Blackwater Project Fish Salvage Logistics Plan

March 1, 2023

Prepared for:
Blackwater Gold Inc.

Prepared by:
Stantec Consulting Ltd.

Project Number:
123222037

Limitations and Sign-off

This document entitled “Blackwater Project Fish Salvage Logistics Plan” was prepared by Stantec Consulting Ltd. (“Stantec”) for the account of Blackwater Gold Inc. (the “Client”). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec’s professional judgment considering the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not consider any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party because of decisions made or actions taken based on this document.

Prepared by: Brad Horne Digitally signed by Brad Horne Date: 2023.03.01 15:42:30 -08'00'

Brad Horne
Printed Name

Reviewed by: Brad Horne Digitally signed by Brad Horne Date: 2023.03.01 15:42:50 -08'00'

Nathan Gregory
Printed Name

Table of Contents

List of Tables

List of Figures

1 Introduction

Prior to construction of the Blackwater Gold Project, Blackwater Gold must conduct a fish salvage to relocate fish within the Project Development Area (PDA) to areas downstream or upstream of potential project impacts. This fish salvage is a requirement of Condition 3.2.1 of the Project's federal Decision Statement and is a mitigation measure included in the *Fisheries Act* Authorization application submitted to Fisheries and Oceans Canada (DFO). A "Fish Salvage and Relocation Plan" has been prepared by Palmer (2022). Blackwater Gold retained Stantec to prepare a fish salvage logistics plan to address the amount of habitat that needs to be salvaged, the distances that fish may need to be transported, and the potential difficulties presented by the surrounding terrain.

Stantec conducted a site reconnaissance of the watercourses in the Davidson Creek and Creek 661 watersheds within the PDA on August 16 and 17, 2022. The objectives of this site reconnaissance were to assess:

1. access constraints to the watercourses that need to be salvaged
2. the likely effectiveness of different methods for capturing fish based on the available habitat
3. the likely effectiveness of methods for transferring fish to other locations
4. the likely duration and level of effort required to complete the fish salvage.

This memorandum summarizes results of the site reconnaissance and provides recommendations for conducting the fish salvage in 2023 based on:

1. the logistical constraints observed during the site reconnaissance
2. Blackwater Gold's mine design and construction schedule
3. Existing access roads and Canfor's future logging plans
4. Blackwater Gold's current Fish Salvage and Relocation Plan (Palmer 2022)
5. Distribution, life history, and habitat use of rainbow trout (*Oncorhynchus mykiss*) in Davidson Creek

Stantec made the following assumptions when preparing this fish salvage logistics plan: 1) Blackwater Gold will have its Section 35(2)(b) *Fisheries Act* authorization from DFO prior to commencement of the fish salvage; 2) the fish salvage will commence on July 15, 2023, the first day of the least risk timing window for rainbow trout in the Omineca Region of BC (BC MWLAP 2004); and 3) rainbow trout are the only fish species present within the PDA.

2 Site Reconnaissance Methods

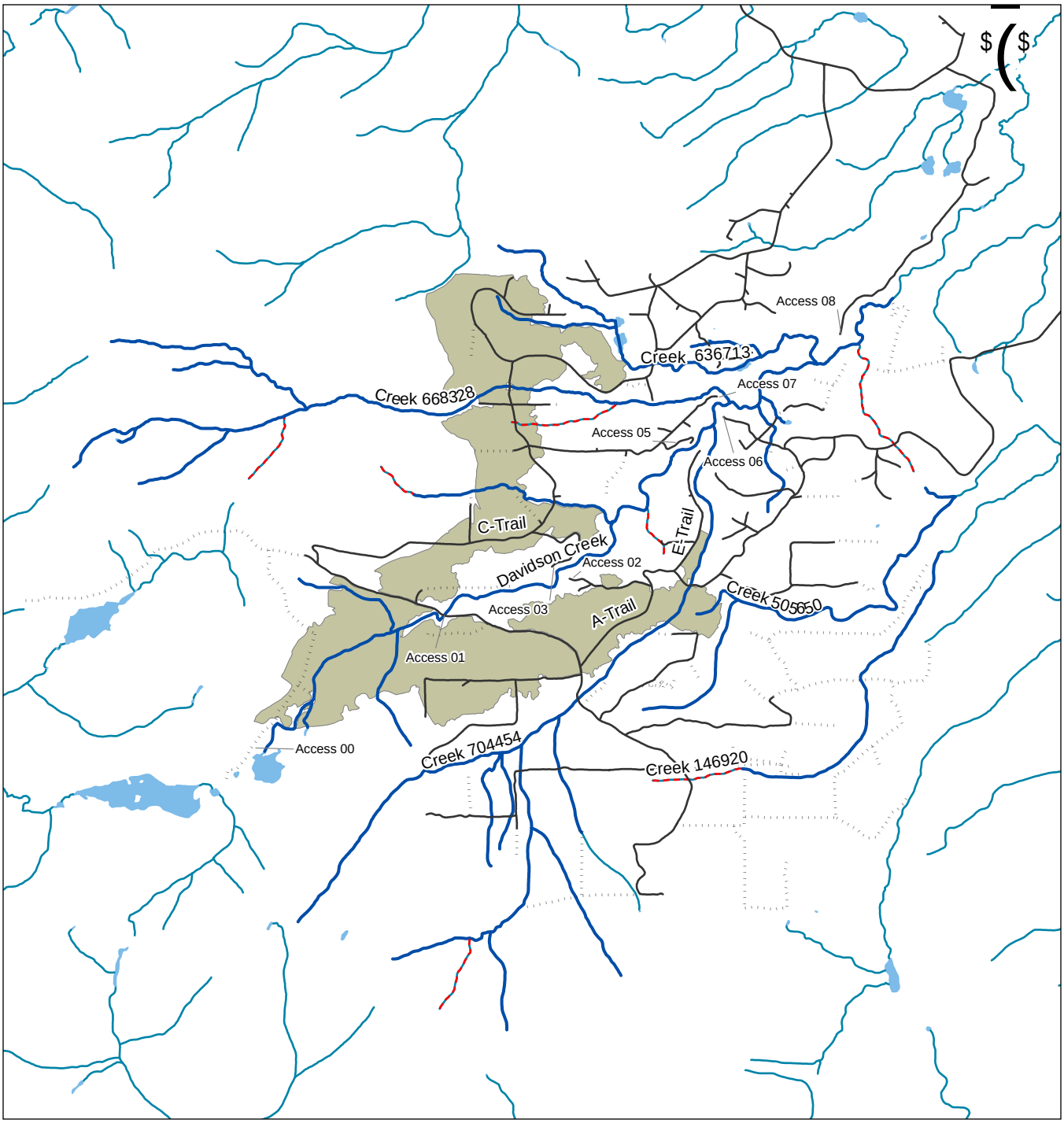
The site reconnaissance was conducted by Brad Horne (Senior Fish Biologist, Stantec) and Eric Turenne (Aquatic Biologist, Stantec), accompanied by Alex Kourline (Construction Project Manager, Blackwater Gold). A helicopter was used on the morning of August 16th to observe Davidson Creek and its tributaries, Creek 668328, and Creek 704454 (aka “Mine Area Creek”), from the air. The helicopter overflight extended from Lake 16 downstream to the proposed location of the Freshwater Reservoir (FWR) in Davidson Creek. The helicopter set down near the location of the proposed FWR (Access 08) and the crew walked downslope to Davidson Creek (Figure 1).

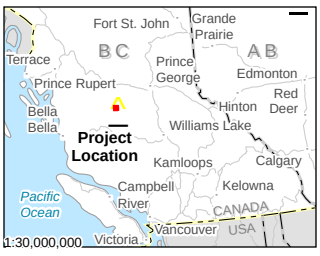
A truck was used in the afternoon of August 16th to visit:

- Davidson Creek at the Km 13 crossing on the mine access road; future location for lock-block weir and pump station
- Lake 16 and Lake 16 outlet channel
- location for proposed culverts under ‘A trail’ to convey Creek 704454 to Davidson Creek prior to construction of the Water Management Pond (WMP)
- location of Main Dam C Proposed near the confluence of Davidson Creek and Creek 704454 at the end of ‘E trail’
- Creek 704454 at the Km 15 crossing on the mine access road

A truck was used on the morning of August 17th to travel to the following locations from ‘C trail’ and ‘A trail’ (Figure 1):

- Davidson Creek upstream of the proposed ‘diversion berm’ (Access 03 via spur road off ‘C trail’)
- location of Main Dam C near confluence of Davidson Creek and Creek 668328 (Access 05 via spur road off ‘C trail’)
- location of Freshwater Reservoir (Access 08 via spur road off ‘C trail’)
- location of Freshwater Reservoir (via an existing drill rig trail off ‘A trail’)
- location of Environmental Control Dam (Access 06 via spur road off ‘A trail’)
- Creek 704454 near proposed WMP (via spur road off ‘A trail’)
- Creek 704454 crossing on the ‘A trail’





Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada

- Additional Roads
- Local Roads
- Watercourses
- Fish Bearing
- Non-Fish Bearing
- Waterbodies
- Future Cut Blocks

