

To,  
The Executive Engineer  
Provincial Division,  
PWD Rudraprayag

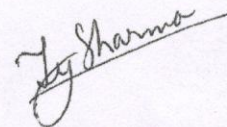
Subject: Submission of geological site assessment report of 3.0 Km long Chopra Udamanda (PMGSY) motor road to Banwaldhar (Jarmwaad)-Benji-Kaandai (SC Basti) motor road.

Dear Sir,

In response to your request of making a site visit for the assessment of 3.0 Km long Chopra Udamanda (PMGSY) motor road to Banwaldhar (Jarmwaad)-Benji-Kaandai (SC Basti) motor road between CH 0.0-3.0 Km, in Agastmuni block, district Rudraprayag, a site visit was made on 25/11/2022 of which a report has been prepared. Therefore it is requested to please find report of the above mentioned site attached with this letter.

**Date: 26/11/2022**

Yours Faithfully



**Dr. Tushar Sharma**  
(Assistant Geologist)  
Office of the Chief Engineer  
PWD Pauri Garhwal (Zone)



**Geological Assessment of 3.0 Km long Chopra Udamanda (PMGSY) Motor Road to Banwaldhar (Jarmwaad)- Kaandai (SC Basti) Motor Road**

**Agastmuni Block, District Rudraprayag**

**Dr. Tushar Sharma**

**26/11/2022**

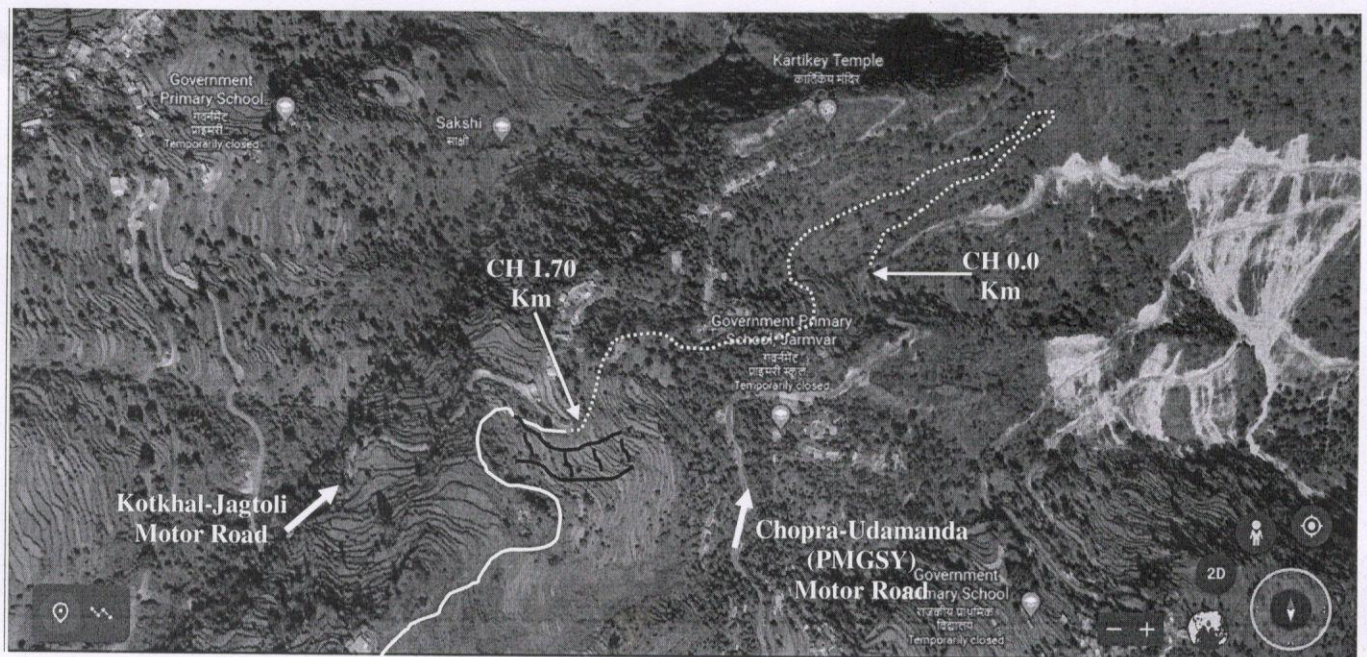
- 1- **Introduction:** The Provincial Division, Rudraprayag, has been entrusted for the construction of 3.0 Km long Chopra Udamanda (PMGSY) motor road to Banwaldhar (Jarmwaad)-Benji-Kaandai (SC Basti) motor road. During survey the residents of Kaandai raised a dispute regarding instability of hill slope at CH ~2 Km. Further an alternate alignment survey of 2.50 Km was conducted in which again unstable slope patch was encountered at ~CH 1.0 Km. In order to assess the geological conditions of the road alignment site for its feasibility, Er. Jeet Singh Rawat (Executive Engineer) Provincial Division, PWD, Rudraprayag asked for a geologist to make a site visit. Consequent to his request a visit to the proposed road alignment site was made on 25/11/2022; Er. Rajat Negi (Junior Engineer) PD PWD, Rudraprayag was present during the site visit.
- 2- **Topographical Information/Location:** The above mentioned motor road alignment diverts from Km 32 of Chopra-Udamanda motor road near village Jarmaad and further touches Km 09 (end point) of Kotkhal-Jagtoli motor road and terminates near Kaandai (SC Basti) villages, in Agastmuni block, district Rudraprayag. The co-ordinates along with elevation, masl of the site at CH 0.0 Km are as follows:

