

Oil & Gas



Geophysical Prospecting

Geophysical field operations, which collect data for producing geological structural and stratigraphic models, can help define drilling targets. Geophysical data cannot directly detect oil and gas resources, only geologic structures that could be oil or gas reservoir traps. Geophysical operations are strictly permitted and inspected in order to minimize environmental impacts and ensure public safety. Refining drilling targets with geophysical data greatly reduces overall surface impacts by reducing the number of exploratory wells necessary to discover new oil and gas fields.

Geophysical permit applications include the following types:

Gravity Surveys – Precise gravity measurements can detect small differences in deep rock density that can aid geologic mapping.

Magnetic Surveys – Regional magnetic measurements also can detect deep rock anomalies.

Seismic Surveys – Reflection and refraction data of induced sound waves are the industry's primary tool for geologic modeling and drilling target selection. There are two basic types of seismic exploration:



Geophysical Drill Buggy in South Florida

Explosive energy source:

- Explosives are detonated at regular intervals in shallow boreholes (typically 100 feet deep) as energy sources for sound pulses that reflect off geologic structures.
- Specialized microphones (“geophones”) deployed at the surface capture timing and intensity data from the reflected sound pulses.
- The data is processed and sometimes calibrated with nearby well data to model deep stratigraphy and geologic structures.

Vibrating energy source:

- This form of seismic prospecting uses specialized vehicles capable of vibrating the ground with sound pulse signals that can be recognized by geophones.

Geophysical Prospecting, continued

- This type of seismic prospecting is faster and has fewer surface impacts, but is less accurate, particularly for deep targets.

3D Seismic – Geophones deployed in two-dimensional arrays at the surface can collect sufficient data to construct three-dimensional geological structural models.