PROPOSAL FOR PRELIMINARY EXPLORATION (G-3)
FOR LIMESTONE IN
ADEGAON BLOCK
(5.35 SQ. KM AREA)
DISTRICT- YAVATMAL, MAHARASHTRA

COMMODITY: LIMESTONE

BY

MINERAL EXPLORATION AND CONSULTANCY LIMITED
DR. BABASAHAB AMBEDKAR BHAWAN
SEMINARY HILLS

PLACE: YAVATMAL

DATE: 6th JULY 2024

Summary for Preliminary Exploration (G-3) for limestone in Adegaon Block (5.35 sq.km area), District- Yavatmal, Maharashtra

	Features	Details
	Block ID	**Adegaon Limestone Block**
	Exploration Agency	Mineral Exploration and Consultancy Limited (MECL)
	Commodity	**Limestone**
	Mineral Belt	Penganga Beds or Penganga Series
	Budget & Time schedule to complete the project	106.41 lakhs & 12 months
	Objectives	Based on the geological data of 10(A) 2(B) cases, provided by DGM, Maharashtra in and around Adegaon Block, Dist-Yavatmal, Maharashtra, the present exploration programme for Preliminary Exploration (G-3) has been formulated. The objectives of the present Preliminary Exploration (G-3) are as follows: i) To carry out Topographical Survey and Geological & Structural mapping on 1:4000 scale. ii) To delineate depth continuity of limestone by drilling on 800m strike interval up to a vertical depth of 50m. iii) To assess the quality and quantity of the resources (333) as per UNFC norms & Minerals (Evidence of Mineral Contents) Rules- 2021. iv) The proposed exploration programme will be helpful in demarcating zone of various grades of limestone in the block as per UNFC norms and estimation of limestone resources which in turn will facilitate the State Govt. for auctioning of the block.
	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.
	Name/Number of Geoscientists	
	Expected Field days (Geology, Geophysics, Surveyor)	Geologist Party days: Field -120 days & HQ-60 days Survey Party days: 30 days Sampling Party days: 45 days

<table>
<tr><td>1.</td><td>Location</td><td>The proposed exploration block is located in Zari-Jamni Tehsil of Yavatmal district and about 130 km in south-east of district headquarter Yavatmal and about 30 km from tehsil headquarter Zari-Jamni. The area falls under the parts of Survey of India Toposheet No 56I/13 and is bounded by latitude 19° 48' 34.827" N to 19° 49' 50.696" N and longitude 78° 52' 38.965" E to 78° 54' 53.558" E (Plate No I).</td></tr>
<tr><td></td><td>Latitude and Longitude</td><td>
<table>
<tr><th colspan="8">Coordinates of Corner Points of Adegaon Block</th></tr>
<tr><th>Sl</th><th>Point</th><th>Latitude</th><th>Longitude</th><th>Sl</th><th>Point</th><th>Latitude</th><th>Longitude</th></tr>
<tr><td>1</td><td>A</td><td>19° 49' 47.706" N</td><td>78° 52' 42.007" E</td><td>7</td><td>G</td><td>19° 49' 0.074" N</td><td>78° 54' 27.817" E</td></tr>
<tr><td>2</td><td>B</td><td>19° 49' 42.567" N</td><td>78° 52' 49.037" E</td><td>8</td><td>H</td><td>19° 49' 10.521" N</td><td>78° 54' 13.295" E</td></tr>
<tr><td>3</td><td>C</td><td>19° 49' 42.041" N</td><td>78° 53' 14.575" E</td><td>9</td><td>I</td><td>19° 48' 57.570" N</td><td>78° 54' 12.519" E</td></tr>
<tr><td>4</td><td>D</td><td>19° 49' 50.696" N</td><td>78° 54' 15.202" E</td><td>10</td><td>J</td><td>19° 49' 0.234" N</td><td>78° 54' 0.228" E</td></tr>
<tr><td>5</td><td>E</td><td>19° 49' 20.177" N</td><td>78° 54' 53.558" E</td><td>11</td><td>K</td><td>19° 48' 34.827" N</td><td>78° 53' 46.237" E</td></tr>
<tr><td>6</td><td>F</td><td>19° 49' 5.793" N</td><td>78° 54' 50.404" E</td><td>12</td><td>L</td><td>19° 49' 15.853" N</td><td>78° 52' 38.965" E</td></tr>
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</td></tr>
<tr><td></td><td>Villages</td><td>Adegaon, Mukutban, Chilai, Ganeshpur, Tundra, yedsi, Amlan</td></tr>
<tr><td></td><td>Tehsil/Taluk</td><td>Zari-Jamni</td></tr>
<tr><td></td><td>District</td><td>Yavatmal</td></tr>
<tr><td></td><td>State</td><td>Maharashtra</td></tr>
<tr><td>2.</td><td>Area (hectares/ square kilometres)</td><td></td></tr>
<tr><td></td><td>Block Area</td><td>5.35 sq. km</td></tr>
<tr><td></td><td>Forest Area</td><td>Forest and Non-Forest area</td></tr>
<tr><td></td><td>Government Land Area</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>3.</td><td>Accessibility</td><td></td></tr>
<tr><td></td><td>Nearest Rail Head</td><td>The nearest railhead is Wani in Central Region which is about 35 km north of the block.</td></tr>
<tr><td></td><td>Road</td><td>The block area is well connected to district headquarter Yavatmal, by all weather metalled road from the MH SH237 and MH SH 234 via Ghatanji and Pandharkawada.</td></tr>
<tr><td></td><td>Airport</td><td>The nearest airport is Dr. Babasaheb Ambedkar International Airport, Nagpur (about 170 km).</td></tr>
<tr><td>4.</td><td>Hydrography</td><td></td></tr>
<tr><td></td><td>Local Surface Drainage Pattern (Channels)</td><td>The general slope of the country is towards south, south-east and east. The southerly and south-easterly flowing drainages are collected by easterly flowing Penganga River. However, the easterly flowing drainages are collected by southerly flowing Vidarbha River, which ultimately goes to Penganga River. The area has got dendritic pattern of drainage.</td></tr>
<tr><td></td><td>Rivers/ Streams</td><td>Vidarbha River towards east of the block and Penganga River towards south of the block.</td></tr>
<tr><td>5.</td><td>Climate</td><td></td></tr>
<tr><td></td><td>Mean Annual Rainfall</td><td>Average annual rainfall is about 100 cm</td></tr>
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<table>
<tr><td></td><td>Temperature:</td><td>Minimum temperatures: below 13°C (December-January),
Maximum temperatures: up to 46°C (April-May)</td></tr>
<tr><td>6.</td><td>Topography</td><td></td></tr>
<tr><td></td><td>Toposheet Number</td><td>56I/13</td></tr>
<tr><td></td><td>Morphology of the Area</td><td>The proposed block area covered under undulating terrain (hilly as well as flat terrain) with a gentle southerly, south-easterly and easterly slope. The most of the block area belongs to agriculture land. The average elevation ranges from 220m to 230 m above MSL. The southerly and south-easterly flowing drainages are collected by easterly flowing Penganga River. However, the easterly flowing drainages are collected by southerly flowing Vidarbha River, which ultimately goes to Penganga River. The area has got dendritic pattern of drainage.</td></tr>
<tr><td>7.</td><td>Availability of baseline geoscience data</td><td></td></tr>
<tr><td></td><td>Geological Map (1:50K/25K)</td><td>1:25,000 (NGDR)</td></tr>
<tr><td></td><td>Geochemical Map</td><td>Not available.</td></tr>
<tr><td></td><td>Geophysical Map (Aeromagnetic, ground geophysical, Regional as well as local scale GP maps)</td><td>Not available.</td></tr>
<tr><td>8.</td><td>Justification for taking up Preliminary Exploration</td><td>i) The Adegaon Limestone block is formulated on the basis of lapsed lease areas by State Government of Maharashtra in and around Adegaon village of Zari-Jamni Tehsil, Yavatmal, Maharashtra, which was granted as per section 10(A) 2(B) of the MMDR Act-15.

ii) The Directorate of Geology and Mining (DGM), Government of Maharashtra, Yavatmal requested MECL to take up the exploration in lapsed 10(A) 2(B) mining lease areas vide letter no. Tech/1848/2023/3938, dated 22/12/2023.

iii) During 24-04-2003 to 23-04-2005, M/s D. Pateria has carried out the prospecting in Adegaon area (0.28 sq.km.) with sinking of 10 pits and analysis of 2 samples. They have established 2.20mt limestone resource in the block area. The analysis of the samples is given below.

