

## The Quest for MMV Optimization: Effective, Adaptive CO<sub>2</sub> Storage Risk Management

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### Summary

Quest Carbon Capture and Storage, operated by Shell Canada, on behalf of the AOSP Joint Venture (Canadian Natural Upgrading Limited, Chevron Canada Oil Sands Partnership and 1745844 Alberta Limited) is a fully integrated, industry scale facility that has been in operation since 2015, injecting approximately one million tonnes of CO<sub>2</sub> annually. To date, over eight million tonnes of CO<sub>2</sub> have been safely stored within a deep saline aquifer, the Basal Cambrian Sandstone (BCS), at a depth of approximately two kilometers below ground.

As a license to operate requirement, the Quest Measurement, Monitoring and Verification (MMV) plan must be updated every three years to ensure that it remains site specific, compliant with any updated regulations, adaptive, based on current technology/sound science, and is focused on the current understanding of the risks associated with CO<sub>2</sub> storage, including containment, conformance and, a new requirement (AER Directive 065 Appendix P) to include a seismicity risk assessment as a standard practice in all MMV applications. Quest has been monitoring for seismicity since 2015 and continues to evolve its program, as is one of the core philosophies of MMV. In late 2021, the Quest team requested processing of any additional events that might have been detected beyond the previous processing limit on the existing Quest downhole micro-seismic monitoring array. This new data set, termed 'regional seismicity' is a strong example of MMV working and the value of having flexibility in the program over time.

Quest's plan utilizes monitoring techniques that can be correlated across data types and domains. It also provides data during operations that enables history matching of models (conformance verification), updating of subsurface risk assessments, containment verification, and provides opportunities to trigger corrective measures. Robust monitoring data collection is therefore critical for safe and efficient CO<sub>2</sub> storage operation.

Since the initial 2014 MMV plan, the Quest MMV Plan has undergone three updates, including the recently approved 2023 plan. Through these iterations, the MMV plan has captured multiple operational updates that reduce operational costs and, where appropriate, included additional scope to ensure that all risks are managed throughout the injection, closure, and post closure phases of the storage facility.

This paper will share the key changes in the 2023 plan which include:

- i) Reduced frequency for injector well casing integrity logging,
- ii) Reduced requirements for hydraulic isolation logging due to time-lapse logging results,
- iii) Transition of pressure monitoring in the deep monitoring wells to Tier 2 requirements (reduced surveillance frequency), and
- iv) The addition of a seismicity risk assessment, in alignment with updated requirements from the regulator.

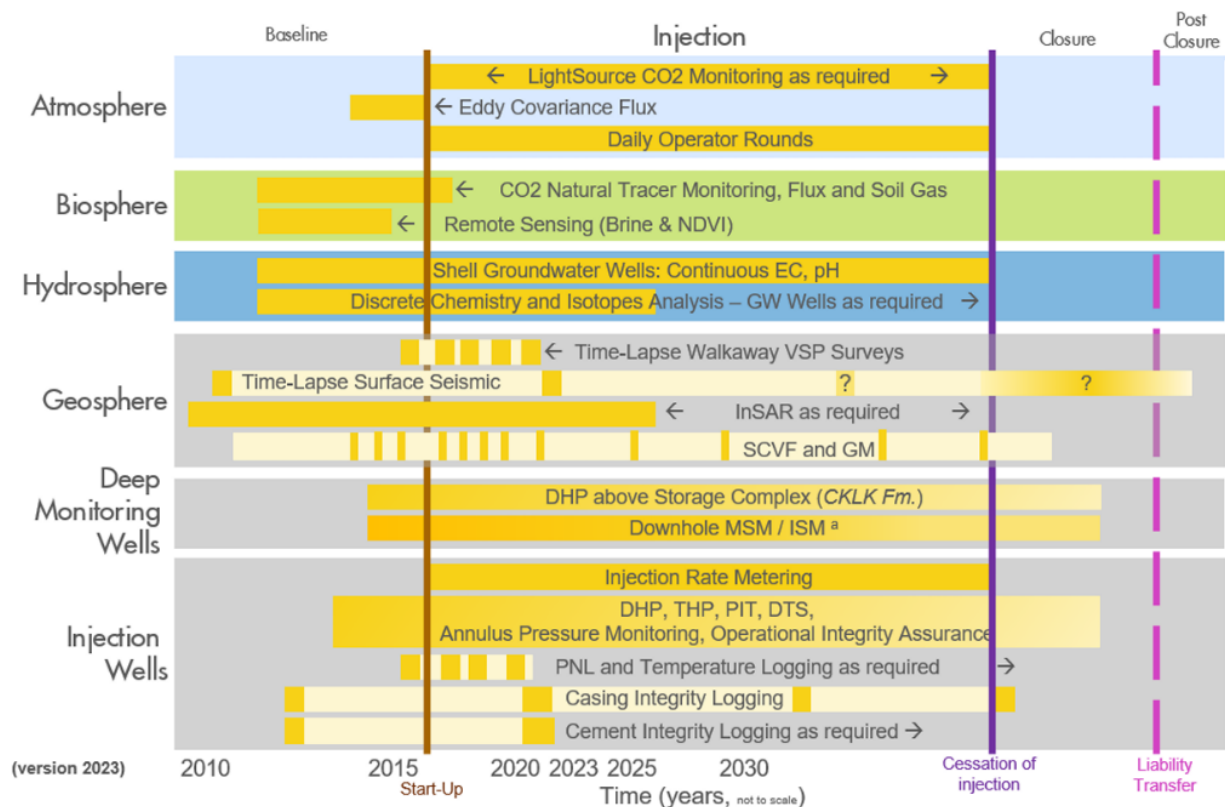


Figure 2: Schematic diagram representing the updated, approved 2023 monitoring plan for the Quest Carbon Capture and Storage site.

Continued evolution of the monitoring program for CCS projects allows for flexibility, learning and technology maturation. This allows the operator to improve efficiency, right-size the monitoring technology to the specific task and add additional monitoring as new requirements or changes in the risk profile are identified.