PROPOSAL FOR RECONNAISSANCE SURVEY (G-4 STAGE) FOR GLAUCONITIC SANDSTONE IN PARSADA-NAWAPARA-GURUR BLOCK, DISTRICT- BALOD, CHHATTISGARH

(AREA 146.27 Sq. Km)

COMMODITY: GLAUCONITIC SANDSTONE

BY

MINERAL EXPLORATION AND CONSULTANCY LIMITED
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SEMINARY HILLS
NAGPUR, MAHARASHTRA

PLACE: NAGPUR
DATE: 18.04.2024

SUMMARY OF THE BLOCK FOR RECONNAISSANCE SURVEY (G-4 STAGE) FOR GLAUCONITIC SANDSTONE IN PARSADA-NAWAPARA-GURUR BLOCK, DISTRICT-BALOD, CHHATTISGARH

Features	Details
Block ID	PARSADA-NAWAPARA-GURUR
Exploration Agency	Mineral Exploration and Consultancy Limited (MECL)
Commodity	GLAUCONITIC SANDSTONE
Mineral Belt	The proposed exploration block falls in southern part of Chhattisgarh Basin. Chandarpur Group of rocks belonging to Chhattisgarh Super Group of Meso-Neo proterozoic age are well exposed in the proposed block. The block is predominantly occupied by Lohardih sandstone of Chandarpur Group of lower Chhattisgarh Supergroup developed in southwestern and central part of the block. Kansapathar sandstone of Chandarpur Group is present in the eastern part of the block which is Glauconite bearing. Instances of glauconite are also present in Lohardih sandstone. Parsada-Nawapara-Gurur block is a part of Glauconitic sandstone Belt situated in the Balod Distt., Chhattisgarh and falls in the Survey of India Toposheet no. 64H/06.
Completion period with entire Time schedule to complete the project	15 Months
Objectives	The exploration scheme of Parsada-Nawapara-Gurur G4 block for Glauconitic sandstone is formulated with the following objectives: 1.To carry out Geological & structural mapping on 1:12,500 scale for demarcation of Glauconitic sandstone with the structural features to identify the surface manifestations and lateral and vertical disposition of the mineralized zones. 2.To collect surface samples including bedrock, channel and Trench samples & to analyze for Glauconite to shape up for further course of exploration program. 3. Pitting / trenching will be done to expose the concealed host rock and mineralization. 4.If phase-I exploration data will give anamolous values, 10 Nos. boreholes on 1600m grid spacing, may be drilled. 5.To estimate resources as per UNFC norms Minerals (Evidence of Mineral Contents) Amendment Rules 2021. 6.To upgrade the block to the higher level of exploration.
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	Nos. of Geoscientists: 2
Expected Field days (Geology, Geophysics, surveyor)	Geologist Party days: 180 (At field) & 60 at HQ
	Survey Party days: 15

1.	**Location**	
	Latitude - Longitude	<table><tr><td rowspan="2">Cardinal Point</td><td colspan="2">UTM Zone 44N (m)</td><td colspan="2">DD° MM' SS"</td></tr><tr><td>Easting</td><td>Northing</td><td>Latitude</td><td>Longitude</td></tr><tr><td>A</td><td>526025</td><td>2294480</td><td>N 20° 44' 59.28"</td><td>E 81° 15' 00"</td></tr><tr><td>B</td><td>535134</td><td>2293300</td><td>N 20° 44' 20.40"</td><td>E 81° 20' 15"</td></tr><tr><td>C</td><td>552073</td><td>2287350</td><td>N 20° 41' 05.28"</td><td>E 81° 30' 00"</td></tr><tr><td>D</td><td>552083</td><td>2284290</td><td>N 20° 39' 25.92"</td><td>E 81° 30' 00"</td></tr><tr><td>E</td><td>526036</td><td>2287660</td><td>N 20° 41' 17.52"</td><td>E 81° 15' 00"</td></tr></table>
	Villages	Parsada, Karahibha, Chirchori, Tarri, Khairwahi, Gurur, Mokha, Nawagaon, Bohardih, Bheja, Kaneri, Anandpur
	Tehsil/Taluk	Balod
	District	Balod
	State	Chhattisgarh
2.	**Area (hectares/ square kilometres)**	
	Block Area	146.27 sq.km
	Forest Area	The block co-ordinates were subjected in the Decision Support System (DSS) of Forest department, Ministry of Environment, Forest and Climate Change (MOEFCC). It has been found that the block area is under ñnot inviolateò. (Go)-Non-Forest area.
	Government Land Area (Bilanam)	Data not available
	Charagaha	Data not available
	Private Land Area	Part of the area is private, cultivated land
3.	**Accessibility**	
	Nearest Rail Head	Dhamtari 16 Km in NE direction. The station lies on the Raipurï Dhamtari branch line of Bilaspurï Nagpur section.
	Road	The exploration block can be reached from Durg via Durg-Balod Road throughNH-7. The road connecting Balod to Dhamtari passes throughout the block in east-west direction and it passes through Karahibha, Gurur, and Anandpur via NH-930.
	Airport	Raipur 80 km in NNE direction
4.	**Hydrography**	
	Local Surface Drainage Pattern (Channels)	The dendritic drainage.
	Rivers/ Streams	
5.	**Climate**	
	Mean Annual Rainfall	Average annual rainfall is 1090 mm
	Temperatures	The cold season lasts for 2.7 months, from mid November to first week of February, with an average daily high temperature below 29°C. The coldest month of the year is December, with an average low of 15°C and high of 26°C. The hot season lasts for 2.0 months, from Mid April to Mid June, with an average daily high temperature above 37°C. The hottest month of the year is May, with an average high of 40°C and low of 28°C.
6.	**Topography**	
	Toposheet No.	64H/06
	Morphology of the Area	The block exhibits flat topography. The highest elevation of the area is 338m in the

