CANADIAN ZINC CORPORATION

July 3, 2016

Mr. Chuck Hubert
Senior Environmental Assessment Officer
Mackenzie Valley Environmental Impact Review Board
5102 50th Avenue,
Yellowknife, NT
X1A 2N7

Dear Mr. Hubert

RE: Environmental Assessment EA1415-001, Prairie Creek Mine
All Season Road, Undertakings from Technical Session

This letter provides the first batch of responses to Undertakings by Canadian Zinc Corporation (CZN). Attached to this letter are responses to Undertakings 1, 3, 4, 7, 21, 33, 38, 39, 42 and 43.

If you have any questions, please contact us at 604 688 2001.

Yours truly,
CANADIAN ZINC CORPORATION

David P. Harpley, P. Geo.
VP, Environment and Permitting Affairs

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UNDERTAKING 1

CanZinc will identify implications (cost and other) of containing and disposing of brown water offsite (instead of using soak-away sumps).

Four camps are proposed in the NNPR to support road construction. The camps proposed at approximately Km 23 and 40 will not have sumps for grey and brown water disposal because of proximity to watercourses, and because the travel distance from these locations to the Mine is not large for a sewage truck.

The camps proposed at approximately Km 65 and 87 are much farther from the Mine. We do not believe these camp locations pose any significant risk to the environment. Therefore, we wish to retain the option to develop sumps at these camps.

Camp KP65

This camp would be developed in a borrow pit on a height of land between sub-basins, and distant from watercourses (see attached figure). The camp would be >1 km south-east of Mosquito Lake, and a similar distance from watercourses.

Camp BP87

This camp would also be developed in a borrow pit, located in a relatively flat lowland area approximately 150 m east of a tributary to the Tetcela River (figure attached).

Sump development

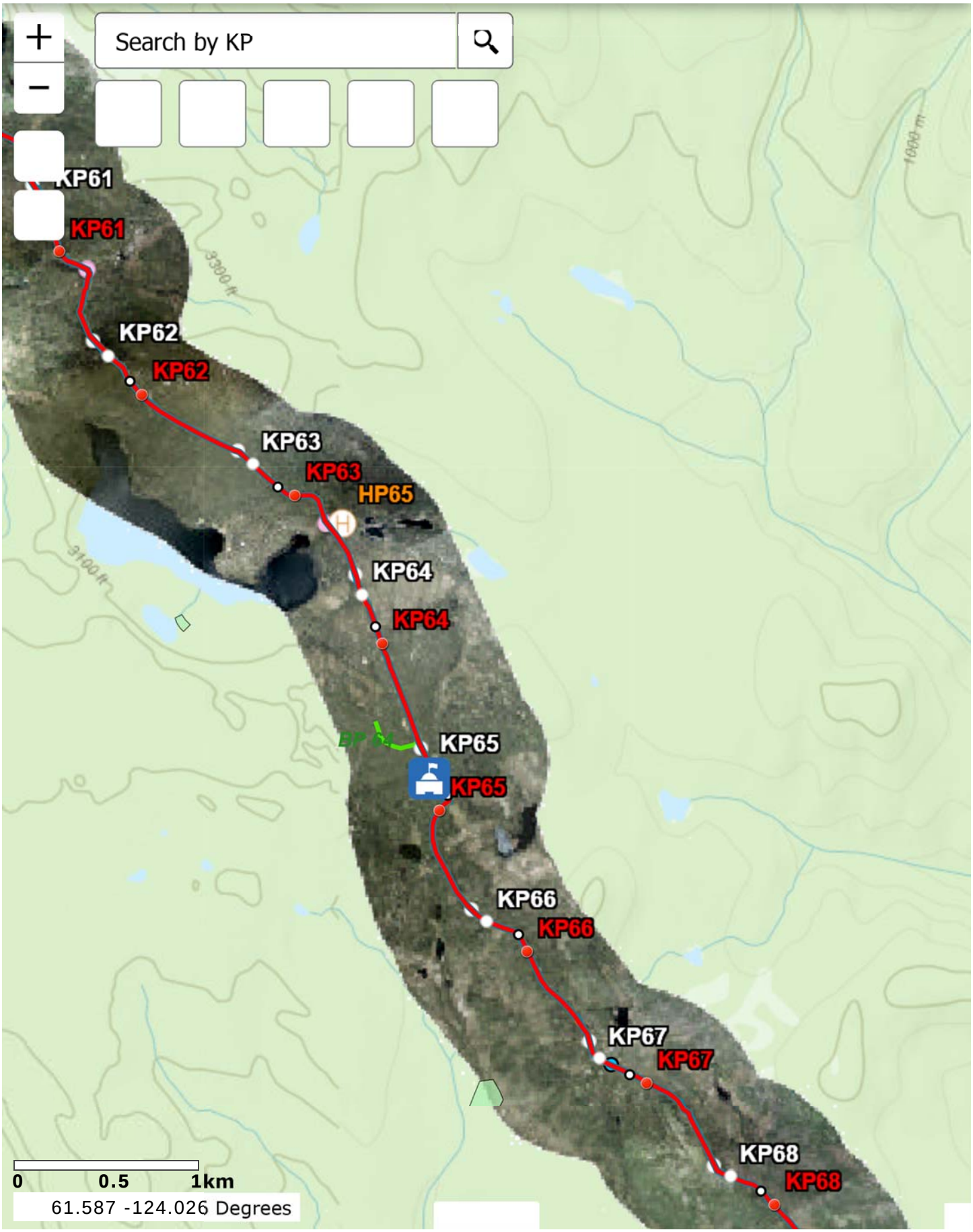
Before a sump is dug, tests will be conducted to confirm suitable seepage capacity based on prevailing septic field standards.

Mitigation

Groundwater flows very slowly, and it would be a long time before sump seepage that entered groundwater would reach a surface waterbody. Sump seepage will contain organic matter and bacteria. These will naturally degrade completely before reaching a surface waterbody. Phosphate-based detergents will not be used at the camps. There will be daily addition of bleach in the dishwater and/or grease trap and lime or crystal lye in the sumps to minimize the associated odours and wildlife attraction.

Canadian Zinc

Prairie Creek Mine Access Road



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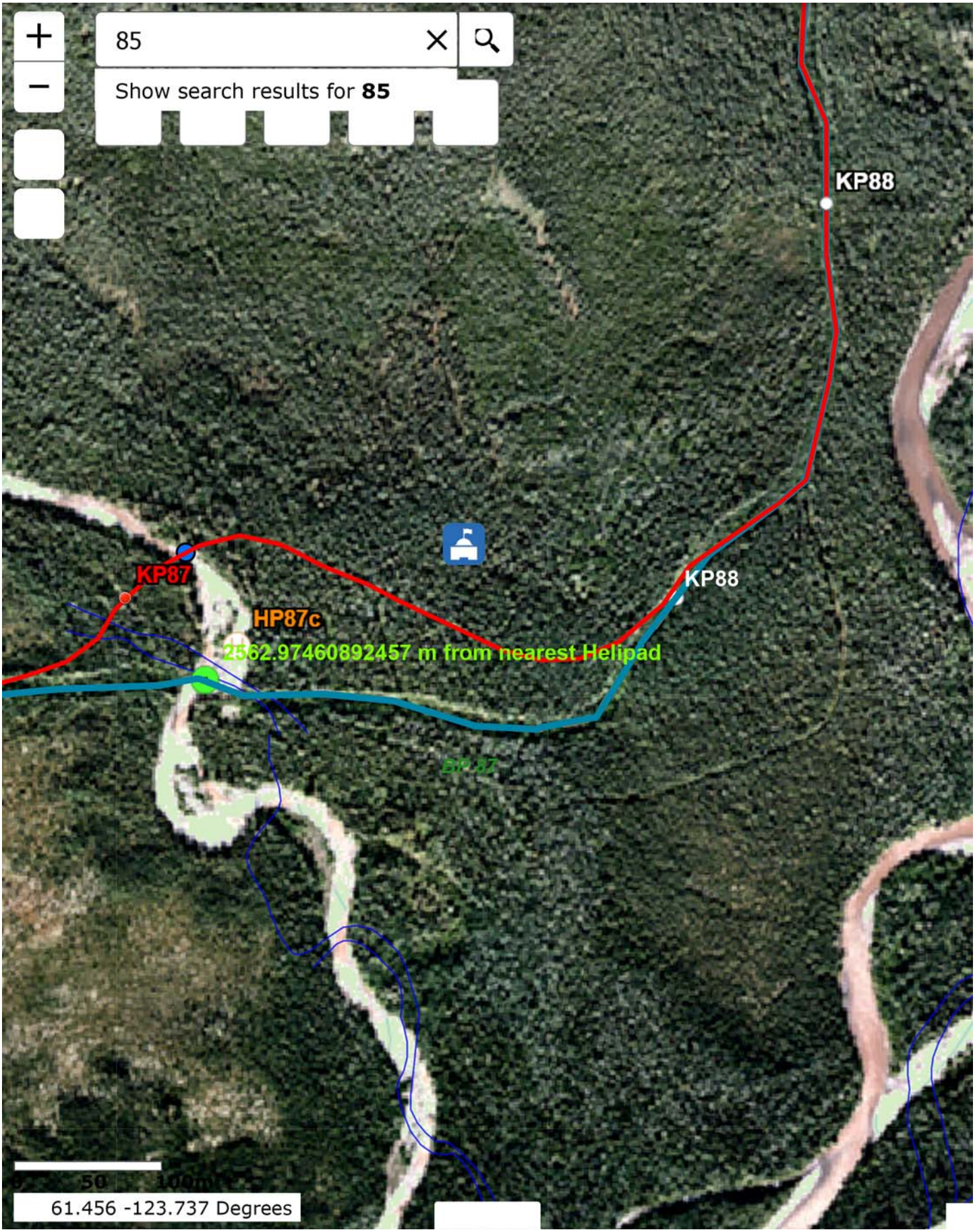
Prairie Creek Mine Access Road



UNDERTAKING 3

Transmitted to DFN (Carrie Breneman) by email:

The proposed realignment from Wolverine Pass (WP) to Grainger Gap (GG) is shown in the maps at the end of Appendix G of the Allnorth report on IR responses. The attached screen shot shows the whole realignment.

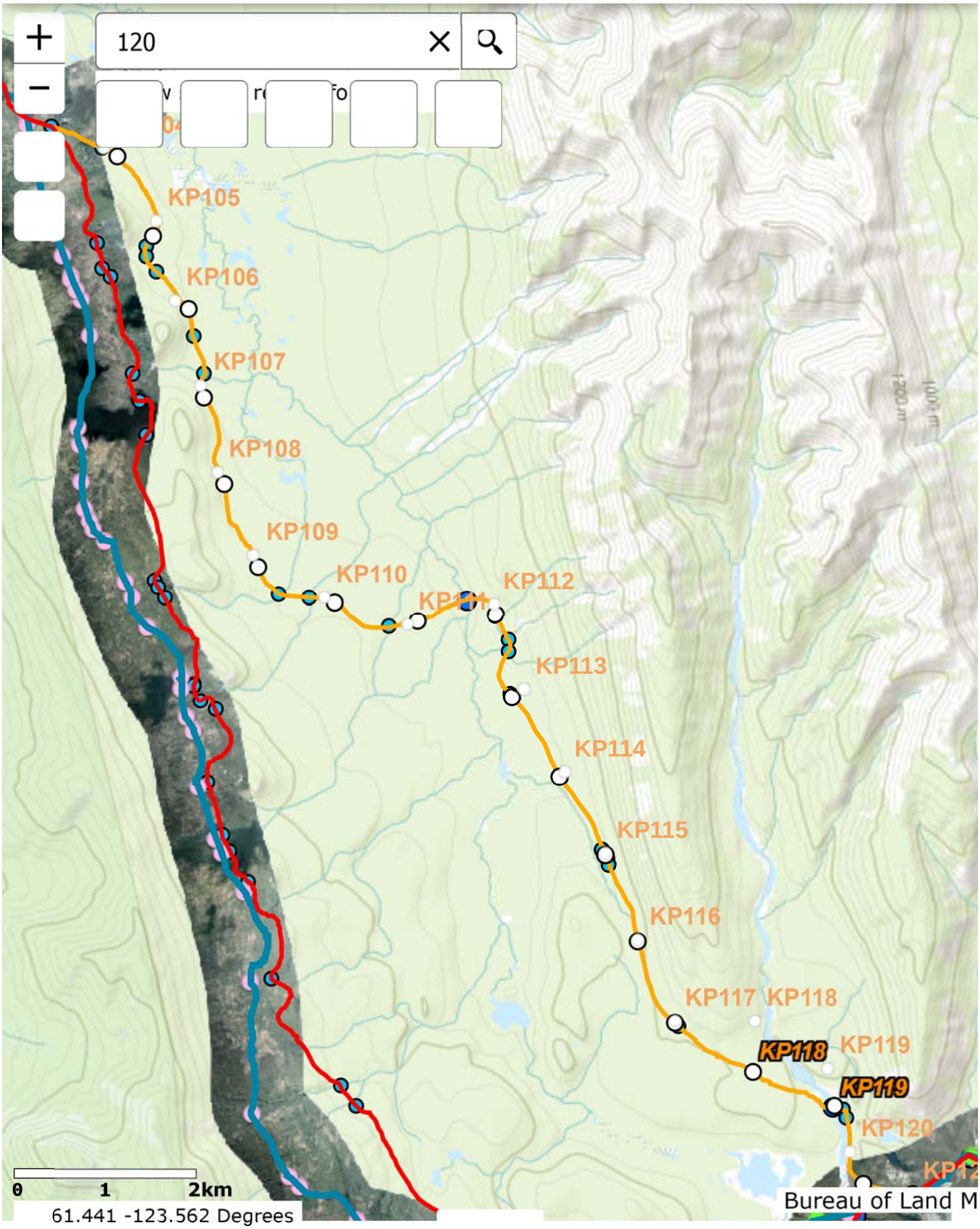
The realignment occurred was confirmed by further fieldwork after engagement in Nahanni Butte, during which an elder noted a preference to minimize blasting. The original alignment includes 2 fish-bearing crossings of Grainger River at Km's 122.1 and 123.1, the latter of which would require some blasting for the southern approach. The realignment avoids these crossings, and is not considered to have any fish-bearing crossings.

There are 2 main water crossings on the realignment at Km's 111.7 and 119.0. Refer to the last page of Table 10 in Appendix E in the above noted Allnorth report. The first of these is a wetland stream crossing. This stream is part of a series of small streams that feed into a wetland system that flows north, ultimately to the Tetcela River. The wetlands include a series of ponds east of Km 104-106. Beaver dams are common and are barriers to fish migration. In any event, habitat is poor for fish due to low DO and warm temperatures in summer. As such, these streams are not considered to be fish habitat. The crossing structure for 111.7 will be a large culvert embedded in the stream bed. A preliminary design is provided in Appendix B of the Allnorth report in Appendix A of the DAR Addendum.

The Km 119.0 (formerly 118.1) crossing is of a debris flow channel which appears to have surface flow only during high water events when debris is carried down from a steep slope above. The bed is very coarse cobble. The channel discharges to Grainger River a few km's downstream via a broad fan. The channel is not considered to be fish habitat because of the difficult access and poor habitat. The crossing will be via multiple large culverts with armour. A design is also provided in the Appendix B noted above (118.1).

