
Bearhole Lake 2014 Annual Report (December)

Park Use Permit #103063

January 9th, 2015

Prepared for:

Kevin Wagner

Peace Area Supervisor, Ministry of Environment

Prepared by:

Chelsea Mottishaw, B.A., A.Ag.

Watershed Technician, City of Dawson Creek

The City of Dawson Creek (City) is submitting this interim report to the Peace Area Supervisor in accordance with Park Permit No. 103063. Currently the City is awaiting approval of their Park Permit renewal, which will run from 2014-2024. In this report, the provisions outlined by the Ministry of Environment (MOE) will be discussed. Due to the delay in the City’s renewal, some provisions have not been met for 2014, but it should be clear that these provisions will be met starting 2015, see Appendix A. A Dam Management Plan has also been created for the Bearhole Lake Control Weir, see Appendix B for those documents. If there are any questions or concerns, please contact Chelsea Mottishaw at the City of Dawson Creek.

Annual Maintenance Schedule for Bearhole Lake (Based on Draft PUP Provisions)

	Spring	Summer	Fall	Winter
1. Inspection and maintenance log boom and weir structure	X	X	X	X
2. Flow discharge measurements	X	X	X	
3. Hazard tree assessments	X			
4. Every two years: Baseline vegetation survey		X		
5. Dissolved oxygen and Temperature measurements	X	X		
6. Fish-passage study		X	X	
7. Updates on research initiatives			X	X
8. Turbidity sampling during weir operations and access construction		X	X	
9. Trail maintenance	X	X	X	X
10. Removal of logs or snags from water control structure	X	X	X	X

Provisions

1. Log Boom and Weir

The log boom located upstream of the weir was inspected upon each field visit in 2014. A break in the log boom was witnessed in early June, following freshet, InterraPlan Inc., for the City reassembled the log boom on June 13th. In following visits, the log boom has been in working order.

The fish passage and weir were inspected upon each field visit for woody debris. On June 11th, InterraPlan Inc. removed logs and sticks that were caught on the structures.

On August 1st, the City cleaned out the fish ladder and the fenced off area around the release. Evidence of beaver activity was noted near the release gate.

On August 27th, the City and Peace Country Technical Services (PCTS) cleared woody debris from the slide gate area. Beaver activity is noted within the downstream side of the weir.

2. Flow Discharge Measurements:

Inflow and outflow measurements have been captured in the Water Balance Study, see Provision 5 for updates.

3. Hazard Tree Assessments:

Chelsea Mottishaw of the City of Dawson Creek was certified as a Wildlife and Danger Tree Assessor as of November 18th, by UNBC. In late spring of 2015, the City will conduct an assessment on the campground, at the boat launch, weir, and at other worksites used by the City of Dawson Creek. It is understood that the MOE may be able to help in falling and bucking of these trees.

4. Baseline Vegetation Survey:

Vegetation surveys will occur bi-annually starting in 2015. These assessments will build on the previous assessments from 2009-2013 (2011 excluded due to weather conditions).

5. DO and Temperature Measurements:

Due to the delay in receiving our 2014-2024 Park Use Permit, it was not clear to the City that lake monitoring was required for 2014 until mid-summer. The City will continue

with the monitoring each March and August for the remainder of the permit. Below are the August 2014 readings:

Aug 1, 2014 Lake Monitoring

Time: 12:15

Location: Deep Station (10U 647730 6102977)

Conditions: 20°C, sunny skies, calm wind from south

Depth (m below surface)	Temperature (°C)	DO (mg/L)	DO %
0	19.9	9.41	103.1
1	19.8	9.38	102.7
2	19.5	9.37	102.0
3	19.2	8.86	96.2
4	18.7	8.2	88.4
5	18.1	6.93	72.6
6	17.3	5.29	55.0
7	17.2	5.07	52.3
8	17.1	4.83	49.3

6. Fish Passage Study:

Due to the consultation delays involved in our Park Use Permit approval, the City requested that the Fish passage monitoring study be deferred to 2015. Kevin Wagner has approved this request. The City has been working with multiple companies to develop a suitable fish passage study for Bearhole Lake weir. The study outline will be forwarded to Lynn Avis (Fisheries Biologist) in the first quarter of 2015.

A visual inspection of the fish ladder on August 1st showed water only in the first stop bay. On August 21st and August 28th, the lake level did not crest the weir, and the crest of the fish ladder was dry. For all remaining trips to the Bearhole weir in 2014, water did not crest the weir or run through the fish ladder.



