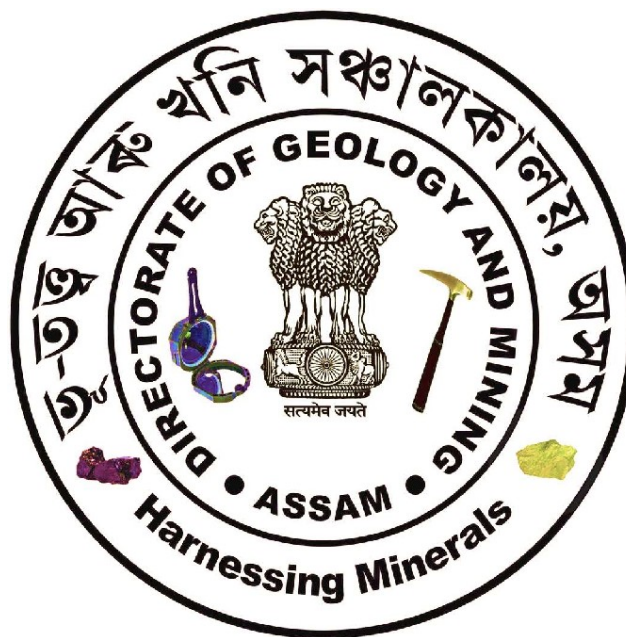


**PROPOSAL FOR RECONNAISSANCE  
(G-4) SURVEY FOR LIMESTONE IN  
DILLAI AREA, DIST: KARBI  
ANGLONG, ASSAM  
(THROUGH NMET FUND)**



খনিজ সম্পদৰ  
অন্বেষণত

**GOVERNMENT OF ASSAM  
DIRECTORATE OF GEOLOGY & MINING  
GUWAHATI**

**RECONNAISSANCE SURVEY (G-4) FOR LIMESTONE IN DILLAI AREA OF  
KARBI ANGLONG DISTRICT- (ASSAM)**

**Details enclosed with map**

i.	Name of Mineral	Limestone
ii.	Name of Block	Dillai
iii.	Location	Latitude: 26°01'40.00"N to 26°04'57.00"N Longitude: 93°35'00"E to 93°37'55.00"E
iv.	Toposheet No.	83 F/12
v.	Name of villages	Molbem, Lokhijan, Ulhaijan
vi.	Sub-division	Bokajan
Vii.	District	Karbi Anglong
Viii.	Area	25 km <sup>2</sup> (approximately)
ix.	Type of Land	
x.	Status of Exploration	Partly explored by DGM
xi.	Detailed mapping	25 sq. km. in 1:12500 Scale
xii.	Present Category of UNFC	334
xiii.	Total Meterage to be drilled	500mtrs (approx.)
xiv.	Number of borehole to be drilled	10 nos. (approx.)
xv.	Spacing of boreholes	More than 800 Mtr. (borehole to borehole)
xvi.	Depth of borehole	50 Mtr. (approx.)
xvii.	Category of exploration as per UNFC	334
xviii.	Logging	All the borehole cores (Approx. 500 Mtr.)
xix.	Sampling	300 Nos. (Approx.)
xx.	Analysis	DGM Lab.
xxi.	Report Writing	Will be done by Exploration agency

## **Reconnaissance survey (G-4 level) for Limestone Exploration at Dillai Area in 25 sq. km. area District Karbi Anglong(Assam)**

### **1. Introduction:**

Assam is the state where Cement is in short supply from the local production. Limestone is perhaps, the most exploited minerals since limestone constitute the basic raw materials for these industries. But today bulk of the cement comes to Assam outside of the state as the local plant is hardly able to meet the growing demand. In view of the above, the central and state government have been evincing keen interest in promoting cement plants, mini or major, within the state of Assam. In this background, the state Directorate of Geology and Mining was entrusted with the task of undertaking raw materials investigation forcement and lime manufacture within the State.

### **2. Location of the Block:**

The area under investigation lies in the Dillai area in Karbi Anglong district, Bokajan subdivision under Dillai Police Station of Karbi Anglong, Assam.

