PROPOSAL FOR PRILIMINARY EXPLORATION (G-3 STAGE) FOR DIAMOND IN ANGIRA –A AND EXTENSION BLOCK (2.30 SQ.KM AREA), DISTRICT-CHATTARPUR, MADHYA PRADESH

(Part of the Toposheet No. 54P/07)

COMMODITY: DIAMOND

BY

MINERAL EXPLORATION AND CONSULTANCY LIMITED
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SEMINARY HILLS
NAGPUR (MH)

PLACE: NAGPUR
DATE: 07 December 2023

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

S. No	Features	Details
1	Block ID	Adjacent Area of Angira-A and Extension 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	18 Months
6	Objectives	Based on the evaluation of available geological data and reported known occurrences of diamond bearing Kimberlite/Lamproite- (Kimberlite Clan Rocks) in the Angira-B Block and surrounding 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 1:2000 scale for demarcation of alteration zone and Ultramafic rocks with structural features to identify the surface manifestations and lateral disposition of in 2.30 sq. km area. 2. Integrated Ground Magnetic Survey will be carried out in a grid pattern Ground Magnetic (station spacing 25m & line spacing 50m), Total number of stations will be 1800. Traverses are planned in North South direction. 3. Collection of 200 no. of Soil and Bedrock samples over the Targets Generated by Geological mapping and Geophysical Survey. The samples will be analyzed for 34 element ICP-MS analysis. **Phase-II** 1. Pitting/Trenching: Pitting/trenching of 320 cubic meters in probable zone will be carried out after evaluation of geological mapping, geophysical survey, and geochemical soil sampling analytical results (if required). The samples will be analyzed mainly for 34 element ICP-MS analysis (mainly for Major oxides and REEs) and Suspected KCR samples would be analysed for heavy mineral separation and EPMA for identification of KIMs and diamonds. 2. Based on, positive outcome of surface geochemical samples and geophysical survey, a total of 10 no. of

S. No	Features	Details
		boreholes (involving about 2000m core drilling) would be carried out, which will generate about 200 nos. of drill core samples. The drill core samples will be analyzed for 34 element ICP-MS (mainly for Major oxides and REEs) analysis and Kimberlitic/Lamproite intersections will be analyzed by heavy mineral separation and EPMA for identification of KIMs and diamonds. 3. Total 25 Nos of Petrography/ thin section study proposed on bed rock and selective drill core samples. 4. To decide the future course of exploration (under G-3 level) based on the results of above exploration work. Note:- i) Total number of Soil/Bed rock samples will be fanalised on the basis of Targets generated by Geological mapping and geophysical survey. ii) Drill hole plan will be finalised after the Geophysical modelling and Geochemical analysis.
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: 180 days (Field); 120 days (HQ) Geophysicist Party days: 150 days (Field); 30 days (HQ) Surveyor Party days: 100 days Sampler Party Days: 40 days **(need to be reviewed)**
10.	**Location**	
		The proposed adjacent area of Angira-A and extension block has an extent of 2.30 sq. km. area, located in Buxwaha Tehsil of Chhatarpur District, Madhya Pradesh.

<table>
<tr><th>S. No</th><th>Features</th><th>Details</th></tr>
<tr><td></td><td>Latitude and Longitude</td><td>Chhatarpur the administrative capital of the district is located 110km north from the proposed block. The block is located about 300 km North-East from state Capital Bhopal. The nearest town is Sagar which is 90km South-West from the block.
<table>
<tr><th rowspan="2">S. No.</th><th rowspan="2">Points</th><th colspan="2">GCS-WGS-1984 (DMS)</th><th colspan="2">UTM (Zone-44N)</th></tr>
<tr><th>Latitude</th><th>Longitude</th><th>Northing (m)</th><th>Easting (m)</th></tr>
<tr><td>1</td><td>A</td><td>24°20'50.22" N</td><td>79°16'41.34" E</td><td>2693758.92</td><td>325324.57</td></tr>
<tr><td>2</td><td>B</td><td>24°20'38.12" N</td><td>79°17'14.13" E</td><td>2693375.27</td><td>326244.00</td></tr>
<tr><td>3</td><td>C</td><td>24°20'06.77" N</td><td>79°16'53.01" E</td><td>2692417.96</td><td>325636.86</td></tr>
<tr><td>4</td><td>D</td><td>24°19'17.50" N</td><td>79°16'55.03" E</td><td>2690901.41</td><td>325675.14</td></tr>
<tr><td>5</td><td>E</td><td>24°19'23.96" N</td><td>79°16'37.11" E</td><td>2691106.47</td><td>325172.44</td></tr>
<tr><td>6</td><td>F</td><td>24°20'22.45" N</td><td>79°16'18.96" E</td><td>2692912.25</td><td>324682.96</td></tr>
</table></td></tr>
<tr><td></td><td>Toposheet</td><td>The area falls in toposheet No. 54P/07</td></tr>
<tr><td></td><td>Villages</td><td>Sagoria, Majora, Dardonia,</td></tr>
<tr><td></td><td>Tehsil/Taluk</td><td>Buxwaho</td></tr>
<tr><td></td><td>District</td><td>Chattarpur</td></tr>
<tr><td></td><td>State</td><td>Madhya Pradesh</td></tr>
<tr><td>11.</td><td>Area (hectares/square kilometres)</td><td></td></tr>
<tr><td></td><td>Block Area</td><td>2.30 sq.km</td></tr>
<tr><td></td><td>Forest Area</td><td>The proposed block area comes under Buxwaha Protected Forest.</td></tr>
<tr><td></td><td>Government Land Area (Bilanam)</td><td>Data not available</td></tr>
<tr><td></td><td>Charagaha</td><td>Data not available</td></tr>
<tr><td></td><td>Private Land Area</td><td>Data not available</td></tr>
<tr><td>12.</td><td>Accessibility</td><td></td></tr>
<tr><td></td><td>Nearest Rail Head</td><td>The nearby railway station is Damoh (65 km), Patharia (70 km) and Chhatarpur (110 km)</td></tr>
<tr><td></td><td>Road</td><td>The national highway NH-34 passes through South and west of the block. The block is well connected with state capital Bhopal through national highway NH-146.</td></tr>
<tr><td></td><td>Airport</td><td>The nearest airport is Khajuraho Airport and located around 140 km north of the proposed block. Another Airport is Jabalpur Airport also known as Dumna Airport The airport is located 180 km south of the proposed block.</td></tr>
<tr><td>13.</td><td>Hydrography</td><td></td></tr>
<tr><td></td><td>Local Surface Drainage Pattern (Channels) Rivers/</td><td>The major rivers flowing in the area are Dhasan and Ken Rivers and their tributaries. The creeks and rivers frequently</td></tr>
</table>

S. No	Features	Details
	Streams	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 to July. Temperate climate prevails during rest of the year; the temperature varies between 3°C to 47°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 geosciences 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 Reconnaissance Survey**	1. The garnets from proposed area and surrounding area was 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

S. No	Features	Details
		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. 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, four Small size kimberlite bodies are present within the proposed block area which are suspected to be diamondiferous kimberlite by ARTE and recommended for further detailed exploration to delineate the geometry of the kimberlites present within the proposed area and also there are chances to identify more kimberlitic bodies within the area. 4. The largest lamproite body which identified by ACC Rio Tinto Private Limited falls 0.5 km from Southeast of the proposed 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>S. No</th><th>Features</th><th>Details</th></tr>
<tr><td></td><td></td><td>
<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 12.14 Million tonnes @ 0.13 carat/tonne.
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FOR DIAMOND IN ANGIRA-A AND EXTENSION BLOCK (2.30 SQ.KM AREA),
DISTRICT- CHATTARPUR, MADHYA PRADESH
(Part of the Toposheet No. 54P/07)

1.0.0 **Preamble**

1.0.1 Till the 18th centuary India is the only country known source of Diamonds in the world. The diamonds have been first recognised and mined in India, for centuries. Diamonds being one of the highly priced gems 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.

