

# MONTHLY UPDATE PRIMROSE OIL SANDS FLOW TO SURFACE

November 3, 2014

## 1 Introduction

Primrose/Wolf Lake Oil Sands Project (PAW) is a thermal in situ operation located approximately 65 km north of Bonnyville and about 350 km northeast of Edmonton, primarily inside the Cold Lake Air Weapons Range. The approved project area covers 288 sections or 73,728 hectares.

Bitumen production from this project employs cyclic steam stimulation (CSS) technology whereby steam is injected into the oil sands formation (at approx. 500 metres depth) through wells to reduce the viscosity of the bitumen. After steaming, bitumen then flows through the same wells and is processed at project facilities.

In May and June of 2013, Canadian Natural discovered four sites in the Primrose project area where bitumen emulsion had flowed to surface (FTS). Measures were immediately taken to address the incidents in order to clean up, investigate, remediate and address the causes of the events.

The legal descriptions of the four FTS sites are:

- 02-22-067-03 W4M (2-22)
- 10-01-067-03 W4M (10-1)
- 10-02-067-03 W4M (10-2)
- 09-21-067-04 W4M (9-21)

The land disturbances associated with the Primrose flow to surface incident will be reclaimed and restored. This includes the surrounding areas and any disturbances associated with the investigation of the incident (roads, well sites, equipment storage, etc.). All aspects of environmental response and management are the responsibility of Canadian Natural and subject to the oversight and regulation of provincial and federal authorities.

Canadian Natural is working with the Alberta Energy Regulator (AER) and Alberta Environment and Sustainable Resource Development (AESRD) to remediate the affected locations and investigate the root cause of the bitumen emulsion seepage to surface. We appreciate AER and AESRD's ongoing support as we continue to manage these events.

In the fall of 2013, Canadian Natural evaluated the best technical approach to access the fissure below the shallow water body at the 9-21 site. In consultation with AESRD, multiple options were considered. Canadian Natural decided the best option was to move the water from its original position and temporarily store it in two near-by locations, allowing access to the underlying fissure.

The water has been returned from its temporary storage locations to its original position. This technical option was chosen as it would be the least environmentally impactful and provide the best approach to contain the entire fissure. You can find weekly photographs documenting this process on our corporate website, at [www.cnrl.com](http://www.cnrl.com).

The best regulatory option to do this work in a timely manner was through an Environmental Protection Order (EPO-2013-33/NR), which we requested and then received on September 24, 2013. The requirement to conduct this work prior to freeze-up was also an essential component of pursuing this regulatory option. Monthly progress reports can be on our corporate website, at [www.cnrl.com](http://www.cnrl.com).

Our efforts to date focused on ensuring each surface location is secured, and that recovery and reclamation activities progress. In August 2013, we began applying for approvals to advance our investigation and requested an Enforcement Order. On October 21, 2013 we received the Enforcement Order (EO-2013/05-NR) that allows us to continue mitigation and investigation activities.

Canadian Natural's plan consists of eight separate plans requiring AESRD and AER approval prior to any earthworks or drilling activity, as described below.

## **2 Summary of Activities to Date**

### **2.1. Surface Site Containment, Delineation and Remediation Plan**

This plan covers site containment, delineation and remediation plans for each site.

- The bitumen surface releases at all sites are fully contained within clay berms.
- Clean-up is complete on all 4 FTS sites.
- Bitumen emulsion recovered to date: 1,064m<sup>3</sup> as of October 20, 2014.

Status at each site:

#### **2.1.1 2-22 (Terrestrial Site)**

- Discovered June 8, 2013.
- Clean up is complete and 7,396 tonnes of impacted material were removed for disposal at the Tervita Class II landfill in Bonnyville, Alberta.
- Bitumen emulsion impacted area is 0.31 hectares.
- Under the Enforcement Order we have been approved to conduct investigative activities in a 26 hectare area. We may not use the entire area, and as of October 31, 2014 we have developed on 16.656 hectares.
- 101m<sup>3</sup> of bitumen emulsion has been recovered as of October 20, 2014.
- Bitumen emulsion seepage from the fissure is too small to measure and is contained within clay berms.
- Construction of the fissure containment structure, bitumen recovery culvert and drilling pad is complete.

#### **2.1.2 10-1 (Terrestrial Site)**

- Discovered May 20, 2013.
- Clean up is complete and 25,394 tonnes of impacted material have been removed for disposal at the Tervita Class II landfill in Bonnyville, Alberta.
- Bitumen emulsion impacted area is 0.55 hectares.
- Under the Enforcement Order we have been approved to conduct investigative activities in an 8 hectare area. We may not use the entire area, and as of October 31, 2014, we have developed on 4.23 hectares.

- 354 m<sup>3</sup> of bitumen emulsion has been recovered as of October 20, 2014.
- Bitumen emulsion seepage from the fissure is too small to measure and is contained within clay berms.
- Construction of the fissure containment structure, bitumen recovery culvert and drilling pad is complete.

