

**In the Matter of Alberta Energy and Utilities Board
Bitumen Conservation Requirements
Phase 3 Final Proceeding**

**Staff Submission Group
Declaration and Supporting Evidence for the
Bitumen Conservation Phase 3 Final Hearing**

February 14, 2005

Contact

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1 Introduction

The Alberta Energy and Utilities Board (EUB/Board) directed the formation and participation of a staff submission group (SSG) as part of Phase 3 of the EUB's Bitumen Conservation Requirements presented in *General Bulletin (GB) 2003-28*¹. The SSG was charged with making recommendations respecting the production status of gas wells in a part of the Athabasca Wabiskaw-McMurray. This area was the subject of a EUB Regional Geological Study (RGS)², which was released on January 2, 2004.

The SSG participated in the Phase 3 interim proceedings (Proceedings No. 1333566³ and 1347004⁴) wherein the Board made decisions regarding the production status of specific intervals within the Wabiskaw Member of the Clearwater Formation and the McMurray Formation (Wabiskaw-McMurray).

On September 15, 2004, the Board held a prehearing meeting to consider submissions from interested parties regarding the scope and nature of the Phase 3 final proceeding. On October 14, 2004, the Board issued *Decision 2004-088*⁵ with respect to the issues discussed at the prehearing meeting. The Board indicated its intention to make final decisions and issue final orders confirming the production status of every interval within the scope of the Phase 3 proceedings. The Board stated that all nonconfidential wells and intervals within the RGS area or in pools that overlap the RGS area will be eligible for the final hearing (with the exception of gas shut in pursuant to *Decision 2000-22*⁶). The Board stated that a party wishing to have the production status of a particular interval or intervals considered in the final hearing must file its declaration listing those intervals as well as the supporting evidence on February 14, 2005.

This submission (and the attached CD) constitutes the SSG's declaration and supporting evidence for the Phase 3 final hearing and is filed pursuant to the direction of the Board in *Decision 2004-088*. In that Decision the Board found that the record of the interim hearing will be continued into the final hearing and as such the SSG intends to rely upon all materials and submissions as previously filed.

¹EUB *General Bulletin 2003-28: Bitumen Conservation Requirements, Athabasca Wabiskaw-McMurray*, July 22, 2003.

²EUB *Report 2003-A: Athabasca Wabiskaw-McMurray Regional Geological Study*, December 31, 2003.

³EUB *Decision 2004-045: Phase 3 Proceedings Under Bitumen Conservation Requirements and Applications for Approval to Produce Gas in the Athabasca Wabiskaw-McMurray Area*, May 31, 2004.

⁴EUB *Decision 2004-062: Review of Wells with Wabiskaw-McMurray Intervals Previously Allowed to Produce Gas by Decision 2003-023, Chard Area and Leismer Field*, July 27, 2004.

⁵EUB *Decision 2004-088: Phase 3 Final Proceeding Under Bitumen Conservation Requirements, Athabasca Wabiskaw-McMurray, Prehearing Meeting Decision*, October 14, 2004.

⁶EUB *Decision 2000-22: Gulf Canada Resources Limited, Request for the Shut-in of Associated Gas, Surmont Area*, March 2000.

2 Scope of the SSG Evidence and Declaration

2.1 Evidence

As stated above, the SSG is charged with making recommendations respecting the production status of gas wells in the RGS area. The reason for making these recommendations is to ensure the conservation of potentially recoverable bitumen in the RGS area by shutting in associated gas production. The SSG believes the majority of the associated gas in the RGS area has been shut-in as a result of the Phase 3 interim proceedings thereby ensuring the conservation of the bitumen resources.

In preparation for the Phase 3 final hearing, the SSG focused its efforts on instances where the conservation of potentially recoverable bitumen may not have been addressed at the Phase 3 interim hearings. Therefore, the SSG continued its analyses of the available geological and pressure/production data as outlined below:

- There are 574 wells that were not reviewed in the RGS (i.e., previously confidential or new drilling) that are now publicly available. The SSG reviewed relevant wells and the resulting production status recommendations are discussed in Section 3.
- The SSG reviewed gas pools interpreted in the RGS to be wholly underlain by regional mudstones and in close proximity to a mudstone edge to confirm that they are not in lateral communication with channel gas. In addition, based on an assessment of expected virgin pressures, depleted initial pool pressures were identified, and the SSG conducted pool reviews. Resulting changes to production status recommendations are discussed in Section 4.
- The SSG reviewed its production status recommendations that the Board did not adopt in *Decision 2004-045* and *Decision 2004-062*. Instances where the SSG recommends the Board reconsider specific findings are discussed in Section 5.
- At the Phase 3 interim hearing, concerns were raised about the capability of well logs for thin-bed resolution, particularly in determining the presence and thickness of the Wabiskaw D shale. The SSG conducted a study of the 232 nonconfidential cores in the RGS area where RGS-interpreted logs identified the Wabiskaw D shale. This study and the resulting changes to production status recommendations are discussed in Section 6.

2.2 Declaration

[Appendix 1](#) lists the wells and intervals for which the SSG is contesting the production status. These wells and intervals were previously considered by the Board in the interim proceedings. *Of these intervals, 76 are recommended to be shut in and 1 is recommended to produce.*

[Appendix 2](#) provides the SSG production status recommendations for wells and intervals not previously reviewed in the RGS. *Of these intervals, 26 are recommended to be shut in and 13 are recommended to produce.*

2.3 Publicly Available Pressure and Production Data

The attached CD contains a file summarizing the publicly available pressure data for gas pools in the RGS area as of February 7, 2005 (Appendix 3 included on the CD). This is an update to the file contained in the SSG's January 26, 2004 submission to Proceeding No. 1333566.

3 Nonconfidential Wells and Intervals Not Reviewed in the RGS

The RGS utilized nonconfidential well data that was publicly available prior to September 2003. As of July 9, 2004, EUB records indicate that data for an additional 574 wells is publicly available. These well locations are shown in Figures 3-1 and 3-2 (included on the CD). The majority of these wells are licensed as oil sands evaluation wells, and are located in the Long Lake, Christina Lake, Foster Creek, Meadow Creek and Hangingstone oil sands project areas.

The SSG evaluated 56 (49 of which are oil sands evaluation wells) of the 574 wells as shown in Figures 3-1 and 3-2. These 56 wells were evaluated either to confirm the presence of the regional mudstone in or near pools that were previously approved for production; or to confirm the location of a mudstone edge. Consistent with the approach used in the RGS, production status recommendations are provided for gas intervals at these wells. The evaluation of these wells did not result in any changes to previous SSG production status recommendations.

Tables 3-1, 3-2, and 3-3 (included on the CD) show the SSG interpretation of the tops and markers, gas pay intervals, and bitumen pay intervals respectively, for the evaluated wells.

The SSG interprets gas pay in 30 intervals at 23 of the evaluated wells. *Of these 30 intervals, the SSG recommends that 17 be shut in and 13 produce.*

4 Changes to Previous SSG Production Status Recommendations

Using the two approaches described below, the SSG identified associated gas that was not previously interpreted in the RGS as associated with potentially recoverable bitumen.

Mudstone Gas Pools

The SSG reviewed gas pools interpreted in the RGS to be wholly underlain by a regional McMurray A2 and/or McMurray B2 mudstone and in close proximity (i.e., one section) to a mudstone edge to determine if they could be in lateral communication with channel gas. This review was conducted to confirm the RGS pooling along mudstone edges. The SSG interprets lateral communication to exist under the following circumstances:

- the basal contacts of the gas intervals within the regional and channel sequences, as interpreted by the SSG, are within the RGS tolerances (i.e., plus or minus 1 m for gas/water; plus or minus 5 m for gas/bitumen and water/bitumen); and

- the available pressure and production data either support or do not refute the pool interpretation.

The SSG continues to believe that reliable pressure data are lacking in the RGS area for a number of reasons, including commingling, limited virgin, initial, and postproduction pressures, and the practice of measuring pressure at the surface. Of particular concern are the insufficient shut-in times for pressure stabilization. The SSG observed a number of instances where wells known to be in the same pool have measured pressure differences of several hundred kPa (examples are provided in the SSG reply submission dated March 3, 2004). The existence of postproduction pressure gradients in a pool could result in the incorrect conclusion that wells are in separate pools. As a result, the SSG believes that postproduction pressure trend data are of limited value for assessing whether wells are in the same pool.

