# Case Study: Horizontal Extended Reach

## GeoROX maximizes reservoir contact through improved horizontal well placement in complex channel environment

### Client

Kuwait Oil Company

Burgan Reservoir, Onshore, Kuwait

### Challenge

Placing horizontal wells optimally in a complex channel environment with heterogeneous reservoir characteristics. Identifying water charged faults to isolate water influx during production.

### Solution

Build a geo-steering model based on offset well logs and a chemostratigraphic model based on XRF analysis of core chips.

### Results

The integrated approach of using real time XRF data and downhole logs lead to geosteering and placing wells with maximum reservoir contact. This use of integrated data sets also assisted in isolating possible trouble zones and improved smart completion designs.

### Value

Improved well placement resulted in improved production and reduced water influx during production.

### Services used

**GeoROX**

### Preparing Geo-Steering and Chemostratigraphic models for optimal well placement

The Burgan formation consists of a braided river system with stacked sand bodies, making this complex channel geometry difficult to navigate through and maintain position in reservoir quality sands. By developing Geo-steering and Chemostratigraphic models that can be used in real-time with both downhole logs and surface logging data, navigating and evaluating the reservoir is now possible with a greater success rate.

### Identifying Faults and associated throws and lateral variations

It was important to not only place the well in the best layers but also to identify faults that were interpreted as being water sources. During Geo-steering an increase in K, Al, Ti, Zr was observed and interpreted as an indication of dirty sands. High reservoir quality was interpreted through a low concentration of these elements and high Si. Areas where Ca increases and Si decreases were indicative of calcite cemented sandstones with lower reservoir quality. It was not always possible to see these changing conditions with down hole logging data and as a result proxies were identified with XRF analysis and advanced mud gas to identify a fault. Three other faults were identified during drilling of the well. Subsequent analysis also identified that Cl was in fact a precursor indicating the approaching of faults. Chemo-steering thus helped to change the well path based on elemental analysis from the GeoROX service and maximize reservoir drainage.
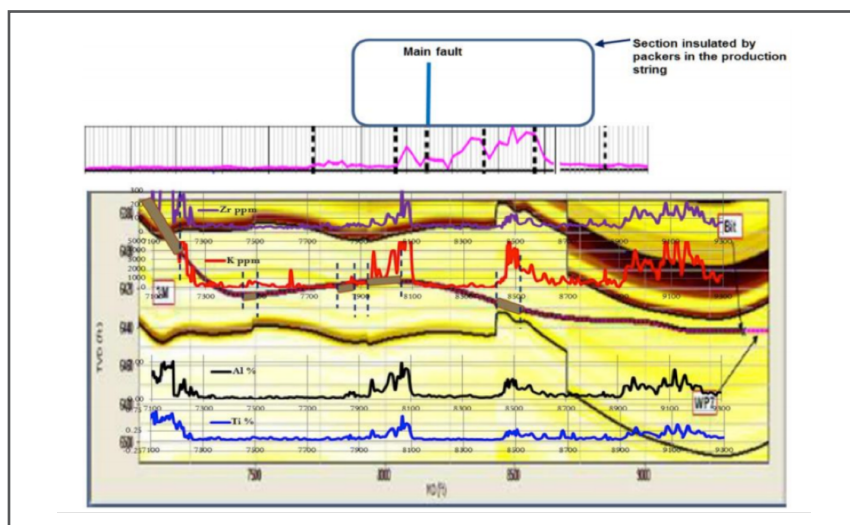


Figure 1.Integrated approach using XRF and mud gas data to place well and to isolate potential trouble zones from faults.

### Technical Paper References

*High Resolution ChemoSteering in Drilling Horizontal Wells.*
*SPE-164385 (MEOS, Bahrain, March 2013)*