Husky Oil Operations Limited

McMullen Thermal Conduction Process Experimental Pilot Project
Experimental Scheme No. 11541

Annual Performance Presentation
Alberta Energy Regulator

March 18, 2016
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1. Brief Background
Project Overview – AER Approvals

• December 20, 2010 - AER issued Experimental Scheme Approval 11541 for the McMullen TCP experimental scheme application (AESRD issued EPEA Approval 265571-00-00 on January 10, 2011)

• January 19, 2012 - AER issued Experimental Scheme Approval 11541A for three additional horizontal production wells as a modification to the scheme

• August 7, 2013 – AER issued Experimental Scheme Approval 11541B for the handling of sour gas at the facility for all production wells

• October 30, 2013 – AER issued Experimental Scheme Approval 11541C to extend the experimental scheme approval and confidentiality period to July 31, 2015

• April 21, 2015 – AER issued Experimental Scheme Approval 11541D to extend the experimental scheme approval to July 31, 2018 and confidentiality period to July 31, 2016
McMullen Thermal Conduction Project (TCP)
Project Location

- Project location is the SW/4 of 35-078-25W4
  - Based on core and log data from 100/03-35-078-25W4 well drilled in November 2008
  - 100/03-35-078-25W4 well has a depleted gas zone of 4 meters in thickness that overlies a bitumen zone of 6 meters in thickness
- Thin bitumen zone of 6 meters has excellent reservoir characteristics
  - Classified as a homogeneous, unconsolidated, clean sand with good porosity, excellent permeability and good oil saturation
- There is no underlying water in contact with the bitumen
- The overlying gas cap has a good seal (Clearwater Shale)
Wabiskaw “A” Project Area Gas Cap Map

AER Approved Expanded Primary Area by an additional 41 sections for a total of 68 sections (down-spaced to 36 wells/section)

McMullen TCP Pilot Project SW 35-078-25W4 Application area

AER Initial Approved Primary Area of 27 sections - down-spaced to 36 wells/section

Husky has drilled 300 wells since 2008
Project Scope

- **Purpose:**
  - Recover bitumen underlying depleted gas cap

- **What We Do:**
  - Ignite and oxidize residual oil saturation (8-15%) within depleted gas cap

- **How We Do it:**
  - Ignition process: Steam/Linseed Oil/Steam/Nitrogen/Air (spontaneously combusts)
  - Wait (3-6 months+) for heat to conduct to underlying bitumen

- **What We See:** (within the depleted gas cap)
  - Combustion zone peak temperature 330°C (burn tube test 600 degrees Celsius (°C))

- **What We Need:** (within bitumen zone)
  - Heated > 56°C to lower viscosity to less than 2,200cp to start producing

- **What We Get:**
  - Flow rate 25 m³/day (from 400m HZ Well)
  - Recovery factor > 50%
Project Status

• 2011/2012 - 13 wells drilled and facility construction completed
• September 28, 2011 – start of temporary steam
• December 8, 2011 – start of first air injection
• January 19, 2012 - received approval to drill three additional horizontal producers
• October 2012 - 3rd train air compression added
• November 1, 2012 – first horizontal well on production
• October 2013 - three additional horizontal wells on production
• September 18, 2014 – shut-in of air injection
• October 31, 2015 – suspension of Project operations
• July 31, 2016 – expiry of confidentiality period
Inter-Well Spacing
Project Objectives

December 2015 - 49 Months after Start of Air Injection:

- Successful ignition and continuous combustion
  - Achieved
- Heating the underlying bitumen through thermal conduction to mobilize the oil
  - As predicted (~25 m³/d; 25-30% BS&W)
- Determine combustion front velocity through the depleted gas zone
  - As predicted
- Determine optimal well spacing for future design of a commercial project
  - Requires Pilot expansion to test new spacing
- No Injected air or combustion gas breakthrough into the horizontal producers
  - Achieved
Improved Recovery Technique

• New innovative technology
  • To recover bitumen underlying a depleted gas cap

• Thermal recovery process
  • Conducts heat downward from the gas zone to the bitumen leg in order to mobilize the oil for production

• Combustion reactions
  • Will be confined to the gas zone and results in high temperature oxidation

• Significant reduction in fresh water usage
  • Over conventional steam assisted methods (Cyclic Steam Stimulation and Steam Assisted Gravity Drainage)
  • Water requirements are for initial steaming only (8311 m$^3$ Cold Water Equivalent (CWE) for the initial heating of the three injectors to ensure ignition when air is injected)
2. Geology / Geosciences
OBIP Reserve Estimate - Volumetric Methodology

Average Reservoir Parameters:
• Net Oil Pay = 6 m
• Porosity = 31%, So = 70%
• Oil FVF = 1.00 m³/m³

Entire approval area - 64 ha (SW/4 section 35-078-25W4)
• OBIP = 833 e³m³

Planned operating portion of the Project - 13 ha (prior to shut-in of air injection)
• OBIP = 169 e³m³

Actual operating portion of the Project - 6 ha (after shut-in of air injection)
• OBIP = 78 e³m³
• The premature shut-in of air injection (and shut-down of combustion) resulted in a smaller portion of the Project being heated than originally estimated. The actual operating portion of the Project (6 ha) is based on an estimated drainage area size of 75 m on either side of the injectors (width) by 400 m long (length of a HZ well).
Wabiskaw “A” Net Oil Pay Values

- SW 1/4 of Section 35-078-25W4
Wabiskaw “A” Net Gas Pay Map

SW 35-078-25W4
Application area
Wabiskaw “A” Net Gas Pay Values

- SW 1/4 of Section 35-078-25W4
Wabiskaw “A” Structure Map (SW 03-078-25W4)

- All depths are subsea
Wabiskaw “A” Structural Values

- SW 1/4 of Section 35-078-25W4
- All depths are subsea
Wabiskaw “A” Gas/Bitumen Contact Structural Values

- SW 1/4 of Section 35-078-25W4
- All depths are subsea
Reservoir & Fluid Characteristics
(100/03-35-078-25W4)

WABISKAW “A”
Marine Shoreline Deposit
- Fine-grained
- Coarsening upward
- Homogeneous & continuous
- Unconsolidated sand

<table>
<thead>
<tr>
<th>Pressure</th>
<th>Viscosity</th>
<th>API</th>
<th>Bitumen Saturation</th>
<th>Porosity</th>
<th>Permeability (Kmax)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1722 Kpa</td>
<td>77,700 cp</td>
<td>9.4 API</td>
<td>18% (2% bulk wt)</td>
<td>27%</td>
<td>3.6 - 4.5 D</td>
</tr>
<tr>
<td>1815 Kpa</td>
<td>95,300 cp</td>
<td>9.1 API</td>
<td>45% (7% bulk wt)</td>
<td>33%</td>
<td>5.10</td>
</tr>
<tr>
<td>1864 Kpa</td>
<td>121,800 cp</td>
<td>8.8 API</td>
<td>75% (11% bulk wt)</td>
<td>32%</td>
<td>5.90</td>
</tr>
<tr>
<td>1815 Kpa</td>
<td>219,800 cp</td>
<td>7.5 API</td>
<td>67% (10.1% bulk wt)</td>
<td>32%</td>
<td>5.40</td>
</tr>
</tbody>
</table>

