RECONNAISSANCE SURVEY (G4) FOR SILLIMANITE IN - SAMELANGSU AREA, KARBI-ANGLONG DISTRICT, ASSAM (THROUGH NMET FUND)

খনিজ সম্পদৰ অন্বেষণত

GOVERNMENT OF ASSAM

DIRECTORATE OF GEOLOGY AND MINING

GUWAHATI

RECONNAISSANCE SURVEY FOR SILLIMANITE IN SAMELANGSU AREA OF KARBI- ANGLONG DISTRICT- (ASSAM) EXPLORATION G-4

SUMMARY OF THE BLOCK:

1	Title of project	Proposal for Reconnaissance Survey for Sillimanite in Samelangsu area (G-4) of district Karbi- Anglong, Assam
2	Mineral/minerals to be explored	Sillimanite
3	Level of proposed Exploration (G4/G3/G2/G1)	G4
4	State District Block/Area	Assam Karbi- Anglong Samelangsu
5	Toposheet No. & Forest comportment No.	83F/3, 83F/7
6	Total area and Coordinates of the area/block (Latitude/Longitude	50 Sq.km. for mapping (1:12,500 scale) The boundary points for the proposed block : A: 93°12'37.6"E 26°21'36.501"N B: 93°16'13.032"E 26°21'35.717"N C: 93°16'15.504"E 26°17'1.84"N D: 93°12'39.424"E 26°17'2.252"N Location of the area that was previously investigated by DGM,Assam 93˚12′35″ to 93˚17′20″ and 26˚17′05″ to 26˚20′00″
7	Background information a. Previous work	• An area of 24 sq. km was mapped on 1:25000 scale by DGM,Assam in 1980-81
8	Brief account of work proposed in the area and expected outcome	Reconnaissance survey ()G-4), demarcation of area for further detailed exploration work on the basis of previous explored area by Directorate of Geology and Mining 31 years ago. The proposed exploration work will be carried out with latest modern technology.

Reconnaissance Survey (G-4 Level) For Sillimanite in Samelangsu in an area of 50 sq. km, Karbi- Anglong district, Assam

1. Introduction:

Sillimanite is considered as essential raw material for the manufacture of high grade heat resisting refractory products, used extensively in the glass and ceramic industries. The increasing demand of Andalusite, Sillimanite & Kyanite has been accorded high priority hence the area has been identified for exploration.

Directorate of Geology & Mining Assam has decided 1 No. of Mineral Exploration Block for G-4 level of Exploration. The Regional Exploration proposed for Sillimanite in Samelangsu area in the district Karbi- Anglong is approximately about 50 sq. km. Accordingly, Directorate of Geology and Mining, Assam has prepared a proposal for reconnaissance survey and is being put up for approval of Technical/ Executive Committee of NMET.

2. Location of the Block:

Samelangsu is situated at a distance of 24 km North East of Dokmoka connected by road while Dokmoka is connected with Diphu, the district H.Q of Karbi-Anglong district by N.H 36.

The Co-ordinates of the corner point of the proposed block are given below and covers an area of 50 sq. km.

A: 93°12'37.6"E	26°21'36.501"N
B: 93°16'13.032"E	26°21'35.717"N
C: 93°16'15.504"E	26°17'1.84"N
D: 93°12'39.424"E	26°17'2.252"N

3. Physiology and Drainage:

The topography of the area is an undulating one. The general slope of the area is towards North West. The attitude of the area varies from 626 mt. to 80 mt. above M.S.L. The area is mostly covered with dense forest on the slope of the hillocks with thick undergrowth.

The area is mainly drained by Samelangsu, Langlaksu and Horu Horgati. These rivers again fed by numerous perennial and sub- perennial stream flowing N-S and S-N direction.

4. Previous work:

The occurrence of sillimanite in the area was first reported by the officers of Directorate of Geology and Mining in 1978-79.Later on the area was surveyed by Sri P. Borphukan, Asstt. Geologist in the field season 1979-80 at a scale of 1: 25000.

Uttam Kumar Baruah, Asstt. Geologist and P.K Borphukan, Asstt. Geologist of DGM, Assam carried out geological survey in the area around Samelangsu-Langlaksu valley in Field season 1980-81. An area of about 24 sq. km has been mapped in the area at a scale of 1:25000.

