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

GOVERNMENT OF ASSAM

DIRECTORATE OF GEOLOGY & MINING GUWAHATI

RECONNAISSANCE SURVEY FOR LIMESTONE IN SHEELVETA AREA OF WEST KARBI ANGLONG DISTRICT- (ASSAM) EXPLORATION G-4

Details enclosed with map

i.	Name of Mineral	Limestone
ii.	Name of Block	Sheelveta
iii.	Location	Latitude: 26°00'00"N to 26°01'51.82"N Longitude: 93°17'35.00"E to 92°22'11.68"E
iv.	Toposheet No.	83 G/5 and 83 F/8
v.	Name of villages	Sheelveta, Paglangso, Meyongdisa
vi.	Sub-division	Diphu Sadar
Vii.	District	Karbi Anglong
Viii.	Area	25 km^2 (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 Sheelveta 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 exploitedminerals since limestone constitute the basic raw materials for theseindustries. 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 Sheelveta area in Karbi Anglong district, Diphu subdivision under Diphu Police Station of Karbi Anglong, Assam.

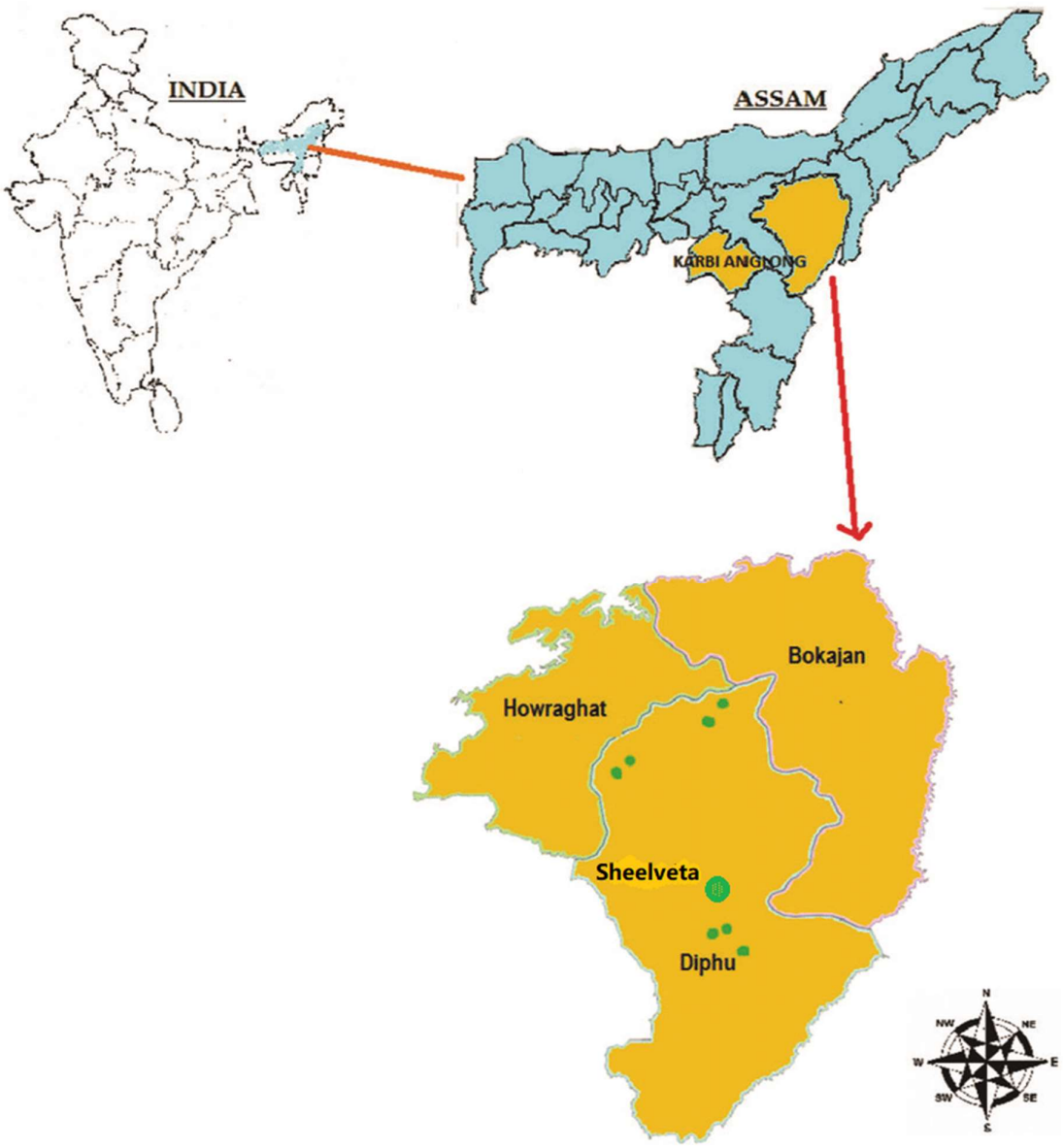
The Limestone Deposits of Sheelveta is located near the Nagaon Doboka Diphu road in Karbi Anglong district. It is 122 km from Nagaon on the Nagaon Doboka Diphu road and 37 km from Diphu. The nearest train station is Diphu Railway Station which fall the main line of North East Frontier railway which lies at a 151 km from Guwahati.

