

# GRAVITY MONITORING OF 4-D FLUID MIGRATION IN SAGD RESERVOIRS INCORPORATING SEDIMENTOLOGY

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## Abstract

Monitoring steam-assisted gravity drainage (SAGD) projects is necessary to assess fluid flow during production and to determine bitumen recoverability, and can be constrained by measuring gravity and gravity gradient signatures. The first part of the study is to design representative geological reservoir models with detailed sedimentary structures, and calculate specific gravity signatures related to fluid migration. As the steam chamber expands in those forward models, it alters the density distribution of the sedimentary layers, and different gravity responses are measured for the reservoir. Next, sensitivity studies will be executed to assess if state of the art relative gravimeters can achieve the required sub-microgal sensitivity, and to develop an optimal survey strategy. The goal is to monitor spatial and temporal steam chamber growth and fluid migration at all stages of reservoir development, and improve recovery of bitumen in each reservoir.

This study aims to develop geological models with representative dimensions for two projects that are undergoing the initial phases of SAGD production. For those reservoirs, the sedimentary structures and background density models will be integrated with time-lapse gravity and gravity gradient measurements, to isolate fluid migration patterns. The feasibility of applying the proposed technique to SAGD reservoirs was hindered by the lack of the required sensitivity, as well as, high noise levels. The funds requested would be used to conduct a weeklong initial site investigation at one of the reservoirs, in order to characterize potential noise sources, identify operational parameters, and evaluate the site for an optimal gravity survey design.

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