GEOLOGICAL FEASIBILITY REPORT FOR CONSTRUCTING 14.5 KMs. ELECTRIC LINE UNDER *DEEN DAYAL UPADHYAY* VILLAGE ELECTRIFICATION PLAN, OVER FOREST LAND, DISTRICT- UTTARKASHI, UTTARAKHAND

SUBMITTED FOR

Executive Engineer (Project)
UTTARAKHAND POWER CORPORATION LTD
(UPCL)
Rural Electrification Unit, Dehradun
Uttarakhand

SUBMITTED BY

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"USE GEOLOGICAL KNOWLEDGE FOR MAKING DISASTER RESILIENT COMMUNITY"

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CONTENTS

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TERMS OF REFERENCE

The study, entitled **"Geological Feasibility Report for constructing 14.5 kms Electric Line Under *Deen Dayal Upadhyay* village Electrification Plan, over Forest Land, Dist. Uttarkashi, Uttarakhand"** requested by Executive Engineer (Project) **Uttarakhand Power Corporation Ltd (UPCL)**, Rural Electrification Unit, Dehradun, Uttarakhand, via **letter No. 215/RED(De.)UPAKALI/2017-18/Forest, Dated 19-03-18,** to Chief Geological Consultant of Progressive Geological & Geotechnical Services (PG2S), Mr Bhuwan Joshi, Empanelled Geologist, Govt. of Uttarakhand & RQP- IBM, Govt. of India; for geological assessment of the proposed alignment over forest land, Dist Uttarkashi, Uttarakhand.

Undersigned (Geological Consultant) carried site/field visit on **04/04/18** & geologically evaluated the alignment for construction of Electric line/discussed with the implementing agency. During the field visit Representative of Uttarakhand Power Corporation Ltd (UPCL) accompanied with the Geologist; geological assessment carried as per available land & community needs.

LOCATION SITE

The above mentioned proposed alignment falls under forest land; administrative belongs to Development Block- Mori, Dist. Uttarkashi, Uttarakhand.

Uttarkashi district lies in the northwestern part of Uttarakhand state. It is bounded by North Latitude 30° 27′ 18″ and 31° 27′ 42″ and East Longitude 77° 48′ 26″ and 79° 24′ 00″ and falls in Survey of India Degree sheet Nos. 53E, F, I, J and M. The geographical area of the district is 8016 km^2. The district is important from religious point of view as the two holy rivers namely Ganga and Yamuna have their emerging

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points in this district. Uttarkashi district, the largest district of Uttarakhand, is also important from strategic point of view as it shares its NE boundary with China.

PURPOSE AND SCOPE

Electrification is proposed in remotest village Salara, Development Block- Mori, District- Uttarkashi by Uttarakhand Power Corporation Ltd, Rural Electrification Unit, Dehradun, Uttarakhand. For this electrification the geological assessment of route alignment is proposed.

- Find out the Regional Geological correlation/setup of the proposed site
- Geological survey of the area.
- Based on Geological & Hazard survey, point out feasibility & possible recommendations for development.

GEOLOGY IN BRIEF

The brief Litho-tectonic succession of the region is as given below:-

Group	Formation	Rock Type
Vaikrita	Joshimath	Sillimanite/ Kyanite /Garnet bearing Biotite -Muscovite schistwith gneiss and migmatite
VAIKRITA THRUST		
Almora	Munsiari (Higher Himalayan Crystallines)	a3:- Phylonite Schist a2:- Mylonitized porphyroclastic augen gneiss, Mica schist and minor amphibolites. a1:- Porphyroclastic granite gneiss, mica schist, and amphibolite
MAIN CENTRAL THRUST		
Ramgargh		Quartz porphyry and porphyritic granite
RAMGARH THRUST		
Jaunsar	Nagthat-Berinag	Orthoquartzites inter-bedded with slates

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KROL/BERINAG THRUST

Tejam	Deoban	Cherty dolomite and dolomitic limestone
Damtha	Rautgara	Sub-greywacke to sub-litharenite

Proposed alignment area regionally falls in to **Central Crystalline Zone** of Almora Group of *Munsyari Formation of rocks.*

MUNSIARI FORMATION (HIGHER HIMALAYAN CRYSTALLINES)-

This Formation is commonly referred as the 'Central Crystallines' or the 'Higher Himalayan Crystallines' because of the extensive presence of metamorphics and gneisses of the Great Himalaya. Lithologicaly this formation is subdivided into three litho-units. The southernmost part is composed of porphyroclastic granite gneiss, mica schist and amphibolites. The central region is composed of mylonitized porphyroclastic augen gneiss, mica schist and amphibolites. The northern most unit is characterized by phylonite schist.