Canadian Zinc

Prairie Creek Mine Access Road



UNDERTAKING 4: ACCESS ROAD CREEK CROSSINGS, HABITAT CROSS-REFERENCE

Km	Stream Name	Fish	Comment	Crossing	Habitat
2.9	Prairie Trib.	N	Very steep slope	C	
3.3	Prairie Trib.	N		C	
4.4	Prairie Trib.	N	Poorly defined small channel with little flow	C	
6.1	Casket Creek	Y	Defined channel above fan, enough flow for fish	B	Already built
6.15	Casket Trib.	N	Stream off hillside discharges to alluvium. Poorly defined channel above and below road.	C	
6.6	Prairie Trib.	N	Very steep slope	C	
9.3	Funeral Trib.	N	Very steep and cut-off by existing road bed.	C	
9.75	Funeral Trib.	N		C	
9.85	Funeral Trib.	N		C	
10.2	Funeral Trib.	N		C	
10.7	Funeral Trib.	N		C	
10.95	Funeral Trib.	N		C	
11.05	Funeral Trib.	N		C	
11.7	Funeral Trib.	N		C	
13.3	Funeral Trib.	N	Very steep section downstream. Electro-shocked.	C	
13.4	Funeral Trib.	N		C	
14.85	Funeral Trib.	N		C	
15.2	Funeral Trib.	N		C	
15.8	Funeral Trib.	N		C	
18.45	Sundog Trib.	N	Very steep. 10 m falls downstream. Electro-shocked.	C	
20.5	Sundog Trib.	N	10 m falls downstream @km 25.5. Electro-shocked.	C	
23.4	Sundog Creek	N	10 m falls @km 25.5. Electro-shocked. Canyon.	B	
25.3	Sundog Trib.	N	Very steep, incised rock chute.	B	
26.6	Sundog Trib.	N	Very steep chute.	C	
27.3	Sundog Trib.	N		C	
28.3	Sundog Creek	Y	Grayling observed in pools. Studies downstream.	B	28.4
28.8	Sundog Creek	Y		B	29.2
28.6	Sundog Trib.	Y	Assumed to be accessible to fish.	B	New crossing
29.1	Sundog Trib.	N	Very steep, crossing rock or talus, usually with a fan of variable size at the toe of the slope.	C	
29.9	Sundog Trib.	N		C	
30.2	Sundog Trib.	N		C	
30.5	Sundog Trib.	N		C	
31.0	Sundog Trib.	N		C	
31.3	Sundog Trib.	N		C	
31.7	Sundog Trib.	N		C	
32.4	Sundog Trib.	N		C	
32.5	Sundog Trib.	N		C	
36.8	Sundog Trib.	N		C	
37.1	Sundog Trib.	N		C	
37.9	Sundog Trib.	N		C	
39.4	Sundog Trib.	Y	Grayling observed in pools. Studies downstream.	B	39.8
40.1	Sundog Trib.	N	Poorly defined channels and habitat at crossings, no defined connections to main stem.	C	
40.3	Sundog Trib.	N		C	
43.15	Sundog Trib.	N	Long, rock chute downstream. Electro-shocked.	C	43.5
45.5	Polje Trib.	N	Grassy swale. No defined channel.	C	
45.8	Polje Creek	Y	Fish caught by Beak, 1982.	C	47.0
46.5	Polje Trib.	N	Wetland. Small, poorly defined channel.	C	
47.2	Polje Trib.	N	Swale.	C	
48.05	Polje Trib.	N	Multiple slumps blocking channel.	C	49.1
48.6	Polje Trib.	N	No channel at all	C	49.4
49.6	Polje Trib.	?	Small accessible channel, poor habitat.	C	50.2
50.7	Polje Trib.	N	Wetland. Small, poorly defined channel.	C	
50.8	Polje Trib.	N		C	

UNDERTAKING 4: ACCESS ROAD CREEK CROSSINGS, HABITAT CROSS-REFERENCE

Km	Stream Name	Fish	Comment	Crossing	Habitat
53.4	Polje Trib.	N	Grassy swale. No defined channel.	C	54.2
53.5	Polje Trib.	Y	4-5 feet wide braided channel off main stem.	B	54.3
53.55	Polje Creek	Y	Fish caught by Beak, 1982. Also, see Bathurst, 2005.	B	54.4
56.35	Polje Trib.	N	Small channel, wetland without defined channel downstream.	C	
56.45	Polje Trib.	N		C	
60.4	Polje Trib.	N	Drains into Polje system with no channel outlet.	C	
61.5	Polje Trib.	N		C	
63.6	Polje Trib.	N	Inlet to Mosquito L., part of Polje system. Wetland, poor habitat.	C	64.6
67.1	Tetcela Trib.	N	Headwater swale, steep incised channel d/s.	C	
71.05	Tetcela Trib.	N		C	
85.45	Tetcela Trib.	N	Densely vegetated. Steep d/s. Poor habitat.	C	
86.9	Tetcela Trib.	N	No defined channel.	C	
87.25	Tetcela Trib.	Y	Major trib. Multiple fish species d/s, Beak 1982.	B	87.7
89.8	Tetcela Main stem	Y	Multiple fish species, Beak 1982.	B	90.1
91.3	Fishtrap Trib.	N	Wetland stream, part of large wetland system forming headwaters to Fishtrap Creek. Poor fish habitat, multiple beaver ponds downstream. No fish, Beak 1982.	C	
92.1	Fishtrap Trib.	N		C	
92.4	Fishtrap Trib.	N		C	
93.0	Fishtrap Trib.	N		C	
93.5	Fishtrap Trib.	N		C	
93.9	Fishtrap Trib.	N		C	
94.2	Fishtrap Trib.	N		C	
94.9	Fishtrap Creek	N		C	95.0
96.9	Fishtrap Trib.	N		C	
97.5	Fishtrap Trib.	N		C	
98.3	Fishtrap Trib.	N		C	
98.6	Fishtrap Trib.	N		C	
103.4	Un-named Ck Trib.	N	Drain into a large headwater wetland sytem that flows north. Poor fish habitat. Multiple beaver ponds.	C	
104.9	Un-named Ck Trib.	N		C	
105.1	Un-named Ck Trib.	N		C	
105.2	Un-named Ck Trib.	N		C	
106.4	Un-named Ck Trib.	N		C	
106.8	Un-named Ck Trib.	N		C	
107.2	Un-named Ck Trib.	N		C	
108.95	Un-named Ck Trib.	N		C	
109.05	Un-named Ck Trib.	N		C	
109.2	Un-named Ck Trib.	N		C	
110.3	Un-named Ck Trib.	N		C	
110.35	Un-named Ck Trib.	N		C	
110.6	Un-named Ck Trib.	N		C	
110.8	Un-named Ck Trib.	N		C	
111.75	Un-named Ck Trib.	N		C	
112.3	Un-named Ck Trib.	N		C	
112.5	Un-named Ck Trib.	N		C	
112.95	Un-named Ck Trib.	N		C	
114.2	Un-named Ck Trib.	N		C	
115.8	Un-named Ck Trib.	N		C	
116.0	Un-named Ck Trib.	N		C	
118.5	Un-named Ck Trib.	N		C	
122.1	Grainger Trib.	Y	Just upstream of fish-bearing Gap Lake.	B	122.8
123.1	Grainger River	Y	Grayling observed in pools. Fish caught, Beak 1982.	B	123.3

UNDERTAKING 4: ACCESS ROAD CREEK CROSSINGS, HABITAT CROSS-REFERENCE

Km	Stream Name	Fish	Comment	Crossing	Habitat
103.8	Un-named Ck Trib.	N	Drain into a large headwater wetland sytem that flows north. Poor fish habitat. Multiple beaver ponds. Main stem crossing at Km 111.7. Debris flow crossings at Km 112.3, 112.45 and 112.6.	C	
105.2	Un-named Ck Trib.	N		C	
105.3	Un-named Ck Trib.	N		C	
105.4	Un-named Ck Trib.	N		C	
106.3	Un-named Ck Trib.	N		C	
106.7	Un-named Ck Trib.	N		C	
109.4	Un-named Ck Trib.	N		C	
109.7	Un-named Ck Trib.	N		C	
110.7	Un-named Ck Trib.	N		C	
111.7	Un-named Creek	N		C	
112.0	Un-named Ck Trib.	N		C	
112.3	Un-named Ck Trib.	N		C	
112.45	Un-named Ck Trib.	N		C	
112.6	Un-named Ck Trib.	N		C	
113.0	Un-named Ck Trib.	N		C	
114.0	Un-named Ck Trib.	N		C	
114.55	Un-named Ck Trib.	N		C	
114.9	Un-named Ck Trib.	N		C	
115.05	Un-named Ck Trib.	N		C	
115.15	Un-named Ck Trib.	N		C	
117.05	Un-named Ck Trib.	N		C	
119.0	Grainger Trib.	N	Mountain outwash fan just below gorge. Braided at main stem. Likely only flows at high water.	C	
119.2	Grainger Trib.	N	Wetland trib. to outwash fan.	C	
124.5	Grainger River	Y	Grayling observed in pools. Fish caught, Beak 1982.	B	125.1
126.2	Grainger Trib.	?	Wetlands at Grainger main stem confluence. Poorly	C	
126.7	Grainger Trib.	N	No channel downstream.	C	
130.7	Grainger Trib.	?	Road crosses near headwaters of streams. Small channels. No obvious signs of downstream beaver dams. May have reasonable connection to Grainger main stem. Fish presence possible but unlikely.	C	131.3
132.7	Grainger Trib.	?		C	133.7
134.5	Grainger Trib.	?		C	135.6
134.8	Grainger Trib.	?		C	
135.5	Grainger Trib.	?		C	
135.95	Grainger Trib.	?		C	136.7
136.5	Grainger Trib.	?		C	
137.2	Grainger Trib.	?		C	
139.6	Liard Trib.	N	Headwater streams. Small channels with poor habitat. Often include steep cobbly sections downstream. Beaver habitat downstream very common e.g. multiple dams downstream of 144. Channel outlets to Liard River also hanging, limiting migration.	C	
140.1	Liard Trib.	N		C	
140.5	Liard Trib.	N		C	
141.8	Liard Trib.	N		C	
144.0	Liard Trib.	N		C	144.7
146.3	Liard Trib.	N		C	
149.3	Liard Trib.	N		C	
150.3	Liard Trib.	N		C	
151.1	Liard Trib.	N		C	
152.2	Liard Trib.	N	No channel.	C	
154.4	Liard Trib.	N	As for 139.6-151.1.	C	154.4
159.7	Liard River	Y		Ba./IB	
163.95	Liard Trib.	N	Hanging wetland channel.	C	
165.4	Liard Trib.	N		C	
172.0	Liard Trib.	N	Wetland exit of old channel, hanging.	C	

Fish: N=No Y=Yes ?=Uncertain

Crossings: C=Culvert B=Bridge Ba.=Barge IB=Ice Bridge

Crossings that would not occur with revised alignment

Crossings on revised alignment

Meeting Report

Meeting date: June 28, 2016

Main Issue:

Undertaking 7: Outstanding information requirements and analysis related to fish and fish habitat loss/gain (including impacts of blasting), to enable DFO to reach a determination and inform the board prior to the hearing phase (before technical reports).

Attendees:

Julie Marentette - DFO
Garry Scrimgeour – Parks Canada
Dave Harpley – CZN
John Wilcockson - Hatfield

Summary of discussion:

JM had provided parties with an information package and Excel sheet for the meeting. This included regulatory documents that help provide context, and a habitat table. JM requested that CZN complete the habitat table with data and citations so that all relevant information is in one place.

JW said this was helpful and would be completed.

JM requested that illustrations be provided with definitions to identify different habitats within the Sundog floodplain, with corresponding quantification of areas.

DH said this had already been initiated.

GS noted that Parks' requirements re floodplain habitat are "a little different from DFO's". GS also said he would like to have a brief discussion re blasting at a later time, and that all he was looking for are commitments to follow appropriate guidelines given that Nahanni National Park Reserve will review provisions of permitting for CZN to use explosives in the reserve including those at sites located adjacent to waterbodies.

Developer commitment(s):

CZN committed to complete the habitat table in the next 2 weeks, in time for consideration during the next conference call in the week of July 11.

Outstanding issue(s) for the party:

Action Items:

CZN to complete the habitat table and floodplain explanation document.

Signature of DFO representative: _____

Signature of Parks Canada representative: _____

Signature of CZN representative: _____

Date: June 29, 2015

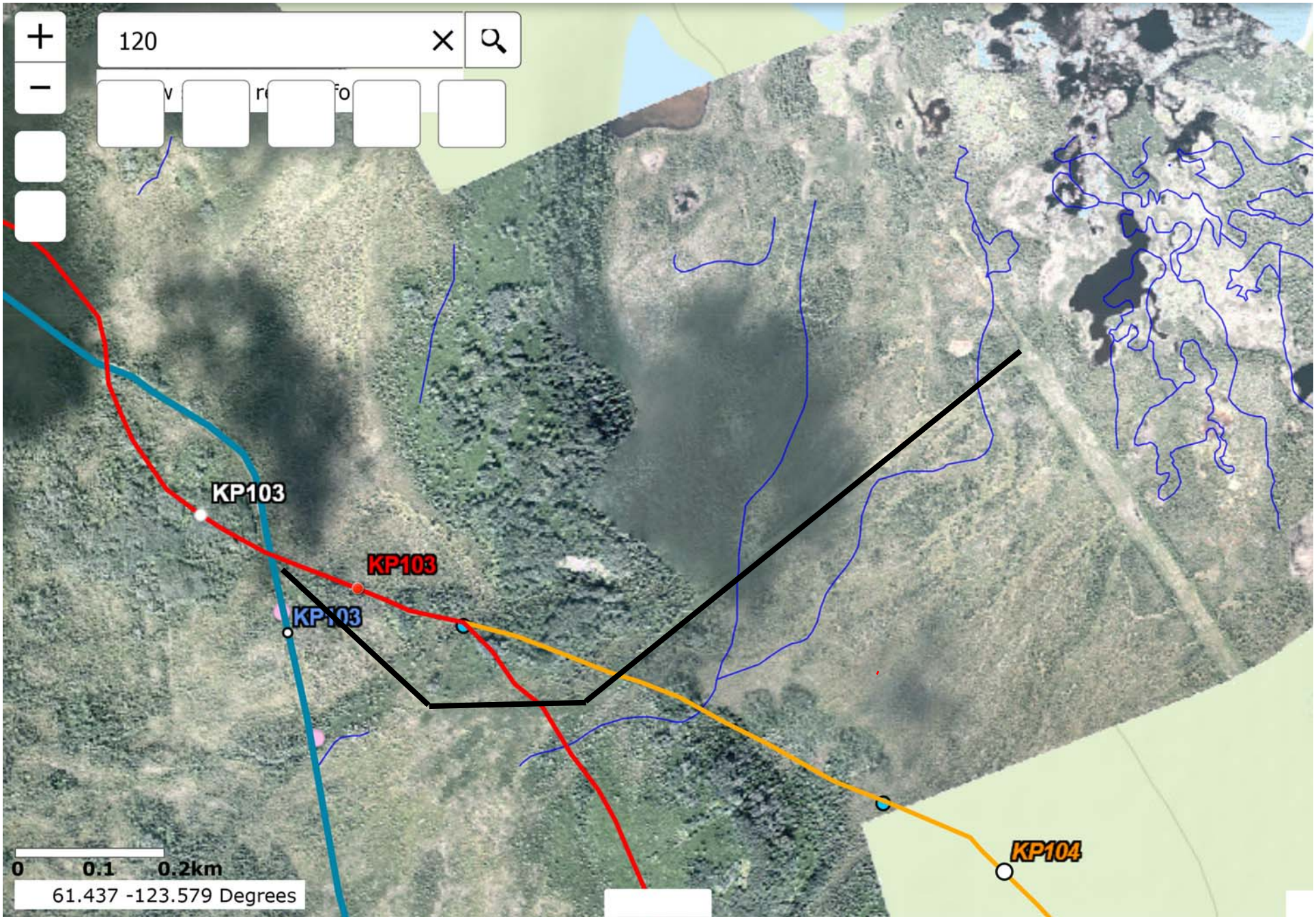
UNDERTAKING 21

CanZinc will provide a map indicating the location of the old winter access road to the old Wolverine airstrip (winter use airstrip).

Two maps are attached of the same area. The first shows road alignments. Note, the black alignment is that portion of the old winter road that differs from the currently permitted winter road, connecting to the Wolverine airstrip (on the eastern end). The airstrip was formed by widening a portion of the old winter road alignment. The second map without road alignments shows the old winter road.