		southern part of the Block. The lowest elevation of the area is 319m in the western and eastern part of the block
7.	**Availability of baseline geoscience data**	
	Geological Map (1:50K/25K)	Geological Map, is available at 1:50,000 scale in Bhukosh.
	Geochemical Map	Available
	Geophysical Map	Not Available
8.	**Justification for taking up Reconnaissance Survey/ Regional Exploration**	**1.** Today most of the potash demand is met through bedded marine evaporite deposits such as sylvite, carnalite, kainite, polyhalite, surface and sub-surface potash-rich brines. In absence of mineable evaporite potash deposit in India, it was considered necessary to look for non-traditional source of potash such as glauconitic sandstone and potash rich shales. **Hence, potash recovery from low grade glauconitic sandstone is essential, as its high grade deposits are limited in our country.** **2.** Glauconite comes in the category of critical minerals and Government of India is presently focusing and simultaneously carrying out the auctioning of potential Critical and Strategic Mineral blocks. So, the exploration of Glauconite prospects of the country is the need of the hour. **3**. GSI during systematic geological mapping on 1:50000 scale during 1987-88, observed the development of glauconitic sandstone in the Kharra, Darra, Narbada, Diyabati, thekwadhi and Usarwara villages which are located in the central and eastern part of the proposed block. **4.** The present Reconnaissance survey in Parsada-Nawapara-Gurur block has been proposed in the SE of GSIôs Kotera-Reghai G-4 block (FSP 2023-24) for Glauconite, where the Glauconite bearing sandstone of Lohardih formation is found to be present. **5.** Apart from that several blocks of GSI for phosphorite are present in the north and NE of the proposed block including Sambalpur G-2 block (F.S 2022-23), Nawagaon G-4 block (F.S. 2023-24), Latabor G-4 block (F.S. 2023-24) and Nipani Kharra G-4 block (F.S. 2024-25). It suggests that the area is very much suitable for the exploration of fertilizer minerals. **6.** NGCM data (Stream sediment samples, C-Horizon Soil Sample and Regolith Samples) suggests the presence of Glauconite in the block. A total of 35 stream sediment samples, 2 Soil samples from C horizon and 2 Soil Regolith samples of NGCM falls within the proposed block. Values of K_2O is varying between 1.00% - 2.05%. **7.**Considering the consistency of glauconitic sandstone in the GSIôs blocks, the

		present exploration programme is planned to prove the continuity of the glauconitic sandstone in the SE extension part.

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1. INTRODUCTION

1.1. Along with nitrogen and phosphorus, potassium is one of the most essential macronutrients and is required in agriculture in relatively large amounts for plantôs healthy growth. After the growing recognition of potassium as one of the key nutrient in plant growth, subsequent development of potash industry was resulted. Reaching an estimated value of one million tonnes in 1921, production of potassium continues to increase consistently and reach to almost 34.6 million tonnes in 2013 (United State Geological Survey, 2013a, 2013b) expecting to raise 37.8 million tons in 2022 with the growth rate of about 2.9% annually (Rawashdeh et al., 2016).

1.2. Today most of the potash demand is met through bedded marine evaporite deposits such as sylvite, carnalite, kainite, polyhalite, surface and sub-surface potash-rich brines. These minerals are mixture of soluble salts, mainly potassium chloride or sulfates. More than 90% of these deposits are mainly concentrated in countries like Canada, Russia, Belarus, Brazil, China, Chile, Germany and USA (Anderson, 1985; The New York Times Editorial Board, 2013; Rawashdeh and Maxwell, 2014) on which rest of the world is dependent for supply of potash fertilizer.

1.3. In order to sustain crop production and to ensure self-sufficiency, exploration and investigation of alternative resource for potassium such as K-bearing silicates could be one of the options to meet the future demand (Manning, 2010; Manning, 2012; Ciceri et al., 2015).

1.4. In absence of mineable evaporite potash deposit in India, it was considered necessary to look for non-traditional source of potash such as glauconitic sandstone and potash rich shales. In many countries deficient in the conventional evaporite deposits insoluble potash used 'to be extracted out of silicate and non silicate minerals. Thus alunite in Bulla dealah in New castle, (Australia) containing 5% to 10%. K_2O was commercially exploited. Extraction of potassium from shales has also been discussed by Everest et al. (1964),Similarly glauconite has been used in USSR as a source of potassium fertilizer's (GSI, CGPB report, 1978 p. 94).

1.5. Out of different non-conventional sources, glauconitic sandstones deposits are available in plenty and are considered as one of the indigenous resources for potassium in India. India has vast reserves of more than 3,000 million tonnes of glauconitic sandstone containing 4 to 8% K_2O occurring in States like Madhya Pradesh, Uttar Pradesh, Bihar. Chhattisgarh, Rajasthan and Gujrat (Kumar and Bakliwal, 2005).

2. BACKGROUND

2.1. Exploration for strategic, critical, precious, rare earths and PGE are given top priority by Govt. of India, after amendment of MMDR Act, 2015 and itôs subsequent amendments up to 2023. Government of India is presently carrying out the auctioning of Critical and Strategic Mineral blocks through different tranche in which MECL is playing the role of the Nodal Agency. In the 1st Tranche of auction, 20 critical and strategic mineral blocks were put on auction platform, out of that 6 blocks has been successfully auctioned. Presently, the process of auctioning of 18 (2nd tranche) and 7 (3rd tranche) critical and strategic mineral blocks are under progress. Keeping in view that Glauconite comes in the category of critical minerals, the present proposal has been prepared and being put up for Reconnaissance Survey for NMET funding and execution.

3. LOCATION AND ACCESSABILITY

3.1. Parsada-Nawapara-Gurur block is a part of Balod Glauconitic sandstone Belt and it is situated in the eastern part of the Balod Distt., Chhattisgarh and falls in the Survey of India toposheet no. 64H/06. The exploration block can be reached from Durg via Durg-Balod Road throughNH-7. The road connecting Balod to Dhamtari passes throughout the block in east-west direction and it passes through Karahibha, Gurur, and Anandpur via NH-930. Dhamtari 16 Km in NE direction. The station lies on the Raipurï Dhamtari branch line of Bilaspurï Nagpur section. Dhamtari railway station is the nearest railway station from the block located 16 Km away in NE direction on Raipurï Dhamtari branch line of Bilaspurï Nagpur section. Raipur is the nearest airport from the block which is 80 km in NNE direction from the block. Block boundary corner points of Parsada-Nawapara-Gurur block is given below:

Cardinal Point	UTM Zone 44N (m)		DD° MM' SS"	
	WGS-84			
	Easting	Northing	Latitude	Longitude
A	526025	2294480	N 20° 44' 59.28"	E 81° 15' 00"
B	535134	2293300	N 20° 44' 20.40"	E 81° 20' 15"
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4. PHYSIOGRAPHY AND DRAINAGE

4.1. The block area exhibits flat topography. The regional slope of the area is towards north and northeast. The highest elevation of the area is 338m in the southern part of the Block. The lowest elevation of the area is 319m in the western and eastern part of the block.

