

**AAPG Annual Convention  
Salt Lake City, Utah  
May 11-14, 2003**

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### **Interpretation of a Soil Hydrocarbon Vapor Survey Over Grant Canyon and Bacon Flat Oil Fields, Nye County, Nevada**

The interpretation of geochemical surveys can be ambiguous, especially where the target is located in a setting characterized by intense recent faulting. Faults often act as conduits for hydrocarbon leakage, resulting in higher leakage rates along the surface fault trace than vertical leakage over a petroleum accumulation. Samples indicating high leakage conceivably could be related to either faulting or direct vertical migration, and the interpreter must develop some scheme to differentiate between the two cases.

1984 saw the acquisition of a soil hydrocarbon vapor survey covering much of Railroad Valley, a late-Tertiary extensional basin which is home to the bulk of the production to date from the state of Nevada. This regional survey was selectively infilled in 1985 to provide detailed coverage over the Grant Canyon and Bacon Flat oil fields. The Grant Canyon oil field, discovered in 1982 with cumulative production in excess of 20 million barrels of oil from an area of approximately 320 acres at a depth of 3500 feet, is one of the most studied fields in Nevada. Data from outcrop, geomorphology, gravity, and a published 3-D seismic survey can be integrated to provide an accurate map of the fault pattern to compare to the soil vapor data.

This comparison indicates that the highest concentrations of light alkanes in the soil vapors are due to migration along fault planes. The concentration associated with direct vertical migration is less than that due to faulting, but still higher than background where neither faults nor petroleum accumulations are known to occur. Detailed examination of histograms of the soil vapor data can yield insights into what thresholds are significant to differentiate between areas of probable vertical migration from hydrocarbon accumulations and background or faults.