The chemical analysis of a few representative samples collected in the area is given

below.

Chemical Analysis:

Sample no.	SiO_2	CaO	TiO_2	Al_2O_3	FeO	L.O.I	MgO
1	50.65	0.28	0.22	45.59	1.19	1.08	Traces
2	50.08	0.17	0.22	40.21	1.19	1.12	Traces
3	41.18	0.31	0.16	54.35	1.19	1.58	Traces
4	53.84	0.22	0.16	35.65	1.19	5.40	Traces
5	56.32	0.24	0.30	37.92	1.38	1.22	Traces
6	65.12	0.33	0.72	28.71	2.59	1.12	Traces

5. Geology and Structure:

Regional Geology of the Area:

Table 3.1: A generalized stratigraphic set up of Assam			
(G.S.I, Miscellaneous Publication No. 30. 2009).			
Age	**Group Name**	**Formation (Thickness)**	**Lithology**
Holocene	Unclassified	Newer alluvium	Sand, silt and clay
Middle to Upper Pleistocene	Unclassified	Older alluvium	Sand, clay, pebble, gravel and boulder deposit
Unconformity/ Tectonic			
Pliocene-Pleistocene	Siwalik Group	Kimin Formation	Sandstone with clay stone
		Subansiri Formation	Micaceous sandstone
Pliocene	Dihing Group	Dihing Formation (900m)	Pebble beds, soft sandy clay, clay, conglomerates, grit and sandstone
Unconformity			
		Dupitila Formation	Sandstone, mottled clay, grit and conglomerate; locally with beds of coal, conglomerate and poorly consolidated sandstone with layers and pockets of pebbles
Mio-Pliocene	Dupitila Group	(Surma valley: 3300)	
		Namsang Formation	Coarse, gritty, poorly consolidated sandstone and conglomerate of coal pebbles
		(Upper Assam: 800m)	
Unconformity			
		Girujan Clay Formation(1800m)	Mottled clays, sandy shale and subordinate mottled, coarse to gritty sandstone

Mio-Pliocene	Tipam Group	Tipam sandstone Formation(2300m)	Bluish grey to greenish, coarse to gritty, false bedded, ferruginous sandstone, clays, shale and conglomerates
Unconformity			
	Surma Group	Bokabil Formation	Shale, sandy shale, siltstone, mudstone and lenticular, coarse ferruginous sandstone
Miocene		(900 to 1800m)	
		Bhuban Formation	Alternations of sandstone and sandy shale and thin conglomerate, argillaceous in middle part.
		(1400 to 2400)	
Unconformity			
		Renji Formation	Massive bedded sandstone; its equivalent- the Tikak Parbat Formation in the Upper Assam is marked by thick coal seam in basal part.
		(600 TO 1000)	
Eocene-Oligocene	Barail Group	Jenam Formation	Shale, sandy shale and carbonaceous shales with interbedded hard sandstone; its equivalent the Bargolai Formation in Upper Assam is marked by thin coal seams.
		(1000 to 3300m)	
		Laisong Formation (2000 To 2500)	Well bedded compact flaggy sandstone and subordinate shale; its equivalent- the Nagaon Formation in Upper Assam is marked by thin bedded, hard sandstone and interbedded shale.
	Disang Group		Splintery dark grey shale and thin sandstone
		Kopili Formation	Shale, sandstone and marl
Palaeocene-Eocene	Jaintia Group		Sylhet Limestone (Fossiliferous Limestone)
		Shella Formation	Sylhet sandstone, clay and thin coal seam
		Langpar Formation (exposed in Meghalaya)	Calcareous shale, sandstone-limestone
Unconformity			
Cretaceous	Alkali Complex of Samchampi		Pyroxenite- serpentinite with abundant development of melilite pyroxene rock, ijolite, syenite and carbonatite