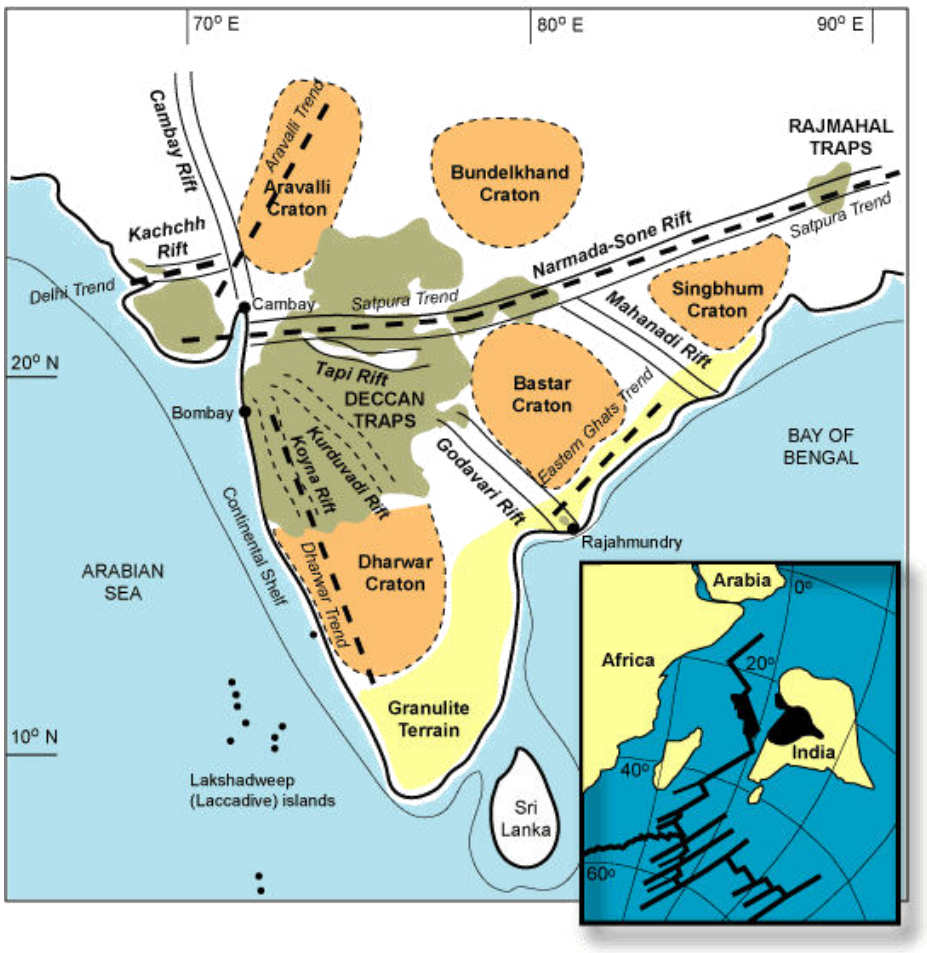
1.0.3 Since last century, no large diamond deposits have been discovered in India except recent discovery of "Bunder - Atri" by Rio-Tinto Exploration (RTE) in Bakshwaha Tehsil, Chhattarpur District of Madhya Pradesh State. However, the possibility of working of small diamondiferous bodies in proximity 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, diamond fields 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 Bastardistrict of Chhattisgarh; and4) Eastern Indian tract mostly of Odisha, lying between Mahanadi and Godavari valleys.

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 BastarCraton 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.

1.12 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 jewellery and automotive. 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-A and Extension 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 and in long term if diamond mine open in the area than it will provide sustainable development of the area and people.

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 58th TCC.

2.0.0 Location and Accessibility

2.0.1 The proposed block has an extent of 2.30 sq.km area which is located in Buxwaho Tehsil of Chhatarpur District, Madhya Pradesh. Chhatarpur the administrative capital of the district which is located 105 km north of the proposed block. The block is located about 300 km north east from the state capital Bhopal. The nearest town Damoh is 65 km south east from the block. The national highway NH-34 passes through South east & 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), Patharia (70km) and Chhatarpur (110). The area falls in toposheet No. 54P/07. The nearest airport is Khajuraho Airport and located around 140 km north of the proposed block. Another 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 Adjacent area of Angira-A and Extension Block falls in Survey of India Toposheet No. 54-P/07, comprising 2.30 sq.km area, in and around Sagoria, Dardonia and Harduba village, Buxwaho 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
Adjacent Area of Angira A and Extension Block (2.30 sq. Km.)

S. No.	Points	GCS-WGS-1984 (DMS)		UTM (Zone-44N)	
		Latitude	Longitude	Northing (m)	Easting (m)
1	A	24°20'50.22" N	79°16'41.34" E	2693758.92	325324.57
2	B	24°20'38.12" N	79°17'14.13" E	2693375.27	326244.00
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6	F	24°20'22.45" N	79°16'18.96" E	2692912.25	324682.96

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 Dhasan 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 to July. Temperate climate prevails during rest of the year; the temperature varies between 3°C to 47°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 Vindhyans Super Group 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	

Supergroup	Group	Formation	Member
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.	

Historically, in Panna Diamond Belt diamonds are recovered from three sources (i) Majhgawan and Hinota Kimberlite pipes, (ii) Diamondiferous conglomerates towards the top of Lower Rewa Sand Stone and base of Jhiri Shales, and (iii) along the Quaternary alluvium of streams draining the diamond belt.

The Panna (Majhgawan) mine is located around 60km to the east north east of the Proposed Block area. The Majhgawan mine is the only hard rock diamond mine in India that produced diamonds from early 19th century. Annual production from Majhgawan is estimated to be 70,000 – 80,000 carats from ore grading around 0.1-0.14 carats per tonne (cpt) (Chatterjee, pers comm, 2007). There are extensive alluvial diamond activities downstream of the Majhgawan mine, which has been the site of similar activities of hundreds of years.

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, basalti flows and sills. The Bijawar group of rocks is overlain by Meso to Neo Proterozoic platformal sediments of Vindhyan Supergroup. In the south and 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./MINlNG/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 was 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 lherzolitic 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 proposed 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, Cd etc). 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 (Kaimur Group) 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 kimberlitic bodies coming in nearby proposed block i.e., B-08, B-38, B-68 and B-48 are available

2. Litholog of borehole holes is 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 nearby area and proposed Angira A and Extension Block, the present exploration program has been formulated in phase wise to fulfil the following objectives.