Preproduction Pressures

While postproduction pressure trend data are of limited value, the SSG believes that valid preproduction pressures that show depletion can be used to reliably determine whether wells are in the same pool. As a result, the SSG conducted a review of gas wells with preproduction pressures and looked for instances where depletion may have occurred prior to gas production from the pool. The process used to identify these instances is as follows:

- The SSG determined expected virgin reservoir pressure for an area.
- Using the on-production date for a pool as a reference, the SSG compared well pressures taken prior to that date to the expected virgin pressure in that area. Wells with a depleted initial pressure were identified (i.e., about 100 kPa less than the expected virgin pressure), and the validity of the pressure was confirmed. For example, in numerous instances the pressure was determined to be commingled where the other pool had already produced.
- If the pressure appeared to be valid, the SSG conducted a review to identify a potential source of depletion and make any appropriate pool changes.

Following are the SSG's reasons for changing its production status recommendations for the wells and intervals resulting from the two approaches described above. Add summary of wells with recommendation changes.

The SSG is changing its production status recommendations for 11 wells to shut in and for 1 well to produce. Further, the SSG recommends 4 new gas interval evaluations be shut in.

4.1 Divide McMurray R and McMurray Undefined 074 Pools

The SSG revised the pooling of the single-well McMurray R Pool (7-28-82-12W4 well) and the single-well McMurray Undefined 074 pool (6-27-82-12W4 well) resulting in a new two-well pool.

The B2 sequence at the 7-28-82-12W4 well and the channel sequence at the adjacent 6-27-82-12W4 well have similar gas/water and water/bitumen contacts (see below table) and are interpreted to be in the same pool.

Well ID	Gas/Water Contact (m ss)	Water/Bitumen Contact (m ss)
7-28-82-12W4	269.1	268.1
6-27-82-12W4	268.8	267.0

There is no pressure or production data available for the 6-27 well, and therefore, pressure analysis was not useful for pool delineation.

Although the B2 mudstone is present at the 7-28 well, the B2 gas is indirectly associated with potentially recoverable bitumen through pooling.

The SSG recommendation for the 7-28 well is changed to shut in.

4.2 Divide McMurray FF, McMurray GG, McMurray II, McMurray JJ, and McMurray KK Pools

The SSG separated one, and amalgamated several other, McMurray B2 sequence and channel pools in Sections 5 through 9 in Township 82-12W4 resulting in two new pools.

The Divide McMurray GG pool, consisting of the 14-5-82-12W4 (B2 sequence) and 7-8-82-12W4 (channel) wells, is divided, with each well pooled with offset wells. This separation results from the SSG's recognition of two vertically stacked McMurray channels at the 7-8 well, each containing gas defined by gas/bitumen contacts where the RGS had interpreted the existence of a single channel. The lower channel gas at the 7-8 well is interpreted to be a single-well pool and the SSG recommendation for this interval remains unchanged (i.e., shut in). The base of gas within the upper channel interval is defined by a gas/bitumen contact at 262.4 m ss. The base of gas within the B2 sequence at the 14-5 well is defined by a gas/bitumen contact at 256.5 m ss. Given this difference in contact elevations, the SSG separated these wells.

The upper channel gas at the 7-8 well is pooled with the channel gas at the 16-8-82-12W4 well (McMurray FF Pool) and the B2 sequence gas at the 7-9-82-12W4 well (McMurray JJ Pool). These were both previously considered to be single-well pools. The pooling of these three wells is based on similar gas/bitumen contact elevations (see below table).

Well ID	Sequence	Base of Gas (m ss)
7-8-82-12W4	Channel	Gas/Bitumen: 262.4
16-8-82-12W4	Channel	Gas/Bitumen: 263.7
7-9-82-12W4	B2 Sequence	Gas/Bitumen: 262.4

Although the B2 mudstone is present at the 7-9 well, the B2 gas is indirectly associated with potentially recoverable bitumen through pooling. Pressure analysis was not useful for pool delineation. This is due to the limited availability of pressure data and commingling at the 7-9 and 16-8 wells.

The SSG recommendation for the 7-9 well is changed to shut in.

The 14-5 well is pooled with the channel gas at the 8-6-82-12W4 (McMurray II Pool) and 1-7-82-12W4 (McMurray KK Pool) wells. These were both previously considered to be single-well pools. The pooling of these three wells is based on similar gas/bitumen contact elevations (see below table).

Well ID	Sequence	Base of Gas (m ss)
14-5-82-12W4	B2 Sequence	Gas/Bitumen: 256.5
8-6-82-12W4	Channel	Gas/Bitumen: 255.5
1-7-82-12W4	Channel	Gas/Bitumen: 260.7

The available pressure and production data is consistent with this pool interpretation. In particular, the initial pressures at all three wells are similar. Although the B2 mudstone is present at the 14-5 well, the B2 gas is indirectly associated with potentially recoverable bitumen through pooling.

The SSG recommendation for the 14-5 well remains unchanged (i.e., shut in).

4.3 Divide McMurray AA and McMurray K Pools

The SSG revised the pooling of the single-well McMurray AA Pool (8-2-82-12W4 well) and the single-well McMurray K Pool (7-3-82-12W4 well) resulting in a new two-well pool.

The B2 sequence gas at the 8-2 well and the channel sequence gas at the 7-3 well have fluid contact elevations that are within the tolerances of the RGS (see below table).

Well ID	Sequence	Base of Gas (m ss)	Top of Bitumen (m ss)
8-2-82-12W4	B2 Sequence	Gas/Bitumen: 262.1	Gas/Bitumen: 262.1
7-3-82-12W4	Channel	Gas/Water: 259.8	Water/Bitumen: 255.5

Although the 7-3 well has a gas/water contact, it is lower than the gas/bitumen contact at the 8-2 well, such that the water is below the gas. The bitumen contacts are within the plus or minus 5 m RGS tolerance. The SSG interprets these two wells to be in a common pool. The limited available pressure data is consistent with this pool interpretation. In particular, the initial well pressures are similar and were taken prior to significant production from the pool.

Although the B2 mudstone is present at the 8-2 well, the B2 gas is indirectly associated with potentially recoverable bitumen through pooling.

The SSG recommendation for the 8-2 well is changed to shut in.

4.4 Duncan McMurray CCC and McMurray YY Pools

The SSG amalgamated the single-well McMurray CCC Pool (7-29-77-12W4 well) with the multi-well McMurray YY Pool based on similar gas/bitumen contacts (see below table).

Well ID	Pool	Sequence	Base of Gas (m ss)
7-29-77-12W4	McMurray CCC	B1 Sequence	Gas/Bitumen: 218.1
15-18-77-12W4	McMurray YY	Channel	Gas/Bitumen: 214.6
12-20-77-12W4	McMurray YY	Channel	Gas/Bitumen: 220.0
6-22-77-12W4	McMurray YY	Channel	Gas/Bitumen: 220.8
15-22-77-12W4	McMurray YY	Channel	Gas/Bitumen: 220.4
10-13-77-13W4	McMurray YY	Channel	Gas/Bitumen: 214.9

This pool interpretation is supported by a depleted initial pressure of 1744 kPaa (AWS) taken on February 18, 2000, at the 7-29 well prior to any production. The expected virgin pressure in the area is about 2050 kPaa.

Although the B2 mudstone is present at the 7-29 well, the B1 gas is indirectly associated with potentially recoverable bitumen through pooling.

The SSG recommendation for the 7-29 well is changed to shut in.

4.5 Hangingstone McMurray KK and McMurray Undefined 074 Pools

The SSG reviewed the single-well McMurray Undefined 074 Pool (10-19-82-10W4 well) and the offsetting two-well McMurray KK Pool (3-30-82-10W4 and 11-25-82-11W4 wells). The SSG reinterpreted the gas-bearing interval at the 10-19 and 11-25 wells and the fluid contacts at the 10-19 and 3-30 wells (see below table).

Well ID	RGS Pool	RGS Interpretation (m ss)	SSG Interpretation (m ss)
10-19-82-10W4	McMurray Undefined 074	B1/B2 Porosity Base: 280.8	B1 Channel Gas/Water: 280.8
3-30-82-10W4	McMurray KK	Channel Gas/Bitumen: 280.0	Channel Gas/Water: 280.1
11-25-82-11W4	McMurray KK	Channel Gas/Water: 282.2	B1 Channel Gas/Water: 282.2

Based on the similar contacts, the 10-19 and 3-30 wells are interpreted to be in the same gas pool. Pressures taken at the 10-19 and 3-30 wells on March 1, 2003, of 2032 and 2007 kPaa (static gradients) respectively, support this interpretation. Although the B2 mudstone is present at the 10-19 well, the B1 channel gas is indirectly associated with potentially recoverable bitumen through pooling.

The SSG recommendation for the 10-19 well is changed to shut in.

The SSG interprets the 11-25 well to be in a single-well pool since the gas/water contact exceeds the RGS tolerance of plus or minus 1 m. This interpretation is supported by a significant difference in initial pressures at the 3-30 and 11-25 wells. The 3-30 well had an initial pressure of 2195 kPaa (static gradient) taken on February 12, 1986, prior to commencing production in March 1999, while the 11-25 well had an initial pressure of 2336 kPaa (surface test) taken on March 16, 1999.