Unconformity			
Cretaceous		Sylhet Trap	Basalt, alkali basalt, rhyolite, acid tuff
		(exposed in Meghalaya)(600m)	
Unconformity			
Perm-Carboniferous	Lower Gondwana	Karharbari Formation	Very coarse to coarse grained sandstone with conglomerate lenses, shale, carbonaceous shale and coal
		Talchir Formation	Basal tillite, conglomerate with sandstone bands, siltstone and shale
Unconformity			
Neo-Proterozoic-early Palaeozoic	Granite Plutons		Porphyritic coarse granite, pegmatite, aplite, quartz vein traversed by epidiorite, dolerite
Intrusive contact			
Palaeo- Meso Proterozoic	Shillong Group		Quartzite, phyllite, quartz-sericite schist, conglomerate
Unconformity			
Archaean (?) Proterozoic	Gneissic Complex		Complex metamorphic group comprising ortho and para gneisses and schists, migmatites, granulites etc. Later intruded by acidic and basic intrusive.

General Geology of the Area:

The dominant rock types occurring in the area are mainly granite, pink feldspathic gneiss, feldspathic quartz biotite gneiss, garnetiferous hornblende biotite gneiss (with laths of sillimanite), quartz schist, feldspathic sillimanite rock (migmatitic) and minor veins of quartz and amphibolite. Pockets of sillimanite bearing rock generally occur within the granite mass. The general geological succession of the area can be deciphered as below.

AGE	GROUP	FORMATION	DESCRIPTION
RECENT			ALLUVIUM AND TALUS
Pre-Cambrian	Gneissic Group	Para or Ortho metamorphics	Pink feldspathic gneiss/Feldspathic quartz biotite gneiss /Garnetiferous hornblende biotite gneiss with sillimanite laths / Sillimanite quartz schist / Feldspathic sillimanite rock. (Migmatite)

Distribution of Rock Units:

Granite, feldspathic quartz biotite gneiss, garnetiferous hornblende biotite gneiss with minor sillimanite laths are the dominant rock types of the area. Subordinate amount of sillimanite quartz schist associated with massive sillimanite and feldspathic sillimanite rock. Small amount of pink coloured feldspathic gneiss is also present in the area. Pink colored feldspathic gneiss mostly occurs north eastern part of the area in Samelangsu nala and some of its tributaries. The rock is intruded by granite.

Feldspathic quartz biotite gneiss is widely distributed in the area. Off course, small pockets are also occur in the mid portion of Samelangsu nala. Garnetiferous hornblende biotite gneiss is concentrated in the mid portion of Samelangsu nala extending from northeast to south west as a lens shaped structure.

Sillimanite quartz schist is mainly occurs on the south western part of the Samelangsu nala. It mainly concentrated at Inglang Pahar and Jimtimthepi hill section. Weathered Sillimanite quartz schist are also occur in southern part of Horu Horgati nala. A few minor quartz veins occur as intrusive in the sillimanite bearing rock at Inglang Pahar. Small pockets of amphibolite are also occurring in some places of the area.

Sillimanite quartz schist occurs as small pocket within the granite mass. Massive sillimanite boulders are also associated with schistose rock. The plain portion of the area is covered by alluvium and slopes of the hillocks are covered by talus deposit.

Description of Rock Units:

1. Garnetiferous hornblende biotite gneiss: The essential constituents of the rock are hornblende, biotite, quartz feldspar and garnet. The foliation of the rock is well defined by the planar orientation of biotite. Garnet (Pinks) occurring as small inclusions in the rock. Quartz grains are oriented parallel to the dominant foliation.
2. Feldspathic Quartz Biotite Gneiss: The rock is mainly consist of Quartz and Feldspar with minor amount of muscovite, apatite, zircon, iron ore occur as accessories.
3. Granite: Two types of granite are occurring in the area. One is fine grained, pink coloured and the other is coarse to medium grained grey coloured granite. Pink variety is essentially consisting of quartz and potash feldspar while the grey variety is of quartz, feldspar and biotite.

Structure

The present structural pattern of the area is the result of polytectonic and polymetamorphic process of deformation. Regional mapping of the area shows that the major structural feature of the area is NE-SW trending asymmetrical fold. The first prominent structural feature is the development of alternation layers of felsic and such mafic minerals. The sillimanite in the area formed along with the lithological banding. The second phase of deformation is indicated by the development of very tight isoclinal and similar folding with the development of axial plane foliation. Both the folding and foliation are affected by NE-SW trending asymmetric folding which sometimes result in the steep dip of the foliation.

