

Sunshine Oilsands Ltd. BA Code A2TF

# 阳光油砂 SUNSHINE OILSANDS LTD.

# WEST ELLS SAGD

#### Scheme No. 11764G 2022 In Situ Performance Presentation June 30, 2023



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# Introduction



# **Location within the Athabasca Oilsands Deposit**





#### West Ells SAGD

- Covering 9,856 contiguous gross hectares in the Athabasca Oil Sands Region
- Two phases of 5,000 bbl/d
  - Phase 1 is currently in Operation since September 2015 and consist of 8 well pairs on Pad 2
  - We estimate Phase 2 will commence production in 2025 from 8 well pairs on Pad 3, which have been drilled and cased, awaiting completion
  - MSL 112941 and MSL 112933 were cleared of vegetation with no soil disturbance, anticipated to serve as additional pads as the project advances





# Subsurface







#### West Ells – 2022 Production





## **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

First Steam – September 2015

First Production – December 2015

Production suspended between April 2020 and July 2022





SAGD Well Pair – Drilled & Completed

SAGD Well Pair – Drilled, liners installed, pump and instrumentation install not complete.

Source Water Well – Drilled & Completed



# Typical SAGD Well Placement (e.g. Pair 8)



Stratigraphic chart

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#### Type Well – OB41 (102/06-31-094-17W4)



The SAGD wells are located at the base of the Wabiskaw D sand unit



# **Top of Bitumen Pay Structure Map**





## **Base of Bitumen Pay Structure Map**





# Wabiskaw C Top Gas Isopach Map





# Wabiskaw D Lean Zone Isopach Map





# **Geomechanical Anomalies - Cap Rock Integrity**

- No geo-mechanical anomalies reported in 2022 as the injection pressure was below MOP\*. The injection pressure in 2022 measured at the heel and toe of the injectors was between 950 and 1,600 kPa
- 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)





Minimum stress, MPa

7-36, PZ

300

350

∆ 14-31, PZ







- 52 corner reflectors installed on pilings below the frost line throughout the development area
- Images were acquired between June 2015 and December 2018
- A maximum uplift of 110 mm was observed at one corner reflector centrally located within the steaming area
- Monitoring was paused when production was temporarily suspended from 2020 – 2022
- Steam injection pressures are well under the approved maximum operating pressure of 4,400 kPa
- Monitoring will resume in 2024

# **3D Seismic Survey and Acquisition Parameters**



• No new seismic data acquired in this reporting period

# Survey Layout



# **Acquisition Parameters**

<b>Area</b> 10.7 (km <sup>2</sup> )					
Source Informati	on	Receiver Information			
Source interval (m)	20	Receiver interval (m)	20		
Source line interval (m)	80	Receiver line interval (m)	60		
Line orientation	N-S	Line orientation	W-E		
Total km of line	167.1	Total km of line	194.9		
Number of source points	7078	Number of receiver points	9681		
Source depth (m)	6				
Source type	Dynamite				



#### **4-D Seismic**

- Based on a volumetric calculation using the average bitumen recovery of a well pair (42,384 m<sup>3</sup>) and assuming steam chamber shape is triangular (see schematic and calculation below), the calculated width of the steam chamber (w) is still quite narrow, about 17.25 m away from the SAGD well pair. Therefore, Sunshine did not plan a 4D seismic acquisition survey in 2022 because it is difficult to image a small steam chamber from the seismic data
- While there are no plans in 2023 to conduct a 4D seismic survey, Sunshine will consider a 4D seismic survey when it is appropriate and provides an advantage for resource recovery





# **Cross-Section A-A' of the Active Development Area**





	Number of SAGD Well Pairs	Drainage Area 50m Boundary	Average Net Pay above producer	Total OBIP	Producible Bitumen in Place	Cumulative Bitumen Produced*	Current Recovery Factor	Estimated Recovery Factor
		(10 <sup>3</sup> m <sup>2</sup> )	(m)	(10 <sup>6</sup> m <sup>3</sup> )	(10 <sup>6</sup> m <sup>3</sup> )	(m <sup>3</sup> )	(%)	(%)
Pad 2	8	504	15.2	1.79	1.12	350,289	19.6	50-60
Pad 3	8	504	15.7	1.85	1.15	0	0	50-60

\*Production to December 31, 2022

	Area	Average Net Pay	Total OBIP
	(10 <sup>3</sup> m <sup>2</sup> )	(m)	(10 <sup>6</sup> m³)
Development Area	10,511	15.2	37.2
Project Area	15,734	14.7	53.7