4.2. The drainage pattern in the area is of dendritic type. No significant stream is present in the area. Mahanadi river passes about 8 km in the east from the eastern margin of the block.

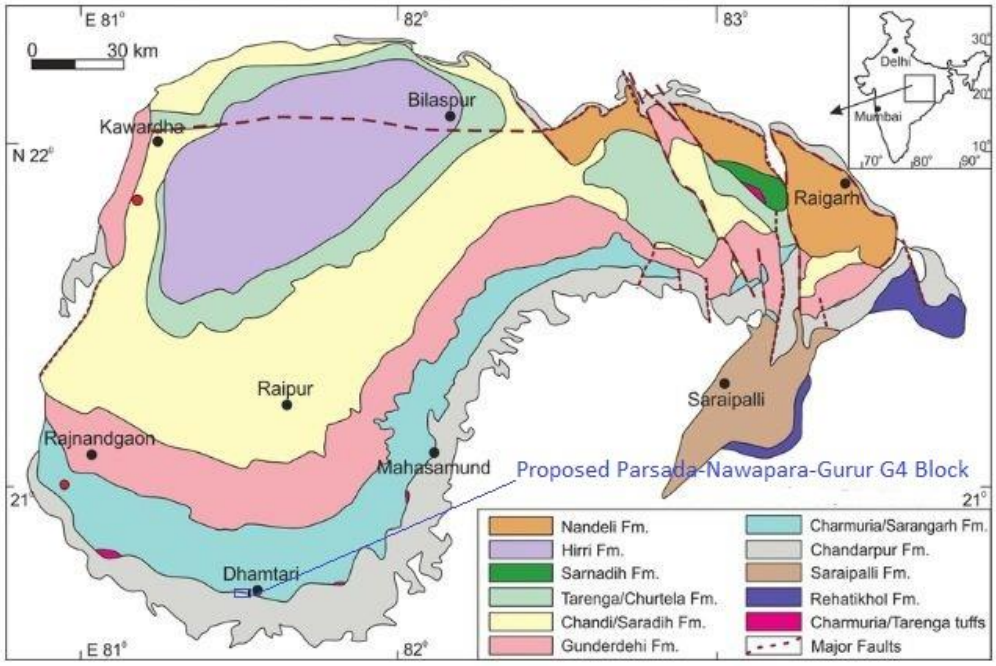
5. CLIMATE

5.1. The climate is tropical monsoon type. The cold season lasts for 2.7 months, from mid November to first week of February, with an average daily high temperature below 29°C. The coldest month of the year is December, with an average low of 15°C and high of 26°C.

5.2. The hot season lasts for 2.0 months, from Mid April to Mid June, with an average daily high temperature above 37°C. The hottest month of the year is May, with an average high of 40°C and low of 28°C.

5.3. Average annual rainfall is 1090 mm with maximum precipitation during July and August.

6. REGIONAL GEOLOGY



A generalized geological map of the Chhattisgarh Basin showing various lithological units of the Chhattisgarh Supergroup, modified after Mukherjee et al. (2014) and Saha and Patranabis-Deb (2014).

6.1. Regionally, The proposed block falls in the southern part of Chhattisgarh basin and lithostratigraphically forms part of Raipur Group and Chandarpur Group of Chhattisgarh Supergroup belonging to Meso-Neo proterozoic age. The intracratonic Chhattisgarh Basin is crescent shaped and covers about 33,000 sq km area in Raipur, Durg, Balod, Rajnandgaon, Bilaspur and Raigarh districts of Chhattisgarh and adjoining parts of Orissa. The rocks of Chhattisgarh Basin rests unconformably over the basement complex comprising different elements of the Archaean-Lower Proterozoic supracrustals and granitoids of Bastar Province in the south and the Bilaspur-Raigarh-Sarguja (BRS) metamorphics of the Satpura Belt in the north. The basin is bounded to the west by the N-S trending volcanics of Dongargarh

Supergroup with faulted contact and to the northeast and southeast by Gondwana rocks (Mahanadi lineament) and the Eastern Ghat Mobile Belt (EGMB) respectively(Geology and mineral resources of Chhattisgarh, 2013).

6.2. The litho-units of the region, ranges from Meso-Neo Proterozoic age Charmuria cherty limestone, Meso-Neo Proterozoic age Kansapathar Glauconitic Sandstone, Meso-Neo Proterozoic age Lohardih Ferruginous Sandstone and Late proterozoic Dongargarh Granite. Dongargarh Granite are exposed in south-western and south-eastern part as represented in Regional Geology Map in Plate-II. Ferruginous Sandstone of Lohardih formation of Chandarpur Group and Chhatisgarh Super group is present in the central part of the region. Glauconitic Sandstone of Kansapathar formation of Chandarpur Group and Chhatisgarh Super group is present in the eastern part of the region while Cherty Limestone of Charmuria formation of Raipur Group and Chhatisgarh Super group is present in the northern part of the region.

6.3. Regional stratigraphic succession of the litho-units after Das e. al (1992), GSI is illustrated in the Table 6.1

Table 6.1

Regional Stratigraphic sequence of Litho units (After GSI)

<table>
<tr><th>Age</th><th>Super Group</th><th>Group</th><th>Formation</th><th>Lithology</th></tr>
<tr><td>Late Proterozoic</td><td>Dongargarh</td><td></td><td></td><td>Dongargarh Granite</td></tr>
<tr><td rowspan="5">Meso Proterozoic ï Neo Proterozoic</td><td rowspan="5">Chhattisgarh</td><td>Raipur</td><td>Charmuria</td><td>Purple limestone (phosphatic), Dark grey bedded limestone with shale intercalations, cherty limestone.</td></tr>
<tr><td colspan="3">----------Gradational contact----------</td></tr>
<tr><td rowspan="3">Chandarpur</td><td>Kansapathar</td><td>Glauconitic Sandstone</td></tr>
<tr><td>Chaporadih</td><td>Shale / Quartz arenite</td></tr>
<tr><td>Lohardih</td><td>Ferruginous Sandstone</td></tr>
</table>

7. GEOLOGY OF THE STUDY AREA

7.1. The proposed block area consist of Meso-Neo Proterozoic age lito-units of Kansapathar and Lohardih formation of Chandarpur Group of Chhattisgarh Super Group of rocks. The Meso-Neo Proterozoic Kansapathar Formation is the topmost unit of the siliciclastic Chandarpur Group of rocks which records a fluvial to marine transition and comprises a fining-upwards transgressive succession overlain by a coarsening-upwards prograding succession. The Kansapathar Formation is composed of medium- to coarse-grained, well sorted quartz-arenite/sandsone. These sandstone is having variable glauconitc content.

