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Aquistore Third Well Project:

Examining a CO_2-saturated aquifer in SE Saskatchewan, and How a New Observation Well Can Inform Projects about MMV and Public Engagement

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The Petroleum Technology Research Centre is embarking on a groundbreaking project to drill the world's first observation and monitoring well directly into a CO_2-saturated reservoir. The Aquistore site, located near SaskPower's Boundary Dam Carbon Capture facility, is the one of the only viable locations in North America for the implementation of such a project. The site has been injecting CO_2 since 2015, with a total of close to 600,000 tonnes already in the Deadwood

Figure1. Current Aquistore injection well.

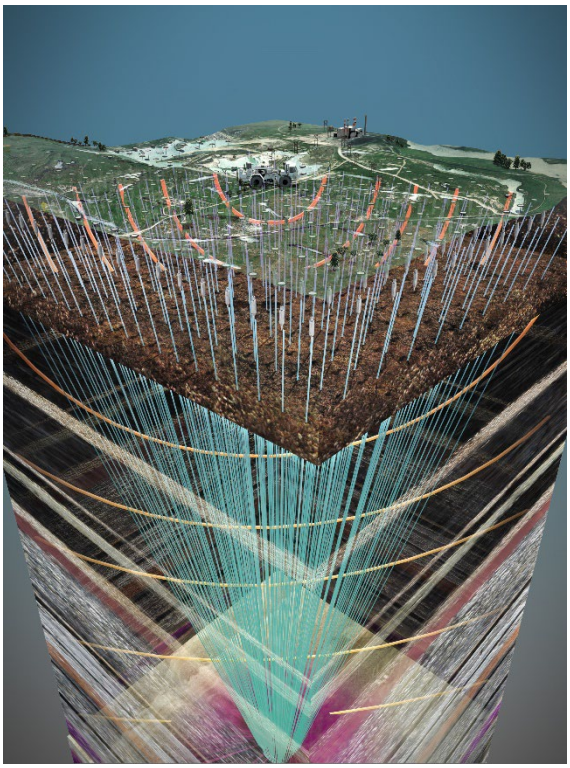

Figure 2. Depiction of permanent geophone array.

Formation reservoir. The existing infrastructure includes an injection well drilled to 3400 metres, an observation well approximately 150 m away, and a 650-geophone permanent array (see Figures 1 and 2) in addition to other MMV (Movahedzadeh 2022). This new well will be placed

a more significant distance away from the two existing wells, at a location that will be determined by seismic images taken at key intervals over the last 9 years of injection (White et al. 2014), which indicate what parts of the target formation contain the highest saturations of CO_2.

This ambitious project aims to provide key, field-based data crucial for guiding new deep saline CO_2 storage hub developments, particularly in the central and western Canadian provinces, and especially related to CO_2 rock interactions and fluid changes caused by the saturation of CO_2 in the reservoir. It is hoped the technical data from this new well, and the affiliated research planned with that data, will help to facilitate the widespread adoption of CCUS) solutions throughout Canada and the world, thereby strengthening industry efforts to implement affiliated technologies to reduce emissions. Specifically, the proposed project involves several key components. First, the well will be cored through the Deadwood Formation in areas of CO_2 saturation. There will be comprehensive core analyses to provide insights into CO_2-saturated reservoir fluid and rock, and the physio-chemical interactions they will cause. Furthermore, in-depth investigations into geochemical properties will be conducted. The installation of new MMV (Monitoring, Measurement, and Verification) technologies down well and along the surrounding monitoring area will be completed. These installations include the latest fiber optic lines down well to measure pressure, temperature, and seismicity and the project will potentially include cost effective permanent seismic sources at the site. Fluid sampling will detect any microbial activity present in the reservoir. A robust geomechanical program will investigate any potential changes to reservoir rock properties vis-à-vis CO2 injection.

When all testing using the new well is completed, the project will investigate well casing installation procedures into a CO_2-saturated reservoir at pressure. As regulations develop and storage sites get larger and coalesce with each other, knowing how to deal with CO_2-saturated reservoirs will be important from a regulatory and procedural standpoint.

Finally, and in some ways most importantly, PTRC will re-enact and expand its public communications and stakeholder engagement activities in relation to this new well including, for example, the creation of “to-scale” images of the wells and storage depth (see Figure 3). From 2011 to 2014, the Aquistore project developed and implemented a number of public

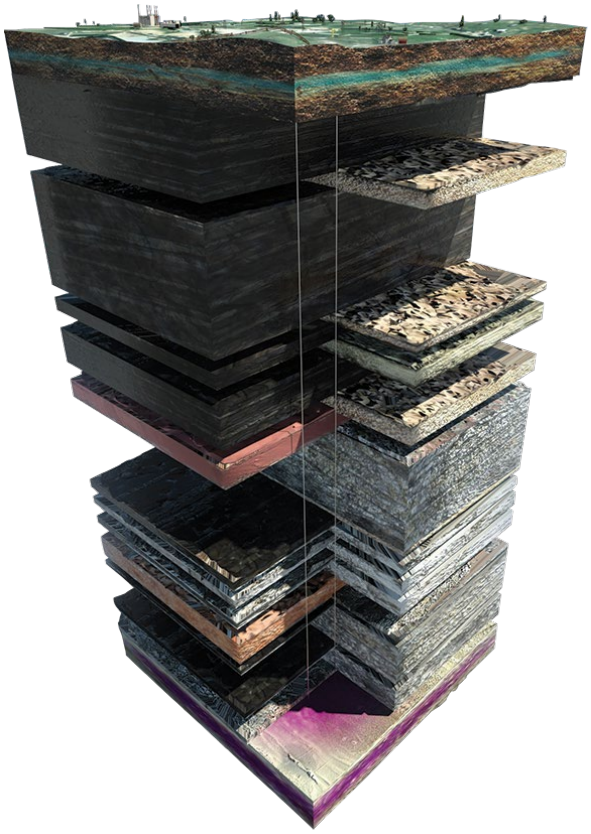

Figure 3. To-scale illustration of Aquistore wells and storage depth used at open houses

engagement activities (Young and Sacuta 2014, Sacuta et.al. 2017)) that included at least three open houses in the City of Estevan, dissemination of information through direct conversations with local landowners and mineral rights holders, engagement with other important stakeholders like political officials and important local organizations, and consultations with local Indigenous groups. The communications learnings from those initial efforts will help to shape this new project's engagement strategy, and in turn help other projects in development across Canada develop their own stakeholder communications to help assure the success of future CCS projects.

References

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