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The geological report for C/o Link Road from Neri-Koti, Sanohat to Village Draina RD 0/0 to 5/560, within the Jurisdiction of Rajgarh Forest Division, District Sirmour, Himachal Pradesh.

1. In consequent to insufficiency of plain land, the road construction in hilly terrain requires site selection, stable alignment along hillslopes with respect to their dip and strike and stable lithology etc. The steep slopes are common type of structural arrangement that is found on hilly terrains which requires proper mapping for stable alignment of road construction.

The Executive Engineer, Rajgarh Division HPPWD, Rajgarh, Distt Sirmour HP is going to construct **Link Road from Neri-Koti, Sanohat to Village Draina RD 0/0 to 5/560, within the Jurisdiction of Rajgarh Forest Division, District Sirmour, HP** (Online Proposal No FP/HP/ROAD/156332/2022). This road needs Geological report for FCA clearance from Forest Division, Rajgarh. Accordingly, The Executive Engineer, Rajgarh Division HPPWD, Rajgarh, Distt Sirmour HP vide his letter no. PW/EE/RAJ-WA-FCA-NERI KOTI ROAD/2024-2025-6208 dated 28-10-2024 requested the Geologist Zone-III, Himachal Pradesh for the Geological investigation of site identified for the construction of link road from Neri Koti-Sanohat-Draina link road (KMS 0/00 to 5/560), Tehsil Rajgarh, Distt Sirmour HP.

Accordingly, The Geologist Zone-III, Himachal Pradesh vide letter No. Ind. Bhu(Geo-7) Eng.- Sirmour-5/2002-7258, dated 13-11-2024 assigned the undersigned to inspect the area proposed for the construction of road and to submit the required geological report.

In compliance to directions received from the office of Geologist (Zone-III), Geological Wing, Shimla bearing No. Ind. Bhu (Geo-7) Engg.-Sirmaur-5/2002-Vol-I-7258 dated 13-11-2024, an inspection of the site i.e. C/o Link Road from Neri-Koti, Sanohat to Village Draina RD 0/0 to 5/560, within the Jurisdiction of Rajgarh Forest Division, District Sirmour, Himachal Pradesh to carry geological investigation was undertaken on 29/01/2025 alongwith Assistant Engineer HPPWD, Habban, Rajgarh Division and other locals of the village.

At the outset of the visit, the Assistant Engineer Informed undersigned that a partial trace of the link road has been carved till village Sanohat and the remaining road of about 2.5 KM till village Draina is under pipeline for the want of necessary Forest Clearance. It was also informed that area to the tune of 2.4657 Hact. Forest land is required to be diverted for the construction of said road. The committee reached the Village Sunohat i.e. R.D. 03/00 KM by vehicle the thereafter took a traverse till village Draina to check the geological setting of the road alignment.

2. Location

- **Location:**

The project area is situated within the Rajgarh Forest Division, District Sirmour, HP. The road stretches from Neri-Koti, Sanohat to Village Draina, covering a range from RD 0/0 to RD 5/560.

- **Geographical Context:**

The road alignment passes through hilly terrain of the Himalyan range, characterized by rugged gentle to moderate slopes and varying altitudes, which may have implications for the engineering and construction of the road.