7.2. The Meso Proterozoic Lohardih Formation is the lowermost unit of Chandarpur Group of rocks. The Lohardih Formation is composed of medium- to coarse-grained, Ferruginous Sandstone.The sandstone of Lohardih Formation is arenitic, comprising ferruginous arenite with polymictic conglomerate at the base. The rock is greyish white to pinkish grey, medium to coarse-grained feldspathic sandstone and ferruginous arenite with shale partings at base. This formation has been interpreted as initial alluvial fan associated with braided fluvial sediment and followed by marine transgression producing wave-tide dominated shallow marine shoal bar, which shows signature of reworking of fluvial sediments. The oldest rock/lithounit subarkosic sandstone of Chandarpur Group of lower Chhattisgarh Supergroup is developed in western andcentral part of the proposed block.

7.3. General strike of the area is almost NW-SE dipping northerly. At places lithounit trend varies from NE-SW with low to moderate dip due in north.

7.4. The tentative srtratigraphic sequence of litho units exposed in the Block area (After GSI) is given in Table 7.1

Table 7.1

Stratigraphic sequence of the Parsada-Nawapara-Gurur G4 Block for Glauconitic sandstone

(After GSI)

Age	Super Group	Group	Formation	Lithology
Meso Proterozoic ï Neo Proterozoic	Chhattisgarh	Chandarpur	Kansapathar	Glauconitic Sandstone
			Lohardih	Ferruginous Sandstone

8. PREVIOUS WORK

8.1. Pioneering geological work in the Chhattisgarh basin was carried out by V. Ball (1877), W. King(1885-90) and Fermor (1919), followed by Narayana Murthy (1955, 1960), Narayana Murthy and Radhakrishna (1961), N.V.B.S. Dutt (1964), W.A. Schnitzer (1971), Murti (1996), Das et al. (1992). Chaudhari et al. (2002) and Deb (2004) provided recent geological summaries of the basin.

8.2. H.B.Medlicott (1866-67) and W. T. Blanford (1869-70) took few traverses and mentioned about quartzites and limestones of Chhattisgarh basin and correlated these with the Cuddapah Supergroup. P.N.Bose (1898-99) described the sediments of this basin as 'Chhattisgarh Plain Seriesô comprising the Chandarpur Sandstone in the lower part and the Raipur shales and limestones in the upper part and correlated them with Lower Vindhyans. D. Bhattacharjee (1936-37, 37-38) mapped the Western part of Durg district and correlated these formations with the Cuddapahs. A sequence of these rocks given by him is as follows: Raipur limestones, Shales and phyllites, Chandarpur sandstone, Khairagarh sandstones. Sen (1963-64), Sen and

Satyanarayanan (1964-65) and Satyanarayanan (1965-67) and Murti (1967-72) carried out systematic geological mapping in parts of Raipur, Durg and Bilaspur districts and located a few rock phosphate bearing horizons in the clay pockets found inthe upper part of Chandarpur sandstone and at the base of Charmuria limestone.

8.3. Dutt (1964) studied in the southwestern part of the Chhattisgarh basin and classified the succession into five series, the Chandarpur Sandstone, Charmuria Limestone, Gunderdehi Shale, Khairagarh Sandstone and Raipur Shale-Limestone. Schnitzer (1969-1971) established five cycles of sedimentation, separated by unconformities in the east central part of the basin. Murti (1987) worked in the south central part of the basin, assigned a ñSupergroupò status to the Chhattisgarh succession and classified the rocks into two groups separated by an unconformity, the lower, Chandarpur Group, and the upper, Raipur Group. Each group comprises several formations. Das et al. (1992) considered that the Singhora Group is the lowermost unit of the Chhattisgarh Supergroup and occurs between the granite gneissic complex of the basement and the Chandarpur Group.

8.4. N.V.B.S. Dutt, K.S. Murti, and a host of GSI workers made valuable contribution towards elucidation of stratigraphy and structure of chhattisgarh Basin. N.V.B.S. Dutt (1963) covered the southern part of Chhattisgarh Basin by traverse mapping and suggested the following succession:-

Raipur shale and limestone	-	(450m)
Khairagarh sandstone	-	Variable
Gundardehi shale	-	(180m)
Charmuria limestone	-	(300m)
Chandrapur sandstone	-	(300m)
----------unconformity----------		
Archean		Granitoids

8.5. During phosphorite investigation (1972-73) U.S. Vatsa et al. observed three different litho members in the Chandrapur Formation, viz. ferruginous sandstone, feldspathic sandstone and orthoquartzite in the southern part of the chhattisgarh basin and reported the presence of phosphate with P2O5 content maximum upto 29% in a few clay samples within cherty-limestone of Charmuria Formation.

8.6. Bhattacharya et. al (1987-88), during systematic geological mapping in 1:50000 scale of toposheet no 64H/10 and 64H/06, observed the development of glauconitic sandstone, which is deep green, medium to coarse grained, laminated and often pyritiferous in the western part of the area mapped, (Toposheet No. 64H/06) near Kharra, Darra, Narbada and Diyabati villages which are located in the proposed block. The lamina is of green and white, colour. In Thekwadhi above this glauconitic sandstone occurs grey micaceous shale which is finely

laminated. In Usarwara, below this shale horizon a thin band of very coarse and granular subarkosic sandstone is encountered.

