



SHALE DEVELOPMENT

CASE STUDY



Using imagery and digital elevation models to improve operational efficiency

Shale development introduces a new level of operational complexity with respect to field operations for oil and gas operators. Long lead times reduce flexibility in operations, and delays in executing on the ground negatively impact the drilling schedule and cost operators real money.

Using high-resolution imagery and digital elevation models (DEMs) to overcome technical challenges in shale operations and to plan well pad locations and pipeline routing increases operational efficiency and production, while reducing operating costs and environmental impact. Specific operational objectives include a reduced timeline in planning to SPUD/construction, lower design and construction costs and improved efficiency.

Verified cost savings with geospatial data

The complexity of field operations is an industry wide issue, so Maxar's Energy team engaged with multiple clients to document where the use of up-to-date high-resolution imagery and DEMs would have a significant impact on their field operations. Together, we dug deep into operational processes and created a generalized workflow for locating a well pad and routing a new pipeline. We then worked to understand the costs involved with these activities and to identify where in the workflow imagery and DEMs would provide a benefit. Together, we calculated and verified the cost savings that could be captured.

The results are striking—especially for operators who are running large-scale drilling programs. The project looked at the operations from a typical large-scale unconventional play.

Operational cost savings

- 1-1.5 avg. surveyor trip savings per well/pad=\$1,500–\$2,250
- 1-1.5 avg. surveyor trip savings per prelim route=\$1,500–\$3,000
- \$4K–\$8K per pad construction costs savings

Example: 300 wells planned in 2013

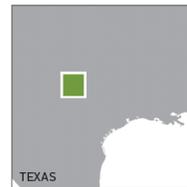
- \$450K–\$675K in pad site surveyor costs savings
- \$450K–\$900K in facilities surveyor costs savings
- \$1.2M–\$2.4M pad site construction savings
- Return on imagery and DEM investment in less than two months of operations

The hard cost savings noted above were operational in nature. However, operators acknowledge that there are other costs savings that can be recognized, such as saving employee time, eliminating idle rigs and reduction of surface damages paid among others.

BENEFITS OF LEVERAGING IMAGERY AND DEMS IN SHALE PLAYS

- Reduce operating costs
- Increase efficiency
- Verify accuracy of other data
- Increase production
- Mitigate risk
- Reduce environmental footprint
- Improve community and public relations

PERMIAN BASIN



The use of high-resolution imagery and elevation data can provide a strong return when effectively used in the planning phase of field operations.

Drilling benefits

- Ensure you have all information necessary to pick preliminary locations from the office, so you can make decisions faster and make better use of drilling and field personnel time.
- Reduce the number and duration of trips to the field and current success rate of 30-50 percent for determining useable locations on the ground should increase to near 100 percent.
- Quickly estimate surface damages from the desk.
- Stay ahead of the drill schedule to avoid the potential for idle rigs.
- Accurately estimate time and cost to construct surface locations based on topography, vegetation and surrounding infrastructure.
- Prioritize the drilling schedule and gain flexibility with better planning.
- Provides a baseline for contractor cost comparison and auditing.
- Significantly reduce time from planned well to approval for construction.

Facilities benefits

- Reduce field visits to determine location of existing infrastructure.
- Determine preliminary/pre-stake routes faster, with more confidence and higher success rate from the desktop.
- Determine timing and level of effort to construct facilities ahead of wells and other activities (land, damages, contractor bidding, etc.).
- Quickly estimate potential surface damages from the desktop.
- Avoid undesirable post-construction surface damages negotiation by staying further ahead of schedule and increased flexibility gained with a faster decision and planning process.

OTHER USES OF IMAGERY AND DEMS IN UNCONVENTIONAL DEVELOPMENT

Energy companies utilize imagery and DEMs across the enterprise and throughout the E&P process in both conventional and unconventional areas of operation. These uses include:

- Mapping and monitoring ground features such as roads, well locations, facilities, property boundaries and utilities
- New well planning and spotting, site development, seismic planning
- Facilities analysis and monitoring, pipeline construction and monitoring
- Environmental impact and hazards assessments and view-shed analysis.
- Monitoring rights of way and other corridors for encroachment, erosion, stability and security
- Monitoring the coastal zone, including erosion, deposition and water conditions
- Monitoring surface stability and deformation in producing areas
- Monitoring changes in the natural and as-built environment