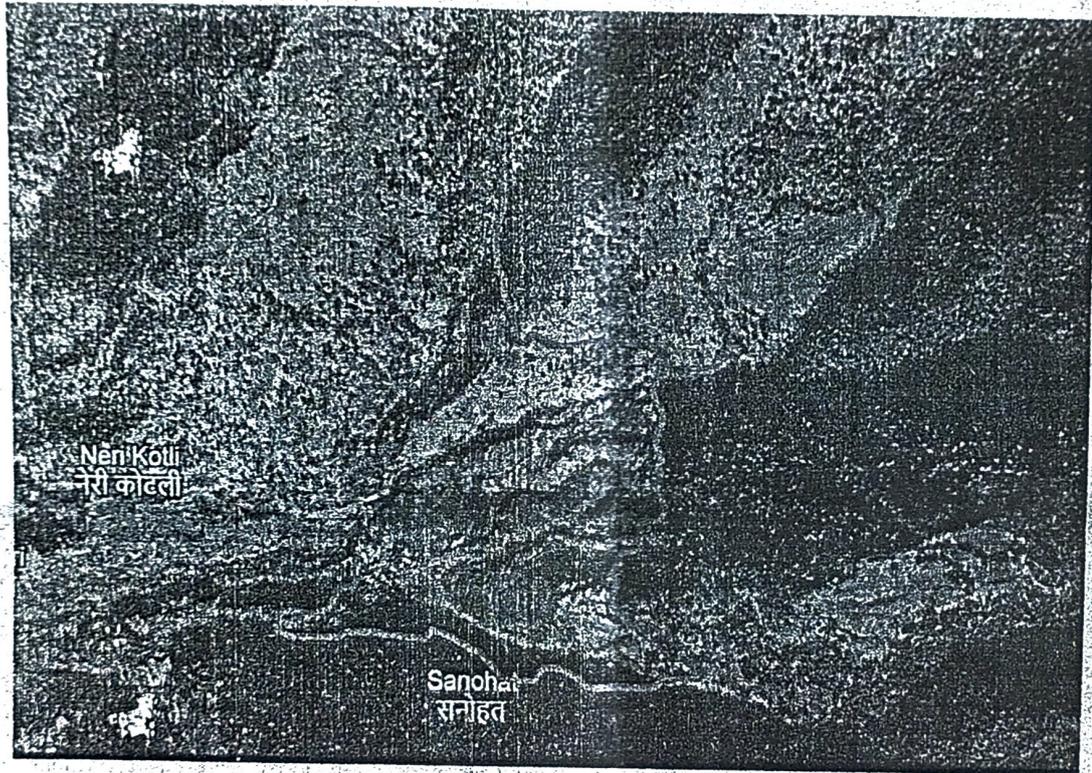


Image 1. Google earth Image of tentative road alignment of Neri Kotli-Sanohat-Draina Link Road.

3. Geological Setting

- **Rock Types and Stratigraphy:**

District Sirmour forms part of the Shiwalik and Lesser Himalaya ranges and it exhibits a rugged mountainous terrain with moderate relief. The rocks found in the area comprise sandstone, shale, limestone and schist deposited during the past 600 million years. Various litho-units ranging from Proterozoic to recent era are found to occur in Sirmour district. Among all, typical Mesozoic era formations cover most of the parts and Quaternary formations occupy the southern part of the district. Granite Gneisses of Jatogh Formation belonging to lower Proterozoic is located in the northern part of the district while Deoban Formation of upper

Proterozoic is confined to the eastern part in a limited extent. Jaunsar and Simla Group of lower Proterozoic to upper Proterozoic period cover middle portion of the district which encircles Tal, Krol and Infra-Krol formation of Triassic period respectively. Among which the Krol Formation of Triassic period is known for its limestone deposits. Subathu and Dharamshala Formation of Oligocene cover a major portion of the southern area.

The area in question is predominantly composed of Jaunsar and Simla Group of lower Proterozoic to upper Proterozoic period mainly phyllite interbedded with quartzite and clay and further.

- o Shivalik sediments (sandstone, siltstone, conglomerates) that have undergone weathering and erosion due to the region's steep terrain.
- o Alluvial deposits are common in valley regions, influencing the type of soil found along the road.
- o Fault zones and fractured rocks are prevalent, especially in the hilly sections, which may affect road stability.
- The geological setup of the site inspected is as under:

Formation	Age	Rock Type
Simla Group	Proterozoic	Phyllite, quartzite, claystone and shale

Along the road alignment of proposed road, the rocks are mostly exposed and fractured. There is very less overburden/soil cover along road alignment. The area is having soil cover varying from 0.2 mtrs. To 1.0 mtrs. At different stretches of the road.

The terrain of the site is largely sloping in the form of hillslope with fractured and thinly jointed Phyllite intermixed with weak decomposed quartzite mixed with clay alterations having a slope angle of gentle to moderate towards uphill. The site shows minor sliding at few locations, but largely it appears that the site is feasible for the development of road construction by using proper slope stability structures.

4. Observations

The road along hill slope imparts their load to the hill slope through moving vehicles and other vibration. It results in increase in the shear stress, which may cause impermanence of hill slopes. It is recognized that designs for the construction of road and foundations associated with variety of related disciplines such as geology, soil and rock dynamics, etc, which plays their important role. In order to carry out any activity in the hill, the hill slope needs to be stabilized. Following recommendations/ suggestions may be considered, which include

Excavation

The exposed rocks are mostly fractured and thinly jointed. It is therefore recommended that the road shall be constructed on half cut half fill method to avoid any major disturbance in the stability of the hill. It is also recommended that the rocks at the site are fractured and weak, so proper cutting of the rock is needed by providing wire meshing structures to give stability to the hill slope.

