

**PROPOSAL FOR PRELIMINARY EXPLORATION (G-3 STAGE)
FOR DIAMOND IN ANGIRA-B BLOCK (4.05 SQ.KM AREA), DISTRICT- CHATTARPUR,
MADHYA PRADESH
(Part of the Toposheet No. 54P/07)**

COMMODITY: DIAMOND

BY

**MINERAL EXPLORATION AND CONSULTANCY LIMITED
DR. BABASAHAB AMBEDKAR BHAWAN
SEMINARY HILLS
NAGPUR (MH)**

PLACE: NAGPUR

DATE: 19 May 2023

Summary of the Block for Preliminary Exploration (G-3 Stage)
GENERAL INFORMATION ABOUT THE BLOCK

S. No	Features	Details
1	Block ID	Angira-B Block
2	Exploration Agency	Mineral Exploration and consultancy Limited (MECL)
3	Commodity	Diamond
4	Mineral Belt	
5	Completion period with entire Time schedule to complete the project	24 Months
6	Objectives	Based on the evaluation of available geological data and reported known occurrences of diamond bearing ultramafic's (kimberlite/lamproite-Kimberlite Clan Rocks) in the Angira-B Block area, the present exploration program has been formulated in phase wise to fulfil the following objectives. Phase-I 1. To carry out geological and structural mapping on 1:2,000 scale for demarcation of Ultramafic rocks with structural features to identify the surface manifestations and lateral disposition of in 4.05 sq. km area. 2. Integrated Ground Gravity and Magnetic Survey will be carried out in a grid pattern of 25m x 25m for Gravity & Magnetic (station spacing 25m & Traverse spacing 25m), followed by Time Domain Electromagnetic Survey to achieve the target objectives. The Time Domain Electromagnetic survey is planned in 25m x 50m (Station 25m, Traverse 50m) grid pattern. Traverses are planned in North South direction. 3. To create geological model based on geophysical and geological mapping data to plan and execute exploratory boreholes in second phase. 4. To collect surface (soil/ bedrock) samples of 500 nos, to test the targets generated by Geological mapping and Geophysical targets in 50m x 50m grid/cross line pattern. The samples will be analyzed for 34 element ICP-MS analysis; few samples would be analyzed for heavy mineral separation for identification of KIMs and diamonds Phase-II 1. Exploratory Pitting/trenching of 400 cubic meters in probable zone will be carried out after evaluation of geological mapping, geophysical survey, and geochemical soil sampling analytical results, if required. Tranches will generate about 1500 tonnes of sample which will generate about 150 nos of samples. The samples will be analyzed mainly for diamond size and shape distribution in the body and for 34 element ICP- MS analysis

S. No	Features	Details									
		and few samples would be analysed for heavy mineral separation for identification of KIMs and diamonds 2. Based on, positive outcome of surface geochemical samples and geophysical survey, a total of 20 no. of boreholes (involving about 5000m core drilling) would be carried out, which will generate about 500 nos. of drill core samples. The drill core samples will be analyzed for diamond shape and size distribution in the body and samples will be analyzed for 34 element ICP-MS analysis and few samples would be analyzed for heavy mineral separation for identification of KIMs and diamonds 3. To estimate the volume of KCR along with associated minerals/elements as per UNFC norms and Minerals (Evidence of Mineral Contents) Rules- 2015 at G-3 level. 4. To decide the future course of exploration (under G-2 level) based on the results of above exploration work. Note:- i) Drill hole plan will be finalised after the Geophysical modelling and Geochemical analysis. ii) Although the previous agency Rio Tinto drilled 07 boreholes in this area as per reports received from IBM, office Nagpur and DMG, M.P. but in the reports only drill hole lithological log along with Collar information available but no sampling and analysis data available related to Angira - B block area.									
7	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	Work will be carried out by the proposed agency (MECL).									
	Number of Geoscientists	Four nos. Geoscientist (2 Field + 2HQ)									
9	Expected Field days (Geology, Geophysics, surveyor)	Geologist Party days: 240 days (Field); 150 days (HQ) Geophysicist Party days: 180 days (Field); 60 days (HQ) Surveyor Party days: 180 days Sampler Party Days: 250 days									
10.	Location										
	Latitude and Longitude	The proposed Angira-B block has an extent of 4.05 sq. km. area, located in Buxwaha Tehsil of Chhatarpur District, Madhya Pradesh.									
		Chhatarpur the administrative capital of the district is located 110km north from the proposed block. The Angira block is located about 300km North-East from state Capital Bhopal. The nearest town is Sagar which is 90km South-West from the block									
		<table><tr><td rowspan="2">Points</td><td colspan="2">GCS-WGS-1984 (DMS)</td><td colspan="2">UTM (Zone:44) (meters)</td></tr><tr><td>Latitude (N)</td><td>Longitude (E)</td><td>Northing</td><td>Easting</td></tr></table>	Points	GCS-WGS-1984 (DMS)		UTM (Zone:44) (meters)		Latitude (N)	Longitude (E)	Northing	Easting
Points	GCS-WGS-1984 (DMS)			UTM (Zone:44) (meters)							
	Latitude (N)	Longitude (E)	Northing	Easting							

S. No	Features	Details				
		A	24° 20' 4.981 "	79° 16'56.818"	2692361.64	325743.5385
		B	24° 19'51.829"	79° 17'17.176"	2691949.949	326312.4054
		C	24° 19' 1.998"	79° 17'24.495"	2691952.61	326518.7828
		D	24° 19'51.523"	79° 17'28.162"	2691936.725	326621.9709
		E	24° 19'50.185"	79° 17'31.559"	2691894.385	326717.222
		F	24° 19'47.718"	79° 17' 3.939"	2691817.667	326783.3792
		G	24° 19'43.108"	79° 17'37.004"	2691674.782	326868.0376
		H	24° 19' 39.108"	79° 17'40.718"	2691550.441	326971.2232
		I	24° 19' 24.109"	79° 18' 4.343"	2691080.857	327631.5601
		J	24° 19' 29.274"	79° 18' 8.838"	2691238.206	327760.215
		K	24° 20' 3.972"	79° 18'26.876"	2692299.462	328281.7001
		L	24° 20' 37.11 "	79° 18'20.534"	2693321.103	328115.3611
		M	24° 20' 45.297"	79° 18'11.827"	2693575.963	327873.0234
		N	24° 20' 48.832"	79° 18' 3.744"	2693687.499	327646.5315
		O	24° 20' 49.872"	79° 17' 2.698"	2693723.305	327335.5914
		P	24° 20' 45.609"	79° 17'33.465"	2693598.807	326791.8967
		Q	24° 20' 47.376"	79° 17'22.159"	2693657.087	326473.9018
		R	24° 20' 44.699"	79°17' 18.338"	2693576.057	326365.1913
		S	24° 20' 31.678"	79°17' 21.067"	2693174.527	326437.1778
		T	24° 20' 23.387"	79°17' 20.729"	2692919.577	326424.5105
		U	24° 20' 19.124"	79°17'18.442	2692789.223	326358.4321
		V	24° 20' 18.787"	79°17' 13.582"	2692780.542	326221.3154
		W	24° 20'16.941 "	79°17' 8.28"	2692725.594	326071.1669
	Toposheet	The area falls in toposheet No. 54P/07				
	Villages	Sagoria, Majora, Dardania, Jagara				
	Tehsil/Taluk	Buxwaha				
	District	Chattarpur				
	State	Madhya Pradesh				
11.	Area (hectares/ square kilometres)					
	Block Area	4.05sq.km				
	Forest Area	The proposed block area comes under Bakswaho Protected Forest.				
	Government Land Area (Bilanam)	Data not available				
	Charagaha	Data not available				
	Private Land Area	Data not available				
12.	Accessibility					
	Nearest Rail Head	The nearby railway station is Damoh (65 km) and Patharia (70 km).				
	Road	The national highway NH-34 passes through west of the block. The block is well connected with state capital Bhopal through national highway NH-146.				
	Airport	The nearest airport is Khajuraho Airport and located around 140 km north of the proposed block. Another Airport is Jabalpur Airport also				

S. No	Features	Details
		known as Dumna Airport The airport is located 180 km south of the proposed block.
13.	Hydrography	
	Local Surface Drainage Pattern (Channels) Rivers/ Streams	The major rivers flowing in the area are Kalidahar and Ken Rivers and their tributaries. The creeks and rivers frequently overflow during the monsoon period, most of the rivers and tributaries drain towards north.
14.	Climate	
	Mean Annual Rainfall	The average rainfall in the area is 900 to 1200 mm/ annum between June to September.
	Temperatures (January) (Minimum) Temperatures (May) (Maximum)	The climate in the proposed area is semi-arid/ monsoonal. The temperate frequently exceeds 45°C during the summer months between April and July. Temperate climate prevails during rest of the year; the temperature varies between 5°C to 35°C.
15.	Topography	
	Toposheet Number	54-P/07
	Morphology of the area	The mean elevation of the area is 455m above the mean sea level and range between 435 to 465m above msl. For most of the part of the proposed block the topography is gentle and flat with most of the topography is accommodated in moderately steep escarpments.
16.	Availability of baseline geoscience data	
	Geological Map (1:50K/25K)	Geological Map (1:50,000 scale) from Bhukosh
	Geochemical Map	Not available.
	Geophysical Data (Aeromagnetic, ground geophysical, Regional as well as local scale GP maps)	Maps Available: • Bunder Prospect Ground Magnetics Survey reduced to Pole Image, ACC Rio Tinto Exploration Limited, 2005. • Bunder Prospect Detailed Ground Magnetics Survey reduced to Pole Image, ACC Rio Tinto Exploration Limited, 2011 • Bunder Prospect Min-Max Electromagnetic Survey 1760 Hz Quadrature Response, ACC Rio Tinto Exploration Limited, 2011 Note: The above data is not available in digital format with DMG, M.P. and IBM, Nagpur.
17.	Justification for taking up Preliminary Exploration	1. The garnets from proposed area analysed by ARTEPL were mostly Iherzolitic pyropes and a few of the garnets were harzburgitic pyropes which were recovered from selected catchments. Pyrope garnet from diamondiferous harzburgite typically is chromium-rich, depleted in calcium and plots within the harzburgite (H) field. The KIMs harzburgitic pyrope garnets are also similar in composition to pyropes found as inclusions in diamonds, which equilibrated at the same temperatures and pressures as the diamond during its formation and growth. Hence harzburgitic composition pyropes recovered from kimberlite concentrate indicate a potential for diamonds from a peridotitic source. The greater the number of