Figure 1: Downstream end of perforated pipe.

To minimize beaver activity during the release trails, the area surrounding the weir release gate and valve was fenced off using chain link fence, and a perforated pipe was installed extending upstream

and downstream from the butterfly valve. Fish presence on both sides of the weir on October 7th was witnessed.

7. Research Initiatives:

The following tasks have been completed in 2014:

Through the installation of a weather station in June, the City was hoping to collect data including: temperature, wind speed, wind direction, relative humidity, precipitation, and lake level. Technical difficulties were encountered and the data collection from June-December has been intermittent.

The City has been able to monitor the weir using the camera installed in June. To view current photos please visit <http://202.36.29.11> (Username: bearhole.user; Password: bearholeuser).

Release Trials

Since 2012, the City has been conducting release trials to better understand the reservoir capacity of Bearhole Lake. In fall of 2013, PCTS and the City conducted a release trial from October and until April 2014, see Appendix C.

In late summer 2014, the City used a variety of tools to monitor the water levels in the Kiskatinaw. In late June, the City and PCTS evaluated the Kiskatinaw River's discharges, groundwater wells, past trends, and long-term forecasts, see Appendix C. With constant monitoring, the City decided a summer release trial of 3000m³/day would be effective in supplying the Kiskatinaw with additional flow for source water and for aquatic protection. This release trial began August 21st, 2014.

Through the use of the weather station camera, the City was able to monitor the structural controls at Bearhole Lake. Unfortunately the release resulted in increased beaver activity which obstructed the slide gate and drastically reduced flows. On August 28th, the City with support from PCTS conducted a field assessment of the slide gate and concluded that frequent maintenance and trapping are required to conduct a successful release trial.

On September 3rd, the City with PCTS installed exclusion fencing on the upstream and downstream sides of the weir, and worked with Kelly Lake Contracting Ltd. to locate and remove beavers from the area.

On September 5th, a second release trial was started with a flow rate of ~3500m³/day.

October 19th, PCTS installed secondary piping downstream of the weir to allow water to flow through the beaver dams without having to remove them. By doing so, the City was able to determine when the slug of water from Bearhole arrived at four different locations within the East Branch of the watershed, including the Arras Intake.

Arrival times for the Bearhole Lake Releases		
Date of Bearhole Release	Kiskatinaw FSR 55.097047°, -120.267259°	Arras Weir 55.755705°,-120.553473°
September 3 rd , 2014	3 days	12 days
October 19 th , 2014	1 day	8 days

The differences between these two releases and the arrival times can be attributed to weather patterns, flow rates in the tributaries and mainstem of the Kiskatinaw, and precipitation.

Water Balance Study

To better understand the surface water – groundwater interaction of the Bearhole Lake reservoir and how this relationship may react to changes in storage capacity (i.e. higher surface water elevation), the City retained Kerr Wood Leidal (KWL) to quantify the surface water and groundwater source components within the reservoir by conducting a water balance study. This study began in summer of 2013 and will be completed fall 2015, see Appendix D for the 2014 Water Balance update from KWL.