Further, the SSG interprets the B2 mudstone to be present below the B1 channel at the 11-25 well. The log character is consistent with the B2 mudstone character as defined in the RGS.

The SSG recommendation for the 11-25 well is changed to produce.

4.6 Hangingstone McMurray DDD, McMurray ZZ and McMurray RRR Pools

The SSG amalgamated the two-well McMurray DDD Pool (2-17-82-9W4 and 5-18-82-9W4 wells) with the single-well McMurray RRR Pool (6-19-82-9W4 well) based on similar fluid contacts (see below table). The SSG reinterpreted the base of gas in the A1 sequence at the 5-18 well as a gas/bitumen contact.

Well ID	Sequence	Base of Gas (m ss)
2-17-82-9W4	A1 Sequence	Porosity Base: 285.3
5-18-82-9W4	A1 Sequence	Gas/Bitumen: 286.0
6-19-82-9W4	Channel	Gas/Bitumen: 284.9

The limited available pressure data is consistent with this pool interpretation. In particular, the initial well pressures at the 6-19 and 2-17 wells are similar, and were taken prior to production from the pool. No pressure data is available for the 5-18 well and no postproduction pressures are available for any of the wells. Although the A2 mudstone is interpreted to be present at both the 2-17 and 5-18 wells, these A1 gas intervals are indirectly associated with potentially recoverable bitumen through pooling.

The SSG recommendations for the 2-17 and 5-18 wells are changed to shut in.

4.7 Hangingstone McMurray Y Pool

The single-well McMurray Y Pool (10-9-82-9W4 well) is pooled with the 7-15-82-9W4 well. The SSG interprets channel gas pay at the 7-15 well that was not previously identified by the RGS. These wells are pooled based on similar fluid contacts (see below table).

Well ID	Sequence	Base of Gas (m ss)
10-9-82-9W4	A1 Sequence	Gas/Bitumen: 283.5
7-15-82-9W4	Channel: 454.0 – 455.0 m KB	Gas/Bitumen: 284.9

The limited available pressure data is not useful for pool delineation. The 7-15 well has no pressure data. The 10-9 well appears to have a depleted initial pressure prior to production, however, a likely source of depletion could not be found. Therefore, the reliability of this surface pressure is questionable. This low pressure could be due to water in the wellbore or a leaky packer (i.e., Clearwater production).

Although the A2 mudstone is interpreted to be present at the 10-9 well, the A1 gas is indirectly associated with potentially recoverable bitumen through pooling.

The SSG recommends that the 7-15 well be shut in and changes its recommendation for the 10-9 well to shut in.

4.8 Hardy McMurray Undefined 074 and Wabiskaw-McMurray A Pools

The SSG interprets the single-well McMurray Undefined 074 Pool (7-30-77-4W4 well) to be in the same region of influence as the Wabiskaw McMurray A Pool.

The channel gas at the 7-30 well is adjacent to the channel gas in the Wabiskaw-McMurray A pool - sequence 006. These pools are situated beyond the eastern limits of the bitumen (the sequence 006 pool is vertically and laterally associated with gas overlying bitumen further to the west) and overlie thick McMurray water-filled sands. The gas/water contacts indicate that the 7-30 well is in a separate gas pool (see below table).

Well ID	Pool	Base of Gas (m ss)
7-30-77-4W4	McMurray Undefined 074	Gas/Water: 232.3
5-19-77-4W4	Wabiskaw-McMurray A (006)	Gas/Water: 237.4
2-31-77-4W4	Wabiskaw-McMurray A (006)	Gas/Water: 238.4
12-25-77-5W4	Wabiskaw-McMurray A (006)	Gas/Water: 236.6
10-36-77-5W4	Wabiskaw-McMurray A (006)	Gas/Water: 236.3

A depleted initial pressure of 1633 kPaa (static gradient) was taken at the 7-30 well on December 7, 2003. The expected virgin pressure in the area is about 1900 kPaa. Given the depleted pressure, the SSG interprets the 7-30 well to be in the same region of influence as the Wabiskaw-McMurray A Pool (sequence 006) with communication occurring through underlying water.

The SSG recommendation for the 7-30 well is changed to shut in.

4.9 Leismer McMurray I4I and McMurray J4J Pools

The SSG removed the 5-20-79-7W4 well from the multi-well McMurray J4J Pool and pooled it with the single-well McMurray I4I Pool (4-30-79-7W4 well) based on similar contacts (see below table).

Well ID	Sequence	Base of Gas (m ss)
5-20-79-7W4	B1 Channel	Gas/Bitumen: 260.7
4-30-79-7W4	Channel	Gas/Bitumen: 261.8

The SSG also interprets gas pay in three intervening wells that was not identified in the RGS (see below table).

Well ID	Sequence	Interval (m KB)	Base of Gas (m ss)
9-18-79-7W4	B1 Channel	310.5 – 315.2	Gas/Bitumen: 261.9
9-19-79-7W4	B1 Channel	312.0 – 317.0	Gas/Bitumen: 261.7
11-24-79-8W4	B1	320.8 – 325.5	Gas/Bitumen: 261.4

Based on the similar contacts, the SSG interprets these five wells to be in a common pool. The majority of the available pressure and production data from these wells is commingled with the Wabiskaw-McMurray A Pool, and therefore, is inconclusive.

Although the B2 mudstone is interpreted to be present at the 9-18, 9-19 and 5-20 wells, the B1 channel gas is indirectly associated with potentially recoverable bitumen through pooling.

The SSG recommends that the 9-18, 9-19, and 11-24 wells be shut in. Further, the SSG recommendation for the 5-20 well is changed to shut in and the recommendation for the 4-30 well remains unchanged (i.e., shut in). The SSG recommendation for the other wells in the McMurray J4J Pool remains unchanged (i.e., produce).

4.10 Thornbury McMurray M5M, McMurray W4W, and McMurray X4X Pool

The SSG revised the RGS pooling for the 5-4-80-11W4, 11-27-79-11W4, 11-22-79-11W4 and 9-20-79-11W4 wells as a result of the reinterpretation of fluid contacts at several wells.

The SSG separated the 5-4 and 11-27 wells (McMurray M5M Pool) based on differences in fluid contacts (see below table). The SSG interprets the 5-4 well to be a single-well pool.

Well ID	RGS Pool	RGS Interpretation (m ss)	SSG Interpretation (m ss)
5-4-80-11W4	McMurray M5M	B1 Sequence Porosity Base: 250.9	B1 Channel Gas/Water: 250.9 Water/Bitumen: 248.9
11-27-79-11W4	McMurray M5M	B1 Sequence Gas/Bitumen: 253.4	B1 Sequence Gas/Bitumen: 253.4

The SSG recommendation for the 5-4 well remains unchanged (i.e., produce).

The 11-27 well is pooled with the McMurray X4X Pool along with the single-well McMurray W4W Pool (11-22-79-11W4 well). The SSG reviewed the RGS interpretations in the McMurray X4X Pool and made some adjustments to the fluid interfaces (see below table).

Well ID	RGS Pool	RGS Interpretation (m ss)	SSG Interpretation (m ss)
11-27-79-11W4	McMurray M5M	Gas/Bitumen: 253.4	Gas/Bitumen: 253.4
11-22-79-11W4	McMurray W4W	Gas/Water: 252.3	Gas/Bitumen: 250.0
11-8-79-11W4	McMurray X4X	Gas/Bitumen: 244.9	Gas/Bitumen: 244.9
11-9-79-11W4	McMurray X4X	Gas/Bitumen: 248.4	Gas/Bitumen: 248.4
12-14-79-11W4	McMurray X4X	Gas/Bitumen: 249.2	Gas/Bitumen: 249.2
13-15-79-11W4	McMurray X4X	Gas/Bitumen: 249.9	Gas/Bitumen: 249.9
15-16-79-11W4	McMurray X4X	Gas/Bitumen: 248.0	Gas/Bitumen: 248.0
10-17-79-11W4	McMurray X4X	Gas/Bitumen: 250.8	Gas/Bitumen: 248.3
9-20-79-11W4	McMurray X4X	Gas/Bitumen: 250.4	Gas/Water: 250.1

Based on these fluid contacts, the SSG pooled the 11-27 and 11-22 wells with the McMurray X4X Pool. Although the B2 mudstone is interpreted to be present at the 11-27 well, the B1 gas is indirectly associated with potentially recoverable bitumen through pooling.

The SSG recommendation for the 11-27 well is changed to shut in.

The interpreted gas/water contact at the 9-20 well (see above table), does not fit with the remaining wells in the McMurray X4X Pool. The SSG interprets the 9-20 well to be a single-well pool.

The SSG recommendation for the 9-20 well remains unchanged (i.e., shut in).

