

Al Irvine
New Graph Environment Ltd.
al@newgraphenvironment
250-777-1518
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Safety Plan - 2025-076-sern-skeena-fraser-fish-passage

The latest version of this pdf can be downloaded [here](#).

This project has two primary goals. The first is to conduct fish passage (Phase 1) and habitat confirmation (Phase 2) assessments within the Tabor River, Willow River, and Lower Salmon River watershed groups. The second goal is to implement baseline monitoring at previously assessed and/or remediated crossings in the Nechako River, Upper Fraser River, Morkill River, and Francois Lake watershed groups. Fieldwork will include electrofishing at permitted sites and collection of environmental DNA (eDNA) samples.

A summary of potential sites for fish passage assessments, habitat confirmation assessments, and electrofishing is provided in Table [7](#) and Figure [4](#). Google Earth (KML) and Garmin (GPX) files for the proposed sites are available for download [here](#).

New Graph Environment Employee Information

Al Irvine
Vehicle: 2013 Toyota Tundra black w/flatdeck and yellow can-am quad
Accommodations: 3396 Rosia Road, Prince George, BC V2K 4Y5
170 7th Avenue, Burns Lake, BC, V0J 1E2

Lucy Schick

Vehicle: 2006 Pontiac Vibe red

Accommodations: 3990 Larisa Court, Prince George, BC V2K 0B1

170 7th Avenue, Burns Lake, BC, V0J 1E2

Crew Members

New Graph Employees Al Irvine and Lucy Schick may be joined by other groups/individuals from the area. All crew member information and emergency contacts can be found below.

Table 1: Crew members details and emergency contacts

name	email	phone	satellite	emerg_name	emerg_email	emerg_phone
Allan	al@newgraphenvironment.com	250-777-	must be contacted by inreach first.	Tara Stark	tara@newgraphenvironment.com	250-505-9854
Irvine		1518	Cannot cold call			
Lucy	lucy@newgraphenvironment.com	604-741-	807-790-9843	Sa Boothroyd	saboothroyd@gmail.com	604-740-7199
Schick		2032				

Equipment Checklists

PLEASE NOTE THAT EQUIPMENT CHECKLISTS ARE PROVIDED FOR THE OVERALL TEAM AND NOT ALL CREWS ARE REQUIRED TO HAVE ALL EQUIPMENT. ALTHOUGH ENCOURAGED FOR ALL ENVIRONMENTAL SCIENCE TECHNICIANS AND MONITORS TO HAVE THE PERSONAL EQUIPMENT NEW GRAPH ENVIRONMENT WILL HAVE ALL EQUIPMENT NECESSARY TO COMPLETE THE WORK.

MINIMUM REQUIREMENTS FOR EACH CREW MEMBER INCLUDES GOOD QUALITY AND APPROPRIATELY FITTING LIGHT WEIGHT WADERS AND SEPERATE WADING BOOTS (RUBBER SOLED), HAT, WATER AND A FOOD.

MINIMUM REQUIREMENTS FOR FIELD TRUCKS INCLUDE A QUALITY RADIO APPROPRIATE FOR FOREST SERVICE ROADS, OFF-ROAD CAPABLE TIRES IN GOOD CONDITION, SPARE TIRE, JACK, AND TOOLS.

Table 2: Personal Equipment Checklist - SEE NOTE ABOVE FOR MINIMUM REQUIREMENTS

Equipment	.	.	.
GPS	Sunscreen	Bugspray	Polarized glasses
Bear Spray	phone/camera	battery pack booster for phone	Hat
first aid kit personal	Waders	Wading Boots (Rubber-soled only)	Ski poles
water	food	gloves work	headlamp
clinometer	field vest (surveyors)	note book	Extra clothes
rain gear	hand lens	range finder	—

