WEST ELLS SAGD

Scheme No. 11764E
AER In Situ Performance Presentation 2017
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Overview

With almost 1,000,000 acres of oil sands and PNG leases, Sunshine holds current Scheme approvals for two 10,000bpd SAGD projects, and a third in the application process.
Sunshine’s main focus is currently West Ells, but Sunshine holds an approval for its Thickwood 10,000bbl/d SAGD project and is in the application stage for the Legend Lake 10,000bbl/d project.
• Covering 9,856 contiguous gross hectares in the Athabasca Oil Sands Region
• Two phases of 5,000 bbl/d
  • Phase 1 currently in Operation since September 2015 is supplied by Pad 2
  • Phase 2 will commence in the future and is supplied by Pad 3 which has already been drilled.
  • MSL 112941 and MSL 112933 were cleared of vegetation with no soil disturbance, anticipated to serve as make-up pads as the project advances
• First production December 2015
Development and Project Area

Area | Land Description
--- | ---
Development Area (4 sections) | T94 R17W4; Sec 30, 31
 | T94 R18W4; Sec 25, 36
Project Area (6 sections) | T94 R17W4; Sec 30, 31, 32, 33
 | T94 R18W4; Sec 25, 36
Development timeline – Scheme 11764

• Mar 31, 2010 - West Ells application submitted to the AER (formerly ERCB)

• January 26, 2012 – Commercial Scheme Approval 11764 received

• February to September 2012 – All season road access construction

• October 2, 2012 – Site construction commences at West Ells

• December 2012- March 2013 – Wells drilled for Pad 2 and Pad 3

• 2013 – Civil work completed, general CPF construction of tank farms, buildings, evaporator and, construction of Operations camp

• 2014 - mid-2015 – Work completed on steam and emulsion lines to pads, final construction and QA/QC

• September 22, 2015 – First Steam at West Ells

• December 7, 2015 – First production from West Ells
• Pad alignment – 11764A and 11764B
  • May 30, 2012 – Amendment 1 filed to change well bore trajectory and pad alignment, approval received February 8th, 2012
  • August 21, 2012 – Amendment 2 filed to change well bore trajectory and pad alignment, approval received October 2, 2012

• Infill wells – 11764C
  • April 8, 2013 – Application submitted for infill wells to improve resource recovery, approval received August 9, 2013

• CPF Changes – 11764D
  • May 28, 2013 – Application filed for minor changes to CPF design such as fuel gas consumption and cold water equivalent for steam, approval received August 30, 2013
Scheme Amendments

• NCG Co-injection – 11764E
  • October 24, 2013 – Application for NCG co-injection during Phase 1 filed, approval received June 19, 2014

• NCG Co-injection Full Field – 11764F
  • July 18, 2014 – Application for NCG Co-injection full field filed, approval received March 2, 2015

• Maximum Operating Pressure – 11764G
  • October 29, 2015 – Application filed to increase the MOP, this brought it in line both with Industry standard (80% cap rock fracture pressure), and with previously filed and approved amendments to the Directive 051 Injection approval for both Phase 1 and 2, approval received March 10, 2016
• CPF design changes
  • December 20, 2012 – Amendment application filed for minor design changes to the CPF that would have affected the modeling and emissions limits, approval received July 4, 2013

• Industrial Runoff Pond design correction
  • In response to a supplemental information request Sunshine had indicated that the designed runoff pond included a polyethylene liner. This was misstated as there was never a liner planned for, nor required. Sunshine confirmed that the pond had been built with a compacted clay liner with the appropriate Proctor compaction for a pond of this type
  • February 5, 2015 – Application filed to amend the approval to use the compacted clay liner as originally designed, approval received February 6, 2015
Geoscience
Location within the Athabasca Oilsands Deposit

West Ells
Located in the NW part of the Athabasca Oilsands Deposit, Alberta, Canada

http://osip.alberta.ca/map/
The Wabiskaw sands are laterally extensive and were deposited along the emergent Devonian highs as the Boreal Sea transgressed over the Athabasca Basin.
Isopach Map (Clearwater Marker to Devonian)

“Paleotopographic” map

- Reflects paleotopography during the Late Cretaceous.
- Warm colors represent valleys and cooler colors represent highs.
- Major McMurray drainage systems are marked with a dashed line.
- Extensive amalgamated shoreface sands (Wabiskaw A, C, & D) were deposited on the east side of the emergent Devonian strata.