6. Objective of the proposed exploration programme:

With this background information it is proposed to take up in Preliminary survey (G4 level exploration) for Sillimanite ore in Samelangsu area of Karbi-Anglong District, in part of Toposheet number 83F/3, 83F/7. The block is bounded as shown in the proposed block map.

Based on the evaluation the present exploration programme has been formulated to fulfill the following objectives: -

i) To carry out geological mapping on 1:12,500 scale and demarcate the rock types of Sillimanite bearing formations with the structural features to identify the surface manifestations and lateral disposition of the mineralized zones (ore body).

ii) To collect surface samples to separate Sillimanite from host rock and assess weight percentage to decide further course of exploration programme.

iii) A total of 5 No. of scout boreholes shall be drilled. The future course of exploration program will be decided after reconnaissance survey (G-4) outcome to G-3/G-2 level of exploration.

iv) To estimate reconnaissance Sillimanite mineral resources along with accessory elements as per UNFC norms and minerals (Evidence of Mineral Contents) Rules-2015 at G-4 level.

7. Planned Methodology:

In accordance to the objective set for the reconnaissance survey (G-4) of the block, the exploration programme is proposed. The exploration shall be carried out as per Minerals (Evidence of Mineral Content) Rule-2015. Accordingly, the following scheme of exploration is formulated to achieve the objectives. The details of different activities to be carried out are presented in subsequent paragraphs.

8. Geological mapping:

Geological mapping will be done in the entire 50 sq.km area on 1:12,500 scale. Rock types, their contact, structural features etc. will be mapped. Surface manifestations of the sillimanite bodies available along with their surface disposition will be marked on the map.

9. Surveying:

As exploration work is at G-4 level, no detailed survey work is planned. The block boundary will be surveyed by total station in WGS-84 datum for demarcation of block boundary points. Borehole fixation and determination of reduced level and co-ordinates of the scout boreholes will be undertaken.

The block is of around 50 sq km area, hence after identifying the disposition of mineralized zones, the area surrounding mineralized zones (ore bodies)/potential area will be contoured on 1:1,000 scale at 1.00m contour interval. Surveying of surface features within such sub blocks will be undertaken.

10. Exploratory Mining

a. Trenching / Pitting:

Shallow trenching (Excavation) shall be carried out in the potential zones identified based on the results of geological mapping. A provision of shallow trenching of 500 cubic meters is kept. Locations of trenches on ground will be decided by field geologist based on field observations.

b. Pit Sampling:

Pitting shall be done for correlation of mineralized zones (if any) on surface up to a depth of 2m after removal of soil/weathered column in the area. A provision of shallow pitting of 50 cubic meters is kept. Locations of pits on ground will be decided by field geologist based on field observations.A provision of 200 Nos of primary & check (5% internal+10% External) trench/pit samples is kept for analysis of Al_2O_3, SiO_2, Fe_2O_3, TiO_2, MgO, Na_2O, K_2O & LOI.

The trench /pit walls will be mapped on 1:200 scale. Thus, a total of 550 cu m of shallow trenching/pitting work along with associated geological & laboratory studies will be carried out.

11. Core Drilling:

Based on Geological mapping, the extension of the mineralized zones (ore bodies) will be marked. To find out the potentiality of mineralized zones in strike & dip, 5 Nos scout boreholes involving 350mtrs. of drilling will be carried out for first level (shallow - 50m) of intersection of mineralized zones.

- **<u>Drill Core Logging:</u>**

The drill core will be logged for rock types, structural features, textures, intersection

of sillimanite zones, types of mineralization and occurrence of various ore minerals. The logging for determination of Rock Quality Determination/Designation (RQD) will also be undertaken.

- **Drill Core Sampling:**

During geological logging of drill core, sillimanite zones will be marked on basis of concentration and lithology. Total 200 Nos of primary and check (5% Internal Check+ 10% External Check) samples will be analyzed for Al_2O_3, SiO_2, Fe_2O_3, TiO_2, MgO, Na_2O, K_2O & LOI.

12. Sampling and Analysis:

Total 200 primary channel samples from trench/pit, 15 internal check and 30 external check samples are proposed to be analysed for Al_2O_3, SiO_2, Fe_2O_3, TiO_2, MgO, Na_2O, K_2O & LOI.