S. No	Features	Details								
		pyrope grains with harzburgitic compositions, the greater the peridotitic diamond potential, particularly if the harzburgitic pyrope population has very subcalcic pyropes (<2.5% CaO). The pyropes recovered from gravel samples within the Bunder Prospect suggested a kimberlitic origin and it was inferred that a diamondiferous source exist within the area. 2. Chromites analyzed by Rio Tinto from the proposed area had shown a wide range of compositions, where a lot of chromites plot within the mantle stability trend and some chromites plot in the diamond stability field. The chromites which plot within the diamond stability field, crystallized at the same temperatures and pressures as diamond. Xenocrystic chromite of similar diamond inclusion compositions were present in the gravel samples which suggested that the source kimberlite tapped chromite bearing mantle material (Iherzolite and/or harzburgite) from within the diamond stability field. Thus, from the chromite plots it can be assumed that diamondiferous source is present in and around the Bunder area. 3. Total 8 nos. of kimberlite were identified within the Damoh West RP by ACC Rio Tinto India Exploration Private Limited with the help of combination of various methods like ground geophysics (both magnetics and EM), soil sampling, and prospecting. All the eight kimberlite bodies were found to be intrusive into the host sequence of mid-Proterozoic sediments on the margin of the Bundelkhand craton. Out of the 8 kimberlite bodies identified by Rio Tinto, two major and two minor kimberlite bodies are present within the proposed Angira-B block which are identified as potential diamondiferous kimberlite by ARTE and recommended for further detailed exploration to delineate the geometry of the kimberlites present within the proposed area and locate more kimberlite within the area. 4. The lamproite body which identified by ACC Rio Tinto Private Limited falls 2 km west of the proposed Angira-B Block and it was auctioned under Bunder Mining Lease to Essel Mining, Aditya Birla Group. Reserves estimated in Bunder ML are given below <table><tr><th>Reserve Category</th><th>Quantity (Mt)</th></tr><tr><td>Proved Category (up to 200 mRL) (111)</td><td>36.46</td></tr><tr><td>Probable Category (upto 200 mRL to 100 mRL) (122)</td><td>17.24</td></tr><tr><td>Total Reserve</td><td>53.70</td></tr></table> Out of the total 53.70 million tonnes reserves South Atri consists of 41.56 Million tonnes @0.78 carat/tonne and North Atri consists of	Reserve Category	Quantity (Mt)	Proved Category (up to 200 mRL) (111)	36.46	Probable Category (upto 200 mRL to 100 mRL) (122)	17.24	Total Reserve	53.70
Reserve Category	Quantity (Mt)									
Proved Category (up to 200 mRL) (111)	36.46									
Probable Category (upto 200 mRL to 100 mRL) (122)	17.24									
Total Reserve	53.70									

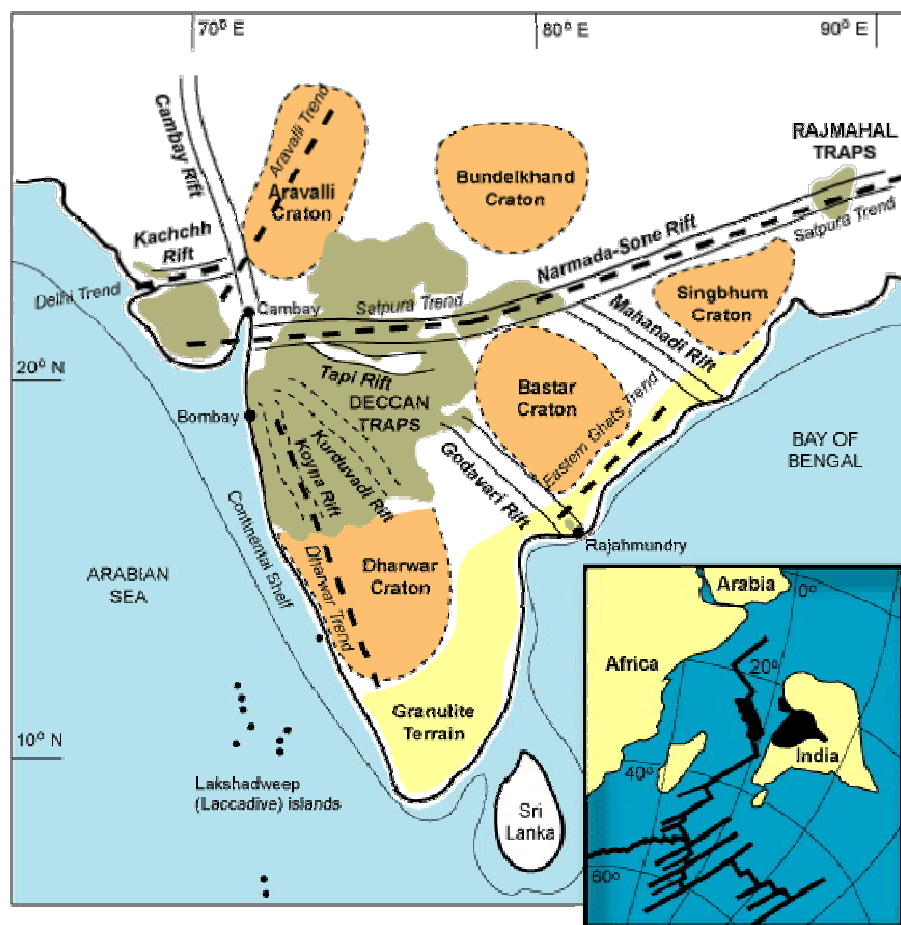
S. No	Features	Details
		12.14 Million tonnes @ 0.13 carat/tonne.

**PROPOSAL FOR PRELIMINARY EXPLORATION (G-3 STAGE)
FOR DIAMOND IN ANGIRA-B BLOCK (4.05 SQ.KM AREA), DISTRICT-
CHATTARPUR, MADHYA PRADESH
(Part of the Toposheet No. 54P/07)**

1.0.0 Preamble

- 1.0.1 Diamond being one of the highly priced gem have lured the mankind since time immemorial. With the development of the nation at economic front, now the general population has also risen to the affordability of Diamond jewellery. Due to the affordability the demand of diamonds got increased drastically. India though is a centre for Diamond cutting industry but majority of rough diamond are being imported. The increasing demand of Diamonds has been accorded high priority in the XIIth Plan document.
- 1.0.2 India has the distinction of producing many of the historically famous diamonds like the Kohinoor (186 ct), the Great Moghul (787 ct), the Hope (67ct), Nizam (440ct), Pitt/Regent (410 ct), Orloff (300 ct) and Daryainoor (185 ct). Till the discovery of the Brazilian diamond fields, India was leading in diamond mining.
- 1.0.3 Since last century, no large diamond deposits have been discovered in India except recent discovery of “Bunder - Atri” by Rio-Tinto Exploration (RTE) in Bakshwaha Tehsil, Chhattarpur District of Madhya Pradesh State. However, the possibility of working of small mineral bodies in proximity to each other, through technological advances and increased operational efficiency, cannot be ruled out. Therefore, it is necessary to locate and explore such small sized deposits in clusters. The present proposed block falls adjacent to the Bunder-Atri as given above.
- 1.0.4 As per the NMI data, based on UNFC system as on 1.4.2015, all India reserves/resources of diamond have been placed at 31.83 million carats. Out of these, 0.95 million carats are placed under Reserves category and 30.87 million carats under Remaining Resources category. By grades, about 2.37% resources are of Gem variety, 2.64% of Industrial variety and bulk of the resources (95%) are placed under Unclassified category. State wise, Madhya Pradesh accounts for about 90.18% resources followed by Andhra Pradesh 5.72% and Chhattisgarh 4.09%.

- 1.0.5 Diamond occurrences are reported since prehistoric times in the country. Presently, diamondfields of India are grouped into four regions: i.e., 1) South Indian tract of Andhra Pradesh, comprising parts of Anantapur, Kadapa, Guntur, Krishna, Mahbubnagar and Kurnool districts; 2) Central Indian tract of Madhya Pradesh, comprising Panna belt; 3) Behradin-Kodawali area in Raipur district and Tokapal, Dugapal, etc. areas in Bastar district of Chhattisgarh; and 4) Eastern Indian tract mostly of Odisha, lying between Mahanadi and Godavarivalleys.
- 1.0.6 The concept-oriented modelling and global strategy by Clifford (1966) reveals that the occurrence of diamondiferous kimberlites are restricted in the rigid cratonic nuclei of respectable antiquity (± 2000 my). In Bastar Craton there has been no major thermal activity after 2200 my. Hence, the Proterozoic platformal belts over the stable cratonic area have been selected for exploration of kimberlite.



Source: www.mantleplumes.org

1.1.0 Global scenario :

1.1.1 World production of diamond is reported mainly from Russia, Canada, Botswana, South Africa, Angola, DR Congo, Ghana, Namibia, Ivory Coast, Brazil and Guinea. The global diamond mining industry is largely dominated by a hand-full of companies. The top three companies – Alrosa from Russia, De Beers from Luxembourg, and British-Australian Rio Tinto – accounts for more than 60 percent of global diamond mine production.

1.1.2 Mined diamonds are mostly processed in and sold via the major global diamond centres: Antwerp, Dubai, New York, Hong Kong, Mumbai, and Tel-Aviv. In contrast to precious gems, there is no universal market price per carat of diamonds. Nevertheless, global diamond prices have increased more than tenfold since 1960 to the prices today.

1.2.0 Global demand:

1.2.1 Global diamond market has grown rapidly in recent years. Demand for rough as well as polished diamonds has mainly driven by industries such as automotive and jewellery. Growing global demand for diamond jewellery has a considerable impact on the growth of the global diamond market. The U.S. and China held major shares in the global diamond jewellery market. The U.S. is regarded as the largest diamond jewellery market in the world. Its strong economic condition in the world aided it to hold such a definite position in the global diamond jewellery market. Global consumer demand for diamond jewellery continued to rise in 2018, driven by sustained growth in the US and increased demand in China. Growing middle class population in China derived a substantial growth in Chinese diamond jewellery market. The global diamond market was dominated by certain key players such as Alrosa, De Beers, Dominion Diamonds and Catoca. Strong performance of Alrosa and De Beers has derived a notable growth in the global diamond market.

