Forest Management Specialists

BC Timber Sales

Strait of Georgia Business Area

370 Dogwood St.
Campbell River, BC
V9W 6Y7

March 19, 2012

Attn: Dave Hamilton

Re: Fish Passage Culvert Inspections – Chilliwack Area EN12TCF055

Forsite Consultants Ltd was retained by BCTS' Strait of Georgia office to complete fish passage assessments through the Chilliwack area in BC. The project was located on the West and East Harrison Forest Service Roads (FSR), around the Wahleach (Jones) Lake drainage, and off the Chehalis FSR up the Statlu drainage.

These assessments were completed with a fisheries technician from the Coldwater Indian band and a registered professional biologist following the specification and guidelines outlined in the *Field Assessment for Determining Fish Passage Status of Closed Bottom Structures* (MoE 2011).

Enclosed in the following package are maps of the inspected watersheds identifying each crossing and its status, data collected for each crossing, recommendations, a summary of the habitat gained index, and the methods used for the project including fish presence determination.

Forsite thanks you for the opportunity to provide our services for this project, and looks forward to collaboration in the future.

Kind Regards,

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Watershed Level Fish Passage Assessments

Fish Passage Assessment – Chilliwack Area

Strait of Georgia Business Area, BC

Prepared for:

BC Timber Sales

370 Dogwood Street
Campbell River, BC
V9W 6Y7

Prepared by:

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Executive Summary

Forsite consultants was retained by BCTS' Strait of Georgia Operating Area to complete fish-passage culvert inspections throughout several watersheds around Chilliwack, BC; in total eight watersheds were assessed. Each stream crossing structure was evaluated to determine fish passage potential. The eight watersheds were tendered out in two groups of four:

Tender (hereafter, Group) A: Wahleach Creek, Cogburn Creek, Tretheway Creek and Trio Creek.

Tender (hereafter, Group) B: Bremner Creek, Statlu Creek, Bear Creek and Tipella Creek,

The project was based on predictions from BCTS identifying the expected amount of work, however, many of the streams did not exist as mapped, many of the roads to be driven were inaccessible, and many of the inferred fish bearing streams were upslope of gradient barriers. Consequently, fewer crossing structures than expected could be evaluated. Several new and unmapped roads were present that required inspection, but rarely yielded assessments due to the gradients being prohibitive to fish passage. That, coupled with a higher than expected number of bridges, meant that the proposed work load was not easily realized in the field.

Due to difficult conditions, and the limitations associated with the bidding package, many of the fixed costs could not be recuperated. In order to make the contract monetarily viable, the Ministry agreed to pay for all of the proposed kilometers and the additional new roads found onsite. This differential offset the costs associated with the project.

All crossings were assessed following the Ministry of Environment's *Field Assessment for Determining Fish Passage Status of Closed Bottom Structures* (2011). The information was recorded following the provincial field cards, and data was entered into the Provincial Stream Crossing Inventory System (PSCIS). Closed bottom structures received complete inspections, while open bottom structures received expedited assessments, and crossings where no fish habitat was available were not assessed. Photos have not been included in this report, but are available in the PSCIS database.

A total of 103 crossing structures were found to require inspection. Of those, sixty-one were close bottomed structures (CBS), thirty-four were open bottomed structures (OBS), and 8 were Other (i.e. Fords). 539 km of road were anticipated for inspection, and 547 km were available including new smaller roads.

Group A included 47 CBS, 15 OBS, and 7 Others. The average fish passage score for CBS here was 25, and all but one CBS structures required replacement or were potential barriers. The average HGI for group A was 0.29, indicating very little additional habitat was available upstream of the crossing locations.

Group B included 14 CBS, 18 OBS, and 1 Other. The average fish passage score was 28 on the CBS in this group, and they all were scored as potential or total barriers to fish passage. The average HGI for group B was 0.68, indicating little additional habitat was available upstream of the crossing locations.

A further explanation of the HGI is included within this document.

In total 61 CBS were identified. Of those, 51 crossings require repair or rehabilitation, 9 are scored as potential barriers but appeared passable, and only 1 CBS was passable.

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Introduction & Background

Forsite Consultants Ltd (Forsite) was retained by British Columbia Timber Sales' (BCTS) Strait of Georgia Business Area to complete fish passage assessments throughout the Chilliwack area of BC.

BCTS has been tasked with managing a number of ecological and landscape interests while working to develop forest harvesting areas. One such interest includes managing for fish habitat, which can be severely limited by poorly maintained road crossings. This particular inventory was related to a province-wide effort to identify fish passage blockages as a result of poorly implemented or maintained crossing structures. In order to standardize evaluation methods, the Ministry of Environment released the *Field Assessment for Determining Fish passage Status Of Closed Bottom Structures* (2011). This document has outlined a scoring system to evaluate the likelihood of fish passage at a given crossing. The ultimate goal of these assessments is to properly identify the status of roads and road crossing structures throughout the province and develop an appropriate management program to deal with the fish passage limitations currently present.

This report is intended to summarize the findings of these fish passage assessments in eight watersheds throughout the Chilliwack Area in southern BC. In addition to this document, assessment data has been submitted through the Provincial Stream Crossing Inventory System (PSCIS) database. Site photos are available within the PSCIS submission, and, consequently, are not included within the report.

Study Area

The project was located in the Lower Mainland (Region 2) of BC, in the Chilliwack area. Eight watersheds were assessed in total, separated into two groups (A and B) of four: Wahleach Creek (A), Cogburn Creek (A), Tretheway Creek (A), Trio Creek (A), Bremner Creek (B), Statlu Creek (B), Bear Creek (B), and Tipella Creek (B). Tretheway, Trio, Bremner, and Tipella were located along the West Harrison Forest Service Road (FSR); Cogburn and Bear were located along East Harrison FSR, Statlu Creek is a tributary to the Chehalis River located at 13 km on the Chehalis FSR, and Wahleach (Jones) Creek was located on the east side of Highway 1 off exit #151 on the Jones Lake FSR. Every accessible road within these watersheds was driven, and their names (where available) were recorded.

The surrounding landscape was comprised of steep, mountainous terrain, old-growth forests, and previous harvesting disturbance. Gradients were a limiting factor to fish passage.

Scope of Works

Forsite's role in this project was defined in the contract under Schedule A – Services. This included driving access roads within the prescribed watersheds and assessing every fish stream crossing encountered. Assessment procedures are outlined below. The results from these assessments were entered in the PSCIS online database, and then used to develop this report. A digital copy of working maps, clearly identifying known or suspected fish streams, road networks and identified sites for field data collection has been included in Appendix 2 – Figures.

For each crossing that requires rehabilitation, a Habitat Gained Index (HGI) was completed to determine the amount of habitat potentially made available by the repair or replacement of the structure in question. The majority of sites were located in steep valleys, and the habitat available upstream was frequently negligible. Overall, most of the HGI values were low.

The restoration needs are identified in the PSCIS data, and the high priority sites are clearly identified in recommendations. Two tables are included in the results section, table 1 outlines the closed bottom structures barrier results, and the other outlines some of the basic information for all of the sites. Project wide, the common replacement recommendations consist of open bottom structures and streambed simulations. In some cases it is recommended that the crossing be removed as the road is inaccessible, or ends shortly after the crossing and is not likely to be used again in the near future.

A map identifying the assessed crossings and barrier locations, as well as kilometers driven, and road deactivations was included in Appendix 2 – Figures.

The data analysis, final mapping, and report completion and submission were developed in accordance with the requirements specified in the document "Field Assessment for determining Fish Passage Status of CBS, Ministry of Environment August 2011".

All works were completed and signed off by a qualified Registered Professional Biologist.

Methods

The initial planning stages for this fish passage culvert assessment project began with watershed-based maps, in this case developed by BCTS. Fish bearing and non fish-bearing watercourses were marked on the maps, and all of the registered roads (historical and current) within a watershed were identified. Each road/stream crossing was marked on the map, and the total number of crossings over inferred and known fish-bearing streams was calculated. From this value, it was assumed that approximately 1.2 closed bottom structures exist for every open bottom structure (a provincial average). Using this information, a rough estimate of crossings was determined as an office exercise.

Although the preparatory process above is useful, there are some limitations. The streams used were from TRIM II mapping and were not always accurate. Additionally, downstream barriers could not be identified during the office portion of this project, and gradients used to determine fish-bearing or non fish-bearing designations required ground-verification. In order to validate the assumptions made during the mapping exercise and to assess each valid crossing within the watershed, a field component was required.

Prior to completing field assessment a planning and prioritization effort was put in place. This included determining fish presence in the known watersheds. Existing data was reviewed through the provincial Fisheries Information Summary System (FISS) available online at http://a100.gov.bc.ca/pub/fidq/main.do [accessed Feb. 20, 2012]. Additional preparation and prioritization followed the guidelines in "The Strategic Approach: Protocol for Planning and Prioritizing Culverted Sites for Fish Assessment and Remediation," from the BC Ministry of Environment (2009). One additional tool used before entering the field was the following url: http://www.for.gov.bc.ca/dck/Engineering/Gate%20Key%20List%20DCK%20Website.pdf. This document contained information regarding gated roads, and contact persons. Not all contacts were accurate or up to date, which led to some delays, but it was a functional tool to get started with.

Field assessments were completed under a standardized methodology to ensure that as sites were prioritized for replacement, they could be compared appropriately to other projects. The standards used were updated as of August 2011 by the Ministry of Environment. Using the *Field Assessments for determining Fish Passage Status of Closed Bottom Structures,* each crossing was scrutinized and ranked to determine its status based on the following information:

- Date, crew, location (UTMs from handheld GPS unit and road location description)

- Site number – created by field crews.
- Channel width
- Crossing structure and its diameter/span and length
- Stream slope & Culvert slope
- Culvert embeddment
- Outlet drop and Outlet Pool Depth

Culvert status was scored based on the Stream Width Ratio (Average Channel Width/ Culvert Diameter), outlet drop, culvert slope, culvert length, and embedment of the culvert. Additional site data including fill depth, beaver activity, fish habitat, valley fill, inlet drop, backwatered percentage, surrounding vegetation, channel complexity/dynamics, and fish sighted were used to rank habitat value (low, medium, high), and evaluate the best replacement crossing structure for the site. Surrounding vegetation, large woody debris, and fish passage barriers (i.e. chutes, waterfalls, logjams) were considered throughout the survey, and also played a role in the habitat-value ranking.

For each assessment a classification was determined: passable, potential, or barrier. If the crossing was a barrier or potential, a replacement structure was identified along with the required dimensions.

Assessments were completed from the back of each watershed and working our way out to simplify start and stop points and per km billing. Additionally, each site was flagged to ensure re-location would be possible.

Watercourses were considered non-fish bearing if the following were true:

- Gradients exceeding 25%.
- Falls/cascades/chutes were present downstream of the crossing that were greater than 2.5 m
- Culverts where no channelization was visible (regardless of mapped information)

Photos were collected at each site depicting the upstream and downstream habitat quality, as well as the inlet, outlet, and barrel shape of the existing structure.