<table>
<tr><th>Sample No.</th><th>CaO%</th><th>MgO%</th><th>SiO_2%</th><th>LOI%</th></tr>
<tr><td>I</td><td>31.60</td><td>21.20</td><td>2.10</td><td>40.40</td></tr>
<tr><td>II</td><td>29.10</td><td>17.40</td><td>10.20</td><td>39.80</td></tr>
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iv) Similarly, during 2006, M/s. Ashutosh Minerals has carried out the prospecting in the area (0.10 sq.km.) with sinking of 5 pits & 3 DTH boreholes and analysis of 8 samples. They have established 2.26mt limestone resource in the block area. The analysis of the samples is given below.

Grade	CaO%	MgO%	SiO_2%	Fe_2O_3%	LOI%
Min.	47.8	2.27	2.75	0.48	40.06
Max.	51.25	2.86	8.33	0.67	42.51

v) During 24-04-2003 to 23-04-2005, M/s. Rajani Minerals has carried out the prospecting in the area (0.35 sq.km.) with sinking of 10 pits and analysis of 3 samples. They have established 2.26mt limestone resource in the block area. The analysis of the samples is given below.

Sample No.	CaO%	MgO%	SiO_2%	Fe_2O_3%	Al_2O_3	LOI%
TP-6	49.78	2.28	1.09	-	-	45.80
TP-8	42.00	3.50	9.28	5.98	1.01	-
TP-9	40.00	3.50	8.88	8.17	2.03	-

vi) M/s. Radhey Minerals has carried out the prospecting in the area (0.42 sq.km.) with sinking of 9 pits and analysis of 4 samples. They have established 0.89mt limestone resource in the block area. The analysis of the samples is given below.

Sample No.	CaO%	MgO%	SiO_2%	Fe_2O_3%	LOI%
TP-1	33.61	18.4	1.13	0.47	44.53
TP-2	48.14	3.20	5.52	0.43	40.89
TP-3	33.33	18.30	2.38	029	45.25
TP-9	52.10	1.50	2.26	0.37	43.20

vii) M/s. S.K. Sarmokdam has carried out the prospecting in the area (0.095 sq.km.) with sinking of 10 pits and analysis of 3 samples for limestone. They have established 0.26mt limestone resource in the block area.

Sample No.	CaO %	MgO %	SiO_2 %	Fe_2O_3 %	LOI %	$CaCO_3$ %	$MgCO_3$ %
8	48.10	10.90	2.80	2.95	41.88	56.84	8.15
9	47.20	10.52	2.62	2.65	42.99	57.23	8.20
10	48.23	10.24	2.30	2.45	42.83	57.30	8.99

		viii) Considering the request of DGM, Maharashtra, available exploration data and demand of limestone, MECL has planned to carry out exploration in the Adegaon Block and proposed Preliminary Exploration (G-3) exploration in block to fulfil the demand of limestone in the country.

PROPOSAL FOR PRELIMINARY EXPLORATION (G-3) FOR LIMESTONE IN ADEGAON BLOCK (5.35 SQ. KM AREA) DISTRICT- YAVATMAL, MAHARASHTRA

1.0.0 INTRODUCTION

1.1.0 Preamble:

1.1.1 Limestone is a sedimentary rock composed mainly of calcium carbonate ($CaCO_3$) in the form of the mineral calcite. About 10% of sedimentary rocks are limestone and most cave systems are through limestone bedrock. Limestone often contains magnesium carbonate, either as dolomite [$CaMg(CO_3)_2$] or magnesite [MgCO3] mixed with calcite. Such rocks are termed as 'dolomitic' or 'magnesian' limestone.

1.1.2 The total reserves/resources of limestone of all categories and grades as per NMI database based on UNFC system as on 1.4.2020 has been estimated at 2,27,589 million tonnes, of which 19,028 million tonnes (8%) are placed under Reserves category and 208,560 million tonnes (92%) are under Remaining Resources category. Karnataka is the leading State having 24% of the total resources followed by Andhra Pradesh (13%), Rajasthan (12%), Gujarat (10%), Meghalaya (10%), Telangana (7%), Chhattisgarh (5%) and Madhya Pradesh (4%). The remaining 15% is shared by other states. Grade-wise, Cement grade (Portland) has leading share of about 68% followed by Unclassified grades (11%) and BF grade (6%). The remaining 15% is shared by various other grades (Mineral Year Book-2022).

1.1.3 On enactment of MMDR Amendment Act 2015, Minerals (Evidence of Mineral Contents) Rules 2015 and Mineral Auction Rules-2015, Govt. of India directed State Governments to speed up exploration work for different Mineral Commodities in the respective states and put them for auction. Recently, some rules in the MMDR Act-15 have been amended which facilitates the state Govt. to auction the blocks with lower confidence level of exploration and put more and more blocks on auction. Accordingly, State Government of Maharashtra, requested to MECL to take up exploration through National Mineral Exploration Trust (NMET) funding mechanism in the lapsed lease areas by state govt. granted as per section 10(A) 2(B) of the MMDR Act-15 in and around Adegaon vide letter no. Tech/1848/2023/3938, dated 22/12/2023.

1.1.4 Considering the request of DGM, Maharashtra, available data and demand of limestone, MECL has proposed Preliminary Exploration (G-3) exploration in Adegaon Block to fulfil the demand of limestone in the country.

1.2.0 Background:

1.2.1 In view of the enactment of the MMDR Amendment Act, 2015 and Mineral Auction Rule, 2015 by the Govt. of India, the State administration of Maharashtra desired that some mineral prospects of the State be explored on priority basis through National Mineral Exploration Trust (NMET) fund so that those could be auctioned and thereby earn revenue for the state along with the augmentation of reserve and resource of the country. Limestone occurrence areas in Yavatmal district of Maharashtra are among them.

1.2.2 The Adegaon Limestone block covers the lapsed lease area by State Government of Maharashtra, which was granted as per section 10(A) 2(B) of the MMDR Act-15. The Directorate of Geology and Mining (DGM), Government of Maharashtra, Yavatmal requested to MECL to take up the exploration in lapsed 10(A) 2(B) mining lease areas vide letter no. Tech/1848/2023/3938, dated 22/12/2023.

1.2.3 Based on the request of DGM, Maharashtra, available data and demand of limestone, MECL has proposed Preliminary Exploration (G-3) exploration in Adegaon Block.

1.3.0 Location& Accessibility of the Area

The proposed exploration block is located in Zari-Jamni Tehsil of Yavatmal district and about 130 km in south-east of district headquarter Yavatmal and about 30 km from tehsil headquarter Zari-Jamni. The area falls under the parts of Survey of India Toposheet No 56I/13 and is bounded by latitude 19° 48' 34.827" N to 19° 49' 50.696" N and longitude 78° 52' 38.965" E to 78° 54' 53.558" E (Plate No I).

The coordinate of cardinal points of block boundary are as follows:

Coordinates of Corner Points of Adegaon Block							
Sl	Point	Latitude	Longitude	Sl	Point	Latitude	Longitude
1	A	19° 49' 47.706" N	78° 52' 42.007" E	7	G	19° 49' 0.074" N	78° 54' 27.817" E
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The block area is well connected to district headquarter Yavatmal, by all weather metalled road from the MH SH237 and MH SH 234 via Ghatanji and Pandharkawada. The nearest railhead is Wani in Central Region which is about 35 km north of the block. The nearest airport is Dr. Babasaheb Ambedkar International Airport, Nagpur (about 170 km).

