

# PLANNING THE BRENNER BASE TUNNEL / NEW GEOTECHNICAL PROGNOSIS

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In the course of updating the feasibility-studies of the Brenner base tunnel (BBT) from 1987 and 1993 a complete reassessment of the geological and geotechnical situation as well of the whole project BBT was undertaken. From the geological-geotechnical point of view the main tasks were: alignment, geological, hydrogeological and geothermal prognosis. Most of the works described below have been carried out by a group of engineering geologists, geotechnical engineers and engineers under contract of BBT EWIV.

Series of investigations including refined geological mappings, drillings, hydrogeological analyses and reflection seismic profiles – which have been carried out between 1999 und 2001 served as a basis for the reassessment.

## Geology

The planed 55,5 km long Brenner base tunnel (BBT) crosses between Innsbruck and Franzensfeste the whole central zone of the Eastern Alps with the so called „Tauern“-window. Further the tunnel will cross the heavily tectonized border zone between Eastern and Southern Alps and south runs for 7 km length within the south alpine granite of Brixen.

The geology along the proposed alignment consists for 63% of schists and phyllites, for 33% of gneisses and granites and for 4 % of carbonates. The geological horizontal section gives an overview over the situation of the proposed alignment, intermediate accesses and position of multifunction stations. The maximum overburden is 1850 m, the average overburden is in the order of 870 m. The Brenner base tunnel is thus – in comparison with e.g. the Gotthard base tunnel - represented by a relative low overburden. Due to the dominance of “rocks of moderate strength” the tunnel can be judged as difficult.

