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Hg AND As SOIL GEOCHEMISTRY AS A TECHNIQUE FOR MAPPING PERMEABLE STRUCTURES OVER A HOT-WATER GEOTHERMAL SYSTEM:

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A multielement soil geochemical technique has been developed to map fault distributions over active geothermal systems. At the Roosevelt Hot Springs KGRA, Utah, nearly 550 soil samples on a 500 ft grid spacing covering approximately 4 square miles were collected and analyzed for Hg and As using, respectively, gold film and colorimetric techniques. Hg concentrations within the survey area range from 10 to 5,300 ppb with a local threshold value of 58 ppb; As concentrations range from <1 41 ppm with a local threshold value of 6 ppm (Bamford, Christensen, and Capuano, in prep.).

Geochemical anomalies occur in a series of closely spaced NE and NW-trending zones that parallel the major fault directions within the geothermal field (Nielson et al., 1978). Portions of these anomalies not associated with mapped faults are believed to reflect concealed faults within the alluvium. Zones of high permeability characterized by extreme enrichment of Hg and As and, in places, hot spring deposits, typically occur at the intersections of these NE and NW structural trends. The distribution of Hg and As suggests that faults are more widespread in the alluvial covered portions of the geothermal field than have been previously mapped and that the intersection of NE and NW-trending structures are of fundamental importance to near-surface fluid flow.

The results of this study suggest that soil geochemistry can be used to map faults that lack surface expressions but have hydrologic importance to the reservoir and can therefore be an effective geothermal exploration tool, particularly in area with alluvial cover.