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September 5, 2006

Mr. Ernie Smith
Alberta Energy and Utilities Board
Applications Branch - 8th Floor
640 – 5th Avenue S.W.
Calgary, Alberta T2P 3G4

Dear Mr. Smith:

Re: Applications 1394112 and 1409180
Cold Lake Oil Sands Area - Clearwater Deposit

In the Notice of Hearing for these two applications, the AEUB invited "all interested parties to participate in the hearing by contributing technical evidence related to the effect of associated gas production on bitumen recovery by cyclic steam stimulation". The AEUB has requested that these technical data be filed no later than September 5, 2006.

In response to this request, Imperial Oil is submitting evidence on the following four technical questions for the AEUB's consideration:

1. Is there technical evidence that free (top) gas production will result in the partial degassing of the underlying bitumen column?
2. Is there technical evidence that free (top) gas production will result in the partial degassing of the bitumen column offsetting the zero edge of the gas cap?
3. Is there technical evidence that the presence of a depleted free (top) gas zone will impact the expected bitumen recovery with cyclic steam stimulation (CSS) directly under the top gas?
4. Is there technical evidence that the production of free (top) gas will impact the expected bitumen recovery with CSS in areas beyond the zero edge of the top gas?

Yours truly,

Susan C. Stark, Manager
In-Situ Development Planning

ELL128/imp
Attachments
cc: EL Lui TJ Boone
SR Maxwell MD Taylor

* an Alberta limited partnership

1. Technical evidence that free (top) gas production will result in the partial degassing of the underlying bitumen column.

Imperial Oil has produced gas from four Clearwater gas pools in the past, and all gas wells have since been shut-in. The slide below summarizes the volumetric gas in place (GIP) estimates and cumulative gas production volumes for the pools. In all four cases the cumulative gas production has exceeded volumetric GIPs, indicating that gas production was being supported by degassing of bitumen.

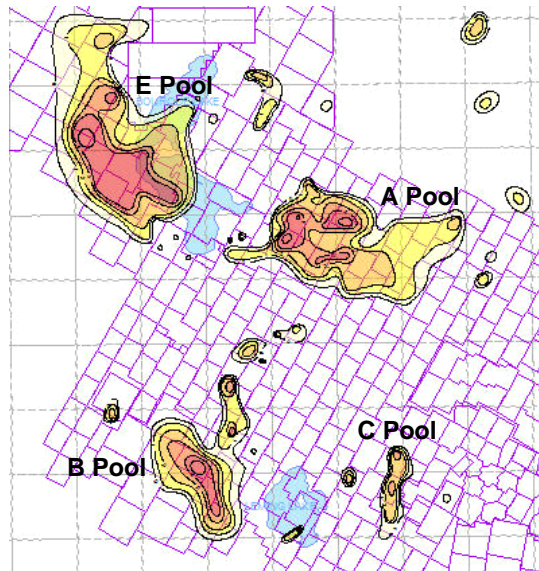
Clearwater Top Gas Production

Leming Upper Mannville (Clearwater) Gas Pools

- **Gas production exceeded volumetric OGIP.**

Pool	Volumetric OGIP ¹ 1e6 sm ³	Cum Gas Production 1e6 sm ³	Last Prod Pressure MPa	Post Shut-in Pressure ² MPa
A	165	180	1.1	1.5 ³
B	73	101	1.1	1.8 ³
C	13	37	1.0	
E	246	307	0.8	1.3 ⁴

Notes:
 1. Discovery pressures ~ 2.7 MPa.
 2. Higher than last production pressure due to bitumen degassing.
 3. May include influence of CSS operations.
 4. No offset CSS operations at time of measurement.



- **Gas interval pressures supported by slow degassing of underlying bitumen column.
> Continued after gas production shut-in.**

- **The absence of water production after the gas wells at E Pool were reactivated demonstrates that water influx is not responsible for the pressure increase observed.**

The E gas pool is unique in that after a shut-in period of approximately 2.5 years, it was returned to gas production. As there were no nearby CSS operations and water production remained minimal, it is highly unlikely that water influx caused the increase in gas pool pressures.

In summary, Imperial Oil has observed gas production in excess of the volumetric GIP estimates for four Clearwater gas pools at Cold Lake. In the E gas pool - after a lengthy shut-in period of approximately 2.5 years - the gas pool pressure increased 50%, indicating that the pressure was being supported by the partial degassing of the associated bitumen column.

