



# **Husky Oil Operations Limited**

**Application for Special Gas Well Spacing  
Strachan Field**

**CONFIDENTIAL until August 1, 2014**

**December 1, 2009**

**ENERGY RESOURCES CONSERVATION BOARD**

**Decision 2009-070: Husky Oil Operations Limited, Application for Special Gas Well Spacing,  
Strachan Field**

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**ENERGY RESOURCES CONSERVATION BOARD**

**Calgary Alberta**

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**HUSKY OIL OPERATIONS LIMITED  
APPLICATION FOR SPECIAL GAS WELL SPACING  
STRACHAN FIELD**

**Decision 2009-070  
Application No. 1610482**

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**DECISION**

The Energy Resources Conservation Board has considered the findings and recommendation set out in the following examiner report, adopts the recommendation, and directs that Application No. 1610482 be approved.

Dated in Calgary, Alberta, on December 1, 2009.

**ENERGY RESOURCES CONSERVATION BOARD**



**B. T. McManus, Q.C.  
Acting Chairman**



# **ENERGY RESOURCES CONSERVATION BOARD**

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Calgary Alberta

## **EXAMINER REPORT RESPECTING HUSKY OIL OPERATIONS LIMITED APPLICATION FOR SPECIAL GAS WELL SPACING STRACHAN FIELD**

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**Decision 2009-070  
Application No. 1610482**

### **1 RECOMMENDATION**

Having considered all of the evidence, the examiners recommend that Application No. 1610482 be approved.

### **2 INTRODUCTION**

#### **2.1 Application**

Birchill Exploration Corp. (Birchill), on behalf of Husky Oil Operations Limited (Husky), applied to the Energy Resources Conservation Board (ERCB/Board), pursuant to Section 79(4) of the *Oil and Gas Conservation Act* and Section 5.190 of the *Oil and Gas Conservation Regulations (OGCR)*, for the suspension of drilling spacing unit (DSU) and target area provisions and the establishment of a holding for the production of gas from the Viking Formation in Section 24 of Township 38, Range 9, West of the 5th Meridian (Section 24). The applicant proposed that within the holding a producing well would be a minimum of 500 metres (m) from any other well producing from the same pool, a producing well would be a minimum of 300 m from the south and west boundaries of the holding, and only two wells per pool per section could be produced.

#### **2.2 Intervention**

Penn West Petroleum Ltd. (Penn West) is a mineral interest owner in Section 25 of Township 38, Range 9, West of the 5th Meridian (Section 25), which offsets the application area to the north. Penn West filed an objection to the application on the basis that the performance of its 02/08-25-038-09W5/2 Viking gas well (02/8-25/2 well) to date was indicative of a relatively high permeability reservoir common to the Viking Channel play-type. Penn West believed that development of Viking reserves did not require a well density beyond one well per section. Penn West also stated that a new well drilled and completed in the Viking within the existing 300 m northern buffer zone of Section 24 would adversely affect the reserves associated with its 02/8-25/2 well and that there was no precedent for holdings in the deep, high-pressure, gas-saturated Viking Channel play-type.

#### **2.3 Confidentiality Orders**

By letter dated July 21, 2009, Birchill, on behalf of Husky, requested that all its seismic data and interpretations of such data be treated as confidential in these proceedings. Birchill based its request on not being the owner of the seismic data and requiring the permission of the owner to use such data in the proceedings. By order dated July 31, 2009, the Board granted Birchill

confidentiality for its seismic data and seismic interpretations (the confidential information), in accordance with Section 13 of the *Energy Resources Conservation Board Rules of Practice* and subject to certain terms and conditions. This order expires on August 1, 2014, at which time the entire record of the proceeding will be available to the public.

On August 17, 2009, Penn West requested that all of its seismic data and related interpretations be kept confidential, pursuant to a confidentiality order. Penn West explained in its submission that disclosure of its seismic data and seismic interpretations would cause it to suffer competitive harm if its proprietary seismic data and interpretations were released on the public record and used by its competitors. By order dated August 21, 2009, the Board granted confidentiality to Penn West for its seismic data and seismic interpretations (the confidential information), in accordance with Section 13 of the *Energy Resources Conservation Board Rules of Practice* and subject to certain terms and conditions. This order expires on August 1, 2014, at which time the entire record of the proceeding will be available to the public.

As a result of the Board's confidentiality orders, this examiner report has a confidential edition and a public edition. The confidential edition, which contains the examiners' review and consideration of Birchill's and Penn West's confidential information, is being made available to only those parties who are signatories of the Declaration and Undertaking Not to Disclose, as described in the orders. In the confidential edition, any reference to the parties' confidential information is in bold type. The public edition of the document denotes where confidential information has been removed by the use of the following statement: *[Confidential information removed, as discussed above in Section 2.3: Confidentiality Orders.]*

## **2.4 Hearing**

The Board held a public hearing in Calgary, Alberta, on September 8 and 9, 2009, before Board-appointed examiners R. J. Willard, P.Eng. (Presiding Member), G. W. Dilay, P.Eng., and T. A. Dibus, P.Geol. Portions of the hearing were public: Opening Remarks, Preliminary Matters, and Final Arguments. As a result of the Board's confidentiality orders, a portion of the hearing was held in camera (confidential), during which the confidential information was discussed as part of Birchill's and Penn West's direct examination, cross-examination, and examination by ERCB staff and the examiners. The examiners ensured that parties getting access to the confidential information and participating in the confidential part of the hearing had filed an undertaking not to disclose the confidential information. Those who appeared at the hearing are listed in Appendix 1.

For the purposes of this report, the examiners consider that the record of this hearing closed on September 9, 2009.