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° 00’ 00” N	93° 17’ 35.00” E
2	B	25° 59’ 58.81” N	93° 22’ 11.68” E
3	C	26° 01’ 50.89” N	93° 21’ 48.23” E
4	D	26° 01’ 51.82” N	93° 17’ 26.23” E

The block lies near the Nagaon Doboka Diphu 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 Southern edge of the Mikir hills is made up of undulating hillocks and flat valleys. The drainage system is controlled by the Jamuna river which flows from east to west direction. The Meyongdisa and Disama, the two North flowing tributaries of Jamuna contribute to the drainage system of the area. Moreover, numerous nalas flow in different directions.

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 19th century. Medlicott (1865) and Smith (1898) visited Mikir Hills and described the rock units. Chandra (1949), Banerjee (1949), Munshi and Raina (1959) investigated for Limestone in the Sheelveta areas.

Since 1972-73, geologists of the State Directorate of Geology & Mining have been carrying out systematic geological mapping for location of promising limestone deposits. The investigation is carried out in the form of detailed geological mapping, sampling, chemical analysis of the samples and petrography of the samples collected from the respective locations.

During the FS 1974-75, Shri R.Kakati, Geologist, Shri J.Kalita, Asstt Geologist, Shri N.C. Baruah, Asstt Geologist reported presence of Limestone at Jamuna valley at Sheelveta area, Dist: Karbi Anglong. This area 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 overlainat 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 (Gneissossity/ 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 limestone under investigation belongs to the Sylhet limestone formation of Jaintia Group of Eocene sediments. This formation is conformably underlain by the Basal sandstone formation and overlain by Kopili formation.

The various lithologic units met with in the area are arranged in their chronological sequence as given below:

Recent - Alluvium with loose sand
---- Unconformity -----
Kopili formation – Alternations of shale and sandstone
Sylhet limestone formation – Fossiliferous limestone with very thin shale and sandstone bands
Basal sandstone – Sandstone with thin coal seams and clay beds
---- Unconformity -----
Sylhet Trap – Highly weathered trap rocks
Precambrians – Granite and granite gneiss

Basal sandstone formation:

The Basal sandstone overlies Precambrians or traps. It is conformably overlain by the Sylhet limestone formation. Occasionally white plastic clay beds have been found to develop at the base of the Basal sandstone formation as observed at road cutting near Sheelveta falls on the Doboka-Dimapur road. The sandstone is composed mainly of medium to coarse grained quartz cemented by ferrugineous materials. It is well bedded and exhibits gentle inclination varying from 8 to 20^{o} towards south-east.

