OILSANDS QUEST

Axe Lake SAGD Test
Horizontal Well pair Configuration
Project Summary Document

July 14, 2010

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1 Test Objectives

Introduction

The Axe Lake deposit, is a perspective *in situ* property that has 1.7 billion discovered barrels of bitumen in place[1] and reservoir properties of high permeability, high oil saturation, and net pay ranging from 15-30m. To date Steam Assisted Gravity Drainage (SAGD) has been the most widely used, and therefore best understood, *in situ* recovery technique used at initial reservoir conditions, for the production of immobile bitumen in the McMurray/Dina formations. SAGD was originally dismissed as recovery technology at Axe Lake due to the fact that the overburden of this Dina deposit was Glacial Till rather than the Clearwater shale that overlies most SAGD properties.

The winter 2009/2010 drilling program included the core and logging of 16 wells across the Axe Lake property. The results of this program demonstrated low permeability in the overburden in all of the wells, with log permeabilities less than 10 mD. A sample log and the results from the first laboratory test are included in Appendix A. These permeabilities suggest that the Glacial Till will behave as a cap for SAGD operations. The purpose of the Axe Lake SAGD Test is to demonstrate that the cap is competent in SAGD operations.

Primary Objective

To test the effects of steam contact from SAGD operation in the McMurray/Dina Formation on the glacial till overburden at Axe Lake and directly demonstrate the cap will perform as a competent steam containment barrier.

Secondary Objectives

To confirm SAGD production and steam rates with a scalable well length in order to improve forecast for a commercial project;

To determine the optimal producing pressure for a commercial project;

To establish gas and water production rates and composition for facility design.

2 Geological/Geophysical Discussion

Axe Lake Geology

Introduction

The Axe Lake Dina bitumen deposit lies primarily in Northwestern Saskatchewan, but straddles the Saskatchewan/Alberta border approximately 80km northeast of Fort

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[1] McDaniel & Associate Consultants Ltd. 2009 Reserves Report, Discovered Resources Best Est. (p50).

McMurray. The thick of the bitumen deposit is centered within Townships 94 and 95, Ranges 24 and 25 west of the third Meridian.

Overview of Stratigraphy

The Axe Lake Dina bitumen reservoirs occupy the lowest stratigraphic position within a thin wedge of Lower Cretaceous sediments that reaches a depositional/erosional limit immediately to the east of the OQI permits. Due to its stratigraphic position, the Dina Formation can be considered approximately time equivalent to the McMurray Formation which hosts the enormous Athabasca Oilsands Deposits located across the border in Alberta. At Axe Lake the oilsands are overlain by 150-200m of Quaternary glacial overburden. Exploitation of this bitumen resource is best suited for thermal *in situ* recovery techniques as it is too deep to mine economically.

The top of the Dina Formation is unconformable with the overlying Quaternary glacial sediments. These sediments are a heterogenous mixture of lithologies including:

- Glacial Till - a chaotic and diverse mix of clay, sand, silt and rafted boulders;
- Glacial Meltwater Channels – primarily coarse sand and gravel;
- Glacial Outwash Sediment – sandy to muddy material displaying organized horizontal bedding; and
- Glacial Lacustrine Sediment – laminar bedded fine silts and clays.

At least 5 or 6 major glacial episodes (observable by seismic analysis) acted to not only deposit the thick sequence of local overburden, but also severely modified the pre-existing Dina sediments by scouring into them and in some cases, incising completely through them. The result is massive glacial channel scours that separate a previously continuous Dina deposit into multiple pods or pools. At Axe Lake, the Quaternary sediments both overlie and are in lateral continuity with the Dina Formation.

The Base of the Dina Formation unconformably overlies Middle Devonian Elk Point Group - marine carbonates consisting of brecciated argillaceous limestone, banded argillaceous limestone, and massive to vugular dolostone. The Elk Point carbonates represent the basement rocks underlying most of the Axe Lake Dina deposit and the Quaternary channels, but in selected areas, intense glacial action has even planed away the Devonian carbonates, exposing metamorphosed Precambrian granites and gneisses. The present day pre-Cretaceous unconformity surface displays significant topographic relief resulting from the action of glacial scour, subaerial erosion, basement faulting and salt collapse within the Prairie Evaporite. At Axe Lake, the Devonian sediments typically vary in thickness from 0 to 30m, including the brecciated remnants of the Prairie Evaporite, which by comparison, thickens to nearly 700m in the Fort McMurray area.