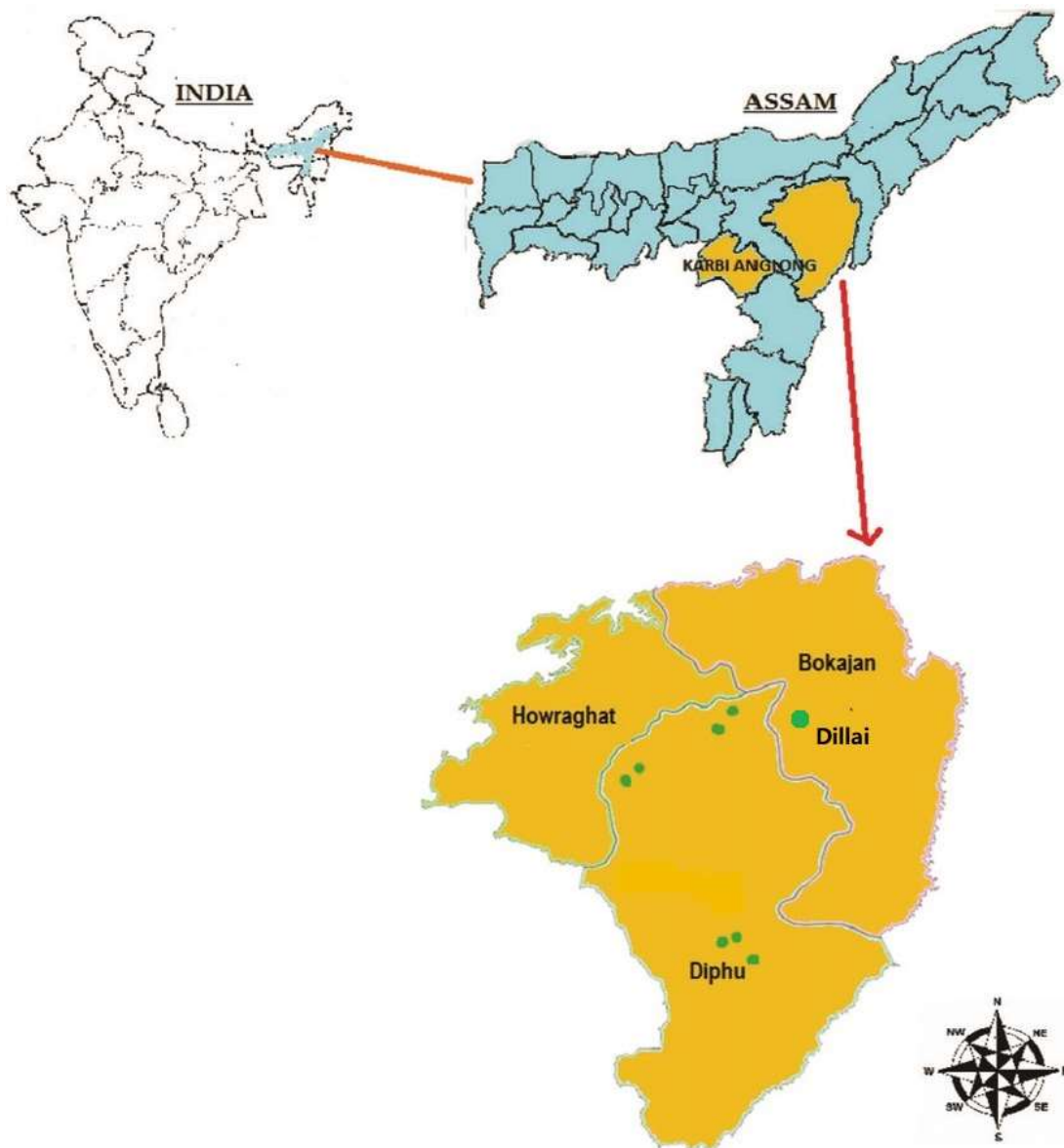
The Limestone Deposits of Dillai is located near the Manja Golaghat road in Karbi Anglong district. It is 30 km from Bokajan, the subdivision of the district, 135 km from Golaghat on the Manja Golaghat road and 57 km from Diphu. The nearest train station is Bokajan Railway Station which fall the main line of North East Frontier railway which lies at a 240 km from Guwahati and large station is Diphu which is around 55 km from Bokajan Railway Station.