Once the information was entered into the provincial database, a habitat gained index (HGI) was developed where the linear length of a watercourse (in kilmeters), upstream from the crossing was multiplied by the habitat value rank (where low=1, med=2, and high=3; Heinrich, 2008).

Results

Based on the initial estimates of stream crossings, a budget was compiled to complete an approximated 139 closed bottom structure assessments and 110 open bottom structure assessments along 539 km of road in eight separate watersheds. Field crews found that the majority of the proposed sites were at gradients of greater than 25% slope, and many of the mapped streams showed no channelization on the ground. In total, 103 potential fish crossings were observed along 547 km of road. Out of the 103 crossings, 61 were closed bottom structures, 8 were fords, and 34 were open bottomed structures.

Of the 61 closed bottomed structures, 1 was passable, 9 were potential barriers, and the remaining 51 were barriers. A habitat gained index was created for each of these crossings to allow for prioritization of replacements. Table 1 outlines the 61 closed bottom crossings and some of their site specific pertinent information to help prioritize replacements. A more comprehensive listing of site information is provided in Appendix 1 – PSCIS Submission Data. A higher HGI indicates a larger gain in habitat with a crossing replacement. Null values indicate that there is no habitat immediately upstream of the crossing.

Table 1. Closed Bottom Structure Results.

Date	Crossing Number	Easting	Northing	Stream Name	Type	Final Score	Barrier Result	Upstream Habitat Length	HGI
2011-11-07	COG-18	598207	5491780	Tributary to Cogburn Creek	CBS	26	Barrier	0	0
2011-11-07	COG-19	598396	5491891	Tributary to Cogburn Creek	CBS	36	Barrier	76	0.23
2011-11-07	COG-8	602291	5488566	Tributary to Cogburn Creek	CBS	16	Potential		0
2011-11-07	COG-9	602134	5488614	Tributary to Cogburn Creek	CBS	21	Barrier	82	0.08
2011-11-03	ST-1	570402	5466495	Tributary to Statlu Creek	CBS	33	Barrier	126	0.38
2011-11-03	ST-2	570184	5466459	Tributary to Statlu Creek	CBS	36	Barrier		0
2011-11-04	ST-5	565297	5472408	Tributary to Statlu Creek	CBS	31	Barrier	108	0.22
2011-11-04	ST-6	565266	5472293	Tributary to Statlu Creek	CBS	36	Barrier		0
2011-11-04	ST-9	565253	5472010	Tributary to Statlu Creek	CBS	21	Barrier		0
2011-11-04	ST-10	565247	5471962	Tributary to Statlu Creek	CBS	21	Barrier	117	0.35
2011-11-04	ST-11	564915	5470558	Tributary to Statlu Creek	CBS	23	Barrier		0
2011-11-04	ST-12	564869	5469377	Tributary to Statlu Creek	CBS	26	Barrier		0
2011-11-04	ST-16	565275	5468610	Tributary to Statlu Creek	CBS	36	Barrier		0
2011-11-04	ST-26	568661	5466721	Tributary to Statlu Creek	CBS	21	Barrier		0
2011-11-04	ST-27	570822	5466630	Tributary to Chehalis River	CBS	23	Barrier		0
2011-11-06	ST-41	568908	5466367	Tributary to Statlu Creek	CBS	26	Barrier		0
2011-11-06	ST-42	566825	5467596	Tributary to Statlu Creek	CBS	26	Barrier		0
2011-11-06	ST-43	564489	5469006	Tributary to Statlu Creek	CBS	36	Barrier		0
2011-11-03	TR-3	564219	5505075	Tributary to Trethaway Creek	CBS	26	Barrier	0	0
2011-11-08	Trio1	571942	5495317	Tributary to Trio Creek	CBS	26	Barrier		0
2011-11-08	Trio6	571842	5495130	Tributary to Trio Creek	CBS	18	Potential		0
2011-11-07	COG-10	601895	5489007	Tributary to Cogburn Creek	CBS	26	Barrier		0
2011-11-07	COG-12	601781	5489158	Tributary to Cogburn Creek	CBS	26	Barrier	99	0.1
2011-11-07	COG-13	601737	5489195	Tributary to Cogburn Creek	CBS	31	Barrier		0
2011-11-07	COG-14	601636	5489286	Tributary to Cogburn Creek	CBS	26	Barrier		0
2011-11-07	COG-15	601462	5490008	Tributary to Cogburn Creek	CBS	36	Barrier		0
2011-11-07	COG-16	601427	5490132	Tributary to Cogburn Creek	CBS	36	Barrier		0
2011-11-07	COG-17	601271	5490352	Tributary to Cogburn Creek	CBS	31	Barrier		0
2011-11-02	WL-1	601597	5452791	Tributary to Wahleach Lake	CBS	31	Barrier		0
2011-11-02	WL-3	601579	5452873	Tributary to Wahleach Lake	CBS	18	Potential		0
2011-11-02	WL-4	601592	5453002	Tributary to Wahleach Lake	CBS	10	Passable		0
2011-11-02	WL-5	601606	5453094	Tributary to Wahleach Lake	CBS	16	Potential		0
2011-11-02	WL-9	601570	5453729	Tributary to Wahleach Lake	CBS	36	Barrier	93	0.19
2011-11-02	WL-10	601670	5454121	Tributary to Wahleach Lake	CBS	26	Barrier		0
2011-11-02	WL-11	601655	5454310	Tributary to Wahleach Lake	CBS	26	Barrier		0
2011-11-02	WL-12	601760	5455881	Tributary to Wahleach Lake	CBS	31	Barrier		0
2011-11-05	WL-21	602585	5451406	Tributary to Wahleach Lake	CBS	26	Barrier		0
2011-11-05	WL-22	602501	5451690	Tributary to Wahleach Lake	CBS	25	Barrier		0
2011-11-05	WL-24	601819	5456212	Tributary to Wahleach Lake	CBS	21	Barrier		0
2011-11-05	WL-25	601835	5456687	Tributary to Wahleach Lake	CBS	26	Barrier		0
2011-11-05	WL-26	601833	5456749	Tributary to Wahleach Lake	CBS	26	Barrier		0
2011-11-05	WL-27	601821	5456836	Tributary to Wahleach Lake	CBS	23	Barrier		0
2011-11-05	WL-28	601816	5456906	Tributary to Wahleach Lake	CBS	31	Barrier		0
2011-11-05	WL-29	601693	5456778	Tributary to Jones Creek	CBS	16	Potential		0
2011-11-05	WL-30	601400	5457883	Tributary to Jones Creek	CBS	21	Barrier		0
2011-11-05	WL-31	600773	5459224	Tributary to Jones Creek	CBS	21	Barrier		0
2011-11-05	WL-32	600650	5459292	Tributary to Jones Creek	CBS	16	Potential		0
2011-11-05	WL-33	600668	5459548	Tributary to Jones Creek	CBS	21	Barrier		0
2011-11-05	WL-35	600401	5461145	Tributary to Jones Creek	CBS	31	Barrier		0
2011-11-05	WL-36	600245	5462621	Tributary to Jones Creek	CBS	31	Barrier	25	0.05
2011-11-05	WL-38	600138	5463065	Tributary to Jones Creek	CBS	15	Potential		0
2011-11-05	WL-41	601536	5457145	Tributary to Jones Creek	CBS	16	Potential		0
2011-11-09	WL-101	600499	5454695	Tributary to Wahleach Lake	CBS	26	Barrier	46	0.09
2011-11-09	WL-102	600780	5455737	Tributary to Wahleach Lake	CBS	31	Barrier		0
2011-11-09	WL-103	600825	5455894	Tributary to Wahleach Lake	CBS	21	Barrier		0
2011-11-09	WL-104	600718	5455989	Tributary to Wahleach Lake	CBS	31	Barrier		0
2011-11-09	WL-105	600808	5456068	Tributary to Wahleach Lake	CBS	23	Barrier		0
2011-11-09	WL-106	600800	5456170	Tributary to Wahleach Lake	CBS	31	Barrier	84	0.08
2011-11-09	WL-107	600798	5456253	Tributary to Wahleach Lake	CBS	26	Barrier		0
2011-11-09	WL-108	600750	5456590	Tributary to Wahleach Lake	CBS	36	Barrier		0
2011-11-09	WL-109	600817	5456716	Tributary to Wahleach Lake	CBS	16	Potential	184	0.55

The highest HGI value was 5.52, for site WL-109, a high quality fish stream. Only 11 crossings were identified as providing upstream fish habitat across all eight watersheds; Wahleach contained 5, Cogburn contained 3, and Statlu contained 3. Only four of these crossings had more than 100 m of potential fish habitat upstream: ST-1, ST-5, ST-10, and WL-109; two additional sites were between 90 m and 100 m: WL-9 and COG-12.

The average HGI for Group A was 0.29, and the average barrier score for Group A CBS was 25. The average HGI for Group B was 0.68, and the average barrier score for CBS was 28. The OBS barrier score average was 0 for both groups, and the overall average was 15.3.

Table 2. All sites with recommendations.

Reference No.	Crossing Type	Diameter or Span (meters)	Length or Width (meters)	Barrier Result	Crossing Fix	Recommended Diameter or Span (meters)	Assessment Comment
COG-18	CBS	0.88	9.70	Barrier	OBS	8.00	An 8 m clear span required.
COG-19	CBS	1.11	9.42	Barrier	OBS	8	An 8 m clear span required.
COG-7	OBS	12.60	3.90	Passable			No further fish passage work required.
COG-8	CBS	0.67	5.84	Potential	Removal		Road is not really accessible past here. There does not appear to be a need to maintain this failed crossing.
COG-9	CBS	0.54	6.50	Barrier	Removal		Road is not really accessible past here. There does not appear to be a need to maintain this failed crossing.
ST-1	CBS	1.40	12.00	Barrier	OBS	12	Clear span bridge.
ST-2	CBS	0.40	10.20	Barrier	Streambed Simulation	2.4	An open bottom arch would be suitable here.
ST-3	OBS	17.00	5.20	Passable			
ST-4	OBS	46.80	4.84	Passable			
ST-5	CBS	0.66	8.60	Barrier	Removal		Road is deactivated 1 km up from here. No need to maintain this crossing.
ST-6	CBS	0.49	8.32	Barrier	Streambed Simulation	2.00	There is minimal upstream fish habitat (<10m length) it is a low priority crossing. Embedded culvert would work
ST-7	OBS	17.00	4.30	Passable			
ST-8	OBS	10.61	6.72	Passable			
ST-9	CBS	0.80	10.21	Barrier	OBS	10.00	A clear span bridge
ST-10	CBS	1.10	10.24	Barrier	Streambed Simulation	2.60	No changes required. Is currently passable.
ST-11	CBS	1.18	10.90	Barrier	OBS	13.00	Bridge Required
ST-12	CBS	0.40	11.40	Barrier	Streambed Simulation	1.40	Gradient is prohibitive. Low priority.
ST-13	OBS	22.50	4.78	Passable			
ST-14	OBS	17.53	4.92	Passable			