SITE INVESTIGATIONS AND FESIBILITY STATEMENT

State- Uttarakhand

Dist- Uttarkashi

Development Block- Mori

Proposed electrification village- Salara,

Proposed Structure- Electric line over forest land

Proposed electrification alignment- over forest land as per coordinates below-

Starting point coordinate of the alignment

- Latitude- 31° 02′ 14.951′′N
- Longitude- 78° 03′ 24.124′′E
- Height(MSL)- ± 1180m

End point coordinates of the alignment

- Latitude- 31° 03′ 52.680′′N
- Longitude- 78° 01′ 16.380′′E
- Height(MSL)- ± 1950m

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Proposed area for construction of electric line- 4.25 Ha.

Topography- river valley

Gradient- moderate/low

Seismicity- Zone-IV

Rainfall- Good, max during monsoon period (July to September)

Adjoining Land use- private land, Forest etc

Soil Cover & characteristics- thin soil cover

Rock exposures & Detail- Proposed region belongs to Almora Group of Munsiyari Formation of rocks, electric line alignment is proposed on river valley slope, the alignment starts from right bank of the Tons River & progresses to left bank mount, up to village Salara, slope direction of the right bank side is south-east to north-west & moderately sloping, slope direction of the left bank side is north-west to south-east & variable sloping angle, major portion of the proposed alignment comes in left side of the valley, a local gadhera is also existed in the same alignment, ultimately meets to Tons river near starting point of the alignment. Proposed alignment belongs to partially slope wash material/thin soil cover supporting the local vegetation & insitu granites, gneiss & associated other rocks (as above geology column), hard & compact, the discontinuity patterns not taken in insitu rock, the course of river near the proposed alignment is south-west to north-east direction.

Ground water/Spring history/Ground seepage- not applicable

Local Community person- NA

Especial observation- as above in rock exposures & detail column

Geotechnical Consideration- recommended for foundation design and others

Important Hazards- Earthquake & Landslides

FEASIBILITY STATEMENT

Based on above fact & community needs, **proposed construction of electric line over forest land** from a part of village- Gunati (at right bank of tons river) to Salara village i.e Latitude- 31° 02′ 14.951″N, Longitude- 78° 03′ 24.124″E to Latitude- 31° 03′ 52.680″N, Longitude- 78° 01′ 16.380″E, Block- Mori, Dist. Uttarkashi ***is feasible with certain measures/recommendations, as*** **mentioned** ***in the next para of the report***

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CONCLUSION & RECOMMENDATIONS

Proposed region belongs to Almora Group of Munsiyari Formation of rocks, electric line alignment is proposed on river valley slope, the alignment starts from right bank of the Tons River & progresses to left bank mount, up to village Salara, slope direction of the right bank side is south-east to north-west & moderately sloping, slope direction of the left bank side is north-west to south-east & variable sloping angle, major portion of the proposed alignment comes in left side of the valley, a local gadhera is also existed in the same alignment, ultimately meets to Tons river near starting point of the alignment. Proposed alignment belongs to partially slope wash material/thin soil cover supporting the local vegetation & insitu granites, gneiss & associated other rocks (as above geology column), hard & compact, the discontinuity patterns not taken in insitu rock, the course of river near the proposed alignment is south-west to north-east direction.

The proposed construction of electric line over forest land recommended from a part of village- Gunati (at right bank of tons river) to Salara village i.e. Latitude- 31° 02′ 14.951′′N, Longitude- 78° 03′ 24.124′′E to Latitude- 31° 03′ 52.680′′N, Longitude- 78° 01′ 16.380′′E, Block- Mori, Dist. Uttarkashi, under safety measures.