## **3 BACKGROUND**

In its original application, Birchill applied on behalf of Husky for a holding for the Cardium, Viking, Notikewin, Glauconitic, and Ellerslie Formations. Since Penn West's objection applied only to the Viking Formation, Birchill amended the application to remove the Cardium, Notikewin, Glauconitic, and Ellerslie Formations. Subsequently, Birchill submitted Application No. 1618462 on behalf of Husky to establish a holding for the production of gas from the



Cardium, Glauconitic, and Ellerslie Formations, which was approved by the ERCB on July 10, 2009.

Prior to the hearing, Birchill had applied for a well licence to drill a gas well targeting the Viking and other formations at Legal Subdivision (LSD) 15, Section 24, Township 38, Range 9, West of the 5th Meridian. On August 5, 2009, the ERCB issued Well Licence No. 0411708, approving Birchill's well licence application.

At the hearing, Birchill made a preliminary motion to the examiners for the summary dismissal of the objection filed by Penn West. Birchill made this motion on the grounds that even if Penn West's evidence were accepted in its entirety, the evidence established that Birchill's application met the requirements of Section 4.040(3) of the *OGCR* and did not result in any inequities. The examiners dismissed Birchill's preliminary motion on the basis that Penn West was entitled to a hearing, as the Board had found that Penn West may be directly and adversely affected by a Board decision on this matter and Section 26(2) of the *Energy Resources Conservation Act (ERCA)* provides certain procedural rights to interveners such as Penn West. These rights include a reasonable opportunity to furnish evidence relevant to the application, opportunity for cross-examination, and adequate opportunity to make representations by way of argument. The examiners noted that Birchill based its motion on its interpretation of Penn West's evidence; however, Penn West wished to test that interpretation, and Section 26(2) of the *ERCA* gave Penn West the right to do so. Considering that the evidence was interpretive, the examiners wanted to hear from all parties as to their interpretations so that the examiners could make a fair and informed decision.

The following wells were discussed at the hearing:

- the 00/09-24-038-09W5 well (9-24 well), which is a commingled producing Husky well located in the application area;
- the 02/8-25/2 well, which is Penn West's producing Viking well in Section 25;
- the 00/08-25-038-09W5/0 well (00/8-25/0 well), which is an abandoned Viking well in Section 25;
- the 02/08-25-038-09W5/0 well (02/8-25/0 well), which is Penn West's dry and abandoned well in Section 25;
- the 00/12-32-038-08W5/3 well (12-32 well), which is a producing Husky Viking well; and
- the licensed well location at 00/15-24-038-09W5 (15-24), which is licensed to Birchill.

Figure 1 identifies the application area, Penn West's mineral interest area, and the wells listed above.

Summary information for these wells from ERCB public records is provided in Table 1.

Table 1. Summary information on the 9-24, 02/8-25/2, 00/8-25/0, 02/8-25/0, 12-32, and 15-24 wells

Well	Well licensee	Current status date	Well status	Initial gas production rate (10 <sup>3</sup> m <sup>3</sup> /d)	Current gas production rate (10 <sup>3</sup> m <sup>3</sup> /d)	Cumulative gas production (10 <sup>3</sup> m <sup>3</sup> )
09-24	Husky	Mar 2008	Gas flow	46.7	16.9	15 925.3
02/08-25/2	Penn West	Mar 1998	Gas flow	46.2	9.1	43 530.7
00/08-25/0	ConocoPhillips	Dec 1996	Abandoned	N/A	N/A	N/A
02/8-25/0	Penn West	Aug 1997	Abandoned	N/A	N/A	N/A
12-32	Husky	Aug 2004	Gas flow	91.7	58.8	13 6737.9
15-24	Birchill	Aug 2009	Licensed	N/A	N/A	N/A

For the 09-24 well, initial segregated absolute open flow (AOF) tests were run on the Cardium, Viking, and Glauconitic Formations, and gas from these zones had been commingled since the commencement of production. The 00/8-25/0 well encountered Viking pay but was abandoned due to equipment stuck in the wellbore. The 02/8-25/0 well was drilled 30 m south of the 00/8-25/0 well and was abandoned because it did not encounter productive Viking reservoir. The producing 02/8-25/2 well was drilled farther north of the abandoned 00/8-25/0 well.

#### 4 ISSUES

The examiners consider that approval of the requested holding would establish the equivalent of reduced gas well spacing and that therefore the application must satisfy at least one of the requirements specified in Section 4.040(3) of the *OGCR*, which states that

The Board shall not grant an application for an order...that would reduce the size of drilling spacing units less than the size of normal drilling spacing units unless the application shows that

- (a) improved recovery will be obtained,
- (b) additional wells are necessary to provide capacity to drain the pool at a reasonable rate that will not adversely affect recovery from the pool,
- (c) the drilling spacing units would be in a pool in a substantial part of which there are drilling spacing units of such reduced size, or
- (d) in a gas field, increased deliverability is desirable.

The examiners consider the issues to be

- whether the application meets one or more of the requirements set out in Section 4.040(3) of the *OGCR* for the establishment of reduced gas well spacing, and
- whether granting the requested holding would result in any unacceptable inequity.

#### 5 CONSIDERATION OF THE APPLICATION

##### 5.1 Views of Birchill

Birchill explained that the mineral rights to gas underlying Section 24 were held by Husky and that it had a farm-out agreement with Husky whereby Birchill was entitled to develop an

additional well on Section 24. Furthermore, Birchill stated that Husky had authorized it to represent Husky's interest in the application and hearing.

Birchill argued that its application satisfied the requirements of Section 4.040(3) of the *OGCR* and therefore the application should be approved. It stated that

- improved recovery of gas in the Viking Formation would be obtained,
- additional wells were necessary to drain the pool at a reasonable rate that would not adversely affect recovery from the pool, and
- the reduced well spacing would not result in any inequity.