It is important to mention here that in the already carved road trace, no major disturbance in the local geology was observed. The road alignment is found mostly stable. Though, the retaining structures are required to maintain its long term stability.

Foundation:

As observed during the inspection that slope is gentle to moderate at the site, it is recommended that hill should be cut in benches by maintaining angle of repose of 45 degrees for slope stability.

Construction of Drainage Channel:

It was observed during inspection that proper drainage channel has not been maintained in the already excavated road alignment till village Sanohat. It is necessary to have proper drainage from consideration of structural safety and stability. The strata belonging to the said site are prone to weathering effect. It is recommended that proper lined drainage arrangements may be made. When there is ingress of rain, it will significantly accelerate this problem. It is therefore, recommended that proper drainage channel should be constructed from the uphill side in order to drain surface water away from the road alignment to further in the natural drain/nallah. Proper and effective method of constructing retaining wall both along downside and upside by making weep hole for draining of water should be made so that there is no ingress/absorption of water in the hill side.

Construction of Retaining Structure:

Site topography reveals that during heavy rains, there may be chances of sudden displacement of soft material which may cause slide or subsidence along the slopes facing valley. The downhill area should be supported with the retaining structure which is also capable to bear the load of the moving vehicles and other vibrations. It is suggested that a proper concrete retaining structure should be constructed from the road level in step manner in order to protect the slope as well as to bear the structural load of the moving objects. Alternate weep holes should be provided in the structure to drain underground water, which may lead to create hydraulic pressure.

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5. Conclusion

The geological conditions along the proposed road alignment from Neri-Koti, Sanohat to Village Draina RD 0/0 to 5/560 are influenced by gentle to moderate slopes, fractured rock formations. While the region offers some challenges due to the tough terrain and its high potential for landslides. It is therefore advised that with proper engineering techniques such as slope stabilization, effective drainage design, and environmental mitigation measures, the construction of the road can proceed with minimal risk to both infrastructure and the surrounding environment.

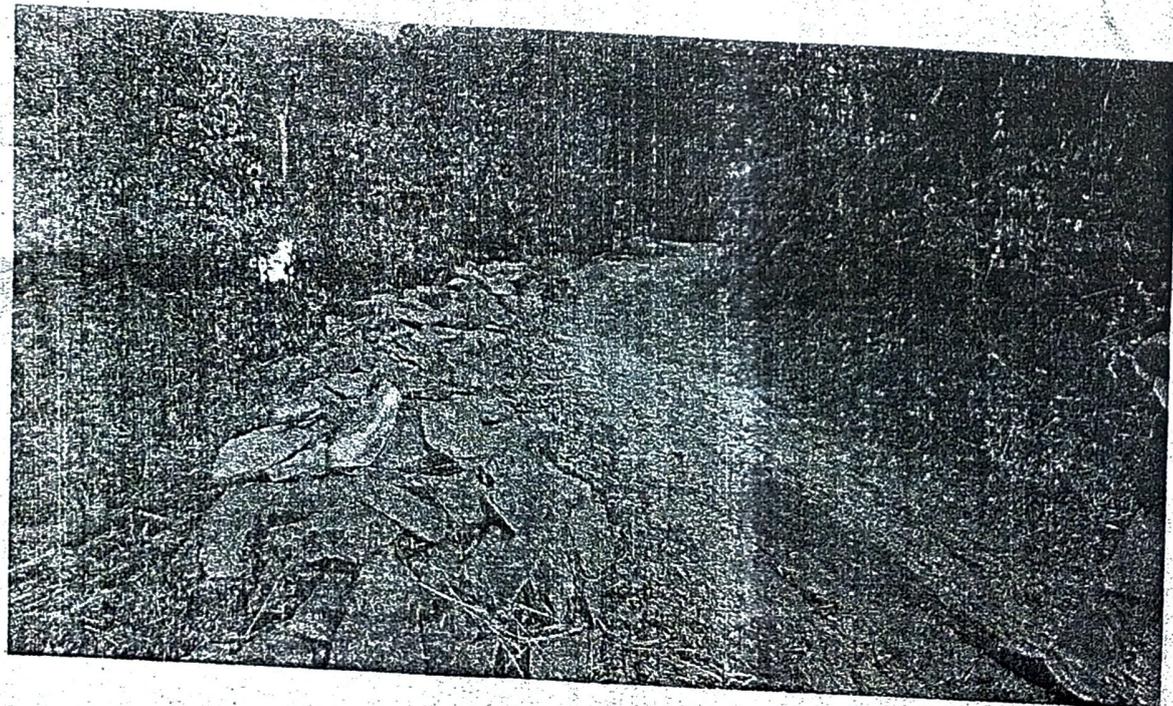


Image-2 The already carved trace of link road till Village Sanohat.