0 0.5 1 1.5 2 km
1:30,000,000 (at original document size of 8.5x11)

Stantec

Project Location: North Central BC

Project Number: 123222037
Prepared EHERTZMAN on 20221007
Requested by BHORNE on 2022107

Client/Project/Report
Blackwater Gold
Fish Relocation

Figure No.
1

Title
Roads, Streams, and Logging Cut Blocks

S:\123222\projects\123222037\analysis\arcgis\123222037_Data Analysis\123222037_Data Analysis.aprx Revised: 2023-02-08 By: ehertzman

3 Site Reconnaissance Summary

3.1 Helicopter Overflight

The following information was acquired during the helicopter overflight on August 16th:

- Lake 16 has a low gradient outlet channel suitable for placement of a temporary fish barrier
- The wetted width of Davidson Creek near the FWR is ~5 m wide, but up to 20 m wide in spring
- Creek 668328 is a small, low-gradient stream, with increasingly frequent wetlands near its headwaters. No barriers or major tributaries were observed
- Creek 704454 flows in a steep valley; a substantial volume of woody debris is present
- Headwater tributaries of Creek 661 (e.g., Creek 505659) are small and originate within 100-200 m of Creek 704454; these headwater tributaries are also in steep valleys

3.2 Truck Tours

The following information was acquired during the truck tours conducted on the afternoon of August 16th and the morning of August 17th:

- Davidson Creek at the Km 13 crossing is ~4 m wide with boulder substrates; there was approximately 10 times the flow at this location compared to the Lake 16 outlet, likely due to groundwater and/or tributary inflows
- The Lake 16 outlet has boulder/cobble substrates with marshy areas downstream. Dam to redirect Lake 16 outflow to Lake 15 will not go directly at outlet but approximately 50 m downstream. Existing road is between 100 m and 200 m from the upper 1.5 km of Davidson Creek downstream of Lake 16. Canfor is logging the area extending from approximately 350 m downstream of Lake 16 to the Km 13 crossing and so will improve access for the fish salvage.
- Culverts will be built under ‘A trail’ to convey Creek 704454 overland to Davidson Creek prior to construction of WMP
- Davidson Creek and Creek 704454 are ~4 m wide and <0.30 m deep near their confluence at the future location of the Main Dam C at the end of ‘E trail’. The confluence of Creek 668 with Davidson Creek is approximately 50 m downstream from here. There is approximately 3 km of Davidson Creek, upstream the confluence with Creek 704454 to Access 03, with no good access and steep valley banks.
- Creek 704454 at the Km 15 crossing on the mine access road is heavily overgrown with riparian vegetation; boulder substrates with substantial amounts of woody debris are present in the channel upstream and downstream of road crossing
- There is a steep ATV road down to creek floodplain at end of Access 03 via spur road off ‘C trail’ (i.e., Davidson Creek upstream of the proposed ‘diversion berm’). This road could be extended

along creek up to mine access road; otherwise, there is about 2 km of Davidson without good access from the ‘C trail’.

- Davidson Creek is only about 40 m from road at Access 05 (via spur road off ‘C trail’) and valley gradient is relatively low (i.e., at future location of Main Dam C near confluence of Davidson Creek and Creek 668328). However, esker material in this area will be used for dam building and, therefore, will have many trucks operating on this road. Davidson Creek will need to be accessed from ‘A trail’ instead of from ‘C trail’ at this location.
- There is a steep valley slope down to Davidson Creek near the future Freshwater Reservoir (i.e., Access 08 via 4 km spur road off ‘C trail’)
- The existing drill rig trail off ‘A trail’ comes within 40 m of Davidson Creek in vicinity of FWR. However, the valley slope at end of trail is steep (~40% grade)
- The ATV trail at end of Access 06 via spur road off ‘A trail’ comes within 40 m of Davidson Creek in vicinity of Environmental Control Dam. However, the creek valley is steep (~50% grade)
- Clear-cuts come within 40 m of Creek 704454 at end of two roads that spilt off spur road from the ‘A trail’ near proposed WMP. Steep valley slope to the creek at these locations.
- Access to Creek 704454 could be provided by using the new drill rig trails that Blackwater Gold is going to pioneer from the low-spot on the A-trail to the water management pond location
- Creek 704454 is <3 m wide with a substantial volume of woody debris and overhanging vegetation at the crossing on the ‘A trail’

4 Fish Salvage Recommendations

Based on results of the site reconnaissance, the information provided by Blackwater Gold regarding Project construction, and the Fish Salvage Plan prepared by Palmer (2022), Stantec has prepared the recommendations that follow in the sections below.

4.1 Fish Salvage Schedule

Stantec understands that Blackwater Gold intends to construct water management and mine infrastructure in the Davidson Creek and Creek 661 watersheds according to the schedule summarized in Table 1. Water management and mine infrastructure components not built within a stream channel or riparian area (i.e., “in the dry”) are assumed to not require a fish salvage prior to construction. Water management and mine infrastructure components within a stream channel or riparian area are assumed to require a fish salvage in reaches within and downstream of the component footprint prior to construction.

Based on when the various water management and mine infrastructure components will be constructed, the fish salvage will need to be conducted in the following order after installation of a barrier to upstream fish migration (see Section 4.7 for discussion of options) in Reach 6 of Davidson Creek:

1. Davidson Creek: Reaches 8, 9, and 10 to the Km 13 road crossing

2. Creek 704454: Reaches 1, 2, 3, and 4 to the Km 15 road crossing
3. Creek 668328
4. Creek 146920: Reaches 1, 2, 3
5. Creek 704454: Reaches 4, 5 and 6 and their tributaries
6. Creek 505569: Reaches 4, 5, and 6
7. Davidson Creek: Reaches 11 and 12 downstream to Km 13 road crossing
8. Davidson Creek: Reaches 6 and 7
9. Creek 636713
10. Unnamed tributary of Davidson Creek affected by construction of northern diversion channel (i.e., tributary entering Davidson Creek from the north between Access 03 and Access 05)

Table 1 Construction Schedule for Water Management Infrastructure and Other Mine Infrastructure

Component	Start Date	End Date	Affected watercourse(s) and Reach(es)	Requires Fish Salvage? (Yes/No)
Tailings Storage Facility (TSF)	Mar 2023	Sept 2023	Davidson: Reaches 8 to 10; Creek 704454: Reaches 1 and 2 Creek 668328	Yes
Water Management Pond	May 2023	July 2023	Creek 704454: Reaches 1 to 4	Yes
Creek 704454 Diversion Channel	Mar 2023	Sept 2023	“in the dry”	No
Processing Plant	Mar 2023	Oct 2024	Creek 146920: reach 3	Yes
Open Pit, Topsoil Stockpile, Low-grade ore Stockpile, and Waste Rock Storage Area	May 2023	Sept 2024	Creek 704454: Reaches 4 to 6 Tributaries of Reach 4, 5, and 6 of Creek 704454 Creek 505659	Yes
Davidson Creek Diversion Pipeline and Diversion Berm	June 2023	Oct 2023	Davidson: Reaches 9 and 10	Yes
Lake 15-16 Connector Channel	June 2023	Dec 2023	“in the dry”	No
Lake 16 outlet dam	Aug 2023	Sept 2023	Davidson: Reach 12	Yes
Freshwater Reservoir	Aug 2023	Nov 2023	Davidson: Reaches 6 and 7 Creek 636713	Yes
Operations Camp	Aug 2023	Oct 2024	Creek 146920: reaches 1 and 2	Yes
Sediment Control Pond	Sept 2023	Oct 2023	“in the dry”	No
North Collection Channel	Oct 2023	Nov 2023	“in the dry”	No

Table 1 Construction Schedule for Water Management Infrastructure and Other Mine Infrastructure

Component	Start Date	End Date	Affected watercourse(s) and Reach(es)	Requires Fish Salvage? (Yes/No)
North Diversion Channel	Nov 2023	Dec 2023	Unnamed Davidson Creek tributary (entering between Access 03 and Access 05)	Yes
South Collection Channel	Dec 2023	Mar 2024	“in the dry”	No
Central Water Transfer Pond	Jan 2024	July 2024	Davidson: Reach 10 and 11	Yes
Interim Environmental Control Pond Dam	Feb 2024	April 2024	Davidson: Reach 7 and 8	Yes
Minor Diversion Channel and Dewatering System	Mar 2024	May 2024	“in the dry”	No

4.2 Woody Debris and Beaver Dam Removal

Small and large woody debris is present in and above most streams in the Davidson Creek watershed. This debris will impede the movement of field crews conducting the fish salvage and reduce the ability of netters to capture fish. Beaver ponds are also present in the Davidson Creek watershed. Soft sediments and deeper water depths in the beaver ponds will make it harder for crews to capture fish safely and effectively. Together, this will slow the speed of the fish salvage and reduce the number of fish that are removed from the creeks. To reduce these effects, Stantec recommends that Blackwater Gold hire a silviculture contractor to remove as much small and large woody debris from the creeks within the mine footprint as practical prior to the fish salvage. Effort should be focused on removing woody debris that would impede the movement of the field crews within the creek channel (i.e., dead trees and branches within 1 m of the water surface). Woody debris should be stockpiled for use in the fish habitat offsetting projects, as and where required, or used for building ATV trails. These same crews could be used to remove beaver dams prior to the fish salvage.