1.4.0 Physiography, Drainage, Climate and Vegetation

1.4.1 The proposed block area covered under undulating terrain (hilly as well as flat terrain) with a gentle southerly, south-easterly and easterly slope. The most of the block area belongs to agriculture land. The average elevation ranges from 220m to 230 m above MSL. The southerly and south-easterly flowing drainages are collected by easterly flowing Penganga River. However, the easterly flowing drainages are collected by southerly flowing Vidarbha River, which ultimately goes to Penganga River. Vidarbha River lies towards east of the block and Penganga River towards south of the proposed block. The area has got dendritic pattern of drainage.

1.4.2 The area experiences moderately dry and wet climate. The temperature rises from March onwards, reaching maximum up to 46°C during April-May. The winter sets from November and lasts upto February. Winter is moderate, temperature dropping below 13°C with occasional colder days. The monsoon sets in July and continues up to September, most of the rainfall occurs during the months of July and August. The annual rainfall in the area is about 100 cm.

1.4.3 The local verities like Shal, Babul and thorny bushes, shrubs are main vegetation in the area. Apart from the above agricultural lands are there where one time crop is being cultivated. Wildlife in the area includes fox, wolf, monkeys, hare (Lepusreficaudatus) and both poisonous and non-poisonous snakes. Domesticated cattles are ox, buffalo, cow, sheep and goat are in villages in and around the block. Birds like myna, parrot, sparrow, cuckoo and owl are seen in the area.

1.5.0 Previous Work

1.5.1 The earliest mention of limestone is by Jenkin (1833) and Voysey (1833) dealing with the geology and mineralogy of the Yavatmal area, Central provinces. The geology of the area was first studied by T.W.H. Hughes, in the year 1877 who mapped the limestone bands as Penganga beds in south of Yavatmal district as Vindhyans. B.N. Sinha mapped the toposheet no 56 I/13. Later workers like A.K.R. Hemmady (1964) considered the Penganga beds to be representing transitional state between Vindhyan and Cuddapah. R.K. Agarwal and V Subba Rao of Geological Survey of India, carried out systematic geological mapping in parts of toposheet no 56 I /09, 56 I/13 and 56 I/14 in field season 1984-85 and mapped the limestone bands as Penganga beds.

1.5.2 During 24-04-2003 to 23-04-2005, M/s D. Pateria has carried out the prospecting in Adegaon area (0.28 sq.km.) with sinking of 10 pits and analysis of 2 samples. They have established 2.20mt limestone resource in the block area. The analysis of the samples is given below.

Sample No.	CaO%	MgO%	SiO_2%	LOI%
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1.5.3 Similarly, during 2006, M/s. Ashutosh Minerals has carried out the prospecting in the area (0.10 sq.km.) with sinking of 5 pits & 3 DTH boreholes and analysis of 8 samples. They have established 2.26mt limestone resource in the block area. The analysis of the samples is given below.

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1.5.5 M/s. Radhey Minerals has carried out the prospecting in the area (0.42 sq.km.) with sinking of 9 pits and analysis of 4 samples. They have established 0.89mt limestone resource in the block area. The analysis of the samples is given below.

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1.5.6 M/s. S.K. Sarmokdam has carried out the prospecting in the area (0.095 sq.km.) with sinking of 10 pits and analysis of 3 samples for limestone. They have established 0.26mt limestone resource in the block area.

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10	48.23	10.24	2.30	2.45	42.83	57.30	8.99

1.6.0 Regional Geology

1.6.1 Geologically, the area presents a variety of geological units right from Archean to Recent. The Proterozoic Pakhal basin extends in NW-SE direction for ~350 km along the Pranhita-Godavari valley from Telangana state in SE to Maharashtra in NW. The Proterozoic sedimentary rocks in the Pranhita-Godavari (PG) valley are exposed along two NW-SE trending parallel belts separated by a medial strip of Gondwana rocks. The south-western belt extends from Khammam in the southeast to Adilabad in the northwest and extends further into Maharashtra state. (Amarsinghe et al., 2015). The north-eastern belt extends from the north of Bhadrachalam in the southeast to beyond Chandrapur, Maharashtra in the north-west Heron (1949) defined the succession that straddles the northern part of the outcrop belt along the southwestern flank of the valley as Pengnaga Series. Chaudhuri et al; (1989) redefined it as Penganga Group, and established its stratigraphic succession in the type area around Adilabad (Table 4.1) The Penganga group comprises of a shallow-marine siliciclastic and a deep-water carbonate-shale dominated succession in the vicinity of Adilabad town, and has been classified in to three formations, the Pranhita sandstone, Chanda Limestone and the Satnala shale, in the ascending order (Chaudhuri et al; 1989). The Pakhal basin includes unmetamorphosed and unfossiliferous sediments of the Pakhal supergroup, unconformably overlain by the rocks of Penganga and Sullavai groups. Conglomerates, arkose, shale, dolomite and quartzites characterize the Pakhals, while arkose and limestone characterize the Pengangas and sandstone characterizes the Sullavais.

Formation	Member	Interval	Dominant Lithology
SATNALA SHALE			Thin-bedded, monotonous chocolate brown shale, intercalated off-white layers.
CHANDA LIMESTONE	Brown heterolithic member (15m)		Alteration between reddish brown shale and Thin beds of brown limestone. Shale content and thickness of beds increase upwards.
	Bilari Member	Upper steel-grey Limestone (30m)	Medium to thin bedded steel-grey limestone.
		Black Limestone (30m)	A heterolitic unit of thin-bedded black limemustone and marl.
		Lower steel-grey Limestone (20m)	Massive, medium to thick bedded (10 to 30cm) steel grey limemudstone with stratiform Stylolites.
	Ramai Member	Grey siliceous limestone (105m)	Siliceous limestone, cream to grey, hard, resistant limestone, medium to thin bedded limemudstone, lime clast conglomerates, calcarenites, and pebbly mudstone with at least two horizons of interstratified bedded chert and mn ore, lower 25m is light grey to cream limemudstone with a few mixed carbonate siliciclastic debris flow beds.
	Bhimsari Member	Pink Limestone (45m)	Massive, medium to thick-bedded pink, dolomitic limemudstone with stratiform stylolites. Stratiform dolomites formed locally. A few beds of mass-flow lime-clast conglomerates.
		Brown Limestone (62m)	Massive, medium to thick-bedded Limemudstone with stratiform stylolites,lower few meters with dem-scale brown limestone-shale heterolithic and brown shale. A few beds of mass-flow conglomerates. A lenticular body of glauconitic sandstone of mass-flow origin at the lower part.
PRANHITA SANDSTONE		Shale member (15m)	Thin laminated green mudstone grading upwards to brown shale.
		Sandstone member (20m)	Cross-stratified, well sorted subarkose
		----------UNCONFORMITY----------	
		Granitic Basement	

