Annual Surmont SAGD Performance Review Approval 9426

April 4, 2018
Calgary, Alberta, Canada
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Introduction, Overview and Highlights

Subsection 3.1.1 (1)
Ownership

- The Surmont In-Situ Oil Sands Project is a 50/50 joint venture between ConocoPhillips Canada Resources Corp. (ConocoPhillips) and TOTAL E&P Canada Ltd; operated by ConocoPhillips.

Project History

- 1997 - First steam at pilot project
- 2007 - First steam at Phase 1
- 2010 - Construction start at Phase 2
- 2015 - Start-up of Phase 2, solvent soak on well pairs 7&8 on pad 103
- 2016 - Start-up of liquid scavenging system

Approval Update - AER Approval No. 9426

Approval 9426MM – June 14, 2017
- Application No. 1880767 - Temporary MOP Increase at DA 262-3 to address problem wells

Approval 9426NN – February 1, 2018
- Application No. 1902010 – NCG Co-injection at four Phase 1 DAs and eleven Phase 2 DAs
- Application No. 1903163 – MOP increase at six Phase 2 DAs: 266-2, 263-2, 264-2, 263-1, 264-1, and 103

Approval 9426OO – March 23, 2018
- Application No. 1906715 – Alternate diluent project to enable the use of condensate
Surmont Overview

Phase 1 is focused on the optimization of production and steam.

Phase 2 is focused on the well ramp up and pressure management.

Currently in a “One Surmont” philosophy.

Surmont combined approved capacity is 29,964 m³/cd (188,700 bbl/cd)*
*(where cd is calendar day on an annual average basis)
Phase 1 production recovery

- Initial results from tubing deployed flow control devices at Pad 101/102 illustrate an increase in total emulsion/bitumen rates.
- Liner installed flow control devices at Pad 103 continue to outperform slotted liners wells.
- iSOR at February 28, 2018 is at an average of 2.84.

Phase 2 continued ramp-up

- Tubing deployed flow control devices continued to strengthen Surmont oil output.
- Liner deployed flow control devices are confirming faster development of the wells compared to typical slotted liner wells.
- Some wells are still challenged with injectivity/productivity issues, which translates into a slower ramp-up or underperformance based on original expectations. Evaluation of optimization opportunities continues.
- 266-2 pad start-up completed
- Forty-five ESP conversions were performed to enable pressure management strategy.
- iSOR at February 28, 2018 is at an average of 3.20.
Subsurface Resource Evaluation and Recovery

Geology and Geoscience
Subsection 3.1.1 (2)
No new wells were drilled between Mar 1, 2017 to Mar 1, 2018
2017-2018 Delineation Campaign and Core Density

Cored Wells – Surmont Lease

Surmont Lease as of March 1, 2018

- 1531 wells total
- 549 existing core wells

- Phase 1 and Phase 2 Development Area
- Drainage Areas

No new cores were cut between Mar 1, 2017 to Mar 1, 2018

Last years presentation stated there were 6 new core from the 2016-2017 program, however, 1 core had been cancelled leaving only 5
2017-2018 Delineation Campaign and FMI/CMI Logs

Subsection 3.1.1 (2f)

No new wells were drilled between March 1, 2017 and March 1, 2018; hence no FMI/CMI logs were taken.
Delineation across Phases 1, 2, and 3

2017-2018 Delineation Campaign and Well Density

Delineation Well Density Map
Mar 2017

Delineation Well Density Map
Mar 2018

Density Map Difference

McMurray penetrated wells only

Subsection 3.1.1 (2f)
Increased core density with latest drilling

2017-2018 Delineation Campaign and Well Density

Cored Wells Density Map
Mar 2017

Cored Wells Density Map
Mar 2018

Cored Density Map Difference

McMurray penetrated wells only
2017-2018 Delineation Campaign and Well Density

Increased Formation Micro Imaging density with latest drilling

FMI Well Log Density Map Mar – 2017

FMI Well Log Density Map Mar - 2018

FMI Density Map Difference

Subsection 3.1.1 (2f)
Interpreting SAGD Interval

Fluid Surfaces

- **Top Gas Surface**: The uppermost limit of gas-bearing sands
- **Bottom Gas Surface**: The lowest occurrence of gas-bearing sands
- **Top Water Surface**: The uppermost limit of water-bearing sands
- **Bottom Top Water Surface**: The lowest occurrence of water-bearing sands above the bitumen
- **Top Bitumen Surface**: The uppermost limit of bitumen-bearing sands with deep resistivity of 10 ohm or greater and a Vsh cutoff of less than 33%
- **Top Continuous Bitumen Surface (TCB)**: The uppermost limit of good reservoir, bitumen-bearing sands.

Gross Fluids

- **Top Gas**: Gross thickness of gas-bearing sands defined by the top and bottom gas surfaces
- **Top Water**: Gross thickness of water-bearing sands defined by the top and bottom water surfaces
- **Top Bitumen**: Gross thickness of bitumen-bearing sands defined by the top and base bitumen surfaces
- **Continuous Bitumen / SAGD Interval**: Gross thickness of continuous bitumen reservoir with deep resistivity of 40 ohm or greater, and does not include continuous muds greater than 3m thick. SAGD interval would be from the producer level (approx. 5m above BCB) to the top of this zone.
- **Bottom Water**: Gross thickness of water-bearing sands defined by the top and bottom water surfaces
Phase 1 Type Log Well Pad 101

Example Log 100161408307w400

McMurray
Continuous Bitumen
Devonian

Phase 1 Area
Pad 101
Type Log
Phase 2 Type Log – Well Pad 264-2

Example Log 100162208306w400

- **McMurray**
  - Top Gas
  - High Sw

- **Continuous Bitumen**

- **Devonian**

Phase 2 Area

Subsection 3.1.1 (2e)
Phase 2 Type Log – Well Pad 261-3

Example Log 100043508306W400

McMurray Net Continuous Bitumen (NCB)

Phase 2 Area

McMurray Net Continuous Bitumen (NCB)

Drainage Area

Continuous Bitumen

Example Log
Phase 2 Type Log – Well Pad 262-2

Example Log 100163408306W400

Phase 2 Area

McMurray Net Continuous Bitumen (NCB)

Example Log

Continuous Bitumen

Drainage Area

Subsection 3.1.1 (2e)
Phase 1 Type Log – Well Pad 103

Example Log 100052308307W400

Phase 1 Area

McMurray Net Continuous Bitumen (NCB)

Continuous Bitumen

Drainage Area

Subsection 3.1.1 (2e)
Subsection 3.1.1 (2f)

**Objectives:**

- Characterize vertical and lateral variance in viscosity at different temperatures.
- Model the variance in bitumen properties and its implications for bitumen production rates during SAGD.
- Characterize relationship between viscosity, density and geochemical composition.

*Viscosity increases with depth in the McMurray Formation.*

- **52 existing viscosity sample wells**
- **Delineated Wells - Surmont**
Viscosity Gradient

Subsection 3.1.1 (2f)

Height above base of bitumen (m)

Dead oil Viscosity (cP)

ConocoPhillips
Representative Structural Cross Section
A well at 4-3-84-6 W4M intersected a raised bitumen/water contact, the contact is ~ 12 m higher than the nearest offset.

The well also intersected a small gas pool under the bitumen.

The presence of basal water becomes a potential impact on production performance on Well Pad 262-1.
## Reservoir Characteristics

### Subsection 3.1.1 (2b)

#### Development Area

**Surmont Lease**

**Drainage Areas**

<table>
<thead>
<tr>
<th>Properties</th>
<th>Depth (masl)</th>
<th>Area (m²)</th>
<th>Thickness NCB (m)</th>
<th>Phie in NCB %</th>
<th>So in NCB %</th>
<th>KH in NCB (mD)</th>
<th>KV in NCB (mD)</th>
<th>Initial Pressure (KPa)</th>
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</thead>
<tbody>
<tr>
<td>Lease</td>
<td>~250</td>
<td>578578000</td>
<td>23.07</td>
<td>31.82%</td>
<td>76.79%</td>
<td>4113</td>
<td>3423</td>
<td>1700</td>
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<tr>
<td>101N</td>
<td>277.52 - 212.11</td>
<td>1090775</td>
<td>35.53</td>
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<td>82.40%</td>
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<td>101S</td>
<td>272.96 - 218.47</td>
<td>1064692</td>
<td>37.43</td>
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<td>80.41%</td>
<td>5482</td>
<td>4604</td>
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<tr>
<td>102N</td>
<td>276.39 - 223.91</td>
<td>975251</td>
<td>31.14</td>
<td>32.71%</td>
<td>80.29%</td>
<td>4536</td>
<td>3877</td>
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<td>264-1</td>
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<td>79.71%</td>
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<td>4763</td>
<td>3965</td>
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<td>281.29 - 207.61</td>
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<td>37.51</td>
<td>31.97%</td>
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<td>271.50 - 215.59</td>
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<td>38.75</td>
<td>32.54%</td>
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<td>42.99</td>
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<td>80.08%</td>
<td>4925</td>
<td>4121</td>
<td>1337</td>
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</tbody>
</table>
McMurray Gross Isopach

2017/2018 Mapping Update
- Minor changes due to:
  - Revised Mapping Surfaces
  - Geological picks from 2016/2017 delineation wells
  - Re-evaluated/unified geologic picks

McMurray Gross Isopach
McMurray Net Gas Isopach

Net Top Gas thickness = sands have deep resistivity $>10 \ \Omega\cdot m$ and Vsh $<65\%$

2017/2018 Mapping Update
- Minor changes due to:
  - Revised Mapping Surfaces
  - Geological picks from 2016/2017 delineation wells
  - Re-evaluated/unified geologic picks

Subsection 3.1.1 (2c)
Net Top Water thickness = 
sands have deep resistivity 
<10 Ω-m and Vsh <45%

2017/2018 Mapping Update
- Minor changes due to:
  - Revised Mapping Surfaces
  - Geological picks from 2016/2017 delineation wells
  - Re-evaluated/unified geologic picks

McMurray Net Top Water Isopach
McMurray Net Bottom Water Isopach

Net Bottom Water thickness = sands have deep resistivity <10 $\Omega\cdot$m and Vsh <45%

2017/2018 Mapping Update
- Minor changes due to:
  - Revised Mapping Surfaces
  - Geological picks from 2016/2017 delineation wells
  - Re-evaluated/unified geologic picks
McMurray Top Continuous Bitumen Structure

TCB = The uppermost limit of good reservoir, bitumen-bearing sands.