4.3 Access Improvements

Figure 1 shows the location of existing access roads and future logging activities in the Davidson Creek and Creek 661 watersheds in the vicinity of the Blackwater Mine. Canfor will complete logging of cut-blocks north of Davidson Creek before July 2023 (K. Popelka, Blackwater Gold, pers. comm.). However, logging of cut-blocks near Lake 16 and between Davidson Creek and Creek 704454 will not begin until after the start of the fish salvage in July (K. Popelka, Blackwater Gold, pers. comm.). Therefore, access to Davidson Creek will exist at the following locations for use during the fish salvage:

- Lake 16 downstream to the mine access road at Km 13 (i.e., Access 01); this includes access to reaches 11 and 12 and the upper 500 m of Reach 10 of Davidson Creek

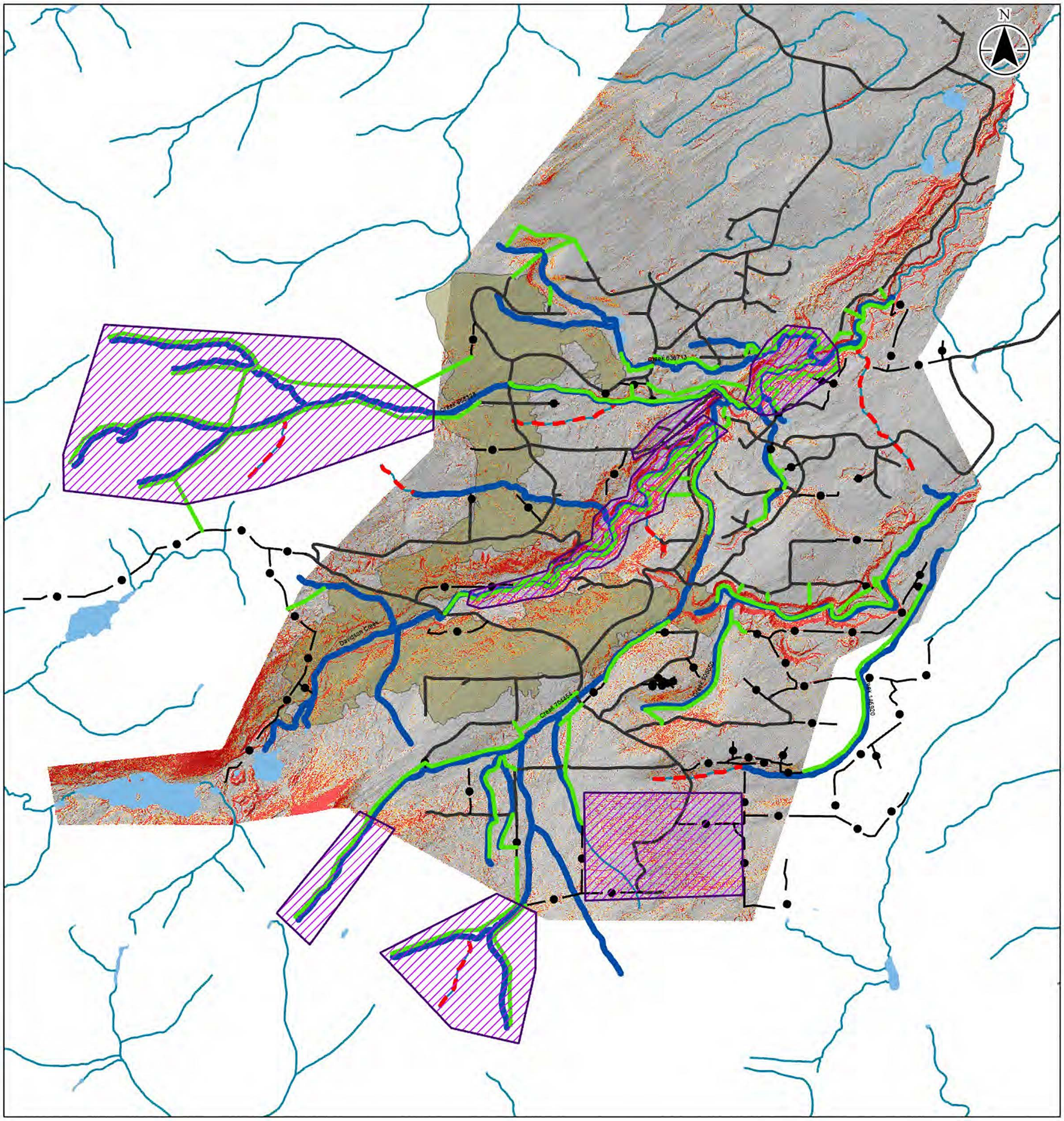
- At the end of spur roads off the ‘C trail” (i.e., Access 03) and the A-trail (i.e., Access 02), providing access to Reach 10 of Davidson Creek
- At the end of the spur road off the C-trail in the vicinity of the Main Dam C for the TSF (i.e., Access 05), providing access to the lower 200 m of Reach 10 of Davidson Creek
- At the end of the spur road off the C-trail in the vicinity of the environmental control dam (i.e., Access 07), providing access to Reaches 8 and 9 of Davidson Creek
- At the end of the spur road off the A-trail in the vicinity of the environmental control dam (i.e., Access 06), providing access to Reaches 8 and 9 of Davidson Creek
- At the end of the spur road off the C-trail in the vicinity of the freshwater reservoir (i.e., Access 08), providing access to Reach 7 of Davidson Creek
- At the end of an existing exploration drilling road off the A-trail in the vicinity of the freshwater reservoir, providing access to Reaches 6 and 7 of Davidson Creek
- the unnamed Davidson Creek tributary that will be affected by the north diversion channel
- an approximately 600 m section of Creek 668328, a tributary of Davidson Creek

Existing roads will provide access to Creek 704454 for the fish salvage at the following locations:

- Km 15 on the mine access road, providing access to Reaches 4 and 5 of Creek 704454
- The bridge on the A-trail, providing access to Reaches 3 and 4 of Creek 704454
- The end of E-trail, providing access to Reach 1 of Creek 704454

Stantec conducted a geographic information system (GIS) analysis to determine where new access would be needed to facilitate the transport of captured fish out of the creek valleys (Figure 2). This analysis used available LiDAR imagery, Canfor cut-block layer imagery, and the existing road, seismic line, and drill road networks provided by Blackwater Gold, and the 1:50,000 stream network from the BC Watershed Atlas. It was assumed that new access, suitable for an ATV with trailer (Figure 3), will be needed along any creek more than 100 metres from any existing road, trail, or seismic line. One hundred metres was selected based on the maximum distance that a field crew could repeatedly carry a cooler of fish and water without spilling, injury, or fatigue. Additional ATV trails were also identified to extend access from existing cut-blocks or roads to the top of the creek valleys. These additional trails will be needed for transport of fish to the downstream release locations by ATV or truck.

Based on this analysis, Stantec estimates that approximately 58,000 m of ATV trails need to be cut within and on top of the Davidson Creek, Creek 704454, Creek 636713, Creek 668328, Creek 5050659, and Creek 146920 valleys and their tributaries to expedite the fish salvage. The location of these ATV trails is shown in Figure 4.



Potential Access Issues
Potential ATV Access
Additional Roads
Local Roads
Upstream of Infrastructure
Fish Bearing
Non-Fish Bearing
Watercourses
Waterbodies
Future Cut Blocks

Slope in Degrees
0.1 - 15
15.1 - 20
20.1 - 81
LiDAR Extent Hillshade
254
0

0 0.5 1 1.5 2 km
1:30,000,000 (at original document size of 8.5x11)

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada

Stantec

Project Location: North Central BC
Project Number: 123222037
Prepared EHERTZMAN on 20221007
Requested by BHORNE on 2022107

