



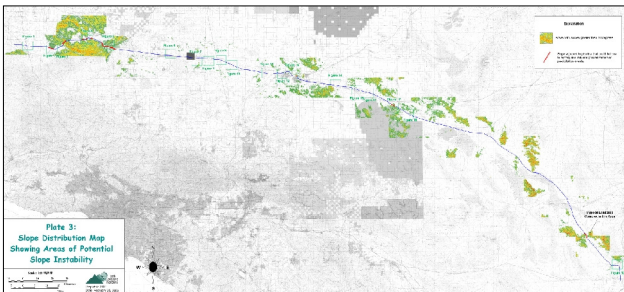
# SEISMIC HAZARDS EVALUATION AND MITIGATION PLANNING for the El Paso Natural Gas Pipeline Mojave Desert Segments, California

## PROJECT DESCRIPTION

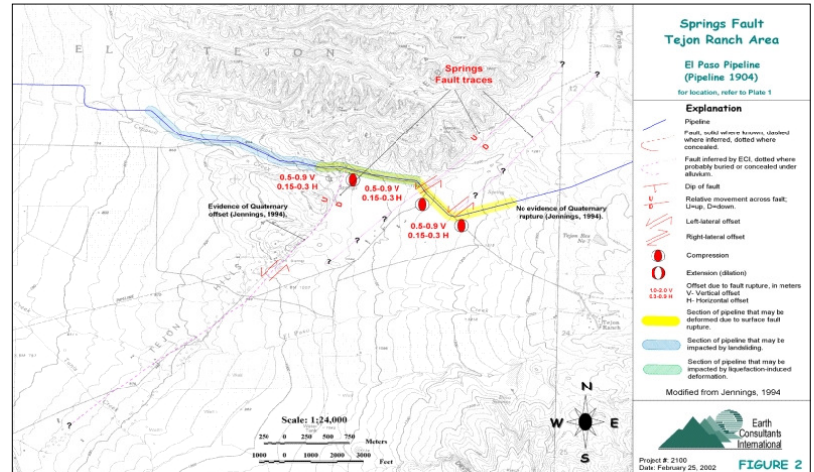
The El Paso Pipeline segment 1904 runs from near Wheeler Ridge to Daggett, California. Segment 1903 extends from Daggett southeastward to Blythe and then on to the California-Arizona state line. A seismic hazards study and mitigation plan were necessary to transition these 30-inch pipeline segments from carrying crude oil to natural gas. *Earth Consultants International's* investigation included identifying active and potentially active faults along the pipeline's right-of-way and evaluating which faults have the potential to rupture during the lifetime of the project. The study also included estimating the amount and sense of displacement expected as a result of an earthquake on each of the faults, identifying areas along the pipeline susceptible to liquefaction, and identifying areas susceptible to landslides and other unstable slope conditions.

## SOLUTION

The data compiled for this study indicate that El Paso Line segments 1904 and 1903 extend across or near 18 fault zones. Nine of these fault zones are active and six are considered potentially active. The remaining three have not moved in the Quaternary (last 2 million years) and are therefore not considered active. The estimated displacements across the faults, should they rupture the ground surface during an earthquake, vary widely; some faults may slip only a few centimeters, whereas others, such as the Garlock fault, may rupture as much as 10 meters laterally in one event.



Slope distribution map showing areas with slopes greater than ten degrees. Slopes adjacent to the pipeline with the potential to fail due to earthquake-induced ground motion or in response to intense precipitation events are marked with solid red lines.



El Paso Pipeline segment 1904 extends through southern Kern County. The figure illustrates the section of pipeline that may be deformed due to surface fault rupture (yellow), landsliding (blue), or liquefaction (green).

The city of Barstow is the largest city near the pipeline right-of-way, and therefore at the highest risk of being impacted should the pipeline fail. The section of the pipeline through Barstow has a high probability of being impacted by any or all three of the hazards assessed: fault rupture, liquefaction and slope instability. To decrease the hazard, *Earth Consultants International* recommended relocating a shut-off valve that had been placed in an area susceptible to liquefaction. We also recommended installing automatic shut-off valves at specific locations along the pipeline in order to reduce the risk to the local population.