1.3.0 India's demand:

1.3.1 In April year the imports of rough diamonds to India increased compared to the same period in 2019, as well as to March this year. Compared to March 2021, the rough diamond supplies increased by 21% (to \$1.69 bn). India's polished diamond exports in April year were at a two-year high level of \$2.25 bn, up 37% compared to April 2019.

1.4.0 Employment generation

- 1.4.1 Employment generation is the natural process of social development. Equal employment opportunity is government policy. Population growth is one of the reasons for unemployment. Creating jobs is a keystone of any economic recovery program. The proposed Preliminary Exploration (G-3 Stage) for diamond in Angira-B Block is likely to generate opportunity of temporary employment on contract basis for short period for local peoples of this remote and rural areas of Chhatarpur district, M.P.

1.5.0 Background

- 1.5.1 Gems and Jewellery export sector has been contributing about 13%-15% to India's total merchandise exports during the last five years. As per industry estimates, this sector employs more than 4.64 million employees. With a view to strengthen the Gems & Jewellery Industry in the country, the Government has taken a number of steps, such as, establishment of Special Notified Zone (SNZ); announcement of separate ITC HS Code for lab-grown diamonds; introduction of Gold Monetisation Scheme; amendment of wastage and value addition norms for gems and jewellery items; approved scheme for setting up of Common Facility Centres for Gem and Jewellery Sector; and providing financial assistance for participation in international fairs, organising buyer-seller meets etc. under Market Development Assistance (MDA) and Market Access Initiative (MAI) Schemes of the Department of Commerce. Findings of new deposits of diamond may boost the Indian Gems & Jewellery sector in near future.
- 1.5.2 Exploration for precious stones is given top priority by Govt. of India, after amendment of MMDR act 2015. Keeping this in view, the present proposal is being put up for Preliminary Exploration (G-3 Stage). Consequent upon positive outcome, the exploration programme shall follow G2 route, which may facilitate state government for auctioning of the block.
- 1.5.3 Directorate Geology and Mining (DGM) Madhya Pradesh and MECL had MoU signed for exploration of minerals to convert them into auctionable blocks in the state of Madhya Pradesh. DGM, MP has accorded consent to MECL for taking up of diamond exploration in Angira blocks A & B by Madhya Pradesh vide State Gazette notification No. F-19-2-2022-Barah-1-Khanij, dated 22nd Feb 2022.

MECL intends to take up the exploration through NMET funding hence this proposal is presented in the 52nd TCC.

2.0.0 Location and Accessibility

2.0.1 The proposed Angira-B block has an extent of 4.05 sq.km. areawhich is located in Buxwaha Tehsil of Chhatarpur District, Madhya Pradesh. Chhatarpur the administrative capital of the district which is located 175 km south of the proposed block. The block is located about 300 km north east from the state capital Bhopal. The nearest town Sagar is 90 km south west from the block. The national highway NH-34 passes through west of the block. The block is well connected with state capital Bhopal through National highway NH-146.

2.02 The nearest railway station is Damoh (65 km) and Patharia(70km). The area falls in toposheet No. 54P/07. The nearest airport is Jabalpur Airport also known as Dumna Airport. The airport is located 180 km south of the proposed block.

2.1.0 Block description

2.1.1 The Angira-B Blocks fall in Survey of India Toposheet No. 54-P/07, comprising 4.05 sq.km area, in and around Sagoria village, Buxwaha Tehsil of Chattarpur district, Madhya Pradesh. The block location on toposheet is given as **PLATE-I**. The Co-ordinates of the corner points of the block area both geodetic and UTM are given in **Table No.-2.1**.

Table-2.1
Co-ordinates of the Corner points of the proposed
Angira-B Block (4.05 sq. Km.)

Sl. No.	Points	GCS-WGS-1984 (DMS)		UTM (Zone:44)(meters)	
		Latitude	Longitude	Northing	Easting
1	A	24° 20' 4.981"N	79° 16' 56.818"E	2692361.64	325743.5385
2	B	24° 19' 51.829"N	79° 17' 17.176"E	2691949.949	326312.4054
3	C	24° 19' 51.998"N	79° 17' 24.495"E	2691952.61	326518.7828
4	D	24° 19' 51.523"N	79° 17' 28.162"E	2691936.725	326621.9709
5	E	24° 19' 50.185"N	79° 17' 31.559"E	2691894.385	326717.222
6	F	24° 19' 47.718"N	79° 17' 33.939"E	2691817.667	326783.3792
7	G	24° 19' 43.108"N	79° 17' 37.004"E	2691674.782	326868.0376
8	H	24° 19' 39.108"N	79° 17' 40.718"E	2691550.441	326971.2232
9	I	24° 19' 24.109"N	79° 18' 4.343"E	2691080.857	327631.5601
10	J	24° 19' 29.274"N	79° 18' 8.838"E	2691238.206	327760.215
11	K	24° 20' 3.972"N	79° 18' 26.876"E	2692299.462	328281.7001
12	L	24° 20' 37.11"N	79° 18' 20.534"E	2693321.103	328115.3611
13	M	24° 20' 45.297"N	79° 18' 11.827"E	2693575.963	327873.0234

Sl. No.	Points	GCS-WGS-1984 (DMS)		UTM (Zone:44)(meters)	
		Latitude	Longitude	Northing	Easting
14	N	24° 20' 48.832"N	79° 18' 3.744"E	2693687.499	327646.5315
15	O	24° 20' 49.872"N	79° 17' 52.698"E	2693723.305	327335.5914
16	P	24° 20' 45.609"N	79° 17' 33.465"E	2693598.807	326791.8967
17	Q	24° 20' 47.376"N	79° 17' 22.159"E	2693657.087	326473.9018
18	R	24° 20' 44.699"N	79° 17' 18.338"E	2693576.057	326365.1913
19	S	24° 20' 31.678"N	79° 17' 21.067"E	2693174.527	326437.1778
20	T	24° 20' 23.387"N	79° 17' 20.729"E	2692919.577	326424.5105
21	U	24° 20' 19.124"N	79° 17' 18.442"E	2692789.223	326358.4321
22	V	24° 20' 18.787"N	79° 17' 13.582"E	2692780.542	326221.3154
23	W	24° 20' 16.941"N	79° 17' 8.28"E	2692725.594	326071.1669

2.2.0 Physiography

2.2.1 The mean elevation of the is 455 m above mean sea level and ranges between 435 m to 465 m above msl. For the most part of the proposed block the topography is gentle and flat with most of the topography accommodated in moderately steep escarpments.

2.3.0 Drainage

2.3.1 The major rivers flowing in the area are Kalidahar and Ken Rivers and their tributaries. The creeks and rivers frequently overflow during the monsoon period, most of the rivers and tributaries in this region drain towards north.

2.4.0 Climate

2.4.1 The climate in the proposed area is semi-arid/ monsoonal. The temperate frequently exceeds 45°C during the summer months between April and July. Temperate climate prevails during rest of the year; the temperature varies between 5°C to 35°C. The average rainfall in the area is 900 to 1200mm/ annum between June to September.

3.0.0 Regional Geology

3.0.1 The regional geology of the area consists of a variety of rock formations consisting of metasedimentaries, meta-volcanics and Bundelkhand granitoids of the Archaeans, sedimentary rocks formations of the Bijawars and Vindhya and Deccan Trap Flows with infra and intertrappean beds. The stratigraphic sequence of the rock formations as per GSI (1974) is given below in **Table No. 3.1**

Table No. 3.1
Regional Lithostratigraphy of the Proposed Area (After GSI):

Supergroup	Group	Formation	Member
		Basic Flows	
Deccan Trap		9 flows with 4 intertrappean beds	
Unconformity			
Lemetas (?)		Bakshwaha Formation	
Unconformity			
	Bhander	Nagode Limestone	
Vindhyan	Rewa	Gahadra Sandstone	
		Jhiri Shale	
	Kaimur	Baghain Sandstone	Bila Sandstone
			Sanodha Shale
			Dulchipur Conglomerate
	Semri	Pandwa Fall Sandstone	
Uncertain boundary but gradational and without break in the area			
	Bijawar	Silot Ferruginous Formation	
		Baraitha Conglomerate	
Unconformity			
	Archaean	Banded hematite quartzite, fuchsite quartzite, muscovite schist, quartz-biotite schist, granitoids, metadiorites and epidiorite dyke.	

3.1.0 Geology of the Block

3.1.1 The geology of the area is defined by lithologies of the Bundelkhand craton and overlying Proterozoic Sedimentary basins. The Oldest rock types include granitoid gneiss with enclaves of dolerite, gabbro, amphibolite and quartz reefs - all of which have been grouped as the 2500 Ma Bundelkhand Craton. Meta-volcanic sedimentary rocks of Paleo Proterozoic Bijawar Basin consist of an unstable rift assemblage of clastics, chert, dolomite units, basaltic flows and sills. The Bijawar group of rocks is overlain by Meso to Neo Proterozoic platformal sediments of Vindhyan Supergroup. In the west, continental flood basalt (Deccan Traps) of Palaeocene age cover the craton and sedimentary rocks of Bijawar and Vindhyan Supergroups. The proposed block is located within the Meso-Proterozoic Kaimur group platformal sediments extending into the Palaeo Proterozoic Bijawar group metasediments to the north.

4.0.0 Previous Work / Background information

4.1.0 Observation and Recommendations of previous work

4.1.1 As per the Fifth Biannual Progress Report submitted on Exploration Activities within Damoh West submitted by ACC- Rio Tinto Exploration Limited (ARTE) on 2005 for (RP No. 368/F.No. /MINING/RP-1/2002) Reconnaissance Permit, M.P., the RP area comprised of 2450 sq. Km. area covering Chhatarpur, Sagar, Damoh and Tikamgarh Districts. In July 2004, 1450 sq. Km. of the original RP was relinquished therefore 1000 sq. km. of the original RP area was in possession of ARTE. A total of 290 heavy mineral gravel samples were collected from selected trap sites within the retained RP area. Observation and probe results from these samples had shown restricted dispersion and isolated catchments shedding kimberlite indicator minerals (KIMs). This area has been termed as the Bunder Prospect. Scanning Electron Microprobe (SEM) studies of major element mineral geochemistry of the KIM samples were conducted.