Phase-I

1. Carry out geological and structural mapping on 1:2,000 scale for demarcation of alteration zone and Ultramafic rocks with structural features to identify the surface manifestations and lateral disposition of in 2.30 sq. km area.

2. Integrated Ground Magnetic Survey will be carried out in a grid pattern Ground Magnetic (station spacing 25m & line spacing 50m),

3. Also proposed Control source Audio Magneto Telluric (CSAMT)/Time Domain Electromagnetic (TDEM) Survey to achieve the target objectives. The survey is planned in 50m x 100m (line spacing 100m and Station 50m) grid pattern. Traverses are planned in North South direction.
4. Collection of 200 no. of Soil and Bedrock samples over the Targets Generated by Geological mapping and Geophysical Survey. The samples will be analyzed for 34 element ICP-MS analysis. (Sample Numbers may Change on the basis of Targets).

Phase-II

5. Pitting/Trenching: Pitting/trenching of 320 cubic meters in probable zone will be carried out after evaluation of geological mapping, geophysical survey, and geochemical soil sampling analytical results (if required). The samples will be analyzed mainly for 34 element ICP- MS analysis (mainly for Major oxides and REEs) and Suspected KCR samples would be analysed for heavy mineral separation and EPMA for identification of KIMs and diamonds.

6. Based on, positive outcome of surface geochemical samples and geophysical survey, a total of 10 no. of boreholes (involving about 2000m core drilling) would be carried out, which will generate about 200 nos. of drill core samples. The drill core samples will be analyzed for 34 element ICP-MS (mainly for Major oxides and REEs) analysis and Kimberlitic/Lamproite intersections will be analyzed by heavy mineral separation and EPMA for identification of KIMs and diamonds.

7. 25 No's of Petrography study.

8. To decide the future course of exploration (under G-2 level) based on the results of above exploration work.

Note:-

i) Soil/Bed rock sample plan will be finalised after the Geophysical modelling and Geochemical analysis followed by Drill hole location plan will be finalised.

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 (1:2000 scale), Integrated Geophysical Survey (Ground Magnetic Survey & Control source Audio Magneto Telluric (CSAMT)/Time Domain Electromagnetic (TDEM) Survey) in the entire area. About 200 nos. of surface sampling (Soil Sample/bedrock) will be collected out during the initial stag over the Geological and Geophysical Targets. A provision of exploratory pitting/trenching of about 320 cubic meters is kept in

Positive Geophysical and Geochemical Targets/Ultramafic zones with geochemical analysis.

On the basis of positive outcomes of surface geochemical samples and geophysical survey, a total of 10 no. of boreholes (involving about 2000m core drilling) would be carried out, which will generate about 200 nos. of drill core samples. The drill core samples will be analyzed for 34 element ICP-MS analysis and Kimberlite/Lamproite intersections will be analyzed by heavy mineral separation and EPMA for identification of KIMs and diamonds.

5.2.0 Phase wise exploration activities

5.2.1 Geological Mapping

Initially Geological Mapping will be done in the entire 2.30 sq.km area on 1:2000 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.

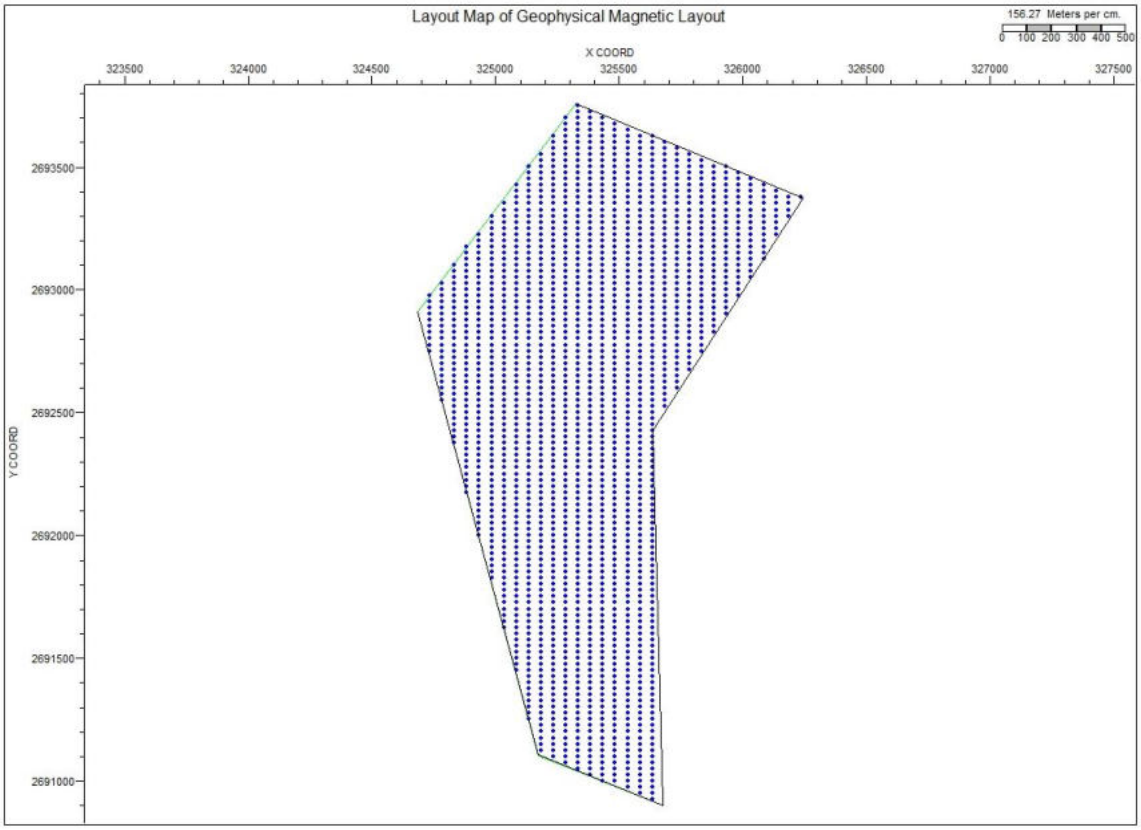
5.2.2 Ground Geophysical Survey

Integrated Ground Magnetic survey will be carried out in a grid pattern of 50m line spacing and 25m station spacing, followed by Time Domain Electromagnetic survey to achieve the target objectives. The Time domain Electromagnetic survey is planned on 100m x 50m (Line spacing 100m and Station spacing 50m) grid pattern.