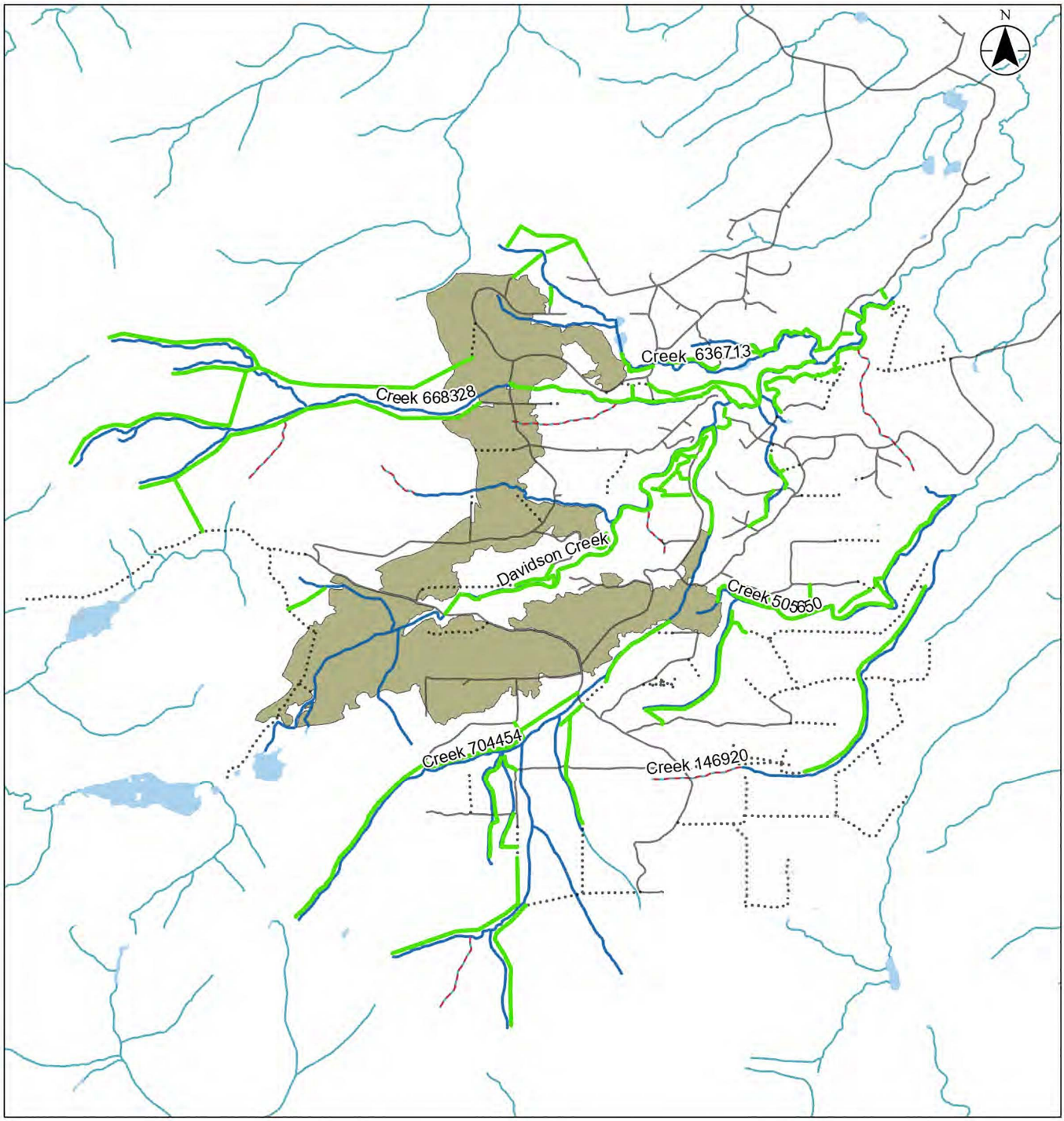
Client/Project/Report
Blackwater Gold
Fish Relocation

Figure No.
2

Title
ATV Road Planning

Revised: 2022-11-29 By: ehertzman

Figure 3 Example of ATV with all-terrain trailer (Source: Marlon Recreational Products)



Additional Roads
Local Roads
Watercourses
Fish Bearing
Non-Fish Bearing
Waterbodies
Future Cut Blocks
Potential ATV Roads

0 0.5 1 1.5 2 km
1:30,000,000 (at original document size of 8.5x11)

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada

Stantec

Project Location:
North Central BC

Project Number: 123222037
Prepared EHERTZMAN on 20221007
Requested by BHORNE on 2022107

Client/Project/Report
Blackwater Gold
Fish Relocation

Figure No.
4

Title
Proposed ATV Roads

4.4 Fish Capture Methods and Effort

Stantec generally agrees with the field methods proposed by Palmer (2022):

1. isolate the area to be salvaged
2. capture fish using methods appropriate for the habitat
3. collect data on sampling effort and number, and morphology of fish, by species
4. relocate fish to appropriate areas

However, Stantec recommends that the fish salvage include a multi-pass approach, comprised of a minimum of two consecutive passes using non-lethal methods within the isolated areas (i.e., 50 m to 100 m sections depending on habitat conditions). While it is unlikely that all fish within an isolated area can be captured, the multi-pass approach will need to show a minimum of 95% fish removal as required by conditions of the provincial Scientific Fish Collection Permit (Appendix A). The number of passes needed to achieve this removal rate will depend on the complexity of the habitat being sampled, the number of fish in the area, and the effectiveness of the gear. Field crews should have tablets with depletion formulas on a spreadsheet to estimate numbers of fish in the isolated areas (with standard error) and to show graphically how quickly the asymptote is being reached with each successive pass.

Most of the habitat to be salvaged is flowing stream and backpack electrofishing within closed sections (i.e., block nets at upstream and downstream ends) is likely to be the most efficient method for capturing fish. However, care should be taken to maximize the effectiveness of the backpack electrofishers for the size and species of fish most likely to be encountered during the fish salvage (i.e., rainbow trout between 50 and 150 mm) and the electrical conductivity of the water (i.e., between 50 and 160 µS/cm in Davidson Creek). This is done by altering the pulse frequency and duration with various voltages so that the duty cycle (i.e., the percentage of time that an electrical field is applied to the water) is between 10% and 50%. Optimizing the duty cycle for the conductivity of the water and the size and species of fish will increase the radius of effective fish immobilization and decrease fish mortalities. The contractor(s) selected for the fish salvages should be made aware of guidance on electrofishing duty cycles in Miranda and Dolan (2004), Dean and Temple (2011), and Meyer et al. (2021).

Other techniques may be more effective for capturing juvenile rainbow trout in beaver impoundments and wetlands that may be encountered during the salvage. These methods included minnow traps baited with cat food or roe or beach seining. Minnow traps may also be set overnight in pools within flowing sections of the creeks, but deployment of these traps should be restricted to the sections of creek sampled that day so not to substantially reduce the amount of time left in the day for electrofishing. Minnow traps should also be deployed only when dissolved oxygen is confirmed to be 6.0 mg/L or greater. Beach seining will only be effective in areas with small substrates and very little woody debris and should be conducted using the same multi-pass approach used for backpack electrofishing so that depletions can be recorded. The provincial Scientific Fish Collection Permit conditions require a minimum of three non-lethal collection methods to be used for any fish salvage. However, the methods used and their deployment will be dependent on the habitat present.

4.5 Fish Handling and Transport

4.5.1 Temporary Storage of Fish

Captured fish will need to be temporarily stored on the creek banks or in the creeks until they can be transported out of the creek valley. This temporary storage needs to be light and easy to move given that the field crews will gradually move upstream as they complete salvaging within discreet sections of habitat and, in many locations, fish (and water) will need to be transported along the creek banks to a central egress location (see section below). Captured fish will also need to be temporarily stored at the top of the creek valleys until they can be transported downstream to the release locations.

Rainbow trout are cold-water fish with a preferred temperature range between 12°C and 18°C (Wismer and Christie 1987) and an optimal temperature of 15.5°C (Hasnain et al. 2010). Rainbow trout also require water with dissolved oxygen concentrations >6 mg/L. Because dissolved oxygen saturation is dependent on water temperature, optimal dissolved oxygen concentrations for rainbow trout are ≥ 7 mg/L at temperatures ≤15°C and ≥ 9 mg/L at temperatures >15°C (Raleigh et al., 1984). Survivorship of captured rainbow trout will be high if water temperatures and dissolved oxygen concentrations in the water used to hold the fish can be maintained within these bounds during transport from the capture sites to the release points.

The fish salvage will be conducted during the summer when air temperatures near Vanderhoof can frequently exceed 25°C. Therefore, to keep water temperatures cool (i.e., <18°C) and dissolved oxygen concentrations high (i.e., >7 mg/L) and to reduce stress on the fish, Stantec recommends:

- Storing captured fish in the creek in “pens” or on the creek banks in coolers with lids and handles
- Only using creek water in the holding tanks used to hold fish on the side of the creek and at the top of the creek valleys
- Placing holding tanks (e.g., steel horse troughs) at the top of the creek valleys and keeping these tanks under shade (e.g., portable tent)
- Placing electric chillers and bubblers in the holding tanks
- Placing portable bubblers in the coolers used to hold fish on the creek banks and in the ATV trailers
- Placing covers over the tanks when not actively adding or removing fish
- Replacing holding tank water on a regular basis (e.g., every three hours)

If high mortality rates are observed, un-ionized salt maybe added to the water to achieve a 0.8% salt solution (i.e., 8 g/L). Such a solution will have the same salt concentration as the fish itself and, therefore, will reduce the energy that fish expend to maintain their salt balance.

4.5.2 Egress of Fish from Creeks

Much of Davidson Creek and its tributaries and the headwater tributaries of Creek 661 are confined in steep-sided (e.g., >40%) valleys. These slopes are too long and too steep for field crews to carry fish and

water up without spilling, injury, or fatigue. This is particularly true given that field crews would need to climb these slopes multiple times a day. For this reason, Stantec has identified two options to transport fish out of the creek valleys: 1) a helicopter with collapsible water bucket (Figure 5); or 2) a mechanical hillslope conveyance system.

