

## Compressive Seismic Imaging Application at Lookout Field, Alaska

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### ABSTRACT

This is the 2nd of two talks on compressive seismic imaging (CSI), with the 1st covering theory, acquisition, and processing. The emphasis in this presentation is on imaging in the Lookout area, showing examples from the overburden, reservoir section, and deeper intervals. Significant improvements in imaging of structural and stratigraphic features were realized. The new data is also suitable for quantitative seismic interpretation, as amplitude fidelity was preserved in processing. The Lookout Field is located onshore on the western North Slope of Alaska, inside the National Petroleum Reserve - Alaska (NPR-A). The discovery well, Lookout 1, was drilled in 2001, and found oil in Upper Jurassic sandstone at around 7800 ft. depth. Expected field startup is in 2018. The legacy seismic data over Lookout is an exploration-quality 3D survey: 1999 NPRA East. Compared to current development-quality 3D surveys on the North Slope, it has low fold, large bin size, and narrow azimuthal coverage. Lookout field was originally identified as a stratigraphic trap with an anomalous seismic amplitude response (DHI) on this legacy survey. Heading into development, important uncertainties remained regarding position of field margins, internal stratigraphy, and fault compartmentalization. It was determined to acquire a new seismic survey in 2015 for reservoir characterization, prior to well planning and development. There are several challenges to imaging in the Lookout area that are common to much of the western North Slope. These include surface ice lakes, variable permafrost conditions, and imaging through the Fish Creek slumps. The acquisition parameters and processing methods of the new survey were designed to overcome these imaging difficulties. The new survey has high fold, smaller bin size, and full azimuthal coverage. The CSI design offered the potential for greater acquisition efficiency, meaning that in this case a larger area and/or higher density coverage could be acquired for the same cost and time. The Lookout CSI was also a relatively small (~80 mi<sup>2</sup>) project that proved up the concept and practicality of CSI for future larger surveys. Since the 2015 Lookout survey, additional CSI surveys have been acquired on the eastern North Slope (Aklaq, 2016) and in NPR-A (Greater Mooses Tooth, 2017).