This formation contains carbonaceous shales and very thin coal seams. The coal seams are not persistent throughout the sandstone and very often they show swelling and pinching nature, i.e., within a distance of 500 m the coal converge to a thickness of 0.3m. The coal is dull brown to black in colour and contains Pyritic grains and fossil resins. The coal seam attains a maximum thickness of about 1.00 metre in the Sheelveta colliery; workable coal seam is also found to occur in the Koliajan Colliery.

Sylhet limestone formation:

The limestone formation of this terrain belongs to the Sylhet limestone formation of the Jaintia Group of Eocene sediments. This formation is underlain by the coal bearing Basal

sandstone formation and overlain by the Kopili formation. The limestone mostly outcrops along the course of the Jamuna River, Meyong Disa tributary and some nala sections. The limestone formation is represented by well bedded fossiliferous limestone with occasional small bands of sandstone and shale. The limestone is highly weathered. The bottom portion of the limestone formation is compact and grey in colour whereas the top portion is ferrugeneous and silicious and attains brown colour. The limestone contains abundant fossils, mostly Nummulits. Other foramenifers like Discocyclina, Alveolina etc. are also common. Some genera of Pelecypods and Gastropods are also occasionally observed in the limestone. The intervening sandstone is grayish brown in colour medium to fine grained in texture. The shale is gray in colour, splintery in nature and contains occasional pyrite balls.

Kopili formation:

The rocks of this formation conformably overlie the Sylhet limestone formation. This formation is rarely exposed in the present area, wherever it is exposed it occurs at the top of the hillocks. A small exposure of Kopili formation is encountered at the road cutting at about 1 km east of the Sheelveta falls. This formation is represented by alternations of shale and sandstone. The shale is gray in colour, well laminated and splintery in nature. The sandstone is brownish in colour and generally medium to coarse grained in texture.

Description of limestone deposit:

The detailed geological mapping was restricted to both banks of the Jamuna river right from Sheelveta falls to the Sheelveta colliery. An area of about 7.5 sq. km (5000 m × 1500 m) was covered by detailed geological mapping in the scale 1:5000 with Brunton and measuring tape.

The outcrops of limestone are very limited in the area. Most of the area is covered by soil. The best outcrops of limestone are seen in the river bed of Jamuna and Meyong Disa. Some scattered outcrops are also seen in some nala sections. From the confluence of Meyong Disa and Jamuna towards upstream of Meyong Disa about 1 sq. km area is most promising where a maximum thickness of 5.5 m was recorded. Another small block of limestone deposit was delineated on the southern bank of the Jamuna from about 500 m downstream from Sheelveta falls towards south-east. The area of the block is about 1.5 km^2. The maximum thickness recorded in this block is 3 m at Jamuna river section.

The top portion (about 1 m) of the limestone band is ferrugineous and siliceons and reddish brown in colour. The bottom portion is gray in colour and highly fossiliferous. A very thin band of splintery shale (about ½ m thick) of gray colour is found to associate with the limestone band as intervening bed. Various genera of Foramenifers, Pelecypods and Gastropods are enclosed in the limestone.

Soil cover is the only overburden of the limestone deposits. It is very difficult to give a correct assessment of overburden as the outcrops of limestone are very limited and most of the area is covered by soil. In most of the outcrops of limestone about 1-2 m of soil cover is observed. For the correct assessment of overburden and thickness of the limestone band drilling programme is essential.

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. Three sets of joints trending N-S, E-W, NW-SE are present in the exposed lithounits of the block.