Basement faulting and resulting extensive salt collapse within the Elk Point Evaporite sequence acted to form a northwest-southeast trending valley system that provided necessary accommodation space for the deposition of the Dina sediments. This valley system is largely responsible for the partial preservation of the Dina sediments which otherwise would have been eroded by glaciation during Quaternary time.

Resource Characterization

Dina Reservoir Characteristics of Test Site 1

At Axe Lake Test Site 1, location 100/05-12-095-25W3/00, the Dina Formation is an accumulation of very coarse grained quartzose sandstone to granitic/gneissic pebbly quartzose sandstone. The overall preserved reservoir thickness varies from 10m-28m, except 1.0 km to the west where a massive glacial incision has completely removed the reservoir.

The Dina depositional history is of a cynical nature. Repetitive upward fining cycles (commonly associated with fluvial environments) can be seen. Each cycle begins with a very coarse sand and grades upwards into a coarse grained quartzose sandstone with scattered pebbles to granule sized material. There is also a coally, paleosol unit at the base of the Dina, which probably formed during a hiatal period between the erosion of the Elk Point carbonates and the onset of Dina reservoir deposition. At other locations this unit expresses itself as a clay rich interbed (high gamma response on petrophysical logs) although mineralogically, it is comprised almost entirely of quartz silt. The earliest Dina deposition in the Axe Lake area appears to infill lows on the basement surface under much lower energy conditions than prevailed during the deposition of the coarse reservoir sand units above.

The Dina reservoir sands and conglomeratic sands typically exhibit porosities from the mid to high 30% range and permeabilities consistently 5 to 30 darcies. The bitumen concentration within the deposit is variable from wet to sparsely saturated sands (0– 3 wt %) to rich material (12–18 wt %). The timing and process of bitumen emplacement is problematic, as wet or poorly saturated bitumen zones can appear overlying the rich bitumen zones, interbedded with them, or underlying them. The bitumen resource at Axe Lake is highly degraded.

For an overview of the geology in proximity to the SAGD well pair and the distribution of the Dina reservoirs at Axe Lake Test Site 1 refer to the attached structural cross section: Figure 2-12.

The horizontal SAGD well placement for the test was carefully selected to intersect Dina reservoir representative of the average reservoir quality in the immediate vicinity of TS1. The selected wellbore trajectories honor 3D seismic mapping in order to maintain a level aspect throughout the 100 m horizontal segments. The horizontal lateral SAGD well pair will consist of a steam injector well located 5m below the top of the Dina and a producer 3m below the injector.

Three vertical observation wells are planned to monitor the SAGD wells at heel, mid-point, and toe positions. These observation wells will provide not only important pressure and temperature data, but will also yield additional data respecting overburden character, reservoir grain size distribution, porosity and permeability continuity, and reservoir saturations.

