PROPOSAL FOR PRELIMINARY EXPLORATION (G-3)
FOR KYANITE AND SILLIMANITE IN
MALDA BLOCK
(2.1 SQ. KM AREA)
DISTRICT- BHANDARA AND GONDIA, MAHARASHTRA

COMMODITY: KYANITE AND SILLIMANITE

BY

MINERAL EXPLORATION AND CONSULTANCY LIMITED

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SEMINARY HILLS

PLACE: NAGPUR

DATE: FEBRUARY 2025

Summary for Preliminary Exploration (G-3 Stage) for Kyanite and Sillimanite in Malada Block (2.1 sq.km area), District- Bhandara and Gondia, Maharashtra

	Features	**Details**
	Block ID	**Malda Block**
	Exploration Agency	Mineral Exploration and Consultancy Limited (MECL)
	Commodity	**Kyanite and Sillimanite**
	Mineral Belt	Sakoli Fold Belt (SFB)
	Budget & Time schedule to complete the project	181.07 lakhs & 12 months
	Objectives	Based on the geological data of 10(A) 2(B) cases, provided by DGM, Maharashtra in and around Malda Block, Dist- Bhandara, 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 Geological & Structural mapping on 1:4000 scale for identification of kyanite-sillimanite bearing formation (host rock) with the structural features to identify the surface manifestation and lateral disposition of the kyanite-sillimanite zones. ii) To prepare the detailed surface map of the area by means of surface contouring at 2m interval in 1:4000 scale. iii) Trenching/pitting will be carried out in the mineralized zone identified by geological mapping and bedrock sampling to establish the continuity of the mineralization along strike direction, which is covered by soil. iv) To establish three dimensional dispositions of the earlier reported kyanite-sillimanite zones by means of drilling. v) To assess the quality and quantity of the resources (333) as per UNFC norms & Minerals (Evidence of Mineral Contents) Rules- 2021.
	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 -150 days & HQ-45 days
		Survey Party days: 30 days (for topographic survey)
		Sampling Party days: 30 days

<table>
<tr><td>1.</td><td>Location</td><td>The proposed exploration block is located in Lakhandur Tehsil of Bhandara district and Arjuni-Morgaon Tehsil of Gondia District. The district headquarters Bhandara and Gondia are located about 60km NNW and 90 km NNE from Malda respectively. The area falls under the parts of Survey of India Toposheet No 55P/13 and is bounded by latitude 20° 51' 46.18" N to 20° 52' 46.08" N and longitude 79° 54' 31.11" E to 79° 55' 17.78" E (Plate No I).</td></tr>
<tr><td></td><td>Latitude and Longitude</td><td>
<table>
<tr><th rowspan="2">Cardinal points</th><th colspan="2">WGS 84 (DMS)</th><th colspan="2">UTM Zone-44N</th></tr>
<tr><th>Latitude</th><th>Longitude</th><th>Easting (m)</th><th>Northing (m)</th></tr>
<tr><td>A</td><td>20° 52' 26.96" N</td><td>79° 54' 31.11" E</td><td>386476.445</td><td>2308605.576</td></tr>
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<tr><td>C</td><td>20° 52' 46.14" N</td><td>79° 55' 16.28" E</td><td>387785.735</td><td>2309186.292</td></tr>
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</td></tr>
<tr><td></td><td>Villages</td><td>Malda, Jhari, Sakri, Dighori Moti, Narwa</td></tr>
<tr><td></td><td>Tehsil/Taluk</td><td>Lakhandur Tehsil of Bhandara and Arjuni-Morgaon Tehsil of Gondia</td></tr>
<tr><td></td><td>District</td><td>Bhandara and Gondia</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>2.1 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 Bhandara in Central Region (about 60 km).</td></tr>
<tr><td></td><td>Road</td><td>The block area is well connected to district headquarters Bhandara and Gondia, by all weather metalled road from the NH-53 and NH-253 via Lakhani and Sakoli respectively.</td></tr>
<tr><td></td><td>Airport</td><td>The nearest Airport is Gondia at 100 km and Nagpur at120 km from the block.</td></tr>
<tr><td>4.</td><td>Hydrography</td><td></td></tr>
<tr><td></td><td>Local Surface Drainage Pattern (Channels)</td><td>The drainage pattern in the area is of dentritic type forming seasonal nalas. Most of the drainage (dentritic pattern) channels drain into northeast to southwest flowing Chulbund River.</td></tr>
<tr><td></td><td>Rivers/ Streams</td><td>The southerly flowing Chulband River flows in the northwestern part of the block area.</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 1300mm to 1600mm</td></tr>
<tr><td></td><td>Temperature:</td><td>Minimum temperatures: below 10°C (December-January),</td></tr>
</table>