Base of Wabiskaw McMurray

<table>
<thead>
<tr>
<th>HZ Well Elevation (4m below G/B contact)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0m Gas (Depleted)</td>
</tr>
<tr>
<td>6.0m Bit</td>
</tr>
</tbody>
</table>

Drilling Depth: ≈ 450m
Porosity: ≈ 31%
Permeability: ≈ 5 Darcies
Net Pay: ≈ 6m
Oil Saturation: ≈ 70%
TAN: 1.3
Viscosity (core): Average 122,000 cp
Viscosity (prod): Average 190,000 cp
API: 8.8
Pressure (current): ≈ 2,200 kPa (December 2015)
Well 100/03-35-078-25W4

- Oil Viscosity (4 m below the Gas Cap)
Fluid Contacts – Well 100/03-35-078-25W4
# Mineral Composition in the Gas and Bitumen zones – Well 102/03-35-078-25W4

## X-Ray Diffraction Analysis
(combined mineral analysis)

**Company:** Husky Energy Inc.  
**File No:** 52135-08-2307B  
**Analyst:** S.M.

### Gas Zone vs. Bitumen Zone

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>OB2</th>
<th>OB3</th>
<th>OB4</th>
<th>OB5</th>
<th>OB6</th>
<th>OB7</th>
<th>OB8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth Interval (m)</td>
<td>443.75</td>
<td>445.3</td>
<td>447.75</td>
<td>450.2</td>
<td>455.45</td>
<td>456.35</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Mineral</th>
<th>Gas Zone Whole Rock Weight %</th>
<th>Bitumen Zone Whole Rock Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quartz</td>
<td>93</td>
<td>96</td>
</tr>
<tr>
<td>K-Feldspar</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Plagioclase</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Anhydrite</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Calcite</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dolomite</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Halite</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Siderite</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pyrite</td>
<td>0</td>
<td>Trace</td>
</tr>
<tr>
<td>Total Clay</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

### Clay Mineral Composition

<table>
<thead>
<tr>
<th>Clay Mineral</th>
<th>Relative Clay %</th>
<th>Relative Clay %</th>
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</thead>
<tbody>
<tr>
<td>Smectite</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Illite / Smectite</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Illite</td>
<td>37</td>
<td>28</td>
</tr>
<tr>
<td>Kaolinite</td>
<td>21</td>
<td>41</td>
</tr>
<tr>
<td>Chlorite</td>
<td>39</td>
<td>23</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

* Illite / Smectite Mixed-Layer Clay

The percentage of smectite layers in illite / smectite clay: **60-70%**

Due to inherent limitations in X-ray diffraction quantification, results must be considered semi-quantitative.
Structural Cross-Section

- Structural cross-section between the three injector wells

A

00/03-35-078-25W4  
RR 2008-11-19  
KB: 579.6m

02/06-35-078-25W4  
RR 2010-03-15  
KB: 579.5m

03/06-35-078-25W4  
RR 2010-03-22  
KB: 579.6m

A’
• Structural cross-section between the six observation wells
Seismic Coverage

- Original Primary Recovery Scheme Boundary
- Expanded Primary Recovery Scheme Boundary
- TCP Recovery Scheme Boundary
- Husky 3-D Seismic Coverage
- Husky 2-D Seismic Coverage
Cap Rock Integrity Program

- Caprock (overlying Wabiskaw “A”)
  - Clearwater shale sequence (~95 meters thick)
- Pilot mini-frac test
  - Conducted in March 2010 on the 14-36-078-25W4 well (RR October 18, 2008)
  - Interpreted in-situ minimum stress in cap rock shale = 8,200 kPa
  - Fracture gradient = 18.51 kPa/m

- AER Scheme Maximum Operating Pressure Approval: 5,000 kPa

- Injection pressures
  - During steaming phase: 2,200 – 2,500 kPa
  - During air injection phase: 2,800 – 3,000 kPa (prior to shut-in air injection)
  - Air injection shut-in: September 18, 2014
  - Current reservoir pressure: ~2,200 kPa (December 2015)
Surface Monitoring Program

• Surface heave monitoring is not required
  • due to the small volume of steam that was injected (8,311 m³ CWE) prior to the start of continuous air injection
3. Drilling and Completions
### Thermal Cement Temperature Ratings

<table>
<thead>
<tr>
<th>Well</th>
<th>Type of Well</th>
<th>Temperature Rating (degrees Celsius)</th>
<th>Type of Cement</th>
</tr>
</thead>
<tbody>
<tr>
<td>105/06-35-078-25W4</td>
<td>Horizontal</td>
<td>1000</td>
<td>LDP-C-310+0.20% SMS + 0.15% CDF-4P + 0.40% CFL-6 + 0.30% + 0.40% CFL-4</td>
</tr>
<tr>
<td>108/06-35-078-25W4</td>
<td>Horizontal</td>
<td>1000</td>
<td>LDP-C-310+1% CFR-5 + 0.5% CFL-3 + 0.3% Citric Acid + 6% Gypsum + 1% TAE + 0.15% CDF-4P</td>
</tr>
<tr>
<td>109/06-35-078-25W4</td>
<td>Horizontal</td>
<td>1000</td>
<td>LDP-C-310+1% CFR-5 + 0.5% CFL-3 + 0.3% Citric Acid + 6% Gypsum + 1% TAE + 0.15% CDF-4P</td>
</tr>
<tr>
<td>110/06-35-078-25W4</td>
<td>Horizontal</td>
<td>1000</td>
<td>LDP-C-310+1% CFR-5 + 0.5% CFL-3 + 0.3% Citric Acid + 6% Gypsum + 1% TAE + 0.15% CDF-4P</td>
</tr>
<tr>
<td>100/03-35-078-25W4</td>
<td>Air Injection</td>
<td>360</td>
<td>Thermal 40 Expandomix + 1.00% CaCl2 + 0.25% CFR-2 + 0.35% CFL-3</td>
</tr>
<tr>
<td>102/06-35-078-25W4</td>
<td>Air Injection</td>
<td>1000</td>
<td>UHTC + 3.0% CFL-6 + 0.20% SMS + 0.20% CR-2 slurry @ 1900 kg/m3</td>
</tr>
<tr>
<td>103/06-35-078-25W4</td>
<td>Air Injection</td>
<td>1000</td>
<td>UHTC + 3.0% CFL-6 + 0.20% SMS + 0.20% CR-2 slurry @ 1900 kg/m3</td>
</tr>
<tr>
<td>104/05-35-078-25W4</td>
<td>Observation</td>
<td>1000</td>
<td>LDP-C-310+0.1% CR-2 + 0.3% CFL-6 + 0.2% SMS + 0.15% CDF-4P</td>
</tr>
<tr>
<td>103/05-35-078-25W4</td>
<td>Observation</td>
<td>1000</td>
<td>LDP-C-310+0.1% CR-2 + 0.3% CFL-6 + 0.2% SMS + 0.15% CDF-4P</td>
</tr>
<tr>
<td>104/06-35-078-25W4</td>
<td>Observation</td>
<td>1000</td>
<td>LDP-C-310+0.1% CR-2 + 0.3% CFL-6 + 0.2% SMS + 0.15% CDF-4P</td>
</tr>
<tr>
<td>104/04-35-078-25W4</td>
<td>Observation</td>
<td>1000</td>
<td>LDP-C-310+0.1% CR-2 + 0.3% CFL-6 + 0.2% SMS + 0.15% CDF-4P</td>
</tr>
<tr>
<td>104/03-35-078-25W4</td>
<td>Observation</td>
<td>1000</td>
<td>LDP-C-310+0.1% CR-2 + 0.3% CFL-6 + 0.2% SMS + 0.15% CDF-4P</td>
</tr>
<tr>
<td>107/06-35-078-25W4</td>
<td>Observation</td>
<td>1000</td>
<td>LDP-C-310+0.1% CR-2 + 0.3% CFL-6 + 0.2% SMS + 0.15% CDF-4P</td>
</tr>
</tbody>
</table>