The deposit occurs on an area with undulating topography with several Hills and Nalas cutting across the region forming valley like topography. The deposit is bounded by the following boundary points:

Sl No	Boundary Point	Latitude	Longitude
1	A	26° 03' 50.00" N	93° 37' 55.00" E
2	B	26° 01' 40.00" N	93° 37' 55.00" E
3	C	26° 01' 50.00" N	93° 35' 0.00" E
4	D	26° 04' 57.00" N	93° 35' 0.00" E

The block lies near the Manja Golaghat road which is all weather road but the roads leading to the block from the highway are kuccha roads which can be used only during dry season. The block is also filled with thick vegetation which can be cleared during dry season only.

The area under investigation is shown as location as in the figure Map.1 below:



### 3. Physiology and Drainage:

The area of the investigation lies on the Eastern edge of the Mikir hills is made up of undulating hillocks and flat valleys. The drainage system is controlled by the Dillai and Koilajan river which flows from east to west direction. Several Nalas form tributary and sub tributary of Dillai and Koilajan river that contribute to the drainage system of the area. Bhalukjan and Ulhaijan are the prominent streams flowing in the area.

### 4. Previous Work:

Many geologists of the Geological Survey of India visited Mikir Hills (present day Karbi Anglong district) at different times since the later part of 19<sup>th</sup> century. The Geological Survey of India at the behest of the State Government had taken traverses over a large belt near the Koilajan area in the year 1947-48. In 1962, the Directorate of Geology and Mining, Assam with the Indian Bureau of Mines had carried out intensive survey to the west of Koilajan colliery.

Since 1972-73, geologists of the State Directorate of Geology & Mining have been carrying out systematic geological mapping for location of promising limestone deposits. A team of experts lead by Sri N.V. Narayan Rao, Managing Director, Cement Corporation of India Limited and Mr F.A. Morrison had also visited the area and observed the deposits. A cement factory is also established at Bokajan by Cement Corporation of India (CCI) and mining lease area of 171.21 Ha is given to CCI for extraction of Limestone.

The area adjacent to it can be taken up for FS 2024-25 for reconnaissance (G-4) survey by geological mapping and drilling in the area.

### 5. Geology and Structure:

#### 5.1. Regional Geology:

Geologically, Assam and NE India compile most astonishing stratigraphy. Starting from oldest Archean gneissic rocks to recent quaternary alluvium found in this part of India. Among all other parts of Assam Karbi-Anglong host most complex geological stratigraphy. These complex stratigraphy, structure, and deformations results in Karbi- Anglong as the most mineralized part of Assam. The Archean basement gneissic complex forms the basement as other parts of NE India. It is followed by quartzites and phyllites metasediments belong to Shillong Group of rocks. But these metasediments are mostly absent in West Karbi- Anglong area. These gneisses and Precambrian metasediments of central part are intruded by younger acidic granitoid intrusive bodies. These granitoid bodies are scattered as Inselberg. These Precambrian rocks are overlain by the younger Tertiary shelf sediments, which are again overlain places by the Quaternary and Recent deposits.

Gneissic Complex represents the oldest group of rocks. The gneiss, when highly weathered, looks like sandstone. However, on careful examination, the dark toned mafic bands can be identified). The most prominent foliation (Gneissosity/ Schistosity/ Cleavage) strike along NE- SW direction and dip by 60°-70° towards southeast (GSI NER Report 1986-87). Exposure of equigranular, hard, compact homogeneous dark colored granite occurs at many places. The granites are generally grey- white in color with a pink tinge on fresh surface. On weathering it becomes dark grey to black in color with sub rounded spheroidally weathered surface. These Precambrian rocks are overlain by tertiary sedimentary sequences of sandstone, limestone and shale and thin coal beds. These strata are mainly horizontal to sub-horizontal striking NNE-SSW dipping towards SE by an amount of about 15 to 30 degrees.