- Within the Bunder Prospect area several Iherzolitic and a few harzburgitic pyropes were recovered from selected catchments. The harzburgitic composition pyropes recovered from kimberlite concentrate indicate a potential for diamonds from a peridotitic source. The distribution of pyropes recovered from gravel samples within the Bunder Prospect suggests that a kimberlitic and likely diamondiferous source (s) exists within this area.
- Chromites from the Bunder Prospect suggest that they have compositions that have crystallized at the same temperatures and pressures as diamond. The presence of xenocrystic chromite of similar diamond inclusion compositions in these gravel samples suggests the source kimberlite tapped chromite bearing mantle material (Iherzolite and/or harzburgite) from within the diamond stability field. These catchments were marked for further follow up ground geophysics, soil sampling and prospecting.
- A total of 112 stream sediment samples sieved at -80# have been collected at each of the indicator mineral (gravel) sample sites.
- A total of 1095 line km of ground magnetics surveys and 52 line km of horizontal loop (Max-Min) electromagnetics surveys were completed over eight grids within the RP area, mostly within the Bunder Prospect. More than 75 geophysical targets were identified.

- A total 2,285 nos of Soil samples at -80# were collected within anomalous catchments identified from KIMs sample result and geophysical survey. The results highlighted discrete soil geochemical targets enriched in key pathfinder trace elements for kimberlite (eg: Nb, Zr, La, Ce). These elements are relatively immobile, and indicate a close proximity to source in this residually weathered environment.
- Based on exploration data, total 8 no of kimberlites were identified within the Damoh West RP which were all found to be intrusive into the host sequence of mid-Proterozoic sediments on the margin of the Bundelkhand craton.

4.1.2 Out of 8 no of Kimberlites identified during RP work, Rio Tinto Exploration India Private Limited (RTEIPL) carried out detailed exploration comprising drilling for grade delineation, target testing, geotechnical studies, ground sterilization and bulk sampling in 25sq.km under Bunder Prospecting License (25 sq.km) Drilling of about 13142.92 meters was carried out in 56 (NQ/HQ) boreholes which include the 6 test drillholes drilled in 2005 under RP to know the geometry of the kimberlites. A hybrid drilling method of Large Diameter Core Drilling (LDC) and PQ drilling was carried out to know the grade and size/frequency distribution of diamonds in kimberlite bodies, of which LDC was 5205 meters in 26 boreholes upto a depth of 25 meter from surface and PQ was 3608.5 meters in 12 boreholes. Total 11 shallow trenches of (20mX20m) of 5 m depth were tested for 61 bulk samples which yielded 1876.43 carats of diamond in total. Total reserves estimated in the PL area upto 100 Mrl are 53.70 Mt, which are classified as Proved Category (111) upto 200 mRL having 36.46 Mt and Probable Category (122) from 200 mRL to 100 Mrl 17.24 Mt. Of the total 53.70 Mt reserve South Atri consists of 41.56 Mt @ 0.78 ct/t and North Atri consists of 12.14 Mt @ 0.13 ct/t.

4.1.3 MECL received ARTPL exploration reports from Indian Bureau of Mines (IBM) Nagpur in the month of May 2023. MECL studied the reports in detail and found that

1. Drill hole collar data pertaining to kimberlite bodies coming in Angira block i.e., B-08, B-38, B-68 and B-48 are available
2. Lithology of borehole holes are available.

3. There is no data on sampling and analytical results of kimberlite/lamproite body intersected in boreholes drilled pertaining to Angira block.

4. Geophysical data is in PDF format, not in digital form, PDF maps would act like guide, however MECL need to carryout geophysical survey for carrying out exploration and drilling with down hole geophysics.

4.2.0 Objectives of Proposed Exploration

4.2.1 Based on the evaluation of available geological data and reported known occurrence of KIMs in the Angira-B Block, the present exploration program has been formulated in phase wise to fulfil the following objectives.

Phase-I

1. To carry out geological and structural mapping on 1:2,000 scale for demarcation of Ultramafic rocks with structural features to identify the surface manifestations and lateral disposition of in 4.05 sq. km area.
2. Integrated Ground Gravity and Magnetic Survey will be carried out in a grid pattern of 25m x 25m for Gravity & Magnetic (station spacing 25m & Traverse spacing 25m), followed by Time Domain Electromagnetic Survey to achieve the target objectives. The Time Domain Electromagnetic survey is planned in 25m x 50m (Station 25m, Traverse 50m) grid pattern. Traverses are planned in North South direction.
3. To create geological model based on geophysical and geological mapping data to plan and execute exploratory boreholes in second phase.
4. To collect surface (soil/ bedrock) samples of 500 nos, to test the targets generated by Geological mapping and Geophysical targets in 50m x 50m grid/cross line pattern. The samples will be analyzed for 34 element ICP-MS analysis; few samples would be analyzed for heavy mineral separation for identification of KIMs and diamonds

Phase-II

1. Exploratory Pitting/trenching of 400 cubic meters in probable zone will be carried out after evaluation of geological mapping, geophysical survey, and geochemical soil sampling analytical results, if required. Tranches will generate about 1500 tonnes of sample which will generate about 150 nos of samples. The samples will be analyzed mainly for diamond size and shape distribution in the body and for

34 element ICP- MS analysis and few samples would be analysed for heavy mineral separation for identification of KIMs and diamonds

Note: Samples will be analysed at outsourced agency in India or overseas.

2. Based on, positive outcome of surface geochemical samples and geophysical survey, a total of 20 no. of boreholes (involving about 5000m core drilling) would be carried out, which will generate about 500 nos. of drill core samples. 10cm of every meter of core will be used for other study like Sp. Gravity and moisture analysis and after that those 10cm samples will be composited for every 10m and will be sent for caustic fusion to recover the diamonds and determine the diamond size frequency distribution in the body. Rest of drill core samples will be analyzed for macro-diamonds along with diamond characterisation for macros if recovered and 34 element ICP-MS analysis and few samples would be analyzed for heavy mineral in separation for identification of KIMs and diamonds.

Note: - Samples will be analysed in outsource agency in India, if available or overseas.

3. Downhole geophysical Survey for boreholes drilled would be carried out which will be comprising of High-Resolution Acoustic Televiewer, Magnetic Susceptibility, Induction probe, Density, Spectral Gamma, Calliper can be used for the well logging.
4. To estimate the volume of KCR along with associated minerals/ elements as per UNFC norms and Minerals (Evidence of Mineral Contents) Rules- 2015 at G-3 level.
5. To decide the future course of exploration (under G-2 level) based on the results of above exploration work.

Note: -

- iii) Drill hole plan will be finalised after the Geophysical modelling and Geochemical analysis.

Although the previous agency Rio Tinto drilled 07 boreholes in this area as per reports received from IBM, office Nagpur and DMG, M.P. but in the reports only drill hole lithological log along with Collar information available but no sampling and analysis data available related to Angira - B block area.

5.0.0 Planned Methodology

- 5.1.0 In accordance to the objective set for the block, the exploration programme is proposed in phase wise manner. The Exploration shall be carried out as per

Minerals (Evidence of Mineral Contents) Rules-2015 amended upto 2021. Accordingly, the following Preliminary Exploration (G-3 Stage)scheme has been formulated, which comprises of Geological Mapping (1:2,000 scale), Integrated Geophysical Survey (Ground Gravity, Magnetic Survey, Time Domain Electromagnetic Survey) in the entire area. About 100 nos. of surface sampling (Soil Sample/bedrock)will be collected out during the initial stag of geological mapping and geophysical survey. A provision of exploratory pitting/trenching of about 400 cubic meters is kept in ultramafic zones with geochemical analysis. On the basis of positive outcomes of geological mapping, geophysical survey and sampling results 5000 m of exploratory drilling in 20 nos. of boreholes shall be drilled in the extended G-3 stage would be helpful to achieve the objectives.

5.2.0 Phase wise exploration activities

5.2.1 Geological Mapping

Initially Geological Mapping will be done in the entire 4.05 sq.km area on 1:2,000 scale Rock types, their contact, structural features will be mapped. Surface manifestations of the kimberlites available along with their disposition will be marked on the map.

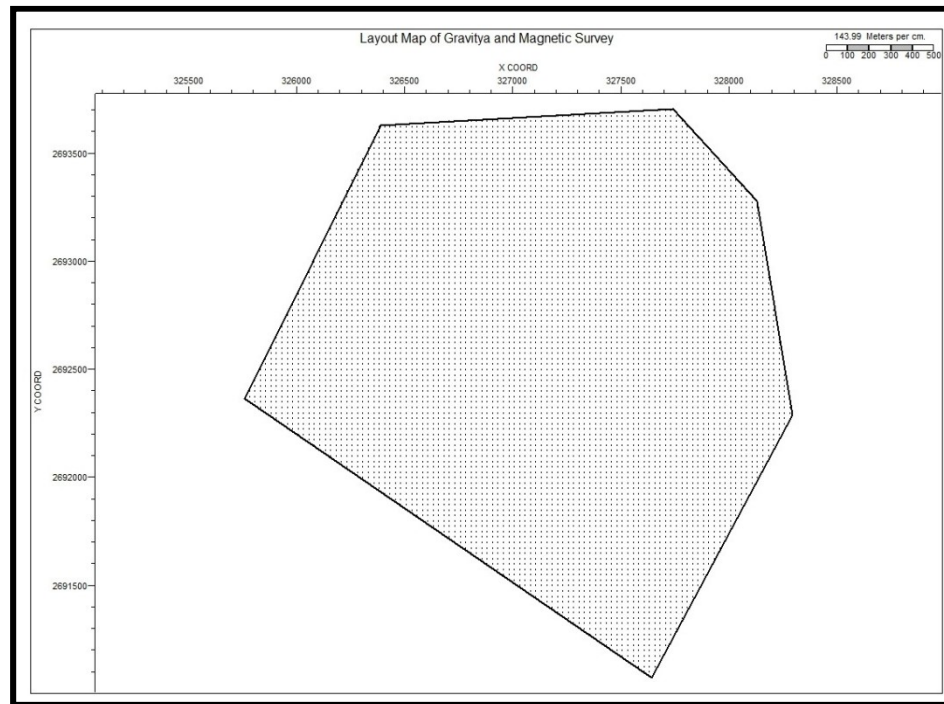
5.2.2 Ground Geophysical Survey

Integrated Ground Gravity and Magnetic survey will be carried out in a grid pattern of 25m x 25m for Gravity & Magnetic (station spacing 25m & Traverse spacing 25m), followed by Time Domain Electromagnetic survey to achieve the target objectives. The Time domain Electromagnetic survey is planned on 25m x 50m (Station 25m, Traverse 50m) grid pattern. Traverses are planned in North South direction.

