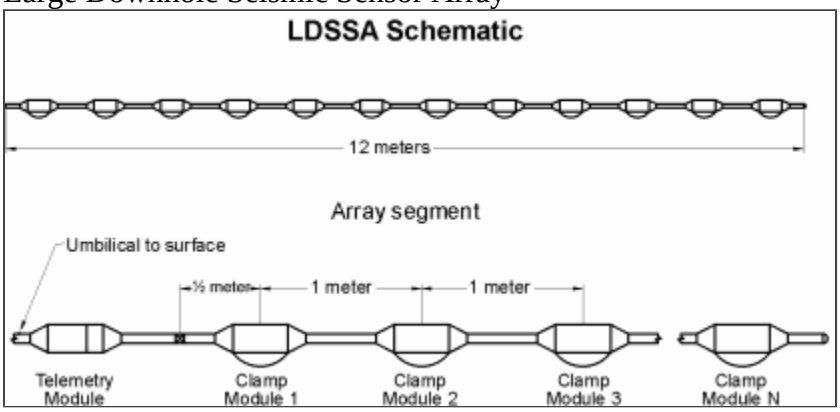
Idaho National Laboratory

Exploration & Production

Large Downhole Seismic Sensor Array



Modular design approach of LDSSA. Individual array segments would be approximately 12 meters long with appropriate connectors on each end.

Accurate prediction of formation pressures (pore pressures) is critical to conducting safe and economic drilling operations. This information is essential for both optimizing casing and drilling fluid programs, and is vital in avoiding well control problems and meeting exploration objectives. Conventional real-time pore-pressure prediction techniques typically relate measured porosity indicators (velocity, resistivity, density) and real-time drilling parameters (drill rate, bit torque, formation gas, etc.) for pore pressure prediction. These parameters can be used effectively to predict pore pressures at the depth the data is being collected while allowing for predictions of pore pressure to be made ahead of the bit using trend analysis methods. However, these methods are highly constrained by lack of data ahead of the bit and do not provide the accuracy required to be a fully effective tool.

The focus of the project is the design, construction, testing, and numerical modeling of prototype seismic sources that will meet the functional and operational requirements required for a while-drilling application. Conceptual designs were developed for two prototype devices, a regenerative combustion source and a capacitive discharge source. The prototypes were evaluated (scheduled at the University of Arkansas' Savoy Field Research Facility). These tests consisted of comparing the prototype sources against the response of two widely utilized commercial sources (air gun and percussion). The data was recorded using an 80-meter long geophone string using three-component geophones on 10-meter spacing. In addition, a three-component geophone was used to record data in a 30-meter-deep borehole located 10 meters from the borehole the prototypes were deployed in. Results from the tests will be used to model the sources in an effort to derive a source function for the prototypes. Upon completion of the modeling, additional field tests will be performed and the prototype designs refined.

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URL: http://www.inl.gov/exploration/projects/downholesensor.shtml