

Unexpected weak zone at the Bergåstunnel construction site – hypotheses about the age and formation

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During the construction of the 2015 m long Bergåstunnel, which comprises a part of the new E6 in Nordland County near Trofors in Grane municipality, an unexpected zone of weak material was encountered beneath the Bergdalen valley. The construction work had to be halted to complete additional investigations to constrain the thickness and composition of the weak zone. From 5 boreholes drilled from the tunnelface and one borehole drilled from the surface down to the level of the tunnel, it was identified that the zone was about 70 m wide and composed of two main layers: a lower unit of light brown, heavily altered bedrock, and an overlying layer of grey, overconsolidated moraine. This weak zone is located at or close to the border between two bedrock units: metasedimentary rocks comprising amongst other limestones and sandstones, and granite to granodiorite. After adjusting the excavation and reinforcement method, the weak zone was successfully excavated from around mid-April to mid-July of this year.

The Norwegian Road authority hired an interdisciplinary group from the Geological Survey of Norway to characterize the mineralogical and geochemical composition of the different layers comprising the weak zone, and to constrain the formation process and age of the weak zone. These analyses were complemented by geophysical investigations of the extend of the weak zone using electrical resistivity and refraction seismic. The geophysical investigations could clearly identify the extent of the weak zone, although the results of the electrical resistivity analysis are strongly influenced by the underground construction work. The structural framework as well as mineralogical and geochemical composition suggest that the lower light brown unit was formed by hydrothermal alteration of the bedrock related to a regional set of east-west striking mineralized fracture zones. Palynological analyses of the overconsolidated moraine identified marine palynomorphs from