Devil's Slide Tunnels Project

Geology

Geotechnical Aspects at Devil's Slide

Physiography

The project site is located on the central California coast, just west of the San Francisco Bay in mountainous terrain. The Devil's Slide complex forms the seaward termination of San Pedro Mountain --- an east-west ridge separating Montara Mountain from the Pacific Ocean.

Resistant beds of massive sandstone and conglomerate form the crest of the ridge. The southwest flank of the ridge is eroded into the underlying, mostly deeply weathered, Montara Mountain Granodiorite.

Local resistant zones within the granodiorite form promontories along the coastline opposite and south of the project.

The North Portals of the tunnels are located in a northeast-aligned spur ridge along the north flank of San Pedro Mountain.

The South Portals are set into the north wall of an alcove-like canyon eroded into the south flank of San Pedro Mountain.

Regional Geology and Tectonics

The project site lies along the western margin of the active San Andreas fault system on the San Francisco Peninsula, between the San Andreas and Seal Cove faults. The San Andreas and the Seal Cove faults are northwest trending, right lateral strike-slip faults that exhibit distinctive patterns of transpressional and transtensional deformation along their principal traces and within the adjacent crust.

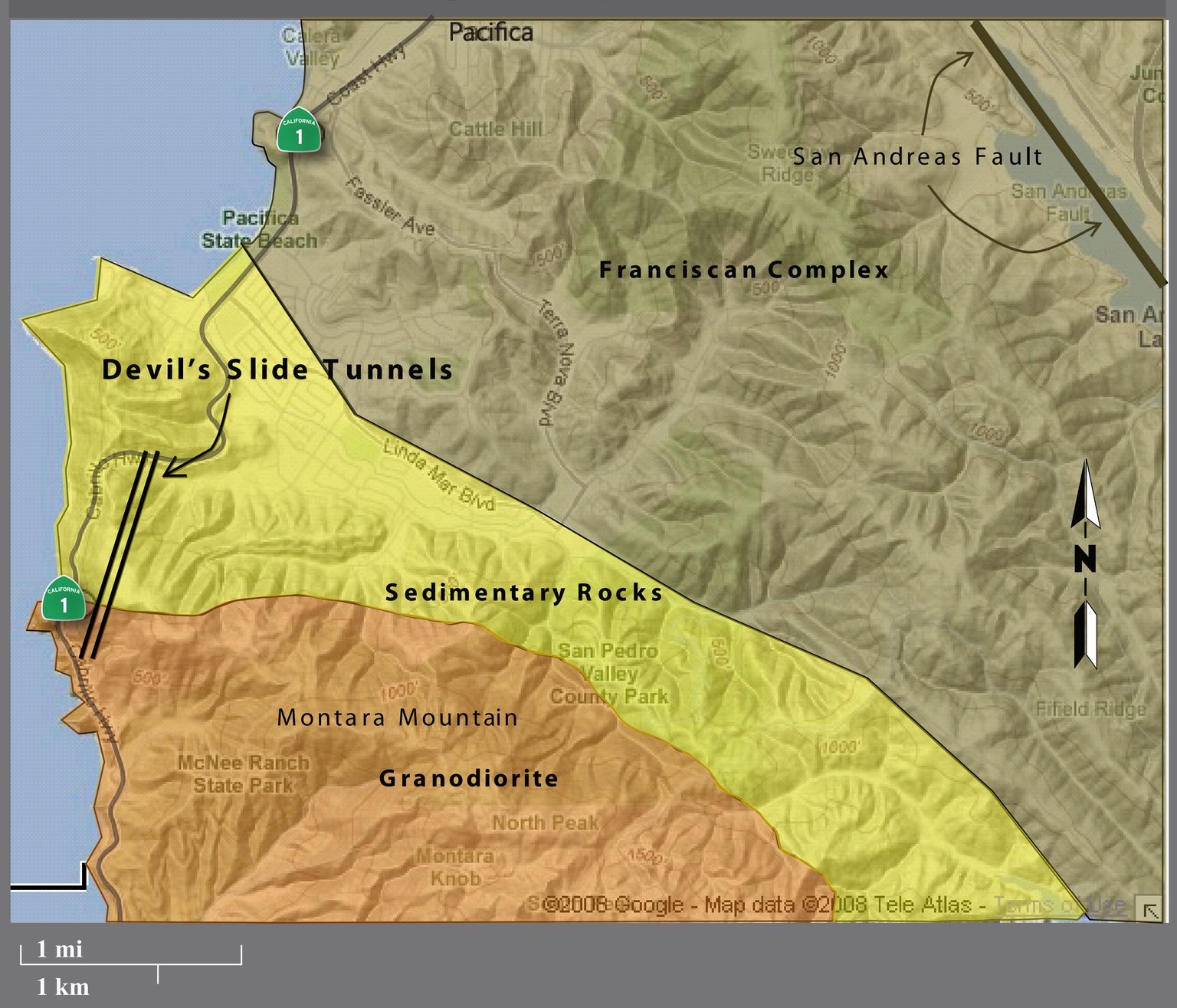
The site is about 2.8 km east of the offshore trace of the Seal Cove fault and 7.2 km west of the surface trace of the San Andreas fault. The geology of the area consists of Mesozoic-age igneons rock (Montara Mountain Granodiorite) structurally overlain by marine sedimentary rocks of Tertiary-age. This sequence is typical of rock assemblages found west of the San Andreas fault known as the Salinian Block. The thurst and high angle faulting seen in the geological cross section below was the result of hundreds of km of displacement of Salinian Block over the last 25 million years.