Subsection 3.1.1 (2d)

2015/2016 Delineation Campaign Update

- December 2015 – minor changes due to:
  - Re-evaluated/unified geologic picks
  - Revised Seismic Interpretation

2016/2017 Delineation Campaign Update

- Minor changes due to:
  - Geological picks from new Wells
  - Re-evaluated/unified geologic picks
  - Revised Seismic Interpretation

2017/2018 Mapping Update

- Minor changes due to:
  - Revised Mapping Surfaces
  - Geological picks from 2016/2017 delineation wells
  - Re-evaluated/unified geologic picks
McMurray Base Continuous Bitumen Structure

BCB = First occurrence of good reservoir, bitumen-bearing sands.

Base Continuous Bitumen Structure

2017/2018 Mapping Update

- Minor changes due to:
  - Revised Mapping Surfaces
  - Geological picks from 2016/2017 delineation wells
  - Re-evaluated/unified geologic picks
McMurray Net Continuous Bitumen Pay

Net continuous bitumen = sands have deep resistivity > 40 Ω-m and Vsh <33%, and no shale greater than 3 m thick

2017/2018 Mapping Update
- Minor changes due to:
  - Revised Mapping Surfaces
  - Geological picks from 2016/2017 delineation wells
  - Re-evaluated/unified geologic picks
Surmont Leases OBIP

Properties Development Area

<table>
<thead>
<tr>
<th>NCB Thickness Range</th>
<th>Development Area</th>
</tr>
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<tbody>
<tr>
<td>0 to Greater than 30 m</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phie in NCB</th>
<th>31.72%</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>So in NCB</th>
<th>75.78%</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>OOIP in NCB &gt; 18m</th>
<th>3423.25 MMbbls Deterministic</th>
</tr>
</thead>
</table>

Surmont Development Area OBIP

OBIP = Thickness x Phie x So x Area
Maximum Bottomhole Injection Pressure (kPag) – ALL PADs
Surface Deformation Monitoring

- Satellite (RADARSAT-2) measurements every 24 days
- Interferometric Synthetic Aperture Radar (InSAR):
  - Corner Reflectors (CR) installed over pads and in areas to measure background deformations.
  - 256 CR’s installed since monitoring program began in 2008.
  - An additional 20 Corner reflectors were installed in 2017 at Phase 2 but are not tied into our current routine data collection yet, so they are not shown on the map.
InSAR Surface Deformation Monitoring

**Vertical Deformation Mar 1 2017 to Jan 31 2018**
(Surmont 1)

- Deformation currently in line with expectations.

**Vertical Deformation Mar 1 2017 to Jan 31 2018**
(Surmont 2)

- Corner Reflector
- Reference Corner Reflector
- Corner Reflector w/quality issue
- Corner Reflector w/Frost Jacking
Caprock Integrity

- Caprock Core Analysis:
  - 14 caprock cores were drilled and analyzed in 2015-2017.
  - Four rock mechanics testing programs were conducted in 2015-2017.

- Diagnostic Fracture Injectivity Tests (DFITs):
  - 8 DFITs were carried out in 2015-2017
  - DFIT locations were selected based on structural and geomechanical analysis of the caprock.

- The completed analysis verified that
  - The best seals within the cap rock interval are the deeper water deposits occurring on maximum flooding surfaces.
  - The seal over the development area is continuous, consistent and laterally extensive.

Conclusions from the study:
- Best Seal: Deeper water deposits
- Muds are more than 80% clay and are correlated throughout and beyond the Surmont lease.
- The geological and geomechanical properties of the caprock allow for providing a continuous seal over the steam chamber.
• ConocoPhillips applies a highly conservative approach towards Subsurface Containment Assurance and follows a stringent approach based on internal SCA standards and regulations.

• Caprock integrity studies in ConocoPhillips include extensive geological, geophysical, petrophysical and geomechanical investigations. ConocoPhillips continues to acquire and interpret the data to mitigate SCA related risks.

• Results of caprock integrity studies allow ConocoPhillips to characterize and mitigate local risks related to geological and geomechanical variations. Analysis of caprock in the development area suggests while the previously used value of 18.4 kPa/m is valid, the minimum horizontal stress is higher in several drainage areas.

• ConocoPhillips continues to propose a flexible tapered strategy envelope bound by the cap rock integrity study and the associated Maximum Operating Pressure (MOP) on one side and economic achievable pressures on the other side. In 2017/18 temporary and permanent changes were made to the MOPs in a number of DAs in Surmont.

• ConocoPhillips has received approval to increase MOP from 15 kPa/m to 16.5 kPa/m in eight DAs in Surmont.

• Another approval was received to temporarily increase the MOP in one DA (262-3) to overcome near-wellbore barriers. A pilot test using one well pair was completed with the temporary MOP and results are being studied before proceeding with the rest of the DA well pairs.
The static geomechanical model used for caprock integrity analyses is regularly updated based on acquired and interpreted data.

Static modeling of reservoir and caprock is used in combination with dynamic simulation of their geomechanical and pressure responses is used to estimate the SCA safety factors.

For all applications and MOP changes, ConocoPhillips has demonstrated that the SCA safety factors have been maintained above 1.2 for the base cases.
Drilling and Completions

Subsection 3.1.1 (3)
Surmont Well Summary

Legend
Well Status:
- ESP
- PCP
- Gas List
- Circulation
Surmont FCD Installations

Legend
FCD Installations:
- **Prod. LDFCD**
  - Phase 1: 12
  - Phase 2: 27
- **Prod. TDFCD**
  - Phase 1: 8
  - Phase 2: 27
- **Inj. LDFCD**
  - Phase 1: 8
  - Phase 2: 5
## Lateral Interwell Spacing

<table>
<thead>
<tr>
<th>Well Identifier - Surface (Downhole)</th>
<th>Lateral Interwell Spacing</th>
<th>Average Infill Spacing</th>
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</thead>
<tbody>
<tr>
<td>101</td>
<td>125 m</td>
<td>62.5 m</td>
</tr>
<tr>
<td>102</td>
<td>125 m</td>
<td>62.5 m</td>
</tr>
<tr>
<td>103</td>
<td>90 m</td>
<td>n/a</td>
</tr>
<tr>
<td>103 – WP 11 &amp; 12</td>
<td>80 m</td>
<td>n/a</td>
</tr>
<tr>
<td>261-3</td>
<td>83 m</td>
<td>n/a</td>
</tr>
<tr>
<td>262-1</td>
<td>83 m</td>
<td>n/a</td>
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<td>262-2</td>
<td>83 m</td>
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</tr>
<tr>
<td>266-2</td>
<td>83 m</td>
<td>n/a</td>
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</table>
## 2017 Re-Drills

- Total of 6 re-drills in 2017.

<table>
<thead>
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<th>Redrill Type</th>
<th>264-2 P04</th>
<th>264-2 P09</th>
<th>264-3 P04</th>
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<tr>
<td>Redrill Type</td>
<td>Whipstock</td>
<td>Whipstock</td>
<td>Whipstock</td>
</tr>
<tr>
<td>Reason for Redrill</td>
<td>Optimization/Unable to recover long tubing due to significant liner deformation</td>
<td>Half of Producer well not open to production due to sand control failure in 2016</td>
<td>The decision was driven by expected production uplift. The well was performing poorly and the liner was too deformed to allow us to run other completions in the existing wellbore.</td>
</tr>
<tr>
<td>Whipstock Depth (mKB)</td>
<td>430 mKB</td>
<td>432.5 mKB</td>
<td>447 mKB</td>
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<tr>
<td>Whipstock Depth (mTVD)</td>
<td>339 mTVD</td>
<td>333 mTVD</td>
<td>345 mTVD</td>
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<tr>
<td>Liner Length (m)</td>
<td>1096 m</td>
<td>1228 m</td>
<td>1342 m</td>
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<tr>
<td>FCD interval Length (m)</td>
<td>937 m</td>
<td>991 m</td>
<td>1195 m</td>
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<tr>
<td>Completion</td>
<td>Gas Lift</td>
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<tr>
<td>Comments</td>
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## 2017 Re-Drills Continued