Reference No.	Crossing Type	Diameter or Span (meters)	Length or Width (meters)	Barrier Result	Crossing Fix	Recommended Diameter or Span (meters)	Assessment Comment
ST-15	OBS	6.60	4.20	Passable			
ST-16	CBS	0.85	10.15	Barrier	OBS	12.00	A 12 m clear span should replace this crossing.
ST-17	OBS	4.20	5.90	Passable			Crossing is ancient, and is in poor condition. Should be replaced with a proper bridge at some point.
ST-18	Other			Unkown			On a frequently used road, and needs a crossing structure to limit sediment mobilization into Statlu Creek. High priority.
ST-19	OBS	4.00	7.50	Passable			Should eventually be upgraded, but low priority.
ST-20	OBS	12.26	4.90	Passable			
ST-21	OBS	48.60	4.90	Passable			
ST-22	OBS	6.30	6.00	Passable			
ST-23	OBS	15.90	4.90	Passable			
ST-24	OBS	6.00	4.90	Passable			
ST-25	OBS	18.80	5.10	Passable			
ST-26	CBS	0.54	9.30	Barrier	Streambed Simulation	1.80	Arch. Very low quality habitat, should be a low priority.
ST-27	CBS	0.90	10.00	Barrier	Streambed Simulation	1.40	Arch culvert location. Moderate priority as is in flood plain, and likely accessible to fish frequently.
ST-28	OBS	5.90	4.80	Passable			
ST-29	OBS	14.80	10.00	Passable			
ST-40	OBS	6.50	6.80	Passable			
ST-41	CBS	0.40	10.20	Barrier	Streambed Simulation	2.00	Arch culvert required. Culvert is angled backwards (i.e. -0.2% from DS looking US).
ST-42	CBS	0.53	8.20	Barrier	Streambed Simulation	2.00	Good hab at crossing, fan DS provides low quality hab due to low volumes of flow.
ST-43	CBS	1.17	14.50	Barrier	OBS	10.00	Clear span bridge replacement required.
BR-1	OBS	30.70	5.10	Passable			90 m upstream of this crossing is a barrier to fish passage for the rest of the Bear Watershed. A 30 m falls exist.
TR-1	OBS	12.20	6.90	Passable			
TR-2	OBS	30.30	4.90	Passable			
TR-3	CBS	1.20	9.20	Barrier	Streambed Simulation	2.00	No fix req'd. Gradient barrier to fish passage. No

Reference No.	Crossing Type	Diameter or Span (meters)	Length or Width (meters)	Barrier Result	Crossing Fix	Recommended Diameter or Span (meters)	Assessment Comment
							Habitat Gained.
TR-4	OBS	30.60	9.80	Passable			
Trio1	CBS	0.37	9.70	Barrier	Streambed Simulation	2.00	Arch. Low quality fish hab.
Trio2	OBS	28.00	5.20	Passable			
Trio3	Other			Unkown			New structure or proper deactivation should be completed.
Trio4	Other			Unkown			recommend new structure or proper deactivation be completed.
Trio5	Other			Unkown			recommend new structure or proper deactivation be completed.
Trio6	CBS	0.40	5.42	Potential	Streambed Simulation	1.00	No upgrades required. 1 m arch could be used.
COG-1	OBS	44.00	4.85	Passable			
COG-5	Other			Unkown			16 m bridge recommended.
COG-6	OBS	37.23	4.75	Passable			
COG-10	CBS	0.51	7.10	Barrier	Streambed Simulation	2.00	Ephemeral stream, low quality habitat, low priority. 2m arch would be applicable.
COG-11	Other			Unkown			Likely no work required unless this road becomes active again.
COG-12	CBS	0.54	10.21	Barrier	OBS	8.00	A bridge is required at this crossing. 8-10m clear span should suffice.
COG-13	CBS	0.38	6.42	Barrier	Streambed Simulation	2.60	An arch culvert would be appropriate here.
COG-14	CBS	0.81	9.07	Barrier	OBS	10.00	Bridge
COG-15	CBS	0.75	9.12	Barrier	OBS	10.00	Bridge
COG-16	CBS	0.54	10.12	Barrier	Streambed Simulation	1.40	Arch
COG-17	CBS	0.54	10.17	Barrier	Streambed Simulation	2.60	Arch
COG-20	Other			Unkown			Minimal access to this location. A low risk site.
COG-21	OBS	27.50	5.00	Passable			Bridge here has been blown out, and should be removed or replaced.
COG-22	OBS	7.50	5.60	Passable			
WL-1	CBS	1.20	10.50	Barrier	OBS	10.00	Bridge should be used here, nice creek.
WL-3	CBS	0.60	8.70	Potential	OBS	12.00	No changes are necessary. Fish can currently pass, and to replace will require an upgrade to a bridge.
WL-4	CBS	1.00	10.17	Passable			
WL-5	CBS	0.60	9.10	Potential	Streambed Simulation	1.60	No change is required. An arch or a slightly larger

Reference No.	Crossing Type	Diameter or Span (meters)	Length or Width (meters)	Barrier Result	Crossing Fix	Recommended Diameter or Span (meters)	Assessment Comment
							culvert would be suitable if a replacement is completed.
WL-9	CBS	0.61	10.05	Barrier	OBS	8.00	Clear span bridge replacement required.
WL-10	CBS	1.20	10.00	Barrier	OBS	10.00	HGI=0 No change required. Need bridge if you go new.
WL-11	CBS	0.59	10.50	Barrier	Removal		Cascade immediately DS of crossing. No fish passage to road. Not worth replacement.
WL-12	CBS	0.60	10.00	Barrier	Streambed Simulation	1.60	Arch culvert.
WL-13	OBS	34.20	4.29	Passable			
WL-20	OBS	10.40	5.10	Passable			
WL-21	CBS	0.56	10.20	Barrier	Streambed Simulation	1.60	Arch Culvert
WL-22	CBS	1.10	10.90	Barrier	OBS	12.00	
WL-23	OBS	10.50	4.80	Passable			
WL-24	CBS	0.74	7.10	Barrier	OBS	15.00	Bridge required here. Fish can pass. Minnow seen US, but messy crossing.
WL-25	CBS	0.60	10.10	Barrier	Streambed Simulation	2.40	2.4m diameter SS arch
WL-26	CBS	0.52	6.10	Barrier	Streambed Simulation	1.60	Arch
WL-27	CBS	0.69	10.20	Barrier	Streambed Simulation	1.00	Arch
WL-28	CBS	0.63	10.20	Barrier	Streambed Simulation	2.00	Arch is an option.
WL-29	CBS	1.12	10.30	Potential	OBS	12.00	No replacement necessary. If structure is replaced, a bridge should be used.
WL-30	CBS	0.61	10.70	Barrier	Streambed Simulation	1.60	Stream ends immediately upstream of crossing. Very low priority, poor habitat.
WL-31	CBS	0.90	10.40	Barrier	Streambed Simulation	2.00	Low priority: poor fish habitat and low HGI. 2 m Arch would work.
WL-32	CBS	0.87	11.00	Potential	Streambed Simulation	1.00	Seasonal fish habitat, no replacement likely required. Good area for compensation. Arch could be used.
WL-33	CBS	0.59	7.90	Barrier	Streambed Simulation	1.00	Arch here, due to substrate.
WL-34	OBS	14.53	4.61	Passable			
WL-35	CBS	1.02	11.00	Barrier	Streambed Simulation	2.00	Arch here due to substrate.
WL-36	CBS	0.63	8.60	Barrier	Streambed Simulation	2.40	Arch. Only 25 m of habitat US; low priority.
WL-38	CBS	0.54	10.20	Potential	Streambed Simulation	1.00	No fix recommended. Poor quality habitat, and passable.
WL-39	OBS	44.00	11.40	Passable			

Reference No.	Crossing Type	Diameter or Span (meters)	Length or Width (meters)	Barrier Result	Crossing Fix	Recommended Diameter or Span (meters)	Assessment Comment
WL-40	OBS	21.80	4.67	Passable			
WL-41	CBS	1.34	7.10	Potential	OBS	8.00	No replacements required. Very low priority. Need 8 m bridge if replacing.
WL-100	Other			Unkown			Gradient barrier immediately upstream of the crossing. No changes necessary.
WL-101	CBS	0.60	9.36	Barrier	Streambed Simulation	2.40	Arch.
WL-102	CBS	0.46	6.15	Barrier	Streambed Simulation	1.60	20 m long arch.
WL-103	CBS	0.45	7.02	Barrier	Streambed Simulation	2.60	Arch likely only option due to substrate.
WL-104	CBS	0.45	9.20	Barrier	Streambed Simulation	1.00	No replacement necessary. Stream grade is limiting to fish US of crossing.
WL-105	CBS	1.44	6.92	Barrier	OBS	15.00	A bridge is best option here due to braiding, and channel jumping.
WL-106	CBS	0.30	10.31	Barrier	Streambed Simulation	1.60	Very low quality. HGI=0. Low priority.
WL-107	CBS	0.54	9.20	Barrier	Streambed Simulation	2.00	Low quality habitat, very low priority.
WL-108	CBS	0.70	8.45	Barrier	Streambed Simulation	2.40	High quality habitat.
WL-109	CBS	0.74	8.20	Potential	Streambed Simulation	2.00	No replacing required. Use arch if change to be made.

Discussion

The data collected indicate that the majority of crossings (50 of 61) were located in areas where no additional habitat was available upstream. In these instances, all of the sites with no habitat gains were built into benches with steep mountain slopes at the road edge. Often times the gradient climbs at >70% slope upstream of the road.

The HGI does not reflect the habitat within the crossing, and this value would be remediated with a structure replacement. Many of the sites with no habitat upstream still call for bridges, and the logic in these cases is that the watercourse crossings are confined in rocky or bedrock substrates where excavation is not possible or practical. In these cases it was assumed by field staff that the most logical (and in some cases only possible) crossing structure would be a bridge.

In order to streamline replacement efforts, Figure 3 identifies the crossings assessed, and indicates which structures require replacement. Higher priority sites are marked in red, moderate in orange and lower in green.

The work for this project was completed in the latter part of the season (early November), and as a result there was a significant risk of snowfall limiting our assessments (these assessments could not be completed in too much snow). In order to best mitigate this risk, higher elevation sites were completed first. There was one day that snow had an influence on site assessments. The assessments were completed, but took more time to determine outlet drop and outlet pool depths. This projects should be started earlier in the year to alleviate these risks.

Recommendations

It is recommended that, due to the low value of habitat within the project area, these sites be carefully evaluated prior to committing the resources for replacement. There are only 11 crossings that, if replaced, will provide a measurable amount of fish habitat to the watershed. It is recommended that the following 6 sites be replaced as priorities: ST-10, ST-5, ST-1, WL-109, WL-9, and COG-19. The Statlu crossings should be completed together as should the Wahleach crossings, for maximum cost efficiency. Other crossings within these watersheds should be ranked as lower priority and be completed where logical with other provincial projects. The ford crossing at Trio3, Trio4, Trio5, ST18 and COG5. These sites are currently accessible to quad and truck traffic and vehicle passage may be negatively impacting downstream water quality. When possible, these sites should be properly deactivated or replaced.

