

Considerations for Efficient Water Wells and Cost Effective Groundwater Supply Projects

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Summary

Water supply for oil field operations is becoming increasingly important in Western Canada as the basin transitions towards being dominated by unconventional development. This talk describes approaches and lessons learned by water supply hydrogeologists in terms of leveraging oil field technology and expertise combined with traditional water well drilling techniques and equipment in order to execute effective oil and gas groundwater supply programs.

Introduction

There is increasing regulatory pressure to use saline or low quality groundwater (including deep sources) as a water supply for oilfield projects. This has resulted in an increasing reliance on oilfield methods, technology and personnel which is often not in their principle areas of expertise. Consideration should be given to the regulatory environment as well as adapting conventional ground water drilling wisdom, equipment and procedures to support oilfield water supply projects to make them more cost effective and resulting in more efficient wells.

This paper provides an overview of the key considerations for Project Managers that are tasked with obtaining a groundwater supply for their oilfield project. Considerations for an efficient and cost effective water supply drilling and testing program will be presented based upon 15 years of experience as a hydrogeologist on water supply projects, including the oil and gas industry.

Regulatory Framework

The regulatory requirements for drilling water wells will be presented as there are significant cost, safety and timing implications for securing a water source. *Water Act* requirements (well completions, licensed drillers, non-saline and low quality groundwater) as well as regulatory guidelines and license requirements (observation wells, testing) for the diversion of groundwater to help guide the Project Manager to a successful program.

Considerable savings in cost and time may be realized for target aquifers that are located at depths of less than 150 m. In such cases, the AER requirements for a licensed well regarding well control (blow out prevention, surface casing, cement, etc) do not apply. For water wells drilled deeper than 150 m (or below a hydrocarbon source), there are circumstances where full or partial waivers may be pursued based on the risks.

Collaboration with Geoscience, Drilling and Completion Departments

Careful planning in the exploration stage, understanding of regulatory requirements, well design, contractor selection, drilling, well development and testing stages can result in a successful and cost effective well completion and testing for a groundwater supply program. Working with drilling and completion departments, beginning in the planning stages, is crucial to the success of the program. It is important to ensure that the objectives and the procedures are understood by all. Items to be presented include maximizing information gathering during the resource exploration program to obtain critical information for designing a cost effective water supply program with efficient water wells. Some of the methods that have been successfully employed to support the water well program include: a) geophysical tools (MDT, XPT or RFT) to obtain aquifer pressures, aquifer salinity and indications of aquifer permeability, b) instrumentation which may preclude the need to drill an additional observation wells, c) obtaining samples to assess cementing and grain-size which may be crucial for well design, and d) casing wells to allow subsequent perforations and testing to confirm aquifer deliverability and possible use as an observation well or even a production well.

Maximizing Well Efficiency

Low water well efficiency reduces the well yield, increases operational costs and could increase the number of wells required to meet the project water needs. Maximizing well efficiency as an objective should be considered from the planning stages as it factors into many stages of the program. Pumping tests can indicate poorly completed or low efficiency wells and subsequent well rehabilitation may be costly or ineffective. The following key considerations that may impact water well efficiency and water supply program costs will be discussed in detail:

- Drilling program design and procedures
- Balancing drilling safety considerations with well efficiency
- Contractor selection
- Well design and materials
- Well development
- Testing program

Conclusion

The most effective water well drilling and completion programs typically involve collaboration between a variety of disciplines including petroleum geologists, hydrogeologists, engineers and field personnel. Collaboration should begin in the planning stages to streamline efforts towards achieving the objectives of minimizing costs and maximizing well efficiency. Knowledge of the regulatory framework and utilizing all available information are key components to a successful program.