West Ells SAGD Project is located in an embayment in T94 R17 W4M.
The SAGD wells are located at the base of the Wabiskaw D sand unit.
### Average Reservoir Properties for Development Area

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bitumen saturation (%)</td>
<td>71</td>
</tr>
<tr>
<td>Porosity (%)</td>
<td>33</td>
</tr>
<tr>
<td>Grain size</td>
<td>Fine to medium</td>
</tr>
<tr>
<td>Net pay (m)</td>
<td>15.2</td>
</tr>
<tr>
<td>Horizontal perm. (D)</td>
<td>2.4</td>
</tr>
<tr>
<td>Vertical perm. (D)</td>
<td>1.7</td>
</tr>
<tr>
<td>Reservoir pressure (kpa)</td>
<td>600</td>
</tr>
<tr>
<td>Reservoir temperature (°C)</td>
<td>9</td>
</tr>
<tr>
<td>Reservoir depth (m TVD)</td>
<td>265</td>
</tr>
<tr>
<td>Bitumen viscosity (cp)</td>
<td>&gt; 1 million</td>
</tr>
<tr>
<td>Well length (m)</td>
<td>800</td>
</tr>
<tr>
<td>Well spacing (m)</td>
<td>70</td>
</tr>
</tbody>
</table>
Wells are placed at the base of the Wabiskaw D unit. The producer well was positioned above the underlying mud unit by using a deep resistivity geosteering tool that detected the proximity of the bed boundary while drilling.

Top 261.6 m

So = 78.6%
Porosity = 35.1%

Injector

kh = 3860 md
kv = 2960 md

So = 83.0%
Porosity = 34.9%

Bottom 268.75 m
Uniform Gamma Ray Profile on SAGD Wells

- Uniform gamma ray profile is indicative of a clean sandy shallow marine environment (e.g., shoreface)
- 3D seismic data shows continuity of Wabiskaw reservoir units.

<table>
<thead>
<tr>
<th></th>
<th>Percent Effective Producer (GR &lt; 60) (%)</th>
<th>Percent Effective Injector (GR &lt; 60) (%)</th>
<th>Horizontal Well Length (m)</th>
<th>Interwell spacing (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pad 2</td>
<td>99</td>
<td>100</td>
<td>800</td>
<td>70</td>
</tr>
<tr>
<td>Pad 3</td>
<td>100</td>
<td>100</td>
<td>800</td>
<td>70</td>
</tr>
</tbody>
</table>
The elevation varies from 290 to 297 m asl.
The elevation varies from 270 to 280 m asl.
The top gas ranges in thickness from 1.0 to 6.4 m and the average is 3.1 m.
The lean zone varies in thickness from 0 to 3.6 m and the average is 1.3 m.
## OBIP for Pads 2 & 3 and Development Area

<table>
<thead>
<tr>
<th>Number of SAGD well pairs</th>
<th>Well Length (m)</th>
<th>Well Spacing (m)</th>
<th>Drainage Area, 50 m boundary (10^2 m^2)</th>
<th>Average Net Pay above Producer (m)</th>
<th>Total OBIP (10^6 m^3)</th>
<th>Cumulative Bitumen Produced* (m^3)</th>
<th>Current Recovery Factor (%)</th>
<th>Estimated Recovery Factor (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pad 2</td>
<td>8</td>
<td>800</td>
<td>70</td>
<td>504</td>
<td>16.2</td>
<td>1.87</td>
<td>15,117</td>
<td>0.81</td>
</tr>
<tr>
<td>Pad 3</td>
<td>8</td>
<td>800</td>
<td>70</td>
<td>504</td>
<td>15.4</td>
<td>1.86</td>
<td>0.00</td>
<td>0</td>
</tr>
</tbody>
</table>