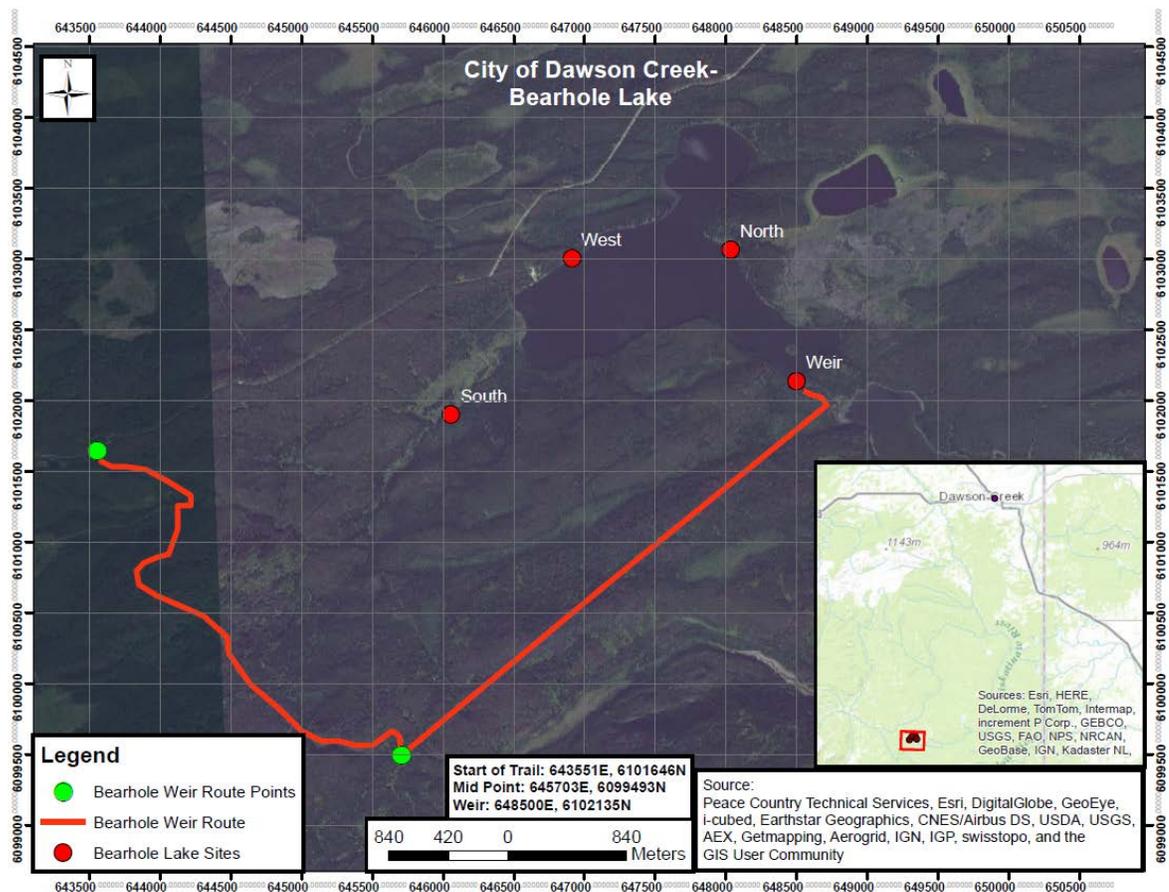
For an update of the 2013 Muskeg and surface water balance study, please see Appendix E. To date this study did not prove effective in identifying major water contribution areas, yet through reconnaissance locations for future investigations were identified.

1. Turbidity Sampling:

On August 27th, a turbidity sample was collected downstream of the weir once maintenance had been completed. The results showed that turbidity was 5.95 NTU. On September 3rd, the turbidity level post maintenance was 6.7 NTU.

2. Trial Maintenance:

On December 12th, the City attempted to reach the Bearhole Lake weir via the west access down the Thunder Mountain Road and seismic lines. At 1.5km on the seismic line, fallen trees and dangerous trees were encountered and the crew decided it was unsafe to continue. On December 19th, the City contracted the maintenance of the East Trail to N-4 Contracting. The trail was cleared of fallen trees, and the workers accessed the weir on December 22.





3. Weir Maintenance:

Removal of logs and woody debris from the control structure was completed at each visit during the summer of 2014 (June 4th, August 1st, and August 25th). Continued monitoring using the camera allows the City to determine when field visits are necessary.

On August 21st, the slide gate was completely opened and closed as per the dam management requirements. The same was done for the butterfly valve on the control structure on August 28th, see Appendix B.

If you have any questions or concerns, please feel free to contact me at any time,

Chelsea Mottishaw, B.A., A.Ag.
Watershed Technician
City of Dawson Creek
Phone 250-782-1793 Cell 250-784-7909

Appendix A

Email for Park Use Permit Clarification

From: Chelsea McClellan
To: [Shawn Dahlen](#); [Kevin Henderson](#)
Cc: [Wagner, Kevin L ENV:EX](#); [John Kalinczuk](#)
Subject: Park Use Permit Clarifications
Date: July-30-14 4:37:00 PM

Kevin and Shawn,

On July 25th, 2014, I spoke to Kevin Wagner about our permit provisions as outlined in the PUP, please see below.

Fish Passage Assessment

- In our PUP, it states that this assessment is a 5 year long commitment that will annually monitor the fish passage. Due to the consultation delays involved in our Park Use Permit approval, the city would like to request that the Fish Passage Assessment will start early 2015. Communication with Lynn Avis will happen over the winter of 2014 to create a plan that will effectively assess the Fish ladder.

ATV Access

- There are currently two existing trails used for access to the weir and our piezometers.