		Maximum temperatures: up to 47°C (April-May)
6.	**Topography**	
	Toposheet Number	55P/3
	Morphology of the Area	The study area forms a flat land (peneplain) with some isolated low rising hilloks in southeast. The peneplain covering cultivated land and fairly dense mixed jungle/forest land at the hillocks. The altitude of the study area varies between 255m and 275m.
7.	**Availability of baseline geoscience data**	
	Geological Map (1:50K/25K)	1:25,000 (Bhukosh, Geological Survey of India)
	Geochemical Map	Not available.
	Geophysical Map (Aeromagnetic, ground geophysical, Regional as well as local scale GP maps)	Not available.
8.	**Justification for taking up Preliminary Exploration**	i) The Sakoli series of rocks in Bhandara district carry important deposits of kyanite-sillimanite associated with chlorite muscovite schists. Of these deposits, massive sillimanite deposits at Pohra occurring in a broad band of about 45 m. wide and extending over a length of 365 m. and the Dahegaon kyanite-sillimanite deposits extending over a length of nearly 4.5 km. in southerly direction up to Pipalgaon village are most important. ii) Besides the above two important deposits, there are also four or five belts of kyanite-sillimanite bearing rocks. At Girola the belt has a maximum thickness of 122'. Kyanite and sillimanite are also reported from Pardi, Mogra, Dighori, Garkhabhonga, and Miregaon villages. iii) Bhoskar (1978) of GSI carried out regional geological mapping (1:63,360), large scale mapping (1:2000), sampling (grab-channel, borehole core), pitting, trenching and drilling and reported 8 potential localities (hitherto unreported) of kyanite sillimanite and corundum in the area. iv) There are Sate Govt. and Private mining leases operating in the district. Out of which, 2 mining lease are present at the north-western boundary of the proposed block area. v) During 15-01-2003 to 14-01-2005, M/s S.S. Islam has carried out

		the prospecting for kyanite, sillimanite and corundom in Malda area (0.33 sq.km.). They have demarcated 2 kyanite zones in the area and established 9200 tonnes kyanite resource in the lapsed lease hold area. vi) 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 Malda village vide letter no. Tech/1848/2023/3938, dated 22/12/2023. The lapsed lease was granted to M/s S.S. Islam during 15-01-2003 to 14-01-2005 for 2 years. M/s S.S. Islam has carried out the prospecting for kyanite, sillimanite and corundom in Malda area (0.33 sq.km.). They have demarcated 2 kyanite zones in the area and established 9200 tonnes kyanite resource in the lapsed lease hold area. vii) The proposed Malda kyanite-sillimanite block is formulated on the basis of lapsed ease area in Malda and available data in and around the area. MECL has proposed Preliminary Exploration (G-3 stage) in Malda Block to assess the quality and quantity of the resources (333) as per UNFC norms & Minerals (Evidence of Mineral Contents) Rules- 2021, which will facilitate state government to auction the block.

PROPOSAL FOR PRELIMINARY EXPLORATION (G-3 STAGE) FOR KYANITE AND SILLIMANITE IN MALADA BLOCK (2.1 SQ.KM AREA) DISTRICT- BHANDARA AND GONDIA, MAHARASHTRA

1. INTRODUCTION

1.1.0 Preamble

1.1.1. Kyanite and sillimanite are anhydrous aluminosilicate minerals that have the same chemical formula Al_2O_3 but differ in crystal structure and physical properties. These are mainly used in refractories and ceramic products because of their ability to form mullite phase at high temperature. Synthetic mullite is an essential component of high-alumina refractories forming the inner lining of furnaces and high temperature vessels widely used in the production of metals, ceramics, glass and cement. Sillimanite refractory bricks are extensively used in steel and glass industries and also in ceramics, cement kilns, heat treatment furnaces and petrochemical industries.

1.1.2 The total reserves/resources of kyanite as per NMI database, based on UNFC system as on 1.4.2020 in the country has been placed at 105.68 million tonnes. Out of these resources, only 0.84 million tonnes are Reserves and 104.83 million tonnes are under Remaining Resources. State wise, share of Telangana is 45.75% of the total resources followed by Andhra Pradesh with 30.28%, Karnataka 12.46% and Jharkhand 7.22%. The remaining 3.69% resources are in Kerala, Maharashtra, Rajasthan, Tamil Nadu and West Bengal collectively. The consumption of kyanite in various industries was 7,700 tonnes in 2019-20 which is about 51% more than previous year. Nearly 88% consumption of kyanite was accounted for by the Refractory Industry and the remaining12% by other industries.

1.1.3 The total reserves/resources of sillimanite as per NMI database, based on UNFC system in the country as on 1.4.2020 has been placed at 72.26 million tonnes. Out of these resources, 8.26 million tonnes are under Reserves Category, while about 64.00 million tonnes are under the Remaining Resources. The resources are located mainly in Odisha (24.49%), Tamil Nadu (24.01%), Uttar Pradesh

(15.84%), Andhra Pradesh (15.32%), Kerala (9.58%) and Assam (6.38%). The remaining 4.38% resources are in Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Meghalaya, Rajasthan and West Bengal. The consumption of sillimanite was 23,400 tonnes in 2019-20, which is about 58% less than that of the previous year. Refractory Industry alone accounted for about 89% of consumption. Ceramic Industry (2%), Foundry Industry (5%) and Other Industries accounted for the rest.

1.1.4 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 Malda village vide letter no. Tech/1848/2023/3938, dated 22/12/2023.

1.1.5 Considering the request of DGM, Maharashtra, available data and demand of kyanite and sillimanite, MECL has proposed Preliminary Exploration (G-3 stage) in Malda Block to fulfil the demand of kyanite and sillimanite 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. The Kyanite-Sillimanite occurrence in Bhandara and Gondia district of Maharashtra are among them.