### 2.1.3 10-2 (Terrestrial Site)

- Discovered May 20, 2013.
- Clean-up is complete and 17,410 tonnes of impacted material were removed for disposal at the Tervita Class II landfill in Bonnyville, Alberta.
- Bitumen emulsion impacted area is 0.57 hectares.
- Under the Enforcement Order we have been approved to conduct investigative activities in a 37 hectares area. We may not use the entire area, and as of October 31, 2014 we have developed on 12.672 hectares.
- 563 m<sup>3</sup> of bitumen emulsion has been recovered as of October 20, 2014.
- Bitumen emulsion seepage from the fissure is too small to measure and is contained within clay berms.
- Construction of the fissure containment structure, bitumen recovery culvert and drilling pad is complete.

### 2.1.4 9-21 (Water Body Site)

- Discovered June 24, 2013.
- On September 24, 2013 we received an Environmental Protection Order for the 9-21 site to allow us to isolate, excavate and contain the fissure below the water body.
- To facilitate this work, the water from the area was removed and stored in two near-by, temporary storage areas.
- Under the Enforcement Order we have been approved to conduct investigative activities in a 28 hectare area. We may not use the entire area, and as of October 31, 2014 we have developed on 11.431 hectares.
- 46 m<sup>3</sup> of bitumen emulsion has been recovered as of October 20, 2014.
- Bitumen emulsion seepage from the fissure is too small to measure and is contained within clay berms and a retaining wall.
- Construction of the fissure containment system is complete.
- Fencing and berms around the 9-21 site are inspected weekly.

## 2.2. Geology and Regional Ground Water Delineation, Monitoring and Remediation Plan

This plan covers ground water delineation, monitoring and remediation in and around the FTS sites.

- The plan was approved by AESRD December 9, 2013.
- A multi stage groundwater drilling investigation has been completed at all 4 sites.
- Construction of the fissure containment structures, bitumen recovery culverts and drilling pads on the 3 terrestrial sites is complete.
- We currently have 71 monitoring wells amongst the 4 FTS sites.
- The wells are being sampled regularly and analyzed by a certified accredited lab. All data collected and work summaries are shared with the AER.

- Construction of the pad within the 9-21 fissure containment structure is complete.
- Preparing to begin drilling seven additional ground water investigation wells starting mid-November.

### **2.3. Source/Flow Pathways Investigation Plan**

We submitted an initial Causation Review Report to the AER in early July 2014. The causation review has identified both the cause of the seepage to surface and the pathway from the Clearwater formation to surface. The results of the Report were reviewed by an independent technical panel. While the causes have been identified, a final report is being prepared that includes a review and discussion of all data required.

### **2.4. Surface Water Management and Monitoring Plan**

This plan covers site surface water management and monitoring plans for the FTS sites. Surface water is managed and monitored at the FTS sites through the following measures:

- The fissure containment structures and drilling pads act as effective barriers to potential contact with surface water.
- Culverts have been installed to re-direct water
- If water is encountered, it will be tested and hauled away for disposal or pumped into the borrow pit adjacent to the 9-21 water body.

### **2.5. Wildlife Management Plan**

This plan addresses wildlife deterrents, capture and treatment of impacted wildlife and rehabilitation/release options.

- Wildlife activity in the vicinity of the FTS sites continues to be minimal.
- Wildlife monitoring crews are monitoring the water body as required.
- Canadian Natural will comply with all federal and provincial legislation that apply to the conservation and management of wildlife.

### **2.6. Waste Management Plan**

This plan outlines the waste management activities that will be undertaken by Canadian Natural at the 4 FTS sites. The Waste Management activities may be adapted as the needs of the investigation and clean-up change, which will be shared with AESRD and AER.

It is Canadian Natural's goal to manage the waste resulting from this bitumen release in a manner that will mitigate environmental impact, minimize waste volumes and utilize recycling opportunities where possible.

Drilling waste from investigation drilling is being managed using remote sumps in accordance with Directive 50.

## **2.7. Reclamation Plan**

In accordance with Enforcement Order EO-2013/05-NR, the final reclamation plan was submitted to AER/AESRD on June 28, 2014. The reclamation plan outlines our reclamation approach including monitoring, managing, scheduling and reporting.

- Once approved by the director, the reclamation plan will be implemented.
- Annual reclamation procedures and progress reporting will begin November 1, 2014 and continue annually until advised otherwise by AER/AESRD.

## **2.8. Communications Plan**

This plan summarizes our planned weekly and monthly communication with stakeholders, regulators, Government officials and the general public.

- Canadian Natural's website is updated on a regular basis.
- We continue to address government, media and public inquiries.
- We provide written summaries and meet with stakeholders as needed to provide updates.

## **3 Summary**

Canadian Natural has full containment of each surface release and has fully cleaned up all of the flow to surface sites. Canadian Natural has completed the ground water drilling program on the land sites of the seepages to surface and has confirmed that there is no on-going contamination of the aquifer away from the sites. The fissures are covered with containment structures and a bitumen collection system is in place. Bitumen emulsion seepage is currently too small to measure.

While the causes have been identified, a final report is being prepared that includes a review and discussion of all data required.