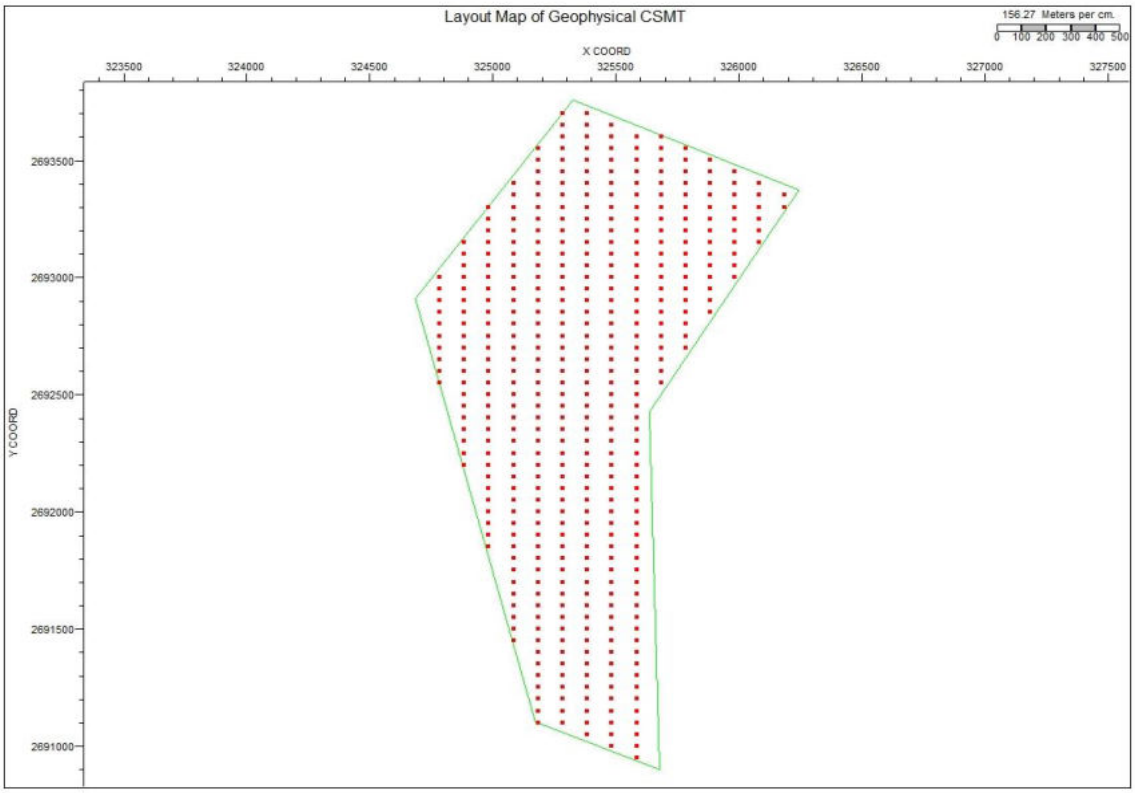
The details of survey stations were given below in **Table No.5.1**. The geophysical layout diagram is given as **Text Figure No. 5.1**.

Table No.5.1.
Tentative quantum of work

Block	Area	Method	Line Spacing	Station Spacing	No of Stations / LKM
Adjacent area of AngiraB and Angira A Block	2.30 Sq. km.	Electromagnetic (TDEM)	100 m	50m	450
		Magnetic	50m	25m	1800



Text Figure No. 5.1: Layout Map of Ground Magnetic survey in (50m x 25m Grid)



Text Figure No. 5.1: Layout Map of Electromagnetic survey in (100m x 50m Grid)

Initially the Ground Magnetic survey will be conducted and after the potential area Time Domain Electromagnetic Survey consisting of 450 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 200 soil/ 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.

5.2.3.2 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.

5.2.3.3 **Exploratory Mining (Pitting/Trenching)**

5.2.3.4 Shallow pitting and trenching of 320 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 2m. 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 1:2000 scale. Pitting would generate about 20 Nos of soil samples and analysed for 34 element ICP- MS analysis and 10 nos. of samples will be analyzed and the 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.

5.3.1 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-4 level of exploration.

5.3.2 Exploratory Drilling (PQ and HQ Size):

Based on Geological Mapping, Geophysical and Geochemical sampling (Soil/bedrock) 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 2000m of drilling will be carried out in 10 no of boreholes for intersection of KCR zones. The exploratory drilling would generate about 200 no of drill core samples, 10cm of every 10 meter interval of core will used for study like Sp. Gravity and moisture analysis and collection of above sample remaining sample send to lab for analysis of 34 element ICP-MS analysis

sample will be analyse for heavy mineral separation and KIMs study with EPMA and diamond counts.

5.4.1 Petrological Studies:

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-A and Extension Block (G-4 Exploration), Chhatarpur District, Madhya Pradesh.

Sl. No.	Item of Work	Unit	Target
1	Geological Mapping (on 1:2000 Scale)	Sq. Km	2.3
	a) Geologist man days (Field)	Days	180
	b) Geologist man days (HQ) (60 days for hand picking of KIMs + 60 days for report writing	Days	120
	c) Sampling Party Days (Geochemical /Trenching/Pitting/Drilling)	Days	40
2	**Geochemical Sampling**		
	a) Bed Rock/Soil Sampling/pit 2.3 Sq. Km. Area	Nos.	200
	b) Core Sampling	Nos.	200
	c) Surveyor Charges	days	100
3	**Geophysical Survey***		
	a) Magnetic Survey (50m line spacing, 25 m station spacing)	No. of Station	1800
	b) High-Resolution Acoustic Televiewer, Magnetic Susceptibility, Induction probe, Density, Spectral Gamma, Calliper can be used for the well logging	M	2000
	Geophysicist man days (HQ)	days	45
4	**Exploratory Mining***		
	Excavation of pits (10 Nos)	Cu. m.	20
	Excavation of trenches	Cu. m.	300
5	**Core Drilling ****		
	a) Drilling	m.	2000
7	**Laboratory Studies**		
	I) Surface Sampling (Bed Rock and Soil) for 34 trace elements (Nb, La, Ce, Cd etc)	Nos.	270
	a) Pit Samples for Trace element and KIMs EPMA	Nos.	20
	b) Separation of Heavy minerals from bedrock and pit samples	Nos.	200+10+10 = 220
	ii) Bed Rock Sample		

Sl. No.	Item of Work	Unit	Target
	a) Whole rock analysis	Nos.	10
	iii) Core Drilling (Primary) Samples**		
	a) Separation of Heavy minerals from drill samples	Nos	200
	b) EPMA studies for suspected Heavy Mineral grains	Hrs	200
	c) Specific Gravity (drill core)	Nos	10
	d) Gemological Study for recovered Diamonds	Nos	50
8	**Petrological Samples (Surface Samples)**		
	a) Preparation of Thin Section	Nos	25
	b) Study of Thin Section (Core Samples)	Nos	25
9	**Report Preparation (5 Hard copies with a soft copy)**	**Nos.**	**1**
10	**Preparation of Exploration Proposal (5 Hard copies with a soft copy)**	**Nos.**	**1**

Note:

1) The actual number of suspected grains for EPMA will be confirmed after microscopic study.
2) Actual number of drill hole will be finalised on the basis of positive Geophysical and Geochemical targets.
3) Actual number of Drill core sample numbers will be finalised on the basis of final intersections of Kimberlite/Lamproite.