The majority of the available pressure data for these wells are initial pressures prior to significant production and are similar to one another. Because they are consistent with the expected virgin pressures in the area, they are not definitive for pool delineation.

5 SSG Production Status Recommendations Not Adopted by the Board

The SSG reviewed its production status recommendations that the Board did not adopt in *Decision 2004-045* and *Decision 2004-062*. The SSG recommends the Board reconsider specific findings based on the analyses discussed below.

The SSG continues to recommend the shut in of 28 wells and is changing its production status recommendation for 2 wells to shut in. Further, the SSG recommends 5 new gas interval evaluations be shut in.

5.1 Kirby Upper Mannville I Pool

The SSG contests the production status for four wells mapped by the RGS in the Upper Mannville I Pool that were allowed by *Decision 2004-045* to produce. These are the 3-21-74-7W4, 12-36-74-7W4, 11-5-75-6W4, and 7-1-75-7W4 wells. The SSG interprets gas/water contacts at these wells (see below table) to be consistent with the gas/water contacts in the Upper Mannville I Pool. Based on the contacts, the SSG interprets these wells to be part of the Upper Mannville I Pool.

Well ID	Gas/Water Elevation (m ss)
3-21-74-7W4	248.5
12-36-74-7W4	248.0
11-5-75-6W4	249.2
7-1-75-7W4	247.3

The available pressure and production data agree with this pool interpretation. In particular, the SSG maintains that the initial pressure of 2027 kPaa (static gradient) taken at the 3-21 well on February 13, 1994, is a depleted pressure and that the source of drainage was production from the Upper Mannville I Pool (see Exhibit H-23 to Proceeding No. 1333566).

The SSG continues to recommend that the 3-21, 12-36, 11-5 and 7-1 wells be shut in.

In addition, the 10-8-74-6W4 well (Upper Mannville A4A Pool) has a gas/water contact at 248.9 m ss. Based on fluid contacts, the SSG interprets the 10-8 well to be part of the Upper Mannville I Pool. Only one pressure was taken at the 10-8 well. This pressure is considered unreliable since the pressure gauge run-depth was 87 m above the mid-point of the perforations due to an obstruction in the wellbore.

The SSG recommendation for the 10-8 well is changed to shut in.

The SSG interprets gas pay within the Wabiskaw B valley-fill at the 10-29-74-6W4, 11-31-74-6W4, 12-34-74-6W4, 11-23-74-7W4 and 10-1-75-7W4 wells that was not previously interpreted in the RGS. The gas/water contacts at these wells are shown in the table below. Based on the contacts, the SSG interprets these wells to be part of the Upper Mannville I Pool.

Well ID	Gas/Water Elevation (m ss)
10-29-74-6W4	249.0
11-31-74-6W4	248.0
12-34-74-6W4	249.9
11-23-74-7W4	248.9
10-1-75-7W4	247.5

The SSG recommends that the 10-29, 11-31, 12-34, 11-23 and 10-1 wells be shut in.

5.2 Kirby Upper Mannville O3O Pool

The SSG contests the production status for the wells in the Upper Mannville O3O Pool which were allowed by *Decision [2004-045](#)* to produce. The RGS interpreted this pool to be associated with channel bitumen based on the absence of a regional mudstone at the 16-5-74-9W4 and 12-9-74-9W4 wells. Although the SSG agrees with the Board's decision that the A2 regional mudstone is present at the 12-9 well, it does not agree that the A2 mudstone is present at 16-5 well based on the absence of the A2 mudstone log character as defined in the RGS. Therefore, the Upper Mannville O3O Pool is associated with channel bitumen at the 16-5 well. Although the RGS interpreted only 2.4 m of net bitumen pay at the 16-5 well, the logs indicate the accommodation space is 25 m thick.

The SSG continues to recommend that the Upper Mannville O3O Pool be shut in.

5.3 Newby Wabiskaw T Pool

The SSG contests the production status for the wells in the Wabiskaw T Pool which were allowed by *Decision [2004-045](#)* to produce. The Decision cites the presence of a regional mudstone as the reason for allowing the pool to produce. The only regional mudstone interpreted by the RGS to be present in the area is the Wabiskaw D shale. As discussed in Section 6, the SSG does not believe the Wabiskaw D shale is a regional barrier.

The Wabiskaw D shale at each of the wells in the Wabiskaw T Pool was interpreted by the RGS to be 0.4 to 0.8 m thick. The SSG interprets the Wabiskaw D shale thickness based on enlarged copies of the logs to more precisely define the interval, measuring the

thickness at halfway along the shallow resistivity and neutron porosity curves at the upper and lower boundary. The revised Wabiskaw D shale thickness ranges from 0.3 to 0.5 m. This is less than or equal to the 0.5 m thickness cutoff used by the Board in *Decision 2003-045*.

The SSG continues to recommend that the Wabiskaw T Pool be shut in, even if the Board does not accept the SSG's contention that the Wabiskaw D shale is not a regional barrier.

5.4 Newby Wabiskaw Undefined 066 Pool

The SSG contests the production status for the Wabiskaw Undefined 066 Pool which was allowed by *Decision 2004-045* to produce. The Decision cites the presence of a regional mudstone as the reason for allowing the pool to produce. The only regional mudstone interpreted by the RGS to be present in the area is the Wabiskaw D shale. As discussed in Section 6, the SSG does not believe the Wabiskaw D shale is a regional barrier.

The RGS interpreted the thickness of the Wabiskaw D shale to be 0.4 m thick at the 13-27-84-6W4 well, which is below the 0.5 m thickness cutoff used by *Decision 2004-045*. The SSG reviewed the logs and confirmed the thickness to be no greater than 0.4 m.

The SSG continues to recommend that the Wabiskaw Undefined 066 Pool be shut in, even if the Board does not accept the SSG's contention that the Wabiskaw D shale is not a regional barrier.

5.5 Hangingstone Wabiskaw-McMurray D, McMurray K3K, and McMurray B2B Pools

The SSG contests the production status for the 8-7-81-7W4, 6-17-81-7W4, 11-13-81-8W4, and 10-14-81-8W4 wells. *Decision 2004-062* removed these wells from the Wabiskaw-McMurray D Pool and put them into the newly defined McMurray K3K Pool.

Respecting these wells, *Decision 2004-062* stated:

The Board agrees with Calpine that the McMurray A2 gas in the 8-7 and 6-17-81-7W4M wells is in a common pool (along with wells 11-13 and 10-14-81-8W4M) that is separate from the wells to the north, based on a gas/bitumen contact in the 11-20-81-7W4M well that is more than 5 m above the base of the gas in the 6-17 well. Since the 6-17 and 11-20 wells are in separate pools, based on contact elevations, the 11-13 and 10-14 wells would not be in sections that are adjacent to a section in the northern part of the D Pool that also has a well, and therefore the Board has pooled the 11-13 and 10-14 wells with the 8-7 and 6-17 wells. The McMurray A2 gas in the 8-7, 6-17, 11-13, and 10-14 wells is underlain by the regional McMurray A2 mudstone; therefore, the Board will continue to allow this gas to be produced from these wells.

The SSG notes that the base of gas at the 6-17-81-7W4 and 11-13-81-8W4 wells in the newly defined McMurray K3K Pool are defined by a porosity base at 269.4 and 275.5 m ss respectively. This results in a difference of 6.1 m between the contacts over a distance of about 3 km. In comparison, the base of gas at the 11-20-81-7W4 well (Hangingstone

Wabiskaw-McMurray D Pool) is a gas/bitumen contact at 275.9 m ss. This results in a difference of 6.5 m between the contacts for the 11-20 and 6-17 wells of over a distance of about 2.5 km.

Based on the contacts, which are within the plus or minus 5 m RGS tolerance (i.e., 10 m across a pool), the SSG continues to interpret the wells in the McMurray K3K Pool to be part of the Wabiskaw-McMurray D Pool. The available pressure and production data agree with this pool interpretation (see Exhibit F-6 to Proceeding No. 1347004).

The SSG continues to recommend that the wells in the McMurray K3K Pool be shut in.

The SSG identified an additional well that it interprets to be in the Hangingstone Wabiskaw-McMurray D Pool. The base of gas at the 14-1-81-8W4 well (McMurray B2B Pool) is defined by a porosity base at 275.7 m ss which is similar to the contacts for the wells in the McMurray K3K Pool. This interpretation is supported by a depleted initial pressure of 1544 kPaa (surface test) taken on March 6, 1997 at the 14-1 well prior to any production from the McMurray B2B Pool. The expected virgin pressure in the area is 1850 kPaa.

The SSG recommendation for the 14-1 well is changed to shut in.