4.5.2.1 Helicopter Option

To facilitate transfer of fish with a helicopter, clearings would have to be cut adjacent to each creek to provide sufficient room between the trees for the helicopter to safely land or lower the water bucket. These clearings would need to be cut in central areas so that fish could be brought to them by the crews from upstream and downstream via ATV or on foot. The benefits of using a helicopter are: 1) requires no additional infrastructure beyond that needed to clear the areas of trees and underbrush; 2) fish can be transferred from the salvage area directly to the release locations downstream (i.e., no need for land-based vehicles); 3) time efficient. The downsides of using a helicopter to transfer fish are: 1) expensive given that the helicopter would need to be used every day during salvage; 2) can't work in heavy fog, smoke, or wind; and 3) availability may be limited during summer fire season.

Figure 5 Bell 407 Long-ranger with Collapsible Water Bucket

4.5.2.2 Mechanical Hillslope Conveyance System

A mechanical hillslope conveyance system is cheaper, not limited by weather, and does not depend on helicopter availability. However, it requires more equipment and man-power to use, requires additional

transportation to get the fish downstream to the release location, and requires moving equipment between sites or installing multiple systems.

The mechanical hillslope conveyance system needs to be portable, to adjust to the changing locations of the field crews in the creeks, relatively easy to set up, and reasonably inexpensive given that there may be a need for one system for each field crew involved in the salvage. The constraints on this system are that it must be water-tight (if reliant on being pulled uphill on the ground) or be able to hold a container full of fish and water plumb to the ground so that water and fish don't spill out.

Stantec has identified three possible systems for use:

- Tram system
- Forestry cable system
- Sled with water-tight container

The tram system involves installing aluminum tracks, mounted on a support rack, down the slope of the hill (Figure 6). Once installed, a tram car is pulled up the tracks using a cable winch system mounted at the top of the hill. This could be a winch mounted on a trailer or a truck or ATV mounted winch, depending on the weight of the tram, container, water, and fish. The benefits of this system are: 1) smoothest and, therefore, least stressful mode of transport for fish; 2) adjustability to decrease or increase track length; and 3) simple to use once installed. The downsides of this system are: 1) difficult to move between locations; 2) needs to be manufactured prior to salvage; 3) requires customization to provide flexibility where it can be installed; and 4) cost.

Figure 6 Hillslope Tram System (Source: Marine Innovations Inc.)

The forestry cable system uses a mainline cable and pulley-wheeled “carriage” that is suspended from a “skyline” cable anchored at the top and bottom of the hillslope (Figure 7). The mainline is connected to a winch at the top of the hill and when engaged, the winch pulls the mainline and carriage along the skyline up the hill. Fish would be placed in a bucket that would hang from the “carriage” and would be pulled uphill with the mainline. For the fish salvage, mine rescue lifting frames could be used to suspend the skyline off the ground from the top of the hill (Figure 8). The skyline cable would be anchored to a tree at the bottom of the slope with a block and tackle or “come-along”.

The advantages of this system are: 1) relatively easy to set up; 2) flexible to various slope lengths and gradients; 3) minimum equipment requirements; and 4) cheaper than tram system. The disadvantages of this system are: 1) lower weight capacity than tram system; and 2) potential safety issues with cables under tension and container of fish and water suspended in the air.

The sled system is the simplest method of the three. It involves pulling a heavy plastic sled, with a cooler full of fish and water tethered inside, uphill on a winched cable. This system would not require any pre-construction or installation but would require clearing the hillslope of logs, trees and shrubs that could impede or catch on the sled during its ascent. It would also be the cheapest and easiest to move between locations. The disadvantages of this system are: 1) it would provide the roughest and, therefore, most stressful mode of transport for fish; 2) it poses a risk of flipping over and spilling water and fish out during ascent; and 3) is likely to require the most labour to operate.

4.5.3 Recommendation

Stantec recommends the forestry cable system, coupled with the mine rescue lifting system, for transporting fish out of the creek valleys. This system provides the best combination of flexibility to the terrain, portability to different locations in the watersheds, easy of set up and use, while reducing stress on fish. Once out of the creek valleys, Stantec recommends transporting the fish to the downstream release locations by ATV or truck. This is because an extensive access road networks already exists which can be used to efficiently move fish.

A mechanical hillslope conveyance method coupled with ground-transportation is recommended instead of the helicopter option. This is because of the helicopter’s much greater cost and its associated weather and availability constraints.

Figure 7 Forestry Cable Skyline System

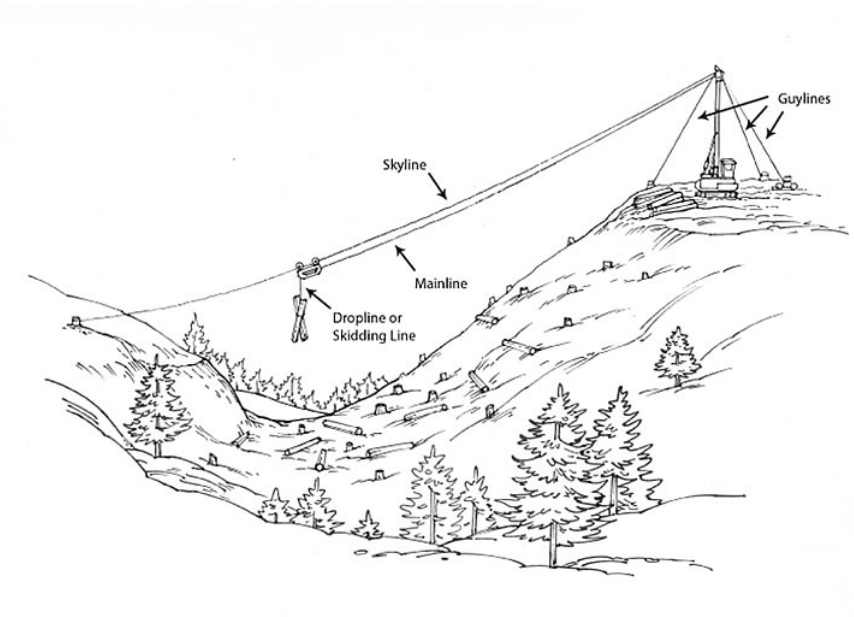


Figure 8 Mine rescue lifting frame

4.6 Fish Release Locations

Palmer (2022) identified eight potential fish release locations in Davidson Creek, one potential fish release location in Lake 16, and five potential fish release locations in Creek 661. The rationale provided for these various fish release locations was to avoid ancillary effects (i.e., transfer of genetic material or parasites) by releasing fish into waters which they would use over their entire life history (Palmer 2022).

Stantec agrees that fish should be released in the same watershed in which they were captured. However, Stantec recommends that the number of fish release locations be reduced to:

- Reach 6 of Davidson Creek downstream of the Freshwater Reservoir for all fish captured in reaches 7 to 10 of Davidson Creek and all its tributaries
- Reach 2 or 3 of Creek 505659 for all fish captured in Creek 661 tributaries 505659 and 146920
- Lake 16 for all fish captured in reaches 11 and 12 of Davidson Creek

The reason for this reduction in release locations is to reduce the distance and handling time required to move fish. It is assumed that fish will naturally re-distribute themselves based on the available habitat and the density of fish already present.

4.7 Prevention of Fish Immigration into Salvaged Areas

Prior to commencement of fish salvages in the Davidson Creek and Creek 661 watersheds, barriers to upstream fish passage will need to be constructed in Reach 6 of Davidson Creek, downstream of the Freshwater Reservoir, and in Reach 2 or 3 of Creek 505659 to prevent captured fish from returning to previously salvaged areas. Davidson Creek in Reach 6 has an average bankfull width of approximately 5 m. Creek 505659 in the Creek 661 watershed has an average bankfull width of approximately 3 m. Four types of barriers are possible for the Blackwater Gold Project's fish salvage at these two locations:

- Nets, fences, or weirs
- Electric barriers
- Velocity barriers
- Vertical drop structures

Each of these barrier types is described below.

4.7.1 Nets, fences, and weirs

Nets, fences, or weirs require the physical placement of netting, wire or plastic fabric, or a vertically placed conduit in the creek channel. The advantage of such a system is the relative ease of installation and lower capital cost compared to the other methods. However, the disadvantage of these systems is that they require maintenance to remove accumulated leaf litter and woody debris, are likely to be blown-out in spring when water velocities and water depths exceed 1.5 m/s and 1 m, respectively, and are

unlikely to withstand ice and snow in winter. Such a system would be effective in Creek 505659 during the open-water season, but not in Davidson Creek.

Mesh size for any net or fence and the gap-opening between conduit pieces for any weir would need to be designed for the smallest rainbow trout likely to be captured in the creek. Based on a minimum rainbow trout length of 50 mm, a maximum stretch mesh size of 1/4” and a maximum gap-opening of ¼” should be used. The advantage of a weir (Figure 9) over a net or fence (Figure 10) is that they are stronger and require less maintenance once in the water but require effort to install and cost more to build.