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.612.82 Lakhs. The summary of cost estimates for Reconnaissance Survey (G-4 Stage)is given in **Table No. -8.1**.

Table No-8.1

Summary of Cost Estimates for Reconnaissance Survey (G-4 Stage)

Sl. No.	Item	Total Estimated Cost (Rs.)
1	Geological, Sampling & Survey Days	35,26,080
2	Geophysical Surveys*	89,16,000
3	Trenching & Pitting	17,05,600
4	Drilling	2,92,18,791
5	Laboratory Studies	65,60,045
	Sub Total (1 to 5)	4,99,26,516
6	Exploration Report Preparation	14,97,795

	Proposal Preparation	5,00,000
7	Peer review charges	10,000
	Sub Total (1 to 7)	5,19,34,311
8	GST 18%	93,48,176
	Total:	**6,12,82,488**
	Say Rs. In Lakh	**612.82**

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 18 months; geological report preparation with peer review will take 4 months with three months overlapping with lab works. Therefore, a total of 18 months is planned for completion of the entire proposed programme. Tentative Time schedule/action plan for proposed Reconnaissance Survey (G-4Stage) for Diamond is given in **Table No. 9.1.**

Table No. 9.1.

Table- 9.1: Time schedule (in months) for G-3 Level Exploration for Diamond in Proposed Angira-A and Extension Block, District: Chhatarpur, Madhya Pradesh.

S. No.	Activities	Unit	MONTHS																		
			1	2	3	4	5	6	Review	7	8	9	10	11	Review		13	14	15	16	17	18
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																				
	Pitting/Trenching																					
7	Surface Drilling (2 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 like forest etc.

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.

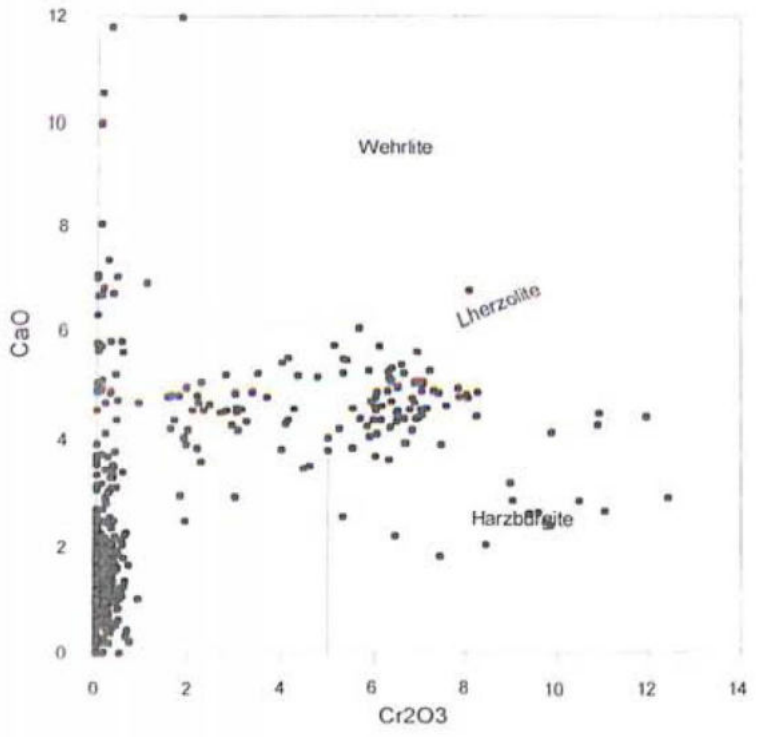


Figure No. 10.1: Garnet: Sobolev Plot, Cr2O3 vs. CaO (Sobolev et. al., 1973) plot for all garnets in the Damoh West Block RP, ACC Rio Tinto India Exploration Private Limited, 2005

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.

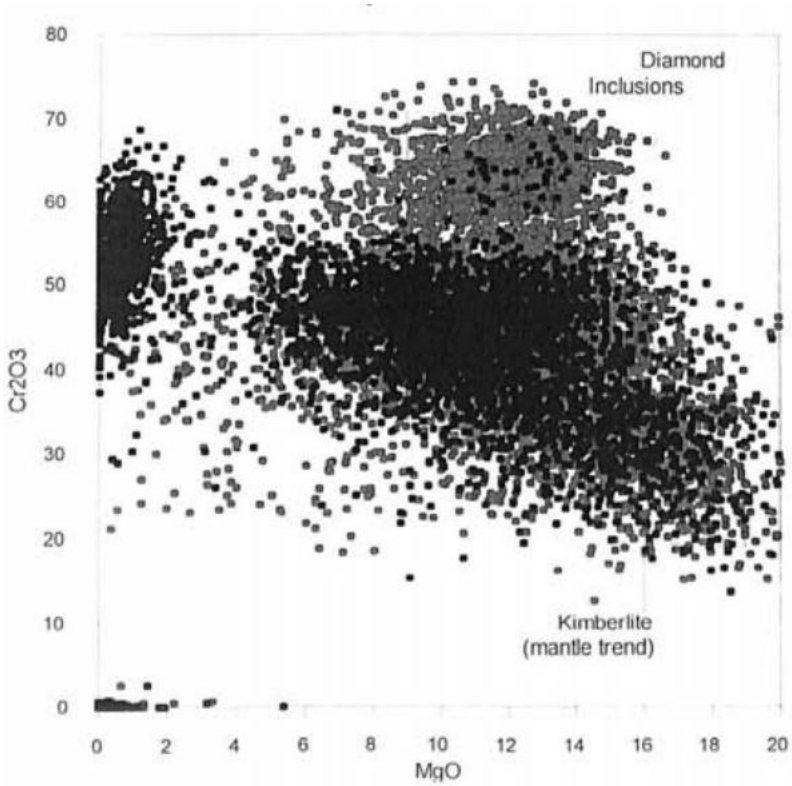


Figure No. 10.2: Chromite: Gurney Plot, MgO vs Cr2O3 (Gurney et. al., 1995) plot for Chromites from the Damoh West Block RP, (Grey= Bunder, Black= Outside Bunder), ACC Rio Tinto India Exploration Private Limited, 2005

5. 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 Electromagnetic), 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, few small suspected Kimberlitic bodies are present within the proposed adjacent area of Angira B and Angira A block. Further exploration detailed exploration is required to delineate the shape and size of the kimberlites present within the proposed area.

6. The Largest Lamproite body which identified by ACC Rio Tinto Private Limited falls 0.5 km South east of the proposed Angira-A and Extension Block and it was auctioned under Bunder Mining Lease to Essel Minning, Aditya Birla Group.

