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### **A Strategy for Integrating Conventional and Unconventional Exploration Tools, Yemen**

A recent exploration campaign for onshore Yemen combined surface and subsurface geologic data, 2-D seismic data, interpretation of satellite imagery, geochemical, and geomicrobial techniques to reduce exploration risks and costs. The satellite image interpretation involved the search for spectral anomalies that might be related to the seepage of hydrocarbons in appropriate structural settings. Processing Landsat Thematic Mapper data, using a powerful minimum noise fraction algorithm, revealed several spectral anomalies that coincided with structural targets mapped from a dense network of 2-D seismic lines.

Detailed work on the prospects included acquiring and mapping additional seismic data, collecting soil gas, geomicrobial, and rock samples, across the satellite spectral anomalies. The infill seismic data verified the geometry of the traps. Geomicrobial and soil gas anomalies and differences in rock chemistry of the type expected to be associated with hydrocarbon microseepage coincided with 18 of 21 Landsat spectral anomalies tested.

Despite the marginal economic outcome of two exploration well tests drilled on the basis of the integrated exploration effort, these results suggest a strategy for blending conventional and unconventional exploration tools. The exploration work flow suggested by this project would be: regional examination with Landsat structural and spectral techniques, acquisition of regional seismic data, verification of the presence of hydrocarbons using geomicrobial and geochemical methods, and validation of trap geometry with detailed seismic.