**Note:**

1000 °C cement is a special cement that was ordered from Chesapeake Virginia.

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32
Thermal Cement Wellbore Integrity

• 100/03-35-078-25W4 drilled in November 2008 as an evaluation well
  • thermal cement rated for 360°C
  • the Project location was based on core and log data from this well
  • converted to an air injection well for the Project

• Observed temperatures in the 100/03-35-078-25W4 air injection well
  • max temp of 220°C during the 30 day steaming phase (October 2011)
  • temperatures constant 20 – 25°C since start of air injection (December 2011)

• Peak combustion temperatures were recorded in two observation wells
  • 103/05-35-078-25W4 and 104/04-35-078-25W4 wells
  • highest combustion temperatures observed in the gas zone ~330°C

• There has been no indication of wellbore integrity issues within the Project
Producing HZ Well 105/06-35-078-25W4

Well: Husky HZ 105 Pelican 6-35-78-25
KB (m): 584.09
Rig: Precision Drilling #102
TD (mKB MD): 992.00
Unique ID: 105/06-35-078-25W4/00
GL (m): 579.62
Spud Date: 06/24/2011 @ 04:00 Hrs
TVD (mKB MD): 454.40
Surface Location: 05/04-35-078-25W4
CF (m): 579.62
Rig Release Date: 07/05/2011 @ 23:59 Hrs
PBTD (mKB MD): 981.59
License #: 0430310
KB-CF (m): 4.47
Profile: Horizontal
PB (mKB MD):

Casing Details:

Surface Hole: 444.5 mm Hole Drilled From 0.00 – 206.00 mKB
Surface Casing: 16 Jts – 339.7 mm, 81.01 kg/m, J-55, ST&C. Landed @ 205.70 mKB
Surface Casing Cement: 32.50 T – Proteus Core + 2.00% Cac2
Returns: 12.00 m3
Intermediate Hole: 270 mm Hole Drilled From 206.00 – 585.00 mKB
Intermediate Casing: 46 Jts – 219.1 mm, 47.621 kg/m, K-55, ST&C. Landed @ 584.90 mKB
Intermediate Casing Cement: 40.00 T – LDP-C-310 + 0.20% SMS + 0.15% CDF-4P + 0.40% CFL-6 + 0.30% CFL-3 + 0.40% CFL-4
Returns: 0.80 m3
Liner Hole: 200 mm Hole Drilled From 585.00 – 992.00 mKB MD
Liner Casing: 35 Jts – Slotted Liner, 139.7 mm, 25.29 kg/m, L-80, GEOCONN. Landed @ 982.00 mKB MD, Liner hanger top @ 557.60 mKB MD

Tubing String Details:

Size: (mm) OD: 88.9
Kg/m: 13.84
Grade: J-55
Landing Depth: (mKB MD): 550.0
No.
1. Instrumentation String #1 - Thermocouples Landed @ 970.0, 945.0, 920.0, 895.0, 870.0, 845.0, 820.0, 795.0, 770.0, 745.0, 720.0, 695.0, 670.0, 645.0, 620.0, 595.0 mKB MD
Instrumentation String #2 - Thermocouples Landed @ 969.0, 770.0, 569.0 mKB MD + Pressure Sensors Landed @ 969.0, 770.0, 569.0 mKB MD
1. - tubing hanger
2. - 60.3mm x 52.4mm cross-over
5. 57 - 52.4mm tubing Jt.

No.
7. 38.1mm coil tubing containing both instrumentation strings - landed @ 961.00 mKB MD
8. R&M energy - hi-temperature tubing rotator
9. 1 - 114.3 mm x 88.9mm cross-over
10. 56 - 68.9mm L-80 tubing with bevelled couplings. Landed @ 501.3 mKB MD
11. PCP - pump intake landed at 501.30 mKB MD
**Injection Well 102/06-35-078-25W4**

| Well: | Husky 102 Pelican 6-35-78-25 |
| KB (m): | 579.46 |
| Rig: | Precision Drilling #164 |
| TD (mKB MD): | 529.00 |
| Unique ID: | 102/06-35-078-25W4/00 |
| GL (m): | 575.32 |
| Spud Date: | 3/15/2010 3:30:00 PM |
| TVD (mKB MD): | 492.12 |
| License #: | 0418707 |
| KB-CF (m): | 4.05 |
| Profile: | Directional |
| PB (mKB MD): | 474.30 (Cement Top) |

### Casing Details:
- **Surface Hole:** 349 mm Hole Drilled From 0.00 – 199.00 mKB MD
- **Surface Casing:** 15 Jts – 244.5 mm, 48.068 kg/m, H-40, ST&C. Landed @ 199.00 mKB MD
- **Surface Casing Cement:** 22.00 T – Proteus CO + 2.00% CaCl2 + 1.00% CFR-2
  - Returns: 4.00 m3
- **Production Hole:** 222 mm Hole Drilled From 199.00 – 529.00 mKB MD
- **Production Casing:** 44 Jts + 1 Marker Jt - 177.8 mm, 34.228 kg/m, L-80, QB2. Landed @ 529.00 mKB MD
- **Production Casing Cement:** Scavenger - 1.00 T - UHTC; Lead - 15.40 T - UHTC + 0.30% CFL-6 + 0.20% CR-2 + 0.20% SMS
  - Returns: 2.00 m3