2. Technical evidence that free (top) gas production will result in the partial degassing of the bitumen column offsetting the zero edge of the gas cap?

Imperial Oil has not attempted to directly measure pressures in the bitumen column that result from gas production operations.

Imperial Oil would suggest that as it has been demonstrated that degassing is occurring within the bitumen column directly under the gas cap, it is logical to believe that degassing will extend laterally in the bitumen column beyond the zero edge of the gas cap.

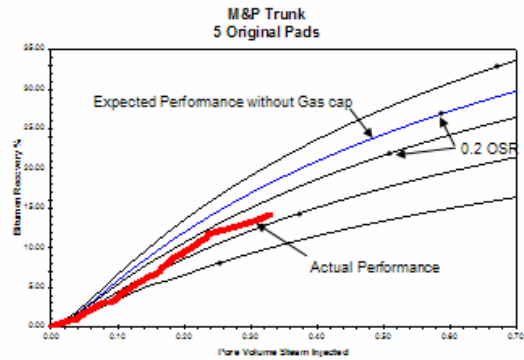
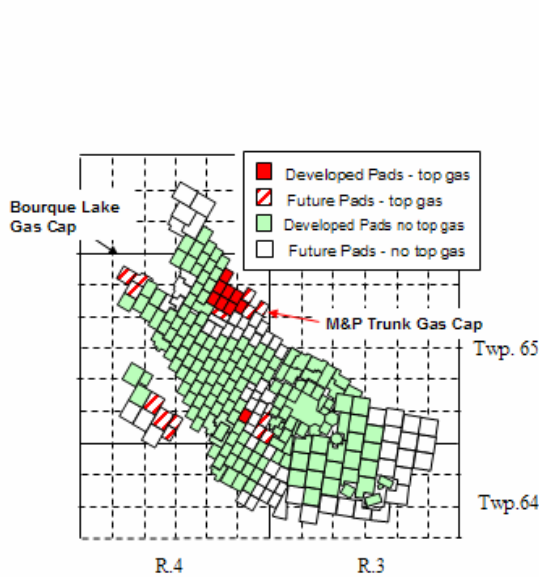
3. Technical evidence that the presence of a depleted free (top) gas zone will impact the expected bitumen recovery with cyclic steam stimulation (CSS) directly under the top gas?

The following slide is from Imperial Oil's Annual 2003 Performance Review for Cold Lake. As communicated to the AEUB in the past, the presence of a large (multi-section in area) depleted gas cap is expected to reduce the recovery performance of CSS by 25%. Imperial Oil does not have any experience with the presence of a large undepleted gas zone which overlies CSS operations.



CSS Performance - Gas Cap

2003 Cold Lake Performance Review



- Two significant gas caps in Clearwater
 - M&P Trunk - producing
 - Bourque Lake gas cap - undeveloped
- M&P Trunk exhibited poorer performance due to pressure losses to the gas cap
- Steaming all pads under a gas cap together reduces steam losses and improves performance
- The current projections of M & P Trunk performance is less than the 25% relative reduction previously assumed
- Recovery assumptions will have implications for the larger Bourque Lake cap development

4. Technical evidence that the production of free (top) gas will impact the expected bitumen recovery with CSS in areas beyond the zero edge of the top gas?

In May 1991, a paper entitled "Evaluation of Key Reservoir Drive Mechanisms in the Early Cycles of Steam Stimulation at Cold Lake" was published in the SPE Reservoir Engineering journal. In this paper, a previously history matched numerical simulation model was used to assess the contribution of reservoir compaction, solution gas, fluid expansion and gravity on the recovery achieved during the first five cycles of CSS. A copy of this paper is attached for your reference.

As summarized in Table 7 of this paper, the removal of 100% of the solution gas from the numerical model resulted in a 20% reduction in the bitumen recovery expected with CSS over the first 5 cycles. Although not addressed in the simulation, a reasonable expectation would be as the quantity of solution gas removed from the bitumen column in the model decreases, the impact on bitumen recovery should also decline.

Imperial Oil did review the performance of CSS wells located adjacent to - but outside of - the zero edge of the M&P and Bourque gas pools. Their performance was compared to the CSS performance of wells located one additional well spacing from the gas pools. (In selecting the two groups in this fashion variations in operating strategy and reservoir quality could be minimized.)

No material changes in cumulative OSR performance were noted between the two groups of wells. This result is reasonable given that the fraction of the solution gas removed from the associated bitumen column as a result of the Clearwater gas production is expected to be small.