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**Technical  
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**Confirming Integrity of  
Close-Proximity Caverns in Bedded Salt**

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## CONFIRMING INTEGRITY OF CLOSE-PROXIMITY CAVERNS IN BEDDED SALT

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### Abstract

Keyera Corporation's Fort Saskatchewan salt cavern field was first developed in 1970 by Chevron Standard to store natural gas liquids as part of a fractionation facility. The salt caverns are in the Upper Lotsberg halite formation, which is 71 m (233 ft) thick overall with the formation top depths averaging 1860 m (6,102 ft). Currently, there are eighteen active storage caverns, ten of which were developed in the 1970s, and eight of which have been developed since 2008.

The oldest caverns have grown in diameter and volume since they were originally developed. Proving cavern integrity thus requires additional analysis tools beyond the straightforward Mechanical Integrity Test (MIT) as set out in CSA Z341.2-2022 "Salt Cavern Storage" standard. Geomechanical modelling has been used to establish maximum allowable operating pressures and are lower than the 18.1 kPa/m pressure gradient that is normally used as a rule of thumb. Isolation testing is used to identify whether geomechanical or hydraulic communication modes are occurring. It is performed by isolating a cavern from surface piping, during an MIT for example, and wellhead pressures are monitored and compared to the pressures of adjacent operating caverns. MIT pressure trends are also analysed to determine balancing pressures.

Based on the analysis techniques above, the quality of the cement bond logs in the lowest 100 m (328 ft) of each well, and the presence of at least 7 m (23 ft) of salt above each cavern, there is very high confidence that all stored products are contained within the Lotsberg salt formation.

Cavern operating practices have been changed where integrity risks are highest. These changes have included reductions in operating pressures, reductions in flow rates, reducing product turnovers per year, and joint operation of one pair of caverns. Where neck leaks have been identified, sealants have been injected to successfully halt these flows.

**Key words:** Canada, Alberta, bedded salt deposits, cavern testing, MIT (mechanical integrity test), caverns for liquid storage, modeling, storage cavern, leak.