The details of survey stations were given below in **Table No.5.1**. The geophysical layout diagram is given as **Text Figure No. 5.1**.

Table No.5.1.
Tentative quantum of work

Block	Area	Method	Line Spacing	Station Spacing	No of Stations / LKM
Angira Block -B	~ 4.05 Sq. km.	Electromagnetic (TDEM)	200 m	40	1000
		Gravity & Magnetic	25	25	6925



Text Figure No. 5.1: Layout Map of Gravity and Magnetic survey with 25m x 25m Grid

Initially the Gravity and magnetic survey will be conducted and after the potential area Time Domain Electromagnetic Survey consisting of 1000 stations will be conducted for finding the depth continuity.

5.2.3 Geochemical Sampling

5.2.3.1 Surface sampling (Bed Rock/Stream sediment/Soil Sample):

During Geological Mapping, the bed rock samples (Grab Samples) from the outcrops and soil samples from suitable sites shall be collected. 10 no of bedrock samples would be analysed for Whole rock analysis. A total of 500soil/ bedrock samples will be collected during the field work. The samples will be analysed for 34 element ICP-MS analysis and few samples would be analysed for heavy mineral separation for identification of KIM's.

5.2.4 Three-dimensional geological model based on geophysical and geological mapping data would be prepared to plan and execute exploratory boreholes along with pitting and trenching in second phase of the preliminary exploration programme.

5.3.0 Exploratory Mining (Pitting/Trenching)

5.3.1 Shallow pitting and trenching of 400 cubic meters shall be carried out in the anomalous zones identified based on the results of Geological mapping, geochemical sampling, geophysical survey. Pitting shall be done for correlation of kimberlite pipe on surface up to a maximum depth of 5m. Locations and interval of trenches & pits on ground will be decided by field geologist based on field observations, detailed mapping, Geophysical survey and chemical analysis. The trench /pit wall will be mapped on 1:200 scale. Pitting would generate about 1500 tonnes of sample and about 150 nos. of samples the samples will be analyzed mainly for diamond size and shape distribution in the body and for 34 element ICP- MS analysis and few samples would be analysed for heavy mineral separation for identification of KIMs and diamonds Hand picking of suspected heavy minerals grains would be analysed by EPMA study.

5.3.2 Surveying

The Borehole fixation and determination of reduced level and co-ordinates of the boreholes only will be undertaken by DGPS at the time of extended G-3 level of exploration

5.3.4 Exploratory Large Diameter Drilling (PQ and HQ Size):

Based on Geological Mapping, Geophysical and stream sediment sample results, the potential zones will be marked. To find out the disposition of potential kimberlite zones in strike & dip direction, exploratory boreholes, involving of about 5000m of drilling will be carried out in 20 no of boreholes for intersection of KCR zones (KCR) in extended G-3 stage. The exploratory drilling would generate about 500 no of drill core samples. 10cm of every meter of core will be used for other study like Sp. Gravity and moisture analysis and after that those 10cm samples will be composited for every 10m and will be send for caustic fusion to recover the diamonds and determine the diamond size frequency distribution in the body. Rest of drill core samples will be analyzed for macro-diamonds along with diamond characterisation for macros if recovered and for 34 element ICP-MS analysis and few samples would be analyzed for heavy mineral separation for identification of KIMs with the help of EPMA studies.

5.4.3 Petrological Studies:

5.4.3.1 During the course of Geological Mapping and drilling 25 samples will be studied for petrography.

6.0.0 Nature, Quantum and Target

6.0.1. Details of the particular, Quantum and the targets are tabulated in **Table No.-6.1.**

Table No.: 6.1
Envisaged Quantum of proposed work in Angira-B Block (G3 Exploration),
Chhatarpur District, Madhya Pradesh.

Sl. No.	Item of Work	Unit	Target
1	Geological Mapping (on 1:1,000 Scale)	Sq. km	4.05
	a) Geologist man days (Field)	Days	240
	b) Geologist man days (HQ) (60 days for hand picking of KIMs + 60 days for report writing)	Days	150
	c) Sampling Party Days (Geochemical /Trenching/Pitting/Drilling)	Days	250
2	Geochemical Sampling		
	a) Bed Rock/Soil Sample in 4.05 Sq. Km. Area	Nos.	500
	b) Pit/Trench Sampling	Nos.	150
	c) Core Sampling	Nos.	500
3	Geophysical Survey*		
	a) Gravity and Magnetic Survey (25m line spacing, 25 m station spacing)	No. of Station	6925
	b) Time Domain Electromagnetic Survey in potential zones (25m X 50 m)	No. of Station	1000
	c) High-Resolution Acoustic Televiwer, Magnetic Susceptibility, Induction probe, Density, Spectral Gamma, Calliper can be used for the well logging	m	5000
4	Exploratory Mining*		
	Excavation of pits	Cu. m.	400
5	Core Drilling **		
	a) Drilling, total 20 borehole	m.	5000
7	Laboratory Studies		
	i) Surface Sampling (Bed Rock and Soil) (Primary samples)	Nos.	500
	a) Pit Samples	Nos.	150
	b) Separation of Heavy minerals from bedrock and pit samples	Nos.	150+10=160
	ii) Bed Rock Sample		
	a) Whole rock analysis	Nos.	10
	iii) Core Drilling (Primary) Samples**		
	a) Separation of Heavy minerals from drill samples	Nos	500
	c) EPMA studies for suspected Heavy Mineral grains	Hrs	1000
	iv) 34 elemental pack by ICP-MS (for Soil and Bedrock Samples, pit and borehole)	Nos	500+150+500=1150
8	Petrological Samples (Surface Samples)		
	a) Preparation of Thin Section	Nos	25
	b) Study of Thin Section	Nos	25
9	Report Preparation (5 Hard copies with a soft copy)	Nos.	1

Sl. No.	Item of Work	Unit	Target
10	Preparation of Exploration Proposal (5 Hard copies with a soft copy)	Nos.	1

Note:1) The number of stations for Gravity and Electromagnetic survey will be decide after the finalising of potential zones.

2)The actual number of suspected grains for EPMA will be confirmed after microscopic study.

7.0.0 Manpower Deployment

7.0.1 Manpower deployment List will be provided later.

8.0.0 Break-up of Expenditure

Cost has been estimated based on actual schedule of rates mandated in the circular OM No. 61/1/2018/NMET dated 31stMarch 2020 for NMET funded Projects. The total estimated cost is Rs.2048.95 Lakhs. The summary of cost estimates for Preliminary Exploration (G-3 Stage)is given in **Table No. -8.1**.

Table No-8.1

Summary of Cost Estimates for Preliminary Exploration (G-3 Stage)

Sl. No.	Item	Total Estimated Cost (Rs.)
1	Geological, Sampling & Survey Days	2,447,840
2	Geophysical Surveys*	60,646,940
3	Laboratory Studies	5,319,115
	Sub Total 1 to 3	68,413,895
4	Geological Logging/ pitting/pit mapping	3,466,320
5	Drilling	68,154,500
6	Laboratory Studies	31,095,275
	Sub Total (4 to 6)	102,716,095
7	Exploration Report Preparation	2,000,000
	Proposal Preparation	500,000
8	Peer review charges	10,000
	Sub Total (1 to 8)	173,639,990
9	GST 18%	31,255,198
	Total:	204,895,188
	Say Rs. In Lakh	2,048.95

9.0.0 Time schedule

9.0.1 The proposed exploration programme envisages geological mapping, surface sampling, geophysical survey, trenching, pitting, drilling, sample preparation and laboratory studies, which will be completed within 24 months; geological report preparation with peer review will take 4 months with three months overlapping with lab works. Therefore, a total of 24 months is planned for completion of the entire proposed programme. Tentative Time schedule/action plan for proposed Preliminary Exploration (G-3 Stage) for Diamond is given in **Table No. 9.1.**

Table No. 9.1.

Table- 2: Time schedule (in months) for G-3 Level Exploration for Diamond in Proposed Angira-B Block, District: Chhatarpur, Madhya Pradesh.																													
Sl. No.	Activities	Unit	MONTHS																										
			1	2	3	4	5	6	7	8	REVIEW	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
1	Geologist Party days in field (1 Party)	day																											
2	Geophysics Party Days (1 Party Field)																												
3	Geophysics Party Days (1 Party HQ)																												
4	Survey Party days (1 Party)	day																											
5	Camp Setting	Month																											
6	Camp Winding	Month																											
7	Surface Drilling (3 rig)	m.																											
8	Sampling Party days, Soil/Pit Sample 100 days +Core Sample200days	day																											
9	Laboratory Studies	Nos.																											
10	Geologist Party days in HQ (60 days for hand picking of KIMs + 60 days	day																											
11	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.

10.0 Justification

1. The garnets from Bunder Prospect area analysed by ARTEPL were mostly Iherzolitic pyropes and a few of the garnets were harzburgitic pyropes which were recovered from selected catchments. Pyrope garnet from diamondiferous harzburgite typically is chromium-rich, depleted in calcium and plots within the harzburgite (H) field shown in of **Figure 10.1**. The KIMs harzburgitic pyrope garnets are also similar in composition to pyropes found as inclusions in diamonds, which equilibrated at the same temperatures and pressures as the diamond during its formation and growth. Hence harzburgitic composition pyropes recovered from kimberlite concentrate indicate a potential for diamonds from a peridotitic source. The greater the number of pyrope grains with harzburgitic compositions, the greater the peridotitic diamond potential, particularly if the harzburgitic pyrope population has very subcalcic pyropes (<2.5% CaO). The pyropes recovered from gravel samples within the Bunder Prospect suggested a kimberlitic origin and it was inferred that a diamondiferous source exist within the area.