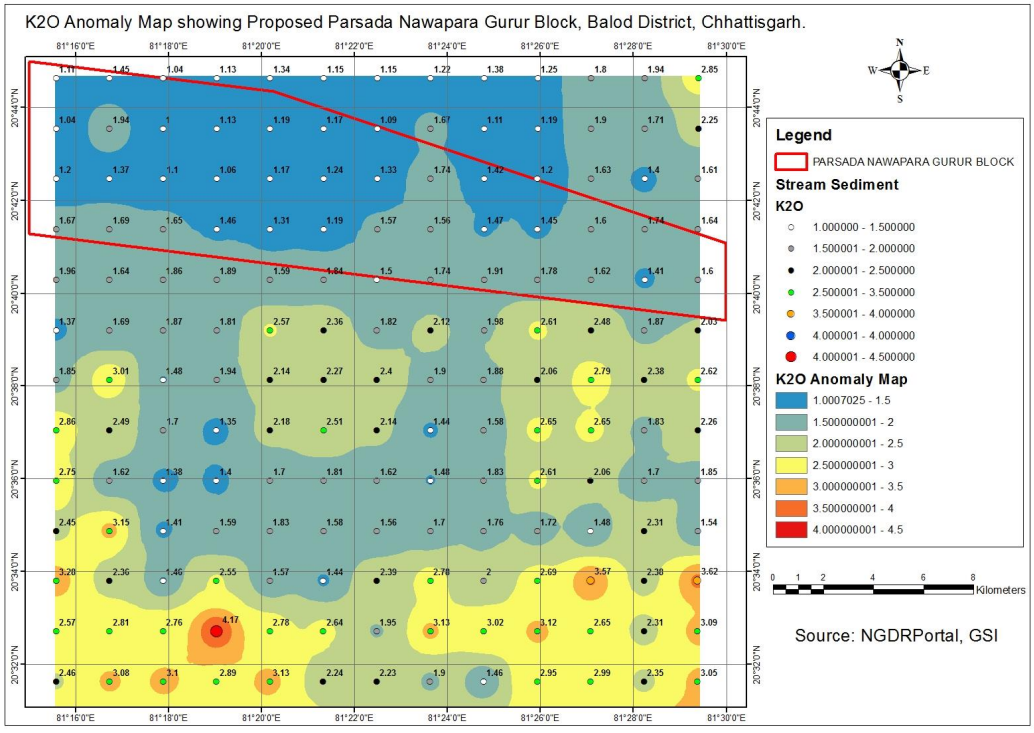
8.7. Bhalukona and Chhuipali (Das et al. 1992; 2003). Patranabis-Deb (2004) and Patranabis-Deb and Chaudhuri (2008) made threefold classification of the succession around the eastern part of the basin. They classified the succession into the Chandarpur, Raipur and Kharsiya groups. Chakrobarty et al. (2015) proposed a four-tier lithostratigraphy for the Chhattisgarh Supergroup namely, Singhora Group, Chadarpur Group, Raipur Group and Kharsiya Group.

8.8. Das et al. (1992) divided the Chhattisgarh Basin into Hirri and Baradwar sub-basins, and Singhora and Barapahar protobasins. They classified the Chhattisgarh Supergroup into three unconformity-bound groups, the Singhora Group, the Chandarpur Group and the Raipur Group in ascending order.

8.9. The present Reconnaissance survey in Parsada-Nawapara-Gurur block has been proposed in the SE of GSIôs Kotera-Reghai G-4 block (FSP 2023-24) for Glauconite, where the Glauconite bearing sandstone of Lohardih formation is found to be present.Apart from that several blocks of GSI for phosphorite are present in the north and NE of the proposed block including Sambalpur G-2 block (F.S 2022-23), Nawagaon G-4 block (F.S. 2023-24), Latabor G-4 block (F.S. 2023-24) and Nipani Kharra G-4 block (F.S. 2024-25). It suggests that the area is very much suitable for the exploration of fertilizer minerals.

8.10. NGCM INVESTIGATIONS

8.10.1. Geological Survey of India under National Geochemical Mapping program systematic stream sediment sampling was carried out in the study area in 1 X 1 km interval in grid pattern. A total of 35 stream sediment samples generated falls within the proposed block.



Values of K_2O is varying between 1.00% - 1.92% (Fig. 8.1). Similar range of values is present in the adjacent north of the proposed block where GSI block for Glauconitic Sandstone is present.

Fig 8.1- K_2O Anamoly Map for StreamSediment Samples as per NGCM data for Toposheet No. 64H/06 alongwith proposed Parsada-Nawapara-Gurur G-4 block for Glauconitic Sandstone

8.10.2. A total of 2 Soil samples from C horizon and 2 Soil Regolith samples falls within the proposed block for which values of K_2O are 1.24% , 2.05% and 1.38% , 1.89% respectively.(Fig. 8.2).