Author (geologist) suggests following recommendations for safe construction & hazard minimization for proposed electric line construction at above mentioned location site (above mentioned alignment):-

- The proposed alignment progresses along the local gadhera in some distantly but this type of gadhera structures are water saturated areas in the mountainous parts, so while assessing the ground strength through geotechnical means/load bearing analysis of the power transmission towers of the alignment partly ground water consideration would be useful.
- Separate geotechnical assessment/load bearing analysis of all power transmission tower locations must be done.
- All related BIS codes, for construction of electric line in seismically active Himalayan terrain, recommended to be followed.

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- Digging/drilling for establishment of Power Transmission towers recommended to be done by latest technique so that minimum disturbances/destruction of the surrounding ground may be ensured.
- The excavated material should be properly managed/dumped for minimize the sliding hazard.
- After cutting the local vegetation within the alignment some instability problem of the ground may be arise so provision of proper protection measures/slope stability measures must be done for constructing the power transmission towers (retaining wall, breast wall, crate wall, concreting etc).

CIRTIFICATION

BHUWAN JOSHI, Empanelled Geologist, RQP, IBM, Govt. of India with Business Address: - House No.-6, Kamal Bhawan, Vijay Colony, Lane No.-1, do hereby certify that:-

a) I am Consulting Geologist registered with National & State Accreditation bodies.
b) I am Life member of Himalayan Geology, Wadia Institute of Himalayan Geology, 33-GMS road, Dehradun
c) I hold M.Sc. Geology from University of Lucknow, Lucknow.
d) I was associated as RA with Wadia Institute of Himalayan Geology, Dehradun.
e) I have obtained various trainings from JNU, New Delhi, Centre University, Allahabad, Wadia Institute of Himalayan Geology, Anna University, NIDM, IIRS, Dept. of Space, Govt of India etc, related to my professional Career.
f) I am consulting various departments in the state as per their requirement.
g) This report is based on Field work as well as table work

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Annexure,

1. Profile photographs of proposed area
2. Satellite view of the proposed alignment site
3. Departmental georeference map
4. Proposed alignment on Toposheet