There has been some re-growth of alder along these trails. Kevin has requested that if we did any maintenance on these trails, we should do minimal clearing in a switchback pattern, as this will reduce the likelihood that ATV users in the Park will use the trails.

Hazard Tree Assessment

- This is outlined in the Park Use Permit. Kevin has added additional clarification "Hazard Tree Assessments must be done for high risk areas such as main operating sites and any heavily used trails, used by either the public or by City of DC staff or contractors. These assessments need to be done by a certified Wildlife and Danger

Tree Assessor. This course is offered annually by UNBC in Prince George. Any assessments conducted within BC Parks must meet the park specific module for the Training, as directed by WorkSafe BC. While BC Parks staff are able to assist as best they can, it may be prudent for a City of DC staff member involved with the weir operation to take the course in order to provide the safety requirements for your staff on a regular basis. In addition to this, BC Parks staff or other government personnel may be available to conduct the falling and bucking required. However, again, we only have a limited budget for this. As the City will be in this Park and conducting weir operations for the distant future, it may be in their best interest to consider these options.”

- I have contacted UNBC, the course will be ran in Spring 2015

“Operation” of the weir

- In the Permit, it states that the City is able to continue operation and maintenance of the Bearhole lake level control weir. The city wanted to clarify that “Operation” includes conducting our release trails for drought resiliency and research. Kevin has stated that due to the nature of permit (it is for our source water), that we are authorized to make judgements for ourselves. If we need to conduct a release, then we have approval.
- Kevin does ask that we complete the Weir Operation Plan that would outline the whole release process (how, when, and possible effects). Notifications of releases do not need to be given to Parks, besides in the annual reports.

PUP

- Our permit at this time has been “approved in principal,” but it needs to go to Front Counter BC now. Once approved we will receive a digital and hard copy. I have been assured that we can continue with our studies and operation of the weir.

Please let me know if you have any questions.

Appendix B

Dam Management Plan

Date	Company	M/S/O	Description
June 3 rd , 2014	InterraPlan Inc., GeoScientific	Operation	<ul style="list-style-type: none"> Installation of the BH Lake Weather Station.
June 13 th , 2014	InterraPlan Inc., Last Enterprises	Maintenance	<ul style="list-style-type: none"> Repaired the log boom cables.
August 1 st , 2014	City of DC, Last Enterprises	Operation and Maintenance	<ul style="list-style-type: none"> Installation of the tipping rain gauge. Cleaned out fish ladder and slide gate.
August 21 st , 2014	City of DC, Peace Country Technical Services	Operation and Maintenance	<ul style="list-style-type: none"> Started a release trial of 3000m³/day. Opened the slide gate Inspected weir and spillway for debris.
August 27 th , 2014	City of DC, Peace Country Technical Services	Maintenance/ Operation	<ul style="list-style-type: none"> Opened and closed the butterfly valve. Removed debris from the spillway and around the slide gate.
September 3 rd , 2014	City of DC, Peace Country Technical Services	Maintenance/ Operation	<ul style="list-style-type: none"> Installed exclusionary fencing measures to deter beavers from the weir and fish ladder areas. Opened the butterfly valve to release a large slug of water ~5000m³/day.
September 5 th , 2014	Peace Country Technical Services, Kelly Lake Contracting	Inspection	<ul style="list-style-type: none"> Identified beaver dams and homes near both the upstream and downstream sides of the weir. Reduced the volume of water released to 3140m³/day.
September 5 th - 15 th , 2014	Kelly Lake Contracting	Operation	<ul style="list-style-type: none"> Beaver trapping was completed.
October 19 th , 2014	Peace Country Technical Services	Operation	<ul style="list-style-type: none"> Installed pipes through beaver dams to allow constant flow of water at the

			outflow without compromising beaver habitat.
November 22 nd , 2014	Peace Country Technical Services	Maintenance	<ul style="list-style-type: none"> Weather station maintenance and installation of solar panel, additional batteries, and stabilization fences.
December 19 th , 2014	N-4 Contracting & the City of DC	Maintenance	<ul style="list-style-type: none"> Trail brushing and falling of dangerous trees on West access trail and seismic line.
December 22 nd , 2014	Peace Country Technical Services & the City of DC	Maintenance/ Inspection and Operation	<ul style="list-style-type: none"> Reduce the release to 2800m³- 3000m³/day. Inspect and do maintenance on weather station.