5.6 Leismer McMurray Z3Z and McMurray Undefined 381 Pools

The SSG contests the production status for the B1 sequence at the 12-36-79-7W4 well (McMurray Z3Z Pool). This is based on the SSG's interpretation that the 12-36 well is in the same pool as the channel gas at the 12-31-79-6W4 well (McMurray Undefined 381 Pool).

The SSG reinterprets the channel gas at the 12-36 well to be within the B1 sequence which is consistent with the Board's interpretation in *Decision 2004-045*. The SSG emphasizes that the gas/bitumen contact difference of 5.9 m between the B1 sequence at the 12-36 well and the channel gas at the 12-31 well is within the RGS tolerance. This interpretation offers a more reasonable explanation for the pressure depletion observed at the 12-31 well than that determined in *Decision 2004-062*. Although the B2 mudstone is present at the 12-36 well it is indirectly associated with potentially recoverable bitumen through pooling.

The SSG continues to recommend that the 12-36 well be shut in.

6 Capability of Well Logs For Determining the Presence & Thickness of the Wabiskaw D Shale

6.1 Background

In *Decision 2003-023*⁷, the Board concluded that if the Wabiskaw D regional shale is greater than 0.5 m thick and present throughout a region of influence there is a low potential risk for pressure communication between Wabiskaw C gas and channel bitumen. Conversely, the Board found that if the Wabiskaw D regional shale is absent or less than 0.5 m thick throughout a region of influence there is a high potential risk for pressure communication (*Decision 2003-023*, Appendix 13, Categories 2 and 3). The RGS adopted this approach in assessing the potential risk for pressure communication between Wabiskaw C gas and channel bitumen. In *Decision 2004-045*, the Board accepted that the Wabiskaw D shale is laterally continuous and serves as a barrier to pressure communication where it is at least 0.5 m thick. The Board acknowledged that logs may not be definitive in determining mudstone/shale thickness and character. However, given that there were insufficient core data available, the Board was satisfied that the application of consistent criteria to log evaluation was the most effective tool for recognition of regional mudstones and shales.

At the Phase 3 interim hearing the SSG, under cross-examination by Nexen Canada Limited, expressed concerns regarding the capability of well logs for thin-bed resolution, and, in particular, for determining the thickness of the Wabiskaw D shale. Not all available cores were examined by the RGS to confirm its Wabiskaw D shale log picks. As a result, the SSG conducted a core-based study regarding the capability of well logs for determining the presence and thickness of the Wabiskaw D shale.

6.2 Core-Based Study

The SSG identified 232 nonconfidential cores in the RGS area for the gross interval picked on logs as Wabiskaw D shale in the RGS. All 232 cores were examined and only 166 were determined to actually have complete core over this interval. The other 66 cores were either too deep or shallow to intersect the Wabiskaw D zone, had nil recovery over that interval, or had core missing from the box. A summary of the results of the core study are shown in Table 6-1 (included on the CD).

The Wabiskaw D shale was confirmed to be present in only 65 of the 166 cores (39 percent). Of these 65 cores, it was determined that the RGS log-thickness overestimated the core-thickness by 0.24 m on average. For example, in the AA/08-36-086-07W4 well, the RGS interprets the Wabiskaw D shale thickness to be 0.7 m from logs. Examination of the core showed that the Wabiskaw D shale is only 7 cm thick. Other similar cases of overestimation of the Wabiskaw D shale thickness from logs are in Appendix 4 (included on the CD). In two-thirds of the cases, the log-thickness is greater than the core-thickness. As shown in Figure 6-1 (included on the CD), there is significant scatter between the log- and core-thickness such that no reasonable correlation can be discerned.

⁷ EUB *Decision 2003-023: Chard Area and Leismer Field, Athabasca Oil Sands Area, Applications for the Production and Shut-in of Gas*, March 18, 2003.

The SSG believes that the discrepancies between log- and core-thickness can be attributed to:

- the averaging of wire-line tool readings over thin-bedded successions (i.e., if beds are thinner than the vertical resolution of the tool and are bounded above and below by beds with different log response properties, there is an amalgamated response for the different beds over the limit of vertical resolution producing spurious results); and
- the significant change in mineralogy going from the McMurray to the Wabiskaw, independent of facies (i.e., the sands change from quartz-dominated in the McMurray to the largely immature litharenites in the Wabiskaw).

Significantly, the Wabiskaw D shale is not present in 101 of the 166 cores (61 percent). Of these, most are a shaly or muddier pulse within the overlying Wabiskaw C (62 cores) or a shaly part of the Wabiskaw D valley-fill (26 cores). The remaining 13 cores are coaly sequences or abandonment fill mudstone in the McMurray.

For example, in the AA/11-11-086-07W4, AA/11-31-085-06W4, and AA/10-14-086-07W4 wells, the RGS recognized a similar log response and picked it as Wabiskaw D shale. Core examination demonstrated that the logs responded similarly to different stratigraphic units, as demonstrated in the following table. Core photos and logs of these examples are in Appendix 4 (included on the CD).

Well ID	RGS Log Interpretation	SSG Core Interpretation
AA/11-11-086-07W4	Wabiskaw D shale	Wabiskaw D shale
AA/11-31-085-06W4	Wabiskaw D shale	Wabiskaw D valley-fill
AA/10-14-086-07W4	Wabiskaw D shale	Wabiskaw C shale

Figure 6-2 (included on the CD) illustrates the areal distribution of the different units identified in core that were interpreted as Wabiskaw D shale from logs in the RGS. The distribution of individual units as identified in core show that thin-bedded units of discrete Wabiskaw D valley-fill, Wabiskaw D shale, and Wabiskaw C mudstone can be mapped in close proximity to one another at the same stratigraphic level. This indicates that there is a lack of continuity in these thin-bedded units and that they are likely erosional remnants. As such, these units cannot be relied on as a regional barrier. Figure 6-3 (included on the CD) superimposes this areal distribution on the RGS Wabiskaw D shale isopach map.

The only exception to this is along the south border of the Surmont leases where the Wabiskaw D shale thickness observed in the 11 cores available correlates with the thickness interpreted from logs. This may be due to the greater thickness of Wabiskaw D shale in this particular area. However, pressure analysis in this area (see [Appendix 5](#)) indicates that, even where the Wabiskaw D shale appears to be consistently thick, it cannot be relied on as a regional barrier.

The SSG does not have similar concerns regarding the capability of logs for determining the thickness and character of the McMurray A2 and B2 mudstones as there is an absence

of the thin-bed effect (i.e., the mudstones always occur at the base of the coarsening-up sequences), the mudstones are more uniform in thickness, and the McMurray mineralogy is consistently quartz-dominated.

The McMurray A2 and B2 mudstones form the base of consistent cleaning-up and coarsening-up sequences. The mud and sand components of these sequences are dominantly quartz and the basal mud tends to be fairly uniform in thickness (approximately 1 to 2 m). By contrast, the Wabiskaw D shale tends to vary in thickness from a few centimeters to meters in scale and is comprised of thin-bedded intercalations of shale and sand.

6.3 Conclusions

Based on its core-based study, the SSG believes that

- well logs cannot be relied on to identify the presence and thickness of Wabiskaw D shale;
- the presence and thickness of the Wabiskaw D shale can only reliably be confirmed by examination of core;
- with the exception of one limited area, mapping of the core results indicates the Wabiskaw D shale is not continuous, and within this limited area, pressure analyses indicate the Wabiskaw D shale may not be a regional barrier; and
- the Wabiskaw D shale cannot be relied on as a regional barrier.

Based on its core study, the SSG reviewed and changed its previous production status recommendations for the Wabiskaw C sand in the area where the RGS mapped the Wabiskaw D shale as a regional barrier. Figure 6-4 (included on the CD) is a revised communication assessment map for the Wabiskaw C sand gas pools.

The SSG is changing its production status recommendations for 35 wells to shut in.

7 Interim Directive 99-1 Applications

The SSG is concerned that there may be uncertainty as to which wells in the RGS area require an *Interim Directive (ID) 99-1* approval to produce. A number of gas intervals that have never produced and/or never been completed in the RGS area may be given a production status of produce as a result of this proceeding, without an *ID 99-1* application. The SSG believes it would be helpful for the Board to clarify whether an application and approval are still required under *ID 99-1* prior to production from these intervals.

8 Pressure Monitoring at Producing Wells

There is a risk that natural communication could exist between overlapping geological sequences that were pooled separately. This risk is associated with the vertical pooling separation criterion of 0.5 m used in the RGS. There is an additional risk associated with the sparse drilling density of one well per section or less that exists in some areas to delineate the extent of the regional mudstones.

Given these risks, the SSG believes it would be prudent to perform pressure testing in those wells where one interval has been allowed to produce and another interval was required to be shut in. Monitoring of the shut in interval would indicate if drainage is occurring.