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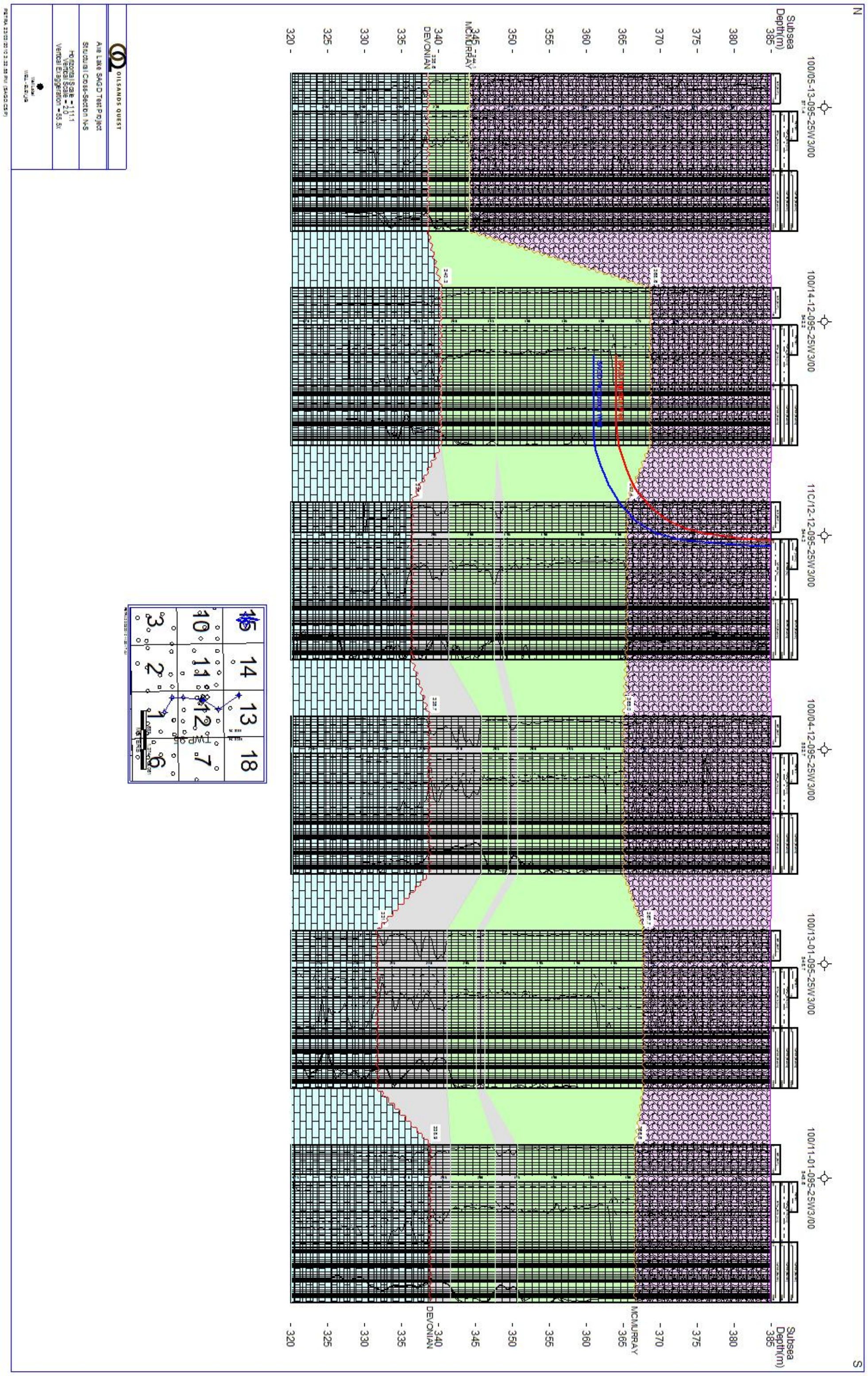
Figure 2-1 Geological Structural Cross section (N-S)



Horizontal SAGD wells

Well Depth

The trajectories of the two horizontal wells are planned such that the 100m long horizontal injector well lies 5m below the top of the Dina with a 100m long horizontal producer well 3m vertically below this.

The inter-well distance was chosen to minimize the circulation time while still leaving adequate inter-well distance so that the pump can be operated with sufficient subcool. Drilling considerations were also taken into account.

The distances of the wells below the top of the Dina were chosen in order to minimize the time for the steam chamber to reach the overburden, while having SAGD development such that the results of the test would be scalable.

Wellbore Design

The preliminary wellbore and completion design for the Axe Lake horizontal wells can be found in Figure 3-1.