The general stratigraphic sequence of the area can be summarized as below:

Age	Group	Formation	Lithounits
Quaternary to recent			Soil and alluvium
Late Eocene to Late Paleocene	Jaintia Group	Kopili Formation	Alteration of splintery shale and fine to medium grained brownish sandstone
		Shella Formation	Sylhet Limestone Member(Fossiliferous Limestone)
			Sylhet sandstone Member with Sandstone, clay and thin coal seam
	----		
	Disconformity		
Precambrians	Shillong Group		Quartzo feldspathic and quartz veins Intrusives- biotite- granitoid
	Angular Unconformity		
	Basement Gneissic Complex(BGC)		Granitoid Gneisses

**Table 1: Generalized regional stratigraphic succession of the area (GSI 1985-86)**

## 5.2 General Geology

The coal seam under investigation belongs to a formation of sandstones which immediately underlie the Sylhet Limestone Stage of Jaintia Series of the Eocene system of Assam. Together, these rocks form the detached part of a belt of sedimentaries which fringe the Pre-Cambrian rocks along the southern edge of the Mikir Hills ranges. The geology laid bare by the Koilajan Nala and shows the following formations in order of superposition.

TABLE I

Nummulitic Limestone	...	...	10 m.
Fine grained brown sandstone	..	...	15 m.
Nummulitic Limestone	...	...	15 m to 20 m.
Hard, gritty or fine grained well sorted sandstone	***	***	15 m to 20 m.
Carbonaceous shale	...	...	0.80 m.
Coal	...	...	1.50 m
Carbonaceous shale	...	...	0.90 m
White or mottled brown clay	...	...	1 m.
Hard, brown, medium grained sandstone (not exposed in the bed of Koilajan)		...	25 m.
-----UNCONFORMITY -----			
-TRAP -			
-----UNCONFORMITY -----			
Metamorphics			

The depth of overburden varies from place to place. In some places, the Limestone is exposed above the surface while in other places, they are present beneath a layer of overburden. A layer of top band of Nummulitic Limestone is present after which a fine grained brown Sandstone appears as intrabed. Below this layer, the bottom bed of Limestone is present. Both the bands are fossiliferous in nature where Nummulites is the primary fossil for which they are termed as Nummulitic Limestone. The depth of each formation has to be confirmed after drilling in the area.

The metamorphics are exposed on the higher ground north of the colliery. The southern limit of the main bulk of these exposures comes to within 1000 m north of the colliery. They are also found to have laid bare as small inliers by the Koilajan and Bhalukjan Nala. These inliers are found associated with trap rocks. The traps occur both as intrusive dykes which

strike E-W, and as stratified sills. Two such exposures of trap and metamorphic inliers fringe the colliery along its northern and southern boundary.

The coal formation outcrops in two patches separated by a discontinuous stretch of trap and metamorphics. The streams Bhalukjan and Ulhaijan flow through this area exposing along their course a good section of sandstone, coal, clay and the underlying metamorphics. Of the two patches the northern is small and elongated, extending in an east-west direction, being bounded on either north and south by the metamorphics. The southern outcrop is triangular in shape, broad on west and gradually tapering towards NE. Towards west it is overlain by the Limestone formation. On east it continues to the left bank of Koilajan beyond which it disappears below thick overburden of the Limestones.

The Sylhet Limestone conformably overlies the coal formation. It forms a long narrow belt east of the colliery and occupies the ground along the left bank of Koilajan, around northwest and north of the Dillai ridge. Towards southeast, this Limestone ends abruptly against a fault striking WSW-ENE. This fault also coincides with the northern scarp of the ridge. On the upthrow side, towards south of this fault, a large area on top of Dillai ridge is covered with boulders of sandstone of the coal formation. Further east, on the eastern slope of the ridge the Sylhet Limestone reappears and continues downhill to the bed of Ulhaijan at the eastern end of the ridge.



### 5.3 Structures

The general trend of the lithology is South easterly dipping which varies from 8° to 20° that includes the local undulations as well. Limestones are well jointed while sinkholes and caves are very rare in nature. Joints are present in the Pre cambrians as well. Two sets of joints trending N-S, NW-SE are present in the exposed lithounits of the block. Bedding is prominent both in Limestone as well as Sandstone. The beds strike in NE-SW direction while they show gentle dip in SE direction.