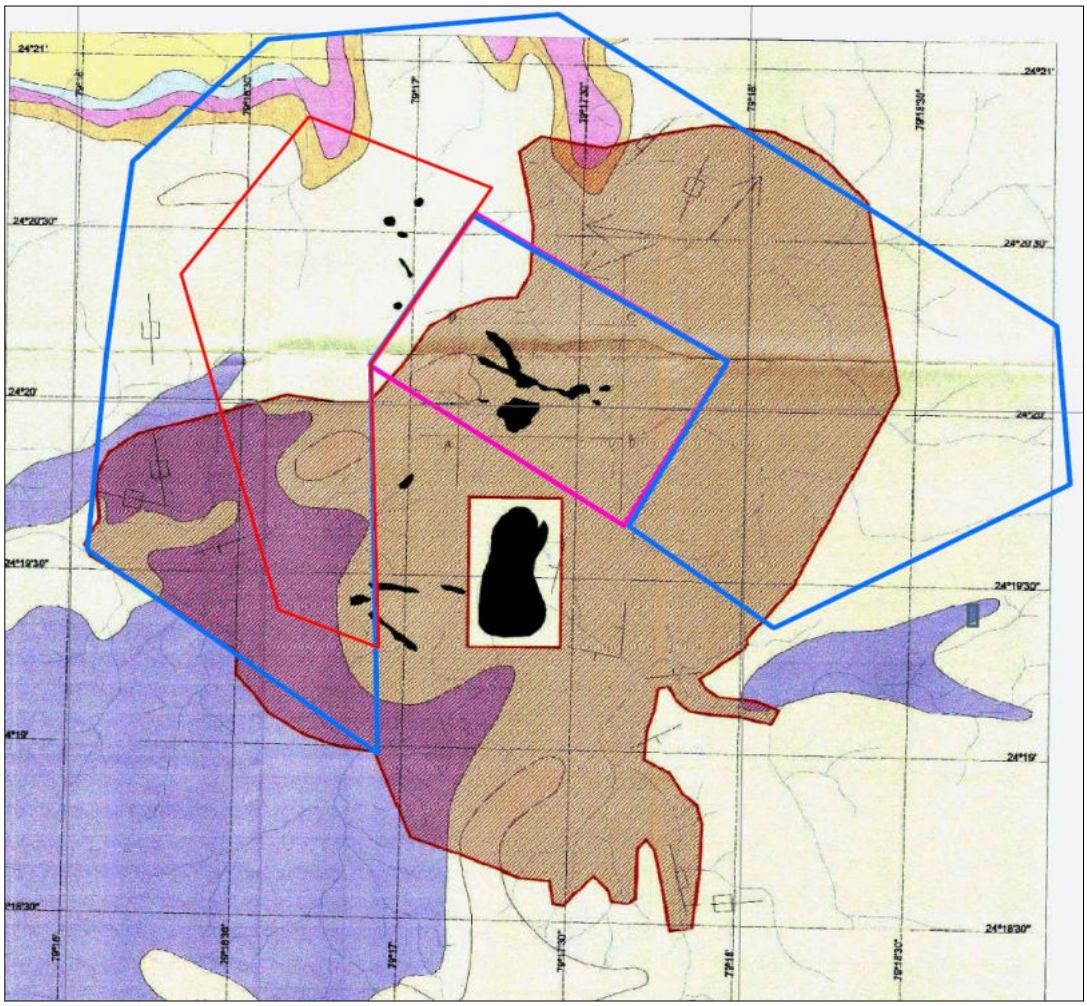


Figure No. 10.3: Lamproite locations as identified and demarcated by ACC Rio Tinto in and around Bunder Mining Lease Area, Chhatarpur, M.P.

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. /MINlNG/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

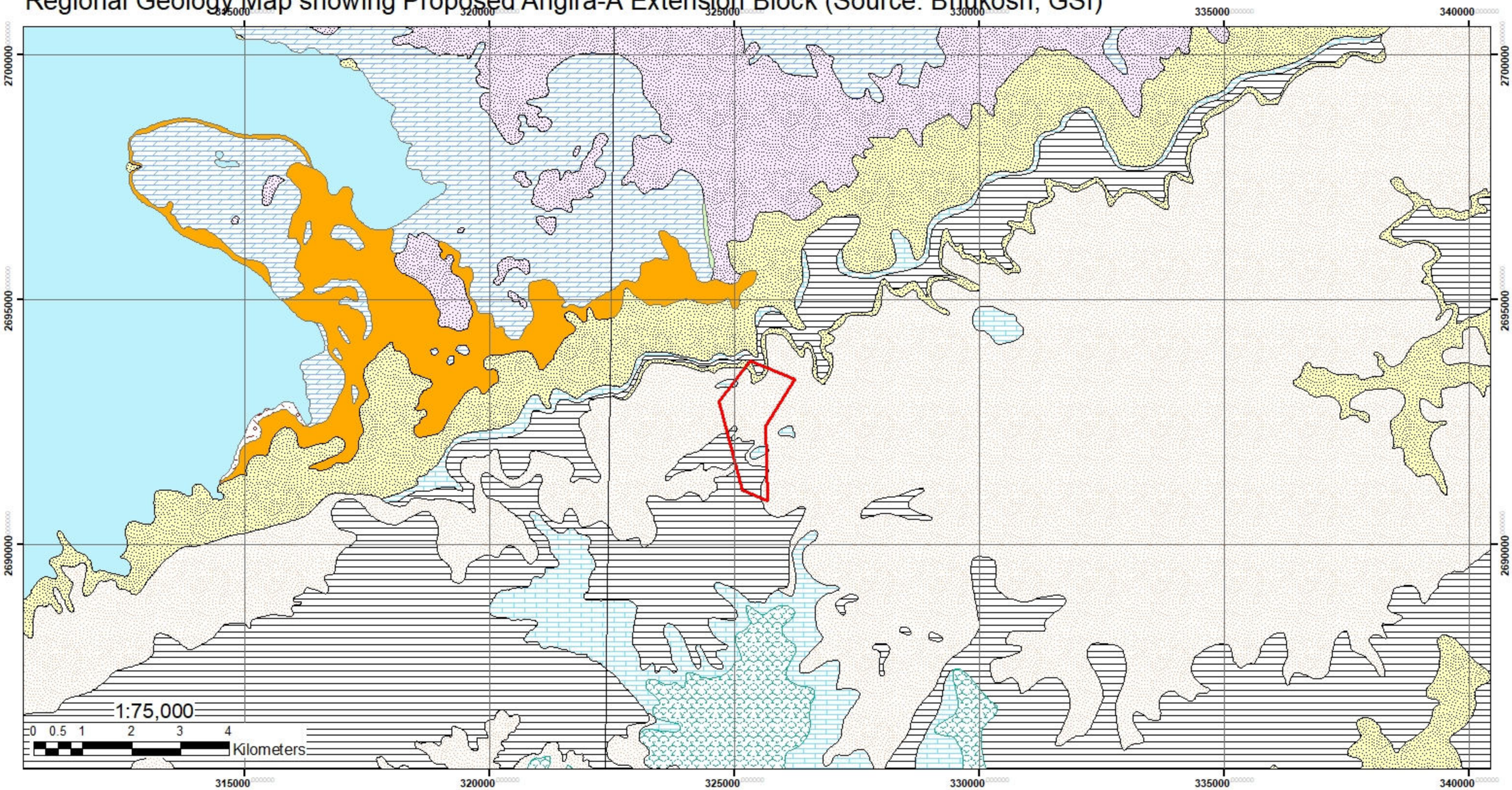
Plate-I: Location Map of Adjacent Area of Angira-B and Angira A Block (10 sq. km.), Buxwaha Tehsil, Chhatarpur District, State: Madhya Pradesh.