*Production to January 2017

### Development Area

<table>
<thead>
<tr>
<th>Area (10^3 m^2)</th>
<th>Average Net Pay (m)</th>
<th>Total OBIP (10^6 m^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development Area</td>
<td>10,511</td>
<td>15.2</td>
</tr>
</tbody>
</table>

\[
OBIP = \text{Area} \times \text{Net Pay} \times \text{Porosity} \times \text{Bitumen Saturation} / \text{FVF}
\]

\[
\text{FVF} = \text{Formation Volume Factor} = 1.005
\]
Wells with Core and Special Core Analysis

Development Area

LEGEND
- Core (43)
- PSD (14)
- Caprock Analysis (5)
- Bitumen Analysis (3)
- Geochemistry (1)
OB41 Temperature Log

- OB41 is 4.2 m east of Pair 12.
- Oil sand with mm to cm silt/shale laminae (act as a baffle and not a barrier).
- Original reservoir temperature is 9 °C.
- Temperature near the injector level is about 200 °C.
- Above the producer, the temperature is greater than 100 °C for 16 m.
### Survey Layout

### Acquisition Parameters

<table>
<thead>
<tr>
<th>Area</th>
<th>10.7 (km²)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Source Information</strong></td>
<td><strong>Receiver Information</strong></td>
</tr>
<tr>
<td>Source interval (m)</td>
<td>20</td>
</tr>
<tr>
<td>Receiver interval (m)</td>
<td>20</td>
</tr>
<tr>
<td>Source line interval (m)</td>
<td>80</td>
</tr>
<tr>
<td>Receiver line interval (m)</td>
<td>60</td>
</tr>
<tr>
<td>Line orientation</td>
<td>N-S</td>
</tr>
<tr>
<td>Line orientation</td>
<td>W-E</td>
</tr>
<tr>
<td>Total km of line</td>
<td>167.1</td>
</tr>
<tr>
<td>Total km of line</td>
<td>194.9</td>
</tr>
<tr>
<td>Number of source points</td>
<td>7078</td>
</tr>
<tr>
<td>Number of receiver points</td>
<td>9681</td>
</tr>
<tr>
<td>Source depth (m)</td>
<td>6</td>
</tr>
<tr>
<td>Source type</td>
<td>Dynamite</td>
</tr>
</tbody>
</table>
As measured on the observation wells, the width of the steam chamber is narrow and less than 10 m from the SAGD well pair. Therefore, Sunshine did not plan a 4D seismic acquisition survey in 2017 because it is difficult to image a small steam chamber in the seismic data.

While there are no plans in 2017 to conduct a 4D seismic survey, Sunshine will consider a 4D seismic survey when it is appropriate and provides an advantage for resource recovery.
Cap Rock Integrity

- Mini-frac tests were performed at:
  - 1AA/14-31-094-17W4/0
  - 1AA/07-36-094-18W4/0
- Caprock average minimum stress gradient = 22 kPa/m (Wabiskaw Shale Member).
- Oil sand average minimum stress gradient = 17 kPa/m (Wabiskaw Sand).
- Sunshine applied for a maximum operating pressure (MOP) of 4400 kPag in the Wabiskaw Shale Member based on a 80% safety factor.
- The maximum operating pressure (MOP) of 4400 kPag was granted on March 10, 2016.
Caprock and Oil Sand from 14-31-94-17W4 Location

Caprock - Wabiskaw Shale Member

Regional Marine Shale (~ 15 m thick)

