

कार्यालय प्रमुख अभियन्ता एवं विभागाध्यक्ष
उत्तराखण्ड लोक निर्माण विभाग,
देहरादून

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Geological Assessment of the alignment corridor proposed for the
construction of 10.40 km long motor road joining village Purkul to
Bhirtali-Kimadi motor road, in Sahaspur block, distt. Dehradun.

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Shiv Kumar Rai

03.02.2020

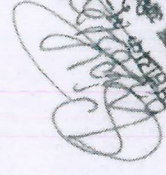
1- Introduction:-

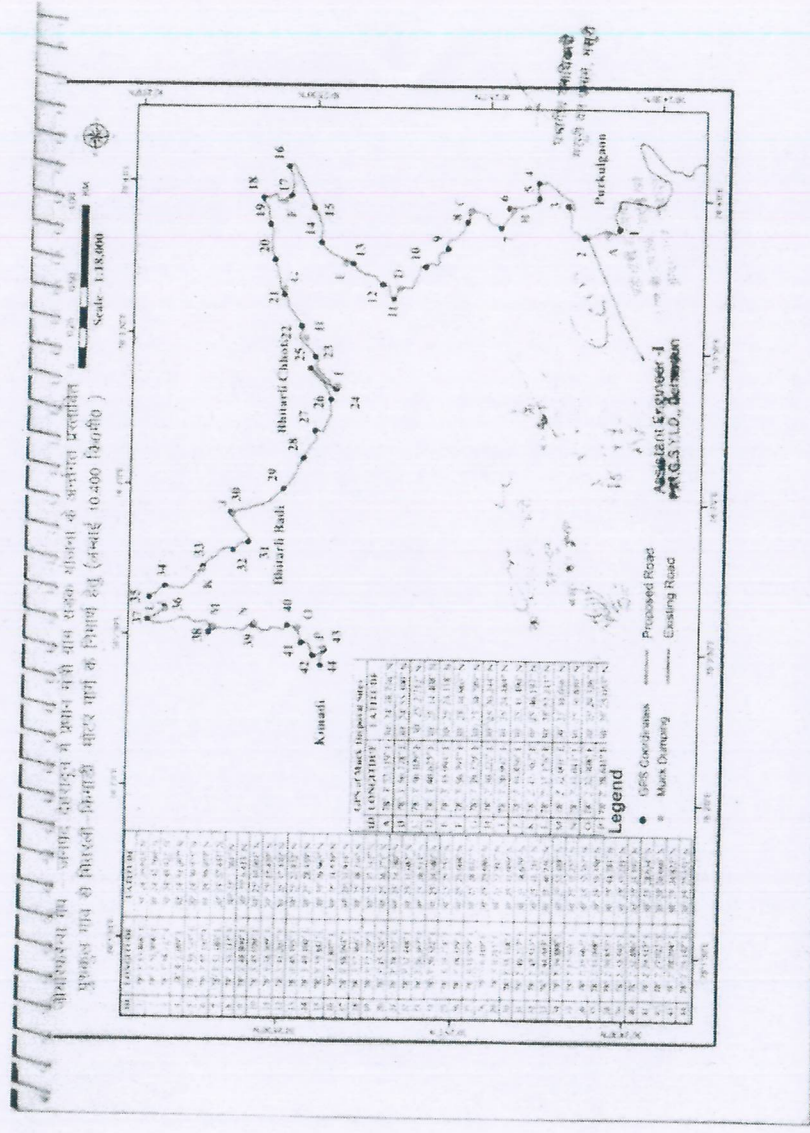
The PMGSY, Irrigation Division, Dehradun has been instructed for the construction of 10.40 km long motor road joining village Purkul to Bhirtali-Kimadi motor road, in Sahaspur block, distt. Dehradun. The geological feasibility report for the above alignment has been submitted by Shri. Harsh Kumar, former Geologist, PWD on 10.12.2009. For the above mentioned road, two alternative alignments have been proposed named Alignment 1 and Alignment 2. The alignment 1 originates from km 6 of Malsi-Purkul motor road comprising 5 HP bends in whole along its length of 10.40 km with two RCC bridge of span 12 covering dominantly the naap land and scanty civil land. The alignment 2 originates from km 5 of Malsi-Purkul motor road in the upslope direction comprising 5 HP bends in whole along its length of 11.04 km with 3 RCC bridges of span 18 m. Therefore, with the ascent of the local villagers, considering the approach road and feasibility study, the alignment 1 has been preferred for the further geological assessment.

Due to the existing narrow jeep road(point no. 25 in digital map shown below) and a stretch of steep hill slope(point no. 11), the alignment 1 was questioned by the "Department of Forest and Climate Change". Therefore, on the request made by Er. Sanjay Singh, Executive Engineer, I carried out the geological assessment of the whole alignment with special focus on the "questioned stretch" of the alignment on 30.01.2020 in the presence of Er. S.B Lingwal, Assistant Engineer and Er. Vikas Barthwal, Junior Engineer, PMGSY, Irrigation Division, Dehradun.

