this regard is required to be provided
v	Monthly Accomodation Charges for drilling Camp (up to 2 Rigs)	month	2.2.9	50,000	4	2,00,000	
vi	Drilling Camp Setting Cost	Nos	2.2.9a	2,50,000	2	5,00,000	
vii	Drilling Camp Winding up Cost	Nos	2.2.9b	2,50,000	2	5,00,000	
viii	Approach Road Making	Km	2.2.10a	22,020	2	44,040	Road Making will be considered as per the requirement and Road Making Charges will be reimbursed for max. 4 km.
ix	Bore Hole Fixation and determination of co-ordinates & Reduced Level of the boreholes by DGPS	Nos	1.6.2	19,200	19	3,64,800	15 Boreholes+ 4 Block Boundary points
x	Drill core preservation: One complete borehole plus mineralised cores of all the remaining Bhs	m	5.3	1,590	465	7,39,350	This amount will be reimbursed after successful delivery of the cores to concerned libraries/authorities
					Sub Total- D	**71,46,318**	
E					**Total A to D**	**1,55,73,018**	
F	**Geological Report Preparation**		**5.2**	For the projects having cost exceeding Rs. 150 lakhs but less than Rs.300 lakhs - A minimum of Rs. 7.5 lakhs or 3% of the value of work whichever is		**7,50,000**	Reimbursement will be made after submission of the final Geological Report in Hard Copies (5 Nos) and the soft copy to NMET.
G	**Peer review Charges**		**As per EC**			**30,000**	
H	**Preparation of Exploration Proposal**	**5 Hard copies with a soft copy**	**5.1**	2% of the Cost or Rs. 5.0 Lakhs whichever is lower		**3,11,460**	EA has to submit the final proposal along with Maps and Plan as suggested by the TCC-NMET in its meeting while clearing the proposal.
I	**Total Estimated Cost without GST**					**1,66,64,478**	
J	**Provision for GST (18% of I)**					**29,99,606.10**	GST will be reimburse as per actual and as per notified prescribed rate
K	**Total Estimated Cost with GST**					**1,96,64,084.46**	
					or Say Rs. In Lakhs	**196.64**	
Note:							
1	If any part of the project is outsourced, the amount will be reimbursed as per the Paragraph 3 of NMET SoC and Item no. 6 of NMET SoC. In case of execusion of the project by NEA on its own, a						