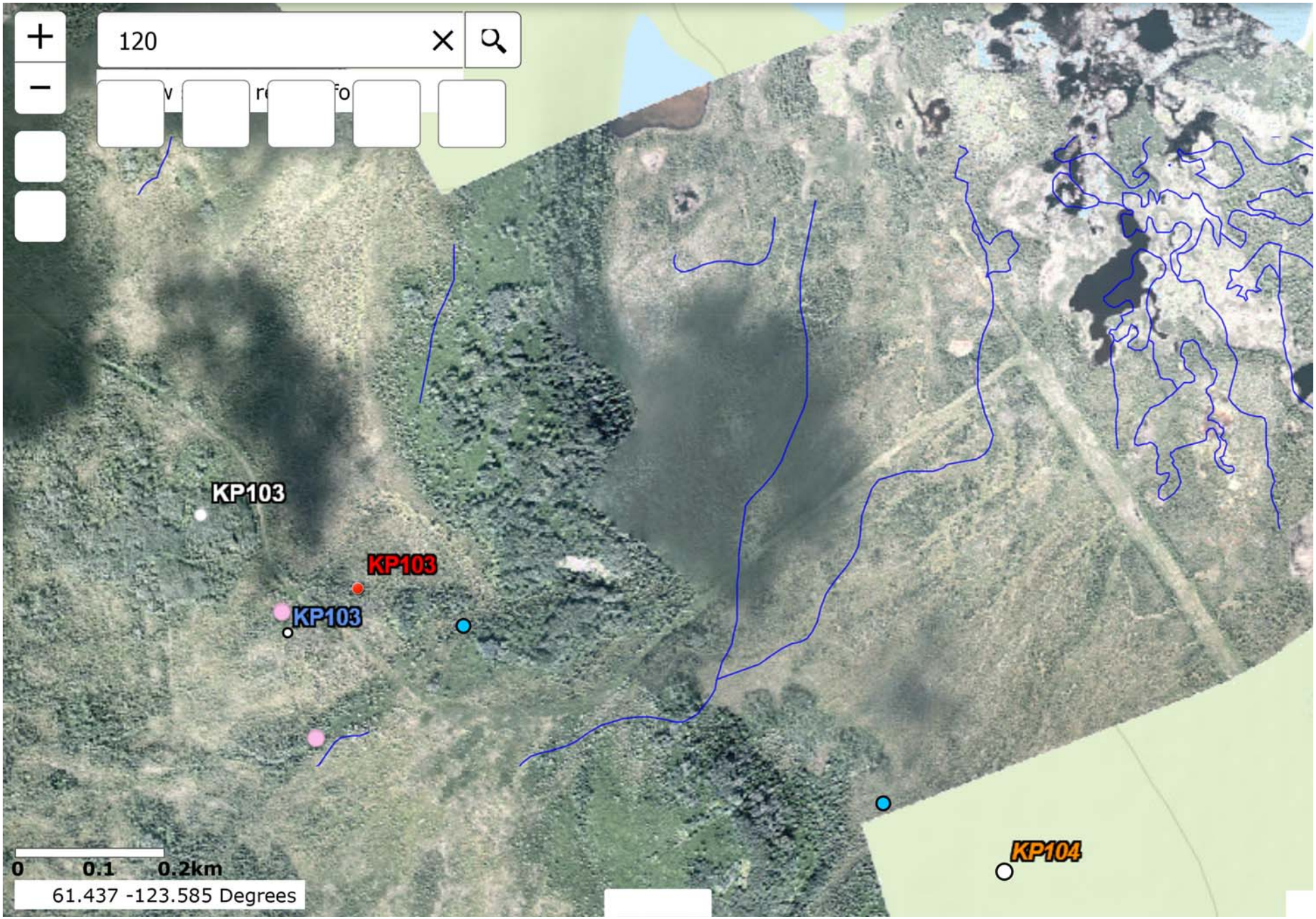
Canadian Zinc

Prairie Creek Mine Access Road



Canadian Zinc

Prairie Creek Mine Access Road



Prairie Creek Mine
Fish Habitat Compensation Plan

January 2013

Prepared for:

Canadian Zinc Corporation
Vancouver, British Columbia

Suite 200 – 850 Harbourside Drive, North Vancouver, British Columbia, Canada V7P 0A3 • **Tel: 1.604.926.3261** • Fax: 1.604.926.5389 • **www.hatfieldgroup.com**

PRAIRIE CREEK MINE

FISH HABITAT COMPENSATION PLAN

Prepared for:

CANADIAN ZINC CORPORATION
#1710 – 650 WEST GEORGIA STREET
VANCOUVER, BC
V6B 4N9

Prepared by:

HATFIELD CONSULTANTS
#200 - 850 HARBOURSIDE DRIVE
NORTH VANCOUVER, BC
V7P 0A3

JANUARY 2013

CZN1856.2

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Lorraine Sawdon	Fisheries and Oceans Canada			✓	

EXECUTIVE SUMMARY

This fish habitat compensation plan provides information on proposed fish overwintering and rearing pools to be constructed as compensation for habitat lost during repairs to the Prairie Creek Mine all-season access road. Approximately 1,125 m^2 of instream fish habitat in proximity to the high watermark was lost, requiring the mine to compensate 1,442 habitat units (HUs). As designed, the proposed compensation habitat will provide 1,727 HUs.

1.0 INTRODUCTION

Canadian Zinc Corporation (CZN) completed repairs to the Prairie Creek Mine all-season road bed 3 to 9 km north of the mine in 2008. The road repairs resulted in the loss of approximately 1,125 m^2 of fish habitat in proximity to the normal high watermark within Prairie and Funeral creeks (CZN 2008a).

As part of the regulatory approval for these works, Fisheries and Oceans Canada (DFO) issued a subsection 35(2) *Fisheries Act A*uthorization (No. SC-04-006) for the harmful alteration, disruption or destruction (HADD) of fish habitat. CZN is required to create 1,442 HUs to compensate for the referenced HADD as a condition of the authorization. This report presents a fish-habitat compensation plan and summarizes the quality and quantity of compensation habitat proposed, design specifications and construction methodology (here forward referred to as the "Project"). A compensation habitat monitoring plan is also presented.

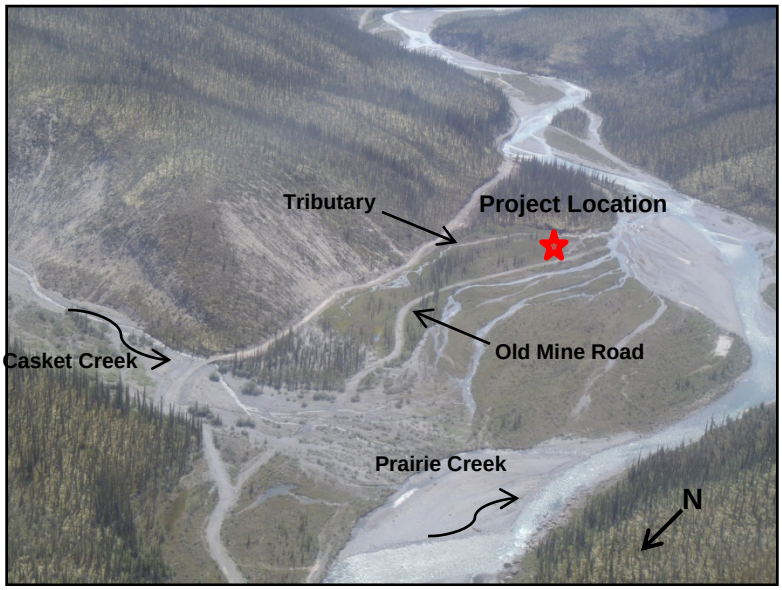
2.0 PROJECT LOCATION

The proposed compensation habitat is situated immediately south of the Casket Creek outwash-fan within the east floodplain of Prairie Creek (Figure 1). Casket Creek is located approximately 4 km northwest of the CZN Prairie Creek mine. The proposed compensation habitat is characterized by deep pools and will receive flow from a small unnamed tributary to Prairie Creek (the Tributary). The following factors were considered when selecting the Project location in the context of the "no net loss" guiding principal outlined in the Policy for the Management of Fish Habitat (DFO 1986):

- Proximity to habitat impacts;
- Fish accessibility;
- Habitat quality within the Project footprint;
- Hydraulic permanency;
- In situ water quality;
- Flood protection; and
- Feasibility of construction (e.g., access).

Figure 1 Photographs of the proposed Project location.

A. Aerial photograph (July 8, 2012).



B. North view (upstream) of the Tributary at the confluence with Prairie Creek; the red arrow depicts the proposed confluence with the compensation habitat (July 9, 2012).

C. South view (downstream) of the Tributary confluence with Prairie Creek (July 9, 2012).

D. South view (downstream) of Tributary flow across a gravel bar to the main channel in Prairie Creek (July 9, 2012).

2.1 ASSESSMENT OF HABITAT WITHIN THE PROJECT LOCATION

The Tributary originates at the south margin of the Casket Creek outwash-fan immediately west of the Prairie Creek Mine all-season road bed. Flows are conveyed south within a well-defined, shallow channel parallel to the mine road for approximately 250 m. The Tributary then flows southwest away from the road for approximately 170 m to the confluence with Prairie Creek. Average channel width (bankfull width), depth and slope are approximately 2.0 m, 0.2 m and 1.5%, respectively. Substrate composition consists of gravel (30%), cobble

(60%) and boulder (10%). The downstream extent of the Tributary is characterized by shallow bedrock. The Tributary is ephemeral and freezes to depth in the winter.

Slimy sculpin (*Cottus cognatus*), mountain whitefish (*Prosopium williamsoni*) and bull trout (*Salvelinus confluentus*) are documented to utilize Prairie Creek (Golder 2010 and Mochnacz 2001) in proximity to the Tributary. Arctic grayling (*Thymallus arcticus*) were reported near the Mine airstrip recently by Parks Canada (Mike Suitor, personal communication with David Harpley, 2012), and is the first time this species has been documented to be present upstream of the lower section of the creek. Habitat provisions associated with the Tributary are likely limited to potential spawning and rearing for slimy sculpin. The shallow depth limits overwintering and summer rearing potential for other species.

3.0 COMPENSATION RATIONALE

Site assessments conducted by Hatfield in August 2011 and July 2012 identified deep-pool rearing and overwintering habitat as a limiting resource for fish productivity within Prairie Creek in proximity to the authorized HADD. Therefore, construction of deep pools is proposed to provide overwintering and summer rearing habitat for fish species within Prairie Creek, rather than following a 'like-for-like' habitat compensation strategy. A 'like-for-like' habitat compensation strategy produces habitat of similar form and function to the authorized HADD (i.e., for the loss of fish habitat in proximity to the normal high watermark). The proposed compensation habitat is compensating for main-channel Prairie Creek and Funeral Creek habitat in proximity to the normal high watermark that was lost during the all-weather road repairs. The referenced main-channel habitat is accessible to fish during periods of high flow; however, it is common in Prairie Creek and does not provide good overwintering or rearing habitat for fish species that utilize Prairie Creek.

The compensation habitat will consist of two large pools located west of the Tributary and east of the old mine access road. The pools will be connected to and receive flow from the Tributary approximately 90 m upstream of the confluence with Prairie Creek. The pools will have a depth of 3.3 m (minimum 1.6 m wetted depth) and discharge to the confluence with Prairie Creek via an outlet channel (Figure 2 to Figure 4). The Tributary downstream of the compensation habitat will remain and serve as an overflow channel for the compensation habitat during periods of significant flow. It is expected that this portion of the Tributary will remain wetted during the open-water season as a result of backwatering from Prairie Creek. Material from the pool and channel excavations will be stockpiled and shaped into a flood protection berm within the footprint of the old mine access road. The west face (i.e., towards Prairie Creek) of the berm will be armored with riprap and boulders not sourced from below the ordinary high water mark. Native vegetation will be planted along the top of banks of the pools and channels of the compensation habitat.

The compensation habitat will be constructed in the summer 2013. Riparian vegetation and cover objects (woody debris) will be installed in the spring and summer 2014, respectively. The phased construction approach is to allow for one winter monitoring season to verify adequacy of overwintering depth prior to installing instream structures. If under ice water depth in the pools is insufficient to provide overwintering habitat during the winter 2014 monitoring period the pools will be deepened during the instream work window in 2014.

3.1 CONTINGENCY

Shallow bedrock is located at the downstream extent of the Tributary which is in proximity to the proposed compensation habitat. Prior to construction small test holes will be excavated within the footprint of the proposed compensation habitat. A contingency plan has been developed in the event that bedrock is encountered during test hole examination. The entire compensation habitat will be shifted northeast (i.e., further upstream the Tributary) such that the configuration and size of the pools would be relatively unchanged. In this scenario the outlet channel of the compensation habitat will reconnect to the Tributary as opposed to the confluence with Prairie Creek (Figure 5 to Figure 7).

3.2 DESIGN SPECIFICATIONS

In order to comply with the compensation requirements specified in the referenced authorization, a number of design criteria have been developed. These criteria target habitat suitability for bull trout, given this species was used in the enumeration of HUs lost as a result of the mine-road repairs (CZN 2008b); however, other fish species will invariably benefit from this compensation plan (e.g., slimy sculpin). The compensation design (including contingency) is depicted in Figure 2 to Figure 7.

3.2.1 Physical Habitat

Design specifications were developed to produce high quality bull trout overwintering and summer rearing habitat. Bull trout rearing preference curves developed by the Washington Department of Fish and Wildlife (WDFW 2008) and the Idaho Power Company (Idaho Power 2003) in association with test pit results (Table 1) and a literature review of preferred bull trout overwintering habitat in the Northwest Territories (Stewart et al. 2007) guided the development of the following design specifications:

- Minimum wetted pool depth equal to 1.6 m (3.3 m from existing ground) to provide free flowing water through winter and achieve desired water quality for overwintering (see section 3.1.3);
- Substrate comprised of cobble and boulders; specified substrates will be salvaged from the Project excavation and just beyond the southern extent of the Casket Creek outwash-fan; and
- Instream and overhead cover characterized by root wads, large woody debris, boulders and over-hanging vegetation.

3.2.2 Riparian Planting

Given the remoteness of the Project location and difficulty accessing nursery stock, riparian planting will consist of live staking with species well suited to site conditions. Live stakes will be comprised of local willow species (e.g., *Salix alaxensis*) and red-osier dogwood (*Cornus stolonifera*) harvested locally while dormant. The live stakes will be planted in the spring following construction of the compensation habitat as per installation instructions (Figure 4). Stakes will be planted along the channel and pool banks at a density of 1.2 plants per square metre (Figure 4). The referenced planting density allocates for an approximate 20% mortality rate over the monitoring period in order to attain the specified success criteria of one surviving and self-sustaining plant per square metre following the three year monitoring period as described in the DFO letter to CZN (Sawdon 2012).

3.2.3 In Situ Water Quality

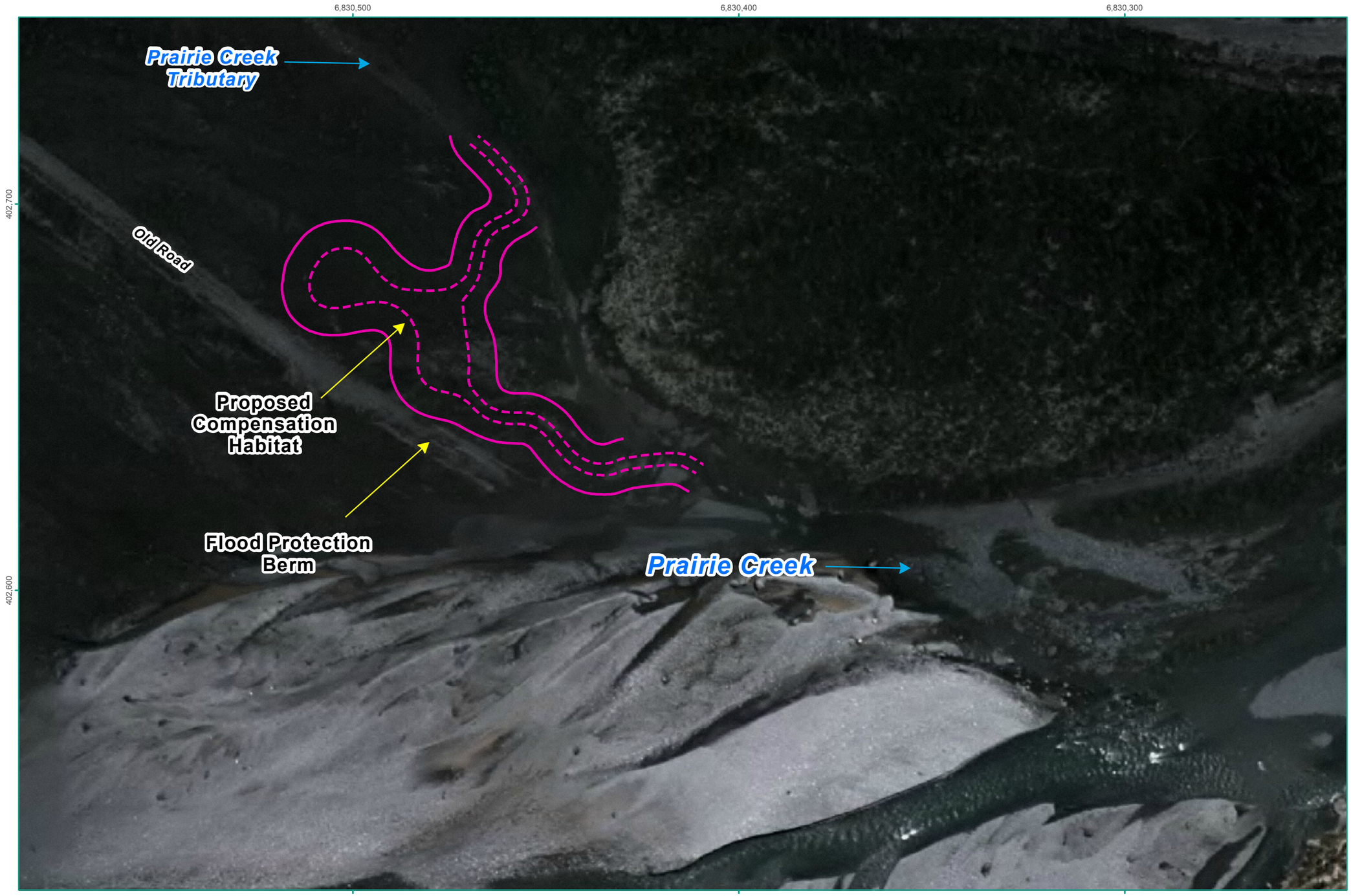
In the fall of 2011, a 1.6 m deep test pit was excavated adjacent to the Tributary in order to determine the depth of pool required to provide overwintering habitat as well as monitor late winter in situ water quality. Winter water quality results from the Tributary test pit are summarized in Table 1.