<table>
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<th>Redrill Type</th>
<th>264-2 P05</th>
<th>266-2 I01</th>
<th>103 P07</th>
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<tbody>
<tr>
<td>Reason for Redrill</td>
<td>Optimization/Unable to recover long tubing due to significant liner deformation</td>
<td>Steam injection significantly dropped off on both heel and toe, impacting chamber development and producer performance. Troubleshooting indicated potential liner plugging. Re-drilling the injector was the top option to fix the issue, and meet forecasted injection/production rates.</td>
<td>4” Toe Tubing Fish in well from 1356.79 to 1399.99 mkb. 392m of 15.9mm Lx Data coil in the lateral. 36 missing clamps in the lateral. Liner Failure at 1259mkb. Packed sand in BHA and 15m of tubing. 4 gallons of metal shavings recovered. Hard Tag @ 1259mkb – did not get past. Opted for sidetrack</td>
</tr>
<tr>
<td>Whipstock Depth (mKB)</td>
<td>435 mKB</td>
<td>552.6</td>
<td>513.29</td>
</tr>
<tr>
<td>Whipstock Depth (mTVD)</td>
<td>345 mTVD</td>
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<td>440.61</td>
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<td>Sidetrack is 7” O.D. ESP landed above sidetrack point due to 7” ID restriction. Slimhole completion design is in development.</td>
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Well Pad 101 North
Producer and Injector Vertical Offset

Subsection 3.1.1 (3a)
Well Pad 101 South
Producer and Injector Vertical Offset

Subsection 3.1.1 (3a)
Well Pad 103
Producer and Injector Vertical Offset

Pad 103

Subsection 3.1.1 (3a)
Well Pad 261-3
Producer and Injector Vertical Offset

Pad 261-3

Subsection 3.1.1 (3a)
Well Pad 262-1
Producer and Injector Vertical Offset

Subsection 3.1.1 (3a)
Pad 262-2

Subsection 3.1.1 (3a)
Subsection 3.1.1 (3a)
Well Pad 263-1
Producer and Injector Vertical Offset

Pad 263-1

Subsection 3.1.1 (3a)
Well Pad 263-2
Producer and Injector Vertical Offset

Subsection 3.1.1 (3a)
Well Pad 264-1
Producer and Injector Vertical Offset

Subsection 3.1.1 (3a)
Well Pad 264-1-11 Fishbone
Producer and Injector Vertical Offset

Injector has 3 legs while producer has 7 legs. 3 vertical offsets.
Well Pad 264-2
Producer and Injector Vertical Offset

Pad 264-2

Subsection 3.1.1 (3a)
Well Pad 264-3
Producer and Injector Vertical Offset

Subsection 3.1.1 (3a)
Well Pad 266-2
Producer and Injector Vertical Offset

Pad 266-2

Subsection 3.1.1 (3a)
Typical Concentric Injector

- 16” Surface Casing
- 11 ¾” Intermediate casing
- 7” Heel tubing String
- 8 5/8” Slotted Liner
- Liner Hanger
- 4 ½” Toe String
### Pad 101, 102 & 103 Well Completions

<table>
<thead>
<tr>
<th>Well Identifier - Surface (Downhole)</th>
<th>Producer Completion</th>
<th>Injector Completion</th>
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## Pad 261-3 & 262-1 Well Completions

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### Pad 263-1 & 263-2 Well Completions

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### Pad 264-1, 264-2 & 264-3 Well Completions

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## Pad 265-2 & 266-2 Well Completions

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<td>266-212</td>
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</table>
2017 FCD Performance

- TDFCD average uplift ~0-50% from 43 installations on data normalized before/after 1 year.
- Uplift dependent on the improvement that TDFCD provides to the level of operability on a per well basis.

- Higher tier indicates higher effective wellbore length.
- 4D volume indicates ~15% improvement in conformance in LDFCD compared to Slotted Liner wells.
Intermediate Casing Integrity

- Majority of failures were at the casing connection
- License# 447680 was a result of an under-reamer being activated in the casing.

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<thead>
<tr>
<th>License #</th>
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Table 1
SCVF Summary

- **2016 SCVF Cold Testing – Summary**
  - Fort McMurray wildfire resulted in field-wide shut-in
  - Used the shutdown to test all SCVFs while the wells were cold (+20 days)
  - 359 SAGD wells bubble tested (10-minute bubble test when well is cold)
  - 4 wells failed
    - Diagnostics concluded:
      - Gas resembles production casing gas (i.e. blanket gas, lift gas, produced gas)
      - Cold flows are the result of minor seepage of blanket/lift gas across production casing connections*
    - High temperatures in operating SAGD wells:
      - May cause seeping surface and production casing connections
      - Quaternary / shallow water is boiled
      - Shallow organic material is heated liberating H2S and hydrocarbons
  - Low Risk
  - Testing wells while cold:
    - Diagnostically faster
    - Easier to identify legitimate SCVF issues
  - Continue to test SCVF on well pairs during well interventions and workovers, when well has cooled.

- **Future Development Focus**
  - Working with ConocoPhillips Global expert in cementing, we are testing the slurry designs to ensure that they meet the objectives, including minimizing SCVF /GM.
  - The drilling program is continuously improved, including suggestions from Global Cementing expert to ensure that best practices are included in the cement placement.
  - We participate in industry benchmark and knowledge sharing sessions on SAGD drilling topic.

*The Thermal Well Casing Connection Evaluation Protocol (TWCCEP) considers a seepage rate of 0.06mL/min a threshold rate for reporting. This equates to a total of 86.4mL/day of seepage per connection.*
Typical Parallel Injector

- 16” Surface Casing
- 4 1/2” Heel tubing String
- 11 ¾” Intermediate casing
- Liner Hanger
- 2 7/8” Toe String
- 8 5/8” Slotted Liner
• Install a heel gas coil (5/8”) to lift heel production, no more blanket gas lifting

• Heel lift gas coil set 10 – 15m TVD above lateral

Subsection 3.1.1 (3c)
- Heel tubing string set 10 – 15m TVD above lateral
- 1 perforated joint on the bottom of heel tubing string with an additional 1-2 casing joints attached below.
Typical ESP Producer

13 3/8” Surface Casing

ESP Power Cable + 3/8” Bubble Tube + 2x ¼” encapsulated F.O. P/T Instrumentation Cables (Intake/Discharge) (Clamp to outside of ESP Production Tubing)

3 ⅛” Production tubing String

2 1/16” Guide String

P/T Sensor clamped to 2-3/8” pup joint

Liner Hanger

9 5/8” Intermediate casing

40pt Fiber Optic LxData 1 ¼” Coil (Inside of Guide Sting & FCD Tubing)

7” Slotted liner
Typical PCP Producer

9 5/8” Intermediate casing

3 ½” Production tubing String

3/8” Bubble Tube

2 1/16” Guide String

PCP (Progressive Cavity Pump)

Liner Hanger

13 3/8” Surface Casing

Sucker Rod / CoRod

7” Slotted liner

P/T Sensor clamped to 2-3/8” pup joint

40pt Fiber Optic LxData 1 ¾” Coil (Inside of Guide Sting & FCD Tubing)
**Typical Flow Control Device (FCD) Completion**

**Subsection 3.1.1 (3c)**

- **13 3/8” Surface Casing**
- **9 5/8” Intermediate casing**
- **7” Non Slotted liner**
- **4 1/2” x 3 1/2” VIT L80:**
- **1” Toe Lift Gas Coil Tubing**
  Inside Toe Tubing
- **5/8” Heel Lift Gas Coil Tubing**
  Clamped to outside of Toe Tubing
- **7” Heel tubing String**
- **10 – 15m TVD**
- **FCD’s with Screens**
- **Emulsion**
- **1.25” Thermocouples (8pt)**
  Clamped to outside of Toe Tubing

**Table: Total Wells with FCDs**

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<th>Total Wells with FCDs</th>
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* Injector wells do not have instrumentation or GL coils

**Example of FCD’s**

**Subsection 3.1.1 (3c)**

**Typical Flow Control Device (FCD) Completion**
Typical Tubing Deployed FCD (TDFCD) Completion – Gas Lift

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<td>263-2</td>
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<tr>
<td>264-3</td>
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</table>

- **13 3/8” Surface Casing**
- **9 5/8” Intermediate casing**
- **7” Heel tubing String**
- **1 ¼” Coil with Temperature Measurement/Gas Lift**
- **7” Production liner**
- **4.5” Tubing Deployed Flow Control Device (TDFCD)**
- **Production Liner Hanger**
- **Swell Packers**
- **FCD Liner Hanger**
- **4.5” Liner Joints**
- **7” Production liner**
Typical Tubing Deployed FCD (TDFCD) Completion – ESP

Subsection 3.1.1 (3c)

- **13 3/8” Surface Casing**
- **4.5” Tubing Deployed Flow Control Device (TDFCD)**
- **9 5/8” Intermediate casing**
- **Swell Packers**
- **Production Liner Hanger**
- **2 1/16” Guide String**
- **40pt Fiber Optic LxData /DTS 1 3/4” Coil** (Inside of Guide Sting & FCD Tubing)
- **7” Production liner**
- **4.5” Liner Joints**

**Production tubing String**

- **ESP Power Cable + 3/8” Bubble Tube + 2x ¼” encapsulated F.O. P/T Instrumentation Cables (Intake/Discharge)** (Clamp to outside of ESP Production Tubing)

**Total Wells with TDFCDs**

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<tr>
<td>265-2</td>
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**10 – 15m TVD**
Current Surmont 2 Steam Splitter Design

- Steam Splitter design used for top water zone risk reduction.
- Splitter open/closed position to be assessed on a well by well basis.
Artificial Lift

Subsection 3.1.1 (4)
Artificial Lift Current Pad Overview

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Subsection 3.1.1 (4a)
## Artificial Lift Types

- **Gas Lift**
  - Gas lift is effective with bottom hole flowing pressures >2,700 kPa with pressure of well head (Pwh) approx. 1,000 kPa
  - Lifting from heel and toe with gas assist at start of vertical section
  - Current production rates range from 100 m$^3$/d to 700 m$^3$/d of emulsion targeting 3,500 kPa

- **Electric Submersible Pump (ESP)**
  - ESP for thermal SAGD applications can be sized to meet the specific deliverability of the well.
  - Operating temperatures typically below 215°C
  - Typically Series 500 installed, and Series 400 pumps installed due to casing restrictions

- **Progressive Cavity Pumps (PCP)**
  - Generally PCPs have been used for low deliverability wells and where potential solids may be produced.*
  - Installation of metal to metal pumps

* ConocoPhillips initial strategy for PCPs was to use them on low deliverability wells where the current ESP designs were deemed less appropriate. However, installation of larger PCP are being considered for wells that may produce relatively “cold” viscous fluid for some time.
ESP Run Life Definitions

• **MTTF**: This run-life measure is calculated as the total exposure time of all systems (running, pulled and failed) divided by the number of failed systems.