Caprock mini-frac

Oil sand mini-frac

Oil sand - Wabiskaw Sand

1AA/14-31-094-17W4/0 Well Log
Surface Heave – Corner Reflector Locations
Surface Heave Monitoring

- 52 corner reflector locations

- Baseline information gathered prior to steaming operations

- Follow up surveys expected to be completed this year
Drilling and Completions
West Ells Pad & Well Locations

- CPF
- Pad 2 (Phase 1)
- Pad 3 (Phase 2)

- **SAGD Well Pair** – Drilled & Completed
- **SAGD Well Pair** – Drilled, not Completed
- **Source Water Well** – Drilled & Completed
Injector Well Completions

- Steam injection down long and short tubing
- Blanket gas held on intermediate casing annulus
Producer Well Completions – Circulation Phase

- Steam injection through long tubing
- Circulation returns via intermediate casing
- Blanket gas contained in short tubing

- Slotted liner in three wells
- Facsrite screen in five wells
• Electric Submersible Pumps (ESP) installed in all SAGD producers
• Blanket gas held on short tubing and intermediate casing
Producer Well Completions – Liner Type

- Slotted Liner – 0.012” x 0.020” RT
- Facsrite – 250 Micron
• All SAGD production wells have been designed to use Electric Submersible Pumping systems (ESP)

• Designed production capacity of the ESPs is 50-350m³/d for initial stage of operation

• Current operational capacity varies between 100-350m³/d

• Designed operational temperature of 230 degrees C

• Current operational temperature between 180-210 degrees C
1.5” instrumentation coils include (all wells):
- Heel and toe bubble tube – pressure
- 8 thermocouples, evenly spaced
- Fiber optic temperature (DTS or 40-point FBG)
Observation Wells

- 7 vertical OB wells drilled on Pad 2 (Phase 1) across zone
- Each well equipped with instrument bundle cemented outside 4 ½” casing, equipped with:
  - 20 thermocouples spaced from above the cap rock to below base of pay
  - 3 piezometers in zones of interest: gas cap, mid-pay, and lower pay
Subsurface and Scheme Performance
All 8 well pairs are now in production mode
  - 2 pumps installed January 2016
  - 3 pumps installed July 2016
  - 3 pumps installed October-November 2016
Currently Sunshine is ramping up towards target steam and fluid rates
• SAGD steam chamber still developing
• The injection pressure currently varies from 1000kPa to 3000kPa
• Sunshine’s near term operating pressure goal is to maintain pressures below 3000kPa.
• Producer pressure currently registers between 1000kPa and 2000kPa
• Approved bottomhole injection pressure of 4400kPag has not been exceeded
Fluid Rates

West Ells Fluid Rates

Rate, m³/d

iSOR, m³/m³

- Fort McMurray Fire
- ESP Installation

- Steam, m³/d
- Bitumen, m³/d
- Water, m³/d
- iSOR

West Ells SAGD 2017 In Situ Performance Presentation
Recovery Patterns Pair 7

P7 Production

Average Oil Production
Average Water
Average Steam
CSOR x 10
ISOR x 10
Cumulative Oil
Cumulative Water
Cumulative Steam

Date
Cumulative Volume (m3)
Recovery Patterns Pair 11

P11 Production

- Average Oil Production
- Average Water
- Average Steam
- CSOR x 10
- ISOR x 10
- Cumulative Oil
- Cumulative Water
- Cumulative Steam

Date
Cumulative Volume (m³)

Average Oil, Water, and Steam Injection Rate (m³/d)
CSOR & ISOR (m³/m³) x 10


Cumulative Volume (m³)
Recovery Patterns Pair 8

P8 Production

Average Oil Production
Average Water
Average Steam
CSOR x 10
ISOR x 10
Cumulative Oil
Cumulative Water
Cumulative Steam

Date
Cumulative Volumn (m3)