Table 1 In situ water quality results from the Tributary test pit, April 2012.

Variable	Result
Depth of ice	1.39 m
Water depth below ice	0.21 m
pH	8.02
Temperature	0.2 °C
Conductivity	305 µs/cm
Dissolved oxygen	10.87 mg/L
Dissolved oxygen percent saturation	75.3%

Dissolved oxygen and conductivity documented within the test pit suggests that the Tributary is fed by subsurface flow originating from Casket Creek.

Figure 2 Proposed Prairie Creek compensation habitat.



Legend

- Bottom of Bank 978 m^2
- Top of Bank 2741 m^2

0 5 10 20 30 m

Scale: 1:1,000

Projection: NAD 1983 UTM Zone 10N

Data Sources:

Contours and Imagery from Client. 2012

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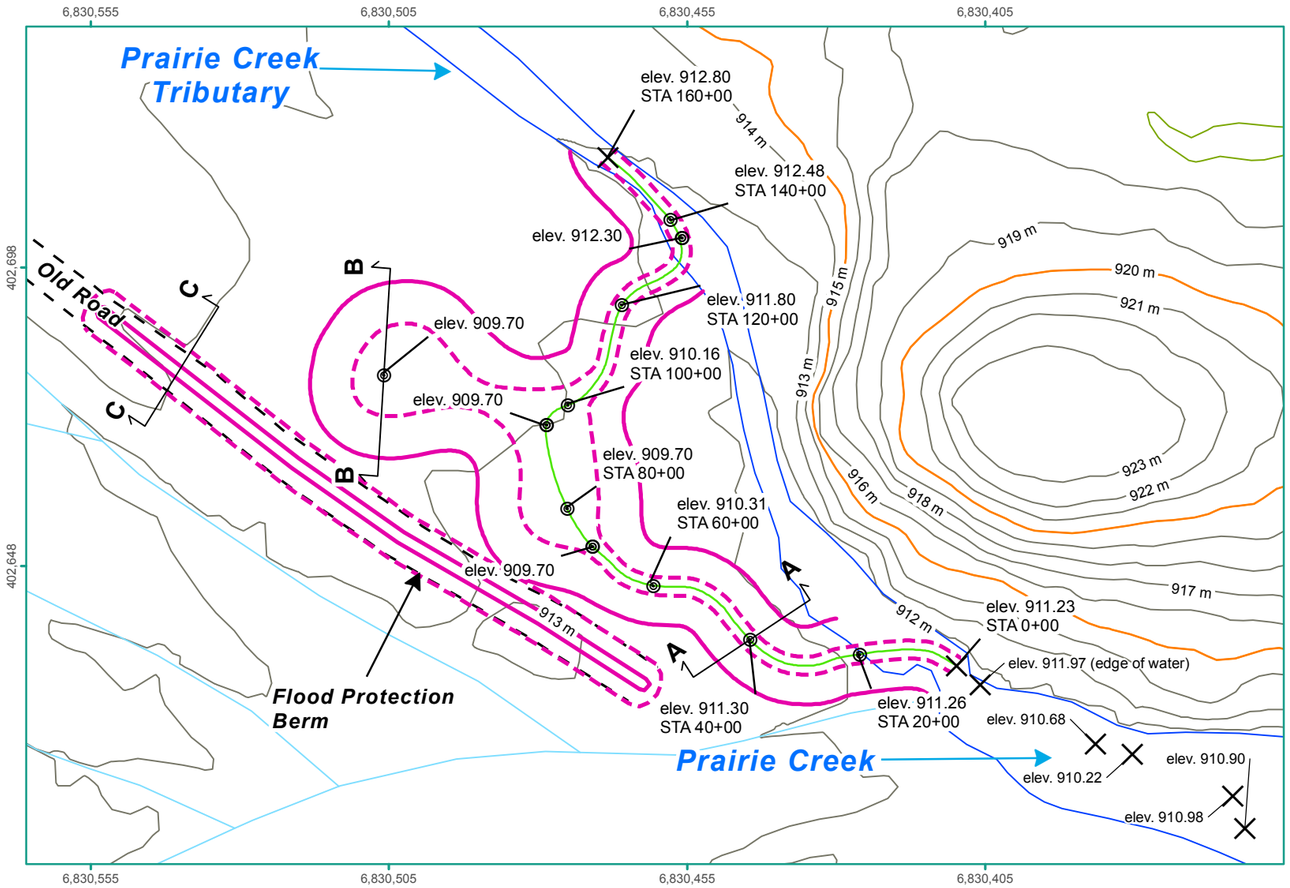
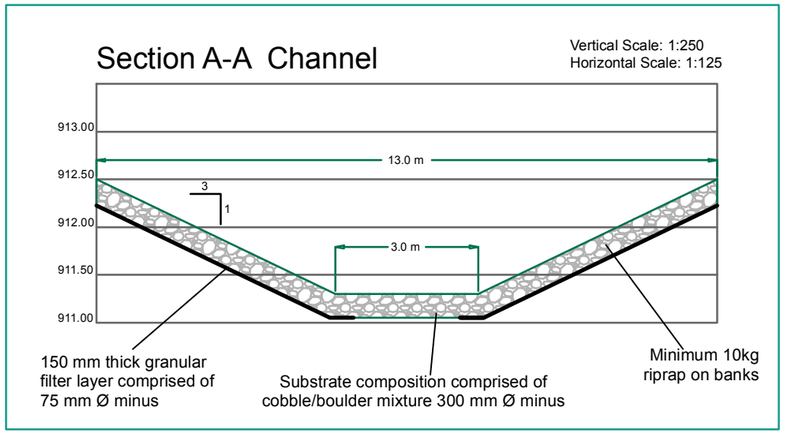
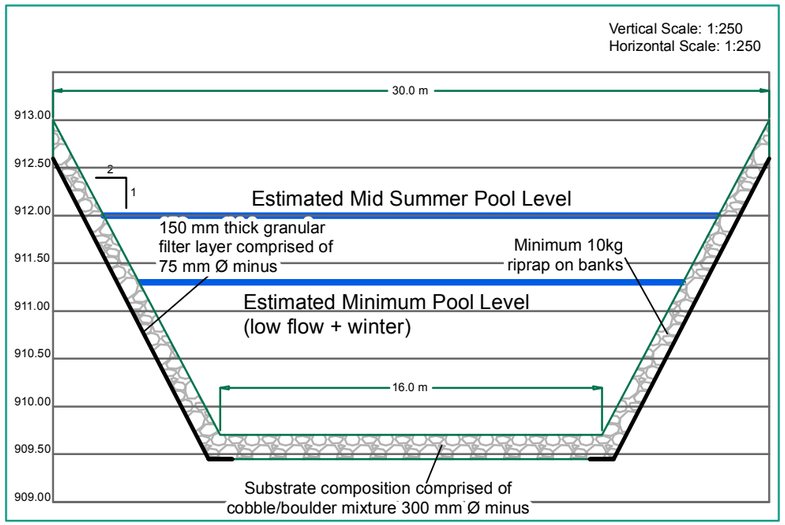
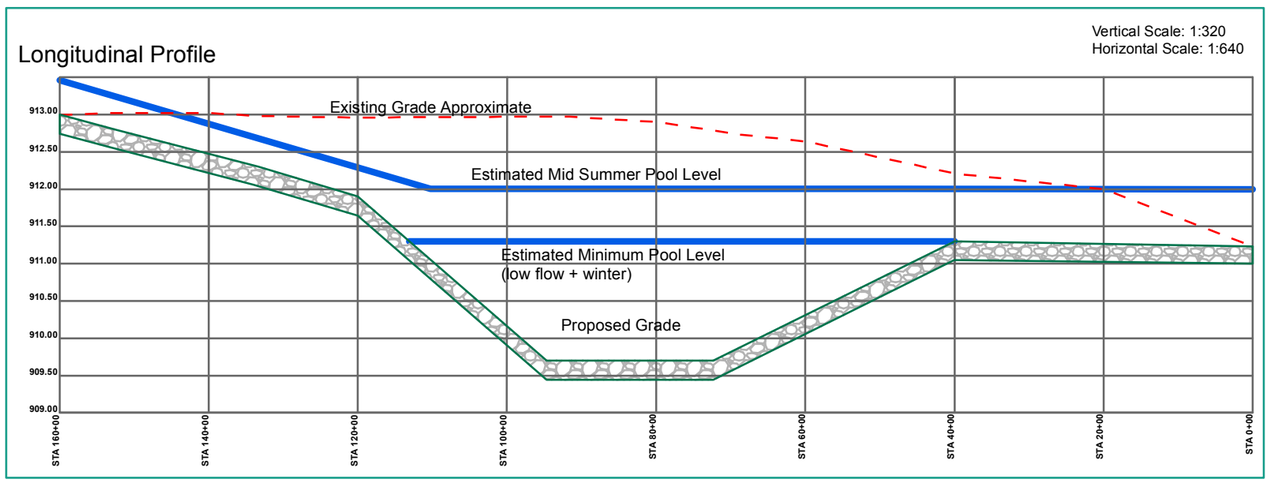
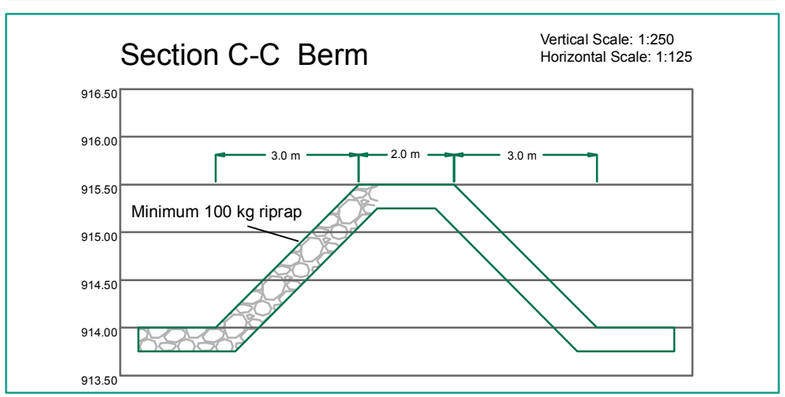
Figure 3 Compensation design specifications.











Legend

- Top of Bank
- Bottom of Bank
- Existing Elevation from 2012 Survey
- Proposed Elevation

0 5 10 20 30 m

Scale: 1:1,000

Projection: NAD 1983 UTM Zone 10N

Data Sources:

Contours and Imagery from Client. 2012

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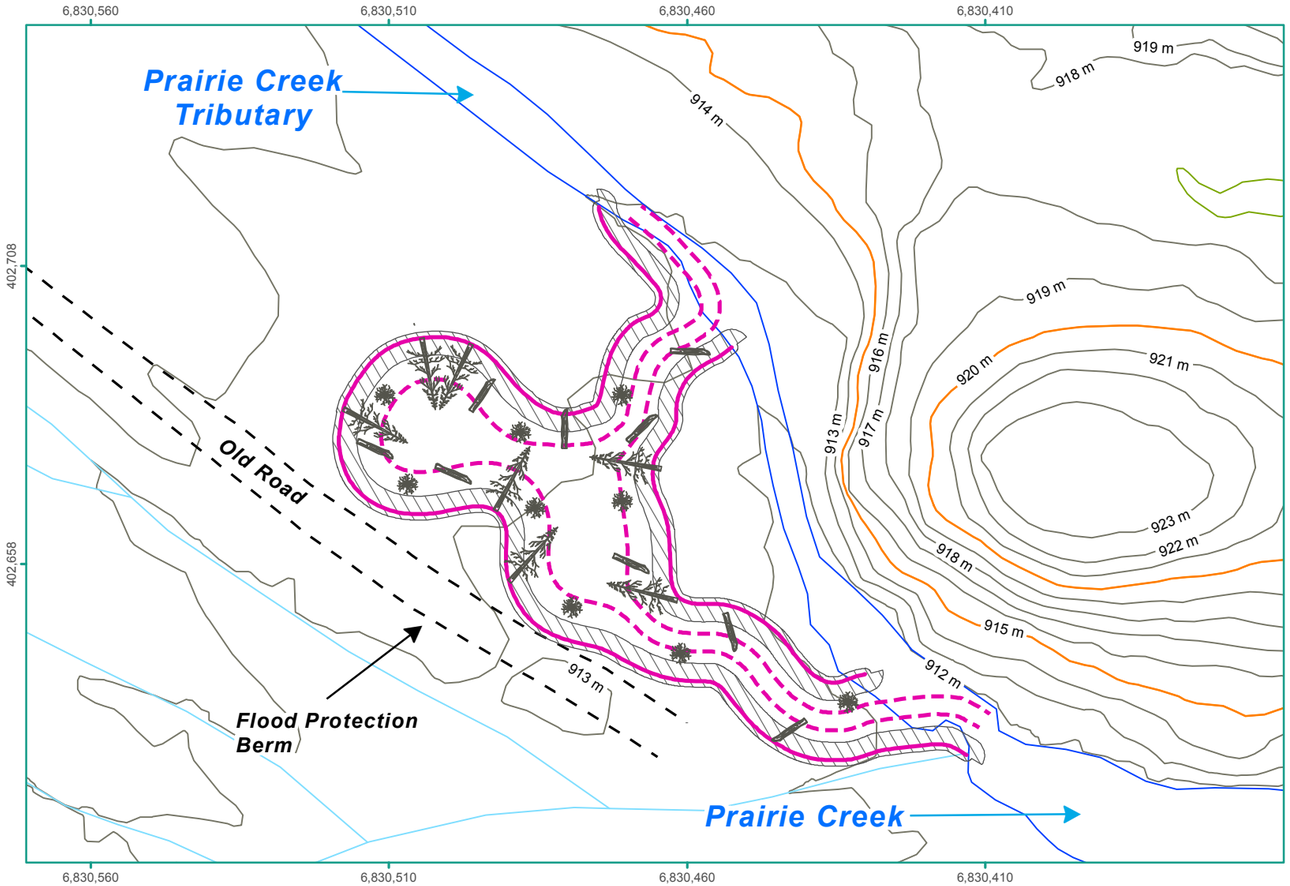
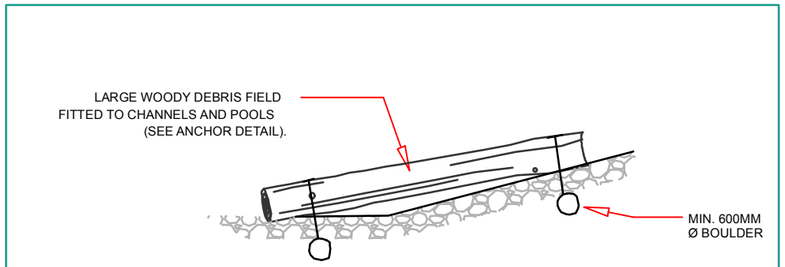
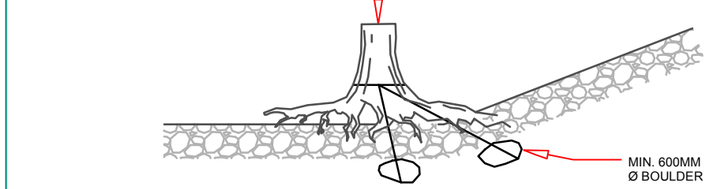
Figure 4 Landscape plan.