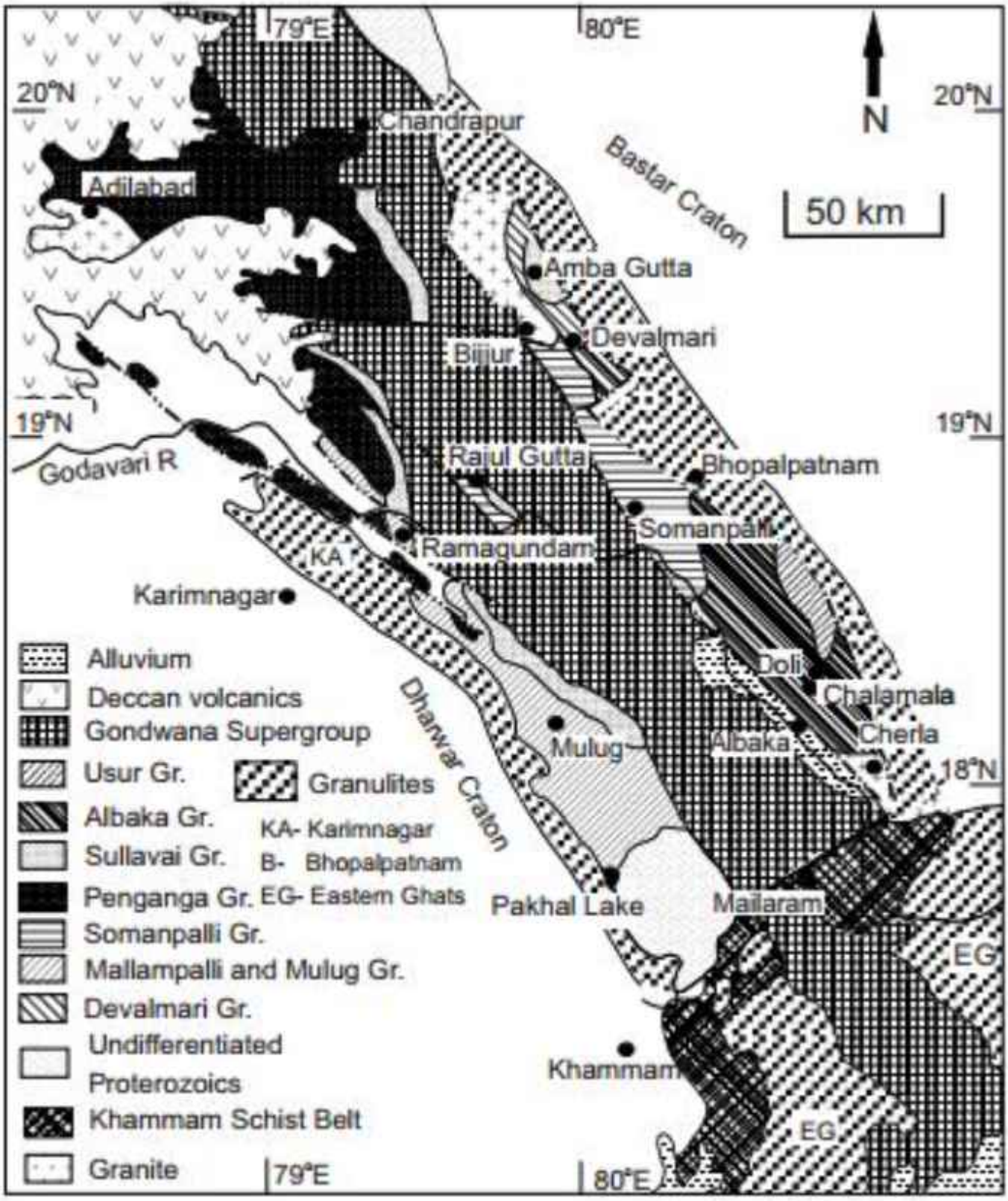

Figure-1: Generalised Geological Map of the Pranhita Godavari (PG) Valley (After Chaudhuri et al. 2012)

1.6.5 Geology of the block area

The rock type of the block area mainly belongs to Penganga group of Meso to Neo Proterozoic age. The Rb-Sr age determination from the lower part of the succession yielded two results 770± 30Ma and 790± 30 Ma (Chaudhuri et al. 1989). The major lithologies observed in the area are Chanda Limestone and Satnala Shale. The Chanda limestone formation (limestone, dolomitic limestone and dolomites) is predominantly a bedded lithographic limestone (Chauduri et al., 1989; Bose and Sarkar, 1991; Bandopadhyay, 1996 and Mukhopadhyay et. al., 1997). The limestone grades upwards to thinly laminated brown shale, the Satnala Shale. The Satnala Shale formation is the thickest of all units in this group, and attains a thickness of about 2000 m at some profiles. The shale is devoid of any siliciclastics coarser than mud and lacks wave/current generated structures suggesting its deposition in deep basinal condition (Mukhopadhyay et. al., 2003).

The stratigraphic sequence of the rock formations in the region is as follows:

Decccan Trap	Basalt Lava flow
Lameta group (Lower Cretaceous)	Argillaceous sand stone and cherty limestone
Lower Gondwana (Permo-carboniferous)	Sandstone
Penganga Beds (Pre-cambrian)	Limestone and Dolomite

In the proposed area the rocks comprising only the limestone and dolomite of Penganga Beds are present. However, these rocks are covered with 0.3m alluvial soil.

Alluvial Soil:
Alluvial soil is pale brown in colour and is formed due to decomposition of Deccan Trap. It is found to occur as a thin layer at places. The average thickness of alluvial soil is varying from 0.3m to 0.6m.

Limestone:
The limestone is fine grained, massive, ash grey to blackish in colour. It occurs mostly in massive beds, averaging a thickness of about 10m. It is characterized by lateral as well as vertical variation from limestone to dolomite. Limestone and dolomite with very local thin inter banding of chert.

The structure of the limestone as seen in the trial pits as well as in the adjoining working pits is fairly simple. The limestone formation in the proposed area exhibits gentle dip maintain a strike line of ENE-WSW (also East-West) with dips 10° to 20° towards south. The strikes and angles of dip are measured from the outcrops and as well as from the trial pits. At places the limestone sequence is marked by thinning and thickening of beds. The limestone well jointed with most joints filled with calcareous/clays matter.

Dolomite:

There are also sample exposures of Dolomite deposit in the southern part of the proposed area. The dolomite deposit is also maintaining the same strike line and dip direction as that of limestone deposit in the area. The angle of dip varies from 10° to 20° towards south. The dolomite deposit is also medium to coarse grained with brownish shade in colour.

1.7.0 Scope of Proposed Exploration

1.7.1 The proposed Preliminary Exploration (G-3 stage) program comprises topographical survey (1:4,000 scale), geological mapping (1:4,000 scale), trenching and drilling of about 350m with associated survey, chemical analysis& physical analysis and geological report preparation.

1.8.0 Observation and Recommendations of previous work

1.8.1 The Adegaon Limestone block is formulated on the basis of lapsed lease areas by State Government of Maharashtra in and around Adegaon village of Zari-Jamni Tehsil, Yavatmal, Maharashtra, which was granted as per section 10(A) 2(B) of the MMDR Act-15. The area was earlier explored by the lessees and all the lessees reported the limestone in the area.

2.0.0 Previous Work / Background information

2.0.1 The background information and previous works have been described in para 1.2.0 and 1.5.0 respectively.

3.0.0 Block description

3.0.1 The proposed block details are given in para 1.3.0.

4.0.0 Objective of the proposed Preliminary Exploration (G-3):

4.1.0 Based on the geological data of 10(A) 2(B) cases, provided by DGM, Maharashtra in and around Adegaon Block, Dist- Yavatmal, Maharashtra, the present exploration programme for Preliminary Exploration (G-3) has been formulated.

4.2.0 The objectives of the present Preliminary Exploration (G-3) are as follows:

i) To carry out Topographical Survey and Geological & Structural mapping on 1:4000 scale.

ii) To delineate depth continuity of limestone by drilling on 800m strike interval up to a vertical depth of 50m.

iii) To assess the quality and quantity of the resources (333) as per UNFC norms & Minerals (Evidence of Mineral Contents) Rules- 2021.

iv) The proposed exploration programme will be helpful in demarcating zone of various grades of limestone in the block as per UNFC norms and estimation of limestone resources which in turn will facilitate the State Govt. for auctioning of the block.

5.0.0 Planned Methodology

5.1.0 In accordance to the objective set for Preliminary Exploration (G-3) of the block, the exploration programme is proposed. The Exploration shall be carried out as per Minerals (Evidence of Mineral Contents) Rule-2015. Accordingly, the following scheme of exploration is formulated in order to achieve the objectives. The details of different activities to be carried out are presented in subsequent paragraphs.

5.2.0 Surveying:

5.2.1 The block area would be tied up with the triangulation network and contouring/ topographical survey will be updated in the entire block area of 5.35 sq.km. The surface features in the block area will be picked up and marked on the map on 1:4,000 scale. The reduced levels and co-ordinates of boreholes, trenches and boundary coordinates would be determined. The contouring will be carried out at 2m interval. The exploratory boreholes and block boundary (total 19 points) shall be surveyed by DGPS and total station in WGS-84 datum, for demarcation of block boundary/corner point's.

5.3.0 Geological Mapping:

5.3.1 Detailed Geological mapping on 1:4,000 scale will be carried out in the entire block area. The rock types, their contact, structural features, mineralisations etc. will be mapped by taking traverses and will be marked on the map. Surface manifestations of the mineralisation available along with their surface disposition will also be marked on the map.

5.6.0 Exploratory Drilling:

5.6.1 The present scheme for limestone exploration includes 350m drilling in 07 no of boreholes with an average depth of 50 m. In the proposed block, vertical boreholes are planned at 800m strike interval with vertical depth of 50m to establish the subsurface dimension of limestone deposit.