The area has a simple regional structure geometry with litho-units mainly trending ENE-WSW to NE-SW and the area lacks any prominent marker horizon for deciphering any fold pattern. Mainly Diastrophic structures are observed in the area. Structures are both planar and linear.

### Chemical analysis of Limestone samples

The Limestone of this area is hard, compact; both the bands are highly fossiliferous in nature with colonies of Nummulites being the primary fossil present in the rocks. The analytical result of limestone samples of filed site is as follows:

S. No.	Sample No	SiO <sub>2</sub>	TiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub> (T)	MnO	MgO	CaO	Na <sub>2</sub> O	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>
		(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
1	DL-1	13.48	0.25	3.51	4.43	0.08	1.31	41.45	<0.1	0.40	0.07
2	DL-2	14.10	0.23	3.37	4.37	0.09	1.14	40.67	<0.1	0.39	0.06
3	DL-3	15.20	0.25	3.21	4.57	0.08	1.28	40.18	<0.1	0.41	0.06
4	DL-4	15.50	0.27	3.31	4.87	0.10	1.18	39.42	<0.1	0.43	0.06
5	DL-5	17.74	0.32	3.54	5.06	0.10	1.28	37.81	<0.1	0.57	0.07

**Analysis is done in the GSI, NER Lab.**

## **6. Objective of the proposed exploration program:**

The following are the objectives of proposed exploration:

- i) To demarcate the Limestone occurrence in the study area by Geological Mapping on 1: 12500 Scale for G-4 level of exploration.
- ii) To collect surface out crop samples and get analysed for six radical to find out the quality & grade of Limestone.
- iii) In case the results of the proposed exploration are encouraging then future exploration can be planned.
- iv) To carry out the exploration as per Mineral (Evidence of Mineral Contents) Rule- 2015, Mineral Auction Rule-2015 and MMDR ACT, 1957 Amended, 2015 in turn to facilitate the State Govt. (Assam) in Auctioning of Blocks.

## **7. Methodology of Exploration:**

### **7.1. Topographic Survey & Geological Mapping:**

Triangulation network will be laid down in the proposed study area of 25.00 Sq.Km. Detailed Geological Mapping will be done in the proposed block on 1:12500 scale. Borehole will be fixed on the ground. RL's and co-ordinates of survey and exploration points will be determined. All the geological features will be recorded. This map will be used as base map for future work.

### **7.2. Surface Sampling:**

Surface / outcrop samples will be collected during Geological Mapping from outcrops / exposures of Limestone formations on a systematic 400m x 400m grid interval in an area of 25 sq.km (Approx). In case outcrops are not available on systematic grid then random samples will be collected from the available outcrops / exposures. On systematic 400m x 400m grid interval approximately 300 number samples will be generated/ collected. Then the Limestone samples will be tested for 6 radicals / major oxides i.e. CaO, MgO, Al<sub>2</sub>O<sub>3</sub>, SiO<sub>2</sub>, Fe<sub>2</sub>O<sub>3</sub> and LOI.

### **7.3. Core Drilling:**

- a) After the analysis of surface samples, number of continuous or detached mineralized zones may come up on map.
- b) Drill Core Logging: The drill core will be logged for rock types, structural features, textures, intersection of ore zones and type of mineralization an occurrence of various core minerals.
- c) Drill Core Sampling: During the geological logging of drill core, mineralized zones will be marked based on concentration and Lithological variation. All core samples (primary) will be analyzed.

#### 7.4. Laboratory Studies:

7.4.1 Chemical Analysis: All the surface / outcrop samples approximately 10 Nos will be analysed for 6 radicals/ all major oxides CaO, MgO, Al<sub>2</sub>O<sub>3</sub>, SiO<sub>2</sub>, Fe<sub>2</sub>O<sub>3</sub> and LOI.