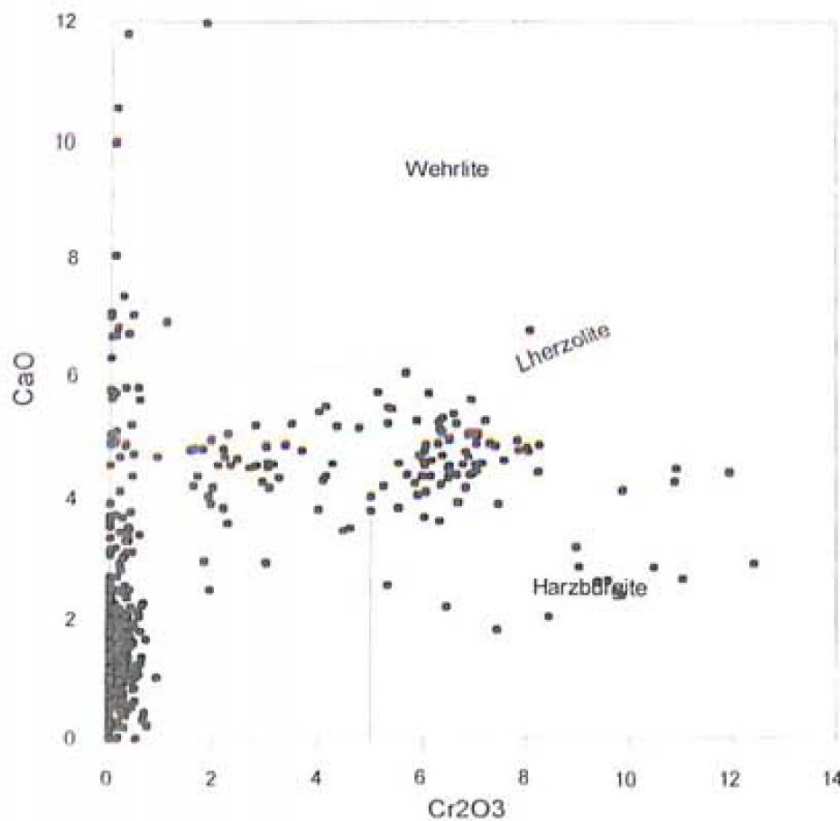


Figure No. 10.1: Garnet: Sobolev Plot, Cr₂O₃ vs. CaO (Sobolev et. al., 1973) plot for all garnets in the Damoh West Block RP, ACC Rio Tinto India Exploration Private Limited, 2005

2. Chromites analysed from Bunder Prospect had shown a wide range of compositions, where a lot of chromites plot within the mantle stability trend and some chromites plot in the diamond stability field. The chromites which plot within the diamond stability field, crystallized at the same temperatures and pressures as diamond. Xenocrystic chromite of similar diamond inclusion compositions was present in the gravel samples which suggested that the source kimberlite tapped chromite bearing mantle material (Iherzolite and/or harzburgite) from within the diamond stability field. Thus from the chromite plots it can be assumed that diamondiferous source is present in and around the Bunder area.

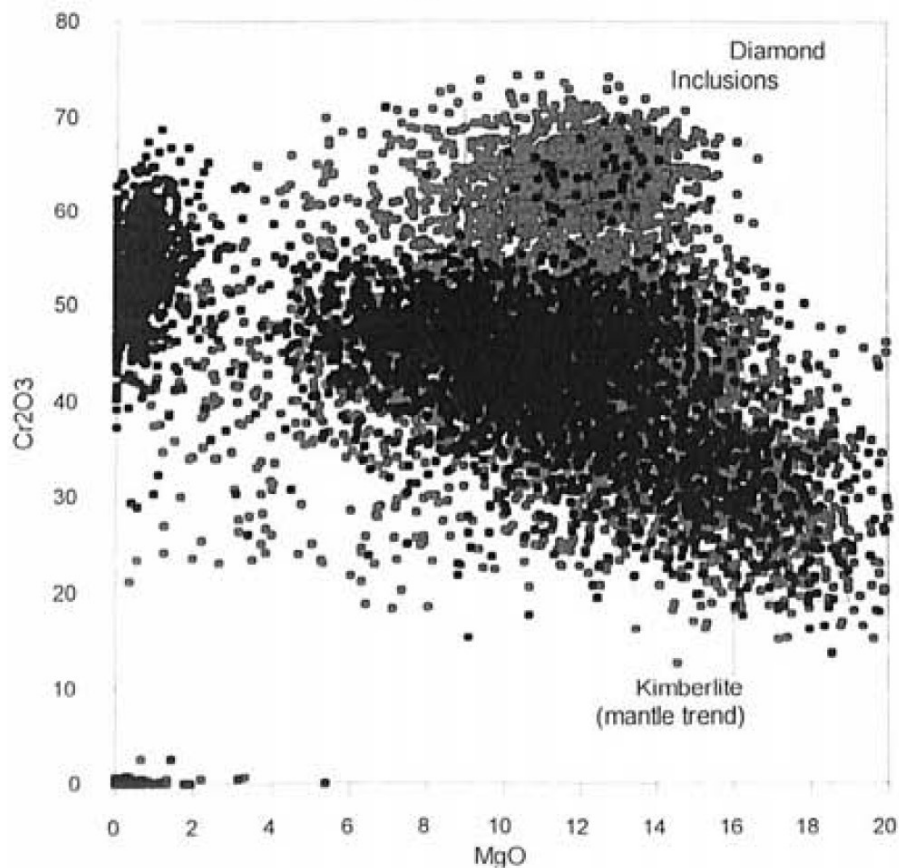


Figure No. 10.2: Chromite: Gurney Plot, MgO vs Cr₂O₃ (Gurney et. al., 1995) plot for Chromites from the Damoh West Block RP, (Grey= Bunder, Black= Outside Bunder), ACC Rio Tinto India Exploration Private Limited, 2005

3. Total 8 nos. of kimberlite were identified within the Damoh West RP by ACC Rio Tinto India Exploration Private Limited with the help of combination of various methods like ground geophysics (both magnetics and EM), soil sampling, and prospecting. All the eight kimberlite bodies were found to be intrusive into the host sequence of mid-Proterozoic sediments on the margin of the Bundelkhand craton. Out of the 8 kimberlite bodies identified by Rio Tinto, two major and two minor kimberlite bodies are present within the proposed Angira-B block. Further exploration detailed exploration is required to delineate the shape of the kimberlites present within the proposed area.

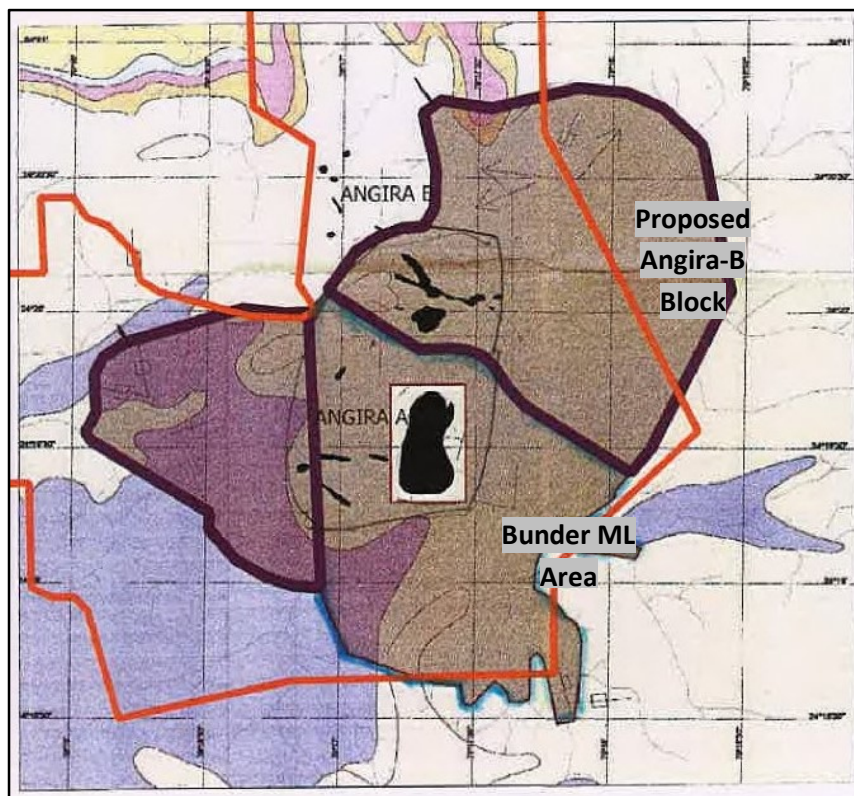


Figure No. 10.3: Lamproite locations as identified and demarcated by ACC Rio Tinto in and around Bunder Mining Lease Area, Chhatarpur, M.P.

4. The lamproite body which identified by ACC Rio Tinto Private Limited falls ? km west of the proposed Angira-B Block and it was auctioned under Bunder Mining Lease to Essel Mining, Aditya Birla Group.

Table No 10.1
Reserve Estimated in Bunder ML.

Reserve Category	Quantity (Mt)
Proved Category (upto 200 mRL) (111)	36.46
Probable Category (upto 200 mRL to 100 mRL) (122)	17.24
Total Reserve	53.70

Out of the total 53.70 Mt reserve South Atri consists of 41.56 Mt @ 0.78 ct/t and North Atri consists of 12.14 Mt @ 0.13 ct/t.