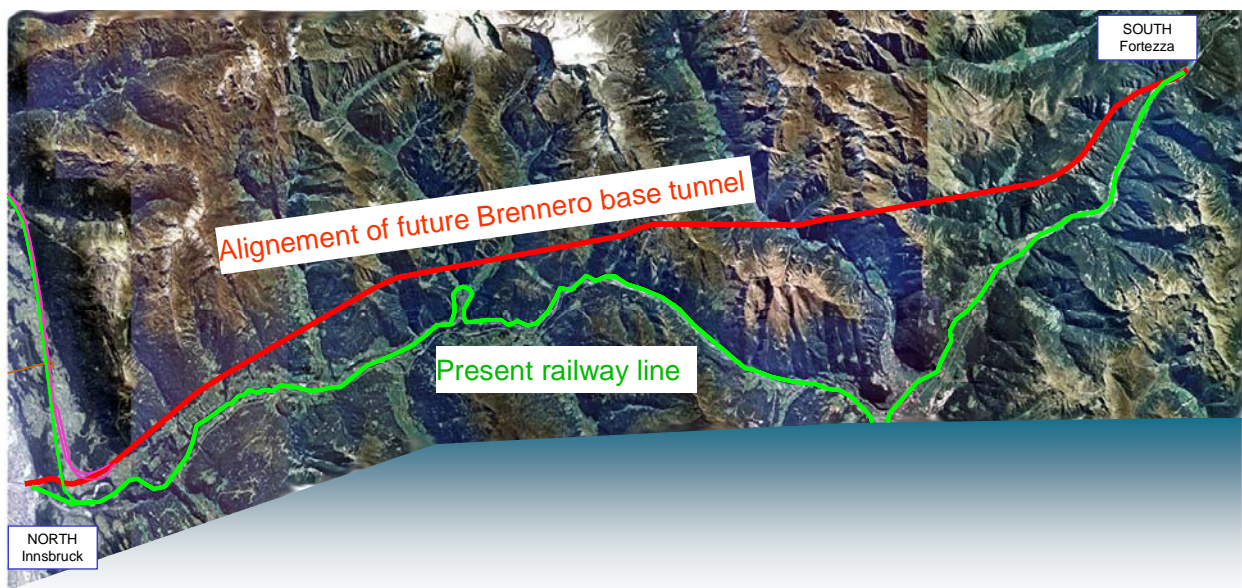


Fig 1: Situation

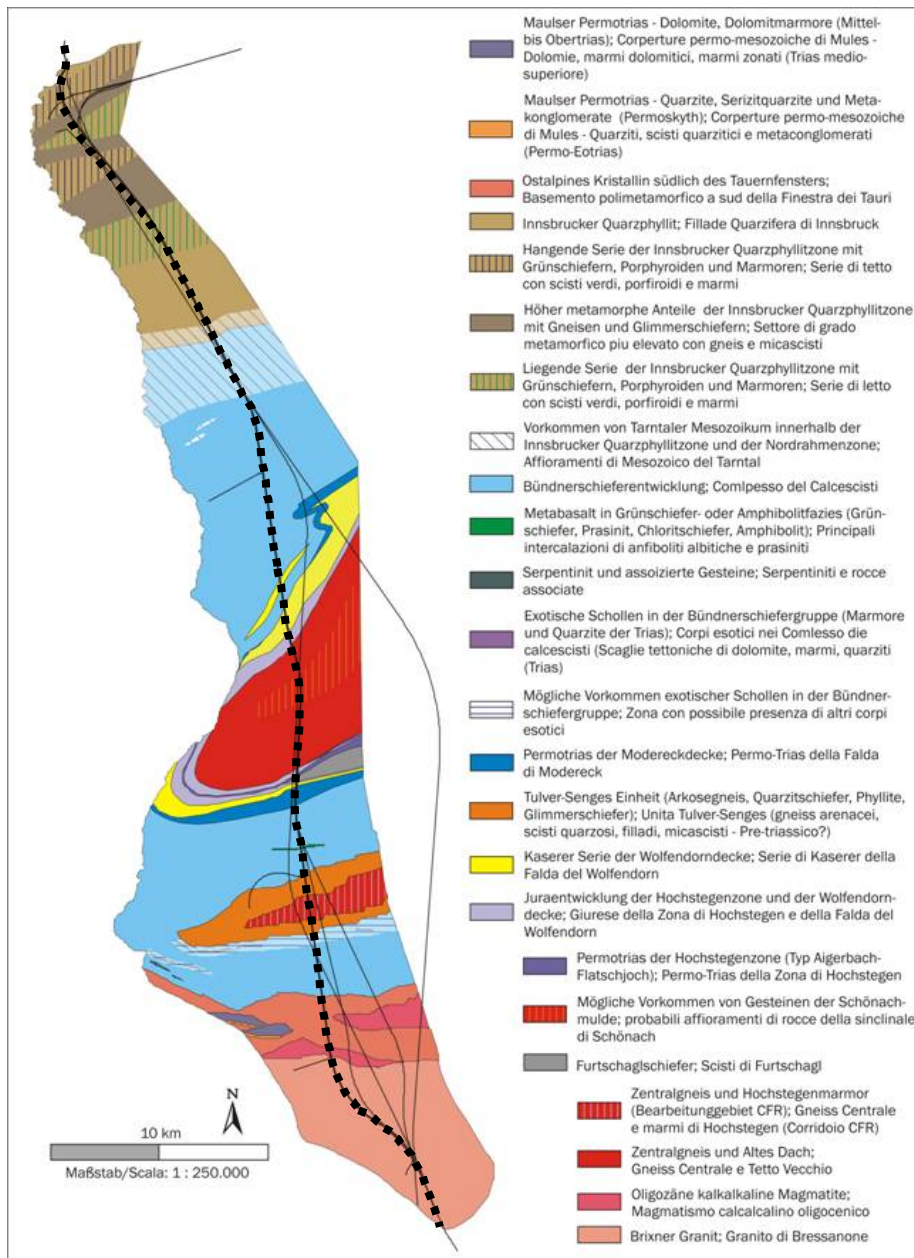


Fig. 2: Geological horizontal section

### Geotechnical prognosis

The geotechnical prognosis included the following steps.

- Establishing hierarchies for rock strength and fracture density.
- Judgement of hazards and their intensities.
- Estimation of rock mass properties derived by the use of rock mass classifications (RMR, GSI) and back calculations of deformations measured in comparable projects
- Prognosis of "Squeezing Potentials" for the whole investigated area and (more detailed) along the proposed alignment
- Full Description - "as detailed as possible" - of 50 sections of similar properties, hazards and behaviour along the proposed alignment. These sections varied between 50 m and 6 km length.

