

Hydrogeology and Management of Water Issues in the Development of Shale Gas in the Horn River Basin in northeastern British Columbia

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Summary

Innovative drilling, well completions and stimulation technologies are making the economic development of natural gas resources from shale deposits a reality in north-east British Columbia.

In this region, fracturing jobs are being executed on a previously unheard of scale; therefore, the water required has created a new water management challenge for operators. Fracturing conventional oil and gas wells in the Western Canadian Sedimentary Basin (WCSB) requires only modest amounts of fluid (180 m³ for a 60 ton frac); whereas the large frac jobs for horizontal shale gas wells commonly require over 100,000 m³/well of water. In the Horn River Basin, it's estimated hundreds of horizontal wells will be drilled, which indicates the need for large volumes of water and the implementation of strategic water management systems. It is important that operators begin the careful evaluation and development of surface and ground water resources in order to develop environmentally sustainable and cost effective access to water supplies.

The author will discuss the issues in the water management cycle, including:

- Water Supply
- Water Storage
- Water Treatment
- Water Re-Use and Disposal

The vast amount of oilfield data generated in the Horn River Basin has provided an opportunity for the hydrogeologist to prepare a hydrostratigraphic understanding of the region, and a basis for screening potential target aquifers at the pre-feasibility level. The author will discuss the hydrogeological characteristics of the geological zones of interest, and the advantages and disadvantages of each from a developmental and environmental perspective.

Flowback of 20-30% of the injected frac fluid creates a need to manage the large volumes of total dissolved solids (TDS) water in an environmentally safe manner. Re-use of flowback and produced water becomes an attractive alternative to many operators. When TDS values are high, water treatment may be necessary to bring the water quality into a range that can be re-used for fracing or be appropriately disposed of in suitable non-potable aquifers.

Shale gas developers are considering extensive treatment options, but also other innovative technologies, to effectively use existing water supplies, including aquifer storage and recovery (ASR). ASR involves the development of non-potable aquifers as both a source of frac water, and as a potential storage or disposal zone for flowback and produced water.

Acknowledgements

The author would like to acknowledge the contributions of; in addition to the Schlumberger staff who helped pull the information together and translate it into presentable material; but also the graphics and insight contributed by MiSwaco and Aquapure. Without their contributions, this paper and accompanying presentation would not have been possible

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