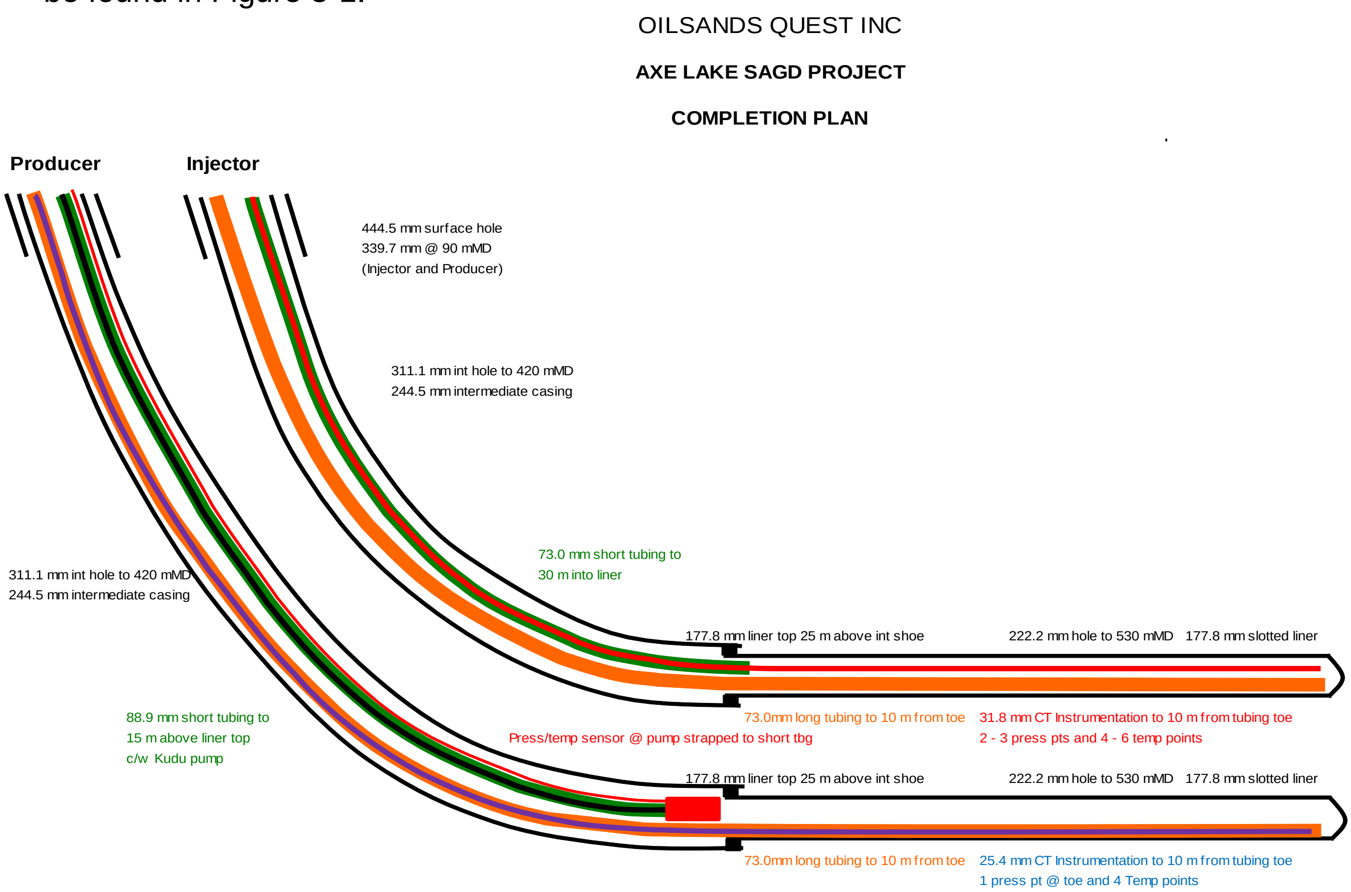


Figure 2-2 Axe Lake Completion Well Design

Instrumentation

The injection well requires pressure sensors at both the heel and the toe, as well as temperature recorders along the length of the well. This instrumentation will ensure early detection and sustainment of good steam quality along the length of the wellbore and that the injection well is not becoming submerged with produced fluid.

The production well requires at a minimum pressure and temperature gauge at the inlet at the pump, to ensure control of steam flashing across the pump.

Vertical SAGD Observation Wells

Well Placement

There are 3 vertical observation wells proposed for this test. They are:

- 1OBS-SAGD: Located 5m away from the toe of the horizontal well pair along the horizontal trajectory.
- 2OBS-SAGD: Located at the middle length of the horizontal well and 3m away from horizontal well perpendicularly.
- 3OBS-SAGD: Located at the heel of the horizontal wells and 5m away from the horizontal well perpendicularly.

Placement will allow early evaluation of the SAGD process, and with the wells proximal to the chamber it will also detect any unexpected fluid movement in the overburden at an early date.

The observation well at the toe will also help to determine the rate of growth of the chamber from the toe of the well relative to the side of the well. This will assist with development of the SAGD well patterns for a commercial project.

