

October 30, 2013

Matrix 8881-523

Mr. Michael Aiton
Regional Compliance Manager
ALBERTA ENVIRONMENT AND SUSTAINABLE RESOURCE DEVELOPMENT
Twin Atria Building
111, 4999-98 Avenue
Edmonton, Alberta T6B 2X3

**Subject: October 2013 Summary Report on Fish and Fish Habitat Assessment Under
EPO-2013-33/NR**

Dear Mr. Aiton:

This letter report is hereby intended to serve as the summary report on fish and fish habitat assessment required by Environmental Protection Order (EPO) No. EPO-2013-33/NR, which was issued to Canadian Natural Resources Limited under the *Environmental Protection and Enhancement Act* on September 24, 2013.

1 BACKGROUND

The Canadian Natural Primrose South in situ oil sands project is located in the Cold Lake Air Weapons Range approximately 65 km north-northeast of Bonnyville, Alberta. Canadian Natural operations staff found a bitumen emulsion flow to surface (FTS) in 09-21-067-04 W4M on June 24, 2013. The FTS area is beneath an unnamed water body within the Canadian Natural Primrose South production zone. The FTS is still occurring beneath the water body but has been contained by booms, X-Tex curtains and a silt fence. In addition, since June 2013, a full-time crew of workers has physically recovered bitumen emulsion from Basin 2 and free bitumen emulsion globules from bottom sediments around Basin 1 and the southern portion of Basin 3.

On September 27, 2013, Canadian Natural began to dewater a portion of the 09-21 water body to remediate affected areas, expose and delineate the FTS fissure, and contain the bitumen release area. Water quality in the 09-21 water body was continuously monitored during the dewatering period and compliance with the EPO was maintained. Daily observations were also conducted to determine whether fish were present in the water body. Activities associated with the dewatering of the 09-21 water body were suspended on October 22, 2013.

2 FISH AND FISH HABITAT ASSESSMENT OBJECTIVES

During the initial response to the bitumen release, fish and fish habitat assessments were completed in late June and mid-August 2013 at various locations on the 09-21 water body to characterize fish habitat and determine whether fish were present. The areas assessed included the 09-21 water body and a fen located downstream of the water body.

During the dewatering phase, fish and fish habitat assessments continued from September 24 to 28, 2013; daily fish sweeps were completed in conjunction with the amphibian salvage program. Thereafter, daily observations were completed to determine the presence, species and quantities of all fish in the water body, and salvage, as necessary.

3 FISH AND FISH HABITAT ASSESSMENTS

Fish capture methods followed the Fish Research Licence 13-2831, as amended, granted by Alberta Environment and Sustainable Resource Development.

3.1 Fish Habitat Assessments Before Dewatering Phase

On June 27, 2013, ten baited minnow traps with 1-inch and 5-inch entrances were positioned throughout the water body for three consecutive periods, for a total effort of 60 hours per trap. Traps were set for a maximum period of 24 hours before being checked and redeployed.

The traps were set in open water areas and within swampy areas containing sedges and rushes (Figure 1). The connectivity of the water body or other fish bearing water bodies or watercourses, particularly Wolf River, was explored. A search was conducted using the *Fish and Wildlife Management Information System (FWMIS) Internet Mapping Tool* (ESRD 2013). Wolf River is the closest fish bearing watercourse with a potential connection to the 09-21 water body. Fish habitat was assessed in terms of depth, cover and overwintering suitability. Water quality parameters that affect fish habitat, including temperature (°C), pH, specific conductivity (µS/cm), and dissolved oxygen (mg/L), were measured and recorded at several sites in the 09-21 water body and the downstream fen.

A follow-up fish and fish habitat assessment was conducted in response to possible sightings of waterfowl consuming fish in the vicinity of the 09-21 water body. On August 13, 2013, fourteen minnow traps were set in the water body at seven locations in Basin 3 and seven locations in Basin 4. The traps were baited and left undisturbed for 24 hours. The traps were set in open water areas and within swampy areas containing sedges and rushes. The traps were retrieved and an inventory of aquatic life was completed.

On August 14, 2013, portable boat and backpack electrofishing was conducted in the water body as follows:

- A Smith-Root, Inc. portable electrofisher was fitted to a Zodiac inflatable boat. The field crew shocked Basin 4 for 640 seconds.
- A Smith-Root® LR-20B backpack electrofisher was fitted to an aluminum flat-bottomed boat. The field crew shocked Basin 3 for 1,418 seconds.

Electrofishing and minnow trapping were not conducted in Basins 1 or 2 due to clean-up operations.

3.2 Fish Habitat Assessments During Dewatering Phase

From September 24 to 28, 2013, shoreline sweeps were conducted along Basins 1 to 3 shoreline of the 09-21 water body (Figure 1). During the shoreline sweeps, baited minnow traps were set and dip nets were used to assess forage fish and amphibian presence in the water body. On September 28, 2013, all minnow traps were removed and daily shoreline sweeps continued using dip nets until October 4, 2013. Daily observations for the presence of fish continued through to October 22, 2013.