Table 3: Crew Equipment Checklist - SEE NOTE ABOVE FOR MINIMUM REQUIREMENTS

Crew Equipment Checklist	.	.	.
glasses safety	Oakton Multimeter	Hand saw	Backpack Electrofisher
stop nets x 4	salt blocks	loose salt	dip nets x 2
Linesman Gloves x 3	tape measure hand	tape measure eslon	pilon x 2
Measuring board	Scale	Permits	Backroads Mapbook
Locational maps	Fish ID book	Background Documents	radio handheld
Satelite communicator	Field Safety Plan	first aid kit level 1	First Aid binder stocked
Site Cards / Field Guide	Minnow Traps	Catfood	Flagging
Laptop w/basecamp	GPS cable	Lazer level	Assessment cards fish passage
UAV radio	UAV	UAV landing pad	UAV GC tape
UAV safety plan (when required)	UAV registration	UAV license	UAV radio license
UAV backpack	Flow meter	ATV	Throw bags
polaski	shovel	fire extinguisher backpack	fire extinguisher pressurized
bucket rigid x 2	bucket foldable	clove oil kit w/ instructions	gloves leather
hard hat	steel toed boots	sharpies	ATV gas
ATV lock	UAV battery charger	wader disinfectant kit	GPS batteries
ATV helmets	Battery booster	Compressor 12V	Rubber boots (no-slip soles)
Small BT Speaker (for bears)	large backpack	—	—

Table 4: eDNA Equipment Checklist - SEE NOTE ABOVE FOR MINIMUM REQUIREMENTS

eDNA Equipment Checklist	.	.	.
field vest (surveyors)	note book	GPS	eDNA sampler
Car adaptor for charging eDNA batteries	Aluminium filter membrane housings x10	Filters	Extra hose
Nalgene bottles	Bleach Decontamination Bottle	Rinse bottle	Forceps/tweezers
95% ethanol	Colman cooler	Ice	Silica beads
Coin envelopes	Ziploc snack bags -medium	Ziploc snack bags -large	Nitrile gloves
3 jars/bowl/cups	–	–	–

Table 5: CABIN Equipment Checklist - SEE NOTE ABOVE FOR MINIMUM REQUIREMENTS

CABIN Equipment Checklist	.	.	.
clinometer	field vest (surveyors)	note book	GPS
phone/camera	Waders	Wading Boots (Rubber-soled only)	Turbidity Meter LaMotte 2020e
bucket rigid x 2	sharpies	wader disinfectant kit	GPS batteries
Colman cooler	Ice	Ziploc snack bags -medium	CABIN field sheets
clipboard	Gloves (rubber, neoprene)	Inside bottle waterproof label - use waterproof paper	Duct tape and tool kit
Densimeter	Velocity metre OR Meter stick	Measuring Tape	15 or 30cm ruler
Hand Level	Calculator	Tent pegs	CABIN Benthic Kick Net
Sieve	White tray	Squeeze Bottles	Spoon/tweezers
Bucket	Cabin sample jars	Formalin	–

Table 6: Truck Equipment Checklist - SEE NOTE ABOVE FOR MINIMUM REQUIREMENTS

Equipment	.	.	.
Hand saw	radio truck	Satellite communicator	first aid kit level 1
polaski	shovel	fire extinguisher backpack	truck tow rope
truck/car jack	Battery booster	Compressor 12V	pilon x 2
Tow strap	cloth or paper towel	–	–