Appendix 1 SSG Contested Wells and Intervals

	Field Name	Pool Name	Well ID	Stratigraphic Interval	Pay Top Depth	Pay Base Depth	SSG Previous Produce / Shut in	SSG New Produce / Shut in	Licensee
1	CHARD	WABISKAW K	00/11-28-080-6W4/0	Wbsk C Sand	280.2	283	Produce	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
2	CHARD	WABISKAW U/D-034	00/06-20-080-06W4/0	Wbsk C Sand	282	284	Produce	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
3	CHARD	WABISKAW U/D-037	00/07-13-080-07W4/0	Wbsk C Sand	307	307.6	Produce	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
4	CHARD	WABISKAW U/D-037	00/07-14-080-07W4/0	Wbsk C Sand	317	319	Produce	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
5	CHARD	WABISKAW U/D-037	00/10-23-080-07W4/0	Wbsk C Sand	312.5	314	Produce	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
6	CHARD	WABISKAW U/D-037	02/09-24-080-07W4/0	Wbsk C Sand	280.8	281.3	Produce	Shut-In	PETRO-CANADA
7	DIVIDE	MCMURRAY K	00/08-02-082-12W4/0	McM B2 Seq	497	498	Produce	Shut-In	STYLUS EXPLORATION INC.
8	DIVIDE	MCMURRAY FF	00/07-09-082-12W4/0	McM B2 Seq	479.4	480.6	Produce	Shut-In	PARAMOUNT ENERGY OPERATING CORP.
9	DIVIDE	MCMURRAY U/D-074	00/07-28-082-12W4/0	McM B2 Seq	412	415	Produce	Shut-In	STYLUS EXPLORATION INC.
10	DUNCAN	MCMURRAY YY	00/07-29-077-12W4/0	McM B1 Seq	451.5	452.2	Produce	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
11	HANGINGSTONE	WABISKAW A	00/11-35-082-08W4/0	Wbsk C Sand	443	444	Produce	Shut-In	NORTHSTAR ENERGY CORPORATION
12	HANGINGSTONE	WABISKAW A	00/07-02-083-08W4/0	Wbsk C Sand	448	448.5	Produce	Shut-In	NORTHSTAR ENERGY CORPORATION
13	HANGINGSTONE	WABISKAW-MCMURRAY D	00/08-07-081-07W4/0	McM A2 Seq	381	382.8	Shut-In	Shut-In	CALPINE CANADA RESOURCES COMPANY
14	HANGINGSTONE	WABISKAW-MCMURRAY D	00/06-17-081-07W4/0	McM A2 Seq	378.5	381.5	Shut-In	Shut-In	CALPINE CANADA RESOURCES COMPANY
15	HANGINGSTONE	WABISKAW-MCMURRAY D	00/14-01-081-08W4/0	McM A1 Seq	399	402	Produce	Shut-In	NORTHSTAR ENERGY CORPORATION

	Field Name	Pool Name	Well ID	Stratigraphic Interval	Pay Top Depth	Pay Base Depth	SSG Previous Produce / Shut in	SSG New Produce / Shut in	Licensee
16	HANGINGSTONE	WABISKAW-MCMURRAY D	00/11-13-081-08W4/0	McM A2 Seq	439.8	441.5	Shut-In	Shut-In	NORTHSTAR ENERGY CORPORATION
17	HANGINGSTONE	WABISKAW-MCMURRAY D	00/10-14-081-08W4/0	McM A2 Seq	453.2	456.2	Shut-In	Shut-In	NORTHSTAR ENERGY CORPORATION
18	HANGINGSTONE	MCMURRAY Y	00/10-09-082-09W4/0	McM A1 Seq	439.5	440.1	Produce	Shut-In	NORTHSTAR ENERGY CORPORATION
19	HANGINGSTONE	MCMURRAY KK	00/10-19-082-10W4/0	McM B1 Seq	425.5	426.8	Produce	Shut-In	PARAMOUNT ENERGY OPERATING CORP.
20	HANGINGSTONE	MCMURRAY UNDEFINED	00/11-25-082-11W4/0	McM B2 Seq	433	437	Shut-In	Produce	PARAMOUNT ENERGY OPERATING CORP.
21	HANGINGSTONE	MCMURRAY RRR	00/02-17-082-09W4/0	McM A1 Seq	437.5	439	Produce	Shut-In	NORTHSTAR ENERGY CORPORATION
22	HANGINGSTONE	MCMURRAY RRR	00/05-18-082-09W4/0	McM A1 Seq	427	427.3	Produce	Shut-In	NORTHSTAR ENERGY CORPORATION
23	HARDY	WABISKAW A	00/03-15-077-04W4/0	Wbsk C Sand	331.2	335	Produce	Shut-In	PARAMOUNT ENERGY OPERATING CORP.
24	HARDY	WABISKAW D	00/04-18-076-03W4/0	Wbsk C Sand	369.8	372.5	Produce	Shut-In	TALISMAN ENERGY INC.
25	HARDY	WABISKAW D	00/08-13-076-04W4/0	Wbsk C Sand	357.5	361	Produce	Shut-In	TALISMAN ENERGY INC.
26	HARDY	WABISKAW F	00/03-11-076-04W4/0	Wbsk C Sand	366.5	368.5	Produce	Shut-In	TALISMAN ENERGY INC.
27	HARDY	WABISKAW G	00/07-06-076-04W4/0	Wbsk C Sand	398	401	Produce	Shut-In	DEVON CANADA CORPORATION
28	HARDY	WABISKAW G	00/01-01-076-05W4/0	Wbsk C Sand	376.8	380	Produce	Shut-In	DEVON CANADA CORPORATION
29	HARDY	WABISKAW U/D-011	00/11-30-075-04W4/0	Wbsk C Sand	381.7	387	Produce	Shut-In	STYLUS EXPLORATION INC.
30	HARDY	MCMURRAY U/D-074	00/07-30-077-04W4/0	McM Channel	338.5	342.5	Produce	Shut-In	SUPERMAN RESOURCES INC.
31	KIRBY	UPPER MANNVILLE I	00/10-08-074-06W4/0	Wbsk B Valley Fill	389	396	Produce	Shut-In	BP CANADA ENERGY COMPANY
32	KIRBY	UPPER MANNVILLE I	00/03-21-074-07W4/0	Wbsk B Valley	442.5	444.5	Shut-In	Shut-In	CANADIAN NATURAL

	Field Name	Pool Name	Well ID	Stratigraphic Interval	Pay Top Depth	Pay Base Depth	SSG Previous Produce / Shut in	SSG New Produce / Shut in	Licensee
				Fill					RESOURCES LIMITED
33	KIRBY	UPPER MANNVILLE I	00/12-36-074-07W4/0	Wbsk B Valley Fill	395.8	398.7	Shut-In	Shut-In	BP CANADA ENERGY COMPANY
34	KIRBY	UPPER MANNVILLE I	00/11-05-075-06W4/0	Wbsk B Valley Fill	382.2	383.4	Shut-In	Shut-In	BP CANADA ENERGY COMPANY
35	KIRBY	UPPER MANNVILLE I	00/07-01-075-07W4/0	Wbsk B Valley Fill	384.2	386.2	Shut-In	Shut-In	BP CANADA ENERGY COMPANY
36	KIRBY	UPPER MANNVILLE O30	00/06-32-073-09W4/0	Wbsk B Valley Fill	426.8	427.8	Shut-In	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
37	KIRBY	UPPER MANNVILLE O30	00/16-33-073-09W4/0	Wbsk B Valley Fill	424.3	426.5	Shut-In	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
38	KIRBY	UPPER MANNVILLE O30	00/15-04-074-09W4/0	Wbsk B Valley Fill	424.5	428	Shut-In	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
39	KIRBY	UPPER MANNVILLE O30	00/16-05-074-09W4/0	Wbsk B Valley Fill	429.5	431	Shut-In	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
40	KIRBY	UPPER MANNVILLE O30	00/12-07-074-09W4/0	Wbsk B Valley Fill	446	447	Shut-In	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
41	KIRBY	UPPER MANNVILLE O30	00/11-08-074-09W4/0	Wbsk B Valley Fill	435.25	437.6	Shut-In	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
42	KIRBY	UPPER MANNVILLE O30	00/12-09-074-09W4/0	Wbsk B Valley Fill	424.5	428.5	Shut-In	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
43	KIRBY	UPPER MANNVILLE O30	00/06-17-074-09W4/0	Wbsk B Valley Fill	431.3	435	Shut-In	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
44	KIRBY	UPPER MANNVILLE O30	00/06-18-074-09W4/0	Wbsk B Valley Fill	440.5	442	Shut-In	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
45	KIRBY	UPPER MANNVILLE O30	00/16-12-074-10W4/0	Wbsk B Valley Fill	450	451	Shut-In	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
46	KIRBY	UPPER MANNVILLE O30	00/02-13-074-10W4/0	Wbsk B Valley Fill	446	447.5	Shut-In	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
47	KIRBY	UPPER MANNVILLE O30	00/02-24-074-10W4/0	Wbsk B Valley Fill	453	456	Shut-In	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
48	LEISMER	MCMURRAY I4I	00/05-20-079-07W4/0	McM B1 Channel	310.8	316.5	Produce	Shut-In	CANADIAN NATURAL RESOURCES LIMITED