OBIP = Area x Net Pay x Porosity x Bitumen Saturation / FVF

FVF = Formation Volume Factor = 1.005





Property	Value
Bitumen saturation (%)	71
Porosity (%)	33
Grain size	Fine to medium
Net pay (m)	15.2
Horizontal perm. (D)	2.4
Vertical perm. (D)	1.7
Reservoir pressure (kpa)	600
Reservoir temperature (°C)	9
Reservoir depth (m TVD)	265
Bitumen viscosity (cp)	> 1 million
Well length (m)	800
Well spacing (m)	70



#### NCG Co-Injection

- Sunshine considers NCG co-injection to be a mature technology with a proven track record of success at several other SAGD operations over the past decade that will result in:
  - Decrease in SOR
  - Option to use the extra steam to start new well pairs
  - Reduction of heat loss to overburden
  - Increased pressure support for the steam chamber
- As per AER approval No. 11764F, Sunshine started NCG co-injection at Pad 2 wells in November 2022. NCG co-injection rates as well as steam injection, NCG mole concentration and produced gas rates are presented on slide 26
- During NCG injection, Sunshine actively monitors:
  - Steam chamber temperatures and pressures in the OBS wells (slide 25)
  - Gas production rate and GOR
  - iSOR
- These parameters will provide a real-time, overall picture of the reservoir performance and help indicate any downhole anomalies resulting from NCG co-injection
- Sunshine didn't observe any changes in the produced gas rates or GOR's after the first two months of NCG co-injection
- The one positive result observed so far is a slope change of the steam chamber pressure, with a resulting benefit of higher steam saturation temperature that results in lower bitumen viscosity (see plot on slide 27)



#### West Ells – OBS wells



Steam chamber pressures and temperatures are continuously monitored in the OBS wells during NCG co-injection



#### **NCG Co-Injection**



- Facility design allows for co-injection down the long or short tubing strings mixed with the steam, as well as down the intermediate casing (blanket gas)
- Injected NCG is natural gas with the following composition for Nov 2022:

N2	CO2	C1	C2	C3	C4	C5+	He
Concentration							
(% Vol)							
0.46%	1.75%	93.40%	3.36%	0.76%	0.22%	0.05%	0.01%



# NCG Co-Injection



Note about the plot: Reporting error for produced gas rate in July, in process of being corrected

West Ells SAGD 2022 Performance





Slope of pressure curves changes in November as a result of starting the NCG co-injection (all pressure measured in the bitumen zone). Marker 1 shows steam injection re-start, marker 2 shows NCG co-injection start



# Surface



**CPF Plot Plan** 

• No major facility modifications during this reporting period





- Steam injection was restarted on March 1, 2022 and bitumen production resumed on July 1, 2022
- On December 9, 2022 P12 ESP pump stopped working
- Due to low oil prices, high gas prices and trucks shortage, bitumen production was slowed down in December 2022



# **Bitumen Production**





#### **Steam Injection**





# Historical & Upcoming Activity



- No new production well suspensions in the reporting year
- Well Pair 11
  - Has been suspended since May 1, 2019 and this suspension impacted production from well pairs 10 and 12
  - It was not economic to fix the well in 2022
  - 226,723 m<sup>3</sup> of remaining reserves
  - Planning to run scab liner and replace the pump in Q3 2023

#### Well Pair 12

- Temporarily suspended since Dec 2022
- Production will resume in Q3 2023 after ESP replacement





• No production wells abandoned to date



# **Regulatory and Operational Changes**

#### Approval, Amendments and Renewals

Application #	Approval/Amendment	Activity	Approval Date
003-266890	EPEA Approval No. 00266890	Renewal	October 2022

Notes

o EPEA – Environmental Protection and Enhancement Act Approval

There were no pilots or major technological innovations conducted in the reporting year



In this reporting year:

- Steam injection was re-started in March 2022 with bitumen production resuming in July 2022 after being shut-in since April 2020
- In November 2022, Sunshine started NCG co-injection as per AER Approval 11764F with a 2 mole percent maximum NCG in the injected steam. Temperatures and pressures in the steam chambers as well as produced gas rate and GOR are closely monitored and NCG coinjection will be adjusted accordingly to ultimately reduce SOR



#### Lessons, Success and Failures

- There were no major failures/incidents reported at the site other than ESP pump failure at P12
- Starting in July 2022, emulsion rate was increased with a corresponding increase of steam injection until December 2022 when production and injection were slowed down due to a combination of high gas and diluent prices as well as a shortage of trucking
- NCG co-injection started in November 2022 with an average of 2.4 e<sup>3</sup>m<sup>3</sup>/d/well pair and a mole concentration of NCG to steam of around 0.8%. Too soon to see the benefits other than a more rapid increase of steam chamber pressure
- Communication is the key to success. Sunshine's staff in Calgary office and at the site work closely together to overcome challenges and adversities. In addition to daily ops meeting, Sunshine implemented weekly team meeting to discuss scheme performance, problem wells, regulatory and work safety issues