11.0.0 References

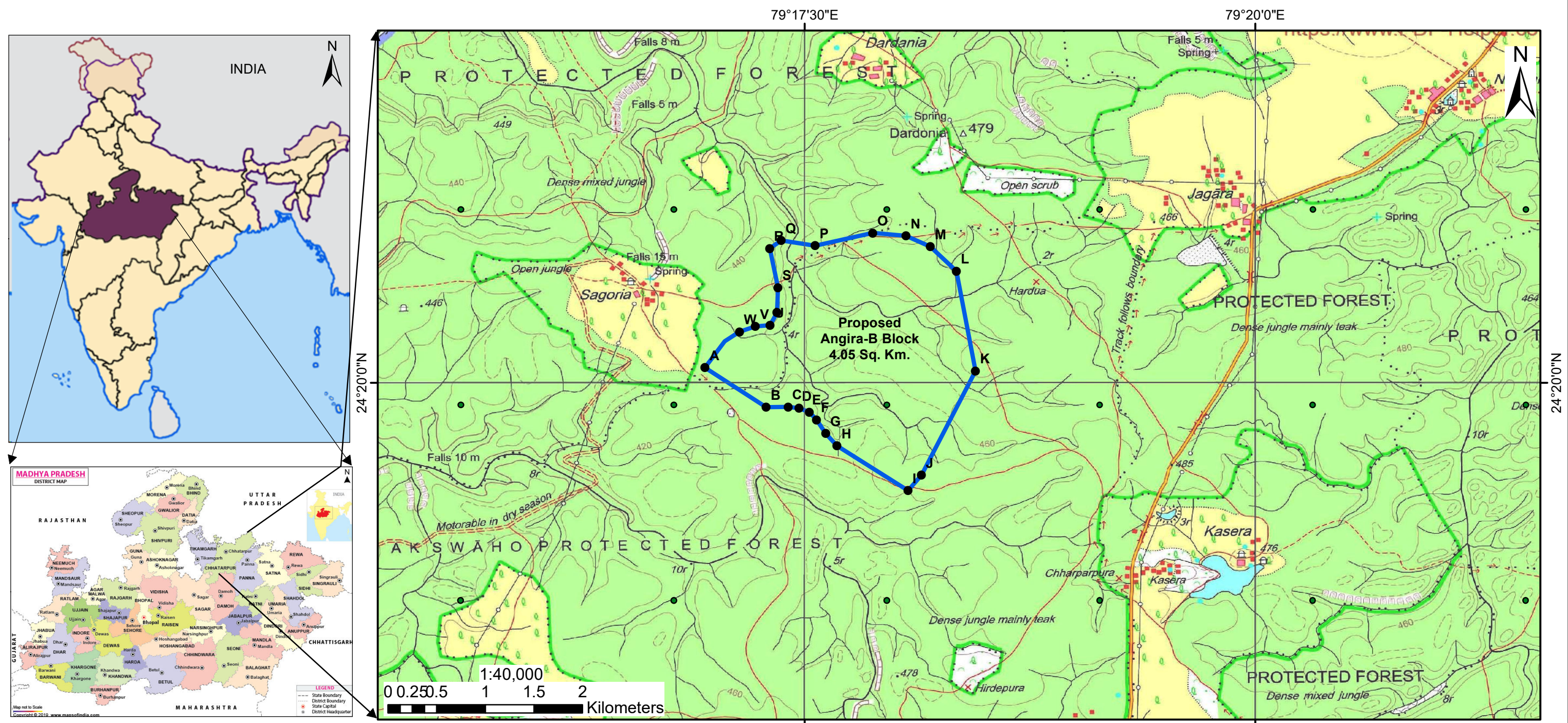
1. Part IV-A Information Memorandum, Reporting of Mineral Resources for Bunder Diamond Block, Tehsil: Buxwaha, Chhatarpur District, Madhya Pradesh.
2. Fifth Biannual Progress Report on Exploration Activities within The Damoh West (RP No. 368/F.No. /MINING/RP-1/2002) Reconnaissance Permit, Madhya Pradesh, ACC- Rio Tinto Exploration Limited (ARTE), 2005.
3. Revised Prospecting report for Bunder Prospecting License (25 sq. Km.), Rio Tinto Exploration India Private Limited (RTEIPL), 2011

12.0.0 List of Plates

Plate-I: Location Map of Angira-B Block (4.05sq. km.), Buxwaha Tehsil, Chhatarpur District, State: Madhya Pradesh.

Plate-II: Regional Geological Map of Angira-B Block (4.05 sq. km.), Chhatarpur District, State: Madhya Pradesh (Source: Bhukosh, GSI).

Location Map of Proposed Angira-B Block (4.05 Sq. Km.), Buxwaha Tehsil, Chattarpur District, Madhya Pradesh



Sl. No.	Block	Points	GCS-WGS-1984 (DMS)		UTM (Zone:44)(meters)	
			Latitude	Longitude	Northing	Easting
1	ANGIRA-B	A	24° 20' 4.981"N	79° 16' 56.818"E	2692361.64	325743.5385
2	ANGIRA-B	B	24° 19' 51.829"N	79° 17' 17.176"E	2691949.949	326312.4054
3	ANGIRA-B	C	24° 19' 51.998"N	79° 17' 24.495"E	2691952.61	326518.7828
4	ANGIRA-B	D	24° 19' 51.523"N	79° 17' 28.162"E	2691936.725	326621.9709
5	ANGIRA-B	E	24° 19' 50.185"N	79° 17' 31.559"E	2691894.385	326717.222
6	ANGIRA-B	F	24° 19' 47.718"N	79° 17' 33.939"E	2691817.667	326783.3792
7	ANGIRA-B	G	24° 19' 43.108"N	79° 17' 37.004"E	2691674.782	326868.0376
8	ANGIRA-B	H	24° 19' 39.108"N	79° 17' 40.718"E	2691550.441	326971.2232
9	ANGIRA-B	I	24° 19' 24.109"N	79° 18' 4.343"E	2691080.857	327631.5601
10	ANGIRA-B	J	24° 19' 29.274"N	79° 18' 8.838"E	2691238.206	327760.215
11	ANGIRA-B	K	24° 20' 3.972"N	79° 18' 26.876"E	2692299.462	328281.7001
12	ANGIRA-B	L	24° 20' 37.11"N	79° 18' 20.534"E	2693321.103	328115.3611
13	ANGIRA-B	M	24° 20' 45.297"N	79° 18' 11.827"E	2693575.963	327873.0234
14	ANGIRA-B	N	24° 20' 48.832"N	79° 18' 3.744"E	2693687.499	327646.5315
15	ANGIRA-B	O	24° 20' 49.872"N	79° 17' 52.698"E	2693723.305	327335.5914
16	ANGIRA-B	P	24° 20' 45.609"N	79° 17' 33.465"E	2693598.807	326791.8967
17	ANGIRA-B	Q	24° 20' 47.376"N	79° 17' 22.159"E	2693657.087	326473.9018
18	ANGIRA-B	R	24° 20' 44.699"N	79° 17' 18.338"E	2693576.057	326365.1913
19	ANGIRA-B	S	24° 20' 31.678"N	79° 17' 21.067"E	2693174.527	326437.1778
20	ANGIRA-B	T	24° 20' 23.387"N	79° 17' 20.729"E	2692919.577	326424.5105
21	ANGIRA-B	U	24° 20' 19.124"N	79° 17' 18.442"E	2692789.223	326358.4321
22	ANGIRA-B	V	24° 20' 18.787"N	79° 17' 13.582"E	2692780.542	326221.3154
23	ANGIRA-B	W	24° 20' 16.941"N	79° 17' 8.28"E	2692725.594	326071.1669

PLATE- I

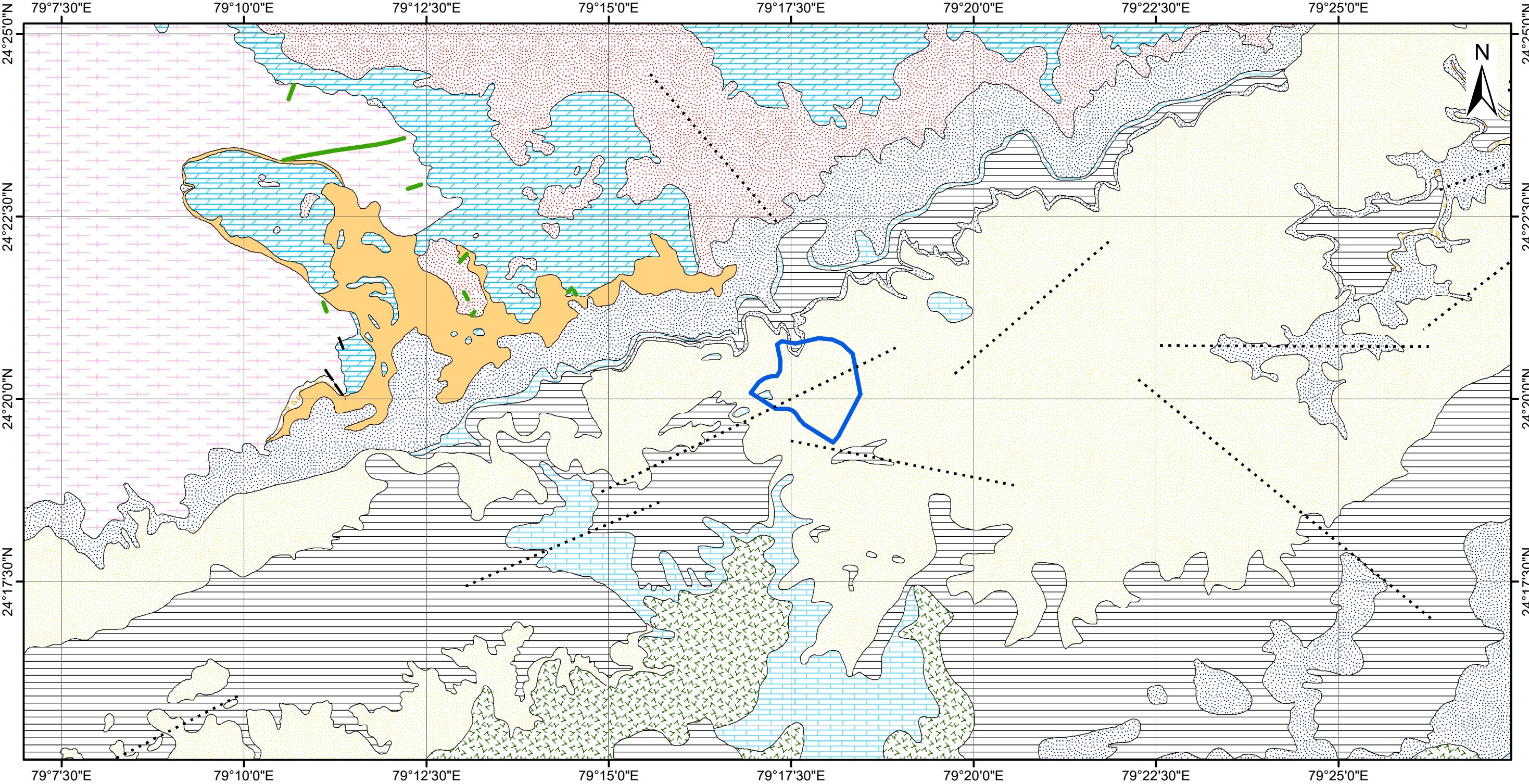
Legend

Proposed Angira-B Block Corner Points

Proposed Angira-B Block (4.05 sq. km.)

Source: Survey of India Toposheet No.: 54-P/07

Regional Geology Map of Proposed Angira-B Block (4.05 Sq. Km.), Buxwaha Tehsil, Chattarpur District, Madhya Pradesh



Legend



Proposed Angira-B Block (4.05 sq. km.)