### Tubing String Details:
- **Size (mm) OD:** 88.9
- **Kg/m:** 13.84
- **Grade:** J-55
- **Landing Depth (mKB MD):**
<table>
<thead>
<tr>
<th>No.</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 - 179.4 mm × 88.9 mm Tubing Hanger</td>
</tr>
<tr>
<td>2</td>
<td>1 - 179.4 mm Tubing Jt.</td>
</tr>
<tr>
<td>3</td>
<td>1 - 179.4 mm x 3.10 m Pup Jt.</td>
</tr>
<tr>
<td>4</td>
<td>1 - 179.4 mm x 1.80 m Pup Jt.</td>
</tr>
<tr>
<td>5</td>
<td>1 - 179.4 mm x 1.20 m Pup Jt.</td>
</tr>
<tr>
<td>6</td>
<td>1 - 88.9 mm x 69.9 mm SX Nipple</td>
</tr>
<tr>
<td>7</td>
<td>1 - 88.9 mm x 3.10 m Pup Jt.</td>
</tr>
<tr>
<td>8</td>
<td>1 - 88.9 mm x 1.80 m Pup Jt.</td>
</tr>
<tr>
<td>9</td>
<td>1 - 88.9 mm x 1.20 m Pup Jt.</td>
</tr>
<tr>
<td>10</td>
<td>1 - 88.9 mm x 69.9 mm SX Nipple</td>
</tr>
<tr>
<td>11</td>
<td>1 - 88.9 mm x 3.10 m Pup Jt.</td>
</tr>
<tr>
<td>12</td>
<td>1 - 114.3 mm x 4.50 m Thermal PermaPack Permanent Seal Bore Packer c/w 1.016 mm x 4.50 m Integral Seal Bore</td>
</tr>
<tr>
<td>13</td>
<td>1 - 88.9 mm x 1.80 m Pup Jt.</td>
</tr>
<tr>
<td>14</td>
<td>1 - 88.9 mm x 1.20 m Pup Jt.</td>
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<tr>
<td>15</td>
<td>1 - 88.9 mm x 69.9 mm SX Nipple</td>
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<tr>
<td>16</td>
<td>1 - 88.9 mm x 3.10 m Pup Jt.</td>
</tr>
<tr>
<td>17</td>
<td>1 - 114.3 mm x 4.50 m Thermal PermaPack Permanent Seal Bore Packer c/w 1.016 mm x 4.50 m Integral Seal Bore</td>
</tr>
<tr>
<td>18</td>
<td>1 - 88.9 mm x 1.80 m Pup Jt.</td>
</tr>
<tr>
<td>19</td>
<td>1 - 88.9 mm x 1.20 m Pup Jt.</td>
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<tr>
<td>20</td>
<td>1 - 88.9 mm x 69.9 mm SX Nipple</td>
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<tr>
<td>21</td>
<td>1 - 88.9 mm x 3.10 m Pup Jt.</td>
</tr>
<tr>
<td>22</td>
<td>1 - 114.3 mm x 4.50 m Thermal PermaPack Permanent Seal Bore Packer c/w 1.016 mm x 4.50 m Integral Seal Bore</td>
</tr>
<tr>
<td>23</td>
<td>1 - 88.9 mm x 1.80 m Pup Jt.</td>
</tr>
<tr>
<td>24</td>
<td>1 - 88.9 mm x 1.20 m Pup Jt.</td>
</tr>
<tr>
<td>25</td>
<td>1 - 88.9 mm x 69.9 mm SX Nipple</td>
</tr>
<tr>
<td>26</td>
<td>1 - 88.9 mm x 3.10 m Pup Jt.</td>
</tr>
<tr>
<td>27</td>
<td>1 - 114.3 mm x 4.50 m Thermal PermaPack Permanent Seal Bore Packer c/w 1.016 mm x 4.50 m Integral Seal Bore</td>
</tr>
<tr>
<td>28</td>
<td>1 - 88.9 mm x 1.80 m Pup Jt.</td>
</tr>
<tr>
<td>29</td>
<td>1 - 88.9 mm x 1.20 m Pup Jt.</td>
</tr>
<tr>
<td>30</td>
<td>1 - 88.9 mm x 69.9 mm SX Nipple</td>
</tr>
<tr>
<td>31</td>
<td>1 - 88.9 mm x 3.10 m Pup Jt.</td>
</tr>
<tr>
<td>32</td>
<td>1 - 114.3 mm x 4.50 m Thermal PermaPack Permanent Seal Bore Packer c/w 1.016 mm x 4.50 m Integral Seal Bore</td>
</tr>
<tr>
<td>33</td>
<td>1 - 88.9 mm x 1.80 m Pup Jt.</td>
</tr>
<tr>
<td>34</td>
<td>1 - 88.9 mm x 1.20 m Pup Jt.</td>
</tr>
<tr>
<td>35</td>
<td>1 - 88.9 mm x 69.9 mm SX Nipple</td>
</tr>
</tbody>
</table>

### Isolation Equipment:

<table>
<thead>
<tr>
<th>Date Set</th>
<th>Make</th>
<th>Model</th>
<th>Depth Set (mKB MD):</th>
<th>Pressure Tested:</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 14, 2011</td>
<td>Logan</td>
<td>177.8 mm Thermal PermaPack Permanent Seal Bore Packer</td>
<td>465.00</td>
<td>7 MPa @ 10 mins</td>
</tr>
<tr>
<td>April 17, 2011</td>
<td>Sanjel</td>
<td>1.20 m3 LDP-C-310 (UHTC) + 0.30% CFL-6 + 0.20% SMS + 0.10% CR-2</td>
<td>522.20-482.60</td>
<td></td>
</tr>
<tr>
<td>July 13, 2011</td>
<td>Sanjel</td>
<td>1.30 T - LDP-C-310 (UHTC) + 0.30% CFL-6 + 0.20% SMS + 0.10% CR-2</td>
<td>482.60-474.30</td>
<td></td>
</tr>
</tbody>
</table>
# Observation Well 104/03-35-078-25W4

<table>
<thead>
<tr>
<th>Well:</th>
<th>Husky 104 Pelican 3-35-78-25</th>
<th>KB (m):</th>
<th>579.60</th>
<th>Rig:</th>
<th>Precision Drilling #163</th>
<th>TD (mKB MD):</th>
<th>487.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unique ID:</td>
<td>104/03-35-078-25W4/00</td>
<td>GL (m):</td>
<td>575.40</td>
<td>Spud Date:</td>
<td>03/30/2011 @ 12:45 Hrs</td>
<td>TVD (mKB MD):</td>
<td>464.83</td>
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<tr>
<td>Surface Location:</td>
<td>04/04-35-078-25W4</td>
<td>CF (m):</td>
<td>575.65</td>
<td>Rig Release Date:</td>
<td>04/04/2011 @ 20:00 Hrs</td>
<td>PBT D (mKB MD):</td>
<td></td>
</tr>
<tr>
<td>License #</td>
<td>0419007</td>
<td>KB-CF (m):</td>
<td>3.95</td>
<td>Profile:</td>
<td>Directional</td>
<td>PB (mKB MD):</td>
<td>430.14 (Cement Top)</td>
</tr>
</tbody>
</table>