1.2.2 The Directorate of Geology and Mining (DGM), Government of Maharashtra, Nagpur requested to MECL to take up the exploration in Malda lapsed 10(A) 2(B) mining lease area vide letter no. Tech/1848/2023/3938, dated 22/12/2023. The Malda lapsed lease area covers an area of 0.33 sq.km near Malda village of Lakhandur Tehsil of Bhandara District. Maharashtra.

1.2.3 Subsequently, MECL studied the available geological data in and around Malda area and has selected an area of 2.1 sq.km. area to take up the further exploration. MECL has formulated a proposal for Preliminary Exploration (G-3) exploration for titaniferous magnetite in Khursipar Block.

1.3.0 Location & Accessibility of the Area

1.3.1 The proposed exploration block is located in Lakhandur Tehsil of Bhandara district and Arjuni-Morgaon Tehsil of Gondia District. The district headquarters Bhandara and Gondia are located about 60km NNW and 90 km NNE from Malda respectively. The area falls under the parts of Survey of India Toposheet No 55P/13 and is bounded by latitude 20° 51' 46.18" N to 20° 52' 46.08" N and longitude 79° 54' 31.11" E to 79° 55' 17.78" E (Plate No I).

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

Cardinal points	WGS 84 (DMS)		UTM Zone-44N	
	Latitude	Longitude	Easting (m)	Northing (m)
A	20° 52' 26.96" N	79° 54' 31.11" E	386476.445	2308605.576
B	20° 52' 38.96" N	79° 54' 49.67" E	387015.153	2308970.748
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E	20° 51' 46.22" N	79° 54' 33.55" E	386538.411	2307352.252

1.3.2 The block area is well connected to district headquarters Bhandara and Gondia, by all weather metalled road from the NH-53 and NH-253 via Lakhani and Sakoli respectively. The nearest railhead is Bhandara Road in Central Region which is about 60 km NNW of the block. The nearest Airport is Gondia at 100 km and Nagpur at120 km from the block.

1.4.0 Physiography, Drainage, Climate and Vegetation

1.4.1. The study area forms a flat land (peneplain) with some isolated low rising hilloks in southeast. The peneplain covering cultivated land and fairly dense mixed jungle/forest land at the hillocks. The altitude of the study area varies between 255m and 275m.

1.4.2 The drainage pattern in the area is of dentritic type forming seasonal nalas. Most of the drainage (dentritic pattern) channels drain into northeast to southwest flowing Chulbund River. The southerly flowing Chulband River flows in the northwestern part of the block area.

1.4.3 The average rainfall is 1300mm to 1600mm (Jun-Sep). The area comes within the semi-arid zone with temperature ranging from 10^0C to 47^0C.

1.5.0 Previous Work

1.5.1 The Kyanite-Sillimanite occurrences and the geology of this area were reported by Dunn (1929), Chatterjee and Bhattacharjee (1931-34), P.N. Dutta 1906-07 (in Pascoe 1973).

1.5.2 Gajbhiye (1962-64) and Adhikari (1972-73) carried out systematic geological mapping in recent years and studied a few of the known or reported kyanite/sillimanite occurrences.

1.5.3 Maharashtra State Department of Geology and Mining conducted prospecting work in Dahegaon-Pipalgaon and Pohra areas by way of large-scale mapping, trenching-pitting, sampling and drilling (vertical) during 1966-68 and 1973-74.

1.5.4 Bhoskar (1978) commenced the reappraisal programme for GSI by way of regional geological mapping (1:63,360), large scale mapping (1:2000), sampling (grab-channel, borehole core) pitting and trenching and drilling (inclined) in parts of Toposheet No. 55P/13 and 55P/14 in Dahegaon-Pipalgaon and adjoining areas. This resulted in location of 8 additional localities (hitherto unreported) of kyanite sillimanite and corundum.

1.5.5 During 15-01-2003 to 14-01-2005, M/s S.S. Islam has carried out the prospecting for kyanite, sillimanite and corundom in Malda area (0.33 sq.km.). The quantum of work during the prospecting includes 10 nos. of auger drilling, sinking of 14 trial pits and 3 trenches with analysed of 10 samples from outcrop, auger drill, trial pit and trenches. They have demarcated 2 kyanite zones in the area and established 9200 tonnes kyanite resource in the lapsed lease hold area. The analysis of the samples is given below.

Sample No.	Location	Analysis (Al_2O_3%)
MLD-1	Outcrop-1	60.23
MLD-2	Pit No.1	34.28
MLD-3	Pit No.2	32.80
MLD-4	Pit No.5	38.50
MLD-5	Pit No.9	40.12
MLD-6	Trench-1	48.09
MLD-7	Trench-3	51.12
MLD-8	Outcrop-2	57.45
MLD-9	Pit No.11	36.48
MLD-10	Hand Auger-8	35.20

2.0.0 Geology

2.1.0 Regional Geology

2.1.1 The proposed block falls in the eastern central part of the ñSakoli fold belt (SFB)ò. The SFB covering an area of 7000 sq km in eastern part of Maharashtra, defines a distinct triangular shaped structural outline within Central India Trust Zone (CITZ) or Central Indian Precambrian shield and was evolved through mutual interplay of the multiphase compressional/extensional tectonism. The SFB is located at the south-western margin of the CITZ along with the western margin of the South Indian cratonic terrain or Baster Craton. The litho units exposed in and around the region belong to the Amagaon Gnessic Complex (AGC) of Archaean-Paleoproterozic age, Sakoli Group of rocks of Mesoproterozoic age and laterite outcrops of Cainozoic age. The Kyanite-sillimanite bearing rocks form a

part of the Precambrian Sakoli Group. The Sakoli rocks forming a triangular out crop (Bhattacharjee 191-34 in Pasco-1973) in parts of Nagpur and Bhandara districts Maharashtra, have been termed as the Bhandara/Sakoli triangle.