Plate-II: Regional Geological Map of Adjacent Area of Angira-B and Angira A Block (10 sq. km.), Chhatarpur District, State: Madhya Pradesh (Source: Bhukosh, GSI).

Plate-III: Block Geological Map of Adjacent Area of Angira-B and Angira A Block (10 sq. km.), Chhatarpur District, State: Madhya Pradesh (Source: Bhukosh, GSI).

Plate-IV: Map of Rio Tinto showing Adjacent Area of Angira-B and Angira A Block (10 sq.km), Chhatarpur District, State: Madhya Pradesh (Source: Rio Tinto Report).

Regional Geology Map showing Proposed Angira-A Extension Block (Source: Bhukosh, GSI)



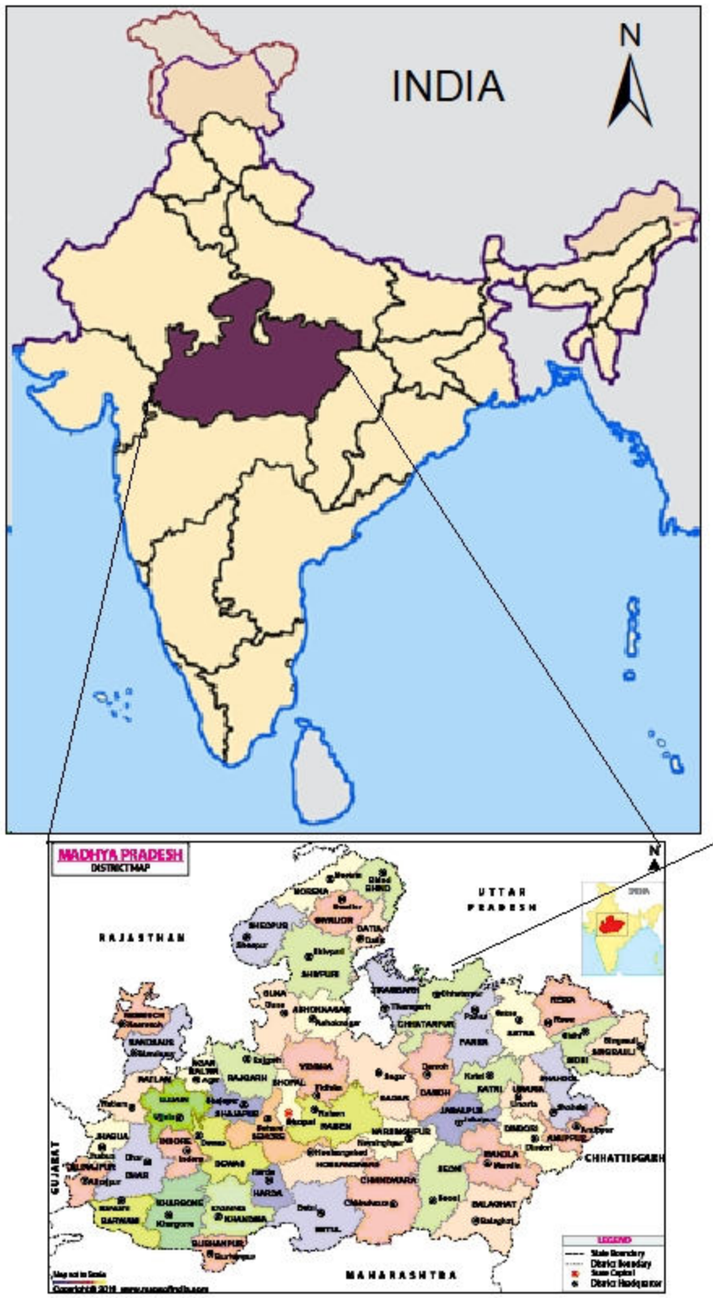
Legend

Angira-A Extension

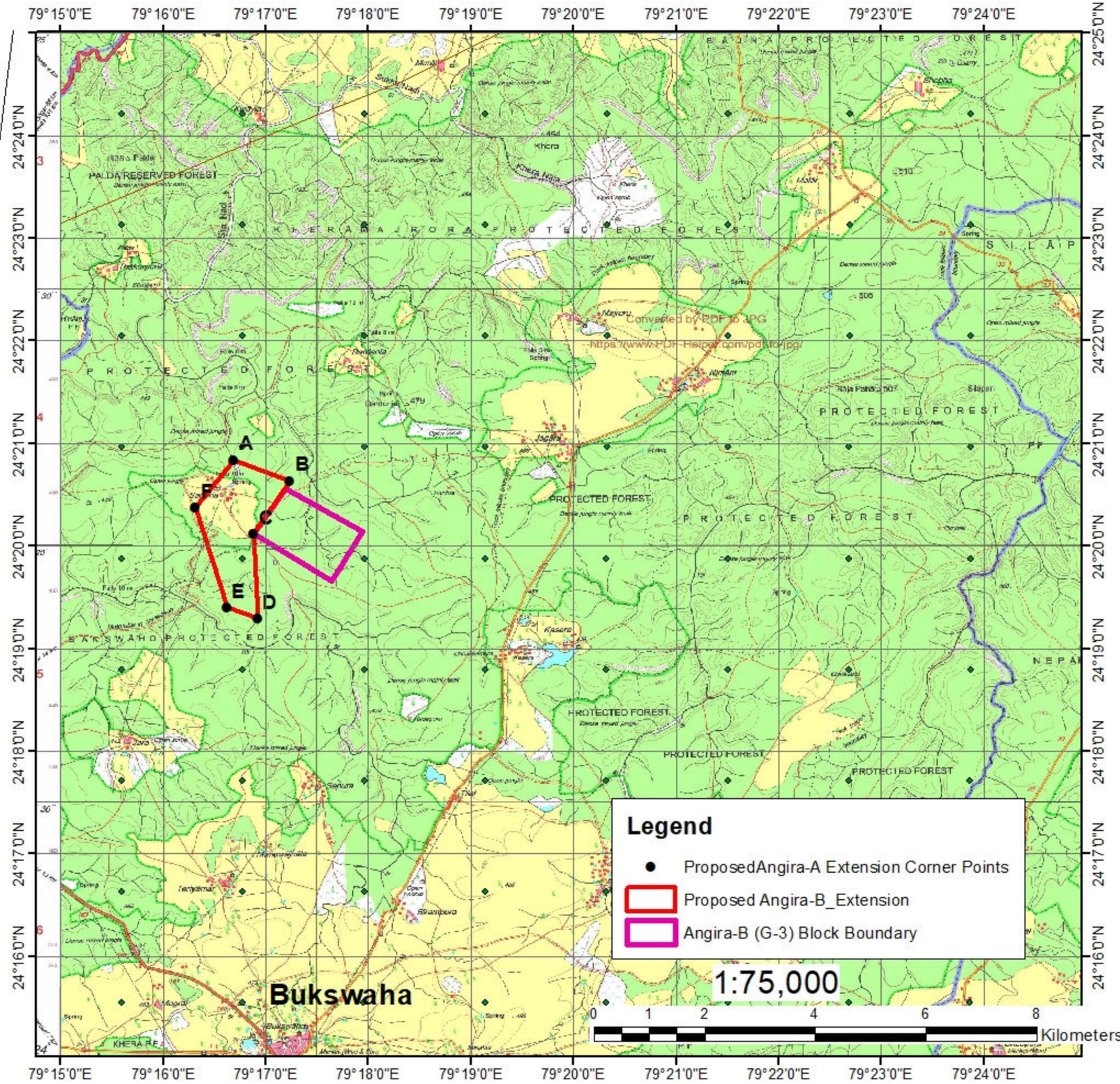
LITHOLOGIC

- BASALT
- CHERT BRECCIA
- LIMESTONE
- SHALE
- SANDSTONE AND ORTHOQUARTZITE
- SANDSTONE
- DOLOMITE
- PHOSPHORITE
- FERRUGINOUS SANDSTONE
- META BASALT
- GRANITE GNEISS