## Casing Details:

| Surface Hole: | 349 mm Hole Drilled From 0.00 – 171.00 mKB MD |
| Surface Casing: | 13 Jts – 244.5 mm, 48.068 kg/m, H-40, ST&C. Landed @ 171.00 mKB MD |
| Surface Casing Cement: | 20.00 T – Proteus Core + 2.00% CaCl2 + 1.00% CFR-2 + 0.15% CDF-4P |
| Returns | 5.00 m³ |

| Production Hole: | 222 mm Hole Drilled From 171.00 – 487.00 mKB MD |
| Production Casing: | 35 Jts + 3 Marker Jt - 114.3 mm, 14.14 kg/m, J-55, ST&C . Landed @ 484.20 mKB MD |
| Production Casing Cement: | 29.40 T – LDP-C-310 + 0.10% CR-2 + 0.20% SMS + 0.30% CFL-6 + 0.15% CDF-4P |
| Returns: | 5.00 m³ |

| Liner Hole: | N/A |
| Liner Casing: | N/A |

## Tubing String Details:

<table>
<thead>
<tr>
<th>No.</th>
<th>Instrumentation String #1 (Outside Of Casing): Thermocouples @ 476.27, 475.14, 474.01, 472.01, 471.75, 470.62, 469.49, 468.36, 467.22, 464.96, 452.52, 451.38 mKB MD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Instrumentation String #2 (Outside Of Casing): Thermocouples @ 470.62, 464.53 mKB MD &amp; Pressure Sensors @ 470.62, 465.53 mKB MD</td>
</tr>
</tbody>
</table>
4. Artificial Lift
Artificial Lift

• Horizontal production well 105/06-35-078-25W4
  • Currently equipped with high temperature metal to metal 80MET1000 PCP
  • Initially equipped with a high temperature 12-ML-17 PCP (rated for a max of 175 °C)
  • Horizontal well 105/06-35 on prod November 2012

• Horizontal production well 109/06-35-078-25W4
  • Currently equipped with high temperature metal to metal 80MET1000 PCP
  • Initially equipped with a high temperature 12-ML-44 PCP
  • Changed to a 16-ML-44 PCP (rated for a max of 175 °C)
  • On production September 2013

• Horizontal production well 110/06-35-078-25W4
  • Currently equipped with high temperature metal to metal 80MET1000 PCP
  • Initially equipped with a high temperature 16-ML-44 PCP (rated for a max of 175 °C)
  • On production October 2013

• Horizontal production well 108/06-35-078-25W4
  • Equipped with high temperature 12-ML-17 PCP
  • Well started back up October 2014
  • On production October 2013 (shut-in December 2, 2013)
5. Instrumentation in Wells
Metering and Monitoring

• Air injection will be measured on an individual well basis; four horizontal wells are equipped with production and sales tanks

• Four Horizontal Oil Production Wells
  • Thermocouples every 25m along the horizontal section
  • Pressure sensors at the heel, middle and toe of the horizontal section
  • Wells equipped with gas chromatographs to monitor produced gas composition
  • Periodic oil & gas samples for analysis
  • Issues with malfunctioning thermocouples & pressure sensors

• Three Air Injection Wells
  • Thermocouples placed at the mid-point of perforations (gas zone)
  • Two wells equipped with temperature sensors to indicate potential flow behind pipe

• Six Observation Wells
  • 12 thermocouples installed per well (2 above the gas zone, 3 gas zone & 7 bitumen zone)
  • One well equipped with pressure sensors

• Offsetting Gas Wells
  • Four area gas wells equipped gas chromatographs for monitoring of produced gas composition
  • Periodic static gradients to monitor reservoir pressure
6. 4D Seismic
4D Seismic

- Lateral distribution of heat
  - Too small to be resolved on 3D or 4D seismic surveys

- 4D seismic data
  - No plans to acquire
7. Scheme Performance
Scheme Performance

• First steam injection on September 28, 2011 (temporary – 8,311 m³ CWE)
• First air injection on December 8, 2011
• Shut-in air injection on September 18, 2014
• Suspension of Project operations on October 31, 2015

• The purpose of the initial steam injection was to raise the formation temperature in each of the three injection wells to 180 – 200 °C to allow for ignition when switching over to air injection.

Criteria for Horizontal Producers Start-up:

• Nine of the 16 thermocouples located along the horizontal section of the wellbore would be heated to a temperature of at least 56 °C, which would result in a bitumen viscosity of 2,200 cp or less and a flow rate of 25 m³/d or higher.
Injection & Production History

- **Start-up of air injection on December 8, 2011**
  - Increases in injection rate:
    - 15 e³ m³/day on December 12, 2011
    - 20 e³ m³/day on December 28, 2011
    - 25 e³ m³/day on January 30, 2012
    - 40 e³ m³/day on February 17, 2012
    - 45 e³ m³/day on March 16, 2012
    - 55 e³ m³/day on April 24, 2012
    - 65 e³ m³/day on July 16, 2012 (two trains)
    - 90 e³ m³/day on October 17, 2012 (third train)
  - Shut-in air injection on September 18, 2014 (after 2 years & 10 months of injection)

- **Shut-in of air injection** was due to increasing concentrations of nitrogen observed in several of Husky’s surrounding primary wells in the area and the potential risk to more production

- **Horizontal Well 105/06-35-078-25W4** on initial production for four days in August 2012
  - Shut-in due to the detection of H₂S, production re-start was on November 1, 2012

- **Horizontal wells 109/06-35-078-25W4, 110/06-35-078-25W4 & 108/06-35-078-25W4** were placed on production in September and October 2013
  - Well 108/06-35-078-25W4 was shut-in on December 2, 2013 to allow bitumen zone to be further heated; was placed back on production October 8, 2014
Nitrogen Monitoring

Wells monitored for Nitrogen
Wells with Nitrogen detected
Nitrogen Breakthrough Mechanism – Gas Discovery

2,800Kpa

2,600Kpa

4m

6m

Wabiskaw “A”

Gas

Oil

HIGH VISCOSITY

LOW VISCOSITY

SAND

FREE WATER
Nitrogen Breakthrough Mechanism – Gas Depletion

Wabiskaw “A”

Gas

Oil

LOW VISC.

Gas

HIGH VISC.

Water

SAND

FREE WATER

2,800Kpa
700Kpa

2,600Kpa
1,500Kpa

4m

6m
Nitrogen Breakthrough Mechanism – Bitumen Discovery

Wabiskaw “A”

700Kpa

1,900Kpa

1,500Kpa

4m

6m

HIGH VISC.

LOW VISC.

GAS

WATER

Gas

Oil

SAND

FREE WATER
Nitrogen Breakthrough Mechanism – Bitumen Production

Wabiskaw “A”

Gas

Oil

LOW VISC.

HIGH VISC.