5.7.0 Drill Core Logging

5.7.1 The borehole cores would be logged systematically; viz. details of the litho units, colour, structural feature, texture etc. On the basis of these parameters, grade of limestone can be broadly presented and it will also be helpful in sampling.

5.8.0 Drill Core Sampling

5.8.1 Primary samples will be drawn at 1m interval subject to change in lithology and core recovery. The following parameters shall be considered while sampling the drill cores.

1) Colour, grain size.
2) Fossil variation.
3) Thin intercalations of shale/siltstone.
4) Partially weathered zone.

5.8.2 For preparation of samples the borehole core will be longitudinally split into two equal halves by using core splitter. One half will be powdered to -200 mesh size and the other half will be kept for future studies. The powdered material will be mixed thoroughly and about 100 gm of samples will be taken for chemical analysis by successive coning and quartering as primary samples and rest of the material (-200 mesh size) will be kept as duplicate half for future reference. All primary and check samples will be analysed for 09 radicals i.e., CaO, MgO, SiO_2, Fe_2O_3, Al_2O_3, SO_3, P_2O_5, K_2O & LOI by XRF.

5.8.3 Total 320 numbers of primary samples are likely to be generated for Limestone. This includes 300 core samples and 20 bedrock samples. Around 10% of Primary samples (32 numbers) will be sent to NABL External Labs for analysis of 9 radicals i.e., CaO, MgO, SiO_2, Fe_2O_3, Al_2O_3, SO_3, P_2O_5, K_2O & LOI by XRF as external check samples.

5.9.0 Petrological Studies

5.9.1 Thin section study on drill cores samples would be done for ascertaining the petrographic characteristics. These samples would be drawn from ore zones and host rocks. A provision of 5 specimens for petrographic study has been kept in the block.

5.10.0 Bulk Density Determination

5.10.1 A provision of 5 samples for bulk density determination has been kept.

5.11.0 Quantum of work:

5.11.1 The quantum of work proposed by MECL in Adegaon Limestone (G-3) Block is given in Table-5.1.

Table-5.1: Proposed Quantum of Exploratory Work in Adegaon Limestone Block District-Yavatmal, Maharashtra

Sl. No.	Item of Work	Unit	Proposed Quantum of work
1	Topographical Survey (1:4000)	sq. km	5.35
2	Geological Mapping (1:4000)	sq. km	5.35
3	Core Drilling	m.	350
4	Sample Preparation & Chemical Analysis		
	i) Primary samples for 9 radicals i.e., CaO, MgO, SiO_2, Fe_2O_3,	Nos.	320

Sl. No.	Item of Work	Unit	Proposed Quantum of work
	Al_2O_3, SO_3, P_2O_5, K_2O & LOI by XRF		
	ii) External Check sample (10% of Primary samples) for 9 radicals i.e., CaO, MgO, SiO_2, Fe_2O_3, Al_2O_3, SO_3, P_2O_5, K_2O & LOI by XRF	Nos.	32
6	Petrographic Studies	Nos	5
8	Bulk Density Determination	Nos	5
9	Report Preparation (Digital format)	Nos.	1

6.0.0 Manpower Deployment

6.0.1 Manpower deployment List may be provided later.

7.0.0 Break-up of Expenditure

7.1.0 The proposed exploration programme is planned for Preliminary Exploration (G-3). The work activities like camp setting, geological work, survey work, drilling & laboratory work, report writing will be completed within 12 months' time. The bar chart showing activities wise time schedule is placed at **Table-7.1.**

Table-7.1.

Time schedule for G-3 Level Exploration for Limestone in Proposed Adegaon Block, Dist-Yavatmal, Maharashtra

Sl. No.	Activities	Unit	MONTHS											
			1	2	3	4	5	6	7	8	9	10	11	12
1	Camp Setting	Month	■											
2	Surface Drilling (1 rig)	m.			■	■	■							
3	Survey Party days (1 Party)	day		■	■		■							
4	Geologist Party days in field (1 Party)	day		■	■	■	■	■						
5	Sampling Party days, Core Sampling (1 party)	day				■	■	■						
6	Camp Winding	Month							■					
7	Laboratory Studies	Nos.						■	■	■	■			
8	Geologist Party days in HQ (1 Party)	day							■	■	■	■	■	■
9	Geological Report Writing with Peer Review	Month							■	■	■	■	■	■

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

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

7.2.0 Tentative cost has been estimated based on Schedule of Charges (SoC) of projects funded by National Mineral Exploration Trust (NMET) w.e.f. 01/04/2020 and the total estimated cost is **Rs. 104.18 Lakh.** The summary of tentative cost estimates for Preliminary Exploration is given in **Table No.-7.2** and details of tentative cost estimates are given as Annexure-I.

Table No-7.2: Summary of Tentative Cost Estimates for Preliminary Exploration (G-3) in Adegaon Limestone Block, District-Yavatmal, Maharashtra

SL. NO.	ITEM	ESTIMATED COST (Rs.)
1	Drilling	37,54,730
2	Geology & Survey	29,39,415
3	Laboratory	15,29,025
	Sub Total (1 to 3)	**82,23,170**
4	Exploration Report	4,11,159
5	Proposal Preparation	1,64,463
6	Peer Review Charges	30,000
	Grand Total	**88,28,792**
	GST 18%	15,89,183
	Total:	**1,04,17,974**
	Say Rs. in Lakhs	**104.18**

8. 0.0 Justification:

i) The Adegaon Limestone block is formulated on the basis of lapsed lease areas by State Government of Maharashtra in and around Adegaon village of Zari-Jamni Tehsil, Yavatmal, Maharashtra, which was granted as per section 10(A) 2(B) of the MMDR Act-15.

ii) The Directorate of Geology and Mining (DGM), Government of Maharashtra, Yavatmal requested MECL to take up the exploration in lapsed 10(A) 2(B) mining lease areas vide letter no. Tech/1848/2023/3938, dated 22/12/2023.

iii) During 24-04-2003 to 23-04-2005, M/s D. Pateria has carried out the prospecting in Adegaon area (0.28 sq.km.) with sinking of 10 pits and analysis of 2 samples. They have established 2.20mt limestone resource in the block area. The analysis of the samples is given below.

Sample No.	CaO%	MgO%	SiO_2%	LOI%
I	31.60	21.20	2.10	40.40
II	29.10	17.40	10.20	39.80

iv) Similarly, during 2006, M/s. Ashutosh Minerals has carried out the prospecting in the area (0.10 sq.km.) with sinking of 5 pits & 3 DTH boreholes and analysis of 8 samples. They have established 2.26mt limestone resource in the block area. The analysis of the samples is given below.

Grade	CaO%	MgO%	SiO_2%	Fe_2O_3%	LOI%
Min.	47.8	2.27	2.75	0.48	40.06
Max.	51.25	2.86	8.33	0.67	42.51

v) During 24-04-2003 to 23-04-2005, M/s. Rajani Minerals has carried out the prospecting in the area (0.35 sq.km.) with sinking of 10 pits and analysis of 3 samples. They have established 2.26mt limestone resource in the block area. The analysis of the samples is given below.

Sample No.	CaO%	MgO%	SiO_2%	Fe_2O_3%	Al_2O_3	LOI%
TP-6	49.78	2.28	1.09	-	-	45.80
TP-8	42.00	3.50	9.28	5.98	1.01	-
TP-9	40.00	3.50	8.88	8.17	2.03	-

vi) M/s. Radhey Minerals has carried out the prospecting in the area (0.42 sq.km.) with sinking of 9 pits and analysis of 4 samples. They have established 0.89mt limestone resource in the block area. The analysis of the samples is given below.

Sample No.	CaO%	MgO%	SiO_2%	Fe_2O_3%	LOI%
TP-1	33.61	18.4	1.13	0.47	44.53
TP-2	48.14	3.20	5.52	0.43	40.89
TP-3	33.33	18.30	2.38	029	45.25
TP-9	52.10	1.50	2.26	0.37	43.20

vii) M/s. S.K. Samokdam has carried out the prospecting in the area (0.095 sq.km.) with sinking of 10 pits and analysis of 3 samples for limestone. They have established 0.26mt limestone resource in the block area.