Nearest Hospitals

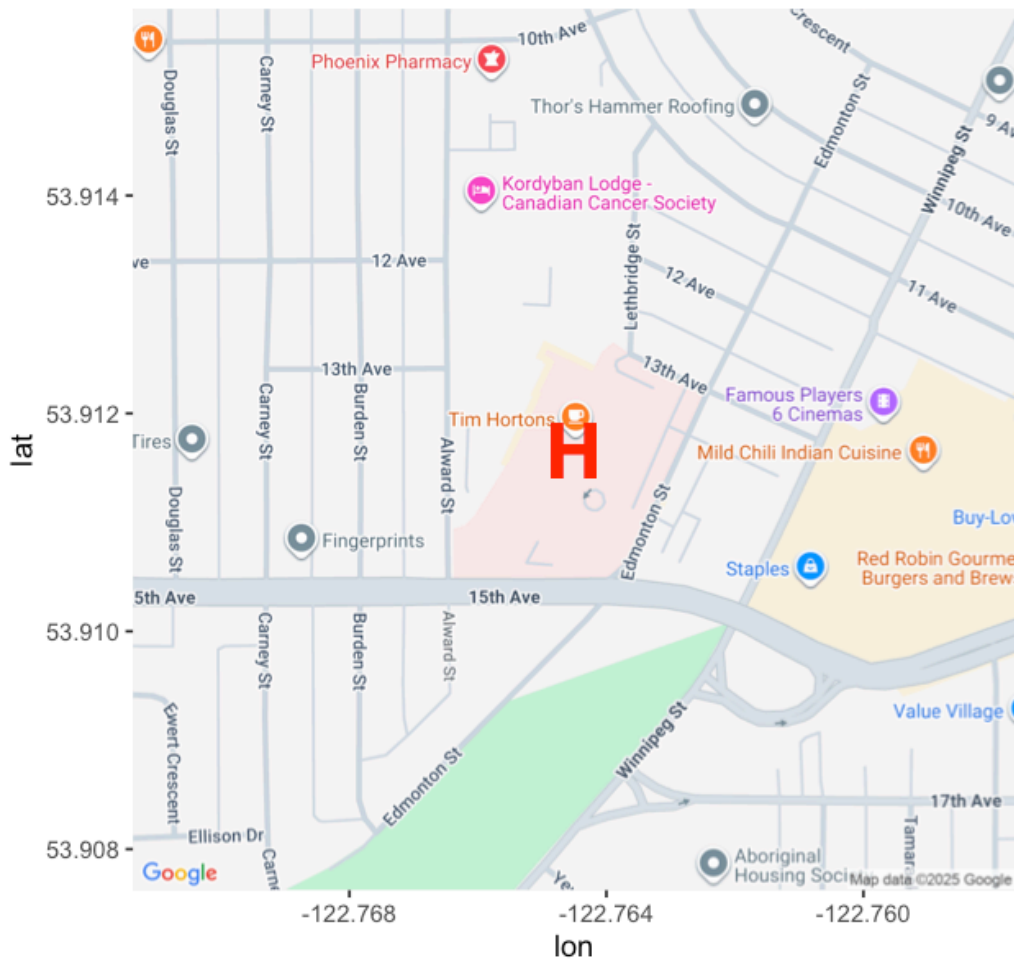


Figure 1: University Hospital of Northern British Columbia - 1475 Edmonton St., Prince George, BC
V2M 1S2 - 250-565-2000