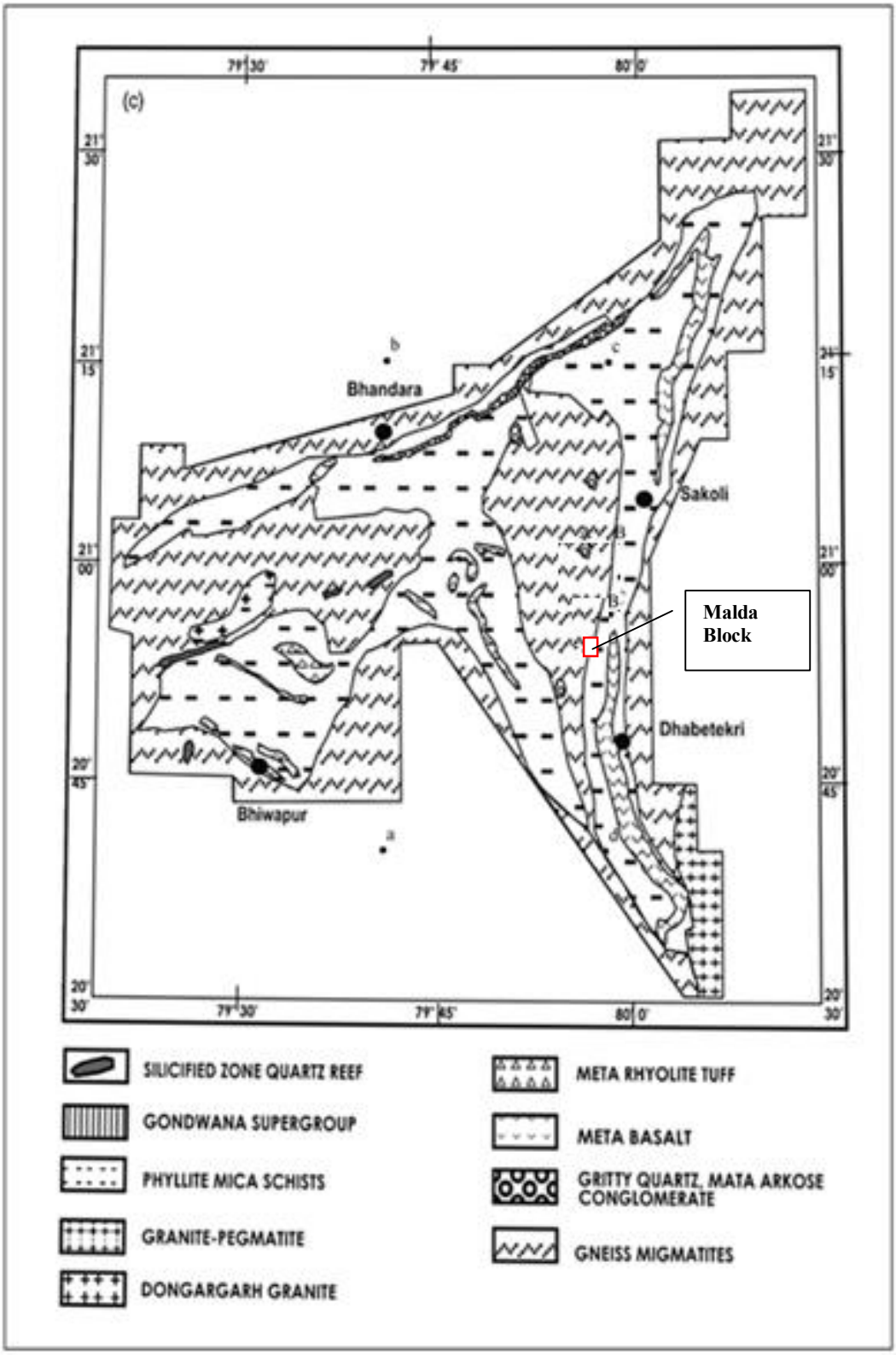
2.1.2 The regional stratigraphic succession of the litho-units (after GSI) is given below

Table I.A
Regional Stratigraphic sequence of Litho units (after GSI)

Age	Group	Litho-units
Holocene-Pleistocene (Quarternery)	Recent	Alluvium
Cainozoic		Laterite
Mesoproterozoic		Meta-gabbro, granite, silicified zone/quartz reef
	Sakoli Group	Cherty quartzite
		Meta-rhyolite/tuff
		Mica schist
		Phyllite, tuffaceous phyllite and carbonaceous phyllite
		Meta-basalt
		Banded Iron formation (BIF)
		Gritty quartizite, meta arkose and conglomerate
Archaean-Paleo Proterozoic	Amagaon Gneissic Complex (AGC)	Amphibolitie, Hornblede schist
		Quartzite, gritty quartzite
		Calc-silicate rock
		Granite gneisses