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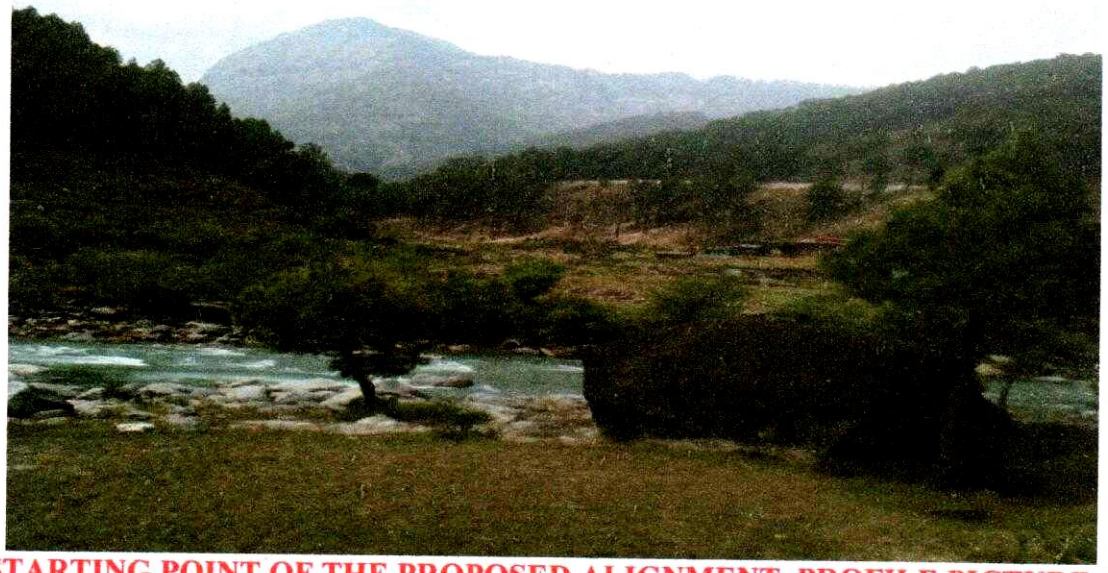
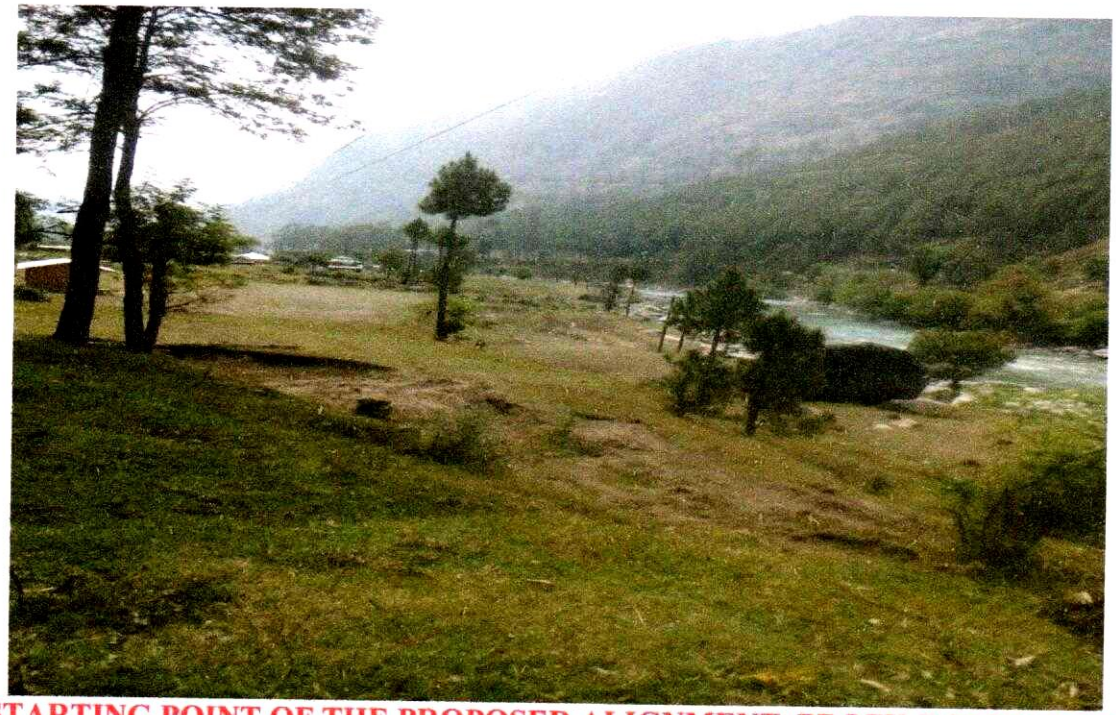
ANNEXURE-1



STARTING POINT OF THE PROPOSED ALIGNMENT, PROFILE PICTURE-1



STARTING POINT OF THE PROPOSED ALIGNMENT, PROFILE PICTURE-2,

PROGRESSIVE GEOLOGICAL & GEOTECHNICAL SERVICES
(PG2S)