GAS

WATER

700Kpa

1,900Kpa

1,700Kpa

1,500Kpa

4m

6m

SAND

FREE WATER
Nitrogen Breakthrough Mechanism - Air Injection
Production History

- Cumulative Oil 228.3 mstb (36.3 e^3 m³) at suspension of operations October 31, 2015
Horizontal Well 105/06-35-78-25W4
Thermocouple Placement
Horizontal Wellbore Temperature History

McMullen TCP 09/06-35 (25 m) On Production Sep 30/13

The diagram shows the temperature history of thermocouples labeled T0 to T20 over a period from September 19, 2013, to December 31, 2013. The temperature values are indicated on the vertical axis ranging from 0 to 200 degrees Celsius. The horizontal axis represents different thermocouples labeled from T0 to T20. The data points are color-coded to show temperature trends over time.
Horizontal Wellbore Temperature History

McMullen TCP 10/06-35 (50m) On Production Oct 6/13

Thermocouples

T20 (Heel)
T19
T18 (faulty)
T17
T16
T15
T14
T13
T12
T11
T10 (faulty)
T9
T8 (faulty)
T7
T6
T5
T4 (faulty)
T3
T2 (faulty)
T1 (Toe)

Temperatures

C

0 20 40 60 80 100 120 140 160 180 200

26-Sep-12
3-Oct-12
10-Oct-12
17-Oct-12
24-Oct-12
31-Oct-12
7-Nov-12
14-Nov-12
21-Nov-12
28-Nov-12
5-Dec-12
12-Dec-12
19-Dec-12
26-Dec-12
2-Jan-13
9-Jan-13
16-Jan-13
23-Jan-13
30-Jan-13
6-Feb-13
13-Feb-13
20-Feb-13
27-Feb-13
6-Mar
13-Mar-13
20-Mar-13
27-Mar-13
3-Apr-13
10-Apr-13
17-Apr-13
1-May-13
8-May-13
15-May-13
22-May-13
29-May-13
5-Jun-13
12-Jun-13
20-Jun-13
26-Jun-13
3-Jul-13
24-Jul-13
7-Aug-13
28-Aug-13
4-Sep-13
11-Sep-13
18-Sep-13
25-Sep-13
30-Oct-13
6-Nov-13
4-Dec-13
8-Jan-14
5-Feb-14
5-Mar-14
3-Apr-14
8-May-14
3-Jul-14
17-Sep-14
11-Dec-14
11-May-15
1-Dec-15
McMullen TCP 08/06-35 (100m) On Prod Oct 18/13, Shut-in Dec 2/13, Re-start Oct 8/14

T20 (Heel)

T19

T18

T17

T16

T15

T14

T13

T12

T11

T10

T9

T8

T7

T6

T5

T4

T3

T2

T1 (Toe)

Thermocouples

0

10

20

30

40

50

60

70

80

90

100

Temperature

3/18/2016 57
• 13 months after start of air injection
• First horizontal well on production November 2012
Heat Response – September 25, 2013

- 21 months after start of air injection
- Prior to placing remaining 3 horizontal wells on production
• 34 months after start of air injection
• Prior to shut-in of air injection on September 18, 2014
OBS Well 103/05-35-078-25W4 - Temperatures

- 25 m from well 100/03-35-078-25W4 (air injector)
OBS Well 104/05-35-078-25W4 - Temperatures

- 87 m north of well 100/03-35-078-25W4 (air injector), ahead of the combustion front
Horizontal Well 108/06-35-078-25W4M Pressure History

HZ 108/06-35-78-25W4 Well Pressures (kPa)

Reduction air injection rates 90 – 60 m³/day

Pressure ~ 2850 kPa

Sep 18 2014 (shut-in air injection)

Pressure ~ 2200 kPa

Oct 31 2015 (suspension of operations)
Calculated Combustion Radius vs Time

- 4m thick gas cap

<table>
<thead>
<tr>
<th>Year</th>
<th>Calculated Gas In Place (m³)</th>
<th>Injection Air (m³/d)</th>
<th>Cum Injection E³m³</th>
<th>Front velocity (m/d)</th>
<th>Front velocity (ft/d)</th>
<th>Calculated Radius (m)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>29,851</td>
<td>52,900</td>
<td>20,896</td>
<td>0.134</td>
<td>0.440</td>
<td>53</td>
<td>actual</td>
</tr>
<tr>
<td>2013</td>
<td>76,727</td>
<td>89,900</td>
<td>53,709</td>
<td>0.080</td>
<td>0.263</td>
<td>82</td>
<td>actual</td>
</tr>
<tr>
<td>2014</td>
<td>103,759</td>
<td>72,500</td>
<td>72,632</td>
<td>0.048</td>
<td>0.160</td>
<td>96</td>
<td>actual</td>
</tr>
<tr>
<td>2015</td>
<td>145,474</td>
<td>80,000</td>
<td>101,832</td>
<td>0.048</td>
<td>0.159</td>
<td>114</td>
<td>estimated</td>
</tr>
<tr>
<td>2016</td>
<td>187,188</td>
<td>80,000</td>
<td>131,032</td>
<td>0.041</td>
<td>0.137*</td>
<td>129</td>
<td>estimated</td>
</tr>
</tbody>
</table>

*Technical literature recommends a minimum burning velocity of 0.125 ft/d in order to have satisfactory combustion (Nelson and McNeil, “How to engineer an in-situ combustion project”, Oil and Gas Journal June 5, 1961)
OBS Well 103/05-35-078-25W4
Gas Cap Temperatures

- 25 m from well 100/03-35-078-25W4 (air injector)
- Front Velocity 25 m in 180 days – 0.138 m/d
Estimated Combustion Front Position

104/05-35 (87 m away)
Ultimate Recovery - Volumetric Method

- **Average Reservoir Parameters:**
  - Net Oil Pay = 6 m, Oil FVF = 1.00 m³/m³
  - Porosity = 31%, So = 70%
  - Recovery Factor = 50%

- **Entire approval area - 64 ha (SW/4 section 35-078-25W4)**
  - OBIP = 833 e³m³
  - ROIP = 416.5 e³m³

- **Planned operating portion of the project - 13 ha (prior to shut-in of air injection)**
  - OBIP = 169 e³m³
  - ROIP = 84.5 e³m³

- **Actual operating portion of the project - 6 ha (after shut-in of air injection)**
  - OBIP = 78 e³m³
  - Cum oil produced = 36.3 e³m³ (suspension of operations October 31, 2015)
  - Recovery Factor to date = 46.5%
Thermal Enhanced Oil Recover - Recovery Factors

- McMullen TCP Pilot estimated > 50%
  - CMG™ numerical simulation was completed in 2015
  - Simulation has confirmed > 50% (RF at suspension of operations is 46.5%)
- Other In-Situ Fields:
  - Suplacu de Barcau Field, Romania - 56%, in operation since 1965
  - Balol/Santhal Fields India - 39/45%, in operation since 1990
  - Bellevue, Louisiana - 60%, in operation since 1970
- Steam Assisted Gravity Drainage (SAGD):
  - 45 to 65%
- Cyclic Steam Stimulation (CSS):
  - 25 to 45%
Temperature, Pressure and Quality of Steam