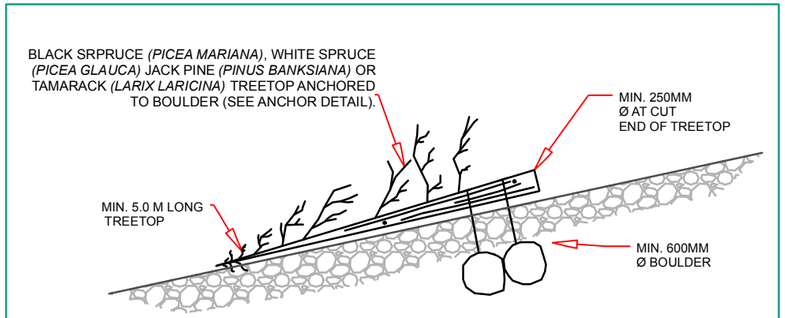
LARGE WOODY DEBRIS DETAIL

N.T.S.



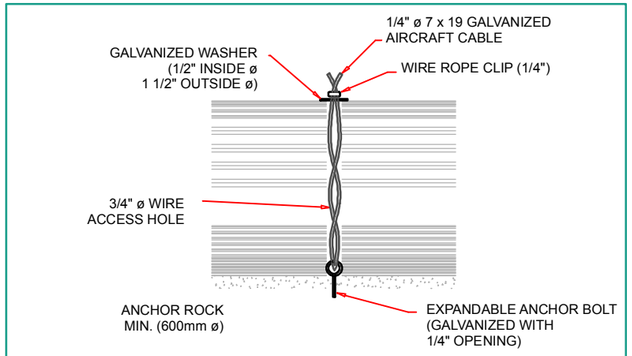
ROOTWAD DETAIL

N.T.S.



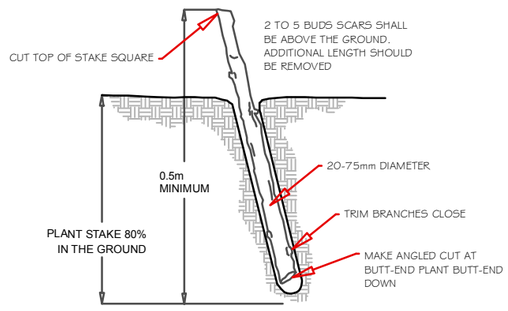
TYPICAL TREETOP DETAIL

N.T.S.



TYPICAL LOG ANCHOR DETAIL

N.T.S.



NOTES:
1. HARVEST AND PLANT STAKES DURING THE DORMANT SEASON
2. USE HEALTHY, STRAIGHT AND LIVE WOOD AT LEAST 1 YEAR OLD.
3. MAKE CLEAN CUTS AND DO NOT DAMAGE STAKES OR SPLIT ENDS DURING INSTALLATION, USE A PILOT BAR IN FIRM SOILS.
4. INSTALL STAKES AT A DENSITY OF 1.2 STAKES PER SQUARE METRE.

LIVE STAKING DETAIL

N.T.S.

Legend

- Top of Bank
- Bottom of Bank
- Live Staking 1315 m^2
- Rootwads - 9
- Tree Tops - 7
- Large Woody Debris - 9

0 5 10 20 30 m

Scale: 1:1,000

Projection: NAD 1983 UTM Zone 10N

Data Sources:

Contours and Imagery from Client. 2012

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Figure 5 Contingency plan.

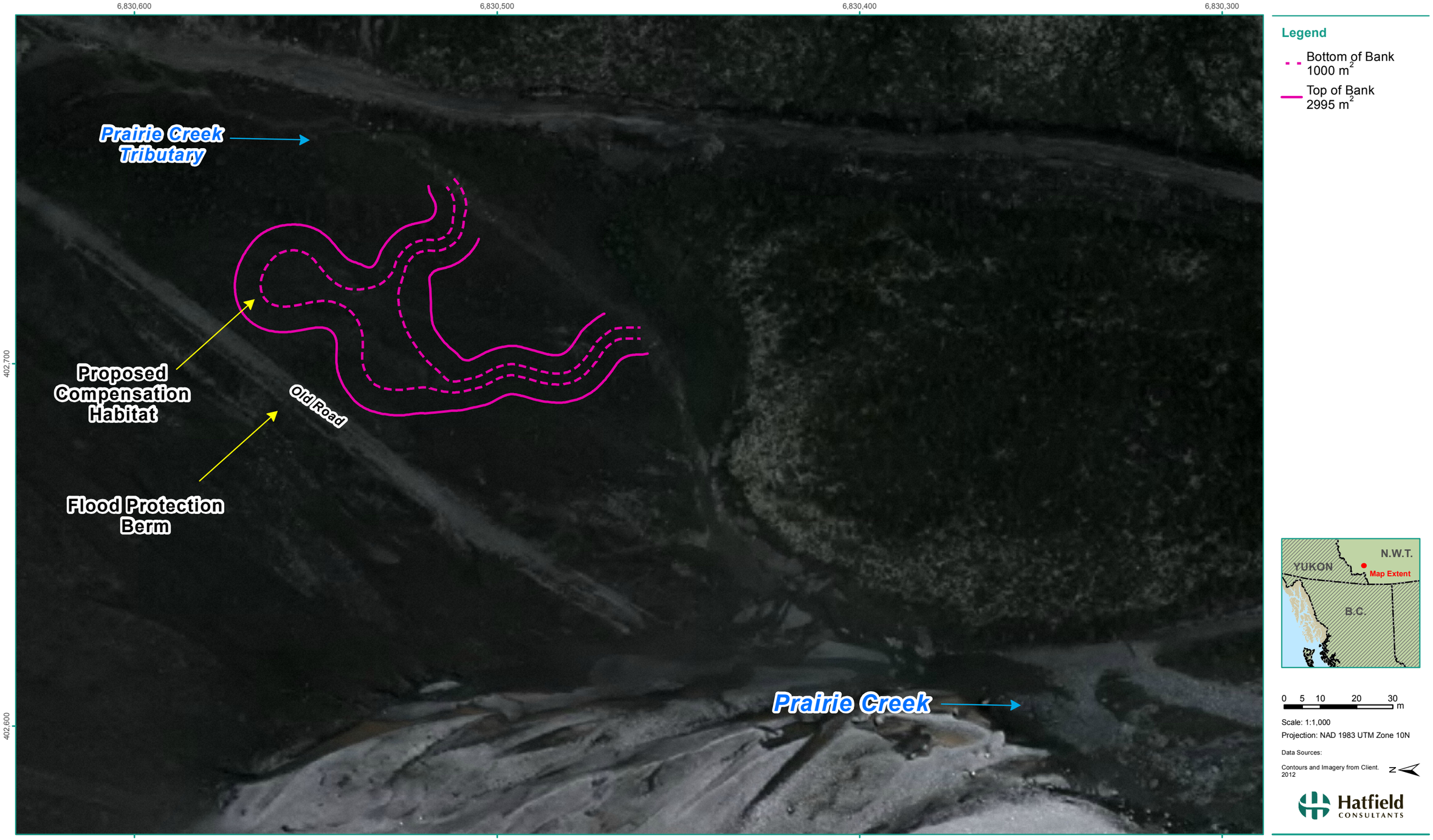
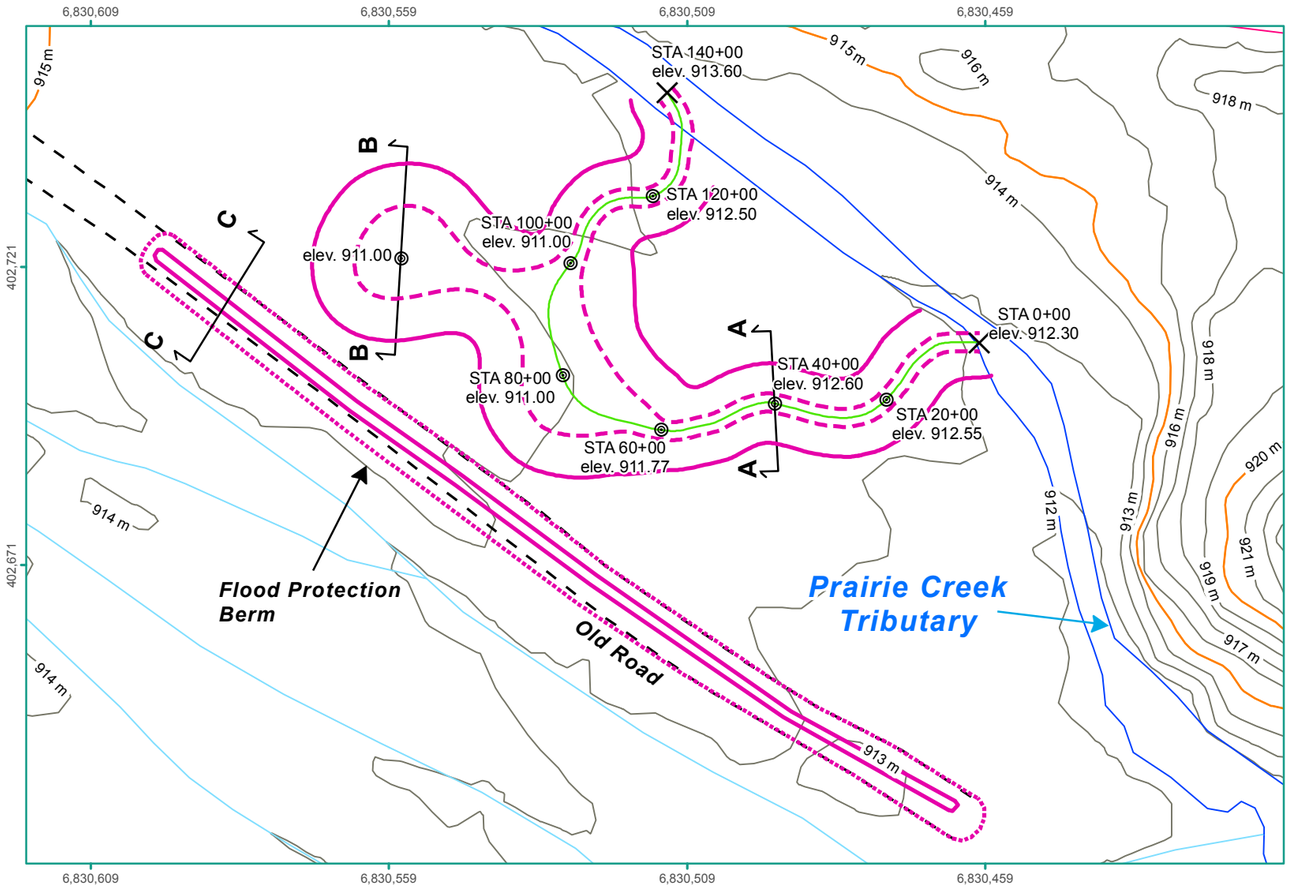
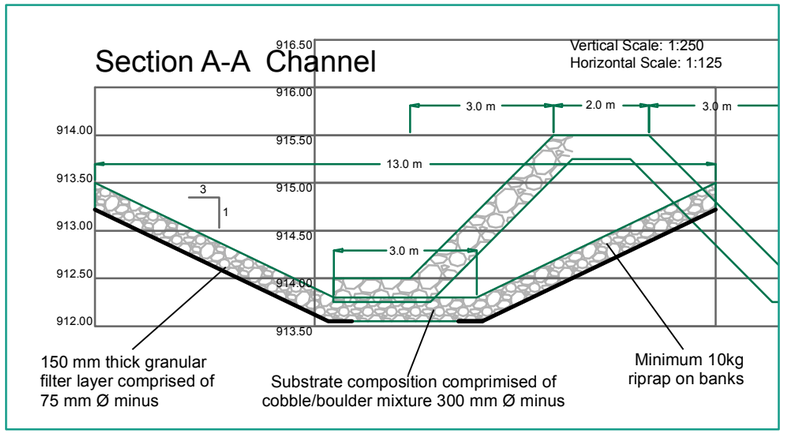
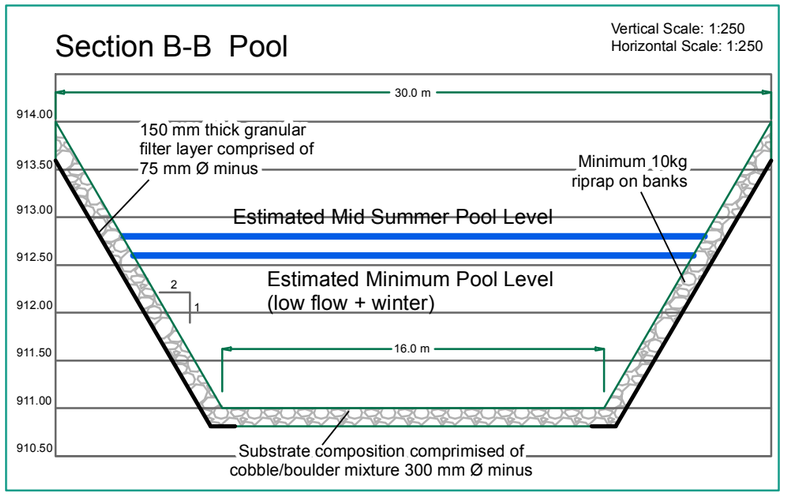
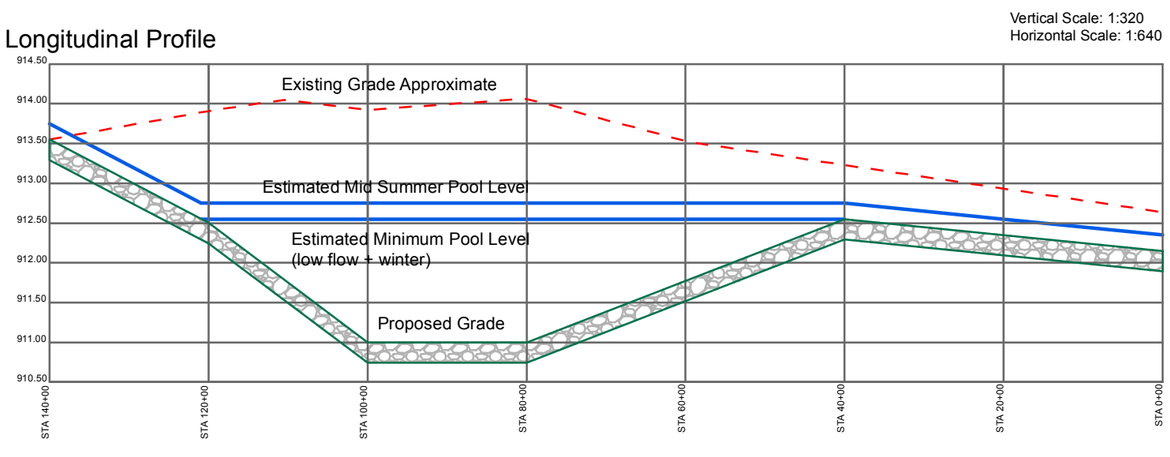


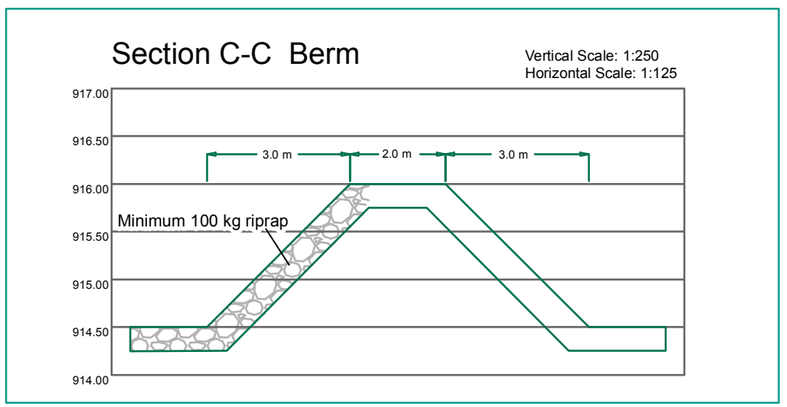
Figure 6 Contingency design specifications.