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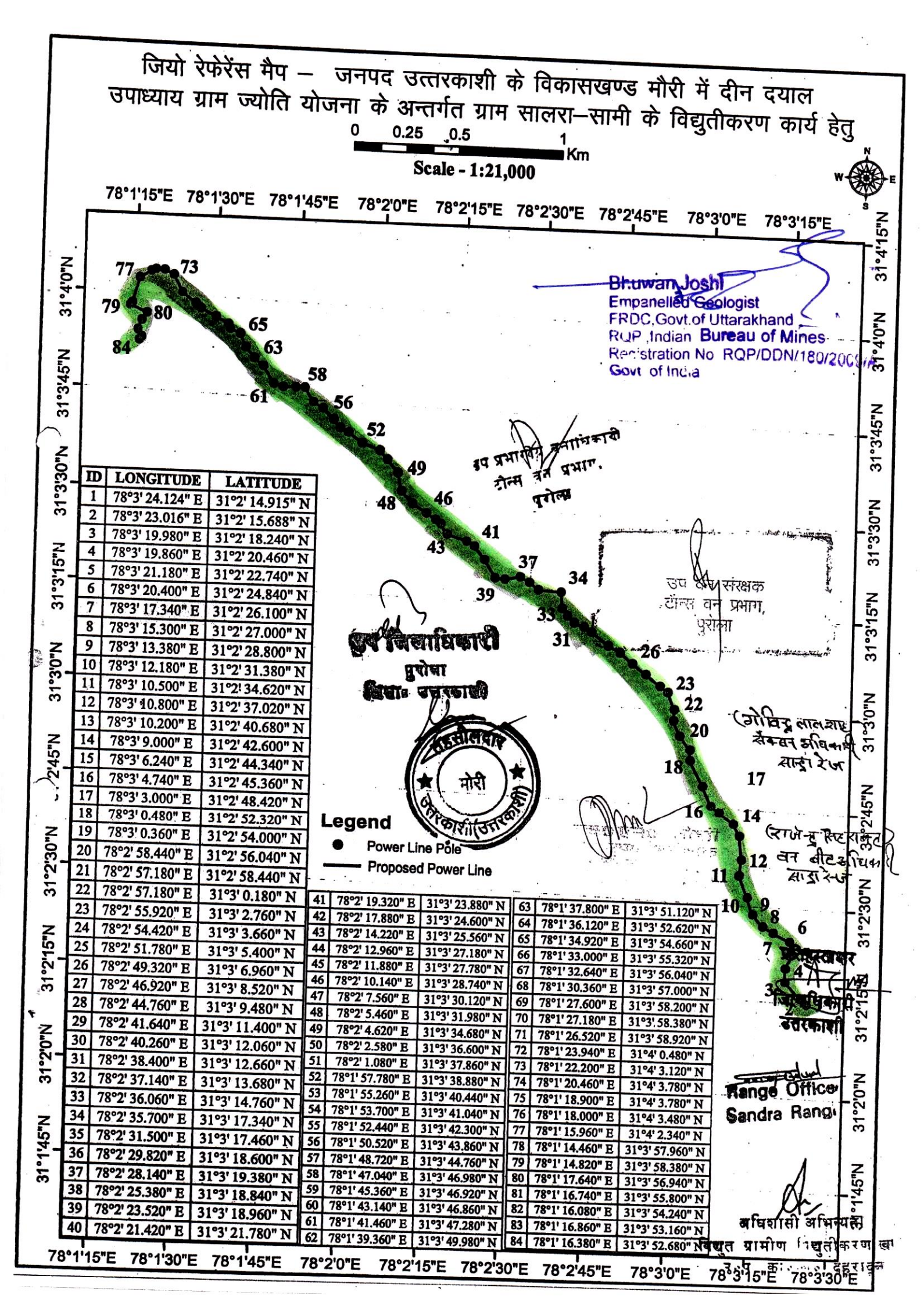
जियो रेफेरेंस मैप – जनपद उत्तरकाशी के विकासखण्ड मौरी में दीन दयाल उपाध्याय ग्राम ज्योति योजना के अन्तर्गत ग्राम सालरा–सामी के विद्युतीकरण कार्य हेतु