# **Compliance History – Approval Contraventions**

The following list summarizes the approval contraventions in this reporting period

Date	EDGE #	Description	Remediation
01-May	390079	Failed to submit March, April, May, June CEMS data on time	Data has been reported
07-Nov	406527	Operating the North Turbine	Plans are in place for the necessary repairs
23-Nov	407021	CEMS failed to meet 90% availability in November	Failed equipment was replaced and Operators were made aware of the importance of taking action upon the discovery of a failed daily calibration



• The following list summarizes the reportable releases in this reporting period

Date	EDGE #	Description	Remediation
10-Jan	0386973	Extreme cold temperatures and failed heat trace on a segment of the utility water piping system resulted in 2 m <sup>3</sup> of water released into the East Tank Building	Water released mixed with existing snow and ice. Once thawed, water was tested against surface water discharge criteria and released into the CPF Industrial Runoff System
12-Jan	0387051	The water inlet line to the Soft Water Tank froze during extreme cold temperatures and 5 m <sup>3</sup> of water was released into the tank farm	Water released mixed with existing snow and ice. Once thawed, water was tested against surface water discharge criteria and released into the CPF Industrial Runoff System
24-Feb	0388213	Utility water system froze during extreme cold temperatures and rupture was realized when system thawed. 5m <sup>3</sup> of water was released into the North Water Building	All water released into the building was sent to the Boiler Feed Water tank berm. Once thawed, water was tested against surface water discharge criteria and released into the CPF Industrial Runoff System
25-Feb	0388247	Utility water system froze during extreme cold temperatures and rupture was realized when system thawed. 30 m <sup>3</sup> of water was released into South Water Building	All water released into the building was sent to the Boiler Feed Water tank berm. Water outside of the building mixed with existing snow and ice and froze in place. Once melted, water was tested against surface release criteria and released into the CPF Industrial Runoff System
25-Feb	0388249	Utility water system froze during extreme cold temperatures and rupture was realized when system thawed. 5 m <sup>3</sup> of water was released into the Evaporator Building	Water was contained within the building and sent to the Steam Blowdown tank
27-Feb	0388264	Utility water system froze during extreme cold temperatures and rupture was realized when system thawed. 30 m <sup>3</sup> of water was released into the Steam Generator Building	All water was contained within the building and sent to the Steam Blowdown tank



# **Compliance History – Reportable Releases**

Date	EDGE #	Description	Remediation
20-Apr	0389760	Joint failure between the carbon steel pipe and HDPE pipe on the source well. 50 m <sup>3</sup> of raw water was released	The released water was lost to the environment. The last source water analysis results were within Alberta Tier 1 Soil and Groundwater Remediation Guidelines and meet surface water discharge criteria. The line was repaired
22-Apr	0389821	Failed gasket on diluent tank valve. 1.6 m <sup>3</sup> of diluent was released into the tank farm	Diluent contaminated snow was removed with a vacuum truck and placed back into the process. Once the remaining snow melted within the tank farm, it was also removed by vacuum truck
02-Aug	0402183	Failed flange gasket on well pair 9 emulsion line	The entire well pad was depressurized and well pair isolated. The emulsion pipeline was also depressurized to minimize the fluid release. The majority of released fluids remained inside the building. Temporary berms and absorbent boom were used to control the spread and prevent any contaminated fluid from entering the well pad ditch. A combination steam/vacuum truck was used to remove fluid from inside and clean the building as well as to recover any fluid from under the building. A skid steer was used to scrape contaminated soil from the surface
28-Nov	0407200	Loaded Midwestern truck and pup jack knifed on RMWB Poplar Creek road. 30 L of diluted bitumen was released off-site	The small amount of dilbit quickly froze in place on the road. A vacuum truck and steamer arrived at daylight to clean up the release. The release was stopped and containment was placed around the truck/trailer to contain the release. A mechanic was sent to location and reconnected the lines. The truck and trailers were then towed to a staging area where the loaded was pumped off into standby tanker



#### Future Plans

- Workover to replace failed ESP pump at P12 expected in June 2023
- Workover to run tail pipe/scab liner or tubing installed inflow control devices to repair damaged liner in P11 and replace ESP pump expected in July-August 2023
- With the P11 and P12 back on production and well optimizations, Sunshine expects to increase production from Pad 2 to around 2,000 bbl/d of bitumen
- Continue to fully demonstrate the reservoir productivity before advancing to Phase 2 (facility construction and Pad 3 well pair completions to add an estimated 5,000 bpd of bitumen production)



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