- No steam injection in 2012, 2013 and 2014
Performance to December 2015

- Reservoir pressure
  - Original 1,750 kPa increased to 3,000 kPa due to air injection; current ~ 2,200 kPa (December 2015)

- H₂S concentration
  - Between 400 – 2,200 ppm (average ~ 1,000 ppm)

- Oil production rate
  - Peak rate 90 m³/day (560 bopd November 2013 – 4 wells)
  - Current 0 m³/day (suspension of operations October 31, 2015)

- Cumulative oil production
  - 36.3 e³m³ (228.3 mbbl), recovery factor 46.5% at suspension of operations

- Total air injected (three (3) injectors)
  - 218 e⁶m³ (7.7 Bcf as of shut-in on September 18, 2014)
Summary of Key Learnings

- December 2015 - 49 months after start of air injection
- Safe and continuous operation of the air injection facilities
- Successful heating of the underlying bitumen through thermal conduction
  - Oil rates as predicted (25 m$^3$/d, 25-30% BS&W)
  - Recovered 36.3 e$^3$m$^3$ (228.3 mbbl) at suspension of operations October 31, 2015
- Successful ignition and continuous combustion
  - Based on produced gas analysis and observed temperatures
- Combustion front radius
  - Travelled a distance of ~96 m after 34 months (at time of shut-in of air injection); the front radius was estimated to travel 130 m after five years
- Effect of Nitrogen on offsetting primary production
  - Future design process requires a waste gas management program for the handling of produced gases
8. Future Plans
Future Plans – 2016

• Monitoring activities to discontinue
  • AER granted verbal approval to Husky on December 17, 2015 to discontinue monitoring of reservoir temperature and pressure by year-end 2015; as a result down-hole monitoring of pressure and temperature and power generation at the injection & production pad sites ceased as of January 6, 2016

• AER Directive 017 annual MARP report
  • 2015 report was completed and finalized on February 2, 2016 and will be kept on file pending AER request for information

• Continue Environmental monitoring
  • 2015 groundwater, air, soil & industrial wastewater & runoff reports to be submitted March 31, 2016
  • Complete final groundwater monitoring program in spring 2016 – final report submitted in fall 2016

• Decommissioning & Reclamation Plan to be submitted to AER April 30, 2016
3.1.2. Surface Issues - Table of Contents

1. Facilities – slide 75
2. Facilities Performance – slide 79
3. Measurement and Reporting – slide 85
4. Water Production and Injection – slide 88
5. Sulphur Production – slide 90
6. Environmental Issues – slide 93
7. Compliance Statement – slide 95
8. Non-Compliance Events – slide 97
1. Facilities
Project Site

- As of October 11, 2013
Plot Plan
2. Facilities Performance
Production Process Flow (1/2)
Facility Performance

- **Bitumen treatment**
  - Bitumen sales started in November 2012
  - H$_2$S scavenger injected to neutralize emulsion to meet sales specifications
  - Majority of the bitumen was trucked to Husky Blackfoot terminal for 2015

- **Water treatment**
  - Water trucking started in November 2012
  - Primary disposal at Husky’s 16-11-078-25W4 (No. 9056B) disposal facility after being treated with H$_2$S scavenger (on site tanks)

- **Steam generation**
  - There was no steam generation in 2015
Facility Performance

- Power consumed in 2015 - generated onsite by a 151 kW unit at the injection pad and a 151 kW unit at the production pad

- Fuel gas usage in 2015:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>107.8</td>
<td>1.46</td>
<td>109.2</td>
</tr>
<tr>
<td>February</td>
<td>94.7</td>
<td>0.0</td>
<td>94.7</td>
</tr>
<tr>
<td>March</td>
<td>99.2</td>
<td>0.0</td>
<td>99.2</td>
</tr>
<tr>
<td>April</td>
<td>89.5</td>
<td>0.59</td>
<td>90.1</td>
</tr>
<tr>
<td>May</td>
<td>84.9</td>
<td>0.0</td>
<td>84.9</td>
</tr>
<tr>
<td>June</td>
<td>73.6</td>
<td>0.0</td>
<td>73.6</td>
</tr>
<tr>
<td>July</td>
<td>83.6</td>
<td>0.16</td>
<td>83.8</td>
</tr>
<tr>
<td>August</td>
<td>86.6</td>
<td>0.0</td>
<td>86.6</td>
</tr>
<tr>
<td>September</td>
<td>87.2</td>
<td>9.96</td>
<td>97.1</td>
</tr>
<tr>
<td>October</td>
<td>82.8</td>
<td>37.54</td>
<td>120.3</td>
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<tr>
<td>November</td>
<td>0.2</td>
<td>15.25</td>
<td>15.5</td>
</tr>
<tr>
<td>December</td>
<td>0.0</td>
<td>16.73</td>
<td>16.7</td>
</tr>
<tr>
<td>Grand Total</td>
<td>890.1</td>
<td>81.69</td>
<td>971.8</td>
</tr>
</tbody>
</table>
Facility Performance

- Latest facility design for the additional production wells
  - Incorporates the incineration of all tank vapors and casing gas produced

- Green house gas emissions:

<table>
<thead>
<tr>
<th>2015 Green House Gas Emissions</th>
<th>AER License</th>
<th>Exceed AER License</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂ (tonnes/year)</td>
<td>CH₄ (tonnes/year)</td>
<td>N₂O (tonnes/year)</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------------</td>
<td>------------------</td>
</tr>
<tr>
<td>2,607.92</td>
<td>28.05</td>
<td>.04</td>
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</table>

<table>
<thead>
<tr>
<th>2015 NOx and CO Emissions</th>
<th>AER License</th>
<th>Exceed AER License</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOₓ (tonnes/year)</td>
<td>CO (tonnes/year)</td>
<td>NOₓ (tonnes/year)</td>
</tr>
<tr>
<td>----------------------</td>
<td>--------------</td>
<td>------------------</td>
</tr>
<tr>
<td>44.33</td>
<td>23.13</td>
<td>182.82</td>
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</table>
3. Measurement and Reporting
Estimating Well Production