From drill core, total 200 primary samples, 10 internal check and 20 external check samples are proposed to be analysed for Al_2O_3, SiO_2, Fe_2O_3, TiO_2, MgO, Na_2O, K_2O & LOI.

- **Petrological Studies:**

During the course of geological mapping and core logging 20 samples from Surface, Trench/Pit and borehole core will be studied for petrography.

- **Specific Gravity Determination:**

The specific gravity determination of 10 samples from the mineralized zones intersected in the boreholes will be carried out.

- **Bulk Density Determination:**

The Bulk Density determination 10 samples from the mineralized zones intersected in the pits will be carried out.

13. Quantum of Work Proposed

Sr.No.	Item of Work	Unit	Target
1	**Geological Mapping** (on 1:12,500 Scale)	Sq km	50
2	**Topographical Survey** (Surface features/Trench/Pit/Borehole* locations etc)	Sq km	In mineralized area (If required)
3	Bore Hole Fixation and determination of co-ordinates & Reduced Level of the boreholes by DGPS	Nos	5
4	**Exploratory Mining (Trench/pit)**		
	a)Excavation (Pitting) (1m*1m*2m)	Cu. m	50
	b)Excavation (Trenching) (2m*1m)	Cu. m	500
5	**Trench/pit Sampling**		
	a) Channel Sampling	Nos	200
	b) Check Samples (5% Internal + 10% External) of Bed Rock	Nos	5
6	**Drilling (coring)***		
	a) Drilling, total 5 (Scout Boreholes) 70 mtrs each	m	350
7	**Drill Core Sampling***	Nos	
	a) Drill Core (Primary) Samples	Nos	170

	b) Drill Core (check) Samples		30
8	**Laboratory Studies**		
	Analysis of alumino-silicate rock	Nos	4
	ii) Surface Sampling (Bed rock samples) (For quantitative REE analysis)	Nos	20
	iii) Check Samples (5% internal and 10% external) of Bed rock (For quantitative REE analysis)	Nos	5
	iv) Primary & Check samples from both Pit & Trench & BH Core samples (for SiO_2 , Al_2O_3, Fe_2O_3, TiO_2, CaO, MgO, Na_2O, K_2O, LOI)	Nos	400
	iv) Petrological Samples (Surface & BH Core Samples)		
	a) Preparation of Thin Section	Nos	20
	b) Study of Thin Section	Nos	20
9	**Specific gravity Determination***	Nos.	10
10	**Bulk density Determination**	Nos	10
11	**Report Preparation (5 Hard copies with a soft copy)**	Nos.	1
12	**Preparation of Exploration Proposal (5 Hard copies with a soft copy)**	Nos.	1
*** The 2nd level of work to be decided after review of Geological Mapping & sampling.**			

14. Time schedule:

Time schedule for Reconnaissance survey (G4) for Sillimanite in Samelangsu in an area of 50 sq. km , Karbi- Anglong district, Assam													
S. No.	**Activities**	**Months**											
		1	**2**	**3**	**4**	**5**	**6**		**7**	**8**	**9**	**10**	**11**	**12**
1	**Camp mobilisation**													
2	**Mapping (1:12500)**													
3	**Geologist days in field**													
4	**Surface drilling (1 rig)**													
5	**Survey days**													
6	**Sampling days**													
7	**Laboratory Studies**													
8	**Camp winding**													
9	**Geologist days in HQ**													
10	**Geological Report Writing**													
Note: 1. Commencement of project may be reckoned from the day the exploration acreage is available along with all statutory clearances.														
2. Time loss on account of monsoon/agricultural activity/forest clearance/local law & order problem may be additional to above time line.														

Review

15. Cost Estimate:

The Project cost with provisional escalation is estimated at say Rs. 627.48 Lakhs

Summary of Cost estimate		
Sr no	**Item**	**Total(Rs)**
1	Geology	**69,35,760.00**
2	Pitting and Trenching	18,55,000.00
3	Drilling	61,74,900.00
4	Subtotal (1-3)	**1,49,65,660.00**
5	In Remote and inaccessible terrain existing in north eastern states {subtotal (1-3) x 3.35}	5,01,34,961.00
6	Laboratory studies	18,71,514.00
7	Charges for one Geologist at HQ	13,50,000.00
8	Report Preparation	19,80,694.25
9	Peer Review	10,000
	Total (5-9)	**5,53,47,169.25**
9	GST-18%	99,62,490.47
	Grand Total	**6,53,09,659.72**

16. Justification:

In the proposed study area, these are few known area & new zones may also be recognized. Their sub-surface continuation in strike & dip directions will be assessed during Geological mapping for targeting the mineralized zones.