2.1.2. Regionally the area consists of Granite genies, calc silicates, quartzites, amphibolites and hornblede schists belonging to Amagaon Gneissic Complex (AGC) Sakoli Group of rocks comprise an litho assemblage of Gritty quartzite, Meta arkose and Conglomerate, Banded Iron formation (BIF), Meta-basalt, phyllite, tuffeceous phyllite and carbonaceous phyllite, Mica schist, Meta-rhyolite/tuff, Cherty quartzite. Sakoli Group of rocks is followed by Meta-gabbro, Granite, silicified zone/quartz reefs of Mesoprterozoic age. Laterite occurrences of Cainozoic age observed at places and followed by recent Quarternary sediments i.e. alluvium. Geological map of Sakoli Fold Belt (after Bandyopadyay et al 1995) is given in **Fig 1.A.**

Fig 1.A: Geological map of Sakoli Fold Belt (after Bandyopadhyay et al 1995)



2.2.0. Geology of the Block

2.2.1. The lithounits exposed in the block area mainly belongs to Mesoproterozoic Sakoli Group followed by Cainozoic (Laterite) and Quaternary sediments. The rocks in the area are generally associated with mica-quartz schists and / or kyanite-sillimanite bearing schists such as quartz-mica-kyanite-sillimanite schist. The rocks are exposed in the nallah cutting as well as the pits in the area. Microsection studies reveals that the rocks are very fine grained, feebly foliated, well banded with recrystallised quartz grains and fine mica flakes alternating. Bhoskar (1978) noticed minor kyanite associated with these rocks. Accessories include detrital tourmaline and magnetite grains.

2.2.2 The most of the part of the block area is covered with alluvium. The primary sedimentary structures are highly obliterated and are hardly preserved in the area. The secondary structure is foliation preserved in micaschist. The general trend of foliation (S1) varies from N-S with 60-70° dip towards east.

3.0.0 Mineral Potentiality based on geology, geophysics, ground geochemistry etc.

3.1.1 The Sakoli series of rocks in Bhandara district carry important deposits of kyanite-sillimanite associated with chlorite muscovite schists. Of these deposits, massive sillimanite deposits at Pohra occurring in a broad band of about 45 m. wide and extending over a length of 365 m. and the Dahegaon kyanite-sillimanite deposits extending over a length of nearly 4.5 km. in southerly direction up to Pipalgaon village are most important.

3.1.2 Besides the above two important deposits, there are also four or five belts of kyanite-sillimanite bearing rocks. At Girola the belt has a maximum thickness of 122'. Kyanite and sillimanite are also reported from Pardi, Mogra, Dighori, Garkhabhonga, and Miregaon villages.

3.1.3 Bhoskar (1978) of GSI carried out regional geological mapping (1:63,360), large scale mapping (1:2000), sampling (grab-channel, borehole core) pitting and trenching and drilling (inclined) in parts of Toposheet No. 55P/13 and 55P/14 in

Dahegaon-Pipalgaon and adjoining areas. They have reported 8 potential localities (hitherto unreported) of kyanite sillimanite and corundum in the area.

1.1.4 During 15-01-2003 to 14-01-2005, M/s S.S. Islam has carried out the prospecting for kyanite, sillimanite and corundom in Malda area (0.33 sq.km.). The quantum of work during the prospecting includes 10 nos. of auger drilling, sinking of 14 trial pits and 3 trenches with analysed of 10 samples from outcrop, auger drill, trial pit and trenches. They have demarcated 2 kyanite zones in the area and established 9200 tonnes kyanite resource in the lapsed lease hold area.

3.1.5 There are Sate Govt., Quasi-Govt. and Private mining leases operating in the district. Out of which, 2 mining leases are present at the north-western boundary of the proposed block area.

3.2.0. Scope of Proposed Exploration

3.2.1 The proposed Preliminary Exploration (G-3 stage) program comprises topographical survey (1:4,000 scale), geological mapping (1:4,000 scale), trenching, pitting and drilling of about 700m with associated survey, laboratory studies including chemical analysis & physical analysis and geological report preparation.

3.3.0 Observation and Recommendations of previous work

1.8.1 The Malda Kyanite and Sillimanite block is formulated on the basis of previous work carried by GSI and lapsed lease areas by State Government of Maharashtra in and around Malda village of Lakhandur Tehsil, Bhandara district, 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 they have reported kyanite and sillimanite in the area.

4.0.0 Previous Work / Background information

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

5.0.0 Block description

5.0.1 The proposed block details are given in para 1.3.0.

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

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

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

i) To carry out Geological & Structural mapping on 1:4000 scale for identification of kyanite-sillimanite bearing formation (host rock) with the structural features to identify the surface manifestation and lateral disposition of the kyanite-sillimanite zones.

ii) To prepare the detailed surface map of the area by means of surface contouring at 2m interval in 1:4000 scale.

iii) Trenching/pitting will be carried out in the mineralized zone identified by geological mapping and bedrock sampling to establish the continuity of the mineralization along strike direction, which is covered by soil.

iv) To establish three dimensional dispositions of the earlier reported kyanite-sillimanite zones by means of drilling.