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 :

The Limestone of this area is hard, compact; the top portion of Limestone is Ferrugeneous and Siliceous, brownish to reddish brown in color while the bottom portion is grey in color. Analytical result of Limestone samples collected from the field site is as follows:

S No.	Sample No	SIO_2 (%)	TIO_2 (%)	AI_2O3 (%)	$Fe_2O_3(T)$ (%)	MnO (%)	MgO (%)	CaO (%)	Na_2O (%)	K_2O (%)	P_2O_5 (%)
1	SIL-I	2.65	0.02	0.58	2.04	0.10	0.75	51.60	<0.1	<0.1	0.03
2	SIL-2	2.85	0.02	0.64	2.12	0.11	0.76	51.30	<0.1	<0.1	0.03
3	SIL-3	12.34	0.16	2.32	2.44	0.29	0.58	46.03	<0.1	0.23	0.15
4	SIL-3	13.30	0.20	2.81	2.75	0.32	0.64	44.74	<0.1	0.29	0.15
5	SIL-5	12.80	0.16	1.72	2.40	0.31	0.55	45.76	<0.1	0.21	0.12

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 GeologicalMapping 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 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 willbe used as base map for future work.

7.2. Surface Sampling:

Surface / outcrop samples will be collected during Geological Mapping from out crops / 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_2O_3, SiO_2, Fe_2O_3 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_2O_3, SiO_2, Fe_2O_3 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 mappingand 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 completedin 6 months from the date of commencement of the project**.**

Table-1: Time Schedule/ Action Plan, for Exploration Work of Limestone, Sheelveta, Karbi Anglong district, District - Assam

SL No.	Activities	Unit	MONTHS Financial Year 2024-25					Total
			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

Sl. No.	Item of Work	Unit	Quantum
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_2O_3, SiO_2, Fe_2O_3 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 earlierdata 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 inTable 3 and summary is given below.

Table 3: Summary of Cost Estimates

Sl. No.	Item	Total Estimated Cost (Rs.)
1	Geological Work	22,76,760.00/-
2	Pitting and Trenching	6,66,000.00/-
3	Core drilling	47,87,000.00/-
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. Total amount for field = 3.35 x (2276760+ 666000+ 4787000) =Rs 2,58,94,696.00		