2- Location:-

The proposed 10.40 km long alignment corridor originating from km 6 of Malsi-Purkul motor road in the upslope direction comprising 5 HP bends following the upslope of the high gradient jeep road, in Sahaspur block, distt. Dehradun. The alignment stretch in questioned is the point no. 11 and 25 as shown in the digital map (explained in details below).


Shiv Kumar Rai
03.02.2020
PMGSY, Irrigation Division
Dehradun



Digital map of the proposed alignment of village Purkul to Bitharli-Kimadi motor road, distt. Dehradun

3-Geological Assessment:- Geologically, Kimadi village and its environs lies in the northern extremity of the Sub Himalayan Belt across which this road is transversely oriented in E-S direction. The NW-SE trending Main Boundary Thrust (MBT), which is a prominent tectonic lineament of the Himalaya intersects the northern end of the road and the entire length of the road falls in its close vicinity. The effect of this prominent thrust is marked on the rocks exposed in this area therefore, the rocks are exposed as crushed, sheared/shattered, fractured and tectonized. Some topographic depressions have been formed almost parallel to the strike of the Main Boundary Thrust (MBT). The entire length of the road passes across the formation Siwalik sandstones which are poorly-consolidated, loose, partially weathered and dissected by linear discontinuities. The rock mass exposed in the corridor of road bears very low physical strength and its "Uniaxial Compressive Strength" has been estimated at the site ranging between 1 M Pa to 5 M Pa. These values comes under the "Exceptionally Weak" rock mass rating. The existing jeep road is undulating (with various high gradient ascent and decent) with bed rock of Siwalik formation which is extensively unconsolidated, weaker in strength and become saturate in monsoon season or during thick rainfall. The saturate condition of the bed rocks shows the plastic behaviour of the ground and may leads to development of wide cracks post road construction. Therefore, passage of alignment from this section will be vulnerable in future prospect.

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 Checked by: *[Signature]*
 Date: *[Date]*

At the point no. 11 as per digital map, there is a small slip zone which activated recently before 2-3 years forming 2 chure. Prima Facie, it seems to be activated due to the continuous hydraulic impact at the toe of the hill slope as the gadera bears the sinous course with left bank as the cut-off side and right bank as slip-off side. The stretch of 40-50 m near point no. 11 passes across this steep slope have extensive seepage with fractured bedrock underneath. Therefore, toe protection is essential to avoid any toe erosion and facilitate sliding in future.

At the point no. 25, there is a existing jeep road but have gradient of 1:6 to 1:12 which is extremely high in comparison to the proposed gradient of 1:24 to 1:20. Also, the current jeep road passes across a slide zone which may become huge post toe-cutting. Therefore, the proposed alignment passing above the crown of the active slide zone.

By and large the alignment slope are stable and do not manifest signatures related to the ground deformation/land sliding. Nowhere the signatures like development of sink/pot holes seen during the site visit.

On the basis of the above and the study carried at the site the following recommendations are being made for the construction of the above mentioned motor road.

4- Recommendations:-

1. Across the steep slope, i.e near point no. 11 in digital map, the construction for 50 m stretch of road should be carried out by half cut and half fill method with ascent upward. The extensive seepage will reduce the intergranular shearing strength and may facilitate sliding. Therefore, the slope with basement for gabion wall should be strength by deeply anchored soil nailing technique (for foundation) followed by shotcreting, so as to improve the ground characteristics and minimize the probability of any rock fall/sliding.
2. Due to the sinous course of the gadera, Gabion wall in 2-3 step should be construct at the toe of the hill slope point no. 11 (in digital map) to avoid toe scouring/erosion by the huge discharge of gadera in monsoon.
3. Remaining part of the alignment can be construct by box like cutting full excavation method.
4. Do not throw the excavated waste on the lower slope due to the presence of cultivated land of the local villagers below.
5. In order to maintain the overall stability of the hill slopes and the road, construct suitably designed retaining walls/ breast walls along the road, wherever required.
6. Construct large hill side lined/concrete drain all along the road and make adequate cross drainage arrangements.
7. Make adequate arrangements to dispose the waste water on the safe/ stable ground.
8. The drainage work must be taken up immediately after the excavation of the hill slopes.
9. All the construction activity must be carried out as per the standards and norms following the BIS codes prescribed for the similar civil construction in Himalayan Zone.

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5- Conclusion:- On the basis of the geological / geotechnical studies carried at the site and with the strict following of the above recommendations only, the alignment corridor was found geologically suitable for the construction of 10.40 km long motor road comprising 5 HP bends joining village Purkul to Bhirtali-Kimadi motor road, in Sahaspur block, distt. Dehradun.



(Shiv Kumar Rai)

Astt. Geologist

Office of the Engineer in Chief,
PWD, Dehradun