• **Average Runtime**: This run-life measure is calculated as the total exposure time of all systems (running, pulled and failed) divided by the number of systems (running, pulled and failed).

• **Average run life running ESP**: This run-life measure is calculated as the total exposure time of running systems divided by the number of running systems.

• **Window**: window time allows for changes in average run-life to be more apparent, as they are less obscured by previous data.
ESP Performance

KPI’s

Population: 99 ESP’s
Cumulative MTTF: 32.5 months
Windowed* MTTF: 38.3 months
Average Runtime: 14.7 months
Windowed Runtime: 14.1 months
Average run life running ESP: 12.5 months
Windowed* Running ESP: 15.2 months

2016: 16 ESP failures
2017: 19 ESP failures
2018: 3 ESP Failure
*(730 day window)
Instrumentation in Wells

Subsection 3.1.1 (5)
Temperature & Pressure Measurement

• Temperature Measurement
  • Producer lateral temperature
    • Measured with 8 thermocouples, 40 LxData, or DTS fiber optic strings. See slides 91 & 92 for details
  • Injector lateral temperature
    • No temperature are measured

• Pressure Measurement
  • Producer
    • Primary bottom hole pressure measurement is done with a bubble tube corrected for TVD
    • Some LxData wells were equipped with toe pressure sensors, but have questions around accuracy
    • Secondary BHP measurement through 2 1/16 guidestring
  • Injector
    • Primary bottom hole pressure measurement is done with casing blanket gas
1. Phasing out all Thermocouples at ESP conversion
2. All wells will contain fiber temperature instrumentation. 3 LxData and 8 DTS pads.

Legend

**Instrumentation Points:**
- **DTS**
- **LX Data**
- **Thermocouple**
Distributed Temperature Sensing (DTS)

Subsection 3.1.1 (5b)

- **13 3/8” Surface Casing:**
- **1” Toe Lift Gas Coil Tubing:** Inside Toe Tubing
- **5/8” Heel Lift Gas Coil Tubing:** Clamped to outside of Toe Tubing

- **4 ½” x 3 ½” VIT L80:**
- **7” Heel tubing String**

- **9 5/8” Intermediate casing**

- **7” Slotted liner**

- **4 ½” Toe String**

- **No Change in 2017**
Typical Observation Well Measurement

- Example thermocouple and piezometer (101-07-OBA)
- Typically 40 TC (2m spacing)
- 0-10 piezometers placed at varying intervals

Soft cable Thermocouple (TC) strings were replaced by hard cable TC strings for improved well integrity.

COP 101-P07-OBA
10/13-13-083-07W/4M
RR - Jan 1W/2003

Piezometer Information

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<tr>
<td>Bitumen</td>
<td>388.1</td>
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</table>

218.1 mm Surface Casing
139.7 mm Production Casing

TC bottom @ 390.6 m GL
TC Top @ 347.1 m GL
39 points TC and 1.5 m spacing out

TD - 414.5m Production casing
4D Seismic

Subsection 3.1.1 (6)
**4D Seismic Location Map – Phase 1**

**Pilot**
- Buried analog single component geophones
- Cased dynamite shots (1/4 Kg) @ 9 m
- 14th monitor acquired in September 2015

**Pad 101N**
- Buried analog single component geophones
- Cased dynamite shots (1/8 Kg) @ 6 m
- 9th monitor acquired in March 2018

**Pad 101S**
- Buried analog single component geophones
- Cased dynamite shots (1/8 Kg) @ 6 m
- 9th monitor acquired in March 2015

**Pad 102N**
- Buried analog single component geophones
- Cased dynamite shots (1/8 Kg) @ 6 m
- 9th monitor acquired in April 2015

**Pad 102S**
- Buried analog single component geophones
- Cased dynamite shots (1/8 Kg) @ 6 m
- 6th monitor acquired in October 2016

**Pads 103 and 104**
- Buried analog single component geophones
- Cased dynamite shots (1/8 Kg) @ 6 m
- 3rd monitor acquired in October 2017 (103)
Phase 2

- Buried analog single component geophones
- Cased dynamite shots (1/8 Kg) @ 6 m
- Acquired in three stages:
  - Initial 11 DA’s: 2010-11
  - South extension: 2013-14
- First Monitors
  - Spring 2016: 263-2
  - Fall 2017: 262-1
- Second Monitors:
## Phase 1 4D Seismic Program

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<th>2016</th>
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- **B**: Baseline
- **M**: Monitor
## Phase 2 4D Seismic Program

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</tbody>
</table>

- **B**: Baseline
- **M**: Monitor
2015 4D Seismic Results Pad 101

- Well Pair 07/08/09, without a true baseline.
- 4D anomaly volume have increased for the remaining well pairs.
- Good conformance, especially at the heel.

- 4D anomaly volumes have increased.
- Continued conformance improvement along Well Pad 10, 11, 16, 17.
- Infill wells drilled between Well Pads 10, 11, 12, 16, 17 and 18 to optimize production in a geological more complex zone.

= 4D anomaly
~60 deg C Isotherm
• 4D anomaly volumes have increased. Improved conformance along well pairs 1 to 9.

• 4D anomaly volumes have increased. Improved conformance along well pairs 10 to 18.
2017 4D Seismic Results Pad 103

- Relative good conformance in most of well pair.
- 4D indications of coalescence with thermal chamber of Pad 101N (103-08/12)
2017 4D Seismic Results Phase 2

- **Spring Monitor:**
  - 262-2
  - 261-3
  - 264-2
  - 263-2
  - 262-3

- **Fall Monitors:**
  - 263-1
  - 264-1
  - 265-2
  - 264-3
  - 262-1

- Relative good conformance in most well pairs (except 264-2)
- 4D indications of coalescence between 263-1 and 264-1

= 4D anomaly  
~60 deg C Isotherm
Seismic Examples: 101-P16 Conformance (Toe)

Problem:
- Well pair 101-P16 lacking good conformance along well pair.

Action:
- Increase pressure of steam injection at toe.

Results:
- Conformance improved at toe.
Seismic Examples: 102-04 OBA Baffle Breakthrough (Heel)

- 2009 RST and 4D surveys confirmed recovery above mudstone.
- Operating pressure reduced to manage thief zone interactions.
4D Seismic Program 2017

• 4D seismic has proven very useful in monitoring and optimizing conformance and pressure strategy.

• 4D correlates with observation well data.

• Continuing to optimize heel/toe production/injection splits using 4D results.

• Ongoing efforts to history match reservoir models using 4D seismic.
Scheme Performance

Subsection 3.1.1 (7)
Surmont: Production vs. Scheme Approval

SURMONT SCHEME APPROVAL = Phase 1 + Phase 2 + Phase 2DB

Subsection 3.1.1 (7a iii)
• SOIP: 6,721 – 10,694 E3M3
• Current RF: 4.0% - 55.1%
• Porosity: 30.3% - 34.0%
• Oil saturation: 72.1% - 82.7%
• Blowdown timing will determine final EUR/RF.
• Recovery factors for drainage areas are based on performance. At this time, the expected ultimate recovery factor is difficult to predict, and these values are subject to change.
Well Retrofits (TDFCD and Steam Splitters) were installed.
103-07 re-drilled due to downhole failure.
102 NCG Trial Ongoing.
Strong performance on pad 103.
Performance and recovery on the west side of the pad has been challenged by multiple liner failures.

Fishbone inline wells online and producing.

Original LDFCD completion (102-06) continues to outperform slotted liner peers.
Performance / Chamber Development Challenges – Pad 102N

- 102-P01;02;03 have been the poorest producers on the pad.
- Recovery remains low and sidetracks are being considered.
Good Performance – WP 103-08

- High quality reservoir.
- FCD installed in Injector and Producer.
- Falloff data and 4D seismic indicates well conformance.
Well performance meets expectations.
Steady rates in terms of injection and production.
Conformance challenged in the toe, due to fish in hole.
• **102-03** is one of the poorest producing well pairs on the pad; bridge Plug was milled out but did not impact production.

• Recovery remains low, and a side-track re-drill is being considered to recover the lateral wellbore length and increase production.
Pilot start dates

- NCG Co-injection started on 3 wells in Jan 2017
  - Pilot suspended in Apr-May 2017 due to diluent outage
  - Re-started and reset in Jun 2017
- Pilot expansion to all 9 wells in Sep 2017

Observations

- Reduction of emulsion rates
- Reduction of water cut
- iSOR reduction of ~30%
- Increase in BHP due to NCG injection
- All steam chambers currently in full coalescence
Phase 1 – Key Learnings

• At pad 101/102, incremental steam injected during 2016/2017 increased the reservoir chamber pressure which attributed to a flat bitumen production profile during the subject timeframe.

• Liner installed flow control devices at pad 103 continue to outperform slotted liner wells.