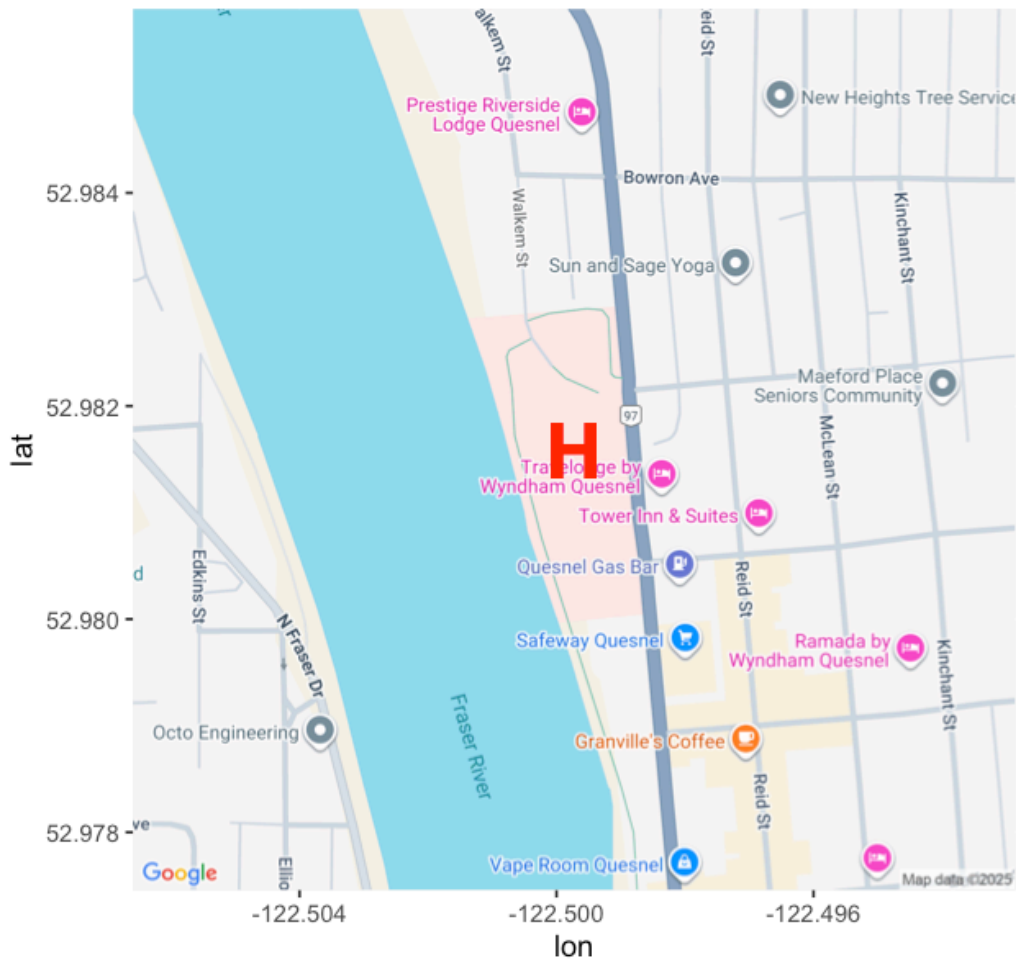


Figure 2: G.R. Baker Memorial Hospital - 543 Front St, Quesnel, BC V2J 2K7 - 250-985-5600

Emergency Response Plan

New Graph Environment's detailed emergency response procedures can be found [here](#). These procedures should be reviewed and an emergency response plan should be completed for each job site. Our Emergency Response Plan template can be downloaded [here](#).

Driving

We will be driving on forest service roads where it is essential to exercise caution and adhere strictly to all radio use protocols to ensure our safety. Proper communication on these roads helps prevent accidents by keeping everyone informed about vehicle movements and road conditions.

Please review the [resource road safety](#) and [radio use](#) sections of our Health and Safety plan so that everyone stays safe.

Field Plan

Fieldwork will focus on baseline monitoring in the Nechako River, Upper Fraser River, Morkill River, and Francois Lake watershed groups, and fish passage (Phase 1) and habitat confirmation (Phase 2) assessments in the Tabor River, Willow River, Lower Salmon River. Activities will include electrofishing at permitted sites and the collection of environmental DNA (eDNA) samples. Crews from McLeod Lake Indian Band and other partners will support the fieldwork.

Fieldwork methods will result in products feeding reporting formats such as our [2023/2024](#) report. We generally follow procedures in:

- [fish passage assessments](#) (Ministry of Environment 2011)
- [habitat confirmations](#) (Fish Passage Technical Working Group 2011).

Information on fish presence/absence, species composition, density, and distribution limits is useful for prioritizing crossings for fish passage restoration and informing follow-up monitoring. To support this, electrofishing, minnow trapping, and eDNA sampling may be conducted where appropriate. Standard Fish and Fish Habitat Inventory Field Forms ([site cards](#)) are used to collect habitat data. The field guide for completing these forms is available [here](#).