	Field Name	Pool Name	Well ID	Stratigraphic Interval	Pay Top Depth	Pay Base Depth	SSG Previous Produce / Shut in	SSG New Produce / Shut in	Licensee
49	LEISMER	MCMURRAY Z3Z	00/12-23-079-07W4/0	McM B1 Seq	299.2	305.5	Shut-In	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
50	NEWBY	WABISKAW S	00/01-02-084-06W4/0	Wbsk C Sand	266.5	268	Produce	Shut-In	PARAMOUNT ENERGY OPERATING CORP.
51	NEWBY	WABISKAW S	00/08-12-084-06W4/0	Wbsk C Sand	212	213	Produce	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
52	NEWBY	WABISKAW T	00/06-09-084-06W4/0	Wbsk C Sand	236.3	237.5	Shut-In	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
53	NEWBY	WABISKAW T	00/05-10-084-06W4/0	Wbsk C Sand	219.3	221	Shut-In	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
54	NEWBY	WABISKAW T	00/07-16-084-06W4/0	Wbsk C Sand	206	207	Shut-In	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
55	NEWBY	WABISKAW T	00/09-17-084-06W4/0	Wbsk C Sand	210.2	211	Shut-In	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
56	NEWBY	WABISKAW T	00/10-20-084-06W4/0	Wbsk C Sand	214.2	214.8	Shut-In	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
57	NEWBY	WABISKAW T	00/10-21-084-06W4/0	Wbsk C Sand	194.5	196	Shut-In	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
58	NEWBY	WABISKAW V	00/10-25-085-06W4/0	Wbsk C Sand	163.2	164.5	Produce	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
59	NEWBY	WABISKAW V	00/10-26-085-06W4/0	Wbsk C Sand	154.2	155	Produce	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
60	NEWBY	WABISKAW V	00/10-27-085-06W4/0	Wbsk C Sand	168	169.6	Produce	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
61	NEWBY	WABISKAW Y	00/12-14-084-06W4/0	Wbsk C Sand	203	204	Produce	Shut-In	PARAMOUNT ENERGY OPERATING CORP.
62	NEWBY	WABISKAW AA	00/14-20-083-05W4/0	Wbsk C Sand	233.3	234	Produce	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
63	NEWBY	WABISKAW AA	00/06-30-083-05W4/0	Wbsk C Sand	258	259	Produce	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
64	NEWBY	WABISKAW U/D-050	AA/02-11-086-07W4/0	Wbsk C Sand	183	184.8	Produce	Shut-In	NEXEN CANADA LTD.
65	NEWBY	WABISKAW U/D-052	AA/06-23-086-07W4/0	Wbsk C Sand	173.8	176	Produce	Shut-In	OPTI CANADA INC.
66	NEWBY	WABISKAW U/D-052	AA/11-23-086-07W4/0	Wbsk C Sand	171	172.5	Produce	Shut-In	OPTI CANADA INC.

	Field Name	Pool Name	Well ID	Stratigraphic Interval	Pay Top Depth	Pay Base Depth	SSG Previous Produce / Shut in	SSG New Produce / Shut in	Licensee
67	NEWBY	WABISKAW U/D-052	AA/07-26-086-07W4/0	Wbsk C Sand	162	163.9	Produce	Shut-In	OPTI CANADA INC.
68	NEWBY	WABISKAW U/D-053	AA/06-28-086-07W4/0	Wbsk C Sand	185.3	186.7	Produce	Shut-In	CANNAT RESOURCES INC.
69	NEWBY	WABISKAW U/D-055	AA/07-33-086-07W4/0	Wbsk C Sand	169	170.5	Produce	Shut-In	CANNAT RESOURCES INC.
70	NEWBY	WABISKAW U/D-060	00/15-31-083-05W4/0	Wbsk C Sand	223	223.7	Produce	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
71	NEWBY	WABISKAW U/D-060	00/12-05-084-05W4/0	Wbsk C Sand	223.4	224.5	Produce	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
72	NEWBY	WABISKAW U/D-063	00/14-11-084-06W4/0	Wbsk C Sand	241.6	243	Produce	Shut-In	PARAMOUNT ENERGY OPERATING CORP.
73	NEWBY	WABISKAW U/D-066	00/13-27-084-06W4/0	Wbsk C Sand	220.5	221.5	Shut-In	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
74	NEWBY	WABISKAW U/D-075	00/15-17-085-06W4/0	Wbsk C Sand	170.5	171.5	Produce	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
75	NEWBY	WABISKAW U/D-081	AA/11-01-086-07W4/0	Wbsk C Sand	174.6	177	Produce	Shut-In	SUNCOR ENERGY INC.
76	RESELN	WABISKAW U/D-013	00/03-18-084-06W4/0	Wbsk C Sand	292.4	293.5	Produce	Shut-In	PARAMOUNT ENERGY OPERATING CORP.
77	THORNBURY	MCMURRAY X4X	00/11-27-079-11W4/0	McM B1 Seq	434	436	Produce	Shut-In	CANADIAN NATURAL RESOURCES LIMITED

Appendix 2 New Well and Gas Interval Evaluations

	Field Name	Pool Name	Well ID	Stratigraphic Interval	Pay Top Depth	Pay Base Depth	New well / New interval Evaluation	SSG New Produce / Shut in	Licensee
1	CHARD	WABISKAW-MCMURRAY A	AA/10-30-079-06W4/0	Wbsk C Sand	259	260	new well	Produce	PETRO-CANADA
2	CHARD	WABISKAW-MCMURRAY A	AA/10-30-079-06W4/0	McM A2 Seq	261	267	new well	Produce	PETRO-CANADA
3	CHARD	MCMURRAY HHH	AA/09-14-078-06W4/0	McM A2 Seq	336	342	new well	Produce	MEG ENERGY CORP.
4	HANGINGSTONE	MCMURRAY P2P	AA/06-25-082-08W4/0	McM Channel	451	460	new well	Shut-in	PETRO-CANADA
5	HANGINGSTONE	MCMURRAY Y	00/07-15-082-09W4/0	McM Channel	454	455	new interval	Shut-In	NORTHSTAR ENERGY CORPORATION
6	HANGINGSTONE	MCMURRAY UNDEFINED	AA/05-24-081-10W4/0	McM Channel	432.5	436	new well	Shut-in	JAPAN CANADA OIL SANDS LTD.
7	HANGINGSTONE	MCMURRAY UNDEFINED	00/09-27-081-11W4/0	McM A Channel	434.5	441	new well	Produce	STYLUS EXPLORATION INC.
8	HANGINGSTONE	MCMURRAY UNDEFINED	AA/03-33-082-08W4/0	McM A2 Seq	456.2	457	new well	Produce	PETRO-CANADA
9	HANGINGSTONE	MCMURRAY UNDEFINED	AB/06-12-083-08W4/0	McM Channel	441	442	new well	Shut-in	PETRO-CANADA
10	HARDY	WABISKAW-MCMURRAY A	AA/03-30-076-05W4/0	Wbsk D Valley Fill	331.8	333	new well	Shut-in	ENCANA OIL & GAS CO. LTD.
11	HARDY	WABISKAW-MCMURRAY A	AA/11-24-077-06W4/0	Wbsk D Valley Fill	320	322	new well	Shut-in	MEG ENERGY CORP.
12	HARDY	WABISKAW-MCMURRAY A	AA/03-30-076-05W4/0	McM Channel	336	337.7	new well	Shut-in	ENCANA OIL & GAS CO. LTD.
13	HARDY	MCMURRAY UNDEFINED	AA/11-24-077-06W4/0	McM Channel	326.5	330	new well	Shut-in	MEG ENERGY CORP.
14	KIRBY	UPPER MANNVILLE I	00/10-29-074-06W4/0	Wbsk B Valley Fill	382.2	384.7	new interval	Shut-In	BP CANADA ENERGY COMPANY
15	KIRBY	UPPER MANNVILLE I	00/11-31-074-06W4/0	Wbsk B Valley Fill	386	388.2	new interval	Shut-In	BP CANADA ENERGY COMPANY
16	KIRBY	UPPER MANNVILLE I	00/12-34-074-06W4/0	Wbsk B Valley Fill	411	412	new interval	Shut-In	BP CANADA ENERGY COMPANY
17	KIRBY	UPPER	00/11-23-074-07W4/0	Wbsk B Valley Fill	415	417.2	new interval	Shut-In	CANADIAN NATURAL