0 5000 10000 15000 20000 25000 30000 35000 40000 45000 50000

0 50 100 150 200 250 300 350 400


0 5000 10000 15000 20000 25000 30000 35000 40000 45000 50000

0 50 100 150 200 250 300 350 400

West Eils SAGD 2017 In Situ Performance Presentation
Steam Strategy - Startup

- Start up strategy:
  - Sunshine had planned to circulate both injector and producer wells simultaneously to pre-heat the wells
  - Results indicated that bottom hole pressure at the injectors and producers may not be high enough to circulate the returns to surface

- Sunshine modified the start up strategy:
  - Start circulation using the production well first without using the injection well
  - When the temperature at the injector reaches at least 100 degrees C between horizontal section of the wellbores, start injection to promote temperature conformance in both wells before starting the producer in SAGD mode
The largest challenge faced was ensuring bottom hole pressures are high enough to circulate steam back to surface.

Key Learnings:
- The reservoir was able to pressure up during the circulation phase in most well pairs.
- Starting steam injection only when the temperature between well pairs was greater than 100 degrees C.
- After the appropriate temperature was reached, it took about 20 days before wells were ready to turn on the ESP to start production.
Key Learnings

• Continuous steam supply is key to steady growth of the steam chamber
• Down hole instrumentation is very important for optimizing well performance
• Better than predicted performance validates proper wellbore placement and good reservoir pressure containment
• Current ESP design needs to be upgraded to meet anticipated higher flow rates
Facilities
CPF Process flow
Steady state operation achieved

- The plant is currently operating in a stable manner, and is in the early stages of SAGD mode
- All equipment operating properly at this time
- All technical issues were addressed during commissioning and startup and SAGD ramp up

Full ABSA compliance, audit completed in 2016

ABSA Certificate Of Authorization Permit No. 11551, Expiry August 31, 2019

Power Generation total: 19.551 GWh

- West Ells has on demand power generation with no load banks and no tie in to the power grid, as such West Ells consumes the same amount of electricity as is generated
Technical Issues

• During Ramp Up
  • Initially during start-up / ramp up the designed Heat Material Balance was difficult to achieve due to low and cold returns from wells. This resulted in lower than normal (steady state / SAGD mode) returns for the various heat exchangers where this heat was intended for various process mediums. One process medium was the natural gas supply which resulted in condensation forming, and freezing of equipment due to the Joules-Thomson effect. As a result Sunshine installed a second PCV for a two stage let down and an gas fired in-line heater to heat the natural gas.
  • Another process medium was the boiler feed water. Initially due to low returns more make up water is required. Treating of the source water was more extensive than what the initial design was capable of. Thus during initial ramp up we required an additional soft water bank
  • The initial design of our diluent pumps was based on a 5 to 10 thousand barrel per day train. During start-up / ramp up we were subjected to pump failure. Sunshine refurbished the pump impellers and used a smaller impeller trim size to suit the low flow rates during ramp up.
Three Viking formation non-saline water source wells are located at:

1. 14-32-94-17W4
2. 16-32-94-17W4
3. 10-33-94-17W4
**Water Source Summary Table**

<table>
<thead>
<tr>
<th>Licence No.</th>
<th>Well Name</th>
<th>Location</th>
<th>Measurement Start Date</th>
<th>Measurement Stop Date</th>
<th>Maximum Approved Rate of Diversion (m3/day)</th>
<th>Maximum Approved Diversion Volume (m3)</th>
<th>Cum Volume produced (m3)</th>
<th>Percent of Max Diversion Volume Produced (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>00316770 (Licence)</td>
<td>WSW 16-32c</td>
<td>16-32-94-17W4</td>
<td>Jan. 1, 2016</td>
<td>Dec. 31, 2016</td>
<td>1400</td>
<td>365,000</td>
<td>110,315</td>
<td>30.2%</td>
</tr>
<tr>
<td>00373742 (TDL)*</td>
<td>WSW 14-32</td>
<td>14-32-94-17W4</td>
<td>Oct. 7, 2015</td>
<td>Oct. 6, 2016</td>
<td>1500</td>
<td>452,600</td>
<td>120,412</td>
<td>26.6%</td>
</tr>
<tr>
<td>00373738 (TDL)*</td>
<td>WSW 10-33b</td>
<td>10-33-94-17W4</td>
<td>Oct. 13, 2015</td>
<td>Oct. 6, 2016</td>
<td>1050</td>
<td>273,750</td>
<td>52,261</td>
<td>19.1%</td>
</tr>
<tr>
<td>00385204 (TDL)**</td>
<td>WSW 14-32</td>
<td>14-32-94-17W4</td>
<td>Oct. 7, 2016</td>
<td>Dec. 31, 2016</td>
<td>1500</td>
<td>182,500</td>
<td>29,143</td>
<td>16.0%</td>
</tr>
</tbody>
</table>