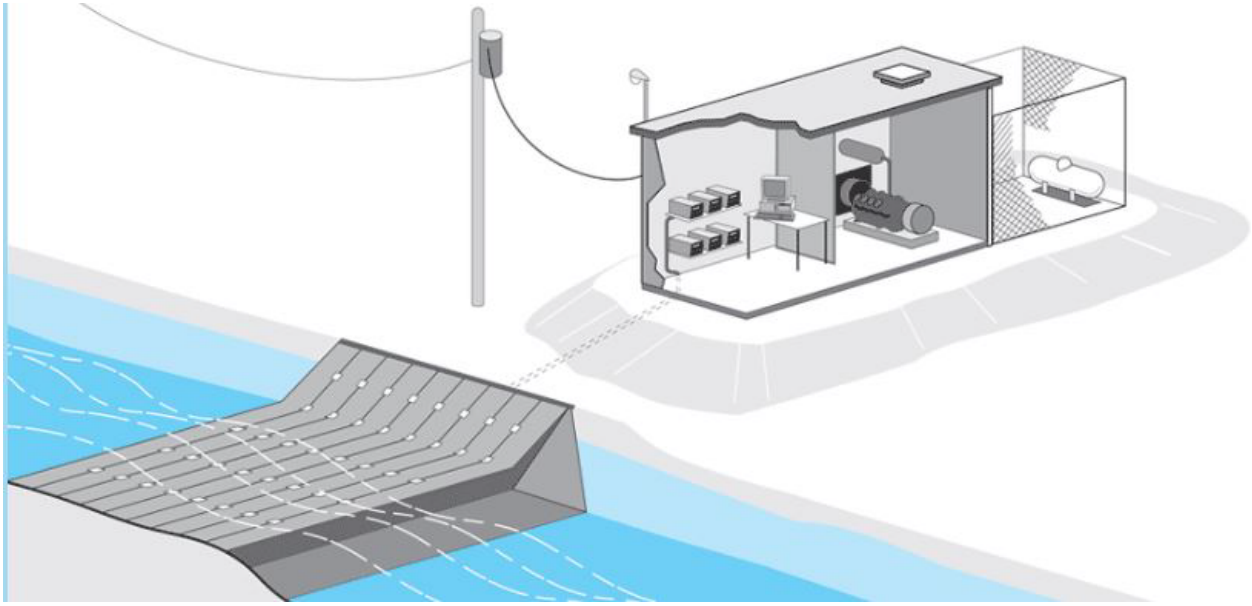
Figure 9 Conduit weir built in Philip Creek in fall 2020 for Thompson Creek Metals Company

Figure 10 Fish fence built in Rainbow Creek in 2020 for Thompson Creek Metals Company

4.7.2 Electric barriers

Electric barriers work by putting an electric field in the water perpendicular to the flow. As fish approach this field, they detect it and turn downstream to avoid being stunned. An electric barrier generally consists of a series of electrodes (i.e., cables or metal bars) attached to the bottom the creek and up the sides of the creek to prevent fish from passing during higher water levels (Figure 11) The cables or bars need to be anchored to the bottom, either with weights or within a concrete sill, so they do not move and become detached from the electric generator on shore. The advantage of an electric barrier is that they do not require any physical structure to be placed in the water that would need regular maintenance and are effective at high and low flows. The disadvantage of an electric barrier is that they are more costly than nets, fences, or weirs and require specialized personnel to design and install (i.e., Smith-Root in Vancouver, Washington, USA).

Figure 11 Typical electric fish barrier arrangement (Source: Smith-Root™)



4.7.3 Vertical barriers

Vertical barriers work by creating a vertical drop in the stream that is high enough that fish cannot jump over it. To be successful, the barrier needs to be high enough and have insufficient depth immediately downstream for a fish attain the swims speeds needed to jump over the barrier. Therefore, the ideal barrier includes a vertical drop with a shallow, non-erodible platform immediately downstream.

Compared to other fish species in the interior of British Columbia (e.g., suckers, burbot), rainbow trout are strong swimmers with good jumping ability. Therefore, the barrier required to preclude them from returning upstream into the salvaged area needs to be higher than it would be for other species.

However, most rainbow trout in Davidson Creek and Creek 661 are small (i.e., <200 mm), so the barrier does not need to be as high as it would be for larger trout or steelhead.

How high a rainbow trout can jump depends on physical and biological factors including, but not limited to, pool depth below the vertical barrier, fish length and weight, water temperature, water turbulence, and height of standing wave below the barrier. In general, rainbow trout between 100 mm and 250 mm in length have a burst swimming speed between 0.200 m/second and 0.229 m/second with smaller fish having higher relative swimming speeds (e.g., 21 body lengths/second for 100 mm long fish) than larger fish (9 body lengths/second for 250 mm long fish) (Webb 1975; 1976). Burst swim speeds are the speeds fish attain when jumping barriers. However, fish cannot attain these speeds to jump without sufficient water depths.

Based on research conducted on brook trout (Kondratieff and Myrick 2011), the height of the vertical drop built in Reach 6 of Davidson Creek should be at least 0.75 m high if water depths downstream of the barrier are >40 cm to prevent a 250 mm long trout from successfully passing over. Alternatively, the vertical drop could be reduced to a maximum of 0.40 m if water depths downstream of the vertical barrier are <10 cm. Conservatively, the vertical drop should be at least 1.0 m high with no downstream pool.

Reasonable methods to build such vertical barriers in Reach 6 of Davidson Creek include:

- A concrete lock block dam, like what Blackwater Gold proposes to build in Davidson Creek upstream of the Km 13 road crossing as part of the Central Water Transfer Pond
- A sheet pile dam with v-notch in middle, like those used for flow monitoring studies
- An Aquadam®, a collapsible water filled bladder (Figure 12)

Figure 12 Aquadam in Jacoby Creek (Source: Aquadam®)

Regardless of method used, the dam would need to extend high enough on both banks to prevent water from flowing around the dam and providing fish with a way through. This is because the dam will impound water behind it which will find the low point in the floodplain if not contained. The ideally sized and placed dam will impound the water and only release water over its crest such that a vertical drop is attained. Additionally, all three methods will need to include an energy-dissipator (e.g., rock armouring or installation of a metal plate) immediately downstream to prevent a plunge pool from forming.

Each vertical barrier method has advantages and disadvantages:

- A concrete lock block dam would likely require some excavation of the channel prior to installation to ensure a water-tight fit and would require heavy equipment for the installation and to build an access road for a flat-bed truck to deliver the blocks to the site. However, this option would provide flexibility in how high and wide the dam would be built. Ideally, the dam is built high enough so that one or two lock blocks can be removed from the middle of the top row to create a more concentrated “waterfall”.
- A sheet pile dam would require installation with an excavator or pile driver. The depth that the sheet pile could be hammered into the channel bottom would be dependent on the presence of large boulder substrates and/or bedrock. This option would be the most difficult to remove from the creek as well.
- An Aquadam® does not require any heavy equipment to install and can be moulded to the channel easier than the other two methods. However, a number of Aquadams® likely would need to placed on top of each other to attain the required vertical drop. Use of Aquadams would also preclude the ability to create a concentrated “waterfall”; instead, water would likely flow over a larger area of the dam than the other two methods. Because they are water filled, Aquadams would also be susceptible to damage during the winter.

4.7.4 Recommendation

Based on bankfull widths and site conditions, Stantec recommends installation of a vertical barrier in Reach 6 of Davidson Creek using a concrete lock-block dam with Aquadams placed in the floodplain on either side and a fish-fence in Reach 3 of Creek 505659. The recommendation for a fish-fence in Creek 505659 assumes that the bankfull width of the creek in Reach 3 is <3.5 m and the peak spring discharge is <0.3 m^3/sec (based on BC Omineca Region WaterTool).

4.8 Estimated Fish Salvage Duration

Approximately 80,000 linear meters or 171,000 m^2 of fish habitat needs to be salvaged of fish prior to construction of the Blackwater Gold Project (Table 2). These estimates include fish habitat effected by the deposit of deleterious mine tailings (i.e., Schedule 2 amendment of the MDMER) and harmfully altered, disrupted, or destroyed (i.e., Section 35(2)(b) *Fisheries Act* Authorization) by mine infrastructure.

Table 2 Dimensions of streams requiring fish salvage for the Blackwater Gold Project

Watershed	Stream	Length (m)	Area (m2)	Estimated average width (m)
Creek 661	Mainstem tributaries	794	794	1.0
	Creek 146920	6,842	9,451	1.4
	Creek 505659	8,218	14,832	1.8
	Creek 505659 tributaries	1,125	2,414	2.1
Davidson Creek	Mainstem	9,501	33,221	3.5
	Mainstem tributaries	10,802	13,865	1.3
	Creek 636713	4,650	15,962	3.4
	Creek 688328	5,342	14,271	1.8
	Creek 704454	7,930	20,639	2.6
	Creek tributaries	21,301	23,571	1.1
Total		**79,689**	**171,067**	

The effort required for fish salvage crews to deplete creek sections of fish is dependent on the size and complexity of the habitat (i.e., larger creeks take longer to salvage than smaller creeks). Assuming salvages are conducted using multiple pass depletions in “closed sites” with a backpack electrofisher, Stantec estimates that one crew of three field technicians can salvage:

- 250 m per day in streams >4 m wide
- 500 m per day in streams between 3 m and 4 m wide
- 750 m per day in streams between 2 m and 3 m wide
- 1000 m per day in streams between 1 m and 2 m wide
- 1500 m per day in stream <1 m wide

Based on these assumptions, Stantec estimates that the fish salvage could be completed in 35 days with three crews of three field technicians or 26 days with four crews of three field technicians. Each field day is 12 hours long. An additional month would likely be necessary for a silviculture crew to cut ATV trails and remove woody debris from the creeks prior to the start of the fish salvage.