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

7.0.0 Planned Methodology

7.1.0 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.

7.2.0 Surveying

7.2.1 The block area would be tied up with the triangulation network and contouring/ topographical survey will be updated in the entire block area of 2.1 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 15 points) shall be surveyed by DGPS and total station in WGS-84 datum, for demarcation of block boundary/corner points.

7.3.0 Geological Mapping

7.3.1 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 kyanite-sillimanite zones available along with their surface disposition will also be marked on the map.

7.4.0 Exploratory Mining (Trenching / Pitting):

7.4.1 During the exploration, shallow trenching/ pitting (excavation) work will be carried out by cutting trenches of 1m width and 2 m depth and by pitting 1m width and 2 m depth directly on the fresh outcrop/rock exposures across the kyanite-sillimanite bearing formations involving 150 cubic meter excavation. The trench walls will be mapped on 1:200 scale.

7.5.0 Geochemical/Trench Sampling

7.5.1 Surface sampling (Bedrock/Trench/Channel):

During the course of Geochemical Sampling the bedrock / trench / channel samples shall be collected from the outcrops or outcrops exposed by trenching. A total of 100 no of primary and 10 no of external check channel samples will be analyzed for major oxides i.e., SiO_2, Al_2O_3, Fe_2O_3, TiO_2, FeO, MnO, P_2O_5, CaO, MgO, Na_2O, K_2O and LOI.

7.6.0 Exploratory Drilling

7.6.1 Based on Geological Mapping and Trenching/ Pitting, the extension of the kyanite-sillimanite zones will be marked. To confirm the potentiality of kyanite-sillimanite zones in strike & dip direction, approximately 700.00 m of drilling (10 BHs) will be carried out for upper (first) level (30m vertical depth) of intersection of kyanite-sillimanite zones. The azimuth and angle of inclination of the proposed boreholes will be decided by the field geologist once the kyanite-sillimanite zones are deciphered after geological mapping and trenching/pitting.

7.7.0 Drill Core Logging

5.7.1 The borehole cores would be logged systematically; viz. details of the litho units, colour, structural feature, texture, mineralization, besides the recovery, rock quality designation (RQD) and kyanite-sillimanite zone would be recorded.

7.8.0 Drill Core Sampling

7.8.1 The mineralized part of drill core will be sampled as primary sample. The length of each sample will be kept 1.00 m within the mineralized zone depending upon the thickness of particular type of mineralisation and its physical characters such as intensity of mineralization, change in lithology and core recovery etc. The primary core samples will be analysed for major oxides i.e., SiO_2, Al_2O_3, Fe_2O_3, TiO_2, FeO, MnO, P_2O_5, CaO, MgO, Na_2O, K_2O and LOI.

a) A total of 100 no of primary core samples will be analysed for major oxides i.e., SiO_2, Al_2O_3, Fe_2O_3, TiO_2, FeO, MnO, P_2O_5, CaO, MgO, Na_2O, K_2O and LOI.

b) Around 10% of Primary samples (10 numbers) will be sent to NABL External Labs for analysis of major oxides i.e., SiO_2, Al_2O_3, Fe_2O_3, TiO_2, FeO, MnO, P_2O_5, CaO, MgO, Na_2O, K_2O and LOI as external check samples.

7.9.0 Petrological & Mineralogical Studies:

7.9.1. Thin section study on drill cores samples would be done for ascertaining the petrographic characteristics. These samples would be drawn from kyanite-sillimanite zones and host rocks. Modal analysis would be carried in all the Petrographic samples, for quantitative analysis of kyanite and sillimanite present in the sample. A provision of 10 specimens for petrographic study has been kept in the block.

7.9.2 A provision of 5 samples has been kept for the study of aspect ratio of kyanite.

7.10.0 Bulk Density Determination:

7.10.1. A provision of 05 samples for bulk density determination has been kept.

7.11.0 Proposed Nature Quantum and Target of Work

7.11.1. The quantum of work proposed by MECL for Kyanite sand Sillimanite in Malda Block (G-3) is given in Table-7.1.

Table-7.1: Proposed Quantum of Exploratory Work in Malda Block District-Bhandara and Gondia, Maharashtra

Sl. No.	Item of Work	Unit	Proposed Quantum of work
1	Topographical Survey (1:4000)	sq. km	2.1
2	Geological Mapping (1:4000)	sq. km	2.1
3	Exploratory Mining (Trenching/Pitting) (1m x 2m x75m)	Cu. m	150
4	Core Drilling	m.	700
5	Sample Preparation & Chemical Analysis		
A.	**Bedrock/Trench / Pit Samples**		
	i) Primary samples for major oxides i.e., SiO_2, Al_2O_3, Fe_2O_3, TiO_2, FeO, MnO, P_2O_5, CaO, MgO, Na_2O, K_2O and LOI	Nos.	100
	ii) External Check sample (10% of Primary samples) for major oxides i.e., SiO_2, Al_2O_3, Fe_2O_3, TiO_2, FeO, MnO, P_2O_5, CaO, MgO, Na_2O, K_2O and LOI	Nos.	10
B.	**Borehole Core Samples**		
	i) Primary samples for major oxides i.e., SiO_2, Al_2O_3, Fe_2O_3, TiO_2, FeO, MnO, P_2O_5, CaO, MgO, Na_2O, K_2O and LOI	Nos.	100
	ii) External Check sample (10% of Primary samples) for major oxides i.e., SiO_2, Al_2O_3, Fe_2O_3, TiO_2, FeO, MnO, P_2O_5, CaO, MgO, Na_2O, K_2O and LOI	Nos.	10
6	i) Petrographic Studies	Nos	10
	i) Modal Analysis	Nos	20
7	Aspect ratio for kyanite	Nos	10
8	Bulk Density Determination	Nos	5
9	Report Preparation (Digital format)	Nos.	1