Latitude : 30°20'24.00"  
Longitude : 79°07'10.00"  
Approximate Elevation : 1590 M



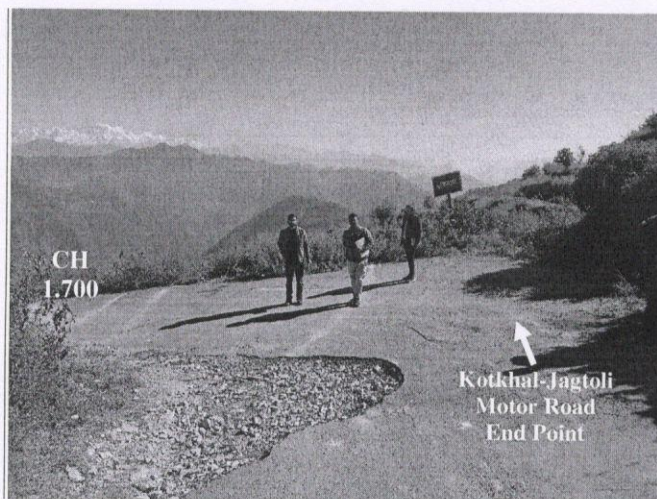
*Wider Satellite view of the motor road alignment site*



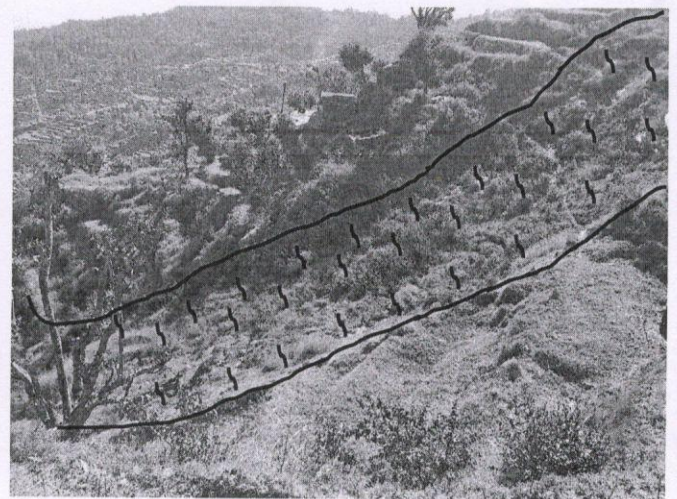


*Closer Satellite view of the motor road alignment site*

- 3- Geological Assessment:** Geologically, the road alignment corridor around the site falls in the Lesser Himalayan Zone of Garhwal Himalaya in the vicinity of thrust contact between Berinag formation and Bhatwari/Barkot units of Jaunsar and Ramgarh groups. The bed rock in and around the site consist of foliate and fractured chlorite schist to schistose quartzite of Ramgarh group. However, the road alignment intersects hill slope covered with overburden (OB) which consists of slope wash material (SWM) and debris along with patches of schistose bed rock (occasionally is highly foliated) over which there is vegetation (Van panchayat) and cultivation land (Naap Khet). The hill slope of the site area is moderately steep which declines at  $\sim 30-40^\circ$  roughly towards South-East direction.