Conclusion

Many of the crossing structures throughout the assessed watersheds were installed as far from the mainstem streams as possible, and frequently at the most severe breaks in slope. These design initiatives have helped maintain fish habitat, despite poor crossing structure installation, as the culverts had minimal impacts on overall fish habitat loss. Due to the extreme gradients and heavy bedrock throughout the area, there are limitations to which crossing structures are possible and where roads can be built. Within these limitations we saw an increased number of bridges than are seen elsewhere in the province, and efforts made to preserve fish passage even on older roads. Few of the fish-bearing watercourses contain debilitating barriers, and provincial replacement priorities should consider this.

References

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Appendix 1 – PSCIS Submission Data

Location and Overview Information

Date of Assessment (YYYY-MM-DD)	PSCIS Crossing ID	My Crossing Reference	Crew Members	UTM Zone	Easting	Northing	Stream Name	Road Name	Road KM Mark	Road Tenure
2011-11-07		COG-18	RB/TF	10	598207.00	5491780.00	Tributary to Cogburn Creek	Cogburn Forest Service Road	13.23	R01712
2011-11-07		COG-19	RB/TF	10	598396.00	5491891.00	Tributary to Cogburn Creek	Cogburn Forest Service Road	13.55	R01712
2011-11-07		COG-7	RB/TF	10	601628.00	5489180.00	Cogburn Creek	Cogburn Forest Service Road	17.20	R01712
2011-11-07		COG-8	RB/TF	10	602291.00	5488566.00	Tributary to Cogburn Creek	Cogburn Forest Service Road	18.10	R01712
2011-11-07		COG-9	RB/TF	10	602134.00	5488614.00	Tributary to Cogburn Creek	Cogburn Forest Service Road	18.25	R01712
2011-11-03		ST-1	RB/TF	10	570402.00	5466495.00	Tributary to Statlu Creek	Chehalis-Statlu FSR	0.50	R02023
2011-11-03		ST-2	RB/TF	10	570184.00	5466459.00	Tributary to Statlu Creek	Chehalis-Statlu FSR	0.86	R02023
2011-11-03		ST-3	RB/TF	10	569428.00	5466543.00	Tributary to Statlu Creek	Chehalis-Statlu FSR	1.36	R02023
2011-11-03		ST-4	RB/TF	10	570823.00	5466504.00	Statlu Creek	Chehalis FSR	13.50	R02023
2011-11-04		ST-5	RB/TF	10	565297.00	5472408.00	Tributary to Statlu Creek	North Statlu FSR	11.50	R02023
2011-11-04		ST-6	RB/TF	10	565266.00	5472293.00	Tributary to Statlu Creek	North Statlu FSR	11.19	R02023
2011-11-04		ST-7	RB/TF	10	565144.00	5472295.00	Statlu Creek	Spur at 11km on North Statlu FS	0.10	R02023
2011-11-04		ST-8	RB/TF	10	565258.00	5472151.00	Tributary to Statlu Creek	North Statlu FSR	10.76	R02023
2011-11-04		ST-9	RB/TF	10	565253.00	5472010.00	Tributary to Statlu Creek	North Statlu FSR	10.62	R02023
2011-11-04		ST-10	RB/TF	10	565247.00	5471962.00	Tributary to Statlu Creek	North Statlu FSR	10.57	R02023
2011-11-04		ST-11	RB/TF	10	564915.00	5470558.00	Tributary to Statlu Creek	North Statlu FSR	8.20	R02023
2011-11-04		ST-12	RB/TF	10	564869.00	5469377.00	Tributary to Statlu Creek	North Statlu FSR	7.85	R02023
2011-11-04		ST-13	RB/TF	10	564869.00	5469377.00	Statlu Creek	Spur @ 7.2km on North Statlu F!	0.10	R02023
2011-11-04		ST-14	RB/TF	10	564584.00	5468930.00	Statlu Creek	Spur @ 7.2km on North Statlu F!	0.15	R02023
2011-11-04		ST-15	RB/TF	10	564017.00	5469292.00	Tributary to Statlu Creek	Spur @ 7.2km on North Statlu FSR	1.85	R02023
2011-11-04		ST-16	RB/TF	10	565275.00	5468610.00	Tributary to Statlu Creek	North Statlu FSR	6.80	R02023
2011-11-04		ST-17	RB/TF	10	565543.00	5468435.00	Tributary to Statlu Creek	North Statlu FSR	6.40	R02023
2011-11-04		ST-18	RB/TF	10	565631.00	5468318.00	Tributary to Statlu Creek	North Statlu FSR	6.20	R02023
2011-11-04		ST-19	RB/TF	10	565849.00	5468166.00	Tributary to Statlu Creek	North Statlu FSR	6.13	R02023
2011-11-04		ST-20	RB/TF	10	565928.00	5468068.00	Alice Creek	North Statlu FSR	5.95	R02023
2011-11-04		ST-21	RB/TF	10	566801.00	5467695.00	Statlu Creek	North Statlu FSR	5.70	R02023
2011-11-04		ST-22	RB/TF	10	568796.00	5499424.00	Tributary to Statlu Creek	North Statlu FSR	2.07	R02023
2011-11-04		ST-23	RB/TF	10	569149.00	5460215.00	Tributary to Statlu Creek	South Statlu FSR	0.10	R02023
2011-11-04		ST-24	RB/TF	10	569142.00	5465960.00	Alf Creek	South Statlu FSR	0.18	R02023
2011-11-04		ST-25	RB/TF	10	569132.00	5466411.00	Statlu Creek	Statlu FSR	1.70	R02023
2011-11-04		ST-26	RB/TF	10	568661.00	5466721.00	Tributary to Statlu Creek	710.D	0.80	R02023
2011-11-04		ST-27	RB/TF	10	570822.00	5466630.00	Tributary to Chehalis River	Chehalis FSR	15.70	R02023
2011-11-04		ST-28	RB/TF	10	572164.00	5465636.00	Tributary to Chehalis River	Chehalis FSR	13.00	R02023
2011-11-04		ST-29	RB/TF	10	572790.00	5465125.00	Tributary to Chehalis River	Chehalis FSR	12.80	R02023
2011-11-06		ST-40	RB/TF	10	567968.00	5466564.00	Tributary to Statlu Creek	South Statlu FSR	1.22	R02023
2011-11-06		ST-41	RB/TF	10	568908.00	5466367.00	Tributary to Statlu Creek	South Statlu FSR	0.20	R02023
2011-11-06		ST-42	RB/TF	10	566825.00	5467596.00	Tributary to Statlu Creek	Statlu FSR	4.90	R02023
2011-11-06		ST-43	RB/TF	10	564489.00	5469006.00	Tributary to Statlu Creek	Spur @ 7.2km on North Statlu FSR	0.41	R02023
2011-11-08		BR-1	RB/TF	10	589583.00	5480013.00	Bear Creek	Harrison East FSR	16.75	Public
2011-11-03		TR-1	RB/TF	10	563149.00	5508485.00	Tributary to Trethaway Creek	Harrison West FSR	67.50	Public
2011-11-03		TR-2	RB/TF	10	563226.00	5504512.00	Trethaway Creek	Harrison West FSR	65.50	Public
2011-11-03		TR-3	RB/TF	10	564219.00	5505075.00	Tributary to Trethaway Creek	Harrison West FSR	65.00	Public
2011-11-03		TR-4	RB/TF	10	565241.00	5505193.00	Tributary to Trethaway Creek	Harrison West FSR	63.50	Public
2011-11-08		Trio1	RB/TF	10	571942.00	5495317.00	Tributary to Trio Creek	Trio FSR	6.50	R01712
2011-11-08		Trio2	RB/TF	10	574496.00	5497764.00	Trio Creek	Harrison West FSR	47.92	R01712
2011-11-08		Trio3	RB/TF	10	574784.00	5497218.00	Tributary to Trio Creek	Spur @ 47.6 Harrison West	0.06	R01712
2011-11-08		Trio4	RB/TF	10	574790.00	5496845.00	Tributary to Trio Creek	Spur @ 47.6 Harrison West	0.43	R01712
2011-11-08		Trio5	RB/TF	10	572086.00	5495119.00	Tributary to Trio Creek	Spur @ 47.6 Harrison West	5.31	R01712
2011-11-08		Trio6	RB/TF	10	571842.00	5495130.00	Tributary to Trio Creek	Spur @ 47.6 Harrison West	7.00	R01712
2011-11-06		COG-1	RB/TF	10	589628.00	5487797.00	Cogburn Creek	Harrison East FSR	24.20	Public
2011-11-07		COG-5	RB/TF	10	597493.00	5491196.00	Tributary to Settler Creek	Spur Rd. to Cogburn FSR	2.10	R01712
2011-11-07		COG-6	RB/TF	10	597693.00	5491337.00	Cogburn Creek	Spur Rd. to Cogburn FSR	0.08	R01712
2011-11-07		COG-10	RB/TF	10	601895.00	5489007.00	Tributary to Cogburn Creek	Cogburn Forest Service Road	17.84	Public
2011-11-07		COG-11	RB/TF	10	601812.00	5489127.00	Tributary to Cogburn Creek	Cogburn Forest Service Road	17.67	Public
2011-11-07		COG-12	RB/TF	10	601781.00	5489158.00	Tributary to Cogburn Creek	Cogburn Forest Service Road	17.47	Public
2011-11-07		COG-13	RB/TF	10	601737.00	5489195.00	Tributary to Cogburn Creek	Cogburn Forest Service Road	17.10	Public
2011-11-07		COG-14	RB/TF	10	601636.00	5489286.00	Tributary to Cogburn Creek	Cogburn Forest Service Road	16.89	Public
2011-11-07		COG-15	RB/TF	10	601462.00	5490008.00	Tributary to Cogburn Creek	Cogburn Forest Service Road	16.51	Public
2011-11-07		COG-16	RB/TF	10	601427.00	5490132.00	Tributary to Cogburn Creek	Cogburn Forest Service Road	16.35	Public
2011-11-07		COG-17	RB/TF	10	601271.00	5490352.00	Tributary to Cogburn Creek	Cogburn Forest Service Road	15.64	Public
2011-11-07		COG-20	RB/TF	10	596215.00	5490862.00	Tributary to Cogburn Creek	Cogburn Forest Service Road	11.40	Public
2011-11-07		COG-21	RB/TF	10	594696.00	5490613.00	Tributary to Cogburn Creek	Cogburn Forest Service Road	10.90	Public
2011-11-07		COG-22	RB/TF	10	590998.00	5490215.00	Craig Creek	Cogburn Forest Service Road	8.50	Public
2011-11-02		WL-1	RB/TF	10	601597.00	5452791.00	Tributary to Wahleach Lake	Jones Lake FSR	12.60	Public
2011-11-02		WL-3	RB/TF	10	601579.00	5452873.00	Tributary to Wahleach Lake	Jones Lake FSR	12.24	Public
2011-11-02		WL-4	RB/TF	10	601592.00	5453002.00	Tributary to Wahleach Lake	Jones Lake FSR	12.00	Public
2011-11-02		WL-5	RB/TF	10	601606.00	5453094.00	Tributary to Wahleach Lake	Jones Lake FSR	11.90	Public
2011-11-02		WL-9	RB/TF	10	601570.00	5453729.00	Tributary to Wahleach Lake	Jones Lake FSR	11.30	Public
2011-11-02		WL-10	RB/TF	10	601670.00	5454121.00	Tributary to Wahleach Lake	Jones Lake FSR	10.50	Public
2011-11-02		WL-11	RB/TF	10	601655.00	5454310.00	Tributary to Wahleach Lake	Jones Lake FSR	10.30	Public
2011-11-02		WL-12	RB/TF	10	601760.00	5455881.00	Tributary to Wahleach Lake	Jones Lake FSR	9.00	Public
2011-11-02		WL-13	RB/TF	10	601795.00	5455973.00	Boulder Creek	Jones Lake FSR	9.20	Public
2011-11-05		WL-20	RB/TF	10	602580.00	5451317.00	Tributary to Wahleach Lake	Jones Lake FSR	14.60	Public
2011-11-05		WL-21	RB/TF	10	602585.00	5451406.00	Tributary to Wahleach Lake	Jones Lake FSR	14.50	Public
2011-11-05		WL-22	RB/TF	10	602501.00	5451690.00	Tributary to Wahleach Lake	Jones Lake FSR	14.20	Public
2011-11-05		WL-23	RB/TF	10	601628.00	5452747.00	Tributary to Wahleach Lake	Jones Lake FSR	12.00	Public
2011-11-05		WL-24	RB/TF	10	601819.00	5456212.00	Tributary to Wahleach Lake	Jones Lake FSR	11.80	Public
2011-11-05		WL-25	RB/TF	10	601835.00	5456687.00	Tributary to Wahleach Lake	Jones Lake FSR	9.55	Public
2011-11-05		WL-26	RB/TF	10	601833.00	5456749.00	Tributary to Wahleach Lake	Jones Lake FSR	9.45	Public
2011-11-05		WL-27	RB/TF	10	601821.00	5456836.00	Tributary to Wahleach Lake	Jones Lake FSR	9.09	Public
2011-11-05		WL-28	RB/TF	10	601816.00	5456906.00	Tributary to Wahleach Lake	Jones Lake FSR	8.80	Public
2011-11-05		WL-29	RB/TF	10	601693.00	5456778.00	Tributary to Jones Creek	Jones Lake FSR	1.10	Public
2011-11-05		WL-30	RB/TF	10	601400.00	5457883.00	Tributary to Jones Creek	Jones Lake FSR	6.70	Public
2011-11-05		WL-31	RB/TF	10	600773.00	5459224.00	Tributary to Jones Creek	Jones Lake FSR	5.01	Public
2011-11-05		WL-32	RB/TF	10	600650.00	5459292.00	Tributary to Jones Creek	Jones Lake FSR	4.70	Public
2011-11-05		WL-33	RB/TF	10	600668.00	5459548.00	Tributary to Jones Creek	Jones Lake FSR	4.40	Public
2011-11-05		WL-34	RB/TF	10	600564.00	5460184.00	Tributary to Jones Creek	Jones Lake FSR	3.93	Public
2011-11-05		WL-35	RB/TF	10	600401.00	5461145.00	Tributary to Jones Creek	Jones Lake FSR	2.70	Public
2011-11-05		WL-36	RB/TF	10	600245.00	5462621.00	Tributary to Jones Creek	Jones Lake FSR	1.20	Public
2011-11-05		WL-38	RB/TF	10	600138.00	5463065.00	Tributary to Jones Creek	Jones Lake FSR	1.10	Public
2011-11-05		WL-39	RB/TF	10	599860.00	5463081.00	Jones Creek	Jones Lake FSR	0.60	Public
2011-11-05		WL-40	RB/TF	10	601727.00	5456784.00	Jones Creek	Jones Lake FSR	1.00	Public
2011-11-05		WL-41	RB/TF	10	601536.00	5457145.00	Tributary to Jones Creek	Jones Lake FSR	0.80	Public
2011-11-09		WL-100	RB/TF	10	600513.00	5464737.00	Tributary to Wahleach Lake	Jones Lake W. FSR	2.20	R18564
2011-11-09		WL-101	RB/TF	10	600499.00	5454695.00	Tributary to Wahleach Lake	Jones Lake W. FSR	2.18	R18564
2011-11-09		WL-102	RB/TF	10	600780.00	5455737.00	Tributary to Wahleach Lake	Jones Lake W. FSR	1.23	R18564
2011-11-09		WL-103	RB/TF	10	600825.00	5455894.00	Tributary to Wahleach Lake	Jones Lake W. FSR	1.07	R18564
2011-11-09		WL-104	RB/TF	10	600718.00	5455989.00	Tributary to Wahleach Lake	Jones Lake W. FSR	1.09	R18564
2011-11-09		WL-105	RB/TF	10	600808.00	5456068.00	Tributary to Wahleach Lake	Jones Lake W. FSR	1.01	R18564
2011-11-09		WL-106	RB/TF	10	600800.00	5456170.00	Tributary to Wahleach Lake	Jones Lake W. FSR	0.99	R18564
2011-11-09		WL-107	RB/TF	10	600798.00	5456253.00	Tributary to Wahleach Lake	Jones Lake W. FSR	0.98	R18564
2011-11-09		WL-108	RB/TF	10	600750.00	5456590.00	Tributary to Wahleach Lake	Jones Lake W. FSR	0.84	R18564
2011-11-09		WL-109	RB/TF	10	600817.00	5456716.00	Tributary to Wahleach Lake	Jones Lake W. FSR	0.31	R18564