5 References

British Columbia Ministry of Water, Land, and Air Protection (MWLAP). 2004. Terms and Conditions for Changes In and About a Stream Specified by MWLAP Habitat Officers, Omineca Region.

British Columbia Ministry of Water, Land, and Air Protection (MWLAP). 2004. Region 7 Omineca – Reduced Risk Timing Windows for Fish and Wildlife. Standards and Best Practices for instream works. Environmental Stewardship Division, Omineca Region Ecosystem, BC Ministry of Water, Land, and Air Protection. April 2004.

Dean, J.C., and A.J. Temple. 2011. Maximum output of peak power for two backpack electrofishers operated at various pulsed direct current duty cycles and water conductivity levels. N. Am. J. Fish. Manag. 31:520-529.

Hasnain, S.S., C.K. Minns, and B.J. Shuter. 2010. Key ecological temperature metrics for Canadian freshwater fishes. Applied Research and Development, Ontario Forest Research Institute, Ontario Ministry of Natural Resources. Climate Change Research Report CCRR-17.

Kondratieff, M.C., and C.A. Myrick. 2011. How high can brook trout jump? A laboratory evaluation of brook trout jumping performance. Trans. Am. Fish. Soc. 135:361-370.

Meyer, K.A., L.V. Chiarmonte, and J.B. Reynolds. 2021. The 100-Watt Method: a protocol for backpack electrofishing in small streams. Fisheries 46: 126-130.

Miranda, L.E., and C.R. Dolan (2004). Electrofishing power requirements in relation to duty cycle. N. Am. J. Fish. Manag. 24:55-62.

Palmer (2022). Blackwater Project: Fish Salvage and Relocation Plan. A report prepared for Blackwater Gold Limited, Vanderhoof, BC by Palmer Environmental Consulting Group, Vancouver, BC.

Raleigh, R.F., T. Hickman, R.C. Solomon, and P.C. Nelson. 1984. Habitat Suitability Information: Rainbow Trout. Western Energy and Land use Team, Division of Biological Services, Research and Development, Fish and Wildlife Service, U.S. Department of the Interior. FWS/OBS-82/10.60. January 1984.

Webb, P.W. 1975. Acceleration performance of rainbow trout and green sunfish. J. Exp. Biol. 63:451-465

Webb, P.W. 1976. The effect of size on the fast-start performance of rainbow trout and a consideration of piscivorous predator-prey interactions. J. Exp. Biol. 65:157-177.

Wismer, D.A., and A.E. Christie. 1987. Temperature relationships of Great Lakes fishes: a data compilation. Great Lakes Fishery Commission Special Publication No. 87-3. Ann Arbor, MI, USA

6 Appendices

Appendix A: Fish Collection Permit Terms

Any Variation of the following terms will require explicit authorization by the appropriate regional Fish & Wildlife Section Head.

Provincial Terms

1. This collecting permit is **only** valid for species listed as threatened, endangered or extirpated under the *Species at Risk Act* (SARA) **in conjunction with a permit issued under Section 73 of SARA from Fisheries and Oceans Canada.**

   NOTE: Contact the Department of Fisheries and Oceans for fish collecting permits for salmon, eulachon or SARA listed species (see Appendix B).

2. Any specimen's surplus to scientific requirements and any species not authorized for collection in this permit must be immediately and carefully released at the point of capture.

3. Fish collected under authority of this permit must not be used for food or any purpose other than the objectives set out in this permit. Dead fish must be disposed of in a manner that will not constitute a health hazard, nuisance or a threat to wildlife.

4. No fish collected under authority of this permit must be transplanted unless separately authorized by the Federal/Provincial Introductions and Transfers Committee.

5. The permit holder must, within 90 days (120 days for the Kootenay/Boundary region and Peace region) of the expiry of this permit, submit a report of fish collection activities. Interim reports may also be required and must be submitted as required by the permit issuer. All submissions must be filed electronically to: https://www2.gov.bc.ca/fish-data-submission-process.

   Reporting specifications, information and templates are available from this website and outline the mandatory information requirements. Prior notification of submission or questions regarding data report standards can be made to: fishdatasub@gov.bc.ca

6. The permit holder must comply with all Workers' Compensation Board requirements and other regulatory requirements. The permit holder is responsible for ensuring authorized persons listed on the permit are properly certified for specific sampling methods or activities (e.g. electroshocking).

7. Any workers not listed on the permit must be supervised by the permit holder or one of the authorized persons named on the permit.

8. All sampling equipment that has been previously used outside of B.C. must be cleaned of mud and dirt and disinfected with 100mg/L chlorine bleach before using in any water course to prevent the spread of fish pathogens (e.g. whirling disease) and/or invasive plant species. Any washed off dirt or mud must be disposed of in a manner such that it cannot enter a watercourse untreated.

9. No electrofishing is to take place in waters having a temperature less than five degrees C.

10. No sampling of fish in waters having a temperature greater than twenty degrees C.

11. Electrofishing must not be conducted in the vicinity of spawning gravel, redds, or spawning fish, or around gravels which are capable of supporting eggs or developing embryos of any species of salmonid at a time of year when such eggs or embryos may be present.

Provincial Terms continued

When work requires de-watering or isolation of the worksite in the stream, a permit for the salvage of fish and wildlife (Scientific Fish Collection permit) must be obtained prior to commencing work. All required salvage permits must be obtained from FrontCounter BC: http://www.frontcounterbc.gov.bc.ca/

Any fish or wildlife salvage must be carried out by a qualified environmental professional registered with a professional association (such as an R.P.Bio.). The qualified professional conducting salvage work must adhere to the conditions below in addition to those required in the Scientific Fish Collection permit.

- Salvage activities must be conducted to the Provincial Resource Information Standards Committee (RISC) standards for capture, data collection, handling and release:

STREAM ISOLATION

- The QP must follow the standards and practices outlined in the Work Area Isolation Appendix found in the Standards and Best Practices for Instream Works. http://www.env.gov.bc.ca/wld/documents/bmp/iswstdsbpsmarch2004.pdf
- A QP must ensure that the worksite has be substantively isolated to prevent any fishes from entering the work area and efforts must be made to exclude fish from entrapment during installation of isolation works. (See section 14.2 of the Standards and Best Practices for Instream Works (MWLAP 2004).
- Dewatering must not result in HADD to fish habitat or the death of fish unless authorized by Fisheries and Oceans Canada.
- While dewatering the work site and dewatering during fish capture, all pump intakes are required to meet the federal COP for fish intake screening guidelines https://www.dfo-mpo.gc.ca/pnw-ppe/codes/screen-ecran-eng.html.

FISH CAPTURE

- Qualified professionals must determine appropriate sampling methods from the RISC standards based on water body type and habitat conditions https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/nr-laws-policy/risc/fishml04.pdf.
- Qualified professionals must use a risk hierarchy of passive to active and low risk to higher risk in collection methods (e.g., minnow traps, fyke nets, beach pole seines, electroshocking, angling).
- Qualified professional must conduct a **minimum of three** non-lethal collection methods in all fish salvages.
- For active collection methods a minimum of two consecutive passes of each method that produces a zero catch must be completed as per total population removal methodology (at a minimum 95% fish removal must be achieved). (https://www.wildsalmoncenter.org/resources/field-protocols-best-monitoring-practices/).
- Where work site isolation cannot be fully achieved (e.g., fast flowing streams, imperfect seal due to substrate) additional efforts are needed to prevent harm to fish. At the end of each workday, a passive form of fish capture (e.g., baited minnow traps) are to be placed in the isolation site. If fish are captured overnight, you must restart isolation procedures at the start of the workday.
- If species at risk are captured, work must stop until proper permits are obtained.

DATA COLLECTION

- Sampling/data collection is a requirement of the Scientific Collection Permit. Sample size requirements are listed in the table below.
- Scientific Fish Collection Permits require a Fish Data Submission Template to be completed. Step 4 (Stream Site Data) of the Fish Data Submission Template must be filled out for the location where fish are salvaged from. https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/fish/fish-and-fish-habitat-data-information/fish-data-submission/submit-fish-data

FISH RELEASE

- Fish must be released following RISC standards.

- All species are to be released in the same watercourse downstream of the work areas or a sufficient distance upstream (5 channel widths to a maximum of 100 meters) into waters of equivalent baseline quality and habitat type (pool, riffle, run).