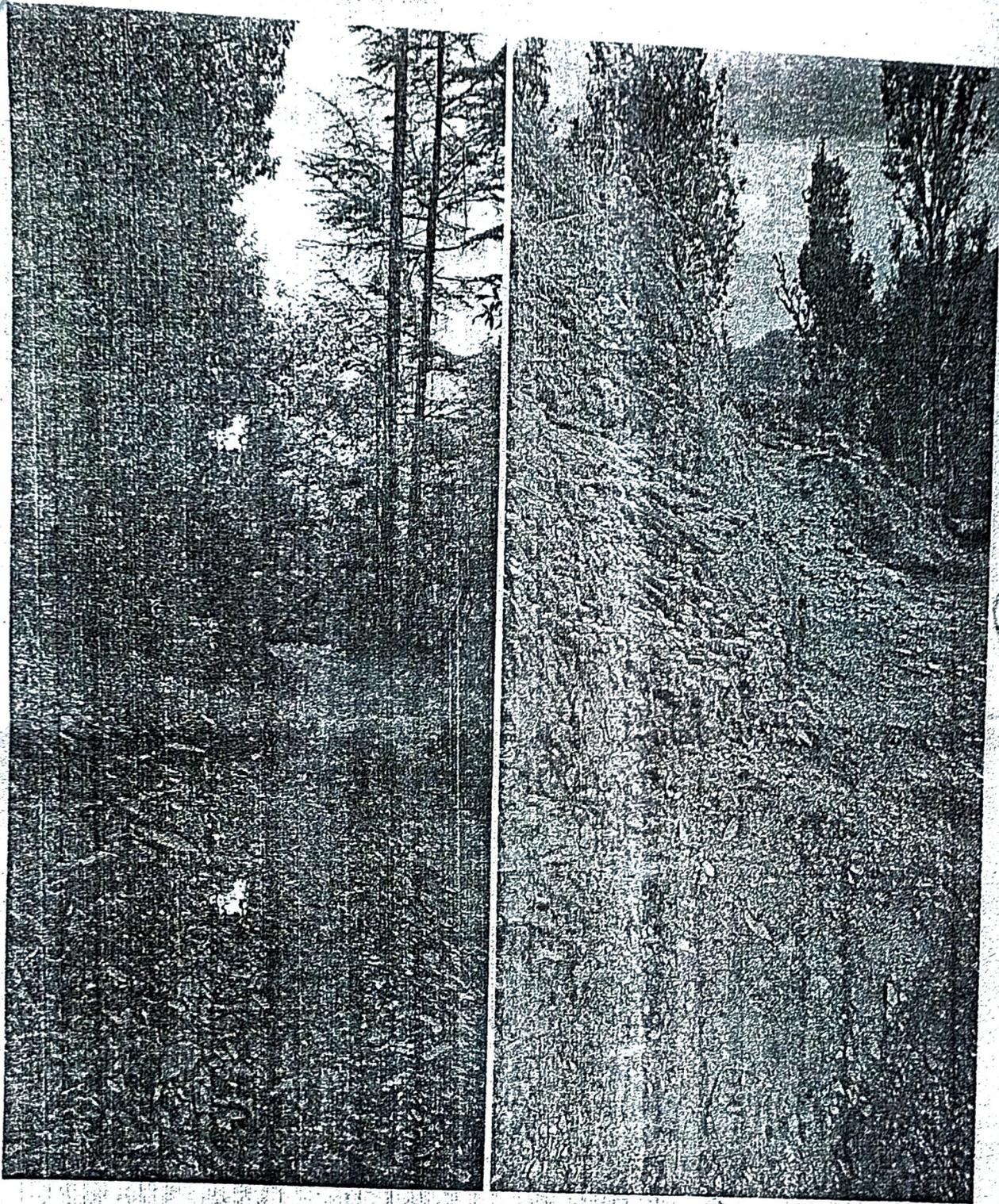


Image-3, 4 The Photograph of the area showing vegetation and geological setting along road alignment.


(Kulbhushan Sharma)

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Distt Sirmour at Nahan