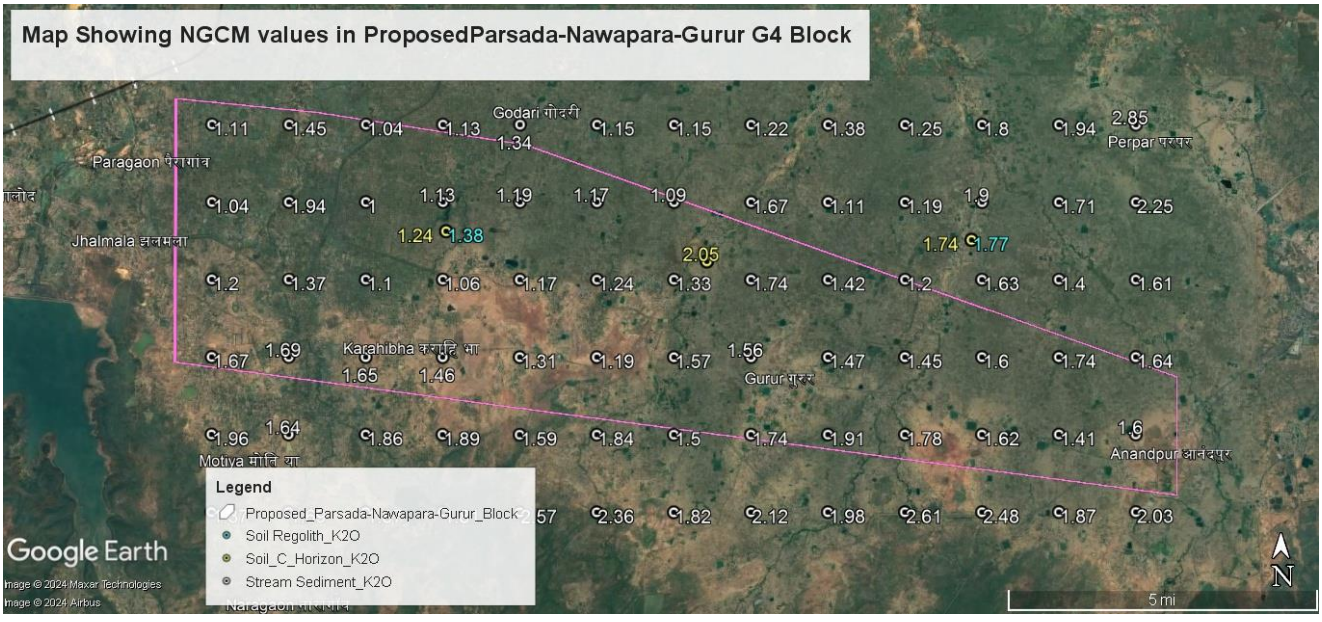


Fig 8.2- K_2O Anamoly Map for Soil C-Horizon Samples and Soil Regolith Samples as per NGCM data for proposed Parsada-Nawapara-Gurur G-4 block for Glauconitic Sandstone

9. PROPOSED SCHEME OF EXPLORATION

9.1. **Geological mapping:** Geological & structural mapping on 1:12,500 scale will be carried out in the proposed block for demarcation of Glauconitic sandstone with the structural features to identify the surface manifestations and lateral and vertical disposition of the mineralized zones

9.2. **Survey:** DGPS survey will be done for determining co-ordinate and reduced level (RL) of all the borehole locations.

9.3. **Surface Geochemical sampling (Bed Rock/Channel/Chip Sample):** During the course of Geochemical Sampling, around 200 nos. of bed rock /Channel/Chip samples shall be collected from the suitable surface locale. A total of 200 nos. of primary and 20 nos. of external check surface samples will be analysed for 4 radicals (K_2O, SiO_2, Al_2O_3& Fe_2O_3). 10% of Primary samples (20 Nos) will be sent to NABL External Labs as External Check Samples.

9.4. **Exploratory Mining (Trenching/Pitting)** Trenching (Excavation) shall be carried out in the potential zones identified based on the results of geological mapping and geochemical sampling. A provision of trenching/pitting of 200 cubic meter has been planned. Trenching work will be carried out by excavating trenches of 1m width and up to 2m depth in the area to expose the source rock and mineralization. Locations of pits/trenches on ground will be decided by field geologist based on field observations. Trenches will be geologically mapped thoroughly by the field geologist. Around 200 nos. of trench samples shall be collected. A total of 200 no of primary and 20 no of external check trench samples will be analysed for 4 radicals (K_2O, SiO_2, Al_2O_3 & Fe_2O_3). 10% of Primary samples (10 Nos) will be sent to NABL External Labs as External Check Samples.

9.5. **Drilling:** If phase-I exploration data will give anamolous values, 10 Nos. boreholes on 1600m grid spacing will be drilled. The boreholes will be planned judicially after the completion of phase-I exploration and will be presented for review before the TCC for final approval.

9.6. **Drill core logging:** Geological core logging will be carried out systematically by recording carefully the minute details and physical/lithological characters of the rock formations including colour, core recovery, grain size, weathered zone, texture, banding, mineralogical composition, micro-structural/structural details, lithological variations along with visual estimate in respect of Potash content encountered in boreholes. As per the requirement the

Rock quality designation (RQD) shall also be carried out, while logging drill cores. On the basis of these parameters, grade of glauconite can be broadly assessed and it will also be helpful in sampling/demarcating the Phosphorite zones.

9.7. **Drill core sampling:** For preparation of samples, the borehole core will be splitted into two equal halves by using core splitter. One half will be powdered to 100 mesh size and the other half will be kept for future studies. The powdered material will be mixed thoroughly and about 100 gram of samples will be taken for chemical analysis by successive coning and quartering as primary samples and rest of the material (-100 mesh size) will be kept as duplicate half for future reference. It will generate about 200 Nos of **primary samples** and 20 Nos of **External Check samples** (10% of Primary samples). External Check samples will be sent to NABL Lab for analysis. **Composite samples** will be prepared borehole wise based on the analytical results of primary sample at every 8m interval (8m bench height). Composite samples shall be prepared from the entire borehole in which glauconitic sandstone bands will be intersected. This will generate about 20 nos. of composite samples. Each sample should be marked at every 1m length in case of continuance of similar mineralogical composition down the borehole. The sample length towards the floor marked by non-ore zone needs also to be adjusted as per variations of the litho-units. Even if the floor is distinctly differentiated by the presence of non-mineralized zone, at least two nos. samples after the Glauconite zone need to be drawn to mark the floor of the Glauconite zone decisively.

9.8. **Chemical Analysis:** All the primary samples and 10% of the Primary samples as External check samples will be analyzed for 4 radicals (K_2O, SiO_2, Al_2O_3 & Fe_2O_3). About 10% of primary samples will be sent to NABL external laboratory as External check samples for analysis of 4 radicals i.e. K_2O, SiO_2, Al_2O_3 & Fe_2O_3. Around 20 composite samples will be analyzed for 12 radicals i.e. K_2O, Na_2O, CaO, MgO, Al_2O_3, SiO_2, Fe_2O_3, SO_3, P_2O_5, Mn_2O_3, TiO_2, and LOI.

9.9. **XRD Study:** To know the different mineral phases, for recovery of potash, XRD study will be performed in 5 samples of glauconitic sandstone.

9.10. **Determination of Bulk density:** To calculate the resource, volume of the ore body need to be multiplied with a density factor. Hence, 5 nos. of samples will be drawn from the glauconitic sandstone for determination of Bulk density.