*Temporary Diversion Licences (TDL) expired on October 6, 2016 (WSW 14-32 was renewed for another year and WSW 10-33b was not required).*

**Additional Temporary Diversion Licence for WSW 14-32 was granted with an effective date from Oct. 7, 2016 to October 6, 2017.**

- Did not exceed the maximum daily or maximum approved diversion volume.
- Did not impact the groundwater levels in the overlying Quaternary sediment.
## Monthly Water Source Production

<table>
<thead>
<tr>
<th>Month</th>
<th>WSW 16-32c</th>
<th>WSW 14-32</th>
<th>WSW 10-33b</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan-16</td>
<td>284</td>
<td>6,739</td>
<td>11,447</td>
<td>18,470</td>
</tr>
<tr>
<td>Feb-16</td>
<td>57</td>
<td>5,197</td>
<td>2,876</td>
<td>8,130</td>
</tr>
<tr>
<td>Mar-16</td>
<td>2,646</td>
<td>8,323</td>
<td>11,962</td>
<td>22,931</td>
</tr>
<tr>
<td>Apr-16</td>
<td>20,877</td>
<td>10,980</td>
<td>1,856</td>
<td>33,713</td>
</tr>
<tr>
<td>May-16</td>
<td>5,610</td>
<td>4,318</td>
<td>1,382</td>
<td>11,310</td>
</tr>
<tr>
<td>Jun-16</td>
<td>2,829</td>
<td>5,401</td>
<td>0</td>
<td>8,230</td>
</tr>
<tr>
<td>Jul-16</td>
<td>11,833</td>
<td>19,537</td>
<td>0</td>
<td>31,369</td>
</tr>
<tr>
<td>Aug-16</td>
<td>18,404</td>
<td>14,838</td>
<td>3,447</td>
<td>36,689</td>
</tr>
<tr>
<td>Sep-16</td>
<td>17,993</td>
<td>18,420</td>
<td>2</td>
<td>36,415</td>
</tr>
<tr>
<td>Oct-16</td>
<td>13,821</td>
<td>16,009</td>
<td>0</td>
<td>29,830</td>
</tr>
<tr>
<td>Nov-16</td>
<td>12,421</td>
<td>5,093</td>
<td>0</td>
<td>17,515</td>
</tr>
<tr>
<td>Dec-16</td>
<td>3,540</td>
<td>11,548</td>
<td>0</td>
<td>15,089</td>
</tr>
<tr>
<td><strong>2016 Total</strong></td>
<td><strong>110,315</strong></td>
<td><strong>126,404</strong></td>
<td><strong>32,972</strong></td>
<td><strong>269,691</strong></td>
</tr>
</tbody>
</table>

### Monthly Water Source Production (m³/month)

![Chart showing monthly water source production for 2016, with data for each month and total for the year.](chart.png)
Water Source Well Typical Completion

