Study of High-Quality Shale Outcrop Enables BP to Better Target Eagle Ford Production Zones

Detailed study of subsurface includes a 3D perspective of the Eagle Ford Formation

**CHALLENGE**
Study subsurface of a shale oil and gas play while maintaining landowner relations and facing difficult site conditions.

**SOLUTION**
Coordinate Schlumberger Water Services with wireline and TerraTek* core services for full data analysis, water well installation, and QHSE management.

**RESULTS**
Acquired more complete understanding of complex shale and succeeded in safety efforts and landowner satisfaction; operator able to better target productive zones.

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Opportunity to study rare unconventional resource in a high-risk location

Unconventional reservoirs, also known as unconventional shale oil and shale gas plays, are increasingly being explored as advances in oilfield technology make development of this resource viable. The Eagle Ford Shale in western and central Texas is an excellent example of an unconventional reservoir that is actively being developed. In Lozier Canyon, the Eagle Ford Shale fully outcrops, thus providing an exceptional opportunity to better understand how to best produce the resource and interpret other shale oil and gas plays.

While exploring unconventional reservoirs in the Lozier Canyon, BP recognized the opportunity for a holistic study of stratigraphy, biostratigraphy, inorganic geochemistry, and organic chemistry of the shale outcrop. A previous study was performed by BP, which involved describing and documenting surface features of the outcrop; however, without a correlation to subsurface conditions, BP was limited in advancing its knowledge.

Project complications went beyond analysis of the outcropping shale and included desert heat and absent cellular service. Being nearly 80 miles from the nearest substantial city (Del Rio, TX) also created a situation where emergency services could not readily be contacted.

Furthermore, the Eagle Ford outcrops in Lozier Canyon were located on private property, a fact that had made access off-limits for decades. Through significant effort, BP had gained access with the agreement that the borehole used for the Eagle Ford study was to be completed as a water well for use by the landowner.

*Schlumberger prioritized safety and security in the remote, dangerous location, instituting specialized journey management procedures to and from the field site and working with local law enforcement.*
Integrated project management strategy implemented to deliver data and mitigate risk

Coordinating with multiple Schlumberger segments and subcontractors, Schlumberger Water Services provided oversight and management for all aspects of the project, including road construction to the site; through coring, logging, and drilling of a water well; and installation of a solar-powered pump for water supply.

Core analysis and rock mechanics services provided analyses of

- gamma logs
- lithological description and petrography
- total organic carbon
- whole core fracture
- X-ray diffraction (XRD)
- CT scanning
- scanning electron microscope (SEM) data
- permeability and porosity
- continuous unconfined compressive strength (UCS) profile
- geophysical log matching.

The core data was correlated with the suite of geophysical logs using wireline services, including combinable magnetic response, natural gamma ray spectroscopy, ECS* elemental capture spectroscopy sonde, Sonic Scanner* acoustic scanning, and FMI* fullbore formation microimager.

As for the QHSE concerns surrounding the field site, safety and security were made a priority by both BP and Schlumberger. Additionally, Schlumberger Water Services initiated a specialized journey management plan for all personnel traveling to and from the site. Utilizing a communications-enabled satellite GPS device allowed a remotely stationed project manager to communicate with personnel in the field, thereby abating issues associated with the remote location and lack of communication with emergency services.

Significant understanding gained for a high-demand shale oil and shale gas play

When the Schlumberger data was combined with the outcrop data already gathered by BP, a complete picture of the Eagle Ford Shale emerged. With a more complete understanding of the shale play, BP is confident that the previously used trial-and-error exploration programs will be set aside; BP is now better able to target the productive zones of the Eagle Ford Shale where it is buried deep beneath south central Texas.

The water well and solar pump installed by Schlumberger Water Services produced six times more water than initially estimated, pleasing the landowner and promoting a mutually beneficial relationship with BP. The landowner received a much needed water well in a hot, dry region of south Texas, and BP maintained its access to the important Lozier Canyon site, which they and Schlumberger use to teach courses on unconventional reservoirs.

Integrating multiple services including borehole core analysis, geophysical logging, project management, and water well installation, Schlumberger gave BP a solution that took into account all the project needs with no adverse QHSE results.