Birchill interpreted the Viking in the Strachan area as a series of regional marine sandstone bars and distributary channels with variable porosity and permeability. It stated that the marine bars were of poorer reservoir quality than the channels, were primarily oil-bearing, and had been mostly depleted. It pointed out that the recent target in the area had been the distributary channels, which were variable in thickness, porosity, and permeability. Birchill submitted that there was a large Viking channel accumulation on the north portion of Section 24 that was not being effectively drained by any of the offsetting wells. Birchill based its submission on its geological and geophysical interpretations.

**Further, after reviewing the seismic data, Birchill interpreted that there was a seismic anomaly ending at or near the north boundary of Section 24 (see Figure 2). Birchill argued that the low amplitudes found on the seismic data in Section 25 were the effect of a near vertical fault located at the section boundary between Sections 24 and 25 and not indicative of an anomaly. Based on seismic evidence, Birchill interpreted the Viking anomaly in the north portion of Section 24 to have an areal extent of one half section.**

Birchill suggested that Penn West's evidence also confirmed that there was a thick and porous Viking channel on the north portion of Birchill's lands that was not currently being drained by Penn West's 02/8-25/2 well.

Birchill stated that the thickest and most porous part of the channel was the best place to recover and drain the reserves. **Birchill's seismic interpretation suggested that the optimum location to drain these reserves was 100 m from the north section boundary.** In order to address Penn West's concerns about potential inequity, Birchill proposed a compromise solution of a setback distance of 150 m from the north section boundary. As the proposal was not accepted by Penn West, Birchill positioned its 15-24 well about 130 m from the north section boundary.

Birchill interpreted the Viking reservoirs as potentially small and discrete accumulations, similar to single-well pools that show little or no communication through poor reservoir quality rock marked by discontinuities associated with the seismic amplitude anomalies. Birchill stated that it was possible that the 9-24 well and the targeted Viking anomaly were discrete and separate reservoirs.

**Birchill further interpreted that the Viking event amplitude in the area indicated that the proposed 15-24 well would be in the thickest part of an east/west trending channel feature extending south to the 9-24 channel trend.**

Birchill stated that the Viking at the proposed 15-24 well was expected to have better reservoir quality that was more porous and thicker than the 12-32 well, which was currently the best Viking well in the Strachan area.

Birchill explained that the application proposed a minimum 500 m interwell distance as a result of Husky requesting this distance between its 9-24 well and any Birchill well. Although Birchill acknowledged that there were other LSDs about 300 m from the north section boundary that maintained the 500 m interwell distance requested by Husky, such locations increased the risk of an uneconomic or a dry well compared to the optimum 15-24 location. Birchill argued that Penn West's seismic interpretation supported the proposed 15-24 location as the only available location to capture the resources underlying its land. Birchill confirmed that the Viking anomaly was the primary reason for choosing the proposed 15-24 location.

Birchill submitted that well logs did not support or complement its seismic interpretation. Birchill used the 02/8-25/2 well as a good example for this conclusion. Despite being drilled on the edge of an anomaly, the 02/8-25/2 well had modest production. This well produced better than the 9-24 well, which was also on the edge of an anomaly and had comparable log responses. Birchill further submitted that multiple pools could exist in the same section based on the discontinuities associated with the observed seismic anomalies, including the area between the 9-24 well and the proposed 15-24 well.

In regard to the parameters that its seismic data were shot in, Birchill stated that two programs were run with different BIN sizes. BIN sizes across the Western Geophysical program, which encompassed the area of interest, were mostly 25 m by 25 m, and the Ram River survey was 35 m by 40 m. Birchill submitted that its interpretation suggested that seismic run with a BIN size of 25 m by 25 m had the ability to resolve channel boundaries and edges. Birchill stated that there was complete separation between the 9-24 well and Penn West's 02/8-25/2 well.

**Birchill agreed with Penn West that the Notikewin channels did impact the Viking amplitudes in the Strachan area, but disagreed with Penn West's mapping and interpretation of this influence at the 12-32 and 9-24 well locations.** Birchill contended that its seismic interpretation should be preferred over that offered by Penn West.

**Furthermore, Birchill stated that its seismic interpretation should be preferred over Penn West's for the following reasons:**

- **The varying thickness and the local dimming attributed to the Upper Mannville coal by Penn West was inconsistent with the geology of the Strachan area. Birchill attributed the local dimming of the Viking, Upper Mannville coal and the two underlying horizons to the presence of a near vertical fault along the north section boundary, which was ignored by Penn West. The loss of amplitude at all levels was more consistent with scaling issues and processing.**
- **The peak amplitude of 30 milliseconds below the Base of Fish Scales used by Penn West was not a unique indicator of the Notikewin channels. Birchill agreed with Penn West that there was no Notikewin channel at the proposed 15-24 well. Therefore, the Notikewin did not influence the Viking amplitudes at this well location.**

Birchill estimated the original gas in place (OGIP) for the north half of Section 24 to be about 423 million cubic metres ( $10^6 \text{ m}^3$ ), based on volumetric calculations. Birchill submitted that the Cardium, Viking, and Glauconitic encountered in the 9-24 well had wellhead AOF rates of 4.7, 9.8, and 36 thousand cubic metres per day ( $10^3 \text{ m}^3/\text{d}$ ) respectively and that the 9-24 well was not expected to drain the Viking reserves in Section 24. Birchill stated that if Husky's 9-24 well was expected to drain the estimated gas reserves contained in the north half of Section 24 at an AOF of  $9.8 \times 10^3 \text{ m}^3/\text{d}$ , it would take about 106 years, assuming constant production at this rate. Therefore, Birchill believed that its proposed well at 15-24 would result in incremental recovery and allow it to drain the resource at a reasonable rate.