0 0.25 0.5 1 Km

Scale - 1:21,000

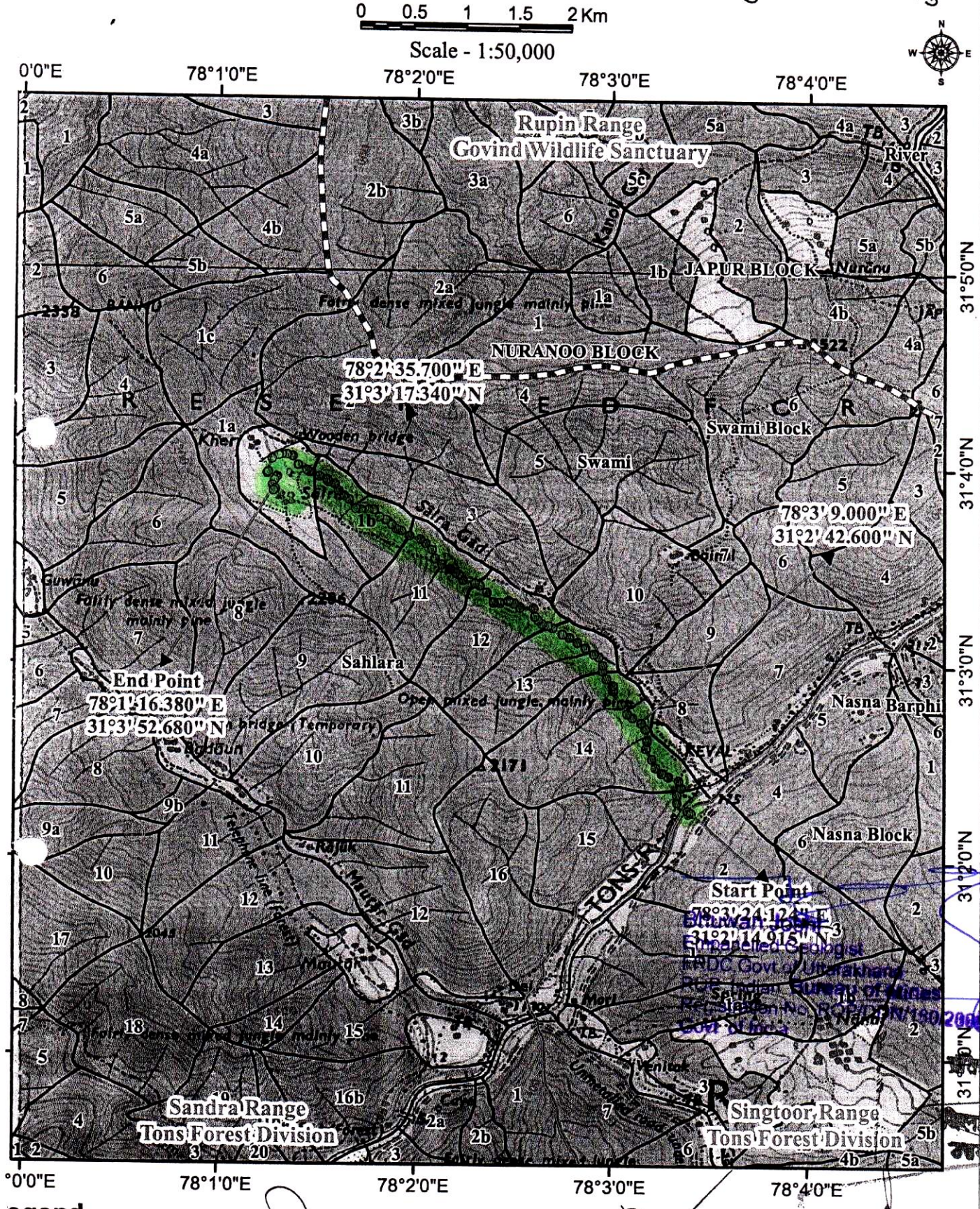


Legend

- Power Line Pole
- Proposed Power Line

ID	LONGITUDE	LATITUDE
1	78°3' 24.124" E	31°2' 14.915" N
2	78°3' 23.016" E	31°2' 15.688" N
3	78°3' 19.980" E	31°2' 18.240" N
4	78°3' 19.860" E	31°2' 20.460" N
5	78°3' 21.180" E	31°2' 22.740" N
6	78°3' 20.400" E	31°2' 24.840" N
7	78°3' 17.340" E	31°2' 26.100" N
8	78°3' 15.300" E	31°2' 27.000" N
9	78°3' 13.380" E	31°2' 28.800" N
10	78°3' 12.180" E	31°2' 31.380" N
11	78°3' 10.500" E	31°2' 34.620" N
12	78°3' 10.800" E	31°2' 37.020" N
13	78°3' 10.200" E	31°2' 40.680" N
14	78°3' 9.000" E	31°2' 42.600" N
15	78°3' 6.240" E	31°2' 44.340" N
16	78°3' 4.740" E	31°2' 45.360" N
17	78°3' 3.000" E	31°2' 48.420" N
18	78°3' 0.480" E	31°2' 52.320" N
19	78°3' 0.360" E	31°2' 54.000" N
20	78°2' 58.440" E	31°2' 56.040" N
21	78°2' 57.180" E	31°2' 58.440" N
22	78°2' 57.180" E	31°3' 0.180" N
23	78°2' 55.920" E	31°3' 2.760" N
24	78°2' 54.420" E	31°3' 3.660" N
25	78°2' 51.780" E	31°3' 5.400" N
26	78°2' 49.320" E	31°3' 6.960" N
27	78°2' 46.920" E	31°3' 8.520" N
28	78°2' 44.760" E	31°3' 9.480" N
29	78°2' 41.640" E	31°3' 11.400" N
30	78°2' 40.260" E	31°3' 12.060" N
31	78°2' 38.400" E	31°3' 12.660" N
32	78°2' 37.140" E	31°3' 13.680" N
33	78°2' 36.060" E	31°3' 14.760" N
34	78°2' 35.700" E	31°3' 17.340" N
35	78°2' 31.500" E	31°3' 17.460" N
36	78°2' 29.820" E	31°3' 18.600" N
37	78°2' 28.140" E	31°3' 19.380" N
38	78°2' 25.380" E	31°3' 18.840" N
39	78°2' 23.520" E	31°3' 18.960" N
40	78°2' 21.420" E	31°3' 21.780" N
41	78°2' 19.320" E	31°3' 23.880" N
42	78°2' 17.880" E	31°3' 24.600" N
43	78°2' 14.220" E	31°3' 25.560" N
44	78°2' 12.960" E	31°3' 27.180" N
45	78°2' 11.880" E	31°3' 27.780" N