• Initial results from tubing deployed flow control devices at pad 101/102 continue to be assessed. However, early days are illustrating a net increase in total emulsion/bitumen rates.

• Optimization continues to improve performance of mature wells:
  • NCG pilot commenced January, 2017 on 102S.
  • Well stimulations (executed approximately ten stimulations)
    • 30% of the well stimulations have been successful in terms of reducing the scale/dP between the wells. This has contributed to higher production rates.
  • Completed two bridge plug drill-outs to recover lost sections of laterals (one on 101N and one on 102N).
**Surmont Phase 2 Aggregate Performance Plots**

- BW Thief zone interactions in 261-3, 262-1 and 262-2.
- One producer and one injector re-drilled due to downhole failures.
- Four producers re-drilled due to poor performance.
- ESP conversions ongoing.

---

**Subsection 3.1.1 (7a i, ii)**
262-3 has been operating at a target pressure of 4,000 kPag
- 12/12 wells converted to SAGD.
- Challenged performance from east to west.
- No thief zone issues.
Performance / Chamber Development Challenges – Pad 262-3

- Limited chamber growth

Subsection 3.1.1 (7b)
Subsection 3.1.1 (7b)

- Severe bottom water interaction on many well pairs.
- Attempted to mitigate BW interaction with various injector retro-fits with limited success.
- Reduced pressure differential between chamber and low pressure BW on wells that are interacting with the BW.
Well Performance exceeds expectations; due to FCD and ESP install. Steam management has led to high production volumes (increased pressure on pad 264-1 to decrease losses on 263-1). Mud channel continues to be a challenge.
Surmont: Obs Wells Temp & GR – 263-1-P06-OBC, 263-1-P09-OBD

Subsection 3.1.1 (7b)
• Stable 2017 production performance, meets expectations.
• Managed top thief zone interaction with dedicated pressure management.
• Challenged well; potential flow baffles above the pair.
Surmont: Obs Wells Temp & GR – 262-3-P07-OBE, 262-3-P09-OBB

Subsection 3.1.1 (7b)
Phase 2 - Key Learnings

- At pad 262-3, higher reservoir chamber pressure has been trialed to overcome under performance with minimal success. A single-well dilation process has also been attempted with minimal success. The pad performance remains to be challenged.

- Tubing Deployed FCDs continue to bring uplift in a sustained manner on base production.

- Injector steam splitters are still being evaluated for SOR improvement. No conclusions to date.

- BW has been very challenging to mitigate due to the early interaction of some wells and the high differential pressure between chamber and the BW zone.

- TW interaction is being mitigated thanks to dedicated pressure management and ESP conversion strategy.
Surmont: Phase 1 Well Pad Rates and SOR / Pad 101

Subsection 3.1.1 (7h)
Surmont: Phase 1 Well Pad Rates and SOR / Pad 102

**102N**
- **Rates (m3/d)**
  - Steam Rate
  - Oil Rate
  - Water Rate

**102S**
- **Rates (m3/d)**
  - Steam Rate
  - Oil Rate
  - Water Rate

**102N**
- **ISOR / cSOR (sm3/sm3)**
  - ISOR
  - cSOR

**102S**
- **ISOR / cSOR (sm3/sm3)**
  - ISOR
  - cSOR

Subsection 3.1.1 (7h)
Surmont: Phase 1 Well Pad Rates and SOR / Pad 103

**Rates (m³/d)**
- Steam Rate: Red Line
- Oil Rate: Green Line
- Water Rate: Blue Line

**iSOR / cSOR (sm³/sm³)**
- iSOR: Red Line
- cSOR: Black Line
Surmont: Phase 2 Well Pad Rates and SOR

Subsection 3.1.1 (7h)
Surmont: Phase 2 Well Pad Rates and SOR

Subsection 3.1.1 (7h)
Expected Drainage Area Outline— PAD 261-3

Subsection 3.1.1 (3a)
Future Plans

Subsection 3.1.1 (8)
Future Plans – Surmont

Surmont 1
• NCG pilot is ongoing on Pad 102S and expanding to 101N and 101S.
• Well stimulations are ongoing to determine the optimal chemical product for SAGD well scale treatment in Surmont.
• Evaluating the tie-in of three outboard Wells in Pad 101.
• Additional tubing deployed flow control devices will be looked at for potential install.
• NCG pilot from 101N to help with pressure support with 103.
• Evaluating infill opportunities.

Surmont 2
• ESP conversions ongoing.
• Continue tubing deployed flow control device installations.
• Evaluation of steam optimization retrofits and their possible mitigation under thief zones interactions.
• Evaluate redevelopment opportunities for under performing pads.
Surface Operations and Compliance
Surmont Project Approval 9426

Facilities
Subsection 3.1.2 (1)
Phase 1 Plot Plan: Pad 101

- E-SAGD Equipment was de-commissioned in 2017
Phase 1 Plot Plan: Pad 102

- No Major Modifications in 2017
Phase 1 Plot Plan: Pad 103

- No Major Modifications in 2017
Installation of one additional OTSG and associated heat exchanger at Surmont 2, OTSG is now operational. No other major changes in other areas of the plant.
Phase 2 Plot Plan: Pad 261-3

• No Major Modifications in 2017

Subsection 3.1.2 (1a)
• No Major Modifications in 2017

Subsection 3.1.2 (1a)
No Major Modifications in 2017
Phase 2 Plot Plan: Pad 262-3

- No Major Modifications in 2017

Subsection 3.1.2 (1a)
Phase 2 Plot Plan: Pad 263-1

- No Major Modifications in 2017

Subsection 3.1.2 (1a)
• No Major Modifications in 2017
• No Major Modifications in 2017
• No Major Modifications in 2017
Phase 2 Plot Plan: Pad 264-3

- No Major Modifications in 2017

Subsection 3.1.2 (1a)
Phase 2 Plot Plan: Pad 265-2

- No Major Modifications in 2017
Phase 2 Plot Plan: Pad 266-2

- No Major Modifications in 2017

Subsection 3.1.2 (1a)
Plant Schematic: Phase 1

Subsection 3.1.2 (1b)
Subsection 3.1.2 (1b)
2017 Surmont Operations

• **Phase 1:**
  - Installed new Economizer box on OTSG with upgraded materials and additional monitoring capabilities.
  - Completed turn around activities at Pad 101, Pad 102 and CPF.
  - Completed steam quality increase from 75% to 85%.
  - Decommissioned Pad 101 E-SAGD equipment.

• **Phase 2**
  - Reached name plate bitumen production.
  - Completed steam quality increase from 75% to 85%.
  - OTSG 19 construction and commissioning complete and operational.
  - Successfully completed a trial with partial condensate blending.
Facility Performance

Subsection 3.1.2 (2)
Facility Performance: Bitumen Treatment by Train

Subsection 3.1.2 (2a)
• Phase 1 water treatment plant continues to operate as per design.
• Phase 1 sludge pond was successfully dredged to remove lime sludge in 2017.
• A maintenance shutdown was successfully completed for Phase 1 in April.
• Monitoring of the sludge pond interstitial space is ongoing.
Facility Performance: Phase 2 Water Treatment

- Continued successful ramp up of Phase 2 water treatment plant to design rates.
- Focused improvement on the reliability of the dry chemical feed system.
- Chemical trials initiated to further improve water treatment performance.
• Saline water treatment plant operating as per design. Treatment flowrates varied as per water balance make-up requirements.

• OTSG blowdown evaporators impacted by higher steam quality operation. Currently operating one of two available blowdown evaporators.
The 19th OTSG was commissioned at Phase 2 in 2017:
- 4 OTSGs in service at Surmont 1.
- 19 OTSGs in service at Surmont 2.
- Economizer section of Surmont 1 OTSG SG-531 A replaced (upgraded).
  - Operation at higher steam qualities (83-85%).
- Implemented learnings from steam enhancement trial across all of Surmont Phase 1 and Phase 2.
  - All of the steam generators target up to 85% steam quality.
- Steam generator pigging frequency decreased.
  - Targeting 365+ days between OTSG outages for pigging (tube cleaning).
- 2018 focus is to maintain online reliability while maximizing steam output.
Phase 1 is at a steady state of production and electrical consumption, however the curtailment in April caused the anomaly in 2017.
Facility Performance: Electricity Consumption Surmont 2

- Effect of curtailment in April created variance – plant up near capacity this year.