On October 15, 2013, six minnow traps were set in a nearby borrow pit, which was the receiving water body for filtered water pumped from Basins 1 and 2 of the 09-21 water body (Figure 1), to confirm a potential visual observation of forage fish. The traps were baited and left undisturbed for 24 hours. The traps were retrieved and an inventory of aquatic life was completed.

4 FISH AND FISH HABITAT ASSESSMENT RESULTS

In situ water quality parameters were measured throughout the summer and early fall from the 09-21 water body and the downstream fen (Table 1). The dissolved oxygen (DO) level was generally low in the water body and nearly anoxic conditions were presented in the downstream fen. The oxygen level in the 09-21 water body was sufficient to support forage fish; however, the average DO concentration of 5 mg/L was equivalent to the minimum acute freshwater aquatic life guideline (AENV 1999).

Table 1 Summary of Water Quality Conditions

Average Concentration	09-21 Water Body	Downstream Fen
Count (n=)	1,242	434
Temperature (°C)	20	17
Dissolved oxygen (mg/L)	5.0	1.71
pH	7.3	6.29
Conductivity (µS/cm)	91	126

The average depth of the 09-21 unnamed water body was recorded as 1.5 m, with a range from less than 1.0 to 2.0 m. Given the shallow nature of the water body, overwintering potential is considered low (Appendix A).

The water level in the downstream fen decreased throughout the open water period, and only shallow pockets of water were noticeable in areas adjacent to the 09-21 water body. There were also two well-developed beaver ponds located approximately 500 m south of the 09-21 water body, near the Ken Baker Road. The fish habitat potential in the downstream fen is nil, with the exception of the beaver ponds where the overwintering potential is considered low.

No fish were caught in any of the minnow traps; however, tadpoles were observed in certain traps collected on June 28, 2013, dragonfly larvae were observed in several traps collected on August 14 and October 16, 2013, and freshwater amphipod crustaceans and water beetles were observed in several traps collected on October 16, 2013. Water beetles and dragon fly nymphs were also observed during the shoreline sweeps. No fish were caught or observed during electrofishing.

The closest fish bearing water bodies include the Wolf River, approximately 6 km to the west, as well as an unnamed water body approximately 1 km away to the northeast; direct connectivity between the 09-21 water body and these areas did not exist during the entire assessment period. These findings are

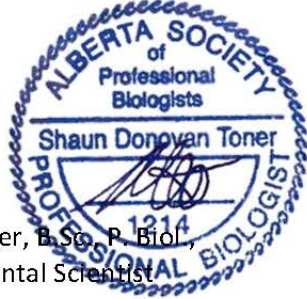
consistent with what was reported in the *Primrose and Wolf Lake (PAW) In-Situ Oil Sands Expansion Project* (Canadian Natural 2000). As well, no fish were captured or observed during June, August, September or October 2013 using minnow traps, dip nets or electrofishing.

Based on these assessments, the lack of connectivity to fish bearing watercourses, low overwintering habitat potential, and the fact that no fish, dead or alive, were observed by the numerous sampling and clean-up crews present on the water body since June 27, 2013, it is unlikely that the 09-21 water body or the borrow pit contains a resident fish population. Furthermore, no fish were observed during the dewatering period, confirming observations made before dewatering.

5 CLOSURE

We trust that this letter report suits your present requirements. If you have any questions or comments, please call either of the undersigned at 403.237.0606.

MATRIX SOLUTIONS INC.



Shaun Toner, B.Sc., P. Biol.
Environmental Scientist

Reviewed by



Henri de Pennart, Ph.D., P. Biol.
Senior Environmental Scientist

ST/scw

Attachments

copy: Ryan Cameron, Canadian Natural Resources Limited, Calgary, Alberta
Kirk Skocylas, Canadian Natural Resources Limited, St. Albert, Alberta

DISCLAIMER

We certify that this letter report is accurate and complete and accords with the information available during the site investigation. Information obtained during the site investigation or provided by third parties is believed to be accurate but is not guaranteed. We have exercised reasonable skill, care and diligence in assessing the information obtained during the preparation of this letter report.