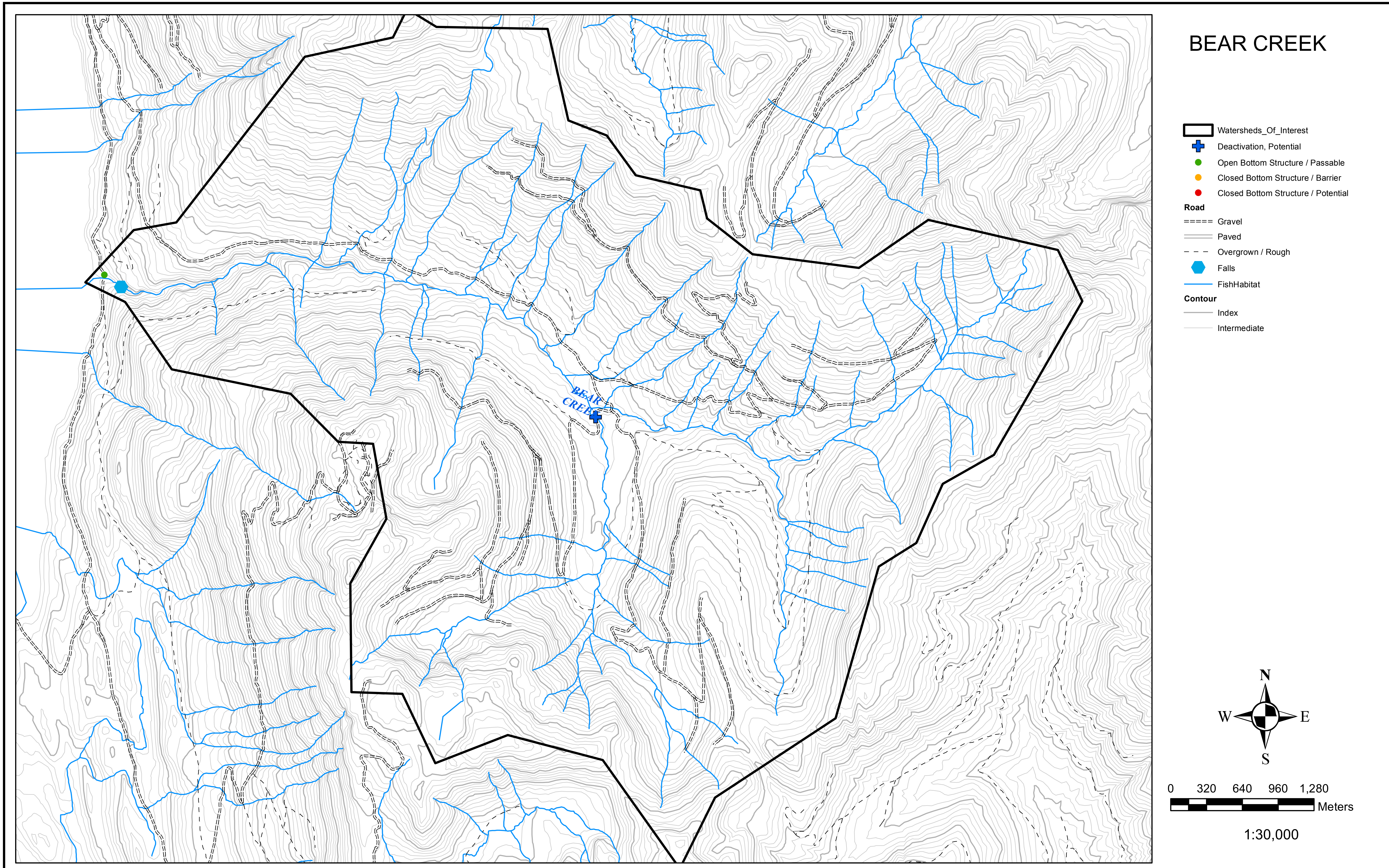
Field Observations and Assessment Measurements / Stream Information