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

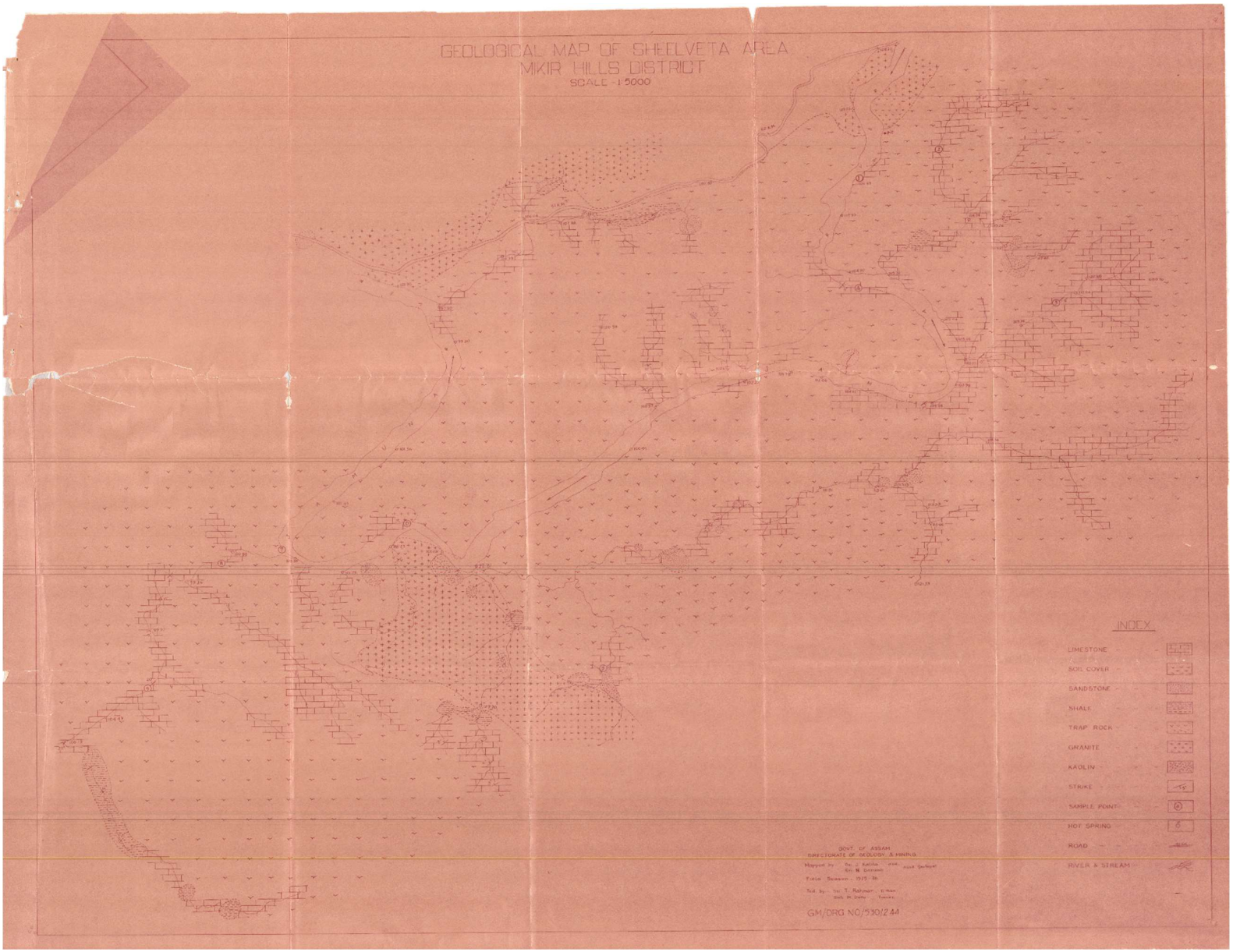
11. Justification

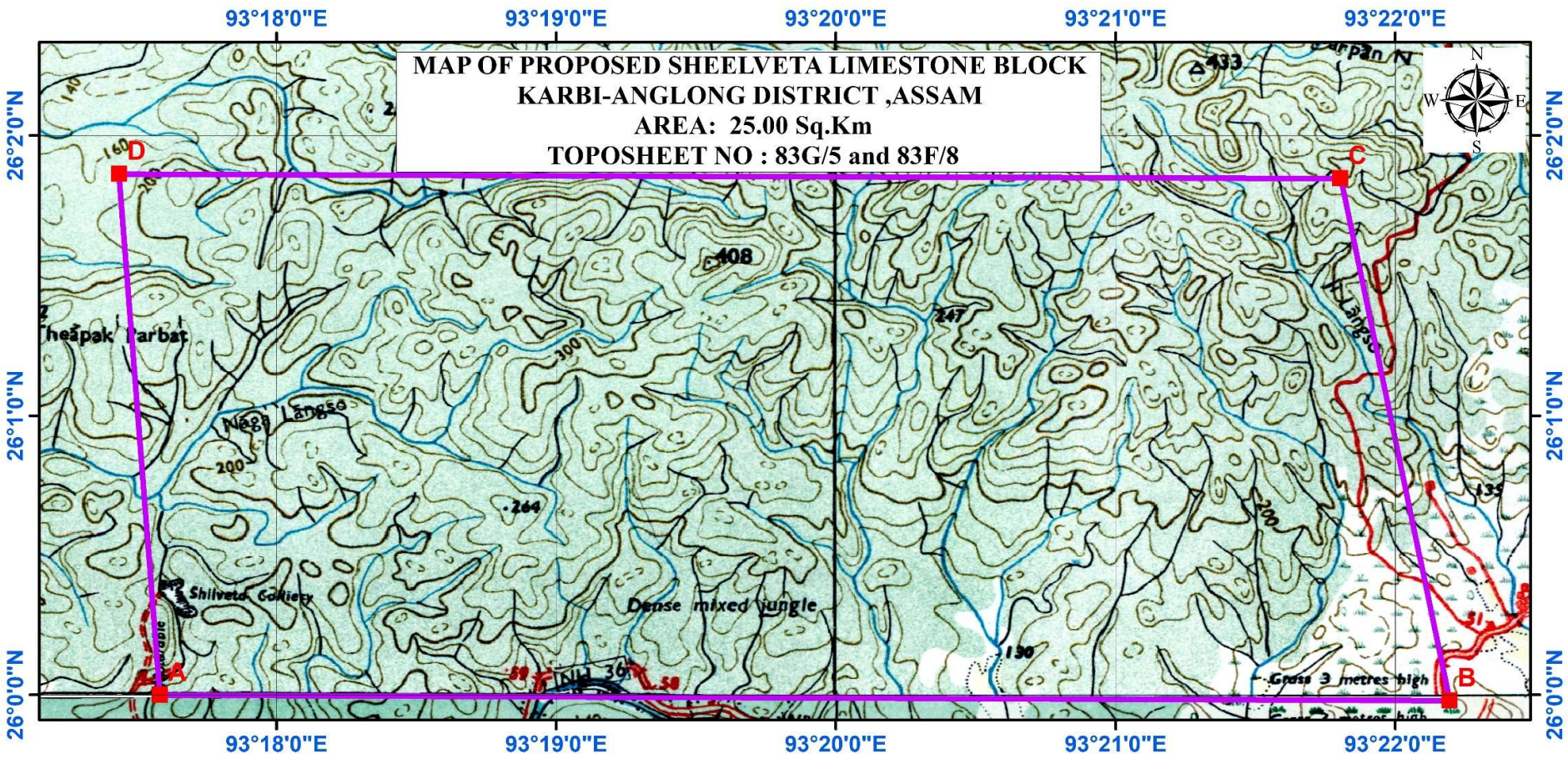
- In view of MMDR Act, 1957 and Mineral Auction Rule 2015 DGM, Assam is willing to take up the exploration in this block.
- The exploration work has to be carried out systematically i.e. GeologicalMapping, Survey, 800 meters spacing of borehole (G-4 level) initially.
- The exploration will help in planning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

Schedule of Charges for LIMESTONE IN SHEELVETA AREA, KARBI ANGLONG DISTRICT, ASSAM					
Sl No.	**Work Activity**	**Unit**	**Charges / Cost in Rs**	**Qty**	**Total In Rs**
A Geological Mapping and Geological Survey Work					
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
Sub Total A					**₹22,76,760.00**
B Pitting & Trenching					
1	Pitting and Trenching	per cu m	₹3,330.00	200	₹6,66,000.00
Sub Total B					**₹6,66,000.00**
C Core Drilling					
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
Sub Total C					**₹47,87,000.00**
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) = **Rs 2,58,94,696.00**					
D Laboratory Studies					
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
Sub Total D					**₹18,25,188.00**
Total of A+B+C+D					**₹2,77,19,884.00**
E Miscellaneous Charges					
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
Total estimated cost without GST					**₹2,89,41,480.00**
Provision for GST (18%)					**₹52,09,466.00**
Total estimated Cost (With GST 18%)					**₹3,41,50,946.00**
Or Say Rs 341.50 Lakh					

Map 1 : Geological Map of Sheelveta area, Dist: Karbi Anglong, Assam





BOUNDARY POINT	BOUNDARY COORDINATE	
A	93°17'35"E	26°00'00"N
B	93°22'11.68"E	25°59'58.81"N
C	93°21'48.23"E	26°1'50.89"N
D	93°17'26.23"E	26°1'51.82"N

0 0.55 1.1 1.65 2.2 Kilometers

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DIRECTORATE OF GEOLOGY AND MINING,ASSAM
KAHILIPARA, GUWAHATI-19