Birchill submitted that pressure data supported its interpretation that the Viking reserves in Section 24 had not been drained by Penn West's 02/8-25/2 well. Birchill indicated that the pressure in Penn West's 02/8-25/2 well was measured on April 30, 1998, and ranged between 30 167 and 31 198 kilopascals (kPa). It added that the initial pressure of the 9-24 well measured on January 23 and February 19, 2008, was 30 885 and 30 794 kPa respectively. Birchill stated that these two pressures from the 9-24 well were within 1 per cent of the highest pressure measured in the 02/8-25/2 well after this well had produced  $43.5 \times 10^6 \text{ m}^3$  of gas over 10 years. Birchill concluded that these pressure data indicated that little or no drainage from Section 24 had occurred due to the significant production of the 02/8-25/2 well. As such, Birchill believed that an additional Viking well in Section 24 would be expected to have no significant impact on the reserves of Penn West's 02/8-25/2 well.

Birchill submitted that the abandoned 00/8-25/0 well discovered the original Viking reservoir. It added that the 02/8-25/0 well, which was drilled about 30 m south of the 00/8-25/0 well, encountered a nonreservoir regional Viking sand. Birchill stated that this absence of Viking reservoir in the 02/8-25/0 well supported its interpretation that the 9-24 well and the 02/8-25/2 well were in separate pools, as an area containing no Viking pay existed between these two wells. Birchill noted that this conclusion was also supported by its seismic interpretation.

Birchill acknowledged that there was no precedent for reduced spacing for the Viking channels in the area of interest. It pointed out that the approved holding for Arriva Energy Inc. (Arriva) in Section 17 of Township 38, Range 8, West of the 5th Meridian (Section 17), allowed for gas production from the Viking Formation with a well density of two wells per pool per section and 300 m south and west buffer zones. However, Birchill admitted that this holding was in a different depositional environment. The Viking in Section 17 was a regional bar environment, while the Viking in Sections 24 and 25 was a channel-type environment.

Birchill submitted that the buffer zone requested in this application was consistent with the standard buffer zones established in ERCB *Bulletin 2007-27: Special Well Spacing Applications: Guidance on Determining Appropriate Buffer Zones for Holdings and Units* for holdings in Area 2 of the province. Birchill believed that Penn West had failed to offer any substantive reasons or technical justification to depart from the standard buffer zones specified in *Bulletin 2007-27*.

Birchill did not believe that there would be any unacceptable inequity resulting from reduced spacing. **Birchill submitted that its seismic interpretation revealed that the targeted Viking anomaly did not extend into Section 25.** It was Birchill's position that Penn West had acknowledged that its current 02/8-25/2 well did not drain the Viking anomaly and was not associated with it. Birchill stated that Penn West had not taken any steps to drain this resource,

although it was free to apply for regulatory approval to do so. It further added that Penn West's reluctance to drill a well to drain gas from the Viking anomaly that Penn West claimed underlay its lands should not impair Birchill's opportunity to do so on its own land. Birchill stated that the ERCB would be acting contrary to its mandate if Birchill were prohibited from draining the Viking resource underlying its land, as the resource would never be captured. Birchill further stated that Birchill and Husky would not object to reduced spacing on Penn West's lands in Section 25, as long as the holding requested two wells per pool per section and the standard buffer zone provided in *Bulletin 2007-27*, which would be 300 m from the south and west boundaries of Section 25.

## 5.2 Views of Penn West

Penn West argued that Birchill's application for reduced gas well spacing for the Viking Formation did not satisfy the requirements of Section 4.040(3) of the *OGCR*. Penn West stated that

- Birchill could not demonstrate increased recovery, given the lack of segregated data from the 9-24 well,
- the need for additional wells to drain the pool at a reasonable rate could not be proven, given the uncertainty of whether the 15-24 well would encounter the same Viking pool as the 9-24 well, and
- there was no precedent for reduced spacing for wells that had encountered Viking channel.

Penn West submitted that the anomaly that Birchill planned to target with its proposed well could be found under both Sections 24 and 25, with the majority being under Section 25.

**Based on its seismic evidence, Penn West interpreted that about 80 per cent of the targeted seismic anomaly was in Section 25 and the remaining 20 per cent was in Section 24 (see Figure 2). Penn West submitted that the Viking was detectable in this area due to appreciable pay and porosity, but it was undetectable in areas with less porosity and pay.**

Penn West submitted that if Birchill's application were approved, Penn West's equity position in Section 25 would be compromised, as Birchill's proposed well in 15-24 would drain Viking reserves from Section 25. However, Penn West acknowledged that it was considering drilling a second Viking well in the south half of Section 25. Penn West explained that as a large company, it would take a longer time to make such decisions compared to a small company, such as Birchill. It added that access to drilling and test data from the proposed 15-24 well would assist in this decision-making.

**Based on its seismic data, Penn West interpreted that the peak amplitude at the top of the Viking dimmed in the presence of a porous Viking channel and also in the presence of underlying proximal Notikewin channels. Penn West submitted that seismic was unable to resolve channel edges but could only detect the presence of the channel by the character of the Viking amplitude. Penn West offered the 12-32 well as an example to confirm this weakness. Penn West explained the difficulties associated with differentiating the regional Viking from that of the tight and/or thin Viking channels by comparing the seismic amplitude of the regional bar Viking in the 02/8-25/0 well to the tight Viking channel in the north half of Section 25 and the thin channel in the 9-24 well. Penn West stated that the seismic**

**amplitude of a porous-thin or tight-thin channel approached that of a regional Viking at these locations and that it became difficult to determine the actual edges of the Viking channels. It further stated that there was a tuning effect when the channel becomes thin, which did not affect the amplitude as it should when the channel is thick and porous.**

Penn West was of the view that Birchill's 15-24 well could possibly be in communication with the 02/8-25/2 well or other wells, including the 9-24 well, **based on seismic amplitude trend.** It interpreted that the proposed 15-24 well would be in the same pool as the 02/8-25/2 well, the 9-24 well, or any other new pool, but would not tie the 02/8-25/2 and the 9-24 wells into the same pool.