7.4.2 Petrological Studies: Petrological studies will be done on around 10 Nos. of drill core specimen.

7.4.3 Specific Gravity Determination: Specific Gravity will be determined on 10 Nos drill core specimen.

### 8. Quantum of Work Time Schedule Proposed:

- 8.1. **Time Schedule:** The proposed exploration programme is planned for activities like, camp setting, topographic survey and geological mapping and surface sample collection winding and laboratory work will be completed within 3 months' time. Report writing will take another 2 months' time including one month overlapping period of one month of laboratory studies. Thus, the total duration of project shall be completed in 6 months from the date of commencement of the project.

<u>Table-1: Time Schedule/ Action Plan, for Exploration Work of Limestone, Dillai, Karbi Anglong district, District - Assam</u>								
SL No.	Activities	Unit	MONTHS					Total
			Financial Year 2024-25					
			1	2	3	4	5	
			08/25	09/25	10/25	11/25	12/25	
1	Camp Setting	Month						1 month
2	Survey – DGPS survey of the area	day						120
3	Geological Party days for Geological Mapping of 25 Sq. Km Area(3 Party)	day						120
4	Sampling	day						90
5	Core drilling	day						150
	-							
6	Laboratory Studies	days						60
7	Report Writing	Months						2 months

\* The Schedule is planned for optimal weather condition, as Assam has long rainy season, drilling and surveying activity can be hampered so need to be planned accordingly.

**Table No.2: - Quantum of Work Proposed**

<b><u>Sl. No.</u></b>	<b><u>Item of Work</u></b>	<b><u>Unit</u></b>	<b><u>Quantum</u></b>
1	Topographic Survey on 1:12500 scale.	Sq. Km.	25.00
2	Geological Mapping on 1:12500 scale.	Sq. Km.	25.00
3	Surface / Out crop sampling	Nos.	300 numbers in an area of 25 Sq. Km
4	Core drilling (B.H)	Nos	10
5	Laboratory Studies: Surface and Drill core Samples for 6 radicals i.e. CaO, MgO, Al <sub>2</sub> O <sub>3</sub> , SiO <sub>2</sub> , Fe <sub>2</sub> O <sub>3</sub> and LOI	Nos	518
6	Petrological Studies (Petrographic Studies)	Nos	10
7	Specific Gravity Determinations	Nos	5
8	Report Preparation (Digital format)	Nos.	1

## **9. Exploration Report:**

Data generated from proposed exploration along with integration of earlier data of GSI will be utilized in Report preparation.

## **10. Cost Estimate:**

Cost has been estimated based on actual and provisional escalation as per RBI indices as on 31-03-15 and provisional escalation of @ 25% points for Geological and Laboratory Studies for the subsequent years. The total estimated cost is Rs 341.50 Lakhs. The details of cost estimates are given in Table 3 and summary is given below.

**Table 3: Summary of Cost Estimates**

<b><u>Sl. No.</u></b>	<b><u>Item</u></b>	<b><u>Total Estimated Cost (Rs.)</u></b>
1	Geological Work	22,76,760.00/-
2	Pitting and Trenching	6,66,000.00/-
3	Core drilling	47,87,000.00/-
<p>As the area falls in remote and inaccessible terrain of North Eastern States and Hilly terrain, the amount will be 3.35 times higher than the normal SoC.</p> <p>Total amount for field = 3.35 x (2276760+ 666000+ 4787000)</p> <p>=Rs 2,58,94,696.00</p>		

4	Laboratory Studies (Include Quantitative analysis of 6 radicals, Petrological study, Bulk density determination)	18,25,188.00/-
5	Misc. Charges (Includes Report Preparation)	12,21,596.00/-
	Total estimated cost (without GST)	2,89,41,480.00/-
	Provision for GST (18%)	52,09,466.00/-
	Total estimated cost (with GST)	3,41,50,946.00 Or say 341.50 Lakh

## 11. **Justification**

- In view of MMDR Act, 1957 and Mineral Auction Rule 2015 DGM, Assam is willing to take up the exploration in this block.
- The exploration work has to be carried out systematically i.e. Geological Mapping, Survey, 800 meters spacing of borehole (G-4 level) initially.
- The exploration will help in planning of future exploration programme.