Location Map of Revised Angira-A Extension Block (2.30 Sq. Km.), Bukswaha Tehsil, Chattarpur District, Madhya Pradesh



Block Boundary Coordinates of Proposed Angira-A Extension Block (2.30 sq km)			
Sl. No	Points	Latitude	Longitude
1	A	24°20'50.22"	79°16'41.34"
2	B	24°20'38.12"	79°17'14.13"
3	C	24°20'06.77"	79°16'53.01"
4	D	24°19'17.50"	79°16'55.03"
5	E	24°19'23.96"	79°16'37.11"
6	F	24°20'22.45"	79°16'18.96"



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

Estimated cost for Reconnaissance Survey (G-4) for Diamond in Adjacent area of Angira-B & Angira-B Block, Chhatarpur District, Madhya Pradesh
Total block area- 10.00 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)	
	Geological, Sampling & Survey Days						
1	**Large scale (LSM) Geological mapping/ Detailed Mapping/Trenching/Drilling**						
1.1	Geologist man days (1 party Field)	days	1.2	11,000	180	19,80,000	
1.2	Labour Charges for Mapping work	per worker	5.7	504	360	1,81,440	per the notified rates by the Central Labour Commissioner
1.3	Geologist man days (HQ)	days	1.3	9,000	120	10,80,000	(Mineral identification days by 2 geologists included & data collation)
1.4	Sampling Charges (Geochemical /Trenching/Pitting/Drilling)	day	1.5.2	5,100	40	2,04,000	
1.5	Labour Charges for Sampling Work	day	5.7	504	160	80,640	per the notified rates by the
	Sub-Total 1					**35,26,080**	
2	**Geophysical Surveys***						
2.1	Magnetic Surveys	per station	3.1b	1,800	1800	32,40,000	
2.3	Electromagnetic (TDEM)	per station	3.7a	21,197	0	0	
2.4	Surveyor Charges	days	1.6.1.a	8,300	100	8,30,000	
2.5	Labours Charges for Survey Work	per worker	5.7	504	400	2,01,600	per the notified rates by the Central Labour Commissioner
2.6	Geophysicist man days (HQ)	days	3.18	9,000	45	4,05,000	Data interpretation
	Sub-Total 2					**46,76,600**	
3	**Excavation (Pitting/Trenching)**						
	Pitting	cu.m	**2.1.3**	5,330	320	17,05,600	
	Sub-Total 3					**17,05,600**	
4	**Drilling****						
4.1	a) Drilling up to 300m (2 Rigs) (Hard Rock)	per m	2.2.4 a	11,500	2000	2,30,00,000	
4.2	Borehole pillaring a) construction of concrete pillar (12"x12"x30")	per bh	2.2.7.a	2,000	10	20,000	
4.3	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)
4.4	Monthly accommodation charges for drilling camp	monthly	2.2.9	50,000	4	2,00,000	
4.5	a) Drilling camp setting (2 rigs)	per drill	2.2.9a	2,50,000	2	5,00,000	
4.6	b) Drilling camp winding (2 rigs)	per drill	2.2.9b	2,50,000	2	5,00,000	
4.7	Approach road making in flat terrain (Flat terrain)	per km	2.2.10	22,020	5	1,10,100	considered as per the requirement and Road Making
4.8	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
4.9	Land/crop compensation	per borehole	5.6	20000	10	2,00,000	Amount will be reimbursed as per actuals or max. Rs. 20000 per BH with certification from local authorities
4.10	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 observation	1.6.2	19,200	10	1,92,000	
4.11	High-Resolution Acoustic Televiewer, Magnetic Susceptibility, Induction probe, Density, Spectral Gamma, Calliper can be used for the borehole logging	m	3.11n, 3.11q, 3.11p, 3.11d, 3.11o & 3.11g	805	2000	12,44,691	
	Sub-Total 4					**2,92,18,791**	

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)	
5	**Laboratory Studies**						
5.1	Chemical Analysis						
	i) Surface sampling/Pit/BH (Stream/Soil/Bed Rock/Pit Samples/Core)						
	ii) Soil/ Bedrock/ Core Sample					-	
	a. Separation of heavy minerals from stream sediment samples of - 2mm size through gravity and magnetic separation	per sample	4.3.6b	13,820	220	30,40,400	500nos-Bedrock/soil/pit, 210nos.- drill core
	b. Heavy mineral separation by liquid	per sample	4.3.6a	2,380	220	5,23,600	500nos-Bedrock/soil/pit, 210nos.- drill core
	c. EPMA studies for suspected Heavy Mineral grains	Per hour	4.4.1	8,540	50	4,27,000	Outsourcing components, will be charged as per actual
	d. Specific Gravity (by drill core)	No. of samples	4.8.1	1,605	10	16,050	Kimberlite/Lamproite intersections (facies wise)
	e. Trace elements (34 element)	No. of samples	4.1.14	7,731	270	20,87,370	Trace elemental study
	f. XRF	No. of samples	4.1.15a	4,200	50	2,10,000	
5.4	**Petrological / Mineralographic studies**						
	a) Preparation of thin section (Surface & BH)	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	
	c) Gemological study	Per sample	4.3.13	1,820	50	91,000	
	Sub-Total 5					**65,60,045**	
6	**Total (1 to 5)**					**4,56,87,116**	
7	**Geological Report Preparation**	Nos	5.2	A Minimum of Rs. 9 lakhs or 3% of the work	1	**13,70,613**	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.
8	**Preparation of Exploration Proposal**	**Nos**	**5.1**	2% or Rs. 500000 which is less	**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.
9	**Report Peer Review Charges**	**lumpsum**	**As per EC decision**	**30000**	**1**	**30,000**	
10	**Total Estimated Cost without GST (6+7+8+9)**					**4,75,87,729**	
11	**Provision for GST (18%)**					**85,65,791**	GST will be reimbursed as per actual and as per notified prescribed rate
12	**Total Estimated Cost with GST**					**5,61,53,520**	
					Say, Rs. in Lakhs	**561.54**	

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 execution of the project by EA on its own, a Certificate regarding non outsourcing of any component/project is required.