**Penn West acknowledged the possibility that the targeted anomaly extending to the south of Section 25 was not connected to the 9-24, well based on isolation of seismic amplitudes suggesting a different pool with significant improvement from the 9-24 well.**

Penn West maintained that the three-dimensional seismic used lacked the resolution necessary to deduce low or zero connectivity between the proposed 15-24 well and other offsetting wells, including the 9-24 well. **Penn West interpreted that the bulk of the detectable porosity and pay of the targeted anomaly was localized, as opposed to an extension of the 9-24 well.** Penn West had surveyed an on-target location to produce this anomaly, which it could produce from if the anomaly was isolated from the existing wells. Or it could shut in the 02/8-25/2 well and produce with no holding in place. **Penn West agreed that its seismic interpretation correctly placed Birchill's proposed location within LSD 15 with no exact "XY" location due to the observed anomaly with no Notikewin influence.**

Penn West contended that Birchill's evidence, including its calculated reserves, showed the possibility for Birchill to drill an on-target well within the north half of Section 24 with a 300 m buffer all around the section and a 500 m interwell distance. **Penn West explained that Birchill's seismic data confirmed its position and displayed a substantial resource underlying Section 24.**

Penn West argued that seismic with a BIN size of 25 m by 25 m could not resolve the actual thickness (vertical resolution) or edges (lateral resolution) of a channel and stated that the BIN size could not be changed.

**Penn West agreed with Birchill that there were some scaling issues with the Mannville coal thickness, but insisted that the trend or strength of the dimming would still be coming from the 15-24 location up through LSD 2 and into LSD 1 of Section 25 even after restoring the Upper Mannville coal to uniform thickness expected in the area. Penn West also argued that the presence of Birchill's interpreted near vertical fault at or near the boundary of Sections 24 and 25 may slightly affect the amplitude at that location, but would not eliminate the Viking amplitude dimming associated with thick and porous Viking in LSD 1 and 2 of Section 25.**

**Penn West interpreted the fault identified by Birchill as an indirect indicator of reservoir development that was consistent with its depositional model, since it created accommodation space for Viking sediments.**

**Penn West stated that despite Birchill's agreement that the Notikewin channels could add risk and uncertainty by dimming of the Viking amplitudes such that they were unreliable as a porosity indicator, Birchill failed to address the Notikewin channel present in Section 24 in the 9-24 well.**

Penn West submitted that incremental recovery in Section 24 could not be proven, due to the lack of segregated production data, subsequent pressure data, well test data, production logging data, and core data for the 9-24 well. As a result, Penn West stated that there was no evidence to confirm the actual size of the Viking reservoir encountered by the 9-24 well. Given that gas production in the 9-24 well was currently commingled in the Cardium, Viking, and Glauconitic Formations, Penn West could not determine the contribution of the individual formations. It was Penn West's position that the holding application was submitted to allow Birchill the unconstrained production of an off-target well and not to achieve incremental recovery within Section 24.

Penn West acknowledged that the 9-24 well had the lowest AOF compared to the absolute open flow potential (AOF<sub>P</sub>) of other Viking wells in the Strachan area. However, Penn West indicated that the actual performance of the 9-24 well may be significantly greater than the AOF would indicate and that Viking wells in the area actually had been shown to produce above their AOF for extended periods of time. It further added that this AOF was a wellhead AOF, which was expected to be less than the AOF<sub>P</sub>, which was not measured in the 9-24 well. Penn West submitted that the AOF was not sufficient to determine the actual size of the reservoir.

Penn West estimated the OGIP of its 02/8-25/2 well to be about  $80.5 \times 10^6 \text{ m}^3$ , based on material balance. Penn West also estimated the recoverable reserves of its 02/8-25/2 well to be about  $56.3 \times 10^6 \text{ m}^3$ , based on decline curve extrapolation, and it back-calculated a drainage area of 142.8 hectares. Penn West submitted that this drainage area of over half a section suggested that the Viking pool encountered by its 02/8-25/2 well, in the absence of a clearly defined reservoir orientation/trend, was likely to extend beyond the boundaries of Section 25 and that there was a possibility that the 02/8-25/2 well could be in communication with a new well drilled in close proximity to the Section 25 boundary including the targeted anomaly. Penn West interpreted a relatively high permeability for the Viking reservoirs in the Strachan area based on the profile and shape of the decline curve for the 02/8-25/2 well. Penn West agreed that the 02/8-25/2 well had modest production when compared to the 9-24 well, despite both wells being thin channel reservoirs. It further noted that the wellbore configuration of the 02/8-25/2 well, which was a highly deviated well with open-hole completion, contributed to this production.

Penn West believed that the OGIP calculated by Birchill for the north half of Section 24 was hypothetical, since Birchill calculated this value by assuming a thick net pay value over an entire half section. Penn West stated that if this OGIP were accurate, Birchill could drill a well anywhere within the north half of Section 24 to access the Viking reserves and that the off-target location at 15-24 was not required.

Penn West agreed with Birchill that the 02/8-25/2 and 9-24 wells were not in communication based on pressure data. However, since the pressure of the proposed 15-24 well was unknown, it was Penn West's position that it was possible that its 02/8-25/2 well may be in communication with Birchill's proposed well at 15-24.