Legend

- Bottom of Bank
- Top of Bank
- Existing Elevation from 2012 Survey
- Proposed Elevation

0 5 10 20 30 m

Scale: 1:1,000

Projection: NAD 1983 UTM Zone 10N

Data Sources:

Contours and Imagery from Client. 2012

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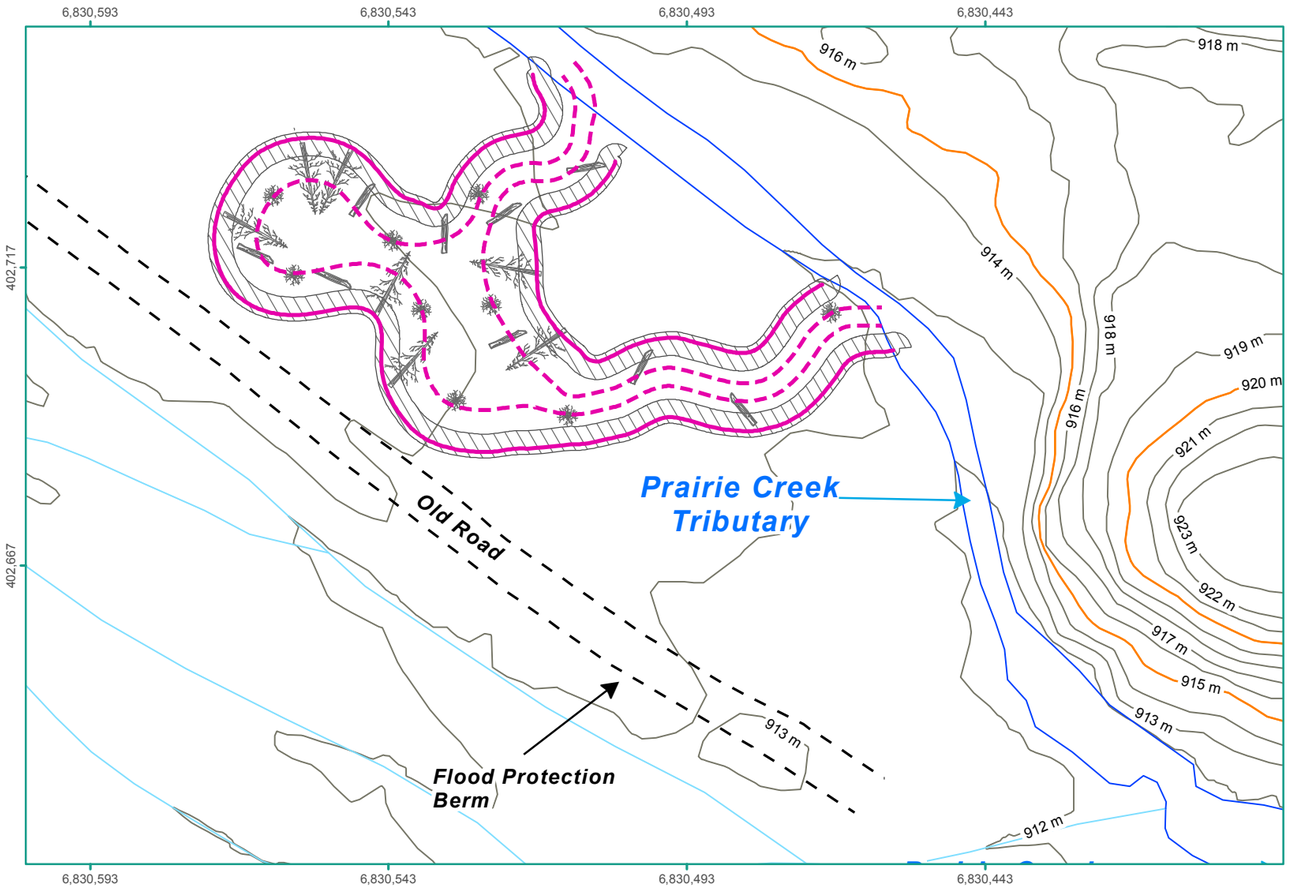
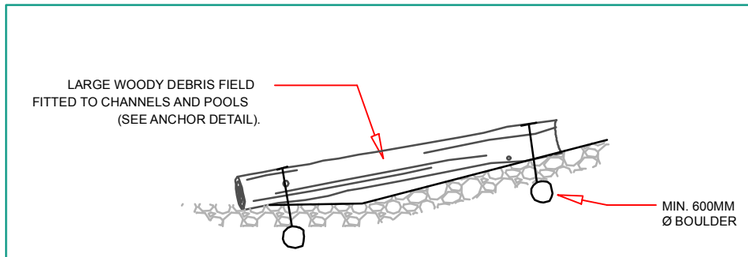
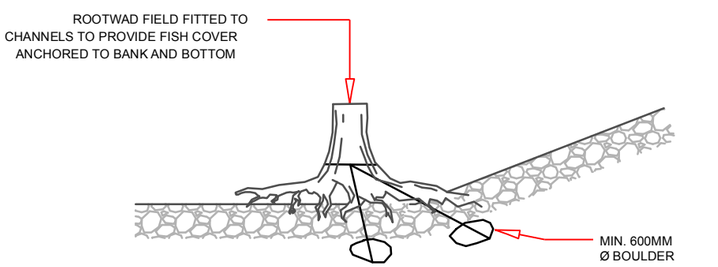
Figure 7 Contingency landscape plan.





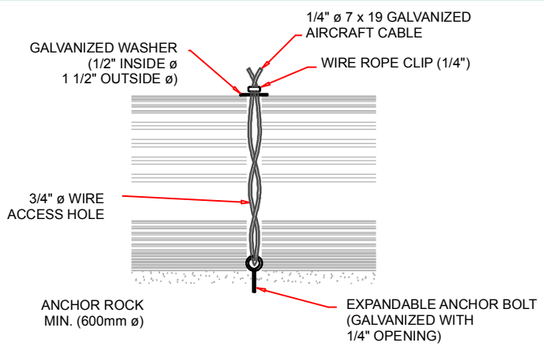
LARGE WOODY DEBRIS DETAIL
N.T.S.



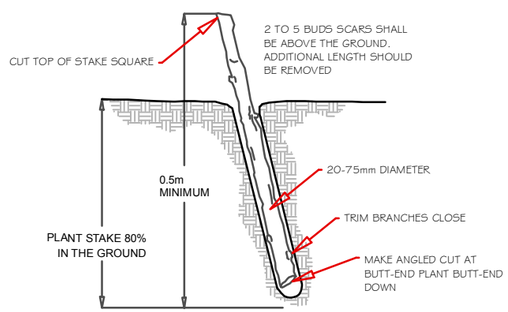
ROOTWAD DETAIL
N.T.S.

Legend

- Bottom of Bank
- Top of Bank
- Live Staking 1292 m^2
- Rootwad - 9
- Tree Top - 7
- Large Woody Debris - 9

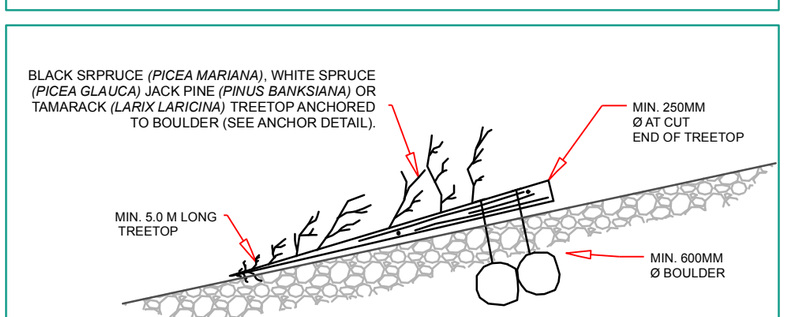


TYPICAL LOG ANCHOR DETAIL
N.T.S.



NOTES:
1. HARVEST AND PLANT STAKES DURING THE DORMANT SEASON
2. USE HEALTHY, STRAIGHT AND LIVE WOOD AT LEAST 1 YEAR OLD.
3. MAKE CLEAN CUTS AND DO NOT DAMAGE STAKES OR SPLIT ENDS DURING INSTALLATION, USE A PILOT BAR IN FIRM SOILS.
4. INSTALL STAKES AT A DENSITY OF 1.2 STAKES PER SQUARE METRE.

LIVE STAKING DETAIL
N.T.S.



TYPICAL TREETOP DETAIL
N.T.S.

0 5 10 20 30 m

Scale: 1:1,000

Projection: NAD 1983 UTM Zone 10N

Data Sources:

Contours and Imagery from Client. 2012

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4.0 HABITAT UNITS CREATED BY COMPENSATION WORKS

A Habitat Evaluation Procedure (HEP) approach (USFWS 1980) was used to quantify habitat gains in the compensation habitat. Habitat gains have been reported as HUs, which are calculated by multiplying the amount of compensation habitat created (surface area) by the quality of the habitat. Habitat quality was evaluated using bull trout habitat suitability indices (HSI), which rank the importance of available habitat for particular species and life stages of fish. Therefore HUs are calculated as:

HU = surface area x HSI

HSI are determined by assigning a value between 0 and 1 (Table 2) based on the most limiting habitat variable (known as a suitability index, or SI). The habitat variables considered generally include substrate composition, depth, cover, flow and water quality.

Table 2 SI and HSI ranking system used in HSI models.

Range of SI/HSI Values From Published Models	Variable Habitat Descriptor
>0.9 to 1.0	Excellent
>0.6 to 0.9	Above Average
>0.3 to 0.6	Average
>0 to 0.3	Below Average
0	None

HSI models have not been published for bull trout. Therefore, Hatfield developed a HSI model for bull trout overwintering and summer rearing based on published preference curves and results from the test pit (Table 3). This is essentially the same information used to develop the design specifications for the compensation habitat. The following habitat variables considered to be of significant importance with regards to bull trout overwintering and summer rearing were input to the model:

- Substrate composition ($\geq$ 3.8 cm diameter substrate rated as excellent);
- depth ($\geq$ 1.6 m rated as excellent); (<1.6 m rated average as potentially not suitable for overwintering, but suitable for summer rearing);
- Cover (overhanging vegetation, root wads and large woody debris rated as excellent); and
- Dissolved oxygen (> 75 percent saturation rated as excellent).

Velocity is also considered to be an important habitat variable for bull trout overwintering and summer rearing; however, insufficient data exist to adequately review velocity within the Tributary. It is anticipated that the large even-gradient pools and shallow-gradient outlet channel will provide suitable velocities for overwintering and summer rearing fish species. Monitoring of flow velocity will be measured and documented as a component of the post-construction monitoring plan.

Depth is considered to be the limiting habitat variable, given the entire compensation habitat cannot achieve depths equal to an SI rating of excellent. For stability, the channel and pool banks will need to be sloped, consequently approximately 26% of the compensation habitat will have minimum depths of 1.6 m (SI = 1.0) while approximately 74% of the compensation habitat will have minimum depths less than 1.6 m (SI=0.5). The resulting weighted SI value for the compensation habitat is rated as above average (weighted SI for depth = 0.63)(Table 3). It should be noted that the minimum depths are based on a worst case scenario (i.e., low water level); a considerable portion of the compensation habitat which has been assigned a depth SI value of average will in fact have depths greater than 1.6 m at various times of the year (i.e. higher water levels).

Table 3 Bull trout overwintering and summer rearing habitat suitability model for the compensation habitat.

Habitat Variable	Weighting Factor	Suitability Index Value
Substrate composition	100%	1.00
Depth	26% SI=1.0 74% SI=0.5	0.63
Cover	100%	1.00
Dissolved oxygen	100%	1.00

The total HUs created by the compensation habitat (2,741 m^2 x 0.63) is 1,727 HUs. This exceeds the requirement to create no less than 1,442 HUs as specified in the authorization. HUs created by the contingency compensation habitat would be (2,995 m^2 x 0.62) equal to 1,857 HUs.

5.0 CONSTRUCTION METHODOLOGY

During the construction phase of the Project, potential impacts to fish habitat are primarily associated with water quality. These include the potential discharge of suspended solids to the aquatic environment of Prairie Creek as a result of episodic soil spills during fill handling and placement, and/or accidental spills of oils or fuels. Best management practices will be implemented to mitigate potential impacts to fish.

5.1 TIMING

Construction of the compensation habitat is proposed to occur in July/August 2013 during a period of reduced risk to fish species within Prairie Creek. Installation of instream structures (i.e., live stakes, treetops, root wads, and large woody debris) will be conducted during the designated instream work window in 2014.

Bull trout and mountain whitefish potentially spawn from late summer through fall and should not be affected by the construction. Slimy sculpin and Arctic grayling spawn in May to early June. Slimy sculpin potentially use this portion of

the Tributary for spawning. Slimy sculpin fry emergence occurs approximately one month after spawning (Evans et al. 2002). Consequently, works are proposed between July 16 and August 14 as per the DFO operational statement for construction-timing windows in the Northwest Territories (DFO 2012). Construction is estimated to take approximately two weeks, with the instream component expected to require approximately one day. However, flood flows related to intense rainfall events are possible at any time. Therefore, construction should only start when Prairie Creek flows are equal to or less than normal (August Q_{mean} 9.53 m^3/s), and the weather forecast does not indicate approaching inclement weather. If either of these conditions are not met, construction may be delayed. This may ultimately lead to construction occurring outside of the timing window.

5.2 SITE ACCESS

Access to the work site will be achieved via the old mine access road such that crossing of the Tributary or floodplain will not be required. 'Swamp mats' will be used in the event that construction crews encounter environmentally sensitive areas (e.g., areas that have the potential to deliver suspended solids to Prairie Creek if disturbed) while utilizing the portion of the old mine road that crosses the Casket Creek out-wash fan. Swamp mats will also be used for machine works that cannot be conducted from the old mine road.

5.3 INSTREAM WORKS

The physical connections to the Tributary and the confluence with Prairie Creek will be completed at the last stage of excavation works. Compensation pools and channels will be constructed in complete isolation of flowing water. Turbid water from within the isolated work area as a result of ground water input will be pumped to a designated area away from Prairie Creek and the Tributary.

The work area will be isolated from fish prior to completing the hydraulic connections. Isolation of this area will be achieved with fish stop-nets (one within the Tributary upstream of the connection and one at the confluence of the Tributary and Prairie Creek) followed by a salvage of aquatic life by suitable environmental field staff. Captured fish will be enumerated and measured (weight and fork length) prior to being released downstream of the work area.

Water from the Tributary will be passively bypassed around the work area in stages during the compensation connection works (estimated to take one day). This will be achieved with a 'Big O' flexible PVC pipe and sandbag headwall. The downstream connection (i.e., outlet) will be completed first. A sandbag headwall complete with pipe will bypass flows around the work area. The same procedure will be completed for the upstream connection (i.e., inlet) at the last stage of instream works. The sandbag headwalls will not be removed until suspended sediments have settled within the work area. The sandbag headwalls will be removed gradually to prevent the release of a water surge and remobilization of sediments. Water pumps will be on hand to pump flows around the work area should the passive system not function as intended.

Environmental monitoring will occur full time by suitable environmental field staff during instream works to ensure all relevant best management practices and design specifications are adhered to. The monitor will enforce the following best management practices during instream works:

- Prevent the release of silt, sediment or sediment-laden water, or any other deleterious substances into the Tributary or Prairie Creek;
- Rock to be placed within the compensation habitat will be free of debris and sediment; if rock is not delivered clean it must be washed away and in isolation from the Tributary or Prairie Creek in a designated staging area for cleaning rock;
- Ensure equipment and machinery is in good operating condition, free of leaks or excess oil and grease. No equipment refueling or servicing should be undertaken within 30 metres of any watercourse or surface water drainage;
- Keep a spill containment kit readily accessible onsite in the event of a release of a deleterious substance to the environment. CZN has an approved Spill Contingency Plan for the site, and a variety of spill contingency materials available, including absorbent pads and booms; and
- Ensure sediment control measures have been installed properly prior to construction and monitor the effectiveness of these measures during construction.

The roles and responsibilities of all parties involved will be communicated through a pre-construction meeting.

5.4 SEDIMENT AND EROSION CONTROL

The compensation habitat work area is characterized primarily by low shrub floodplain. Sediment and erosion control will be managed primarily through preventative measures and include the following:

- the construction footprint (i.e., staging areas, access points, stockpiling areas) will be minimized to the greatest extent practical and situated as far away from the Tributary and Prairie Creek as feasible;
- use existing trails and roads for access and/or staging;
- avoid disturbance to existing vegetation to the greatest extent practical;
- avoid working on unstable areas and steep slopes; and
- schedule construction to take advantage of drier weather.

Active sediment and erosion control measures will include the following:

- sequencing construction such that disturbed areas within the construction footprint are covered and stabilized immediately following work in that area (e.g., lined with clean rock or covered with a biodegradable erosion control blanket);
- contain temporary stockpiles with silt-fencing and/or manufactured straw wattles properly keyed into the ground (e.g., North American Green's SedimentSTOP); hay/straw bales should be avoided to prevent accidental introduction of non-native seeds;
- daily removal of construction machinery and debris accumulation from the work area;
- shutdown procedures for unforeseen inclement weather conditions include removal of all machinery and construction material from the work area, deployment of standby pumps to remove additional water from the work area and full-time monitoring of sediment and erosion control features; and
- daily inspections of sediment and erosion control features by the environmental monitor to identify and remediate deficiencies immediately.