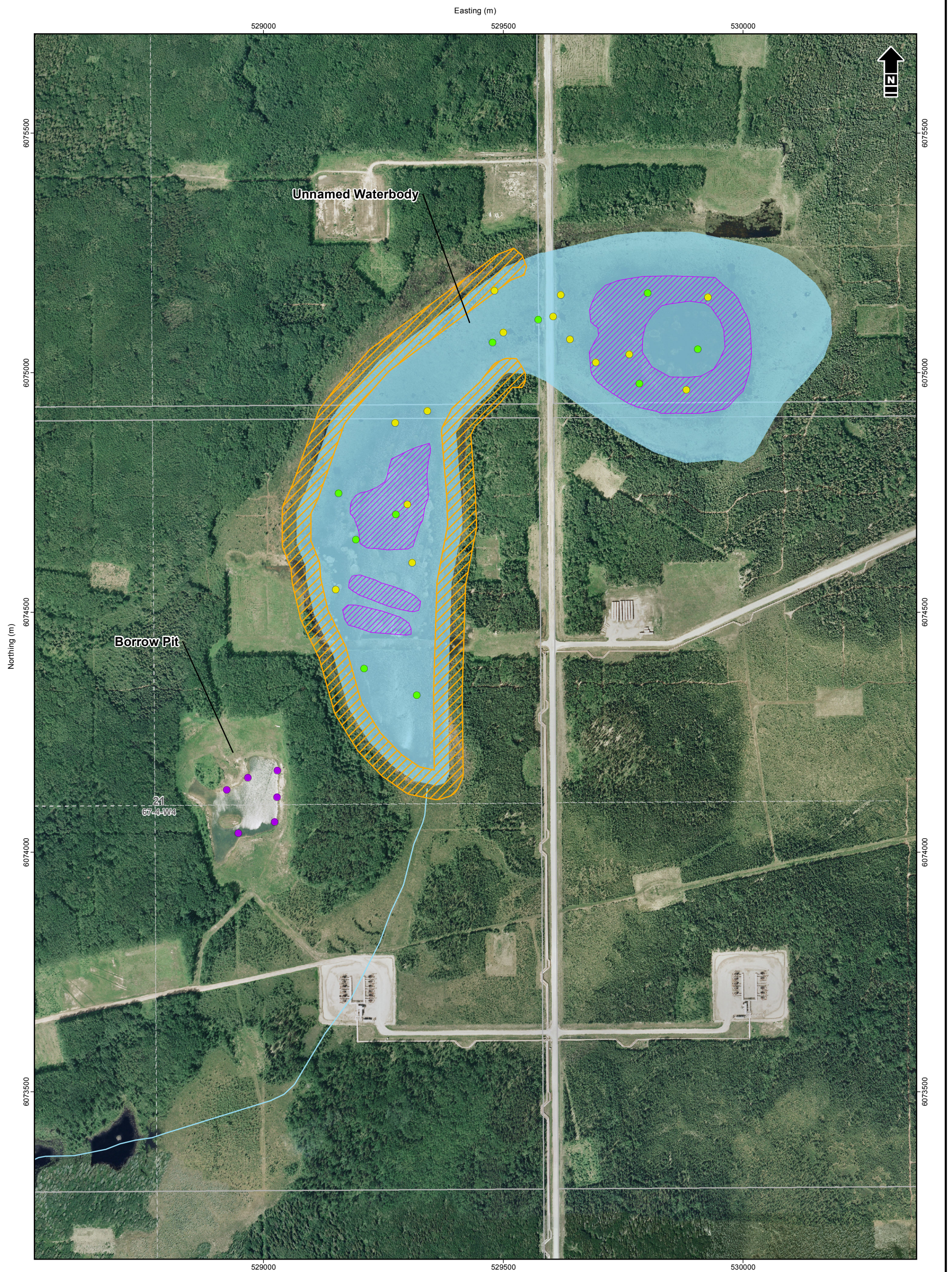
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REFERENCES

Alberta Environment (AENV). 1999. *Surface Water Quality Guidelines for Use in Alberta*. Environmental Assurance Division, Science and Standards Branch. Publication No. T/483. ISBN: 0-7785-0897-8. Edmonton, Alberta. November 1999. <http://environment.alberta.ca/01323.html>

Alberta Environment and Sustainable Resource Development (ESRD). 2013. *Fish and Wildlife Management Information System (FWMIS) Internet Mapping Tool*. http://xnet.env.gov.ab.ca/imf/imf.jsp?site=fw_mis_pub

Canadian Natural Resources Limited (Canadian Natural). 2000. *Primrose and Wolf Lake (PAW) In-Situ Oil Sands Expansion Project*. Application to Alberta Energy and Utilities Board and Alberta Environmental Protection. October 2000.



-  Electrofishing Effort Zone (August 14, 2013)
-  Shoreline Sweep (September 24-28, 2013)
-  Water Body
-  Watercourse
-  Minnow Trap (June 28, 2013)
-  Minnow Trap (August 14, 2013)
-  Minnow Trap (October 16, 2013)



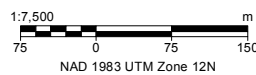
Canadian Natural Ltd.
Primrose 09-21-067-04W4M

Summary of Fishing Effort in the Unnamed Water Body and Borrow Pit

Date: 30 Oct 2013 Project: 8881-523 Technical: S. Toner Reviewer: H. de Pennart Drawn: R. Keller

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Figure 1



APPENDIX A
SITE PHOTOGRAPHS



Photograph 1: 09-21 Water body and borrow pit (September 28, 2013)



Photograph 2: 09-21 Water body and borrow pit (October 12, 2013)



Photograph 3: Downstream fen with beaver Ponds; view towards Ken Baker Road (October 12, 2013)



Photograph 4: Beaver ponds near Ken Baker Road (October 12, 2013)



Photograph 5: Basin 3 shoreline (October 3, 2013)



Photograph 6: Basin 3 shoreline (October 3, 2013)