Penn West argued that there was no precedent for reduced spacing for the Viking channel in the Strachan area. Penn West submitted that the Viking reservoir in the holding approved for Arriva in Section 17 was for a different depositional environment (Viking marine bar) from that of Sections 24 and 25 (Viking channel). It further stated that Arriva's wells were not off-target to Penn West's lands.

Penn West stated that it was aware that the buffer zone requested by Birchill was consistent with the standard buffers established in *Bulletin 2007-27*. It was Penn West's position that Birchill was using the holding application process to allow Birchill to specifically target a seismically defined geological feature on the lease line between Sections 24 and 25. Penn West stated that the proposed 15-24 well would result in lease line drainage that would have an adverse impact on Penn West. It further stated that Birchill's requested holding was predicated on a low-quality reservoir, but Birchill's sole objective was to drill a high-quality well, which was expected to be of higher quality than the best Viking well in the area. Penn West submitted that a holding with a buffer zone of less than 300 m from the section boundary would still result in inequity, regardless of which company drilled the Viking anomaly first.

Penn West believed that a 300 m south and west buffer zone could only be justified in cases where a large multi-DSU reservoir of low quality was being targeted. Penn West stated that the standard buffers in *Bulletin 2007-27* did not need to be applied in this application. Penn West believed that *Bulletin 2007-27* was a guideline and not a binding rule. Penn West added that it had submitted technical justification as to why the standard buffers should not be applied in this case and, as such, the Board was not bound by *Bulletin 2007-27*.

### 5.3 Findings of the Examiners

The examiners considered the seismic evidence and interpretations presented by both parties and observed the following:

- The parties had differing views on the location and areal extent of the Viking anomaly that Birchill planned to target. **Birchill's seismic interpretation and mapping showed a Viking anomaly essentially confined to the north half of Section 24, while Penn West's seismic interpretation and mapping showed about 80 per cent of the anomaly located in Section 25, with the remaining 20 per cent located in Section 24.**
- There were differences between the parties' seismic interpretations. For instance, Birchill submitted that three-dimensional seismic with BIN size of 25 m by 25 m could sufficiently determine communication and resolve channel edges. However, it admitted that multiple pools could exist in the same section, based on the observed discontinuities in seismic amplitudes between the proposed 15-24 well and the 9-24 well, which were believed to be in the same channel. Penn West, on the other hand, stated that with similar BIN size, seismic was unable to determine communication and channel edges and could not resolve channels less than 25 m in thickness.
- The parties believed that there were significant flaws in each other's seismic interpretation. Birchill argued that the non-uniform and inconsistent thickness of a key marker formation, **the Mannville coal**, in Penn West's seismic interpretation did not accurately depict the geology of the area. Penn West, on the other hand, argued that Birchill did not account for

the influence of a deeper formation, **specifically the effect of the Notikewin channel**, on the observed Viking amplitude.

- Each party had the seismic data processed and modelled exclusively.

The examiners appreciate the complexities associated with the processing and modelling necessary to produce a detailed seismic analysis. The examiners find the submitted analysis to be highly interpretive, given that each party has the ability to influence the processing and modelling of the data. Furthermore, the examiners are of the view that seismic data cannot accurately confirm communication or pool continuity and extent, but can only suggest it.

The examiners find that the seismic evidence and analysis have assisted them in reaching the conclusion that an anomaly with the potential to contain considerable gas reserves exists in the area. However, after considering the parties' seismic interpretations, the examiners are unable to determine the location and the areal extent of the anomaly or whether the targeted anomaly is in communication with an existing Viking pool. As a result, the examiners are unable to adopt one party's seismic interpretation over the other.

The examiners note that while the parties agreed that the Viking interval encountered in the 9-24 well was of poorer quality, suggesting a channel edge (thin channel) location, there were differences between Birchill's and Penn West's views with respect to the production life of the 9-24 well. Specifically, Birchill estimated that it would take 106 years for the 9-24 well to produce the estimated gas reserves contained in the north portion of Section 24. Birchill's estimation was based on the 9-24 well producing at the constant rate of the initial AOF for the Viking interval and assumed that the Viking in the north half of Section 24 has an average net pay of 10 m over the half section. Penn West was of the view that the production rate from the Viking in the 9-24 well was not known because of the commingled nature of its production. Penn West suggested that segregated testing should be conducted in order to more accurately determine the current production contribution of each perforated interval and believed the absence of these data does not allow for the accurate determination of the production life of the 9-24 well. Penn West also did not agree with Birchill's assumption of an average thickness of 10 m over the half section.

The examiners acknowledge that the production life for the 9-24 well cannot be determined with an absolute certainty; however, the examiners believe that the available information does permit a general assessment of the capacity of the 9-24 well to drain the pool at a reasonable rate in the context of clause (b) of Section 4.040(3) of the *OGCR*. In this regard, the examiners find the following:

- The assumption by Birchill of an average 10 m thickness of the Viking in the north half of Section 24 is optimistic. However, both parties identify an anomaly within the area of application, and therefore the parties have attributed some pay to the Viking. The examiners find that there is a thickening of the Viking in the area of application.
- The initial AOF distribution showed that the Viking interval in the 9-24 well was contributing about 20 per cent of the total initial production. The November 2008 commingled production rate showed about a 50 per cent decline from the initial production rate in November 2007. A review of the log information filed in the hearing showed that the Viking interval had about 12 per cent of the total net pay thickness for the three commingled

zones. While the areal extents of the three intervals are unclear, the examiners believe it is unlikely that the Glauconitic and Cardium Formations have been fully depleted.

