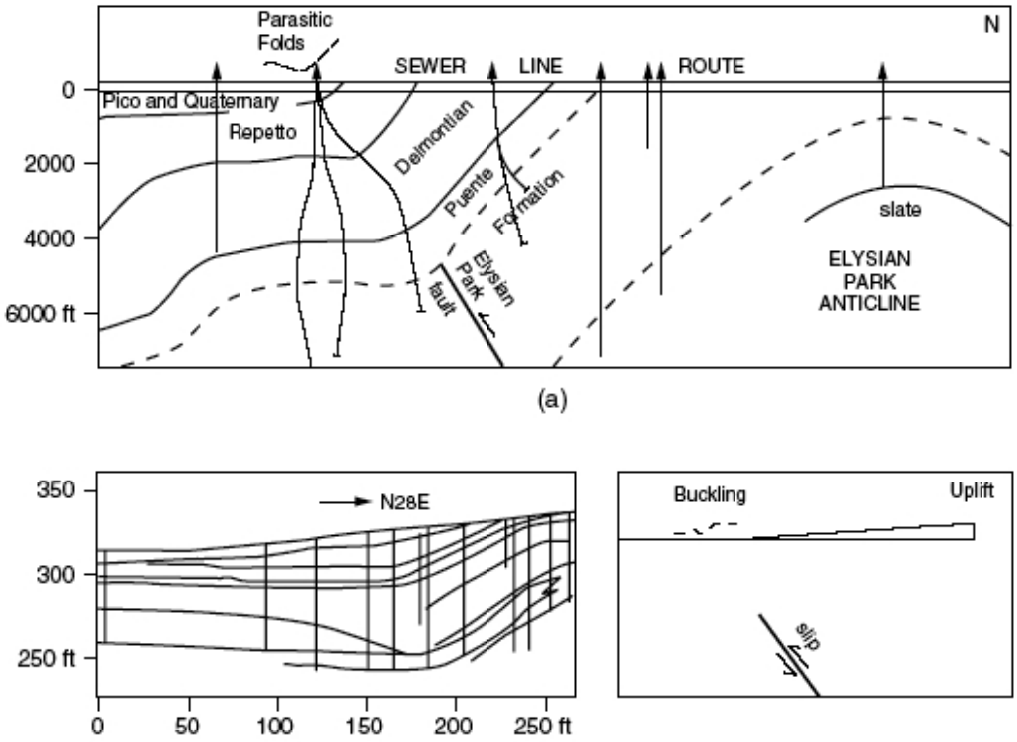
Quantitative Analysis of Faulting and Fold Deformation

from the Elysian Park Blind Thrust for the City of Los Angeles Trunk Sewer Tunnel (NEIS)

PROJECT DESCRIPTION

The City of Los Angeles proposes to build a new trunk sewer tunnel between the San Fernando Valley and the downtown area, following the course of the Los Angeles River through the Santa Monica Mountains and the Elysian Hills. The proposed alignment crosses the Elysian Park anticline, a fold generated by a blind thrust fault that expresses itself at the surface as a line of low hills south of downtown Los Angeles. These hills have been uplifted by repeated earthquakes on the blind Upper Elysian Park thrust, and the next earthquake on this fault is expected to result in surface folding and deformation across the proposed sewer tunnel. The task of *Earth Consultants International* was to develop the folding parameters that the tunnel designers would use to mitigate the seismic deformation.



Simple cross-section along the Los Angeles sewer tunnel alignment showing the folding of the sedimentary strata that were used to quantify the deformation by the Elysian Park blind thrust. Two parameters were evaluated as significant design constraints: tilting along the fold panel and compression at the fold hinge.

SOLUTION

Earth Consultants International correlated continuously cored geotechnical borings to measure the folding rate in both the bedrock and in the overlying alluvial stratigraphy. Fault displacements of 3 to 5 feet had been previously estimated across the Elysian Park fault, and using the three-dimensional fault geometry, 1.6 to 2.5 feet of shortening and 0.5 degrees of tilting were calculated through the tunnel section. The shortening is not expected to be evenly distributed, but is to concentrate at the hinge of the fold, along a feature called the Coyote Pass Escarpment. Average per-earthquake deformation at this point was estimated based on the total amount of deformation observed in a stream terrace of the Los Angeles River that is thought to be 70,000- to 80,000-years old. Angular deformation of 0.14 to 0.37 degrees across a 100-foot length was calculated for the design-level earthquake.

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