Sample No.	CaO %	MgO %	SiO_2 %	Fe_2O_3 %	LOI %	$CaCO_3$ %	$MgCO_3$ %
8	48.10	10.90	2.80	2.95	41.88	56.84	8.15
9	47.20	10.52	2.62	2.65	42.99	57.23	8.20
10	48.23	10.24	2.30	2.45	42.83	57.30	8.99

9. 0.0 References:

Agarwal R.K.,V Subbarao 1986; Geology of parts of Yavatmal and Chandrapur district, Maharashtra, Geological Survey of India.

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Chaudhuri, A.K., Deb, G.K., Deb, S.P., Sarkar, S., 2012, "The Palaeozoic and Tectonic Evolution of the Pranhita- Godavari valley, Central India: A stratigraphic perspective", American Journal of Science, Vol. 312, pp. 766-815.

Guntiwar V.S., Samji R.N. 1986, Report on prospecting for limestone in Jawra-Tulsi area, Tah Rajura, Chandrapur District Maharashtra, Directorate of Geology and Mining, Maharashtra

Mukhopadhyay Joydip, Chaudhuri Asru K., 2003, "Stratigraphy of the Chanda limestone of the Proterozoic Penganga Group, Adilabad, Andhra Pradesh: New light on Depositional setting and Paleogeography",Journal Geological Society of India, Vol.62, Sept 2003, pp. 356-358.

M/s. Aashutosh Minerals; Report on Prospecting of Adegaon Calcite, Limestone & Dolomite Deposit, Village- Aegaon, Dist-Yavatmal, Maharashtra.

M/s. D.Pateria; Prospecting Report of Adegaon Limestone & Dolomite Deposit, Village-Aegaon, Dist-Yavatmal, Maharashtra.

M/s. Radhey Minerals Ltd.; Prospecting Report of Adegaon Limestone & Dolomite Deposit, Village- Aegaon, Dist-Yavatmal, Maharashtra.

M/s. Rajani Minerals; Prospecting Report of Adegaon Limestone & Dolomite Deposit, Village-Aegaon, Dist-Yavatmal, Maharashtra.

M/s. S. K. Sarmakdam; Geological & Prospecting Report of Limestone & Dolomite in Aegaon, Tah. Jhari-Jamni, Dist-Yavatmal, Maharashtra.

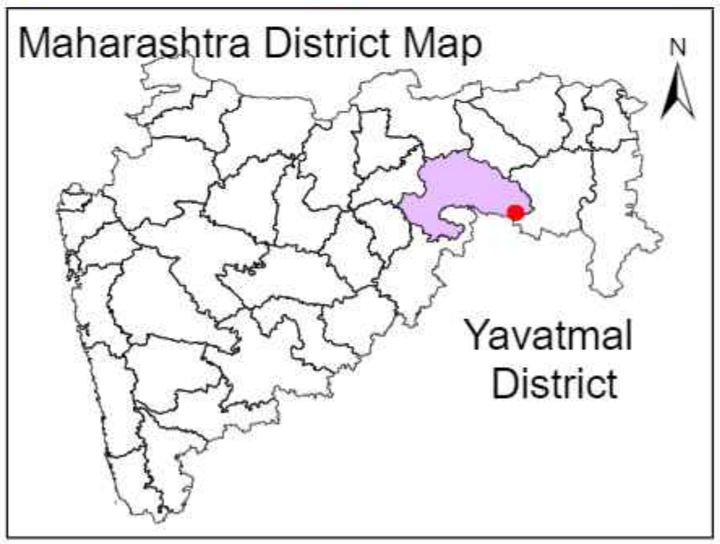
List of Plates:

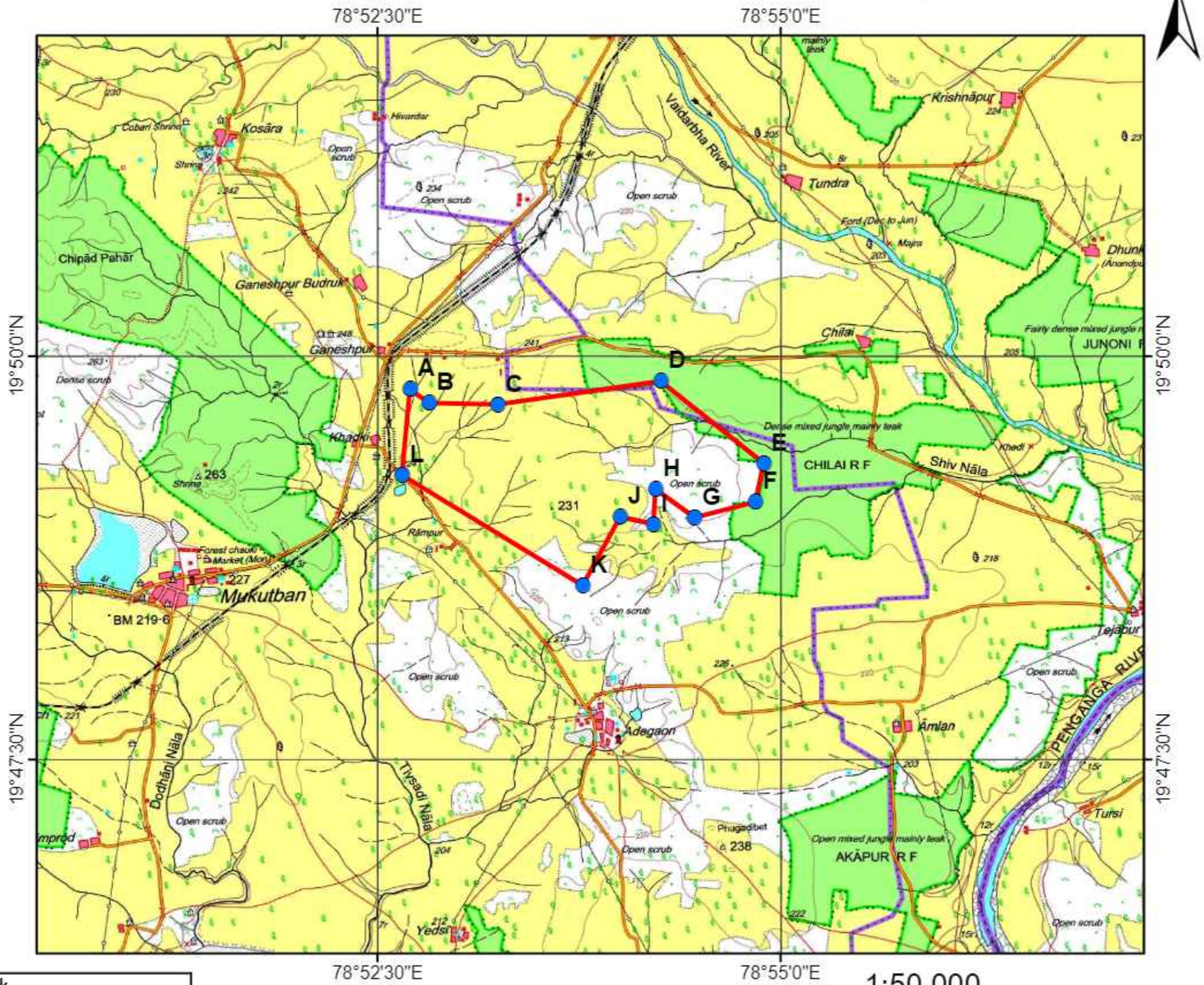
1. Plate-I: Block Location Map of Adegaon Block in Toposheet no. 56I/03, District-Yavatmal, Maharashtra.
2. Plate-II: Regional Geological Map of the area (Scale 1: 50,000)
3. Plate-III: Geological Map of the block (Scale 1: 25,000)
4. Plate-IV: Borehole plan along with Geological Map of the block (Scale 1: 25,000)

List of Annexures:

1. **Annexure-I:** Details of the total cost estimatedfor the Preliminary Exploration (G-3) in Adegaon Block, District-Yavatmal, Maharashtra.