- Birchill's approach of determining the time it would take the 9-24 well to drain the pool based on its estimated gas reserves and the original AOF may be optimistic, and some discounting is considered necessary in the circumstances. Based on the finding that the Viking thickens in the area of application and taking a conservative approach, the examiners assumed that the Viking reserves in the north half of Section 24 were 50 per cent of what Birchill submitted. The examiners also assumed that the production rates from the Glauconitic and Cardium Formations had declined significantly more than the decline in the production rate from the Viking Formation, such that the Viking is now providing 40 per cent of the total commingled production rate. This set of assumptions results in a remaining life of about 50 years. While there may be other combinations of assumptions that could be made, the examiners find no reason to completely discount production from the other two zones or adopt a small volume of gas inconsistent with the presence of an anomaly. Accordingly, within a calculation bounded by some current production coming from two or more of the commingled zones, the examiners find that it would take a long time for the 9-24 well to produce the Viking reserves. Therefore, the rate at which the pool could be drained by the 9-24 well is considered to be unreasonable.
- Since the estimated production life for the 9-24 well is still very long and segregated testing would only provide point-in-time data and not the trend that Penn West viewed as the most desirable and reliable information, the examiners find no compelling reason to require segregated testing to be done on the 9-24 well.

Based on these findings, the examiners conclude that an additional well is necessary to provide capacity to drain the Viking pool at a reasonable rate.

Considering that the parties were in agreement that the Viking interval encountered in the 9-24 well was of poorer reservoir quality, suggesting a channel edge (thin channel) location, and that there were wide variations in reservoir properties evident in the three wells drilled in close proximity to each other in Section 25, indicative of high reservoir heterogeneity, the examiners also believe that a second well in Section 24 would likely also provide some additional gas recovery. However, there is insufficient information for the examiners to determine whether or not the expected incremental increase in gas recovery would be significant. Therefore, the examiners are not able to determine that improved recovery would be obtained and consequently clause (a) of Section 4.040(3) of the *OGCR* is not met.

The examiners note that Penn West stated it was also considering drilling a second well in the south half of Section 25 and commented that access to drilling and test data from the proposed 15-24 well would assist it in making the decision whether to drill a second well. The examiners find this statement to be inconsistent with Penn West's position that an additional Viking well is not required to recover Viking reserves in the area of application.

With regard to the broad question of whether or not granting the requested holding would result in any unacceptable inequity, the examiners note that the ERCB's standard rules regarding buffer zones would normally apply in this case. Accordingly, the requested buffer zone is consistent with the standard buffer zones established by Section 4.030(2.1)(b) of the *OGCR* and described by the ERCB in *Bulletin 2007-27*. The examiners are of the view that Penn West has not raised

sufficient technical justification for the Board to deviate from the standard buffer zones. These standard buffer zones were established to give industry the greatest flexibility for well placement in holdings, and there is no prescribed limitation that restricts the use of holdings to large pools and not to focused geological features, as suggested by Penn West. Corner target areas are well established in certain areas in Alberta, and these target areas inherently grant the opportunity to produce from wells close to at least one lease line. Penn West's position on inequitable drainage is largely based on its seismic interpretation, which in its view suggested that the majority of the anomaly is located in Section 25. For the reasons outlined above, this evidence is viewed by the examiners as inconclusive. The examiners are not convinced that the requested reduced spacing would result in inequitable drainage of gas underlying Penn West's lands. The examiners also note that Penn West has the opportunity to submit its own application for a holding to produce more than one Viking well in Section 25.

#### **5.4 Other Matter**

In its final argument, Penn West introduced a new concern that the holding applied for by Birchill was unlawful, as the applicable legislation required common ownership throughout a holding. Penn West argued that the ownership in Section 24 was not common, given that Birchill would not have an interest in Section 24 until it drilled a well. Penn West further stated that even after Birchill drilled a well, the ownership would still not be common because Husky had not agreed to transfer any ownership interest in its 9-24 well and there was no pooling agreement between Birchill and Husky in place or on the horizon.

In response, Birchill reiterated that Husky was the 100 per cent holder of the mineral rights in Section 24. Birchill submitted that Husky was the party that should have raised a concern related to ownership, not Penn West, and if Husky had concerns about the legality of the holding application, it would not have agreed to this application. Birchill submitted that if the Board were to rule that a farmee, such as Birchill, could not apply for a holding because it did not have common ownership, this would broadly impact the oil and gas industry, where these types of farm-in agreements are quite common. Finally, Birchill argued that this was "trial by ambush" as Penn West did not raise this issue in the written submissions or put it directly to Birchill's witnesses, but raised it for the first time in final argument. Birchill stated that it was clear that Husky was the 100 per cent owner in Section 24, and Birchill could have provided the terms of the farm-in agreement and potentially any other agreements that might exist, had it known these agreements would be pertinent.

The examiners note that common ownership is a firm requirement that industry must satisfy when applying for a holding. The purpose of a common ownership requirement is to allow for parties located within a holding to receive a fair share of the production. The rights of parties offsetting a holding are protected by terms of the holding, such as buffer zones.

In this particular case, during the hearing Birchill made it clear that it applied for the holding on behalf of Husky and that it was authorized to represent Husky in the proceedings. Husky is the 100 per cent owner of the mineral rights in Section 24, therefore there is common ownership throughout the proposed holding. Any approved holding would be issued to Husky, not to Birchill. In order for common ownership to fail, Birchill must first earn an interest in the holding and then, if not already established, Husky and Birchill must fail to reach a pooling agreement.

The examiners find that it is speculative for Penn West to argue that there will not be common ownership at some point in the future.

Consequently, the examiners find that the legal requirements for common ownership in Section 24 are met and the application for a holding may be considered subject to Section 4.040(3) of the *OGCR*.