46	78°2' 10.140" E	31°3' 28.740" N
47	78°2' 7.560" E	31°3' 30.120" N
48	78°2' 5.460" E	31°3' 31.980" N
49	78°2' 4.620" E	31°3' 34.680" N
50	78°2' 2.580" E	31°3' 36.600" N
51	78°2' 1.080" E	31°3' 37.860" N
52	78°1' 57.780" E	31°3' 38.880" N
53	78°1' 55.260" E	31°3' 40.440" N
54	78°1' 53.700" E	31°3' 41.040" N
55	78°1' 52.440" E	31°3' 42.300" N
56	78°1' 50.520" E	31°3' 43.860" N
57	78°1' 48.720" E	31°3' 44.760" N
58	78°1' 47.040" E	31°3' 46.980" N
59	78°1' 45.360" E	31°3' 46.920" N
60	78°1' 43.140" E	31°3' 46.860" N
61	78°1' 41.460" E	31°3' 47.280" N
62	78°1' 39.360" E	31°3' 49.980" N
63	78°1' 37.800" E	31°3' 51.120" N
64	78°1' 36.120" E	31°3' 52.620" N
65	78°1' 34.920" E	31°3' 54.660" N
66	78°1' 33.000" E	31°3' 55.320" N
67	78°1' 32.640" E	31°3' 56.040" N
68	78°1' 30.360" E	31°3' 57.000" N
69	78°1' 27.600" E	31°3' 58.200" N
70	78°1' 27.180" E	31°3' 58.380" N
71	78°1' 26.520" E	31°3' 58.920" N
72	78°1' 23.940" E	31°4' 0.480" N
73	78°1' 22.200" E	31°4' 3.120" N
74	78°1' 20.460" E	31°4' 3.780" N
75	78°1' 18.900" E	31°4' 3.780" N
76	78°1' 18.000" E	31°4' 3.480" N
77	78°1' 15.960" E	31°4' 2.340" N
78	78°1' 14.460" E	31°3' 57.960" N
79	78°1' 14.820" E	31°3' 58.380" N
80	78°1' 17.640" E	31°3' 56.940" N
81	78°1' 16.740" E	31°3' 55.800" N
82	78°1' 16.080" E	31°3' 54.240" N
83	78°1' 16.860" E	31°3' 53.160" N
84	78°1' 16.380" E	31°3' 52.680" N

डिजिटल मानचित्रः— जनपद उत्तरकाशी के विकासखण्ड मौरी में दीन दयाल उपाध्याय ग्राम ज्योति योजना के अन्तर्गत ग्राम सालरा–सामी के विद्युतीकरण कार्य हेतु



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(राजेन्द्र सिंह रावत)
वन बीट अधिकारी

कार्यकारी अभियन्ता
विद्युत परिमाण विद्युतीकरण खण्ड
उ०प्रा०का०लि०, देहरादून