The exploration will be helpful in estimation of reconnaissance resources of Sillimanite in block area.

In case the results of the reconnaissance survey are positive, it will help in planning of general exploration programme, which in turn will facilitate the state govt. for auctioning of block.

17. Map details :

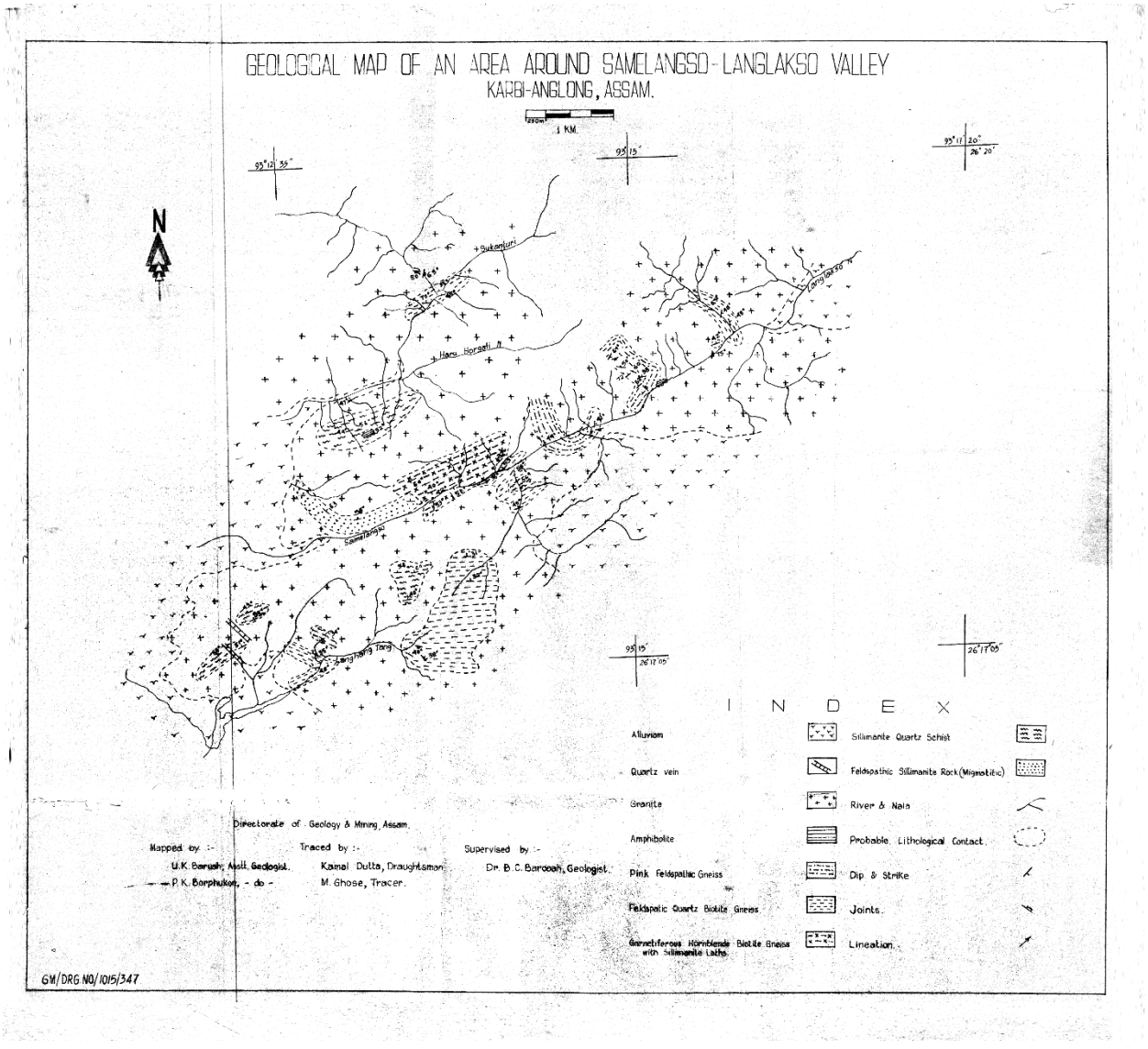