10. QUANTUM OF WORK

10.1. The following quantum of work have been proposed for Reconnaissance Survey (G-4 stage) for glauconitic sandstone in Parsada-Nawapara-Gurur block:

Sl. No.	Item of Work	Unit	Target
1	Geological Mapping (1:12500 scale)	Sq. Km	146.27
2	DGPS Survey for Borehole fixation	Nos.	10
3	Surface Geochemical sampling (Bed Rock/Channel/Chip Sample)	Nos.	200
4	Exploratory Mining (Trenching/Pitting)	Cu M.	200
5	Drilling (Core)	m.	500
6	Sample Preparation & Chemical Analysis		
A.	Surface samples (Bedrock/Channel/Chip etc Samples)		
	i) Primary, & 10% External check for 4 radicals viz. K_2O, SiO_2, Al_2O_3 & Fe_2O_3	Nos.	220 (200+20)
B.	Trench Samples		
	i) Primary, & 10% External check for 4 radicals viz. K_2O, SiO_2, Al_2O_3 & Fe_2O_3	Nos.	220 (200+20)
C.	BH samples		
	i) Primary, & 10% External check for 4 radicals viz. K_2O, SiO_2, Al_2O_3 & Fe_2O_3	Nos.	220 (200+20)
	ii) Composite sample Analysis for 12 radicals viz. K_2O, Na_2O, CaO, MgO, Al_2O_3, SiO_2, Fe_2O_3, SO_3, P_2O_5, Mn_2O_3, TiO_2, and LOI.	Nos.	20
7	Petrographic Studies	Nos	10
8	XRD Study	Nos.	5
9	Determination of Bulk Density	Nos.	5
10	Geological Report preparaton	Nos.	1

11. TIME SCHEDULE AND ESTIMATED COST

11.1. The proposed exploration programme envisages geological mapping, Surface sampling, Trenching, core drilling, sample preparation and laboratory studies, which will be completed within 15 months, geological report preparation and peer review, will take 4 months with two month overlapping with lab works. Therefore, a total of 15 months is planned for completion of the entire proposed programme.

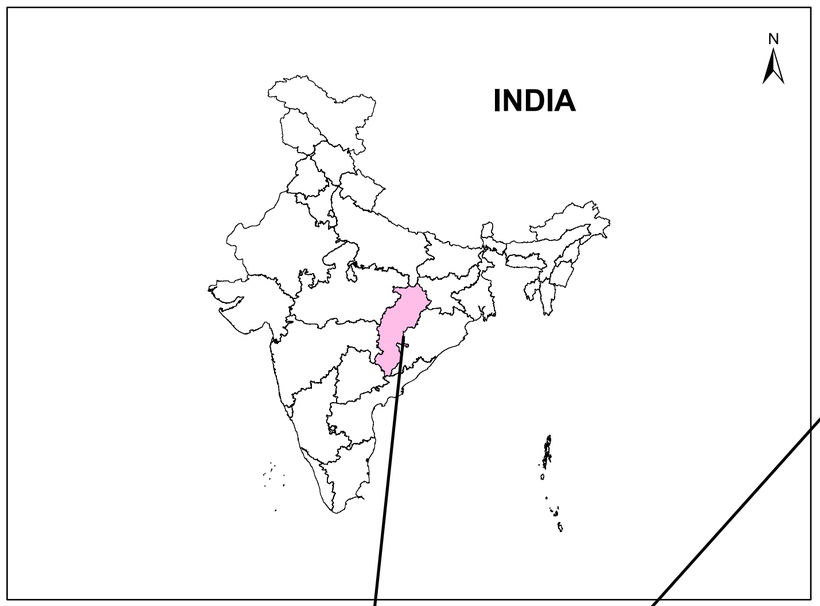
Timeline Reconnaissance survey (G4) for Glauconitic Sandstone in Parsada-Nawapara-Gurur Block, District: Balod , State: Chhattisgarh. [Block area- 146.27 sq. km; Schedule timeline- 15 months]

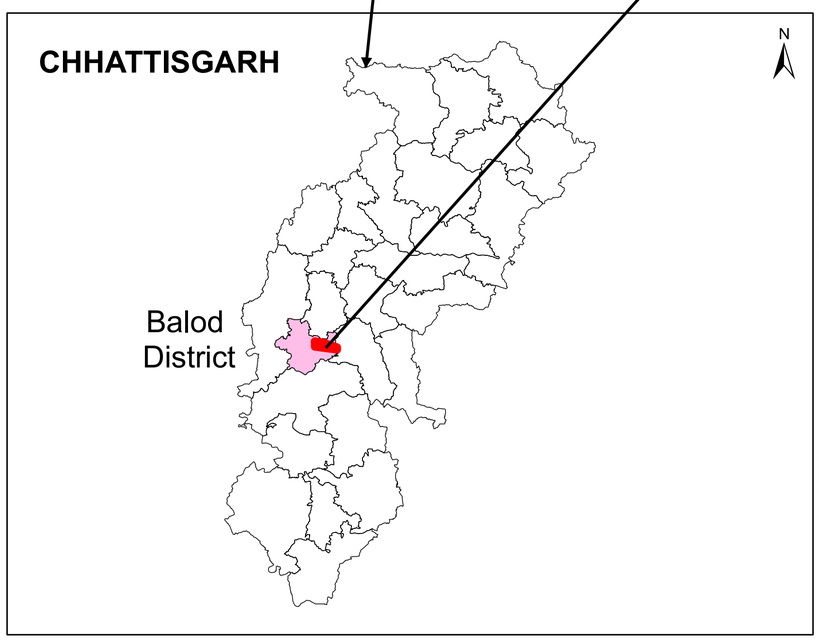
S. No.		Months /Days	1	2	3	4	5	6	7	8	9	Review	10	11	12	13	14	15
1	Camp Setting	months																
2	Geological	months																
3	Survey days	days																
5	Trenching	cu.m																
6	Drilling (1 rig)	m																
7	Geologist days	days																
8	Sampling days,	days																
9	Camp winding	months																
10	Laboratory Studies	months																
11	Geologist days, HQ	days																
12	Report Writing with Peer Review	months																