Schedule of Charges for LIMESTONE IN DILLAI AREA, KARBI ANGLONG DISTRICT, ASSAM					
Sl No.	Work Activity	Unit	Charges / Cost in Rs	Qty	Total In Rs
<b>A Geological Mapping and Geological Survey Work</b>					
1	Charges for Geologist (Field)	Days	₹11,000.00	120	₹13,20,000.00
1	Charges for Surveyor	Days	₹8,300.00	30	₹249,000.00
	Labour charges for geological mapping/survey	days	₹437.00	240	₹1,04,880.00
	Charges for Sampler	Days	₹5100.00	60	₹3,06,000.00
2	Labour charges for sample work	Days	₹437.00	240	₹1,04,880.00
3	Borehole fixation and Determination of Coordinate & RL	No.	₹19,200.00	10	₹1,92,000.00
<b>Sub Total A</b>					<b>₹22,76,760.00</b>
<b>B Pitting &amp; Trenching</b>					
1	Pitting and Trenching	per cu m	₹3,330.00	200	₹6,66,000.00
<b>Sub Total B</b>					<b>₹6,66,000.00</b>
<b>C Core Drilling</b>					
1	Drilling – Soft rock	Mtr	₹5242.00	500	₹6,66,000.00
2	Land/Crop compensation in case BH falls in agricultural land	Per BH	₹20000.00	10	₹2,00,000.00
3	Construction of concrete pillar (12" x 12" x 30")	Per BH	₹2000.00	10	₹20,000.00
4	Transportation of Drill rig & truck associated per drill	km	₹36.00	500	₹18,000.00
5	Monthly accommodation charges for drilling camp (upto 2 Rigs)	Month	₹50,000.00	3	₹1,50,000.00
6	Drilling camp setting cost	Nos.	₹2,50,000.00	1	₹2,50,000.00
7	Drilling camp winding up cost	Nos.	₹2,50,000.00	1	₹2,50,000.00
	Road making (Flat terrain)	Km	₹32,200.00	15	₹4,83,000.00
	Drill core preservation	Per m	₹1590.00	500	₹7,95,000.00
<b>Sub Total C</b>					<b>₹47,87,000.00</b>
As the area falls in remote and inaccessible terrain in NE states and Hilly terrain, the amount is 3.35 times higher than the normal SoC, hence the total amount = 3.35x(2276760 + 666000 + 4787000) = <b>Rs 2,58,94,696.00</b>					
<b>D Laboratory Studies</b>					
a) Chemical Analysis					
1	Primary samples (CaO,MgO,Al2O3,SiO2,Fe2O3 & LOI)	Per Sample	₹2841.00	450	₹12,78,450.00
2	Check samples (CaO,MgO,Al2O3,SiO2,Fe2O3 & LOI)	Per sample	₹2841.00	68	₹1,93,188.00
b) Physical Analysis					
1	Preparation of thin section	No.	₹2,353.00	10	₹23,530.00
2	Bulk density determination	No.	₹3,540.00	5	₹17,700.00
3	Petrographic Studies	No.	₹2353.00	10	₹23,530.00
4	Charges of one Geologist per day at HQ	day	₹9000.00	30	₹2,70,000.00
<b>Sub Total D</b>					<b>₹18,25,188.00</b>
<b>Total of A+B+C+D</b>					<b>₹2,77,19,884.00</b>
<b>E Miscellaneous Charges</b>					
1	Preparation of Exploration proposal	5 Hard Copies and Soft Copies	2% of the Total A+B+C+D	1	₹3,80,000.00
2	Geological Report Preparation	5 Hard Copies and Soft Copies	3% of the Total A+B+C+D or Minimum of 7.5 Lakhs	1	₹8,31,596.00

3	Peer review charges	As per EC decision			₹10,000.00
<b>Total estimated cost without GST</b>					<b>₹2,89,41,480.00</b>
<b>Provision for GST (18%)</b>					<b>₹52,09,466.00</b>
<b>Total estimated Cost (With GST 18%)</b>					<b>₹3,41,50,946.00</b>
<b>Or Say Rs 341.50 Lakh</b>					