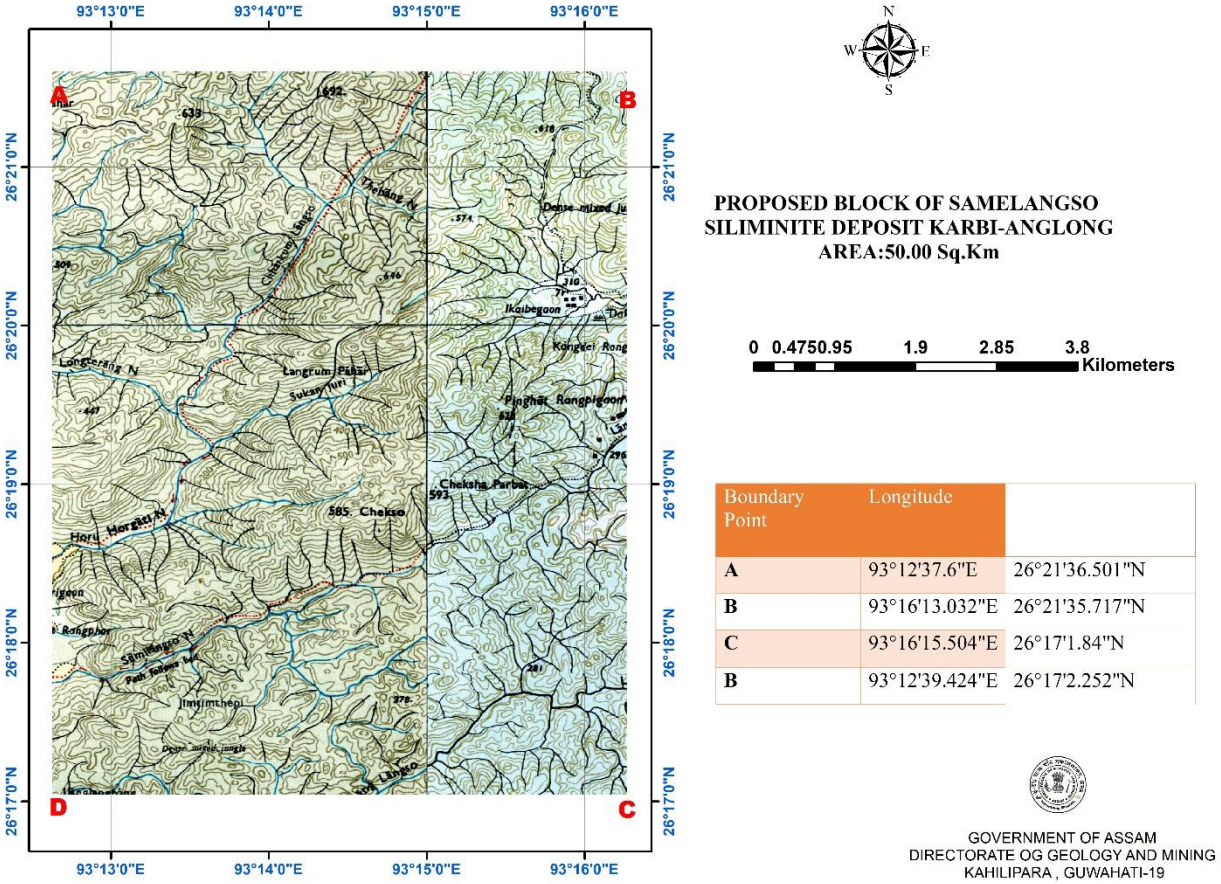
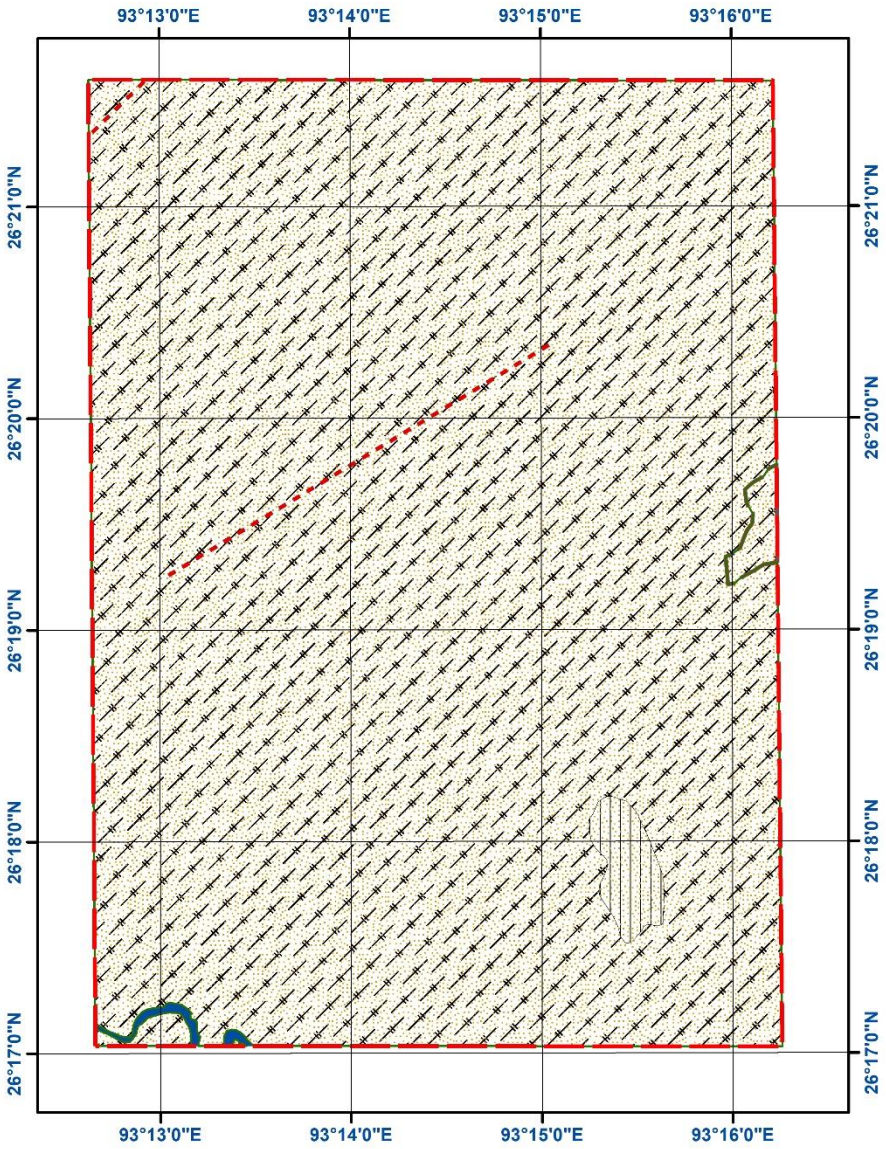


PLATE I: Geological map of an area around Samelangso – Langlakso valley



Boundary Point	Longitude	
A	93°12'37.6"E	26°21'36.501"N
B	93°16'13.032"E	26°21'35.717"N
C	93°16'15.504"E	26°17'1.84"N
B	93°12'39.424"E	26°17'2.252"N

PLATE II: Proposed block map



Legend

Lineament_Form

Proposed Block Boundary

Geomorphology

StrOri - Moderately Dissected Hills and Valleys

Valley

WatBod - River

Lithology

MICA(BIOTITE)GNEISS

SILLIMANITE GNEISS

Geology

ASSAM - MEGHALAYA GNEISSIC COMPLEX SGp.

BHUKOSH GEOLOGICAL MAP OF PROPOSED BLOCK OF SAMELANGSU SILLIMINITE DEPOSIT , KARBI-ANGLONG
AREA: 50 Sq.Km
TOPOSHEET NO: 83F/3, 83F/7

0 0.375 0.75 1.5 2.25 3 Kilometers