Minimum Standards During Salvage for Fish Collection Sampling Effort*

Fish Species	Age Class	Size range	Minimum Sampling Size for lengths	Sample column required (from Individual Fish Data form)	Notes
Salmonids, including RB, CT(CCT), DV, BT, GR, LT, KO	fry	20 to 80 mm	up to 30 after 30 count	J (if possible), K	
	juvenile	81 mm-250 mm	Measure all fish caught	J, K, L	
	adult	greater than 250 mm	Measure all fish caught	J, K, L, M, N	
Coarse Fish (cyprinids, stickleback, dace, shiner, carp, pikeminnow)		under 200 mm	up to 30 after 30 count	J, K	
	Adult	over 200 mm	All	J, K, L, M	
Sport other (bass, perch, sunfish, walleye, northern pike)		all	up to 30 after 30 count	J, K, L	
Sculpin sp.		0-150mm (total length)	up to 30 after 30 count	J, K	
		Over 150mm	All	J, K, L	
Burbot, Lamprey		0-150 mm (total length)	All	J, K, L, N	
Listed Species (salish sucker, sturgeon, etc.)		All	All		Refer to SAR permit for conditions
All fishes not listed above		All	minimum 10 of each then count only	J, K, L	

Abbreviations for salmonids

RB-Rainbow
CT(CCT)-Cutthroat
DV-Dolly Varden
BT- Bull Trout
GR- Arctic Grayling
LT- Lake Trout
KO- Kokanee

Region Specific Terms

West Coast Region

- Within the boundaries of Management Units 1-1 through 1-13, there is no electrofishing in: (1) streams above 630 meters elevation, (2) in anadromous rivers from January 1 to June 30, (3) or any lake tributaries from January 1 to June 30.
- All sampling gear follow Association of Professional Biologists' advisory practice bulletin #5. Practice Advisory – Dydimo, see: http://a100.gov.bc.ca/pub/eirs/viewDocumentDetail.do?fromStatic=true&repository=BDP&documentId=9469
- The permit holder must advise the West Coast Region of sampling activities 24 hrs. prior to field operations. Please complete the following notification form: http://www.env.gov.bc.ca/pasb/reports/fish/permit_notify1.html

South Coast Region

- The permit holder must notify Fish and Aquatic Habitat Branch of the Ministry of Forests, Lands, Natural Resource Operations and Rural Development at SCFishandAquaticWildlife@gov.bc.ca with the following information at least 24 hours prior to undertaking work:
    - approved SFC permit number
    - company
    - contact
    - address
    - phone
    - water body
    - purpose of collection
    - start date
    - end date
- All streams sampled, for which a watershed code does not presently exist, will require a map showing the location of the stream and sampling location with the map scale identified at time of reporting.
- Electrofishing and minnow trapping can harm or kill non-target species of management concern such as the endangered Coastal Giant Salamander (within the Chilliwack River drainage system), Oregon Spotted Frog, and Pacific Water Shrew (within the lower Fraser River Valley). Any incidental captures (alive or dead) of any red-listed or blue-listed wildlife species must be reported to the Ministry of Forest, Lands, Natural Resources and Rural Development, South Coast Region. For further information on these species or to report incidental captures, please contact the Fish and Aquatic Habitat Branch by e-mail at SCFishandAquaticWildlife@gov.bc.ca.
- All non-native fish species captured under this permit are to be humanely euthanized and disposed of appropriately. Within 48 hours of capture, a record of the species, capture location, date, waterbody, number, size range (mm) and digital imagery must be submitted to the Fish and Aquatic Habitat Branch by email at SCFishandAquaticWildlife@gov.bc.ca. Non-native fish species include but are not limited to: American Shad; Black Catfish; Black Crappie; Brown Catfish; Carp; Goldfish; Largemouth or Smallmouth Bass; Pumpkinseed Sunfish; and Weather-fish.
- Please refer to the following website for the least risk in-stream work windows: https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-licensing-rights/working-around-water/regional-terms-conditions-timing-windows. Where possible, collection should be conducted during the least risk work windows identified. The exception is seasonal or ephemeral streams where sampling may not be possible during the prescribed window due to flow conditions.
- The permit holder must refer to the following when sampling Salish Sucker, Nooksack Dace and Stickleback species.
  Salish sucker sampling guidelines -
  http://www.frontcounterbc.gov.bc.ca/pdf/SalishSuckerCollectionGuidelines2015.pdf

Nooksack dace sampling guidelines – http://www.frontcounterbc.gov.bc.ca/pdf/NooksackDaceCollectionGuidelines2015.pdf

Stickleback species pairs sampling guidelines - http://www.dfo-mpo.gc.ca/species-especes/publications/sara-lep/stickleback-epinoches/index-eng.html

Thompson/Okanagan Region

- Please refer to information at: https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-licensing-rights/working-around-water/regional-terms-conditions-timing-windows for the appropriate in stream work windows.

Kootenay/Boundary Region

- No electrofishing is permitted between September 15 and June 15 in streams containing bull trout.
- The permit holder must contact the local zone Conservation Officer Service prior to initiating the field collections.
- All burbot traps must have a section in the top or sidewall that has been secured by a length of untreated, 100% cotton twine no greater than No. 30 (e.g. 30 thread count) or 3 mm diameter. When twine deteriorates, this must produce a square opening with a minimum size of 20 cm x 20 cm. This is intended to ensure that if the trap is lost, the section secured by the twine will rot, allowing captive fish to escape, and preventing the trap from continuing to fish.
- All sampling gear follow Association of Professional Biologist's advisory practice bulletin #5. Practice Advisory Dydimo, see: http://a100.gov.bc.ca/pub/eirs/viewDocumentDetail.do?fromStatic=true&repository=BDP&documentId=9469
- All fishing gear (e.g. gill nets, minnow traps, etc.) that are left unattended must have the permit holders contact information (name and phone number).
- Within 120 days of expiry of this permit, the permit holder must submit a report that summarizes all field and any laboratory analysis data related to the sampling program (typically location of catch, species, individual fish tissue metals analysis, moisture content, fish length and weight, etc., and as applicable) and all associated raw laboratory data.

  The digital final written report (e.g. report, summary, memo, letter) is required and shall be submitted along with the standard format Excel data submission template.

Cariboo Region

- Cariboo Region requires seven days (7) written notice, complete with waterbody and watershed codes for the proposed areas prior to sampling in the Cariboo Region. Please submit written email notice to: Lee.Williston@gov.bc.ca or fax to 250 398 4214.
- Until such time as the permit holder has discussed specific activities with the Regional Manager and obtains written permission, fish collection, fish sampling or fish salvage may not be undertaken within the boundaries of Management Units 5-04 or 5-05.

Skeena Region

- For information related to Fish Collection Permit Activities in the Skeena Region, please contact Kristin Charleton at 250-876-7131 or Kristin.Charleton@gov.bc.ca.
- Accidental fish mortalities and or injuries that occur during salvage activities, related to this permit, must be reported to the Skeena Regional office within 48 hrs. Contact Troy Larden at Troy.Larden@gov.bc.ca or Kristin Charleton at Kristin.Charleton@gov.bc.ca to report.

Omineca Region

- The permit holder must advise Region 7A (Omineca) of sampling activities 48 hrs. prior to field operations by completion of the following form: http://www.env.gov.bc.ca/pasb/reports/fish/permit_notify7a.html
- No electrofishing is permitted between September 15 and June 15 in streams containing bull trout.
- Voucher specimens for all regionally significant red and blue-listed species (3 per species), with exception to SARA-listed white sturgeon (*Acipenser transmontanus*), must be submitted to the Regional Fish Information Specialist as per RISC standards.
- All sampling gear follow Association of Professional Biologist's advisory practice bulletin #5. Practice Advisory Dydimo, see: http://a100.gov.bc.ca/pub/eirs/viewDocumentDetail.do?fromStatic=true&repository=BDP&documentId=9469.When lethal sampling has occurred for the purposes of environmental effects monitoring or impact assessment, the permit holder must, within 90 days of the expiry of this permit, submit a report that summarizes all raw data related to the lethal program. This would typically include location of catch, species, fish tissue metals analysis, fish tissue moisture content, fish length and fish weight, at minimum. Interim reports may also be required and must be submitted as required by the permit issuer. All fish tissue analysis data related to the lethal program must be submitted ALONG with the standard sampling effort data submission template to https://www2.gov.bc.ca/fish-data-submission-process. Questions regarding submission requirements for lethal sampling may be directed to Susanne.Weber@gov.bc.ca.

Peace Region

- No electrofishing is permitted between September 15 and June 15 in streams containing bull trout.
- All sampling gear follow Association of Professional Biologists' advisory practice bulletin #5. Practice Advisory – Dydimo, see: http://a100.gov.bc.ca/pub/eirs/viewDocumentDetail.do?fromStatic=true&repository=BDP&documentId=9469
- All fishing gear (e.g. gill nets, minnow traps, etc.) that are left unattended must have the permit holders contact information (name and phone number).
- Within 120 days of expiry of this permit, the permit holder must submit a report that summarizes all field and any laboratory analysis data related to the sampling program (typically location of catch, species, individual fish tissue metals analysis, moisture content, fish length and weight, etc., and as applicable) and all associated raw laboratory data.

  The digital final written report (e.g. report, summary, memo, letter) is required and shall be submitted along with the standard format Excel data submission template.