Passive Integrated Transponder (PIT) tagging equipment is available and may be used to mark fish captured at electrofishing sites. Tagging can support long-term monitoring by providing data on population size and fish movement upstream and downstream of crossings. An overview of the tagging process is available [here](#). To anesthetize fish prior to PIT tagging, we use a clove oil solution at 0.1mL/L (1:10,000), which provides effective sedation with minimal residual effects (Fernandes et al. 2017). The solution is prepared by dissolving clove oil in ethyl alcohol at a 1:9 ratio before mixing into water (Fernandes et al. 2017).

Digital field forms are used to collected data, utilizing [Mergin Maps](#), which syncs with QGIS and supports offline use. Instructions for setting up Mergin Maps and using the digital field forms can be

found in the [Fish Passage Guidebook](#). Users should send their Mergin usernames to enable project sharing and form access.

A field guide to freshwater fish identification, such as *Field Key to the Freshwater Fishes of British Columbia* by McPhail and Carveth (1993), can be useful during fieldwork. It is available for download [here](#).

Check In Procedures

Call, text, or InReach Tara Stark (2505059854) each morning to share the plan for the day (i.e. name of roads and sites). Check in time is before 7pm each evening although we regularly check in throughout the day (ex. at arrival to site, 1pm and 4pm) on the InReach or by text and report position/provide updates.

Procedures for Failed Check-In - for Check in person

Procedures are summarized in Figure 3. If phone call or InReach check-in is not received by 7pm send text to InReach units, call or text cell phones of field crew members. If no response please call accommodations then personal emergency contacts to see if they have heard anything. Wait 1 hour and text InReach, text or call cell phones and personal emergency contacts and accommodations again. Repeat after 2 hours (9 pm) - if no response then notify the RCMP of a missing persons in field.