For deep seated tunnels the overburden is of great relevance. The analyse the influence of the overburden on the rockmass behaviour the Squeezing Potential has been used as a key parameter.

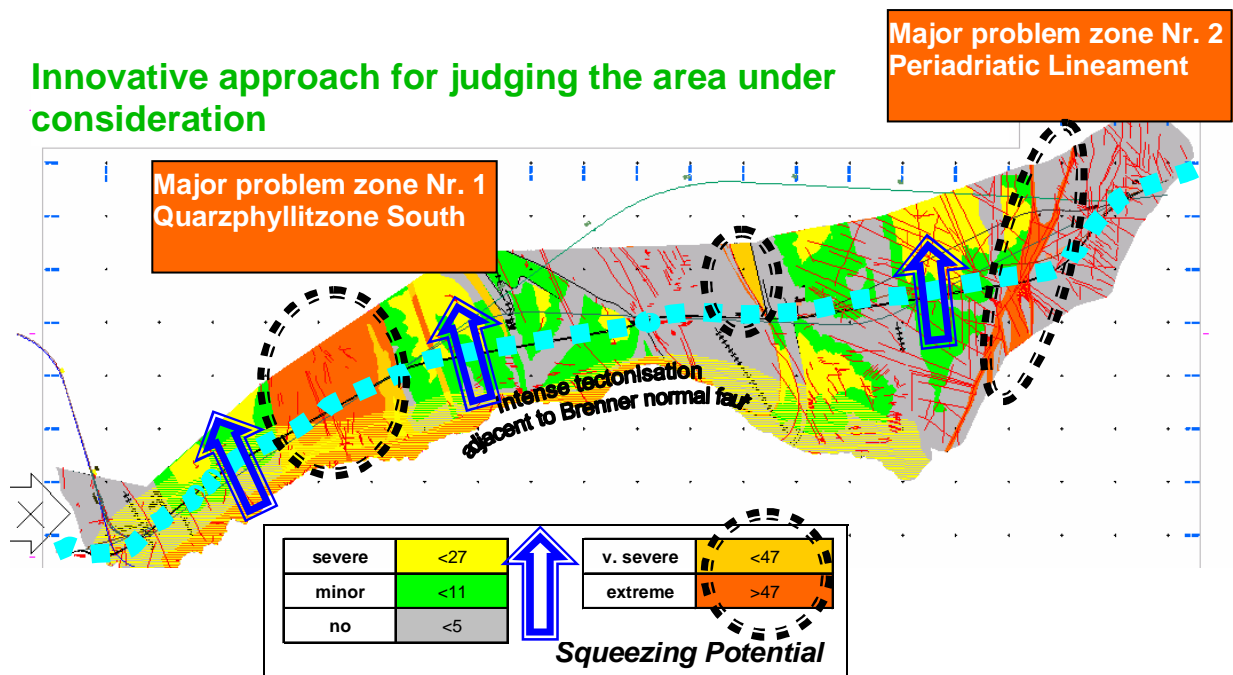


Fig. 3: Squeezing potential

### Hydrogeological prognosis

The hydrogeological prognosis included the following steps.

- Establishing hierarchies for permeability of the rock mass
- Judgement of hazards for heavy water inflow with different origin
- Estimation of hydraulic rock mass properties derived e.g. by back calculations of inflows measured in comparable projects or hydro tests carried out in drill holes
- Judgement of range of inflow, that has to be expected within each lot
- description of the need of investigation drill holes for areas, where a reliable hydro geological prognosis is presently not possible

### Investigation program

In spite of partly poor databases efforts have been undertaken to end up with a detailed prognosis. Numbers have been put to geology in all aspects. Uncertainties in the geological, geotechnical or hydrogeological prognosis are described in various reports and a detailed investigation program has been proposed, to eliminate or reduce them.