Location Map showing Proposd Adegaon Block (5.35 sq km), Zarizamni Tehsil, Yavatmal District, Maharashra





Coordinates of Corner Points of Adegaon Block							
Sl	Point	Latitude	Longitude	Sl	Point	Latitude	Longitude
1	A	19° 49' 47.706" N	78° 52' 42.007" E	7	G	19° 49' 0.074" N	78° 54' 27.817" E
2	B	19° 49' 42.567" N	78° 52' 49.037" E	8	H	19° 49' 10.521" N	78° 54' 13.295" E
3	C	19° 49' 42.041" N	78° 53' 14.575" E	9	I	19° 48' 57.570" N	78° 54' 12.519" E
4	D	19° 49' 50.696" N	78° 54' 15.202" E	10	J	19° 49' 0.234" N	78° 54' 0.228" E
5	E	19° 49' 20.177" N	78° 54' 53.558" E	11	K	19° 48' 34.827" N	78° 53' 46.237" E
6	F	19° 49' 5.793" N	78° 54' 50.404" E	12	L	19° 49' 15.853" N	78° 52' 38.965" E

Legend

PLATE- I

Corner Points of Adegaon Block

Proposed Adegaon Block Boundary

Source: Part of Toposheet No. 56I/13

Regional Geology Map showing Proposd Adegaon Block (5.35 sq km), Zarizamni Tehsil, Yavatmal District, Maharashra

N

78°52'30"E
78°55'0"E
78°57'30"E

19°57'30"N
19°55'0"N
19°52'30"N
19°50'0"N
19°47'30"N

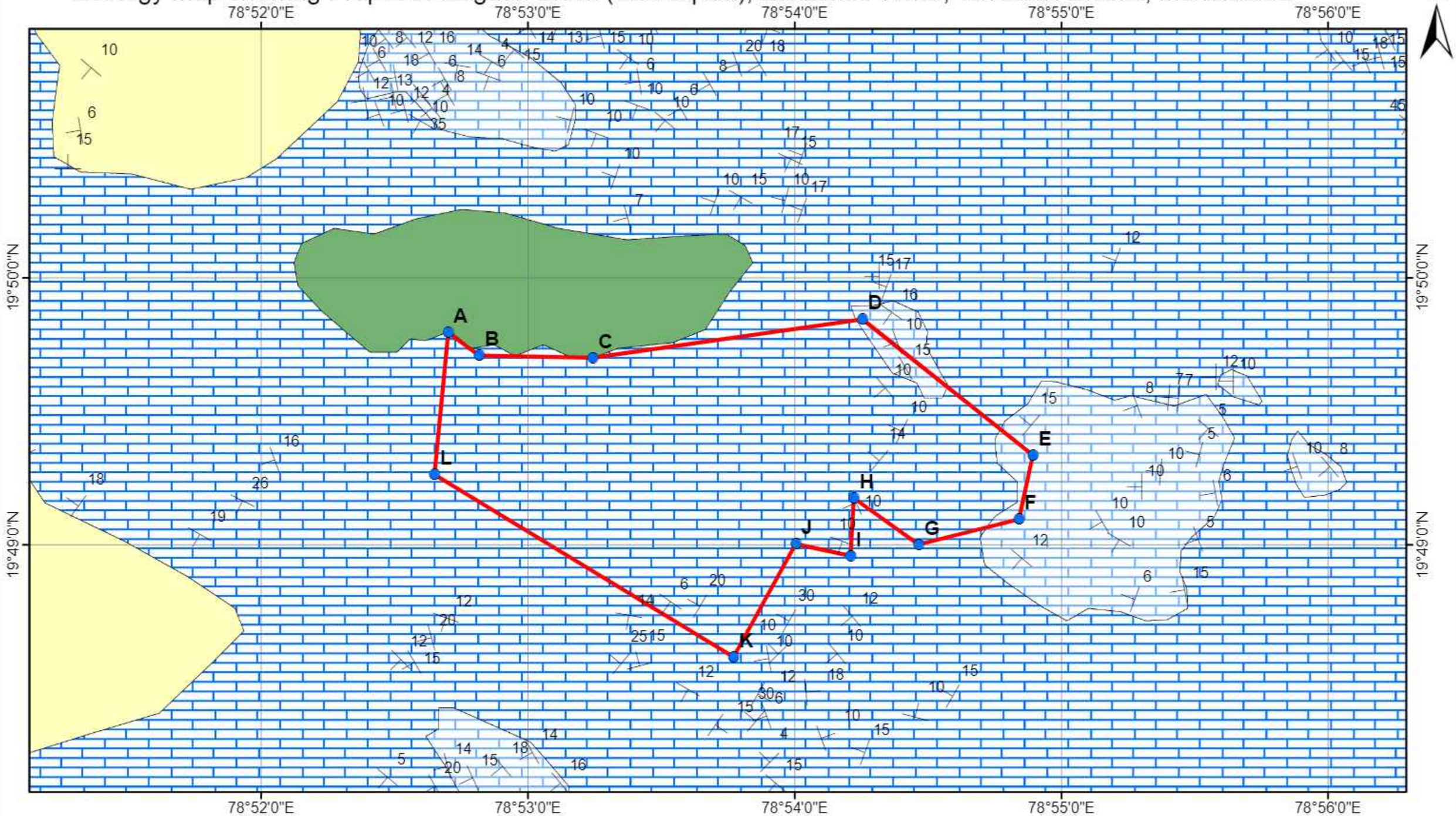
Legend

- Proposed Adegaon Block
- Basalt
- Limestone
- Sandstone
- Sandstone and Palaeosol
- Satnala Shale
- Shale of Pranhita Sandstone
- Stromatolitic Limestone
- Bedding (S0)
- Vertical Bedding
- Vertical Joint

1:50,000

0 0.5 1 2 3 4 Kilometers

Geology Map showing Proposd Adegaon Block (5.35 sq km), Zarizamni Tehsil, Yavatmal District, Maharashra



Legend

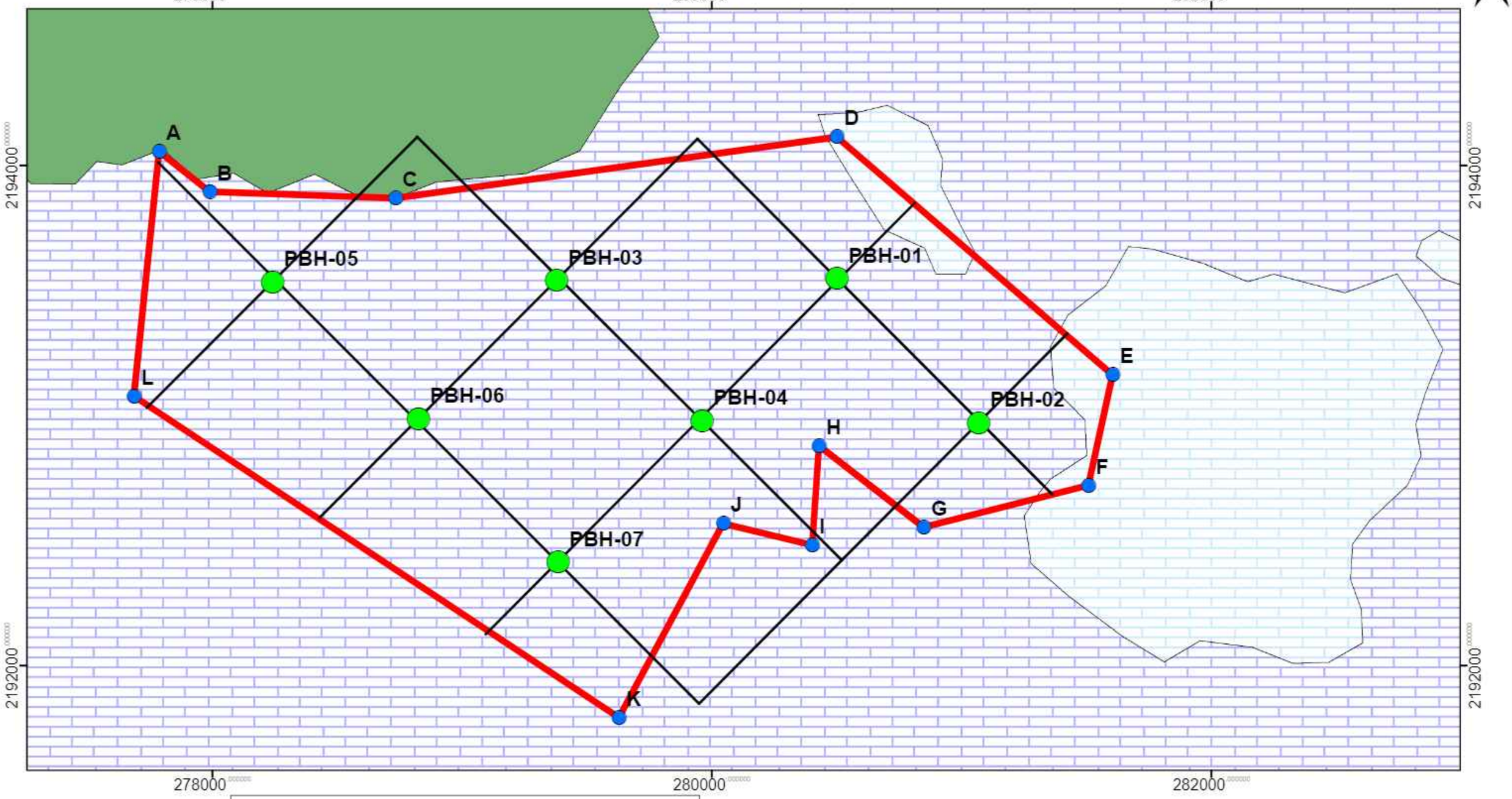
- Corner Points of Adegaon Block
- Proposed Adegaon Block Boundary
- Basalt
- Limestone
- Sandstone
- Stromatolitic Limestone
- Bedding (S0)