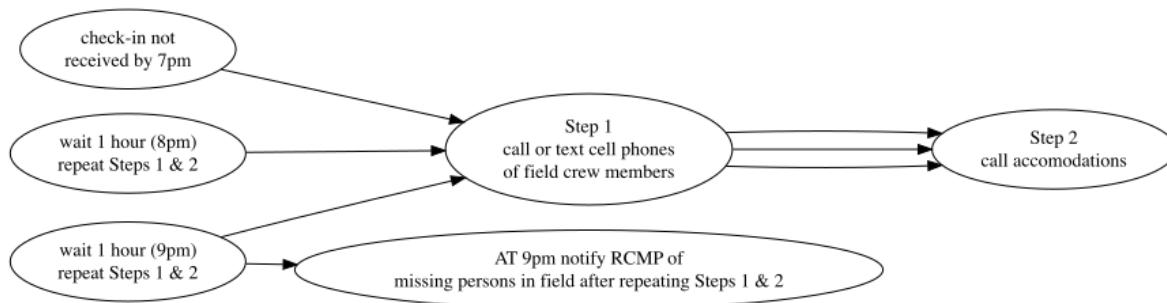


Figure 3: Procedures for failed check-in

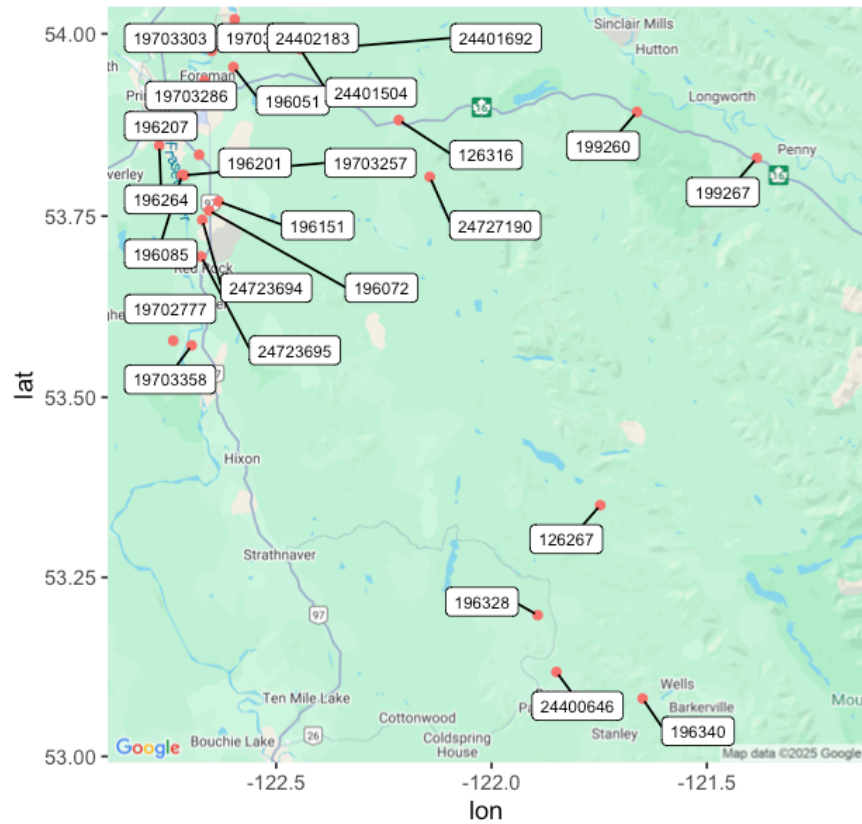


Figure 4: Map of potential sampling areas.

Table 7: Potential Phase 1 assessment, Phase 2 assessment, and Electrofishing Locations

id	stream_name	utm_zone	utm_easting	utm_northing	watershed_group_code	pscis_assessment_comment
7622	Burnt Cabin Creek	10	388738	5997154	FRAN	<p>The culvert is undersized for current flow volumes, as indicated by the 1.15m outlet drop. The local name of the stream is Burnt Cabin Creek.</p> <p>A landowner adjacent to the crossing downstream on Gala Bay Road (PSCIS 199171) reported observing adult sockeye along the shoreline near the confluence with Fraser Lake in past years, and noted that the stream flows year-round, even in dry conditions, fed by a spring at the headwaters. Habitat confirmations were completed upstream, downstream, and below Gala Bay Road. MoTi chris_culvert_id: 1794196</p>
126267	Stephanie Cr.	10	583374	5911978	WILL	—
126290	Hay Creek	10	537250	5991350	WILL	—

id	stream_name	utm_zone	utm_easting	utm_northing	watershed_group_code	pscis_assessment_comment
196051	Unnamed	10	526285	5978523	TABR	–
196072	Cale Creek	10	522679	5956610	TABR	–
196085	Tabor Creek	10	518502	5962002	TABR	Fish observed at outlet.
196151	Cale Creek	10	524160	5957999	TABR	Beaver dam at inlet.
196201	Haggith Creek	10	521127	5965112	TABR	14m fill depth.
196207	Hudson Bay Slough	10	516996	5972733	TABR	Outlet control.
196264	Parkridge Creek	10	515025	5966533	TABR	–
196328	Archer Creek	10	573972	5894796	WILL	–
196340	Slough Creek	10	590481	5882133	WILL	–
199171	Burnt Cabin Creek	10	388946	5997015	FRAN	<p>The local name of the stream is Burnt Cabin Creek. A large outlet drop and a heavily eroded outlet pool indicated the culvert was undersized. The stream provided complex habitat with abundant cover. The crossing was located on a low-traffic dirt road with minimal fill, making replacement relatively straightforward. An adjacent landowner reported observing adult sockeye along the shoreline near the confluence of the stream and Fraser Lake in previous years. They also said the stream is reported to flow year-round, even in dry conditions, fed by a spring at the headwaters, and that the section of stream below Gala Bay Road has been diverted to accommodate a driveway for a recreational property. MoTi chris_culvert_id: 1790951</p>
199172	Scotch Creek	10	388276	5996950	FRAN	<p>The culvert was very undersized for the stream, as indicated by the large outlet drop. The stream had a good amount of given the time of year and uncharacteristically dry year. Habitat was of medium value, with abundant large woody debris creating complex habitat and pools, providing ample cover for fish. Adjacent landowners reported that the stream was previously used as a water source for bottling and distribution across the province. Habitat confirmations were completed upstream and downstream of Stella Road as well as below Gala Bay Road. The local name of the stream is Scotch Creek. MoTi chris_culvert_id: 1794199</p>
199173	Tributary To Nechako River	10	398938	5996429	NECR	<p>The culvert had a moderate outlet drop with some erosion around the pipe at the outlet. The pipe was in good condition. The stream provided excellent habitat, with several pools and abundant undercut banks. Fish were observed during the assessment (~40-90mm in length), and chinook have been captured upstream of this crossing as part of an</p>

