
Weber sandstone compressibility and matrix studies to investigate the probability of fluid-withdrawal-related subsidence over the Mackenzie River gas fields

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The removal of pore-filling material from porous rock can result in the compaction and subsequent subsidence of the rock as compression pressures are increased on the grains to compensate for the removal of supporting pore-filling materials. This type of subsidence can occur as the result of groundwater, gas or oil withdrawal; there are many examples worldwide of it occurring. This thesis will focus on the current question of the possibility of subsidence in the Mackenzie River Gas fields, Yukon, by comparing the attributes of the Mackenzie River fields to case studies of subsidence in other areas, as well as lab-based compressibility and thin-section testing to gain an understanding of the likelihood of the Mackenzie River fields to undergo subsidence.

The Project will include background research into several examples of related case studies of similar subsidence, including instances such as the groundwater-removal-related subsidence in Venice, Italy, the subsidence of the Ekofisk offshore platform over the ConocoPhillips North Sea gas fields, and the oil field subsidence at Wilmington, California. This examination will highlight the types of fluid removed, age, characteristics and type of rock involved, and the amount and effects of the subsidence that occurred. All of this information will be compared to data on the Mackenzie River Gas fields.

Data will also be collected through the testing of Weber Sandstones to compare the compressibility of a sample's matrix to the compressibility of samples with included discontinuities. Matrix thin sections will also be used to study the grain-to-grain contacts within the samples, and data from all these tests will be compared to the conditions at the Mackenzie Gas Fields as well.