Datapages/Search and Discovery Article #90224 GeoConvention © 2014, FOCUS - Adapt, Refine, Sustain Calgary, Alberta, Canada, May 12-16, 2014

Integrating Environmental Data Acquisition and Seismic Data Acquisition

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Abstract

Environmental concerns and the concomitant regulatory oversight are central to energy exploration activity, particularly in remote Arctic and sub-Arctic regions. Increasingly, regulatory approval processes are focused on vetting the methods proponents will employ mitigate impacts on environmental values. Often, the basis for establishing these valued ecological components lacks valid scientific data, which in turn results in mitigation measures, which miss the mark or are focused on a species that may not be present. In many cases, emphasis is placed on monitoring activities, which can be superficial in nature and come too late in the operation to create meaningful outcomes. From their perspective, regulators often complain that they lack the funding and resources required to acquire the environmental data they need to properly inform their oversight.

While the core activity of exploration operations is grounded in real and carefully applied science and engineering that are integrated to construct a sub-surface earth model in order to understand and visualize the exploration opportunity to minimize risk and maximize the likelihood of success, the same model is not routinely applied to the environmental management component of these activities. Environmental data are often perceived as an inconvenient requirement for the approval process, with activities and their associated costs occurring outside the core exploration activity. Opportunities for integrating the data acquisition efforts and building an integrated earth model that includes both the surface (and flora and fauna on the surface) as well as the sub-surface are therefore missed, with the associated value creation and risk management opportunities vanishing into thin air.

We present two case studies to show how environmental data acquisition can be integrated with seismic data acquisition. We demonstrate how the results of this integrated data acquisition effort fills in knowledge gaps with both the sub-surface earth model and the surface earth model in a way that leads to minimized risk for exploration and enhances opportunities for minimizing environmental impact.

First, we show work from the Central Mackenzie Valley in the Northwest Territories of Canada where data was gathered to measure the spatial distribution of boreal woodland caribou, moose and wolves concurrently with seismic acquisition activities. These data were further integrated with high-resolution satellite imagery and LiDAR to drive an enhanced understanding of the surface above the seismic image. This work has important and immediate implications for the interpretation and implementation of new federal boreal woodland caribou regulations - an exploration risk every bit as significant as subsurface drilling hazards.

Second, we show work from the Liard Basin in British Columbia where monitors integrated into the seismic acquisition operation measured a baseline density and distribution of snowshoe hare and several species of ungulates along regional mega transects and established permanent

plots to measure change over time. Again, understanding the position of these indicator species will aid proponents' exploration plans, inform discussions with local aboriginal groups and will help minimize exploration risk.

While both case studies describe work and results in differing regions with different objectives, both show how highly valuable and scientifically valid, quantitative environmental data were collected quickly and seamlessly during seismic data acquisition operations.