- 2015 Well production

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Oil (m³)</td>
<td>Water (m³)</td>
<td>Gas (e³m³)</td>
<td>Oil (m³)</td>
</tr>
<tr>
<td>January</td>
<td>77.47</td>
<td>40.31</td>
<td>45.72</td>
<td>248.19</td>
</tr>
<tr>
<td>February</td>
<td>40.63</td>
<td>17.77</td>
<td>30.8</td>
<td>120.86</td>
</tr>
<tr>
<td>March</td>
<td>32.8</td>
<td>14.78</td>
<td>78.85</td>
<td>27.79</td>
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<tr>
<td>April</td>
<td>0</td>
<td>0</td>
<td>1.32</td>
<td>0</td>
</tr>
<tr>
<td>May</td>
<td>3.75</td>
<td>-3.34</td>
<td>1.77</td>
<td>3.2</td>
</tr>
<tr>
<td>June</td>
<td>0</td>
<td>0</td>
<td>6.93</td>
<td>182.99</td>
</tr>
<tr>
<td>July</td>
<td>2.2</td>
<td>5.28</td>
<td>6.67</td>
<td>181.45</td>
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<tr>
<td>August</td>
<td>16.86</td>
<td>29.2</td>
<td>28.25</td>
<td>84.92</td>
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<tr>
<td>September</td>
<td>0</td>
<td>0</td>
<td>0.02</td>
<td>87.36</td>
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<td>October</td>
<td>-43.36</td>
<td>33.85</td>
<td>0</td>
<td>23.91</td>
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<tr>
<td>November</td>
<td>-1.4</td>
<td>8.44</td>
<td>0</td>
<td>-73.42</td>
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<tr>
<td>December</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Total</td>
<td>128.95</td>
<td>146.29</td>
<td>200.33</td>
<td>887.25</td>
</tr>
</tbody>
</table>

Note: Negative production values are a result of tank cleaning and balancing tank inventory

- Each well treated as a single well battery:
  - liquids: sales = production
  - gas: individual orifice meter used to measure gas production
- Proration factors – N/A
- Optimization of test durations – N/A
- New measurement technology - No
Measurement and Reporting

- Injection volumes
  - No steam was injected in 2015
  - Air injection was shut-in September 18, 2014
    - No air was injected in 2015

- Air Injection Volumes at well 100/03-35-078-25W4 Injection Pad – Per Well

<table>
<thead>
<tr>
<th>Month (2015)</th>
<th>Volume (e³m³)</th>
<th>Daily Rate/Well (e³m³/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>February</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>March</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>April</td>
<td>0</td>
<td>0</td>
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<tr>
<td>May</td>
<td>0</td>
<td>0</td>
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<tr>
<td>June</td>
<td>0</td>
<td>0</td>
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<tr>
<td>July</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>August</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>September</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>October</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>November</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>December</td>
<td>0</td>
<td>0</td>
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</table>
4. Water Production and Injection
Water Production and Injection

- Produced water volumes:

<table>
<thead>
<tr>
<th>Well</th>
<th>2015 Total Water (m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>105/06-35-078-25W4</td>
<td>146.3</td>
</tr>
<tr>
<td>109/06-35-078-25W4</td>
<td>861.1</td>
</tr>
<tr>
<td>110/06-35-078-25W4</td>
<td>702.9</td>
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<tr>
<td>108/06-35-078-25W4</td>
<td>471.5</td>
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</tbody>
</table>

- No produced water recycle volumes or percent

- Disposal wells:
  - 16-11-078-25W4 and 10-23-078-25W4
  - Approval No. 9056B
5. Sulphur Production
Sulphur Production

- There is no sulphur recovery
  - all produced gas is incinerated at well 04-35-078-25W4

### Summary of 2015 Quarterly SO₂ Emissions

<table>
<thead>
<tr>
<th>Month</th>
<th>Monthly Sulphur (tonnes)</th>
<th>Monthly SO₂ (tonnes)</th>
<th>Quarter</th>
<th>Quarterly SO₂ (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>0.059</td>
<td>0.118</td>
<td>1</td>
<td>0.288</td>
</tr>
<tr>
<td>February</td>
<td>0.049</td>
<td>0.098</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>March</td>
<td>0.036</td>
<td>0.072</td>
<td>2</td>
<td>0.094</td>
</tr>
<tr>
<td>April</td>
<td>0.036</td>
<td>0.072</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>May</td>
<td>0.000</td>
<td>0.000</td>
<td>3</td>
<td>0.092</td>
</tr>
<tr>
<td>June</td>
<td>0.011</td>
<td>0.022</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>July</td>
<td>0.014</td>
<td>0.028</td>
<td>4</td>
<td>0.040</td>
</tr>
<tr>
<td>August</td>
<td>0.012</td>
<td>0.024</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>September</td>
<td>0.020</td>
<td>0.040</td>
<td></td>
<td></td>
</tr>
<tr>
<td>October</td>
<td>0.020</td>
<td>0.040</td>
<td></td>
<td></td>
</tr>
<tr>
<td>November</td>
<td>0.000</td>
<td>0.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>December</td>
<td>0.000</td>
<td>0.000</td>
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</tr>
</tbody>
</table>

- Sulphur balance
  - SO₂ emissions based on 100% conversion of H₂S to SO₂

- Sulphur emissions
  - below 1 tonne/day; no sulphur recovery methods required
Sulphur Production

- **Facility**
  - Approved for 0.41 tonnes of SO₂ per day

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<thead>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Daily Peak SO₂</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(t/d)</td>
<td>0.004</td>
<td>0.004</td>
<td>0.002</td>
<td>0.002</td>
<td>0.000</td>
<td>0.002</td>
<td>0.002</td>
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<td>0.002</td>
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<tr>
<td><strong>AER Approved SO₂</strong></td>
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<td></td>
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</tr>
<tr>
<td>(t/d)</td>
<td>0.41</td>
<td>0.41</td>
<td>0.41</td>
<td>0.41</td>
<td>0.41</td>
<td>0.41</td>
<td>0.41</td>
<td>0.41</td>
<td>0.41</td>
<td>0.41</td>
<td>0.41</td>
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<tr>
<td><strong>Exceeds Approval</strong></td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>limit (Yes/No)</strong></td>
<td></td>
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</tr>
</tbody>
</table>

*Note: No produced gas for the month of November and December, facility shut-in.

- **EPEA Approval** - no requirement to monitor ambient air quality
6. Environmental Issues
Environmental Issues - Reporting

- Annual Monitoring and Reporting due March 31, 2016
  - Annual air emission and summary and evaluation report (final annual air summary report)
  - Annual Industrial wastewater and runoff report
  - Groundwater monitoring program
    - Shallow groundwater – no indication of adverse impacts
    - Quaternary channel thermal – maximum temperature increase ~3.5°C (from baseline)
      - Temperatures show a declining trend post air injection suspension
    - Dissolved arsenic concentrations consistent with baseline values
    - Complete final groundwater monitoring program in spring 2016 – submit report in the fall
    - Propose to abandon groundwater monitoring wells following the confirmation of no impacts during final site reclamation

- Other Monitoring and Reporting
  - Soil monitoring (2014 and 2018)
  - Soil management report submitted November 2015
  - Soil management program hand auger assessment proposed for 2016
    - Delineate salinity in the top 15 cm of soil near the tank farm load outs in southeast corner of well 04-35-078-25W4 production site

- Participation in Alberta Biodiversity Monitoring Institute (ABMI)
7. Compliance Statement
Compliance

• To the best of Husky’s knowledge, the Project is currently compliant with all regulatory approval conditions and associated requirements
8. Non-Compliance Events
Non-Compliance

- No non-compliance events for the reporting period
8. Future Plans
Future Plans

- Future Pilot expansion application activities
  - No expansion activities/commercial development are planned as the Project is currently not economic