8.0.0 Manpower Deployment

86.1.0 Manpower deployment List may be provided later.

9.0.0 Break-up of Expenditure

9.1.0 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 monthsô time. The bar chart showing activities wise time schedule is placed at Table-9.1.

Table-9.1

Estimated time schedule for Preliminary Exploration (G-3 Stage) for Kyanite and Sillimanite in Malada Block, District- Bhandara and Gondia, Maharashtra [Block area-2.1 sq. km; Schedule timeline- 12 months]																
S. No.	**Particulars**	**Months**	**1**	**2**	**3**	**4**	**5**		**6**	**7**	**8**	**9**	**10**	**11**	**12**	
1	Camp Setting	Months														1 month
2	Survey Party days (1 Party)	days														30 Days
3	Trenching / Pitting	cu.m														150 cu. m.
4	Drilling (2 rig)	m														700m
5	Geologist Party days (1 Party)	days														150 Days
6	Sampling days for Trench & Core Sampling (1 Party)	days														26 Days
7	Camp winding	Months														1 month
8	Laboratory Studies	days														5 months (239 samples)
9	Geologist days, HQ	days														45 days
10	Report Writing with Peer Review	days														4 months

9.2.0 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. 181.07 Lakh. The summary of tentative cost estimates for Preliminary Exploration is given in Table No.-9.2 and details of tentative cost estimates are given as Annexure-I.

Table No-9.2
Summary of Tentative Estimated cost for Preliminary Exploration (G-3 Stage) for Kyanite and Sillimanite in Malada Block, District- Bhandara and Gondia, Maharashtra

Sl. No.	Item	Total
1	Geological Work	30,29,040
2	Pitting & Trenching	4,99,500
3	Laboratory Studies	11,28,270
4	Drilling	96,56,050
	Sub total	**1,43,12,860**
5	Report	7,15,643
6	Peer Review	30,000
7	Proposal Preparation	2,86,257.20
	Total	**1,53,44,760**
8	GST (18%)	27,62,056.84
Total cost including 18% GST		**1,81,06,817**
SAY, in Lakhs		**181.07**

8.0.0 Justification

8.1.1 The Sakoli series of rocks in Bhandara district carry important deposits of kyanite-sillimanite associated with chlorite muscovite schists. Of these deposits, massive sillimanite deposits at Pohra occurring in a broad band of about 45 m. wide and extending over a length of 365 m. and the Dahegaon kyanite-sillimanite deposits extending over a length of nearly 4.5 km. in southerly direction up to Pipalgaon village are most important.

8.1.2 Besides the above two important deposits, there are also four or five belts of kyanite-sillimanite bearing rocks. At Girola the belt has a maximum thickness of 122'. Kyanite and sillimanite are also reported from Pardi, Mogra, Dighori, Garkhabhonga, and Miregaon villages.

8.1.3 Bhoskar (1978) of GSI carried out regional geological mapping (1:63,360), large scale mapping (1:2000), sampling (grab-channel, borehole core), pitting, trenching and drilling and reported 8 potential localities (hitherto unreported) of kyanite sillimanite and corundum in the area.

8.1.4 There are Sate Govt. and Private mining leases operating in the district. Out of which, 2 mining lease are present at the north-western boundary of the proposed block area.

8.1.5 During 15-01-2003 to 14-01-2005, M/s S.S. Islam has carried out the prospecting for kyanite, sillimanite and corundom in Malda area (0.33 sq.km.). They have demarcated 2 kyanite zones in the area and established 9200 tonnes kyanite resource in the lapsed lease hold area.

8.1.6 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 Malda village vide letter no. Tech/1848/2023/3938, dated 22/12/2023. The lapsed lease was granted to M/s S.S. Islam during 15-01-2003 to 14-01-2005 for 2 years. M/s S.S. Islam has carried out the prospecting for kyanite, sillimanite and corundom in Malda area (0.33 sq.km.). They have demarcated 2

kyanite zones in the area and established 9200 tonnes kyanite resource in the lapsed lease hold area.

8.1.7 The proposed Malda kyanite-sillimanite block is formulated on the basis of lapsed ease area in Malda and available data in and around the area. MECL has proposed Preliminary Exploration (G-3 stage) in Malda Block to assess the quality and quantity of the resources (333) as per UNFC norms & Minerals (Evidence of Mineral Contents) Rules- 2021, which will facilitate state government to auction the block.

8.1.0 References:

Adhikari S.D., (1973): Progress report on systematic geological mapping in parts of Bhandara District (MS) TS550/16) unpub. GSI report 1972-73.