My Crossing Reference	Crossing Type	Crossing Subtype	Diameter or Span (meters)	Length or Width (meters)	Continuous Embeddedment? Yes/No	Average Depth Embededdment (meters)	Resemble Channel? Yes / No	Backwatered? Yes / No	Percentage Backwatered	Fill Depth (meters)	Outlet Drop (meters)	Outlet Pool Depth (0.01m)	Inlet Drop? Yes / No	Culvert Slope (%)	Downstream Channel Width (meters)	Stream Slope	Beaver Activity? Yes / No	Fish Observed? Yes / No	Valley Fill	Habitat Value
COG-18	Closed Bottom Structure	Round Culvert	0.88	9.70	No		No	No		0.82	0.42	0.04	Yes	0.50	2.14	4	No	No	Shallow Fill	High
COG-19	Closed Bottom Structure	Round Culvert	1.11	9.42	No		No	No		0.29	0.58	0.16	Yes	5.00	3.96	5	No	No	Shallow Fill	High
COG-7	Open Bottom Structure	Bridge	12.60	3.90													No	No		
COG-8	Closed Bottom Structure	Round Culvert	0.67	5.84	No		No	No		0.22	0	0.00	No	0.70	2.28	4	No	No	Bedrock	Low
COG-9	Closed Bottom Structure	Round Culvert	0.54	6.50	No		No	No		0.44	0.08	0.06	No	2.20	2.14	9	No	No	Shallow Fill	Low
ST-1	Closed Bottom Structure	Round Culvert	1.40	12.00	No		No	No		0.98	0.32	0.37	No	3.00	1.60	6	No	No	Shallow Fill	High
ST-2	Closed Bottom Structure	Round Culvert	0.40	10.20	No		No	No		1.25	0.38	0.23	No	4.00	1.41	6	No	No	Shallow Fill	Medium
ST-3	Open Bottom Structure	Bridge	17.00	5.20													No	No		
ST-4	Open Bottom Structure	Bridge	46.80	4.84													No	No		
ST-5	Closed Bottom Structure	Round Culvert	0.66	8.60	No		No	No		0.70	0.34	0.38	Yes	2.10	2.64	10	No	No	Shallow Fill	Medium
ST-6	Closed Bottom Structure	Round Culvert	0.49	8.32	No		No	No		0.30	0.65	0.22	No	6.00	1.78	14	No	No	Shallow Fill	Low
ST-7	Open Bottom Structure		17.00	4.30													No	No		
ST-8	Open Bottom Structure	Bridge	10.61	6.72													No	No		
ST-9	Closed Bottom Structure	Round Culvert	0.80	10.21	No		No	No		0.58	0.23	0.26	No	0.20	1.29	7	No	No	Shallow Fill	Medium
ST-10	Closed Bottom Structure	Round Culvert	1.10	10.24	No		No	No		0.64	0.25	0.53	No	0.80	2.54	8	No	No	Shallow Fill	High
ST-11	Closed Bottom Structure	Round Culvert	1.18	10.90	No		No	No		0.76	0.98	0.19	No	0.10	1.40	19	No	No	Bedrock	Low
ST-12	Closed Bottom Structure	Round Culvert	0.40	11.40	No		No	No		2.04	0.1	0.09	No	3.00	1.20	25	No	No	Shallow Fill	Low
ST-13	Open Bottom Structure	Bridge	22.50	4.78													No	No		
ST-14	Open Bottom Structure	Bridge	17.53	4.92													No	No		
ST-15	Open Bottom Structure	Wood Box Culvert	6.60	4.20													No	No		
ST-16	Closed Bottom Structure	Round Culvert	0.85	10.15	No		No	No		0.63	0.85	0.05	Yes	9.00	1.65	10	No	No	Bedrock	Medium
ST-17	Open Bottom Structure	Wood Box Culvert	4.20	5.90													No	No		
ST-18	Other	Ford															No	No		
ST-19	Open Bottom Structure	Wood Box Culvert	4.00	7.50													No	No		
ST-20	Open Bottom Structure	Bridge	12.26	4.90													No	No		
ST-21	Open Bottom Structure	Bridge	48.60	4.90													No	No		
ST-22	Open Bottom Structure	Bridge	6.30	6.00													No	No		
ST-23	Open Bottom Structure	Bridge	15.90	4.90													No	No		
ST-24	Open Bottom Structure	Wood Box Culvert	6.00	4.90													No	No		
ST-25	Open Bottom Structure	Bridge	18.80	5.10													No	No		
ST-26	Closed Bottom Structure	Round Culvert	0.54	9.30	No		No	No		0.85	0.08	0.07	No	1.00	1.60	21	No	No	Shallow Fill	Low
ST-27	Closed Bottom Structure	Round Culvert	0.90	10.00	No		No	No		1.12	0.4	0.17	Yes	0.30	1.10	5	No	No	Shallow Fill	Low
ST-28	Open Bottom Structure	Wood Box Culvert	5.90	4.80													No	No		
ST-29	Open Bottom Structure	Bridge	14.80	10.00													No	No		
ST-40	Open Bottom Structure	Bridge	6.50	6.80													No	No		
ST-41	Closed Bottom Structure	Round Culvert	0.40	10.20	No		No	No		1.97	0.3	0.01	No	-0.20	1.89	20	No	No	Shallow Fill	Low
ST-42	Closed Bottom Structure	Round Culvert	0.53	8.20	No		No	No		0.46	0.14	0.09	Yes	5.00	1.79	2	No	No	Shallow Fill	Medium
ST-43	Closed Bottom Structure	Round Culvert	1.17	14.50	No		No	No		0.80	0.95	0.29	Yes	9.00	2.14	18	No	No	Bedrock	High
BR-1	Open Bottom Structure	Bridge	30.70	5.10													No	No		
TR-1	Open Bottom Structure	Bridge	12.20	6.90													No	No		
TR-2	Open Bottom Structure	Bridge	30.30	4.90													No	No		
TR-3	Closed Bottom Structure	Round Culvert	1.20	9.20	Yes	0.05	Yes	No		0.60	0.2	0.33	Yes	4.10	1.60	31	No	No	Shallow Fill	Low
TR-4	Open Bottom Structure	Bridge	30.60	9.80													No	No		
Trio1	Closed Bottom Structure	Round Culvert	0.37	9.70	No		No	No		1.30	0.11	0.08	No	5.00	1.78	11	No	No	Shallow Fill	Low
Trio2	Open Bottom Structure	Bridge	28.00	5.20													No	No		
Trio3	Other	Ford															No	No		
Trio4	Other	Ford															No	No		
Trio5	Other	Ford															No	No		
Trio6	Closed Bottom Structure	Round Culvert	0.40	5.42	No		No	No		0.43	0.05	0.18	No	2.30	0.50	12	No	No	Shallow Fill	Medium
COG-1	Open Bottom Structure	Bridge	44.00	4.85													No	No		
COG-5	Other	Ford															No	No		
COG-6	Open Bottom Structure	Bridge	37.23	4.75													No	No		
COG-10	Closed Bottom Structure	Round Culvert	0.51	7.10	No		No	No		0.34	0.05	0.03	No	3.40	2.09	1	No	No	Bedrock	Low
COG-11	Other	Ford															No	No		
COG-12	Closed Bottom Structure	Round Culvert	0.54	10.21	No		No	No		0.57	1.4	0.21	No	0.10	1.78	16	No	No	Shallow Fill	Low
COG-13	Closed Bottom Structure	Round Culvert	0.38	6.42	No		No	No		1.22	0.59	0.15	No	1.20	2.41	0	No	No	Shallow Fill	Low
COG-14	Closed Bottom Structure	Round Culvert	0.81	9.07	No		No	No		0.54	0.81	0.52	No	-0.01	2.56	17	No	No	Bedrock	Low
COG-15	Closed Bottom Structure	Round Culvert	0.75	9.12	No		No	No		0.24	0.93	0.03	No	4.00	3.51	13	No	No	Bedrock	Low
COG-16	Closed Bottom Structure	Round Culvert	0.54	10.12	No		No	No		0.45	0.73	0.09	Yes	9.00	1.22	20	No	No	Shallow Fill	Low
COG-17	Closed Bottom Structure	Round Culvert	0.54	10.17	No		No	No		0.37	0.4	0.06	No	1.00	2.42	18	No	No	Shallow Fill	Low
COG-20	Other	Ford															No	No		
COG-21	Open Bottom Structure	Bridge	27.50	5.00													No	No		
COG-22	Open Bottom Structure	Bridge	7.50	5.60													No	No		
WL-1	Closed Bottom Structure	Round Culvert	1.20	10.50	No		No	No		0.65	0.46	0.68	No	2.00	3.48	15	No	No	Shallow Fill	High
WL-3	Closed Bottom Structure	Round Culvert	0.60	8.70	No		No	No		0.33	0	0.00	Yes	1.10	0.70	8	No	No	Deep Fill	Low
WL-4	Closed Bottom Structure	Round Culvert	1.00	10.17	No		No	No		0.52	0	0.00	Yes	0.20	0.90	3	No	No	Shallow Fill	High
WL-5	Closed Bottom Structure	Round Culvert	0.60	9.10	No		No	No		0.36	0	0.01	No	0.70	0.90	6	No	No	Shallow Fill	Low
WL-9	Closed Bottom Structure	Round Culvert	0.61	10.05	No		No	No		0.40	0.66	0.45	No	4.00	2.50	20	No	No	Shallow Fill	Medium
WL-10	Closed Bottom Structure	Round Culvert	1.20	10.00	No		No	No		0.52	0.69	0.34	No	-1.00	1.90	12	No	No	Shallow Fill	Medium
WL-11	Closed Bottom Structure	Round Culvert	0.59	10.50	No		No	No		0.75	0.11	0.17	Yes	7.00	1.10	13	No	No	Deep Fill	Medium
WL-12	Closed Bottom Structure	Round Culvert	0.60	10.00	No		No	No		0.10	0.63	0.11	No	1.00	1.40	9	No	No	Deep Fill	Medium
WL-13	Open Bottom Structure	Bridge	34.20	4.29													No	No		
WL-20	Open Bottom Structure	Bridge	10.40	5.10													No	No		
WL-21	Closed Bottom Structure	Round Culvert	0.56	10.20	No		No	No		0.39	0.22	0.08	Yes	2.90	1.58	6	No	No	Bedrock	Low
WL-22	Closed Bottom Structure	Round Culvert	1.10	10.90	No		No	No		1.02	0.51	0.12	Yes	2.70	1.04	7	No	No	Bedrock	Medium
WL-23	Open Bottom Structure	Bridge	10.50	4.80													No	No		
WL-24	Closed Bottom Structure	Round Culvert	0.74	7.10	No		No	No		0.46	0.04	0.13	No	1.00	3.40	5	No	Yes	Shallow Fill	High
WL-25	Closed Bottom Structure	Round Culvert	0.60	10.10	No		No	No		0.22	0.43	0.20	No	0.90	2.18	4	No	No	Shallow Fill	Medium
WL-26	Closed Bottom Structure	Round Culvert	0.52	6.10	No		No	No		0.25	0.25	0.08	Yes	1.30	1.52	4	No	No	Shallow Fill	Medium
WL-27	Closed Bottom Structure	Round Culvert	0.69	10.20	No		No	No		0.41	0.33	0.10	Yes	0.50	0.76	4	No	No	Bedrock	Low
WL-28	Closed Bottom Structure	Round Culvert	0.63	10.20	No		No	No		0.41	0.55	0.10	No	2.40	1.80	4	No	No	Shallow Fill	Medium
WL-29	Closed Bottom Structure	Round Culvert	1.12	10.30	No		No	No		0.93	0	0.00	No	0.00	4.60	4	No	Yes	Bedrock	High
WL-30	Closed Bottom Structure	Round Culvert	0.61	10.70	No		No	No		0.57	0.06	0.09	Yes	2.80	1.47	15	No	No	Deep Fill	Low
WL-31	Closed Bottom Structure	Round Culvert	0.90	10.40	No		No	No		0.70	0.09	0.29	No	2.10	1.60	18	No	No	Bedrock	Low
WL-32	Closed Bottom Structure	Round Culvert	0.87	11.00	No		No	No		0.51	0	0.00	No	0.00	1.81	2	No	No	Shallow Fill	Medium
WL-33	Closed Bottom Structure	Round Culvert	0.59	7.90	No		No	No		0.25	0.28	0.22	No	0.80	0.81	3	No	No	Bedrock	Low
WL-34	Open Bottom Structure	Bridge	14.53	4.61													No	No		
WL-35	Closed Bottom Structure	Round Culvert	1.02	11.00	No		No	No		0.74	0.67	0.03	No	2.00	1.61	6	No	No	Bedrock	Medium
WL-36	Closed Bottom Structure	Round Culvert	0.63	8.60	No		No	No		0.40	0.36	0.03	No	1.40	2.34	5	No	No	Shallow Fill	Medium
WL-38	Closed Bottom Structure	Round Culvert	0.54	10.20	No		No	No		1.19	0.07	0.01	No	2.00	0.38	5	No	No	Shallow Fill	Low
WL-39	Open Bottom Structure	Bridge	44.00	11.40													No	No		
WL-40	Open Bottom Structure	Bridge	21.80	4.67													No	No		
WL-41	Closed Bottom Structure	Round Culvert	1.34	7.10	No		No	No		0.40	0.02	0.28	No	0.90	2.75	19	No	No	Bedrock	Low
WL-100	Other	Ford															No	No		
WL-101	Closed Bottom Structure	Round Culvert	0.60	9.36	No		Yes	No		0.85	0	0.00	No	7.00	2.31	13	No	No	Shallow Fill	Medium
WL-102	Closed Bottom Structure	Round Culvert	0.46	6.15	No		No	No		0.50	0.18	0.18	No	3.90	1.50	11	No	No	Bedrock	Low
WL-103	Closed Bottom Structure	Round Culvert	0.45	7.02	No		No	No		0.67	0.08	0.09	No	1.40	2.53	20	No	No	Bedrock	Medium
WL-104	Closed Bottom Structure	Round Culvert	0.45	9.20	No		No	No		0.41	0.24	0.11	No	6.00	0.97	22	No	No	Bedrock	Low
WL-105	Closed Bottom Structure	Round Culvert	1.44	6.92	No		No	No		0.27	0.34	0.07	No	0.20	1.49	8	No	No	Shallow Fill	Low
WL-106	Closed Bottom Structure	Round Culvert	0.30	10.31	No		No	No		0.67	0.19	0.01	No	6.00	2.00	29	No	No	Bedrock	Low
WL-107	Closed Bottom Structure	Round Culvert	0.54	9.20	No		No	No		0.37	0.11	0.02	No	7.00	1.78	19	No	No	Bedrock	Low
WL-108	Closed Bottom Structure	Round Culvert	0.70	8.45	No		No	No		0.70	0.64	0.47	No	4.00	2.00	10	No	No	Shallow Fill	Low
WL-109	Closed Bottom Structure	Round Culvert	0.74	8.20	No		No	No		1.00	0.14	0.36	No	0.20	1.79	3	No	No	Shallow Fill	High