Subsection 3.1.2 (2d)
Facility Performance: Gas Consumption

<table>
<thead>
<tr>
<th>Month</th>
<th>Solution Gas</th>
<th>Imports (TCPL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan-17</td>
<td>4,586</td>
<td>113,311</td>
</tr>
<tr>
<td>Feb-17</td>
<td>4,752</td>
<td>104,930</td>
</tr>
<tr>
<td>Mar-17</td>
<td>4,418</td>
<td>107,418</td>
</tr>
<tr>
<td>Apr-17</td>
<td>3,513</td>
<td>78,178.</td>
</tr>
<tr>
<td>May-17</td>
<td>5,640</td>
<td>116,243</td>
</tr>
<tr>
<td>Jun-17</td>
<td>5,647</td>
<td>121,223</td>
</tr>
<tr>
<td>Jul-17</td>
<td>5,257</td>
<td>119,106</td>
</tr>
<tr>
<td>Aug-17</td>
<td>5,917</td>
<td>129,797</td>
</tr>
<tr>
<td>Sep-17</td>
<td>5,867</td>
<td>128,776</td>
</tr>
<tr>
<td>Oct-17</td>
<td>6,009</td>
<td>134,091</td>
</tr>
<tr>
<td>Nov-17</td>
<td>5,912</td>
<td>125,430</td>
</tr>
<tr>
<td>Dec-17</td>
<td>6,114</td>
<td>136,690</td>
</tr>
<tr>
<td>Jan-18</td>
<td>6,065</td>
<td>134,310</td>
</tr>
<tr>
<td>Feb-18</td>
<td>5,817</td>
<td>122,568</td>
</tr>
</tbody>
</table>
Facility Performance: Gas Consumption by Location

<table>
<thead>
<tr>
<th></th>
<th>Jan-17</th>
<th>Feb-17</th>
<th>Mar-17</th>
<th>Apr-17</th>
<th>May-17</th>
<th>Jun-17</th>
<th>Jul-17</th>
<th>Aug-17</th>
<th>Sep-17</th>
<th>Oct-17</th>
<th>Nov-17</th>
<th>Dec-17</th>
<th>Jan-18</th>
<th>Feb-18</th>
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</thead>
<tbody>
<tr>
<td>Flared Gas</td>
<td>8</td>
<td>43</td>
<td>12</td>
<td>9</td>
<td>12</td>
<td>6</td>
<td>0</td>
<td>37</td>
<td>0</td>
<td>19</td>
<td>64</td>
<td>30</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Camp</td>
<td>213.8</td>
<td>189.5</td>
<td>195.6</td>
<td>137.1</td>
<td>91.3</td>
<td>70.4</td>
<td>64</td>
<td>63.2</td>
<td>79.4</td>
<td>133.4</td>
<td>201.6</td>
<td>207.9</td>
<td>217.1</td>
<td>210.9851</td>
</tr>
<tr>
<td>Battery</td>
<td>2,907</td>
<td>2,674</td>
<td>3,237</td>
<td>2,827</td>
<td>1,545</td>
<td>2,290</td>
<td>2,488</td>
<td>1,389</td>
<td>1,430</td>
<td>1,555</td>
<td>2,487</td>
<td>2,709</td>
<td>2,789</td>
<td>2,754</td>
</tr>
<tr>
<td>OTSGs</td>
<td>114,556</td>
<td>106,519</td>
<td>108,077</td>
<td>78,690</td>
<td>120,234</td>
<td>124,202</td>
<td>121,408</td>
<td>133,860</td>
<td>131,896</td>
<td>136,757</td>
<td>127,121</td>
<td>138,377</td>
<td>135,822</td>
<td>124,075</td>
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</table>
Surmont Facility Performance: 2017 Gas Usage

<table>
<thead>
<tr>
<th></th>
<th>Jan-17</th>
<th>Feb-17</th>
<th>Mar-17</th>
<th>Apr-17</th>
<th>May-17</th>
<th>Jun-17</th>
<th>Jul-17</th>
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<th>Oct-17</th>
<th>Nov-17</th>
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<th>Jan-18</th>
<th>Feb-18</th>
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<tr>
<td>Flared Gas</td>
<td>8</td>
<td>43</td>
<td>12</td>
<td>9</td>
<td>12</td>
<td>6</td>
<td>0</td>
<td>37</td>
<td>0</td>
<td>19</td>
<td>64</td>
<td>30</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Solution Gas</td>
<td>4,586</td>
<td>4,752</td>
<td>4,418</td>
<td>3,513</td>
<td>5,640</td>
<td>5,647</td>
<td>5,257</td>
<td>5,917</td>
<td>5,867</td>
<td>6,009</td>
<td>5,912</td>
<td>6,114</td>
<td>6,065</td>
<td>5,817</td>
</tr>
<tr>
<td>Imports (TCPL)</td>
<td>113,31</td>
<td>104,93</td>
<td>107,41</td>
<td>78,178</td>
<td>116,24</td>
<td>121,22</td>
<td>119,10</td>
<td>129,79</td>
<td>128,77</td>
<td>134,09</td>
<td>125,43</td>
<td>136,69</td>
<td>134,31</td>
<td>122,56</td>
</tr>
</tbody>
</table>
Surmont Facility Performance: Year over Year Gas Usage

- New: 1 OTSG - Total 23
  Average 83% Steam Quality
- New: 7 OTSGs Start and Ramp Up, minus 1 Flare Stack
  Average 77% Steam Quality
- New: Flare Stack, 2 GTH & 11 OTSGs Start and Ramp Up
  Average 70% Steam Quality
- 1 GTH, 2 Flare Stacks & 4 OTSGs
  75% Average Steam Quality

<table>
<thead>
<tr>
<th>Year</th>
<th>Flared Gas</th>
<th>Solution Gas</th>
<th>TCPL Imports</th>
<th>Average GOR</th>
<th>Average SOR</th>
<th>% Sol. Gas Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>4,641</td>
<td>2,755</td>
<td>42,999</td>
<td>7.04</td>
<td>3.29</td>
<td>94.45%</td>
</tr>
<tr>
<td>2008</td>
<td>6,439</td>
<td>4,155</td>
<td>160,095</td>
<td>12.10</td>
<td>2.76</td>
<td>95.49%</td>
</tr>
<tr>
<td>2009</td>
<td>3,962</td>
<td>10,073</td>
<td>183,933</td>
<td>10.87</td>
<td>2.56</td>
<td>98.57%</td>
</tr>
<tr>
<td>2010</td>
<td>705</td>
<td>12,703</td>
<td>223,447</td>
<td>10.83</td>
<td>2.45</td>
<td>99.31%</td>
</tr>
<tr>
<td>2011</td>
<td>625</td>
<td>13,869</td>
<td>228,344</td>
<td>10.81</td>
<td>2.45</td>
<td>98.10%</td>
</tr>
<tr>
<td>2012</td>
<td>218</td>
<td>15,193</td>
<td>250,412</td>
<td>10.85</td>
<td>2.42</td>
<td>97.54%</td>
</tr>
<tr>
<td>2013</td>
<td>117</td>
<td>17,005</td>
<td>230,339</td>
<td>8.55</td>
<td>2.18</td>
<td>98.90%</td>
</tr>
<tr>
<td>2014</td>
<td>271</td>
<td>14,246</td>
<td>240,496</td>
<td>12.12</td>
<td>3.67</td>
<td>99.62%</td>
</tr>
<tr>
<td>2015</td>
<td>475</td>
<td>19,301</td>
<td>433,138</td>
<td>7.78</td>
<td>3.67</td>
<td>100.00%</td>
</tr>
<tr>
<td>2016</td>
<td>371</td>
<td>33,636</td>
<td>962,313</td>
<td>9.19</td>
<td>3.10</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>239</td>
<td>63,633</td>
<td>1,415,198</td>
<td>8.92</td>
<td>3.00</td>
<td></td>
</tr>
<tr>
<td>Feb. 2018</td>
<td>1</td>
<td>11,883</td>
<td>256,879</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
• Phase 2 battery utility FG measurement has been relocated to each user for better measurement of battery FG and solution gas quantification.

• Phase 1 continuing flaring of TCPL gas, through the VRU, after plant trips has been significantly reduced (to almost zero) through DCS logic reconfiguration.

• 2017 flare volumes reduced by 35% from 2016:
  • Major flare events due to plant trips as a result of power outages.
  • Completed Surmont 1 turnaround, with flared volumes significantly reduced compared to 2014 TA.

• Overall increased FG usage, mainly due to increased steam production:
  • Total of 23 OTSGs running (1 new in 2017).
  • Average steam quality increased from 77% in 2016 to 83% in 2017.

• Six new wells added to the NCG co-injection trial (total of 9 wells). Gas co-injected with steam is assumed to remain in the reservoir (does NOT return with solution gas to plant).
Agreement with AER to continue reporting Phase 2 CO2e emission, through its ramp-up, separately from Phase 1.

2017 SGER intensity reduction target of 20% was not achieved.

2017 GHG Emission intensity is currently being verified for payment submission.
Measurement and Reporting

Subsection 3.1.2 (3)
Well Testing

- Surmont Well Pads are configured to, automatically and sequentially, align each production well into the Test Separator.
- Well Test Duration, Total Produced Emulsion, Average Water Cut and Total Produced Water Vapors are recorded for each Well Test.
- Well Test Results are reviewed to: “Approve”, if representative of the wells production, or “Reject.”
- Well Test Durations range from 5 to 10 hours, with up to 4 hours purge, based on the wells previous liquid production rates.
Well Estimated Monthly Production

Each well’s estimated monthly production is calculated using only “approved” Well Test Results. Daily estimated volumes are used to calculate the wells monthly estimated volume from the time of an approved well test, until its next approved well test.

**Well Monthly Estimated Oil Production** = 

\[
\text{Well Estimated Daily Oil Production} \times \text{Hours per Days in Operation}
\]

- **Well Estimated Daily Oil Production** = 
  \[
  \frac{\text{Test Produced Emulsion Volume} \times (1 - WC\%)}{\text{Test Duration (hours)}} \times 24 \text{ hours}
  \]

**Well Monthly Estimated Water Production** = 

\[
\text{Well Estimated Daily Water Production} \times \text{Hours per Days in Operation}
\]

- **Well Estimated Daily Water Production** = 
  \[
  \frac{\text{Test Produced Emulsion Volume} \times WC\% + \text{Water Vapor}}{\text{Test Duration (hours)}} \times 24 \text{ hours}
  \]
**Well Estimated Monthly Oil Production × Oil Proration Factor**

- Oil Proration Factor =

  \[
  \frac{\text{Battery Produced Oil}}{\text{Total Estimated Monthly Oil Production}}
  \]

- Battery Produced Oil =

  \[
  \text{Oil Dispositions} + \text{Battery Tank Inventory} + \text{Shrinkage} - \text{Receipts} + \text{Well Load Oil}
  \]

- Total Estimated Monthly Oil Production =

  \[
  \sum_{n=1}^{x} \text{Well}_n \text{ Estimated Monthly Oil Production}
  \]

  where \( x \) is the total number of production wells for the reporting period.