BASALT



CHERT BRECCIA



DOLOMITE



FERRUGINOUS SANDSTONE



GRANITE GNEISS



LIMESTONE



META BASALT



PHOSPHORITE



SANDSTONE



SANDSTONE AND ORTHOQUARTZITE



SHALE



Dyke



Fault



Lineament 250K

PLATE - II

1:100,000

0 1.25 2.5 5 7.5 10 Kilometers

Source: Bhukosh, GSI

Estimated cost for Preliminary Exploration (G-3) for Diamond in Angira-B Block, Chhatarpur District, Madhya Pradesh Total block area- 4.05 sq km; Completion Time- 24 Months							
Sl. No	Item of Work	Unit	Rates as per NMET SoC		Estimated Cost of the		Remarks
			SoC- Item- S. No.	Rates as per SoC	Qty.	Total Amount (Rs)	
Phase-I							
1	Geological, Sampling & Survey Days						
	Large scale (LSM) Geological mapping/ Detailed Mapping						
1.1	Geologist man days (1 party Field)	days	1.2	11,000	160	17,60,000	
1.2	Labour Charges	per worker	5.7	477	320	1,52,640	per the notified rates by the Central Labour Commissioner
1.3	Geologist man days (HQ)	days	1.3	9,000	40	3,60,000	(Mineral identification days by 2 geologists included & data collation)
1.4	Sampling Charges (Geochemical /Trenching/Pitting/Drilling)	day	1.5.2	5,100	25	1,27,500	
1.5	Labour Charges for Sampling Work	day	5.7	477	100	47,700	Amount will be reimbursed as per the notified rates by the Central Labour Commissioner
	Sub-Total 1					24,47,840	
2	Geophysical Surveys*						
2.1	Gravity and Magnetic Surveys	per station	3.1b	4,500	6925	3,11,62,500	
2.3	Electromagnetic (TDEM)	per station	3.7a	21,197	1000	2,11,97,000	
2.4	Geophysicist man days for Geophysical Survey	days	3.18	11,000	180	19,80,000	
2.5	Down the hole Survey comprising of High-Resolution Acoustic Televiewer	Per m	3.11n	298	5000	14,90,000	
	Magnetic Susceptibility	Per m	3.11q	129	5000	6,45,000	
	Induction probe Density	Per m	3.11p	93	5000	4,65,000	
	Spectral Gamma	Per m	3.11o	164	5000	8,20,000	
	Density	Per m	3.11d	102	5000	5,10,000	
2.6	Surveyor Charges	days	1.6.1.a	8,300	180	14,94,000	
2.7	Labours Charges for Survey Work	per worker	5.7	477	720	3,43,440	per the notified rates by the Central Labour Commissioner
2.8	Geophysicist man days (HQ)	days	3.18	9,000	60	5,40,000	Data interpretation
	Sub-Total 2					6,06,46,940	
3	Laboratory Studies						
3.1	Chemical Analysis						
	i) Surface sampling (Stream/Soil/Bed Rock)						
	a) Whole rock analysis (Major oxides)	per sample	4.1.15a	4,200	10	42,000	
	ii) Soil/ Bedrock						
	a. Separation of heavy minerals from stream sediment samples of - 2mm size through gravity and magnetic separation	per sample	Outsourcing rate of IREL	30,759	10	3,07,590	Outsourcing rate of IREL has been taken into consideration. Outsourcing components, will be charged as per actual
	b. Heavy mineral separation by liquid	per sample					
	c. EPMA studies for suspected Heavy Mineral grains	Per hour	4.4.1	8,540	110	9,39,400	Outsourcing components, will be charged as per actual
	d. Processing of samples for idetification of diamond	nos	Not in SoC		650	0	Will be charged as per actual
	e. Trace elements (34 element)	No. of samples	4.1.14	7,731	500	38,65,500	Trace elemental study
3.2	Petrological / Mineralographic studies						
	a) Preparation of thin section (Surface)	per sample	4.3.1	2,353	25	58,825	
	b) Study of thin section for petrography	per sample	4.3.4	4,232	25	1,05,800	
	Sub-Total 3					53,19,115	
	Sub-Total 1 to 3 (Phase-I)					6,84,13,895	
Phase-II							
4	Geological Logging/ pitting/pit mapping						
4.1	Geologist man days (1 party Field)	days	1.2	11,000	80	8,80,000	
	Labour Charges	per worker	5.7	477	160	76,320	per the notified rates by the Central Labour Commissioner or respective State Govt. -

Sl. No	Item of Work	Unit	Rates as per NMET SoC		Estimated Cost of the		Remarks
			SoC- Item-S. No.	Rates	Qty.	Total Amount (Rs)	
				as per SoC			
4.2	Geologist man days (HQ)	days	1.3	9,000	110	9,90,000	Mineral identification days by 2 geologists included & Report writing/Data collation
4.3	Excavation (Pitting/Trenching)						
	Pitting	cu.m	2.1.2	3,800	400	15,20,000	Approx 50 nos of pits
	Sub-Total 4					34,66,320	
5	Drilling**						
5.1	a) Drilling up to 300m (2 Rigs) (Medium Hard Rock)	per m	2.2.4 a	12,120	5000	6,06,00,000	
5.2	Borehole pillaring a) construction of concrete pillar (12"x12"x30")	per bh	2.2.7.a	2,000	20	40,000	
5.3	Transportation of drill rigs &truck associated per drill (To & Fro from HQ) (2 rig)	per km	2.2.8	36	2000	72,000	(To & Fro from HQ = 1000 kms for 1 rig)
5.4	Monthly accommodation charges for drilling camp	monthly	2.2.9	50,000	7	3,50,000	
5.5	a) Drilling camp setting (2 rigs)	per drill	2.2.9a	2,50,000	2	5,00,000	
5.6	b) Drilling camp winding (2 rigs)	per drill	2.2.9b	2,50,000	2	5,00,000	
5.7	Approach road making in flat terrain (Flat terrain)	per km	2.2.10	22,020	5	1,10,100	Road Making will be considered as per the requirement and Road Making Charges will be reimbursed for max. 5 km.
5.8	Drill core preservation	per m	5.3	1590	2000	31,80,000	This amount will be reimbursed after successful delivery of the cores to concerned libraries/authorities
5.9	Land/crop compensation	per borehole	5.6	20000	20	4,00,000	Amount will be reimbursed as per actuals or max. Rs. 20000 per BH with certification from local authorities
5.10	Demarcation Fixation of borehole and determination of co-ordinates & Reduced Level (RL) of the boreholes by DGPS (including charges for labours deployed for the work)	Per point of observati on	1.6.2	19,200	43	8,25,600	20 boreholes and 22 block boundary points and one base point
5.11	Sampling Charges (Geochemical /Trenching/Pitting/Drilling)	day	1.5.2	5,100	225	11,47,500	
5.12	Labour Charges for Sampling Work	day	5.7	477	900	4,29,300	Amount will be reimbursed as per the notified rates by the Central Labour Commissioner or respective State Govt. - whichever is higher
	Sub-Total 5					6,81,54,500	
6	Laboratory Studies						
6.1	Chemical Analysis						
	i) Sub-Surface sampling/Pit (Pit/Core Samples)						
	ii) Pit/ Core Sample						
	a. Separation of heavy minerals from stream sediment samples of - 2mm size through gravity and magnetic separation	per sample	Outsourcing rate of IREL	30,759	150+500 = 650	1,99,93,350	Outsourcing rate of IREL has been taken into consideration. Outsourcing components, will be charged as per actual
	b. Heavy mineral separation by liquid	per sample					
	c. EPMA studies for suspected Heavy Mineral grains	Per hour	4.4.1	8,540	700	59,78,000	Outsourcing components, will be charged as per actual
	d. Processing of samples for idetification of diamond	nos	Not in SoC		650	0	Will be charged as per actual
	e. Trace elements (34 element)	No. of samples	4.1.14	7,731	650	50,25,150	Trace elemental study
6.2	Petrological / Mineralographic studies						
	a) Preparation of thin section (BH)	per sample	4.3.1	2,353	10	35,295	
	b) Study of thin section for petrography	per sample	4.3.4	4,232	10	63,480	
	Sub-Total 6					3,10,95,275	
	Sub-Total 4 to 6 (Phase-II)					10,27,16,095	
7	Total (1 to 6) (Phase- I & II)					17,11,29,990	

Sl. No	Item of Work	Unit	Rates as per NMET SoC		Estimated Cost of the		Remarks
			SoC- Item-	Rates	Qty.	Total Amount (Rs)	
			S. No.	as per SoC			
8	Geological Report Preparation	Nos	5.2	A Minimum of Rs. 9 lakhs or 3% of the work	1	20,00,000	For the projects having cost up to exceeding Rs. 300 Lakhs: A Minimum of Rs.9 lakhs or 3% of the value of work whichever is more subject to a maximum amount of Rs. 20 lakh and Rs. 10000/- per each additional copy.
9	Preparation of Exploration Proposal	Nos	5.1	500000	1	5,00,000	EA has to submit the Hard Copies and the soft copy of the final proposal along with Maps and Plan as suggested by the TCC- NMET in its meeting while clearing the proposal.
10	Report Peer Review Charges	lumpsum	As per EC decision	10000	1	10,000	With handling Charges
11	Total Estimated Cost without GST (7+8+9+10)					17,36,39,990	
12	Provision for GST (18%)					3,12,55,198	GST will be reimbursed as per actual and as per notified prescribed rate
13	Total Estimated Cost with GST					20,48,95,188	
					Say, Rs. in Lakhs	2048.95	
Note - <i>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 execution of the project by EA on its own, a Certificate regarding non outsourcing of any component/project is required.</i>							

Table- 2: Time schedule (in months) for G-3 Level Exploration for Diamond in Proposed Angira-B Block, District: Chhatarpur, Madhya Pradesh.

Sl. No.	Activities	Unit	MONTHS																									
			1	2	3	4	5	6	7	8	REVIEW	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1	Geologist Party days in field (1 Party)	day																										
2	Geophysics Party Days (1 Party Field)																											
3	Geophysics Party Days (1 Party HQ)																											
4	Survey Party days (1 Party)	day																										
5	Camp Setting	Month																										
6	Camp Winding	Month																										
7	Surface Drilling (3 rig)	m.																										
8	Sampling Party days, Soil/Pit Sample 100 days +Core Sample200days	day																										
9	Laboratory Studies	Nos.																										
10	Geologist Party days in HQ (60 days for hand picking of KIMs + 60 days GR)	day																										
11	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.