The examiners note that this issue was not raised in the written submissions or put to Birchill directly during examination by Penn West. Raising issues in final argument is unfair to the other parties and is contrary to the *Energy Resources Conservation Board Rules of Practice*, and the Board may refuse to consider such issues.

## 6 CONCLUSION

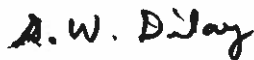
Based on the above, the examiners are satisfied that Birchill's application satisfies the criterion in Section 4.040(3)(b) of the *OGCR*. Specifically, additional wells are necessary to provide capacity to drain the pool at a reasonable rate that will not adversely affect recovery from the pool. Approval of the application would not result in an unacceptable inequity to Penn West, and Penn West has not raised sufficient technical justification for the Board to deviate from the standard buffers established by Section 4.030(2.1)(b) of the *OGCR*. The examiners therefore recommend that the application be approved.

Dated in Calgary, Alberta, on December 1, 2009.

### ENERGY RESOURCES CONSERVATION BOARD



R. J. Willard, P.Eng.  
Presiding Member



G. W. Dilay, P.Eng.  
Examiner



T. A. Dibus, P.Geol.  
Examiner

## APPENDIX 1 HEARING PARTICIPANTS

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### Principals and Representatives (Abbreviations used in report)

### Witnesses

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Birchill Exploration Corp. (Birchill)  
M. Ignasiak

P. MacDonell, P.Eng.  
B. Dick, P.Geoph.

Penn West Petroleum Ltd. (Penn West)  
J. Lowe

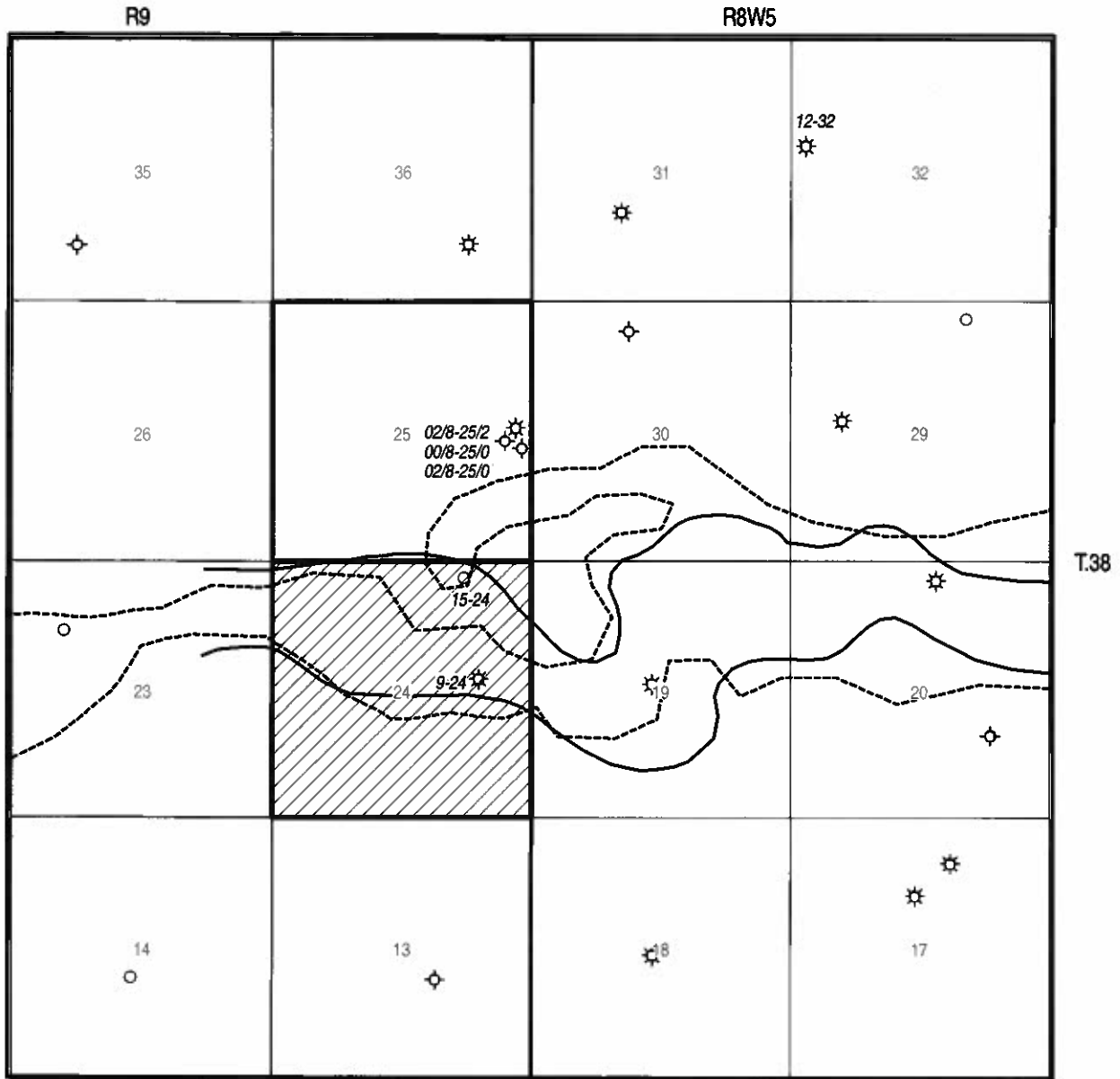
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A. Lung  
K. Fisher  
P. Gigantelli, P.Geol.  
M. Wuraola, P.Geol.

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**Legend**

- ⊕ Abandoned well
- Proposed location
- ⊛ Gas well
- Birchill interpretation
- - - Penn West interpretation
- ▨ Application area
- Penn West mineral interest

**Figure 2. Viking channel trends**