Bhoskar K.G., (1979): Progress report on the reports of kyanite sillimanite deposites of Dahegaon-Pipalgaon and adjoining areas, Bhandara and Chandarapur districts (MS) Unpub. GSI report FS 1978-79.

Gajbhiye N.G., (1963): Geology of a portion of Sakoli and Bhandara taluka of Bhandara District in TS 55P/13. Progress report GSI 1963-64 (unpub).

M/s S.S. Islam: Prospecting report on 33.36-hectare area granted under prospecting license for minerals kyanite, sillimanite, corundum and associated minerals.

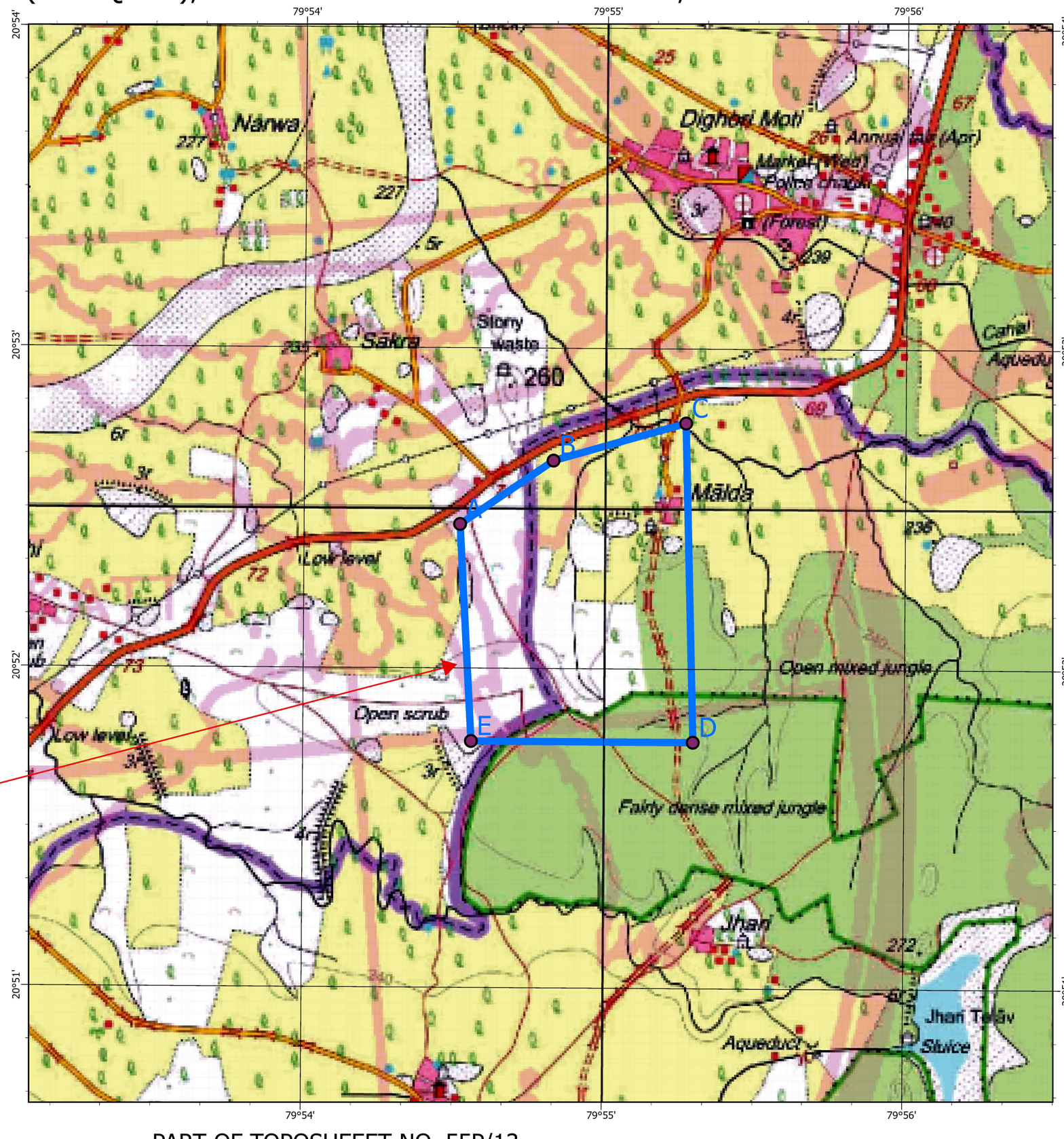
Pascoe E.H., (1973): A manual of geology of India and Burma Vol. I.

State Directorate of Geology and Mining Maharashtra., (1978) Maharashtra minerals.

List of Plates:

1. Plate-I: Block Location Map of Malda Block, Bhandara and Gondia District, Maharashtra.
2. Plate-II: Regional Geological Map with Located of Malda Block, Bhandara and Gondia District, Maharashtra.
3. Plate-III.A: Geological map of Malda Block, Bhandara and Gondia District, Maharashtra.

LOCATION MAP OF PROPOSED MALDA BLOCK (2.0 SQ.KM.), DISTRICT-BHANDARA AND GONDIA, MAHARASHTRA



PART OF TOPOSHEEET NO. 55P/13