id	stream_name	utm_zone	utm_easting	utm_northing	watershed_group_code	pscis_assessment_comment
<p>ongoing environmental DNA (eDNA)</p> <p>project led by Dr. Brent Murray and Barry Booth at UNBC. Upstream of the crossing, the stream was channelized with some pockets of gravel suitable for rearing rainbow trout and potentially chinook. It then transitioned into beaver-impounded wetland areas storing large quantities of water, likely sustaining year-round stream flow at this crossing. There was extensive cattle trampling around the inlet of the pipe and throughout the surveyed upstream area. The crossing was located approximately 150m upstream from the Nechako River mainstem. The lower 200m of the stream is incorrectly mapped in the BC Freshwater Atlas. Instead of flowing east along Dog Creek Road as mapped, the stream flows south, crosses Dog Creek Road, and joins the Nechako River. MoTi</p> <p>chris_culvert_id: 1794340</p>						
199190	Clear Creek	10	425562	5996164	NECR	<p>The bottom of the culvert had been reinforced with concrete, likely to address holes noted in the previous assessment. A large pile of riprap was placed at the outlet, possibly to reduce the outlet drop, though its placement appeared unusual and could inhibit fish passage. The habitat was high quality, with a large pool just downstream of the culvert and abundant gravels suitable for spawning fish. In the lower section of Clear Creek, downstream of Braeside Road,</p>

id	stream_name	utm_zone	utm_easting	utm_northing	watershed_group_code	pscis_assessment_comment
<p>chinook salmon have</p> <p>been repeatedly</p> <p>documented through</p> <p>sampling efforts part of</p> <p>an ongoing</p> <p>environmental DNA</p> <p>(eDNA) project led by</p> <p>Dr. Brent Murray and</p> <p>Barry Booth at UNBC.</p> <p>MoTi chris_culvert_id:</p> <p>1806163</p>						
199237	Snowshoe Creek	10	650785	5934863	MORK	<p>The culvert had a deep outlet pool and a very large outlet drop. The stream contained functional large woody debris creating complex cover and pools.No photos are available because the surveyors phone fell into the stream. Fill depth estimated. MoTi chris_hwy_structure_road_id: 3751</p>
199260	Tributary To Sugarbowl Creek	10	587921	5972451	MORK	<p>The culvert had a significant 1.4m outlet drop, and inlet drop due to a small debris jam. The stream flowed through mature old-growth forest and provided high-quality habitat with steep gradients, step pools, and cascade pools, suggesting the potential presence of bull trout. The highway crossing had a large amount of road fill, making construction difficult and expensive. The site would be a good candidate for replacement if feasible. The riparian area at the outlet had been cleared due to overhead powerlines.</p> <p>MoTi chris_culvert_id: 1992815</p>
199267	Driscoll Creek	10	606373	5965783	MORK	<p>The culvert had a deep outlet pool and a very large outlet drop. The stream was banked with a well-developed, healthy, riparian zone consisting of old-growth forest. A beaver dam was located just upstream of the culvert inlet. No photos are available because the surveyors phone fell into the stream.</p> <p>MoTi chris_culvert_id: 1992674</p>
199278	Teepee Creek	11	344034	5862741	UFRA	<p>A moderate outlet drop was present and would be substantial at lower flows. Flow was steady at the time of assessment. The culvert was in good</p>