- **Production Casing**: 219.1 mm OD (8 5/8") Steel Casing
- **K-Packer**
- **Tubing String**: 86 mm (3 3/8" OD) Galvanized Pipe, 76 mm (3") ID
- **Polytube with Pressure Transducer**: 34.9 mm (1 3/8" OD), 25.4 mm (1” ID)
- **Submersible Turbine Pump**: Franklin 350STS8 40HP
- **Wire-wrapped Telescopic Screen**: 190.5 mm (7 ½") OD, 0.012" Screen
### Source Water Composition

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>WSW 14-32</th>
<th>WSW 16-32c</th>
<th>WSW 10-33b</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab pH</td>
<td>pH</td>
<td>7.78</td>
<td>7.85</td>
<td>7.73</td>
<td>7.79</td>
</tr>
<tr>
<td>Lab Ec</td>
<td>μS/cm</td>
<td>1230</td>
<td>892</td>
<td>944</td>
<td>1022</td>
</tr>
<tr>
<td>Ca</td>
<td>mg/L</td>
<td>46.5</td>
<td>74.3</td>
<td>89.7</td>
<td>70.2</td>
</tr>
<tr>
<td>Mg</td>
<td>mg/L</td>
<td>20.1</td>
<td>20.5</td>
<td>25.5</td>
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<tr>
<td>Na</td>
<td>mg/L</td>
<td>217</td>
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<td>K</td>
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<td>Cl</td>
<td>mg/L</td>
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<td>mg/L</td>
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<td>376</td>
<td>430</td>
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<tr>
<td>HCO3</td>
<td>mg/L</td>
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<td>458</td>
<td>525</td>
<td>542</td>
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<tr>
<td>SO4</td>
<td>mg/L</td>
<td>148</td>
<td>116</td>
<td>86</td>
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<td>Hardness</td>
<td>mg/L</td>
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<td>270</td>
<td>329</td>
<td>266</td>
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<tr>
<td>TDS</td>
<td>mg/L</td>
<td>759</td>
<td>528</td>
<td>540</td>
<td>609</td>
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• Daily oil rate of each well is calculated using the most current well test flow rate from the test separator and the manual oil cut percentage
  • Due to the slugging nature of the wells and high water flow during initial production, the test separator is not fully commissioned
  • There is only one separator on the well pad and well tests generally last for 8 to 15 hours depending on the fluid rate from the well (includes time to purge the test pipeline and test vessel)
  • To properly conduct a well test, with 8 wells on a pad, only one well can be tested every 4 - 5 days
• With the total production from the pad, individual well volumes are prorated against the overall production volume
• The same philosophy and process is applied to produced water and gas
• Currently, the meters on the test separator are being verified every time by comparison with the manual oil cut and water
• Water balance at the project has been maintained within +/- 5% and well within reporting and Petrinex limits

• Meter Calibration is now underway for 2017
  • Sunshine has only recently achieved steady state operation at the CPF (approximately 2-3 months)
  • Sunshine is now in the process of ensuring that the annual meter calibrations are completed.
• Currently there are no approved disposal facilities or wells associated with the West Ells Project

• Development of a disposal well would be beneficial to the project, unfortunately all receptive formations in the region are hydrocarbon bearing zones and as such inappropriate for disposal

• All waste streams are currently collected on site and trucked off to 3rd party approved oilfield waste facilities
• Due to there being no disposal wells associated with the West Ells Project, all water is trucked off site to approved waste management facilities in the form of Evaporator Blowdown water

• Directive 81 currently requires a disposal limit of 6.47%
  • \( \left( \frac{\text{Fresh In} \times D_f + \text{Produced In} \times D_p}{\text{Fresh In} + \text{Produced In}} \right) \times 100 \)

• West Ells has had an average disposal rate of 4.52% for the life of the project
  • \( \left( \frac{\text{Total Disposal}}{\text{Fresh In} + \text{Produced In}} \right) \times 100 \)

• West Ells had a disposal rate of 3.72% for the month of January 2017, inside of compliance limits
### Water Disposal And Recycle Rates