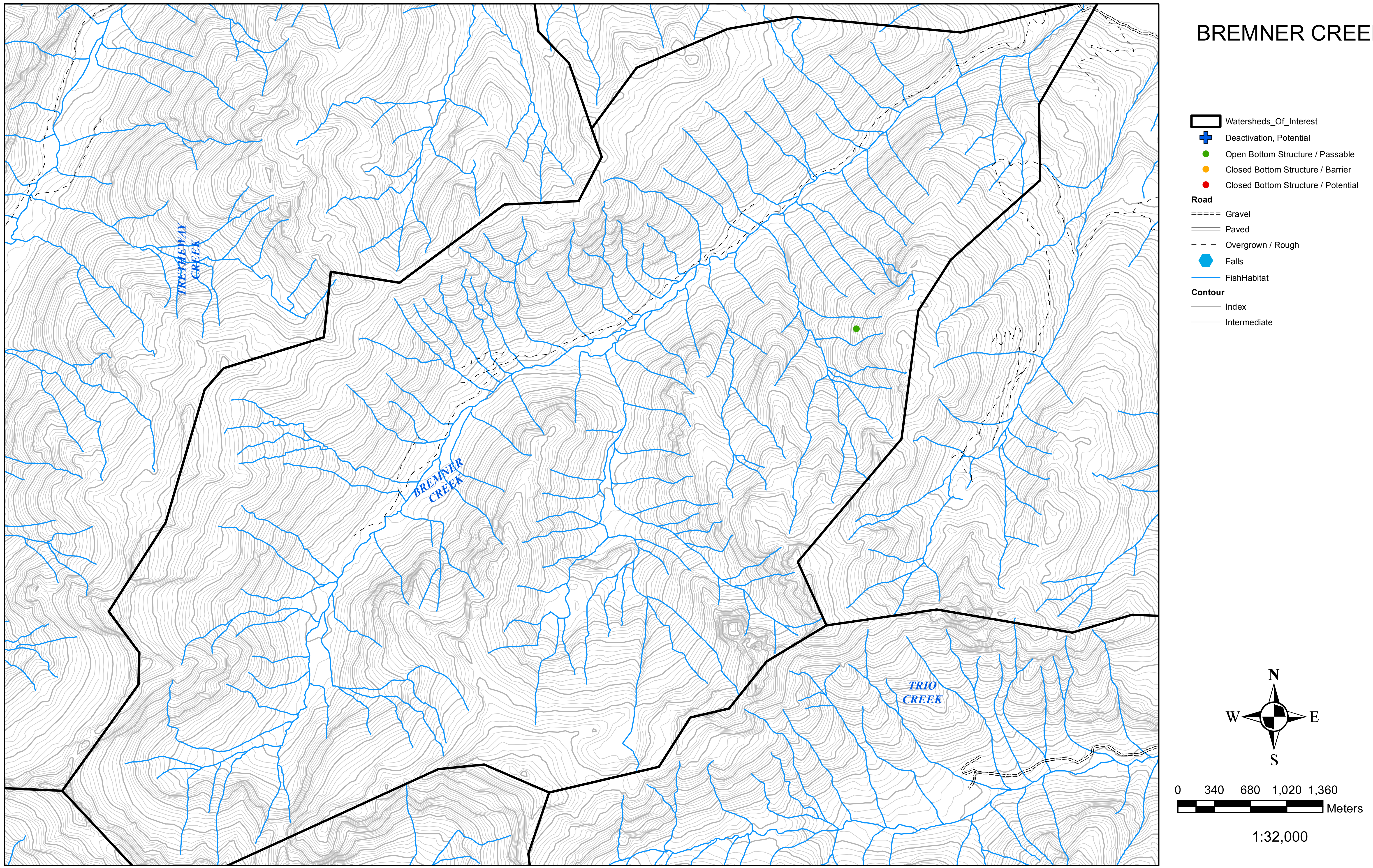
Scoring Data / Recommendations

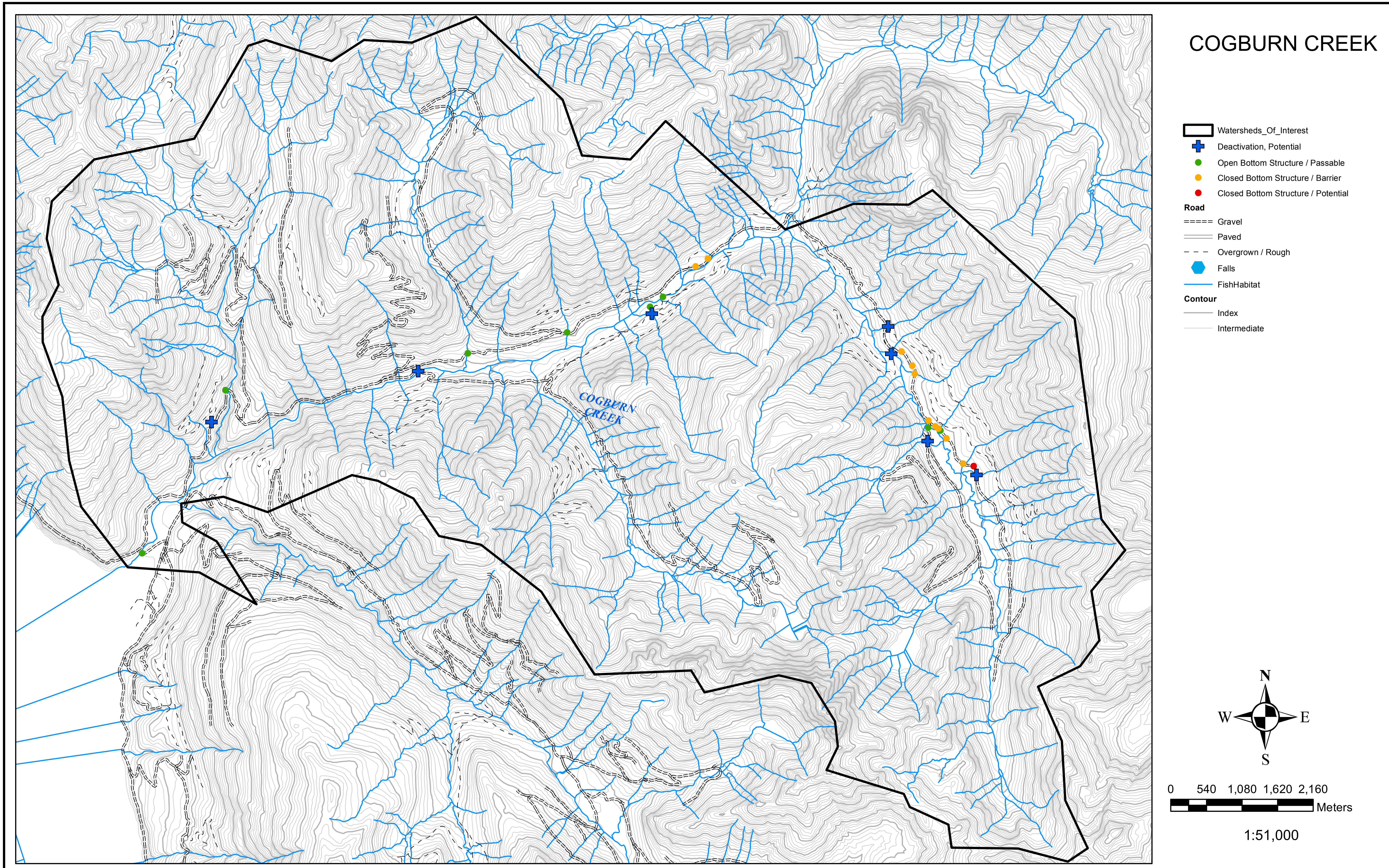
My Crossing Reference	Stream Width Ratio	Culvert Length Score	Embed Score	Outlet Drop Score	Culvert Slope Score	Stream Width Ratio Score	Final Score	Barrier Result	Crossing Fix	Recommended Diameter or Span (meters)	Assessment Comment
COG-18	2.43	0	10	10	0	6	26	Barrier	Open Bottom Structure	8.00	An 8 m bridge span should be used to replace this culvert.
COG-19	3.57	0	10	10	10	6	36	Barrier	Open Bottom Structure	8	An 8 m bridge span should be used to replace this culvert.
COG-7	0.00	0	0	0	0	0	0	Passable			No furhter fish passage work required.
COG-8	3.40	0	10	0	0	6	16	Potential	Removal		Road is not really accessible past here. There does not appea
COG-9	3.96	0	10	0	5	6	21	Barrier	Removal		Road is not really accessible past here. There does not appea
ST-1	1.14	0	10	10	10	3	33	Barrier	Open Bottom Structure	12	this crossing should be reoplaced with a clear span bridge.
ST-2	3.53	0	10	10	10	6	36	Barrier	Streambed Simulation	2.4	An open bottom arch would be suitable here.
ST-3	0.00	0	0	0	0	0	0	Passable			
ST-4	0.00	0	0	0	0	0	0	Passable			
ST-5	4.00	0	10	10	5	6	31	Barrier	Removal		The road is deactivated 1 km further up from here. There is r
ST-6	3.63	0	10	10	10	6	36	Barrier	Streambed Simulation	2.00	There is minimal upstream fish habitat (<10m length) it is a lo
ST-7	0.00	0	0	0	0	0	0	Passable			
ST-8	0.00	0	0	0	0	0	0	Passable			
ST-9	1.61	0	10	5	0	6	21	Barrier	Open Bottom Structure	10.00	A 10 m clear span bridge would be the best crossing design fo
ST-10	2.31	0	10	5	0	6	21	Barrier	Streambed Simulation	2.60	No changes required. Is currently passable to fish, even at lo
ST-11	1.19	0	10	10	0	3	23	Barrier	Open Bottom Structure	13.00	A bridge would be required, but it's extremely rugged terrain
ST-12	3.00	0	10	0	10	6	26	Barrier	Open Bottom Structure	1.40	Gradient may be prohibitive. Low priority.
ST-13	0.00	0	0	0	0	0	0	Passable			
ST-14	0.00	0	0	0	0	0	0	Passable			
ST-15	0.00	0	0	0	0	0	0	Passable			
ST-16	1.94	0	10	10	10	6	36	Barrier	Open Bottom Structure	12.00	A 12 m clear span should replace this crossing.
ST-17	0.00	0	0	0	0	0	0	Passable			Crossing is ancient, and is in poor condition. Should be repla
ST-18	0.00	0	0	0	0	0	0	Unkown			On a frequently used road, and needs a crossing structure to
ST-19	0.00	0	0	0	0	0	0	Passable			Should eventually be upgraded, but low priority.
ST-20	0.00	0	0	0	0	0	0	Passable			
ST-21	0.00	0	0	0	0	0	0	Passable			
ST-22	0.00	0	0	0	0	0	0	Passable			
ST-23	0.00	0	0	0	0	0	0	Passable			
ST-24	0.00	0	0	0	0	0	0	Passable			
ST-25	0.00	0	0	0	0	0	0	Passable			
ST-26	2.96	0	10	0	5	6	21	Barrier	Streambed Simulation	1.80	Could use an embedded culvert and recreate stream substrat
ST-27	1.22	0	10	10	0	3	23	Barrier	Streambed Simulation	1.40	Arch culvert location. Moderate priority as is in flood plain, a
ST-28	0.00	0	0	0	0	0	0	Passable			
ST-29	0.00	0	0	0	0	0	0	Passable			
ST-40	0.00	0	0	0	0	0	0	Passable			
ST-41	4.73	0	10	10	0	6	26	Barrier	Streambed Simulation	2.00	Open bottom arch culvert for replacement. Existing culvert is
ST-42	3.38	0	10	0	10	6	26	Barrier	Streambed Simulation	2.00	Good hab at crossing, fan DS provides low quality hab due to
ST-43	1.83	0	10	10	10	6	36	Barrier	Open Bottom Structure	10.00	Clear span bridge replacement required.
BR-1	0.00	0	0	0	0	0	0	Passable			90 m upstream of this crossing is a barrier to fish passage for
TR-1	0.00	0	0	0	0	0	0	Passable			
TR-2	0.00	0	0	0	0	0	0	Passable			
TR-3	1.33	0	5	5	10	6	26	Barrier	Streambed Simulation	2.00	No fix. Gradient barrier to fish passage. No Habitat Gained.
TR-4	0.00	0	0	0	0	0	0	Passable			
Trio1	4.81	0	10	0	10	6	26	Barrier	Streambed Simulation	2.00	Arch culvert would be good. Low quality fish hab.
Trio2	0.00	0	0	0	0	0	0	Passable			
Trio3	0.00	0	0	0	0	0	0	Unkown			Is driveable, and looks to provide high quality fish habitat. Ne
Trio4	0.00	0	0	0	0	0	0	Unkown			Is driveable, so recommend new structure or proper deactiva
Trio5	0.00	0	0	0	0	0	0	Unkown			Is driveable, so recommend new structure or proper deactiva
Trio6	1.25	0	10	0	5	3	18	Potential	Streambed Simulation	1.00	No upgrades required. 1 m cv with substrate could be used.
COG-1	0.00	0	0	0	0	0	0	Passable			
COG-5	0.00	0	0	0	0	0	0	Unkown			Access available. Should be crossed with 16.5 m bridge.
COG-6	0.00	0	0	0	0	0	0	Passable			
COG-10	4.10	0	10	0	10	6	26	Barrier	Streambed Simulation	2.00	Ephemeral stream, low quality habitat, low priority. 2m arch