1:25,000

0 0.25 0.5 1 1.5 2 Kilometers

PLATE- III

Borehole plan in 800 m grid interval for Proposed Adegaon Block (5.35 sq km), Zarizamni Tehsil, Yavatmal District, Maharashra



Legend

- Corner Points of Adegaon Block
- Proposed Adegaon Block Boundary
- 800 m grid interval
- Borehole Location

Lithology

- Basalt
- Limestone
- Stromatolitic Limestone

1:15,000

0 0.15 0.3 0.6 0.9 1.2 Kilometers

PLATE- IV

TABLE- 1: COST SHEET FOR G-3 LEVEL EXPLORATION FOR LIMESTONE IN PROPOSED ADEGAON BLOCK, DISTRICT- YAVATMAL, MAHARASHTRA

Total Area - 5.35 Sq Km; Nos. of Borehole - 07; Borehole depth range - 50m (BGL); Completion Time - 12 Months

S.N	Item of Work	Unit	Rates as per NMET SoC 2020-21		Estimated Cost of the		Remarks
			SoC-Item -Sl No.	Rates as per SoC	Qty.	Total Amount (Rs)	
A	**GEOLOGICAL WORK**						
1	**Mapping (1:4000), Borhole logging & Sampling & Report writing**						
a	Charges for one Geologist per day at HQ	day	1.3a	9,000	60	5,40,000	
b	Charges for one Geologist per day at field	day	1.3b	11,000	120	13,20,000	
c	Labour for Geologist (2 Nos)	day	5.7	522	240	1,25,280	Amount will be reimburse as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher
d	Charges for one Sampler per day (1 Party)	one sampler per day	1.5.2	5,100	42	2,14,200	
e	Labours for sampling work (4 Nos)	day	5.7	522	135	70,470	Amount will be reimburse as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher
2	**Survey (on 1:4000 Scale)**						
a	Bore Hole Fixation and determination of co-ordinates & Reduced Level of the boreholes and block cardinal points by DGPS	Per Point of observation	1.6.2	19,200	19	3,64,800	Block cardinal point- 12 Borehole- 7
b	Charges of one Surveyor (1 Party)	one surveyor per day	1.6.1a	8,300	30	2,49,000	Contouring at 2m interval
c	Labours (4 Nos)	day	5.7	522	120	62,640	Amount will be reimburse as per the notified rates by the Central Labour Commissioner or respective State Govt. whichever is higher
	Sub-Total A					**29,46,390**	
B	**DRILLING**						
1	Drilling -Soft rock	m	2.2.1.1b	7,168	350	25,08,800	MoC Rate
2	Land / Crop Compansation (in case the BH falls in agreecultural Land)	per BH	5.6	20,000	7	1,40,000	Amount will be reimburse as per actuals or max. Rs. 20000 per BH with certification from local authorities
3	Construction of concrete Pillar (12"x12"x30")	per borehole	2.2.7a	2,000	7	14,000	
4	Transportation of Drill Rig & Truck associated per drill	Km	2.2.8	36	400	14,400	To & fro
5	Monthly Accomodation Charges for drilling Camp (up to 1 Rigs)	month	2.2.9	50,000	3	1,50,000	
6	Drilling Camp Setting Cost	Nos	2.2.9a	2,50,000	1	2,50,000	
7	Drilling Camp Winding up Cost	Nos	2.2.9b	2,50,000	1	2,50,000	
8	Road Making (Flat Terrain)	Km	2.2.10a	22,020	4	88,080	Road Making will be considered as per the requirement and Road Making Charges will be reimbursed accordingly.
9	Drill Core Preservation	per m	5.3	1,590	320	5,08,800	
	Sub Total B					**39,24,080**	
C	**LABORATORY STUDIES**						
1	**Chemical Analysis**						
i)	**Primary samples**						
	a. For 9 radicals i.e. CaO, MgO, Al2O3, SiO2, Fe2O3, SO3, P2O5, K2O and LOI by XRF	Nos	4.1.15a	4,200	320	13,44,000	
ii)	**External Check samples (10%)**						
	a. For 9 radicals i.e. CaO, MgO, Al2O3, SiO2, Fe2O3, SO3, P2O5, K2O and LOI by XRF	Nos	4.1.15a	4,200	32	1,34,400	

S.N	Item of Work	Unit	Rates as per NMET SoC 2020-21		Estimated Cost of the		Remarks
			SoC-Item -Sl No.	Rates as per SoC	Qty.	Total Amount (Rs)	
iii)	**Petrological samples (Bh Core Samples)**						
i	Preparation of thin section	Nos	4.3.1	2,353	5	11,765	
ii	Study of Thin Section	Nos	4.3.4	4,232	5	21,160	
iv)	**Bulk Density Determination**						
	Bulk Density	No.	4.1	3,540	5	17,700	
	Total - C					**15,29,025**	
D	**Sub Total (A to C)**					**83,99,495**	
E	**Geological Report Preparation**		**5.2**	For the projects exceeding Rs. 50 Lakhs but less than 150 Lakhs: A Minimum of Rs. 2.5 lakhs or 5% of the work whichever is more		**4,19,975**	EA has to submit the final Geological Report in Hard Copies (5 Nos) and soft copy to NMET
F	**Preparation of Exploration Proposal (5 Hard copies with a soft copy)**	**5 Hard copies with a soft copy**	**5.1/28th EC**	2% of the Cost or Rs. 5.0 Lakhs whichever is lower		**1,67,990**	EA has to submit the Hhard copies and soft copies of final proposal along with maps and plan as suggested by the TCC-NMET in its meeting while clearing the proposal.
G	**Peer review Charges**		**As per EC decision**			**30,000**	Cost Estimated for two peer review of 2 blocks seperately (Naddisinur-1 and Naddisinur-2 Blocks)
H	**Total Estimated Cost without GST**					**90,17,460**	
I	**Provision for GST (18% of H)**	**%**				**16,23,143**	GST will be reimburse as per actual and as per notified prescribed rate
J	**Total Estimated Cost with GST**					**1,06,40,602**	
				or Say Rs. In Lakhs		***106.41***	

Note - If any part of the project is outsourced, the amount will be reimbursed as per the Paragraph 3 of NMET SoC and Item no. 6 of NMET SoC. In case of execusion of the project by NEA on its own, a Certifiate regarding non outsourcing of any component/project is required.