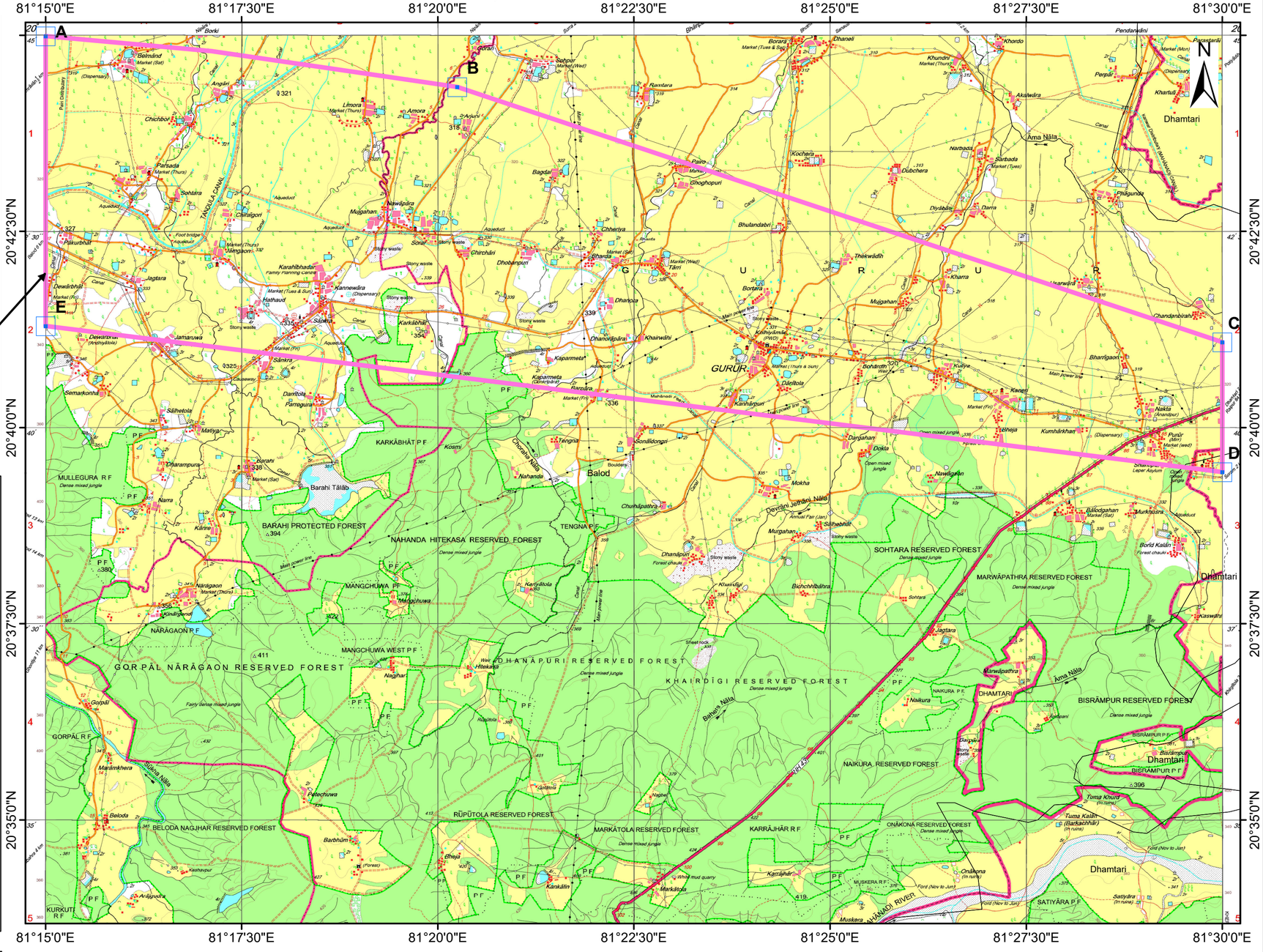
11.2. Cost has been estimated based on actual schedule of rates mandated in the circular OM No. 61/1/2018/NMET dated 31st March 2020 for NMET funded Projects. The total estimated cost is Rs. 216.30 Lakhs. The summary of cost estimates for this reconnaissance survey (G4) is given below:

Sl. No.	Item	Total
1	Geological Work	**3,460,344**
2	Pitting & Trenching	**666,000**
3	Drilling	**7,369,980**
4	Laboratory Studies	**2,878,350**
	Sub total	**14,374,674**
5	Report	**431,240**
6	Peer Review	**30,000**
7	Proposal Prepration	**287,493.48**
	Total	**15,123,408**
8	GST (18%)	**2,722,213.39**
Total cost including 18% GST		**21,629,787**
SAY, in Lakhs		**216.30**

Location Map Showing Proposed Parsada-Nawapara-Gurur G4 Block For Glauconite, Balod, Chattisgarh (146.274 sq. km)
(Parts of Toposheet No. 64 H/06)







Legend

- Cardinal Point of Parsada-Nawapara-Gurur Block
- Proposed Parsada-Nawapara-Gurur G4 Block For Glauconite

1:75,000

2 1 0 2 4 6 8 Kilometers

Co-ordinate of Cardinal Point of Parsada-Nawapara-Gurur G-4 Block for Glauconite District: Balod, Chhattisgarh					
Cardinal Point	UTM Zone 44N (m)		DMS		Area (Sq. Km)
	Easting	Northing	Latitude	Longitude	
A	526025	2294480	20.7498	81.2500	146.274
B	535134	2293300	20.7390	81.3375	
C	552073	2287350	20.6848	81.5000	
D	552083	2284290	20.6572	81.5000	
E	526036	2287660	20.6882	81.2500	

MECL

PLATE - I: Location Map

Parsada-Nawapara-Gurur G4 Block For Glauconite

REGIONAL GEOLOGY MAP (After GSI) SHOWING PARSADA-NAWAPARA-GURUR G-4 BLOCK FOR GLAUCONITE, BALOD, CHHATISHGARH

N
W E
S

81°13'0"E 81°16'30"E 81°20'0"E 81°23'30"E 81°27'0"E 81°30'30"E

20°46'30"N

20°43'0"N

20°39'30"N

20°36'0"N

A B C D E

Legend

Proposed Parsada-Nawapara-Gurur G-4 Block (Glauconite)

Corner Point

Lithology

- Dongargarh Granite
- Charmuria Cherty Limestone
- Kansapathar Sandstone
- Lohardih Sandstone

Oriented Structure Plane

- BEDDING
- JOINT

1:50,000

0 1.25 2.5 5 km

(Part of Toposheet No 64H/06)

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PLATE - II: Regional Geology Map