- Oil Dispositions =

  \[
  \text{Sales CTM}^{1} + \text{Enbridge Tank Inventory} + \text{TruckOut}
  \]

- Oil in Battery’s Tank Inventory =

  \[
  \text{Sales Oil Tanks} + \text{OffSpec Tanks} + \text{Slop Oil Tanks} + \text{Skim Oil Tanks}
  \]

- Receipt =

  \[
  \text{Diluent CTM}^{1} + \text{Diluent Tank Inventory} + \text{Diluent TruckIn}
  \]
Well Allocated Water Production

**Well Estimated Monthly Water Production \( \times \) Water Proration Factor**

- Water Proration Factor =
  \[
  \frac{\text{Battery Produced Water}}{\text{Total Estimated Monthly Water Production}}
  \]

- Battery Produced Water =
  \[
  \text{Water Dispositions} + \text{Battery Tank Inventory} - \text{Receipts} + \text{Well Load Water}
  \]

- Total Estimated Monthly Water Production =
  \[
  \sum_{n=1}^{x} \text{Well}_n \text{ Estimated Montly Water Production}
  \]
  where \(x\) is the total number of production wells for the reporting period.

- Water Dispositions =
  \[
  \text{Dispositions to Injection Facility} + \text{Truck–Out}
  \]

- Water in Battery’s Tank Inventory =
  \[
  \text{Skim Oil Tanks} + \text{Slop Oil Tanks} + \text{DeSand/BackWash/ORF Tanks} + \text{Sales/OffSpec/Diluent Tanks}
  \]

- Receipt =
  \[
  \text{IF Condensate Returns} + \text{Water in Diluent} + \text{Truck–In}
  \]
Well Allocated Gas Production

Well Allocated Oil Production $\times$ GOR

- Gas to Oil Ratio (GOR) =
  \[
  \frac{\text{Battery Produced Gas}}{\text{Battery Produced Oil}}
  \]

- Battery Produced Gas =
  \[
  \text{Gas Dispositions} - \text{Receipts}
  \]

- Gas Dispositions =
  \[
  \text{Battery Utility } FG^2 + \text{Steam Generators } FG + \text{Flare Purge} + \text{NCG Co-Injection} + \text{Flared Gas}
  \]

- Receipt =
  \[
  \text{TCPL Fuel Gas } CTM^1
  \]

1 CTM: Custody Transfer Meter

2 Phase 2 Battery Utility FG relocated to measure each user's FG consumption.
**Well Measured Steam × Steam Proration Factor**

- **Well Measured Steam** = 
  \[ \text{Steam Injected @Heel} + \text{Steam Injected @Toe} \]

- **Steam Proration Factor** = 
  \[ \frac{\text{Steam Produced}}{\text{Total Measured Steam}} \]

- **Steam Produced** = 
  \[ \text{Steam Generated (CPF)} - \text{Steam Condensate Returns} \]

- **Total Measured Steam** = 
  \[ \sum_{n=1}^{x} \text{Well}_n \text{ Measured Steam} \]

  where \( x \) is the total number of injection wells during the reporting period.
2017 Highlights and Changes

- Phase 2 battery utility FG measurement relocated to each user for better quantification solution gas.


- Condensate blending trial completed:
  - Developing flashed diluent recovery unit.

- Non condensable gas (NCG) co-injection trial:
  - Initiated November 2016 in 3 wells.
  - Extended to 6 other wells starting September 2017.
  - Co-injected volumes added to battery’s gas dispositions (assumes gas co-injected with steam does not return to the injection facility with solution gas).

- Maintained proration factor regulatory compliance through all 2017, with increased number of producing wellheads and operational changes:
  - 182 wells in SAGD operation (107 pump and 75 gas lift).
  - 1 well in steam circulation.
Oil and Water Production Proration Factors

2017: Maintained Regulatory Compliance all Year

Regulatory Compliance Limits
0.85 - 1.15

Subsection 3.1.2 (3b)
2017 Average Steam Proration Factor: 0.986
Always within ±5%

Sept. 2017: Completed revision of Phase 1 Produced and Injected Steam Dynamic Flow Compensation

Regulatory Compliance Limits 0.85 - 1.15
Water Production, Injection, and Uses

Subsection 3.1.2 (4)
Surmont Phase 1 and Phase 2 Water Source Wells

### Surmont Phase 1 Non-Saline Water Source Wells

<table>
<thead>
<tr>
<th>Source Well</th>
<th>Observation Well</th>
<th>Formation</th>
<th>Water Act Licence No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1F1021808306W400</td>
<td>1F2021808306W400</td>
<td>Lower Grand Rapids</td>
<td>00253532-02-00</td>
</tr>
<tr>
<td>1F1041808306W400</td>
<td>102041808306W400</td>
<td>Lower Grand Rapids</td>
<td>00253532-02-00</td>
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<tr>
<td>1F1011908306W400</td>
<td>100011908306W400</td>
<td>Lower Grand Rapids</td>
<td>00253532-02-00</td>
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<tr>
<td>1F1032308307W400</td>
<td>100032308307W400</td>
<td>Lower Grand Rapids</td>
<td>00253532-02-00</td>
</tr>
</tbody>
</table>

### Surmont Phase 2 Non-Saline Water Source Wells

<table>
<thead>
<tr>
<th>Source Well</th>
<th>Observation Well</th>
<th>Formation</th>
<th>Water Act Licence No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1F1022108306W400</td>
<td>100022108306W400</td>
<td>Lower Grand Rapids</td>
<td>00312463-01-00</td>
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<tr>
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<tr>
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### Surmont Phase 2 Saline Water Source Wells

<table>
<thead>
<tr>
<th>Source Well</th>
<th>Formation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1F1020308404W400</td>
<td>Clearwater</td>
</tr>
<tr>
<td>1F1020608404W400</td>
<td>Clearwater</td>
</tr>
<tr>
<td>1F1033008304W400</td>
<td>Lower Grand Rapids</td>
</tr>
<tr>
<td>1F1042208305W400</td>
<td>Clearwater</td>
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<tr>
<td>1F1071308305W400</td>
<td>Clearwater</td>
</tr>
<tr>
<td>1F1081008305W400</td>
<td>Lower Grand Rapids</td>
</tr>
<tr>
<td>1F1101708404W400</td>
<td>Clearwater</td>
</tr>
<tr>
<td>1F1160908404W400</td>
<td>Clearwater</td>
</tr>
<tr>
<td>1F2091708404W400</td>
<td>Lower Grand Rapids</td>
</tr>
<tr>
<td>1F2141108404W400</td>
<td>Lower Grand Rapids</td>
</tr>
</tbody>
</table>

No Changes in 2017

Subsection 3.1.2 (4a)
Surmont Non-Saline and Saline Water Source Wells Production Volumes

- Surmont Phase 2 Saline [4 Lower Grand Rapids, 6 Clearwater Wells]
- Surmont Phase 2 Non-Saline [7 Lower Grand Rapids Wells]
- Surmont Phase 1 Non-Saline [4 Lower Grand Rapids Wells]
Water Production and Steam Injection Volumes

- Produced water
- Steam Injection

Subsection 3.1.2 (4c, 4d)
Directive 81: Injection Facility Water Imbalance

- Surmont in compliance with *Directive 81 Injection Facility Water Imbalance* since June 2014
- No issues foreseen for 2018

### Fort McMurray Wildfire

Emergency Shutdown & Re-start
Surmont anticipates *Directive 81* disposal limit compliance in 2018 as per current trend (5.4% actual vs. 11.1% disposal limit)

Surmont accomplished *D-81* compliance in 2016 (7.5% actual vs. 10.6% disposal limit) after commissioning brackish water system and blowdown evaporators at Phase 2 CPF

Increased steam quality contributing to reduced blowdown disposal rates
## Surmont Phase 1 Water Disposal Wells

<table>
<thead>
<tr>
<th>Well</th>
<th>Zone Approved for Disposal</th>
<th>Maximum Wellhead Injection Pressure (kPa)</th>
<th>Well Status</th>
<th>AER Disposal Approval No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>100/01-16-083-05W4/0</td>
<td>McMurray</td>
<td>2700</td>
<td>Water Disposal</td>
<td>10044I</td>
</tr>
<tr>
<td>100/07-22-083-05W4/0</td>
<td>McMurray</td>
<td>2500</td>
<td>Water Disposal</td>
<td>10044I</td>
</tr>
<tr>
<td>100/08-10-083-05W4/0</td>
<td>McMurray</td>
<td>2300</td>
<td>Water Disposal</td>
<td>10044I</td>
</tr>
<tr>
<td>100/04-21-083-05W4/0</td>
<td>McMurray</td>
<td>2500</td>
<td>Water Disposal</td>
<td>10044I</td>
</tr>
<tr>
<td>100/01-11-083-05W4/0</td>
<td>McMurray</td>
<td>2500</td>
<td>Water Disposal</td>
<td>10044I</td>
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</tbody>
</table>
### Surmont Phase 2 Water Disposal Wells