Seismicity

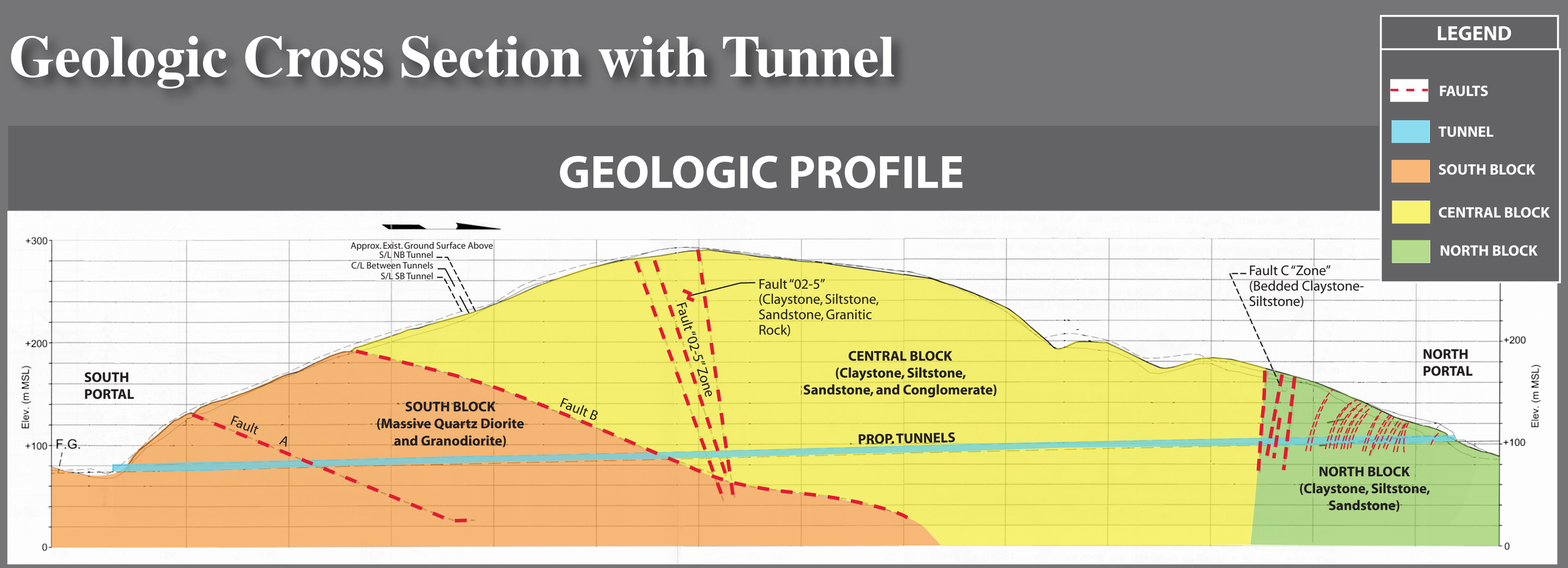
The pattern of seismicity in the San Francisco Bay region during the Late Quaternary corresponds generally to the regional fault pattern. Among regional scale faults the seismic sources of most significance for the project are the local reaches of the San Andreas and Seal Cove faults. The peninsula reach of the San Andreas fault has produced major earthquakes at average intervals of around 150 to 250 years. The USGS Working Group on California Earthquake Probabilities has estimated a 21% probability of a strong earthquake (>M6.7) occurring on the peninsula section of the San Andreas fault within the next 30 years.

The most recent damaging shock to originate on this part of the San Andreas fault was the M5.3 San Francisco earthquake of 1957. The maximum earthquake possible on this reach of the San Andreas fault is estimated to be M8.0.

Idealized Geologic Map of Devil's Slide Area



Geologic Cross Section with Tunnel



South Block - Montara Mountain Granodiorite

Predominantly massive quartz diorite, locally grading to granodiorite; locally with irregular quartz and felsic dikes. "Basement rock" of the San Pedro Mountain region.

Central Block - unnamed strata of San Pedro Mountains

Predominantly interlayed thick beds of massive marine sandstone, conglomerate, and clay-siltstone, structurally overlying Granitic Rock of Montara Mountain and truncated on the north by "Fault C".

North Block - unnamed strata of Shamrock Ranch

Predominantly thin to medium bedded interlayered fine-grained marine sandstone and clay-siltstone, with one or more beds or lenses of sandy conglomerate low in the section. The North Block section is disturbed by a wide shear zone consisting of many steeply south-dipping to near vertical planar zones of fault gouge, some of which enclose blocks of rotated and independently folded strata.

Caltrans
CT1901 District 4 Audio Visual Graphic Services 9/09