#### Directive 081 Monthly balances

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<td>17728.60</td>
<td>25705.80</td>
<td>3806.30</td>
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<td>1647.90</td>
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<td>8.31</td>
<td>3.91</td>
<td>5.00</td>
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<td>8229.66</td>
<td>31369.30</td>
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<td>Disposal Rate %</td>
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<td>5.28</td>
<td>5.48</td>
<td>4.88</td>
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Water Disposal Rate

Water Disposal Actual Rate versus Limit

- **Disposal rate**
- **Limit**
West Ells has a sulphur inlet rate of 0.34 t/d
• Emissions intensity was 0.896 tonnes/m³ for life of project including prior to steady state operation
• Emissions intensity of zero on monthly graph indicates no bitumen production
Oil, Water, Steam Proration Factors

- Proration Factor

- Jul-16 to Feb-17

- Oil
- Water
- Steam
Produced Gas Monthly Average

Produced Gas Volume $10^6$m$^3$

- September 2015
- October 2015
- November 2015
- December 2015
- January 2016
- February 2016
- March 2016
- April 2016
- May 2016
- June 2016
- July 2016
- August 2016
- September 2016
- October 2016
- November 2016
- December 2016
- January 2017
Flaring Volume

Flaring Volume

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• There have been no changes to the MARP since the 2015 update
  • Reporting codes associated with West Ells
    • ABBT0123666
    • ABIF0123667
    • ABWS0139258, ABWS0139259, ABWS0139260
Regulatory and Compliance
• **Issues**
  
  • Air monitoring
    
    • No major issues, a few minor procedural issues at the start of the project for the ambient air monitoring, all issues resolved with dedicated field personnel and on-site training
    
    • CEMS has been running successfully since commissioning
    
    • No major spills or releases (>2m³)

• **Successes**
  
  • Bear awareness training
    
    • Had a very large number of bears in 2014, more intensive training and management was implemented in 2015, and saw a drastic reduction in bear interactions in 2015 and continuing in 2016
    
    • Worked with AEP directly on bear management
  
  • Internal sump system tied into slop tank
    
    • This system has reduced minor spills to almost zero while allowing full containment and proper disposal of all waste
  
  • Enviroboxes
    
    • In use at inherently high risk load/unload points and have been very successful
West Ells site underwent a mandatory evacuation in May of 2016, and did not have site personnel return for approximately 30 days
  • Instrumentation string in two wells damaged beyond repair and replaced
  • Ongoing evaluation of potential damage to other instrumentation strings
  • No impact to surface facilities

Minor Compliance issues due to mandatory site evacuation
  • Ambient Air Monitoring was unable to be maintained due to absence
  • Shallow groundwater monitoring, one sample event missed due to absence

All compliance issues were reported to AER and AEP

Sunshine was an active participant in regional initiatives at the time, and worked with all levels of Government during this emergency

West Ells site and helipad used as a staging area for Wildfire Alberta helicopters
Future Plans

• Regulatory
  • Solvent Surfactant Application
    • Sunshine expects to apply for solvent surfactant approval to improve resource recovery

• Phase 1 (5,000bbl/d)
  • Sunshine plans to continue to fully demonstrate the reservoir productivity before advancing to Phase 2

• Phase 2 (5,000bbl/d)
  • Sunshine continues to plan the development of Phase 2 and will incorporate any and all key learnings from Phase 1 to improve design and efficiency

• Steam Strategy
  • Continue to maximize steam efficiency and improve uptime
  • Sunshine will continue building the steam chamber and ramping up production towards nameplate capacity
  • Increased plant reliability will be a major focus
Compliance Declaration

Sunshine is compliant with all AER Rules and Regulations and meets all approval requirements under the Environmental Protection and Enhancement Act.
Thank you for your time!

Sunshine Oilsands Ltd.
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Calgary, AB T2P 0P7
(403) 984-1450
info@sunshineoilsands.com