<table>
<thead>
<tr>
<th>Well</th>
<th>Zone Approved for Disposal</th>
<th>Maximum Wellhead Injection Pressure (kPa)</th>
<th>Well Status</th>
<th>AER Disposal Approval No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>100/01-09-083-05W4/0</td>
<td>McMurray</td>
<td>3400</td>
<td>Water Disposal</td>
<td>10044I</td>
</tr>
<tr>
<td>100/01-04-083-05W4/0</td>
<td>McMurray</td>
<td>2500</td>
<td>Water Disposal</td>
<td>10044I</td>
</tr>
<tr>
<td>102/08-21-083-05W4/0</td>
<td>McMurray</td>
<td>3400</td>
<td>Water Disposal</td>
<td>10044I</td>
</tr>
<tr>
<td>100/01-28-083-05W4/0</td>
<td>McMurray</td>
<td>3400</td>
<td>Water Disposal</td>
<td>10044I</td>
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<tr>
<td>100/10-15-083-05W4/0</td>
<td>McMurray</td>
<td>3400</td>
<td>Water Disposal</td>
<td>10044I</td>
</tr>
<tr>
<td>102/15-15-083-05W4/0</td>
<td>McMurray</td>
<td>3400</td>
<td>Water Disposal</td>
<td>10044I</td>
</tr>
<tr>
<td>100/08-27-083-05W4/0</td>
<td>McMurray</td>
<td>3400</td>
<td>Water Disposal</td>
<td>10044I</td>
</tr>
<tr>
<td>100/08-23-083-05W4/0</td>
<td>McMurray</td>
<td>3400</td>
<td>Water Disposal</td>
<td>10044I</td>
</tr>
<tr>
<td>100/16-24-083-05W4/0</td>
<td>McMurray</td>
<td>3400</td>
<td>Water Disposal</td>
<td>10044I</td>
</tr>
</tbody>
</table>

- **Lower Grand Rapids**: Surmont Pilot
- **Clearwater**: Surmont 1
- **McMurray**: Surmont 2
- **Keg River**: Non-Saline Source Water Well
- **Disposal Well**: Saline Source Water Well

Subsection 3.1.2 (4g)
Surmont Water Disposal Wells Injection Rates (McMurray)

Subsection 3.1.2 (4h)
Subsection 3.1.2 (4h)
Surmont Phase 2 Water Disposal Wells Well Head Pressure (McMurray)

Approval Max. WHP (except 100/01-04): 3400 kPa

Approval Max. WHP for 100/01-04: 2500 kPa

Subsection 3.1.2 (4h)
Water Disposal Well 100/08-10-083-05 W4M Observation Well Pressure (McMurray)

Subsection 3.1.2 (4h)
## Waste Disposal

<table>
<thead>
<tr>
<th>Waste Description</th>
<th>Disposal Weight (Tonnes)</th>
<th>Disposal Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dangerous Oilfield Waste</td>
<td>24,436</td>
<td></td>
</tr>
<tr>
<td>Hydrocarbon/Emulsion Sludge</td>
<td>1,357</td>
<td>Oilfield Waste Processing Facility</td>
</tr>
<tr>
<td>Crude Oil/Condensate Emulsions</td>
<td>21,779</td>
<td>Oilfield Waste Processing Facility</td>
</tr>
<tr>
<td>Various</td>
<td>1,300</td>
<td>Landfill</td>
</tr>
<tr>
<td>Non-Dangerous Oilfield Waste</td>
<td>66,659</td>
<td></td>
</tr>
<tr>
<td>Lime Sludge</td>
<td>56,938</td>
<td>Landfill</td>
</tr>
<tr>
<td>Various</td>
<td>9,486</td>
<td>Landfill</td>
</tr>
<tr>
<td>Well Fluids</td>
<td>235</td>
<td>Cavern</td>
</tr>
</tbody>
</table>
## Waste Recycling

<table>
<thead>
<tr>
<th>Waste Description</th>
<th>Disposal Weight (Tonnes)</th>
<th>Disposal Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil</td>
<td>12</td>
<td>Used Oil Recycler</td>
</tr>
<tr>
<td>Empty Containers</td>
<td>21</td>
<td>Recycling Facility</td>
</tr>
<tr>
<td>Fluorescent Light Tubes</td>
<td>0.93</td>
<td>Recycling Facility</td>
</tr>
<tr>
<td>Batteries</td>
<td>8</td>
<td>Recycling Facility</td>
</tr>
</tbody>
</table>
## Typical Water Analysis

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Non-Saline Makeup Water (mg/L)</th>
<th>Saline Makeup Water (mg/L)</th>
<th>Produced Water (mg/L)</th>
<th>Disposal Water (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>8.5</td>
<td>8.2</td>
<td>7.5</td>
<td>11.8</td>
</tr>
<tr>
<td>Total Dissolved Solids (TDS)</td>
<td>1,400</td>
<td>8,000</td>
<td>1,800</td>
<td>23,000</td>
</tr>
<tr>
<td>Chloride</td>
<td>200</td>
<td>2,800</td>
<td>650</td>
<td>9,500</td>
</tr>
<tr>
<td>Hardness as CaCO₃</td>
<td>&lt;0.5</td>
<td>225</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Alkalinity as CaCO₃</td>
<td>900</td>
<td>350</td>
<td>250</td>
<td>2,700</td>
</tr>
<tr>
<td>Silica</td>
<td>8</td>
<td>7</td>
<td>190</td>
<td>225</td>
</tr>
<tr>
<td>Total Boron</td>
<td>6</td>
<td>3.3</td>
<td>40</td>
<td>260</td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>15</td>
<td>4</td>
<td>500</td>
<td>2,150</td>
</tr>
<tr>
<td>Oil Content</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>65</td>
<td>30</td>
</tr>
</tbody>
</table>
Sulphur Production

Subsection 3.1.2 (5)
SO2 emissions were managed below the 1.6t/d in 2017.
The decreased SO2 emissions in February 2018 were due to a conservative philosophy with regard to operating the Produced Gas header to remain below the 1.6 tpd SO2 limit.
Operations is working on a strategy to safely manage the liquid buildup in the Produced Gas header without risking a plant trip.
• Sulphur recovery unit maintained 100% uptime.
• Surmont achieved greater than the required 69.7% quarterly sulphur recovery in 2017.
Continuous ambient air monitoring: all Alberta Ambient Air Quality Objectives were met in 2017.
Ambient Air Quality Monitoring

Falsely high readings in December due to heavy machinery exhaust next to air quality monitor

- Continuous ambient air monitoring: all Alberta Ambient Air Quality Objectives were met in 2017
Environmental Compliance

Subsection 3.1.2 (6)
Environmental Monitoring

• Groundwater Monitoring Program:
  • Program revised to focus monitoring on early change detection.
  • 2017 monitoring results are being analyzed in 2018.
  • Installed new monitoring wells at the Central Processing Facility 1 and the Well Pads.
• Wetlands:
  • Program revised to focus monitoring on early change detection.
  • 2017 monitoring results are being analyzed in 2018.
  • Installed new monitoring wells around saline source wells.
• Wildlife Monitoring Program:
  • Wildlife handling permit obtained.
  • No vehicle/animal collisions.
  • No serious nuisance wildlife or human-bear interactions.
• Reclamation Work:
  • Re-vegetation, through the establishment of reclamation trials, was initiated on two borrow pits in 2017.
  • Temporary reclamation areas were identified and planted with a mix of native trees and shrubs.
• Update to the Reclamation Monitoring Program Proposal:
  • Per Schedule IX of EPEA Approval number 48263-01-00, as amended, a update to
    the Reclamation Monitoring Program proposal was submitted November 30, 2017.
  
  • 2017 Soil monitoring at Surmont complete as per 5 year rotational
     requirement outlined in EPEA Approval 48263-01-00.

  • Air monitoring trailer purchased from Wood Buffalo Environmental
    Association to comply with continual ambient monitoring during facility
    operations as per EPEA Approval number 48263-01-00.
Compliance Confirmation and Non Compliances

Subsection 3.1.2 (7) + (8)
Compliance Confirmation and Non Compliances

ConocoPhillips is in regulatory compliance for 2017 with the exception of the following:

**Surmont Well 264-1 I05 Valve Failure – FIS Incident 20170074:**
- Incident occurred between Jan 7-10, 2017.
- Cause of the incident was determined to be a master valve bonnet failure due to freezing.
- Environmental clean up is complete and the Incident Investigation was closed on Jan 15, 2018.

**Surmont Well 264-3 I12 Steam Injector Release – FIS Incident 20173863:**
- Incident occurred on Dec 19, 2017 for approximately 5 hours.
- Cause of the incident was determined to be a result of the fluid column in the well boiling off allowing flow to surface.
- Secondary cause of the incident was determined to be an inoperable TIW safety valve, likely due to freezing.
- Environmental clean up is complete and the Incident Investigation is active.

**Surmont Phase 1 Pond Primary Liner:**
- A corrective action plan was submitted in 2015 and the action items were completed.
- ConocoPhillips provided an update to the AER on Mar 17, 2017 indicating that the pond Action Leakage Rate is not currently exceeded and will continue to monitor.
Future Plans

Subsection 3.1.2 (9)
Future Plans – Surmont

• Design work for the Surmont landfill will be on-going in 2018 with construction planned for 2019.

Phase 1:
• Pad 103 turn-around planned for 2018.
• Continued monitoring of sludge pond primary liner.
• Potential expansion of NCG co-injection pilot to Pad 101 in 2018.

Phase 2:
• Pad 264-1 turn-around planned for 2018.
• Continuous partial condensate blending operation planned to start in 2018.
• Design work on-going for modifications for 100% condensate blending through 2018, with planned construction in 2019.
• Full plant turn-around is in planning stage for 2019 execution.
• 267 is the next pad in the queue.
• 104 is second in the queue.
• Third pad in queue: Looking at near-CPF options.
• 268 is on hold pending further review.