	id	stream_name	utm_zone	utm_easting	utm_northing	watershed_group_code	pscis_assessment_comment
<p>for the stream. Additionally, minimal road fill made this crossing a significant flood hazard, which could wash out Highway 5. Downstream, the stream had frequent pools 0.3-0.5m deep, providing good overwintering habitat for fish, and abundant gravels suitable for spawning. Roughly 150m downstream of the culvert, several cattle pens crossed the stream and appeared to be set up to provide cattle access for drinking. These areas were visibly trampled, with significant loss of riparian vegetation. Upstream, the stream was relatively confined, with only rare pockets of unembedded gravels. Deep pools were present, formed by boulder and large woody debris scour. Numerous small steps, ranging from 30-60cm, were present due to the steep, boulder-dominated nature of the stream. A salmon point was noted near the pipeline location in FISS. Bull trout have previously been captured both upstream and downstream of the highway crossing by Triton Environmental Consultants Ltd. Electrofishing would be beneficial for further assessment. The site was a highway crossing, making replacement difficult. Upstream of the Mount Tinsley Pit Road crossing, a hiking trail follows Teepee Creek and provides access to Mount Terry Fox Provincial Park. MoTi chris_culvert_id: 1467202</p>							
	12200024	—	10	515409	5989806	LSAL	—
	12202167	—	10	496209	5999657	LSAL	—
	19702777	—	10	517279	5936628	TABR	—
	19703257	Tabor Creek	10	518845	5961982	TABR	—
	19703286	Bittner Creek	10	521864	5976392	TABR	—
	19703295	—	10	526448	5985791	TABR	—
	19703303	Bertschi Creek	10	522978	5980978	TABR	—

id	stream_name	utm_zone	utm_easting	utm_northing	watershed_group_code	pscis_assessment_comment
19703358	Trapping Creek	10	520105	5935908	TABR	–
24400646	Ruchon Creek	10	577020	5886032	WILL	–
24401504	Tsadebtsa Creek	10	536470	5981315	WILL	–
24401692	–	10	541465	5981577	WILL	–
24402183	–	10	541358	5981709	WILL	–
24723694	Cale Creek	10	521645	5955176	TABR	–
24723695	Red Rock Creek	10	521513	5949553	TABR	–
24727190	Wansa Creek	10	556416	5962053	WILL	–

References

- Fernandes, I. M., Y. F. Bastos, D. S. Barreto, L. S. Lourenço, and J. M. Penha. 2017. “The Efficacy of Clove Oil as an Anaesthetic and in Euthanasia Procedure for Small-Sized Tropical Fishes.” *Brazilian Journal of Biology = Revista Brasileira De Biologia* 77 (3): 444–50. <https://doi.org/10.1590/1519-6984.15015>.
- Fish Passage Technical Working Group. 2011. “A Checklist for Fish Habitat Confirmation Prior to the Rehabilitation of a Stream Crossing.” <https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/land-based-investment/forests-for-tomorrow/checklist-for-fish-habitat-confirmation-201112.pdf>.
- McPhail, J. D., and R. Carveth. 1993. “Field Key to the Freshwater Fishes of British Columbia.” https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/nr-laws-policy/risc/field_key_to_freshwater_fishes_of_bc_field_size_water_resistant_version.pdf.
- Ministry of Environment. 2011. “Field Assessment for Determining Fish Passage Status of Closed Bottom Structures.” BC Ministry of Environment (MoE). <https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/land-based-investment/forests-for-tomorrow/field-assessment-for-determining-fish-passage-status-of-cbs.pdf>.