A plan view and vertical cross section of the well placement of the vertical wells relative to the horizontal wells can be seen below.

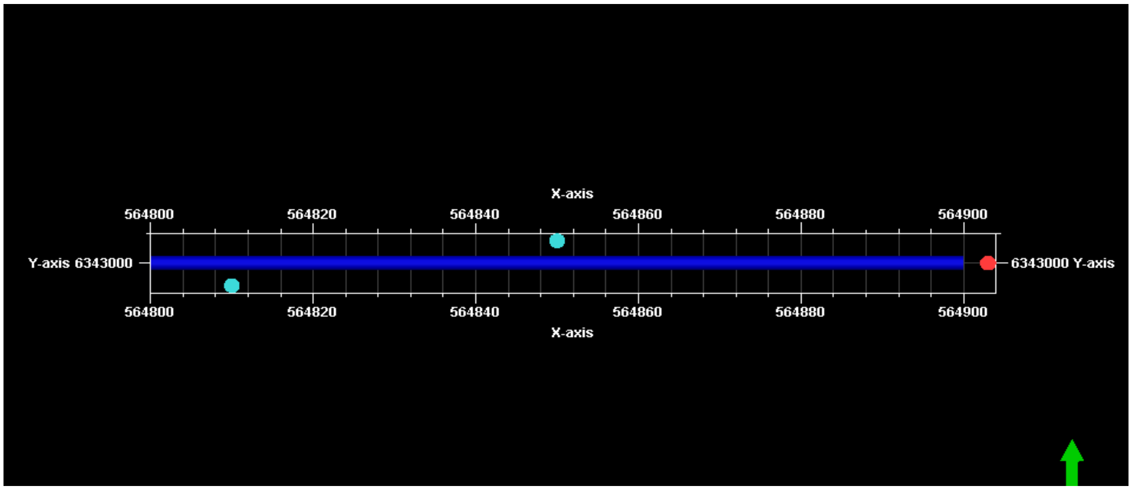


Figure 2-3 Vertical Cross Section of Vertical Observation Wells

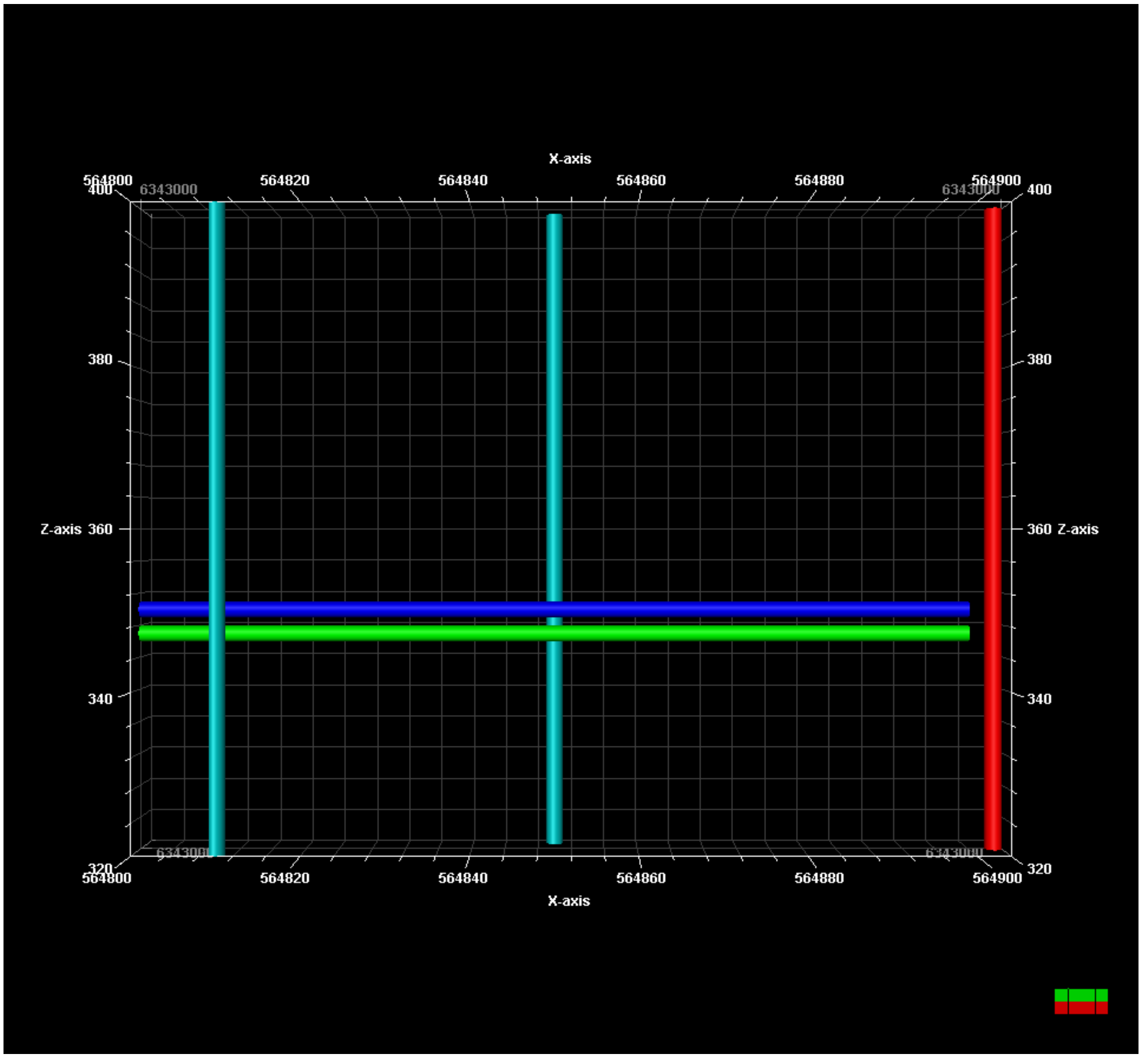


Figure 2-4 View of Vertical Observation Wells

Instrumentation

To be determined.

3 Pilot Design

Cold Water Injection (CWI) Test

Objective

Inject cold water into the reservoir prior to steam injection to help understand the initial reservoir conditions. This will assist in better understanding the initial critical water saturations in bitumen rich zones, for use in forecast model.

The injection of cold water into the injection well prior to SAGD start-up will allow us to measure the amount of initial fluid mobility, if any, in the bitumen rich regions of the reservoir. The subsequent pressure and temperature movement will help to quantify the amount of irreducible water saturation.

It was determined that the injection well was the optimal well for this test, rather than the production well, as this eliminates the risk of any change in the reservoir properties around the production well which might skew the interpretation of the test results. Further, the injection well will be instrumented with pressure and temperature measurement so that the test can be better monitored.

SAGD Test

Objective

The primary objective of this test is to observe the ability of the Glacial Till overburden to act as a steam cap for SAGD operations in the Dina formation at the Axe Lake Project. Secondary objectives of this test are to confirm SAGD and the steam to injection rates as well as determine the optimal SAGD pressure for a commercial scale project.