	Field Name	Pool Name	Well ID	Stratigraphic Interval	Pay Top Depth	Pay Base Depth	New well / New interval Evaluation	SSG New Produce / Shut in	Licensee
		MANNVILLE I							RESOURCES LIMITED
18	KIRBY	UPPER MANNVILLE I	00/10-01-075-07W4/0	Wbsk B Valley Fill	384	386	new interval	Shut-In	BP CANADA ENERGY COMPANY
19	KIRBY	WABISKAW UNDEFINED	AA/03-35-075-06W4/0	Wbsk C Sand	345	345.9	new well	Shut-in	ENCANA CORPORATION
20	KIRBY	WABISKAW-MCMURRAY A	AA/01-35-075-06W4/0	Wbsk D Valley Fill	353	355.1	new well	Shut-in	ENCANA CORPORATION
21	KIRBY	WABISKAW-MCMURRAY A	AA/03-35-075-06W4/0	Wbsk D Valley Fill	346.1	349	new well	Shut-in	ENCANA CORPORATION
22	KIRBY	MCMURRAY UNDEFINED	AA/01-34-075-06W4/0	McM Channel	359	360	new well	Shut-in	ENCANA CORPORATION
23	KIRBY	MCMURRAY UNDEFINED	AA/03-35-075-06W4/0	McM Channel	352	354.5	new well	Shut-in	ENCANA CORPORATION
24	LEISMER	WABISKAW UNDEFINED	AB/02-04-076-06W4/0	Wbsk C Sand	357.5	358	new well	Produce	DEVON ARL CORPORATION
25	LEISMER	WABISKAW UNDEFINED	AA/03-04-076-06W4/0	Wbsk C Sand	355	356	new well	Produce	DEVON ARL CORPORATION
26	LEISMER	WABISKAW UNDEFINED	AA/14-09-076-06W4/0	Wbsk C Sand	331	331.5	new well	Produce	ENCANA OIL & GAS CO. LTD.
27	LEISMER	WABISKAW-MCMURRAY A	AA/10-14-079-07W4/0	Wbsk C Sand	295.4	296	new well	Shut-in	PETRO-CANADA
28	LEISMER	WABISKAW-MCMURRAY A	AA/10-14-079-07W4/0	McM A2 Seq	297.7	299.5	new well	Shut-in	PETRO-CANADA
29	LEISMER	WABISKAW-MCMURRAY D	AA/12-13-077-08W4/0	Wbsk C Sand	301.5	303	new well	Shut-in	NEXEN CANADA LTD.
30	LEISMER	WABISKAW-MCMURRAY G	AA/12-04-076-06W4/0	Wbsk C Sand	353.2	354.2	new well	Produce	DEVON ARL CORPORATION
31	LEISMER	WABISKAW-MCMURRAY G	AA/12-04-076-06W4/0	McM A2 Seq	354.2	357	new well	Produce	DEVON ARL CORPORATION
32	LEISMER	WABISKAW-MCMURRAY G	AA/14-09-076-06W4/0	McM A2 Seq	333	333.5	new well	Produce	ENCANA OIL & GAS CO. LTD.
33	LEISMER	MCMURRAY UNDEFINED	AA/03-04-076-06W4/0	McM B1 Seq	363	364	new well	Shut-in	DEVON ARL CORPORATION
34	LEISMER	MCMURRAY UNDEFINED	AA/11-23-077-06W4/0	McM Channel	326	328	new well	Shut-in	MEG ENERGY CORP.

	Field Name	Pool Name	Well ID	Stratigraphic Interval	Pay Top Depth	Pay Base Depth	New well / New interval Evaluation	SSG New Produce / Shut in	Licensee
35	LEISMER	MCMURRAY I4I	00/09-18-079-07W4/0	McM B1 Channel	310.5	315.2	new interval	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
36	LEISMER	MCMURRAY I4I	00/09-19-079-07W4/0	McM B1 Channel	312	317	new interval	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
37	LEISMER	MCMURRAY I4I	00/11-24-079-08W4/0	McM B1 Seq	320.8	325.5	new interval	Shut-In	CANADIAN NATURAL RESOURCES LIMITED
38	NEWBY	WABISKAW-MCMURRAY H	00/07-22-083-05W4/0	Wbsk D Valley Fill	220	223	new well	Produce	CONOCOPHILLIPS CANADA RES. CORP.
39	UNDEFINED	WABISKAW UNDEFINED	AA/05-28-082-08W4/0	Wbsk C Sand	448.5	449	new well	Produce	PETRO-CANADA

Appendix 3 Pressure and Production Data (February 7, 2005) (CD Only)

Appendix 4 Wabiskaw D Shale Core Study Photos (CD Only)

Appendix 5 Pressure Evidence of Communication through the Wabiskaw D Shale

In Section 6, the SSG identified an area along the south border of the Surmont leases where the Wabiskaw D shale core thickness correlates with the log thickness and is greater than 0.5 m. The 6-20-80-6W4 and 11-30-80-6W4 wells are located within this area and new pressure data is available for each.

The SSG believes that drainage is indicated by the static-gradient pressures taken on the Wabiskaw C sand at the 6-20 and 11-30 wells on February 20 and 23, 2004. The expected virgin pressure in this area is between 1650 kPaa and 1700 kPaa. The SSG interprets the pressures to be valid, and with values of 1514 kPaa (6-20 well) and 1543 kPaa (11-30 well), they are not virgin pressures.

6-20-80-6W4M Well

For the 6-20 well, the nearest Wabiskaw C producer is the 11-28-80-6W4 well, 2.5 km to the northeast, which had commingled production from the McMurray and Wabiskaw zones. However, the SSG notes that the 7-29-80-6W4 well is located between the 11-28 and 6-20 wells and has no gas pay in the Wabiskaw C sand, suggesting that the gas pool is not continuous between the two wells. The RGS mapped the 6-20 and 11-28 wells in separate, single-well pools in the Wabiskaw C. The SSG also notes that most of the gas production from the 11-28 well occurred from the channel sand only (i.e., 21.7 E6 m³ from February 1986 to January 1994). The only Wabiskaw C production occurred after the sand was perforated and commingled with the channel sand on January 21, 1994. After that date the 11-8 well produced an additional 3.6 E6 m³, of which only a portion came from the much thinner and shalier Wabiskaw C. The well's production history indicates that both sands had reached their economic limit when production ceased in September 2001.

Based on the limited production from 11-28 well subsequent to commingling the Wabiskaw C and channel sands, and the lack of gas pay at the intervening 7-29 well, the SSG agrees with the RGS interpretation of a single-well pool in the Wabiskaw C at the 6-20 well.

11-30-80-6W4M Well

For the 11-30 well, the nearest producer is also the 11-28 well, 3 km to the east. However, the intervening 7-29, 2-32, and 7-32-80-6W4 wells have no gas pay in the Wabiskaw C sand.

The next nearest Wabiskaw production comes from the 3-34 and 4-35-80-7W4 wells, and the 7-2-81-7W4 well, all of which have commingled production from multiple pools, including the Wabiskaw C sand. These wells are at least 4 km to

the west and northwest, and the intervening 11-25, 10-26, and 2-36-80-7W4 wells, and 14-31-80-6W4 well have no gas pay in the Wabiskaw C sand.

Based on the lack of gas pay at the offsetting wells, the SSG agrees with the RGS interpretation of a single-well pool in the Wabiskaw C at the 11-30 well.

Conclusion

Both the 11-30 and 6-20 wells have drained initial pressures in the Wabiskaw C sand, yet the geological and production review indicate that these wells are in single-well gas pools. This depletion may be occurring through the Wabiskaw D shale as a result of production from the underlying channel gas. Therefore, the SSG believes that the Wabiskaw D shale may not be a regional barrier along the south border of the Surmont leases.

Table 3-1	Tops and Marker Data (CD Only)
Table 3-2	Gas Evaluation and Delineation Date – New Wells (CD Only)
Table 3-3	Bitumen Evaluation – New Wells (CD Only)
Table 6-1	Wabiskaw D Shale Core Study Data (CD Only)
Figure 3-1	New Wells Relative to McMurray B Sequence Zones (CD Only)
Figure 3-2	New Wells Relative to McMurray A Sequence & Wabiskaw Zones (CD Only)
Figure 6-1	Crossplot of Log Versus Core Thickness (CD Only)
Figure 6-2	Areal Distribution of Core in Study (CD Only)
Figure 6-3	Areal Distribution of Core in Study Superimposed on RGS Wabiskaw D Shale Isopach Map (CD Only)
Figure 6-4	Communication Assessment Map – Wabiskaw C Sand Gas Pools (CD Only)
Attachment 1	Computer Disk Containing the SSG submission and all Tables, Figures, and Appendices