*View of motor road alignment site near CH 1.700 Km*



*View of unstable hill slope of at CH ~2.0 Km*

The motor road joins the end point of Kotkhal-Jakhtoli motor road at CH 1.700 Km after which the road alignment moves further towards Kaandai (SC Basti) villages. After  $\sim 250$  meter the alignment intersects steep slope which constitute of highly foliated and fractured chlorite schist bedrock and at this patch is highly susceptible to subsidence and failure. Such conditions were



also observed below village Kaandai, due to which a slide zone has been developed at ~Km 31 of Chopra-Udamanda motor road. Such slope conditions were also observed at ~CH 1.0 Km of 2.5 Km long alternate motor road alignment.

The approximate strength of exposed rock mass varies between 50 to 100 MPa and has undergone  $W_0$  to  $W_4$  weathering grade. There is only one hair pin bend on the alignment which is at CH 0.425 Km and two on the alternate alignment which are at CH 0.450 and 1.150 Km respectively. The road alignment has 1:20 of rising gradient and no falling gradient with 1:40 gradient at the hairpin bends.

- 4- Seismicity of the area:** According to Indian Standard code the site falls in seismic zone V of seismic zoning Map of India (IS 1893, part 1, 2002) which corresponds to intensity IX and above on MM scale.

On the basis of the geological inspection of the site studies carried and the facts given above, the following recommendations are being made for the construction of the proposed motor road failing to these recommendations this report will be automatically treated as cancelled.

**5- Recommendations:**

1. Blasting by explosives for the road construction is to be avoided as far as it is possible. Use of explosives will render the slope highly unstable as the generally slope consists of overburden and slope wash material.
2. Excavation work must be carried out by skilled manual workers as the rock slopes might slide down in case of rapid disturbance.
3. At places where the hill slopes are steep and covered with thick debris are to be protected by the construction of suitably designed retaining wall/breast wall with proper weep holes, this work shall be carried out simultaneously with the advancement of the road cutting.
4. Construct longitudinal concrete lined drain all along the hill side of the road with adequate provision of cross drains is necessary. Doing so will help in decreasing the chances of subsidence/slide during rainy season.
5. Construct the road by cutting/excavating to its full width which is very important for long term stability of the motor road. At places where the hill slope is steep, half cut and half fill techniques should be applied by proper dynamic compaction of the fill material.
6. At places the motor road alignment passes quite near to rural residential buildings therefore utmost care is to be taken while cutting/excavating the hill slopes in that area along with provisions of retaining and breast walls for maintain the stability of the hill slope around the area.
7. Disposal of muck and excavated waste on the lower slopes of this road is to be strictly avoided; failing to which will increase the weight of the lower slope resulting in increase in driving forces. It is advised to dispose the muck on the identified site for muck disposal.

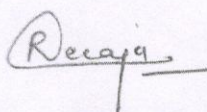


8. All the construction activities ought to be carried out as per the standard codes of practice laid by the BIS and MORTH.

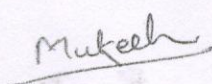
**6- Conclusion:** On the basis of the geological observation/studies carried out at the site and keeping in view the hill slope conditions of the site, the proposed of 3.0 Km long Chopra-Udamanda (PMGSY) motor road to Banwaldhar (Jarmwaad)-Benji-Kaandai (SC Basti) motor road was found geologically suitable for construction between CH 0.0 to 1.700 Km till it meets Km 09 (end point) of Kotkhal-Jagtoli motor road at Village Jarmwaad. It is advised to either terminate the construction at CH 1.700 Km or carry out fresh alignment survey beyond that point (between CH 1.700 & 3.000 Km), avoiding the hill slope patch which is susceptible to failure.

**Place: Provincial Division, PWD Rudraprayag**

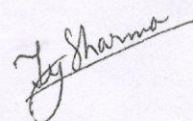
**Date: 26/11/2022**



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