The well design is based on the primary objective of allowing steam to contact the overburden. In order to accomplish this objective as quickly as possible, the horizontal wells are proposed to be 3m apart vertically. This is a safe drilling distance, but minimizes the circulation time. This inter-well distance is also sufficient to allow for a liquid level between the two wells sufficient so that the pump in the producer can operate without significant steam flashing.

The injector is planned to be 5m from the top of the reservoir, resulting in the producer placement at 8m below the top of the reservoir.

The proposed well length is 100m. This well length will minimize the amount of production from the well, while providing good scalability. There is considerable history as the Dover Phase A wells were 55m in length and were shown to be scalable to longer wells in the Dover reservoir. This well length will also mitigate risk, as a smaller steam chamber will be more easily quenched if necessary.

Test Design

Step 1: Circulation

Inject into the tubing of both the injector and the production well and produce steam back up the annulus steam.

Step 2: SAGD

Once the wells have been circulated, steam will be injected into the upper well while the lower well will be used solely for production. Steam injections will be tested over a range of pressures, starting at just above the initial reservoir pressure and not to exceed 90% of fracture pressure.

The SAGD test application extends for a period of 6 months. This will allow time for the cold water injection test, two to three months of circulation and 2-3 months of SAGD production. If the effects of SAGD in the Axe Lake reservoir are not understood sufficiently for the optimization of commercial design, the test will be extended for another 6 months time period.