Organic spoils will be removed from the work area on a daily basis. All non-organic spoils will be stockpiled, shaped and stabilized as per design specifications (Figure 3 and Figure 6).

5.5 WATER QUALITY MONITORING DURING CONSTRUCTION

Turbidity (NTU) will be used to monitor water quality within Prairie Creek during construction. Turbidity will be used rather than total suspended solids (TSS, mg/L) given the remoteness of the site and lengthy turnaround time required to obtain results from a laboratory. During instream works, turbidity will be measured in Prairie Creek upstream and downstream of the confluence with the Tributary and within the Tributary upstream and downstream of the isolated work areas three times a day. Immediate action will be taken to enhance sediment control features should turbidity levels downstream of the work area exceed background levels (i.e., upstream the confluence within Prairie Creek or within the Tributary upstream the isolated work area) by more than 5%.

5.6 REPORTING

A construction monitoring report summarizing construction activity, water quality results, incidents and mitigation measures employed will be submitted to DFO within 60 days following completion of works. A detailed photographic record of the works will be included.

6.0 MONITORING PLAN

The following monitoring plan is designed to verify conformance with the referenced DFO authorization and evaluate the performance of the compensation habitat with respect to its intended function (i.e., provide overwintering and summer rearing habitat).

6.1 AS-BUILT SURVEY

An as-built survey will be conducted once the compensation habitat has been excavated to verify adherence to design specifications and ensure the specified HUs have been created. A second as-built survey will be completed following placement of instream structures during the 2014 specified work window. A construction monitoring report including the results of the as-built survey will be submitted to DFO within 60 days following completion of construction.

6.2 MONITORING SCHEDULE

Post-construction monitoring of the compensation habitat will occur biannually (winter and summer) each year of the three year monitoring program. An additional year of monitoring (i.e. year 4) will be conducted to assess benthic invertebrate production should fish not be documented within the compensation habitat after three years. An additional year of monitoring will be conducted two years later (i.e. year 6) should benthic invertebrates not be documented within the compensation habitat.

6.3 MONITORING ACTIVITIES

Monitoring activities will include an assessment of physical stability, riparian vegetation, in situ water quality, fish use and habitat suitability.

6.3.1 Physical Stability

Monitoring of the compensation habitat physical stability and connectivity to Prairie Creek will include a visual assessment. Any evidence of erosion, slumping, tension cracks, movement of bedload or instream structures and debris/sediment accumulation will be documented and photographed. Mitigation measures will be implemented should monitoring indicate the compensation habitat is becoming isolated from Prairie Creek. A stream specialist (Professional Engineer) has reviewed and commented on the compensation design as specified by DFO (Appendix A1). Potential mitigation to maintain channel connectivity includes the installation of an attracting spur if required.

6.3.2 Habitat Suitability

Habitat suitability will be monitored by establishing two cross-sectional transects across the compensation habitat; one transect across a pool and the other across the outlet channel. The pool and channel profile from top-of-bank to top-of-bank

will be surveyed in detail at each transect in relation to a local benchmark. Each transect will be permanently marked to ensure identical locations and stations are measured on each survey. The transects will measure a number of habitat variables including velocity, depth, substrate composition and percent cover by type. Information from the transects in association with water quality data will be input into the HSI model for bull trout overwintering and summer rearing to rank habitat suitability of the compensation habitat.

6.3.3 In Situ Water Quality

Monitoring of in situ water quality will include an assessment of dissolved oxygen (mg/L), pH, temperature (°C) and conductivity (µs/cm) at the surface (0.3 m depth) and bottom (1.0 m to 1.5 m depth) of the pools. Water quality results will be compared against water quality guidelines for the protection of aquatic life (CCME 2007) and published bull trout preference curves for dissolved oxygen and temperature (Idaho Power 2003). Turbidity (NTU) will also be measured during the assessment. A background sample will be collected from within the Tributary upstream of the compensation habitat for comparison.

6.3.4 Fish Sampling

An assessment of fish use within the compensation habitat will be conducted by minnow trapping and snorkel surveys during the summer sampling sessions. Three minnow traps will be installed within each pool and three within the outlet channel for a total of nine traps. Minnow traps will be baited with manufactured trout bait and soaked for 24 hrs. An assessment of fish use within the Tributary upstream and downstream of the compensation habitat as well as within Prairie Creek in proximity to the Tributary will be conducted with a backpack electrofisher. All fish will be enumerated per species, measured (fork length) and weighed (grams). An underwater camera will be lowered into the pools in an attempt to document overwintering use during the winter sampling sessions.

6.3.5 Riparian Vegetation

An assessment of riparian vegetation associated with the compensation habitat will include and inventory of species and an assessment of plant density, vigor and cover. Additional plantings will be installed should plant survivorship be less than one plant per square metre at the end of the monitoring period. Any vegetation established through natural colonization will also be documented.

6.4 REPORTING

Annual reports summarizing results of the above referenced monitoring activities will be submitted to DFO on or before November 30th of each year of the monitoring program. The report will include photographic documentation of the compensation habitat from the same vantage point each year.

Recommended remedial works will be provided should any of the monitoring activities indicate that the compensation habitat is not functioning as intended.

7.0 CLOSURE

We trust the above information meets your requirements. If you have any questions or comments, please contact the undersigned.

HATFIELD CONSULTANTS:

Approved by: _____ January 14, 2013

Tim Poulton
Component Manager

Date

Approved by: _____ January 14, 2013

Martin Davies
Project Director

Date

8.0 REFERENCES

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APPENDICES

Appendix A1

Fish Habitat Compensation Plan Review

9819 – 12 Avenue SW | Edmonton, AB T6X 0E3 | 780.436.5868 | www.nhcweb.com

nhc
northwest hydraulic consultants

Ref. No. 16987

Jan 11, 2013

Canadian Zinc Corporation
Suite 1710 - 650 West Georgia Street
Vancouver, BC
V6B 4N9

Attention: David Harpley

Via email: david@canadianzinc.com

Re: Prairie Creek Mine
Fish Habitat Compensation Plan Review

Dear Mr. Harpley:

Hatfield Consultants has prepared a Fish Habitat Compensation Plan for the work done to repair the access road to the Prairie Creek Mine. Northwest Hydraulic Consultants was requested by Canadian Zinc to provide a hydrotechnical review of this Compensation Plan. This letter report summarizes the results of the hydrotechnical review.

The Fish Habitat Compensation Plan proposes to construct two interconnected over-wintering pools on a small tributary of Prairie Creek just downstream of the confluence with Casket Creek. The pools will be located on the flood plain of Prairie Creek and must be stable and maintain a connection to Prairie Creek to be successful in providing fish habitat.

Prairie Creek is a steep, braided, gravel bed river which is subject to shifting of the main channel during high flows. Currently the main channel is located on the right side of the active channel on the opposite side of the narrow valley from the proposed pool. According to photographs provided by Hatfield, the tributary is connected to a secondary Prairie Creek channel on the left side of the active channel. This secondary channel is connected to the main channel through shallow flow over gravel bars. The combined flow from the tributary and secondary channel appears to be enough to maintain the connection to the main channel.

The secondary channel and the downstream end of the tributary appear to be relatively stable features caused by scour as Prairie Creek flood flows are directed around the higher bank downstream of this area. However, it is recommended that monitoring of this area be carried out to ensure that the connection is being maintained. If the connection to the creek is found to be deteriorating, an attracting spur (angled downstream) can be constructed along the downstream side of the channel to enhance the scouring effect at high flows.

The habitat pool areas are subject to flooding during high flows because they are located on the flood plain. The flood protection berm will help to keep the high velocity water away from the pool areas but the flood plain may still fill with slower moving water. Sediments may be transported into the pools at high flows but most of these will be swept out though the downstream outlet as the water level recedes. The position of the

pools within the flood plain make them susceptible to erosion and channel migration during the most severe flood events but they are likely to be stable for more frequent, less severe, flood events.

The sill level of the outflow channel from the pools has been set so that even if there is very little flow in Prairie Creek, the pool depth will be 1.6 m. Hatfield observed an ice thickness of 1.4 m in April, 2012 in a 1.6 m deep test pit dug in the area the previous fall. Under similar conditions, with the ice floating in the water, there would be about 0.3 m of water under the ice in the pool.

One of the interconnected pools has been located where it will not receive any through-flow so sediment may settle out in this pool. However, given that the source of the water in the tributary appears to be seepage through gravel from Casket Creek, the water will be quite clear so sediment buildup should not be an issue.

The evaluation of the Fish Habitat Compensation Plan provided above indicates that the proposed pools should maintain their functionality unless a very severe flood event occurs which rearranges the creek channel within flood plain. We trust that the above assessment meets your immediate needs; please do not hesitate to call if there are any questions.

Respectfully submitted,

Northwest Hydraulic Consultants Ltd.

Gary Van Der Vinne, M.Sc., P.Eng.
Principal

CANADIAN ZINC CORPORATION

Construction of Fish Compensation Habitat near Prairie Creek Mine

Progress Report

September 2013

TABLE OF CONTENTS

CONSTRUCTION OF FISH COMPENSATION HABITAT NEAR PRAIRIE CREEK MINE

PROGRESS REPORT

1.0 INTRODUCTION

Canadian Zinc Corporation (CZN) presents this progress report on fish habitat compensation works, which are intended to provide fish overwintering and rearing pools. The compensation is for habitat lost during repairs associated with the Prairie Creek Mine Access Road. Approximately 1,125 m^2 of main-channel straight-run habitat were lost, requiring the mine to compensate 1,442 habitat units (HU's).

A Fish Habitat Compensation Plan dated January 2013 and prepared by Hatfield Consultants provided a design of one large pond with a connecting channel to Prairie Creek. Following on-site review of construction issues, and the discovery of important habitat and fish abundance in an existing channel, the compensation design was modified to consist of two smaller ponds to be located nearer to the Casket Creek alluvial fan, with connections to and minimizing the loss of the existing channel. The modified design is shown in the figure contained in Appendix A. The figure shows the outline of two ponds proposed to meet the compensation requirement. Each pond has an area of slope and an area of pond bottom which should be at least 1.6 m deep. Using habitat unit conversion factors of 0.5 for the area of slope (1,266 m^2) and 1.0 for the area of pond bottom (939 m^2), habitat units total 1,572. This is comfortably greater than the 1,442 target.

The following sections describe the compensation works undertaken so far.

2.0 CONSTRUCTION APPROACH

Before commencing construction, the existing channel was isolated from Prairie Creek using a stop net near the mouth. Fish salvage was then undertaken.

Written guidance was provided to the construction crew with respect to the management of inflowing and outflowing water in the construction area, the placement of silt fences in the channel downstream, and turbidity monitoring requirements. The document in Appendix A is a copy of the guidance provided. The key construction-related points for this year were as follows:

1. Prior to construction, hold a pre-construction meeting to review construction phasing and commitments in the Fish Habitat Compensation Plan (FHCP);

2. Review monitor's responsibilities with person selected (i.e., document daily works, environmental issues, photographs, water quality log). The monitor can also assist in the installation of erosion and sediment control measures;

3. Check stability of stop net on channel near confluence of Prairie Creek. Install multiple silt fences across channel between stop net and construction area;

4. Depending on flow in channel, relieve flow by digging a sump upstream of the construction area and pumping clean water around the area **OR** pump from the excavation and discharge water to an area away from receiving water to allow suspended sediment to settle out. The object is to avoid sediment release – choose the best option for this;

5. Strip any organics and stockpile them so these can be reinstated on disturbed areas after construction. Spread the organics over disturbed areas outside of the habitat when construction is finished. Ensure silt control measures are implemented;

6. If possible, stockpile cobbles and boulders for the pool and channel bottom from the excavation (make sure substrate meets design specifications);

7. If possible, stockpile root wads, tree tops and logs for 2014 works;

8. Ensure a minimum 1.6 m depth is attained across the bottom of the excavation. A low berm will be required around the downstream edge of the ponds to ensure a consistent depth across the ponds, and to direct outflow to the selected discharge location. Minimize loss of cobble channel sections during pond excavation. Ensure pond bottom area is not less than that provided to DFO in final redesign (939 m^2);

9. Water quality monitoring is conducted 3 times a day (morning, noon and afternoon) within Prairie Creek upstream and downstream the confluence with the tributary and in two locations within the tributary downstream of the construction area. Works should stop and erosion and sediment control measures implemented if background turbidity is exceed by more than 5%; and,

10. Maintain pumping and sediment controls after completion of construction works until water is clear and can be released. Stop net removal should be the last task and only after conditions have substantially stabilized and no sediment is being produced.

3.0 CONSTRUCTION PROGRESS

Team members reviewed the construction guidance (Appendix A) before starting work.

Construction of the ponds was initiated on September 11, 2013. The weather was optimal with sunny, cool days. Water levels and flows in the channel were low.

Personnel involved in the construction included:

Alan Taylor: VP Exploration and Equipment Operator
Ted Boychuk: Camp Manager and Equipment Operator
Kerry Cupit: Geologist and Environmental Monitor

David Harpley, VP Environment, oversaw program design and provided the construction guidance.

3.1 CONSTRUCTION

The revised pond outlines were outlined in the field. Silt fences were then erected downstream of each pond. The North Pond site silt fence was placed in the headwaters of a small stream that had a small flow at the time. There was no obvious inflow of surface water to the North Pond site.

The South Pond silt fence was placed approximately 50 metres downstream of the South Pond site, and was placed in a U-shape across the channel. The stream had a moderate flow at the location. Some ponding of water occurred upstream of the fence, but enough water filtered through for the fence to remain stable.

Prior to excavation, a berm was created across the channel upstream of the South Pond site to pond the flow in the intermediate channel section. Thus, for excavation of the North Pond site, the ponded intermediate stream and the South Pond site were isolated, and were available as settling ponds, if necessary.

A Hitachi back hoe and a D8H caterpillar were used in the construction of the ponds. These units were cleaned of oils and grease prior to construction. Drip pans were installed overnight, and a portable spill kit was kept at the construction site.

A thick (0.3-0.6 m) organic layer was removed from the North Pond location first on September 12. The organics proved difficult to manage since they had a high silt/clay content, causing clumps that were hard to remove from equipment. The material was placed in a low berm around the excavation, except on the north-west corner where valuable wetland habitat exists. The redistribution of this material is not necessary or recommended. Organics can be seen on the west side of the North Pond. Once the organic layer was stripped off, the Cat scraped out gravel until the water was too deep. The backhoe was then used to deepen the pond to the required 1.6m+ depth.

The South Pond site did not have much of an organic cover, and alluvial gravels predominated. While the backhoe was completing excavation of the North Pond, the Cat stripped material from the South Pond and bladed off as much material as possible. A low berm was again created around the pond. The backhoe worked on the South Pond on September 13. All major excavation work was completed on September 14.

The excavated material is very soft and is being allowed to dry before completing contouring and construction of the facilities. The excavated ponds remain isolated and suspended sediment in ponded water is being allowed to settle before connections to the existing channel are opened and the pond banks finished off. This work is scheduled to be completed approximately two weeks after the initial construction. Photos of the construction follow.

Silt fence erected downstream from South Pond Site prior to excavation

Silt fence erected just downstream of North Pond Site prior to excavation

Construction of North Pond. Notice the pond is self-contained and retaining all silt

Looking north from lower silt fence. Cat is excavating South Pond and backhoe is excavating North Pond

Completed North Pond and back hoe working in South Pond, both self-contained

North Pond: September 12, turbid water (still self-contained)

North Pond: September 13th, showing rapid settling and clearing of pond

September 14, 2013: View of all habitat works looking downstream

3.2 MONITORING

Water monitoring stations were located on the channel approximately 100 m downstream of the lower silt fence, and just downstream of the fish stop net established near the confluence with Prairie Creek. Two monitoring stations were also located on Prairie creek upstream and downstream of the channel confluence. The GPS location details of the monitoring stations are as follows (UTM NAD83):

- Prairie Creek (upstream): 10 V 402528 6830432
- Prairie Creek (downstream): 10 V 402625 6830210
- Channel (upper): 10 V 402749 6830514
- Channel (lower): 10 V 402668 6830442

Turbidity measurements were made in the field with a LaMotte 2020e turbidity meter. The meter was calibrated with a blank of deionized, filtered (0.45µm) water, and with a 1.0 NTU standard before each sampling round. During each round and at each location, sample results were averaged over 5 readings within the device. Results are given in the following table:

TURBIDITY MEASUREMENT RESULTS

DATE	TIME	PRAIRIE CREEK		CHANNEL	
		Upstream	Downstream	Upper	Lower
12-Sep-13	Morning	n/a	n/a	0.30	n/a
12-Sep-13	Mid-day	0.41	0.42	0.32	0.43
12-Sep-13	Afternoon	0.39	0.43	0.44	0.42
13-Sep-13	Morning	0.38	0.36	0.26	0.46
13-Sep-13	Mid-day	0.39	0.30	0.77	0.39
13-Sep-13	Afternoon	0.33	0.35	0.55	0.31
14-Sep-13	Morning	0.44	0.44	0.43	0.27
14-Sep-13	Mid-day	0.30	0.34	0.87	0.53

Kerry Cupit measuring turbidity at the upstream Prairie Creek station

September 14, 2013: Aerial photo of Fish Compensation area after construction of ponds. The locations noted by stars are the turbidity monitoring sites.

Appendix A

Memorandum

Date: September 4, 2013

Re: Construction Approach and Monitoring for compensation habitat

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This memo outlines some key elements of construction and construction-monitoring duties during the construction of the compensation habitat. These elements are presented in greater detail in the Hatfield report, *Prairie Creek Mine Fish Habitat Compensation Plan* (FHCP, January 2013).

The construction monitor must take good notes and photographs. They must document the stages of construction, any environmental issues and any mitigation actions taken. The individual also must collect and record three turbidity measurements per day at four different locations. This data is for a construction-monitoring report, to be submitted to DFO 60 days after construction.

Construction-related key points are as follows:

1. Prior to construction, hold a pre-construction meeting to review construction phasing and commitments in the FHCP;

2. Review monitor's responsibilities with person selected (i.e., document daily works, environmental issues, photographs, water quality log). The monitor can also assist in the installation of erosion and sediment control measures;

3. Check stability of stop net on channel near confluence of Prairie Creek. Install multiple silt fences across channel between stop net and construction area;

4. Depending on flow in channel, relieve flow by digging a sump upstream of the construction area and pumping clean water around the area **OR** pump from the excavation and discharge water to an area away from receiving water to allow suspended sediment to settle out. The object is to avoid sediment release – choose the best option for this;

5. Strip any organics and stockpile them so these can be reinstated on disturbed areas after construction. Spread the organics over disturbed areas outside of the habitat when construction is finished. Ensure silt control measures are implemented;

6. If possible, stockpile cobbles and boulders for the pool and channel bottom from the excavation (make sure substrate meets design specifications);

7. If possible, stockpile root wads, tree tops and logs for 2014 works;

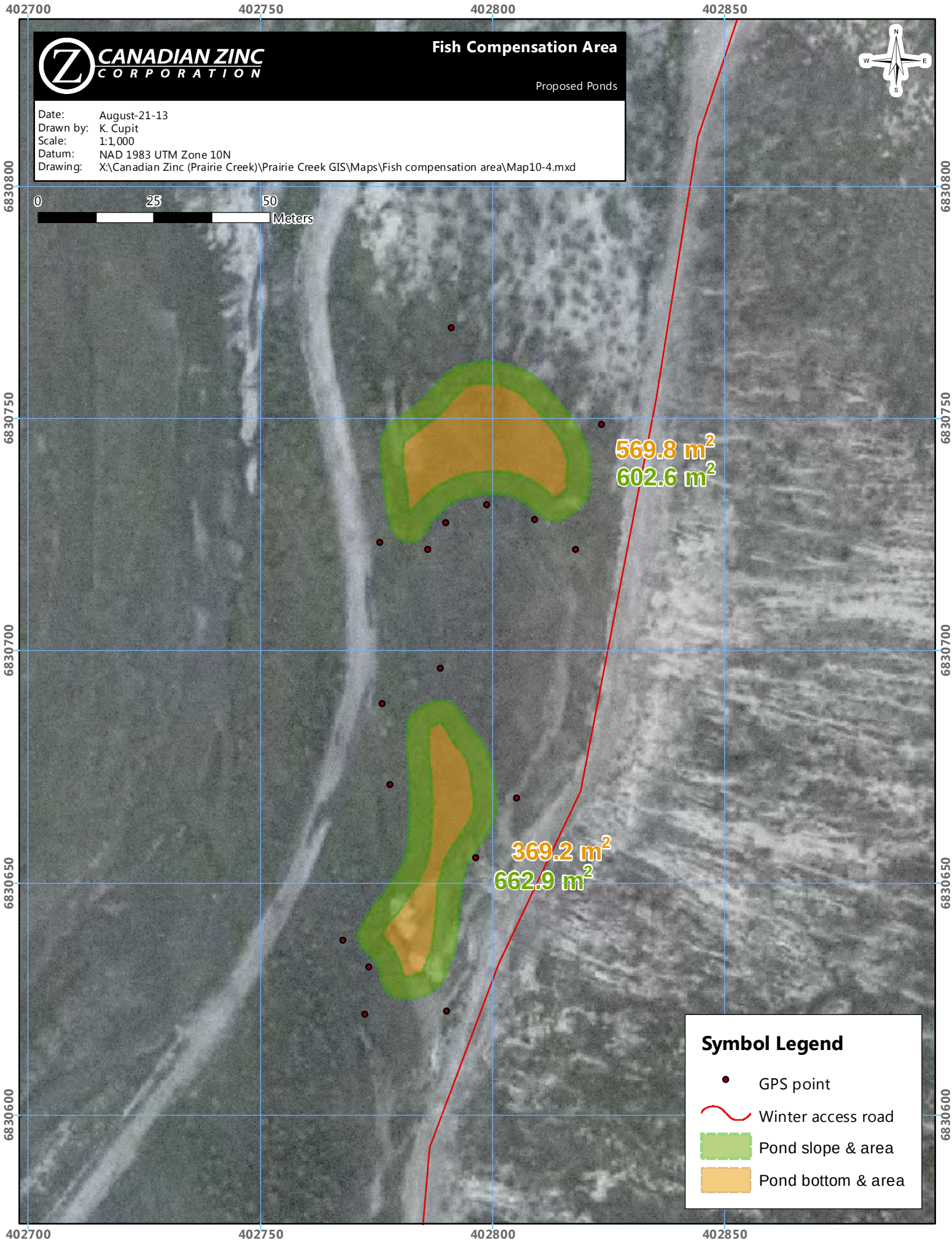
8. Ensure a minimum 1.6 m depth is attained across the bottom of the excavation. A low berm will be required around the downstream edge of the ponds to ensure a consistent depth across the ponds, and to direct outflow to the selected discharge location. Minimize loss of cobble channel sections during pond excavation. Ensure pond bottom area is not less than that provided to DFO in final redesign (939 m^2, see attached);

9. Water quality monitoring is conducted 3 times a day (morning, noon and afternoon) within Prairie Creek upstream and downstream the confluence with the tributary and in two locations within the tributary downstream of the construction area. Works should stop and erosion and sediment control measures implemented if background turbidity is exceed by more than 5%;

10. Maintain pumping and sediment controls after completion of construction works until water is clear and can be released. Stop net removal should be the last task and only after conditions have substantially stabilized and no sediment is being produced;

11. Locate suitable harvest location for willow and dogwood live stakes (harvesting will occur in late fall, winter or early spring, while dormant and before leaf formation);

12. Complete an as-built survey of the new habitat when completed for the construction monitoring report. At a minimum, this should provide detailed location and elevation of top of bank and bottom of banks.


CANADIAN ZINC CORPORATION
Fish Compensation Area
Proposed Ponds
Date: August-21-13
Drawn by: K. Cupit
Scale: 1:1,000
Datum: NAD 1983 UTM Zone 10N
Drawing: X:\Canadian Zinc (Prairie Creek)\Prairie Creek GIS\Maps\Fish compensation area\Map10-4.mxd
0 25 50 Meters
N
W
E
S
402700
402750
402800
402850
6830800
6830750
6830700
6830650
6830600
569.8 m2
602.6 m2
369.2 m2
662.9 m2
Symbol Legend
GPS point
Winter access road
Pond slope & area
Pond bottom & area

Southern pond. Photo taken from east side of future pond looking north.

Southern pond. Photo taken from east side of future pond looking west.

Southern pond. Photo taken from east side of future pond looking south west.

Southern pond. Photo taken from east side of future pond looking south.

Northern pond. Photo taken from northeastern corner looking west.

Northern pond. Photo taken from north eastern corner looking southwest.

Northern pond. Photo taken from north eastern corner looking south

Installed stop-net looking downstream

Overview of site, looking Northeast

Undertaking # 38: CanZinc to confirm estimates of maximum potential traffic volumes (or range) of the road to considered as part of the scope of this development.

From detailed mine plans and milling studies, it is projected that the Prairie Creek Mine may produce a variable amount of concentrate per annum due to the nature of mineralization and the ability to mine, mill and process the ore. The 2016 Technical Report demonstrates a 17 year life of mine production averaging 123,000 tonnes concentrate, but looking closer at the more optimal production life of 13 years, averages 134,000 tonnes with a minimum of 112,000 t and up to a maximum 161,000 t of concentrate. Taking this estimated variable production number and applying an estimated operational window for the all season road, with a target truck capacity of 50 t, the trucking fleet traffic operating on the new all season road will range between 11-16 trucks/round trips/day on the all season road. With further utilization factors applied for preventative maintenance and mechanical issues, weather factors etc. a 10% factor is applied bringing the estimated range between 12-18 trucks/round trip/day on the all season road.

The same trucks hauling out concentrate would be utilized for backhaul of the majority of supplies and equipment back into the mine site. As previously noted, there would also be some select loads transported in on exclusive custom trucks, such as supplies of explosives.

In our letter to the Board dated April 1, 2016 we noted a potential maximum number of concentrate trucks per day of 20. This figure does not include maintenance and monitoring crews operating on parts of the road (4), or the occasional special deliveries or visitors, or very infrequently, crew changes. Estimates of these frequencies are provided in our reply to Oboni Riskope IR1.

For the purposes of this EA, we recommend that a maximum number of concentrate truck trips per day of 25 be assumed.

Undertaking #39: CanZinc will provide information on the determination of a 13 hour cycle time estimated for return trips.

In 2015, CZN engaged Allnorth, an engineering consultant, to produce a comprehensive transportation plan with estimated capital and operating costs (refer to 2016 Technical Report) and to advance the design of the all-season road. The transportation plan is based on trucking to Fort Nelson. Travel on the 183 km of road from the Mine to the Liard Transfer Facility (LTF) near the Liard Highway would be limited to operating periods during certain times of the year, due to spring and fall restrictions and limitations related to the Liard River crossing and highway load restrictions. It is proposed to utilize covered Tridem or Tandem Class 8 Super B-train with payloads of 41 or up to 51 tonnes per load depending on road conditions and permits. Cycle times were determined by the type of truck and an average of 40km/hr (some sections <30km/hr) over the all season road. Allnorth determined a return trip cycle time from the Mine to the LTF and back of 12.4 hours. This was based on average concentrate production, and while the number of trucks would increase with increasing production (refer to reply to Undertaking #38), their cycle times will remain the same.

Division of the 366 km return distance by the estimated 12.4 hour cycle time yields an overall average speed of 30 km/hour.

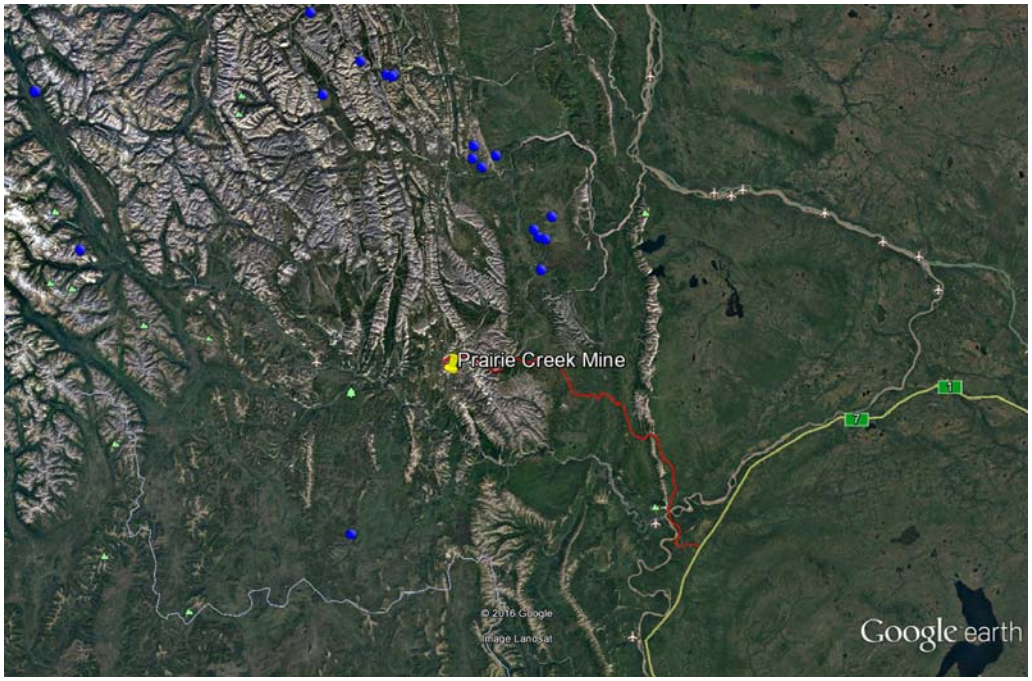
Undertaking #42 : ***CanZinc to provide periods for earthquake events of magnitude 4.0 or higher, and how many earthquakes of this magnitude have occurred in the last 10 years.***

A list of earthquakes of magnitude 4.0 or higher occurring in the last 10 years in the region is indicated in the table below.

Date	Time(UT)	Lat	Long	Depth	Magnitude	Region and Comment
2014/03/31	16:30:27	62.288	-124.522	1.0g	4.3Mw	180 km W of Fort Simpson
2013/09/28	21:47:05	62.572	-127.894	1.0g	4.0ML	277 km NNE of Watson Lk.
2013/07/12	19:59:48	62.039	-124.119	1.0g	4.7Mw	153 km W of Fort Simpson
2013/01/31	10:14:29	62.319	-124.588	1.0g	4.5Mw	184 km W of Fort Simpson
2013/01/30	15:05:15	62.363	-124.577	1.0g	4.3Mw	185 km W of Fort Simpson
2011/07/30	16:08:00	62.065	-124.153	1.0g	4.4ML	155 km W of Fort Simpson
2011/06/12	16:25:49	61.926	-124.112	1.0g	4.1Mw	151 km W of Fort Simpson
2010/10/24	08:52:32	62.555	-125.702	10.0g	4.3ML	247 km W of Fort Simpson
2010/10/05	20:38:58	62.616	-125.180	1.0g	4.1ML	224 km WNW of Fort Simpson
2010/09/13	10:07:56	62.621	-125.223	1.0g	4.1ML	226 km WNW of Fort Simpson
2009/07/31	17:46:50	61.048	-125.500	1.0g	4.3Mw	208 km ENE of Watson Lk.
2007/04/07	23:33:23	62.671	-125.418	1.0g	4.2ML	238 km WNW of Fort Simpson

"g" - depth fixed by seismologist

A total of 12 events of 4.0 magnitude or higher have occurred within a 200 kilometre radius of the Prairie Creek Mine site at 61°.33 latitude, 124°.48 longitude. This data is generated from the Natural Resources Earthquake Database (http://www.earthquakescanada.nrcan.gc.ca/). Most events occurred north of the Prairie Creek Mine and access road, as can be seen on the Google map below.



Undertaking #43: ***CanZinc to provide return periods for earthquakes of similar magnitude as the 1985 and 1987 events or higher.***

A list of earthquakes of magnitude 6.0 or higher occurring on record in the region is indicated in the table below:

Date	Time(UT)	Lat	Long	Depth	Magnitude	Region and Comment
1988/03/25	19:36:46	62.119	-124.209	10.0g	6.0MS	129 km N from Nahanni Butte
1985/12/23	05:16:03	62.187	-124.243	10.0g	6.9MS	125 km S from Wrigley
1985/10/05	15:24:02	62.208	-124.217	6.0g	6.6MS	122 km S from Wrigley

"g" - depth fixed by seismologist

A total of 3 events of 6.0 magnitude or higher were found on record (since 1985) within a 200 kilometre radius of the Prairie Creek Mine site at 61°.33 latitude, 124°.48 longitude. This data is generated from the Natural Resources Earthquake Database (http://www.earthquakescanada.nrcan.gc.ca/). All 3 events occurred in the North Nahanni/Ram Plateau region.