COG-11	0.00	0	0	0	0	0	0	Unkown			Likely no work required unless this road becomes active agai
COG-12	3.30	0	10	10	0	6	26	Barrier	Open Bottom Structure	8.00	A bridge is required at this crossing. 8-10m clear span should
COG-13	6.34	0	10	10	5	6	31	Barrier	Streambed Simulation	2.60	An arch culvert would be appropriate here.
COG-14	3.16	0	10	10	0	6	26	Barrier	Open Bottom Structure	10.00	Bridge
COG-15	4.68	0	10	10	10	6	36	Barrier	Open Bottom Structure	10.00	Bridge
COG-16	2.26	0	10	10	10	6	36	Barrier	Streambed Simulation	1.40	Arch
COG-17	4.48	0	10	10	5	6	31	Barrier	Streambed Simulation	2.60	Arch
COG-20	0.00	0	0	0	0	0	0	Unkown			Minimal access to this location. Probably a low risk site.
COG-21	0.00	0	0	0	0	0	0	Passable			Bridge here has been blown out, and should be removed or r
COG-22	0.00	0	0	0	0	0	0	Passable			
WL-1	2.90	0	10	10	5	6	31	Barrier	Open Bottom Structure	10.00	Bridge should be used here, nice creek.
WL-3	1.17	0	10	0	5	3	18	Potential	Open Bottom Structure	12.00	No changes are necessary. Fish can curerntly pass, and to rep
WL-4	0.90	0	10	0	0	0	10	Passable			
WL-5	1.50	0	10	0	0	6	16	Potential	Streambed Simulation	1.60	No change is required. An arch or a slightly larger culvert wo
WL-9	4.10	0	10	10	10	6	36	Barrier	Open Bottom Structure	8.00	Clear span bridge replacement required.
WL-10	1.58	0	10	10	0	6	26	Barrier	Open Bottom Structure	10.00	HGI=0 No change required. Half to cross with birdge if you go
WL-11	1.86	0	10	0	10	6	26	Barrier	Removal		Cascade immediately DS of crossing. No fish passage to road
WL-12	2.33	0	10	10	5	6	31	Barrier	Streambed Simulation	1.60	Arch culvert.
WL-13	0.00	0	0	0	0	0	0	Passable			
WL-20	0.00	0	0	0	0	0	0	Passable			
WL-21	2.82	0	10	5	5	6	26	Barrier	Streambed Simulation	1.60	Arch Culvert
WL-22	0.95	0	10	10	5	0	25	Barrier	Open Bottom Structure	12.00	
WL-23	0.00	0	0	0	0	0	0	Passable			
WL-24	4.59	0	10	0	5	6	21	Barrier	Open Bottom Structure	15.00	Bridge required here. Fish can pass. Minnow seen US, but m
WL-25	3.63	0	10	10	0	6	26	Barrier	Streambed Simulation	2.40	2.4m diameter SS culvert or arch
WL-26	2.92	0	10	5	5	6	26	Barrier	Streambed Simulation	1.60	Arch or culvert.
WL-27	1.10	0	10	10	0	3	23	Barrier	Streambed Simulation	1.00	Arch. SS no easy to implement with substarte type.
WL-28	2.86	0	10	10	5	6	31	Barrier	Streambed Simulation	2.00	Arch is an option as well.
WL-29	4.11	0	10	0	0	6	16	Potential	Open Bottom Structure	12.00	No replacement necessary. If a new structure is put in place,
WL-30	2.41	0	10	0	5	6	21	Barrier	Streambed Simulation	1.60	Stream ends immediately upstream of crossing. Very low pri
WL-31	1.78	0	10	0	5	6	21	Barrier	Streambed Simulation	2.00	Low priority, poor fish habitat and low HGI. Could use a 2 m
WL-32	2.08	0	10	0	0	6	16	Potential	Streambed Simulation	1.00	Seasonal fish habitat, no replacement likely required. This wo
WL-33	1.37	0	10	5	0	6	21	Barrier	Streambed Simulation	1.00	Arch here, due to substrate, and to keep size down.
WL-34	0.00	0	0	0	0	0	0	Passable			
WL-35	1.58	0	10	10	5	6	31	Barrier	Streambed Simulation	2.00	Arch here due to substrate.
WL-36	3.71	0	10	10	5	6	31	Barrier	Streambed Simulation	2.40	2.4m arch. Only 25 m of habitat US, so low priority.
WL-38	0.70	0	10	0	5	0	15	Potential	Streambed Simulation	1.00	No fix recommended. Poor quality fish habitat, and passable
WL-39	0.00	0	0	0	0	0	0	Passable			
WL-40	0.00	0	0	0	0	0	0	Passable			
WL-41	2.05	0	10	0	0	6	16	Potential	Open Bottom Structure	8.00	No replacements required. Very low priority. Need 8 m brid
WL-100	0.00	0	0	0	0	0	0	Unkown			Gradient barrier immediately upstream of the crossing. No c
WL-101	3.85	0	10	0	10	6	26	Barrier	Streambed Simulation	2.40	Arch. SS not easy to implement with substarte type.
WL-102	3.26	0	10	5	10	6	31	Barrier	Streambed Simulation	1.60	20 m long and angled pipe installation.
WL-103	5.62	0	10	0	5	6	21	Barrier	Streambed Simulation	2.60	Arch likely only option due to substrate.
WL-104	2.16	0	10	5	10	6	31	Barrier	Streambed Simulation	1.00	No replacement necessary. Natural stream gradient is limitin
WL-105	1.03	0	10	10	0	3	23	Barrier	Open Bottom Structure	15.00	A bridge appears to be the only realistic option here due to b
WL-106	6.67	0	10	5	10	6	31	Barrier	Streambed Simulation	1.60	Channel up and downstream of crossing, but very low quality
WL-107	3.30	0	10	0	10	6	26	Barrier	Streambed Simulation	2.00	Low quality fish habitat, very low priority.
WL-108	2.86	0	10	10	10	6	36	Barrier	Streambed Simulation	2.40	High quality rearing habitat throughout and a little ways up st
WL-109	2.42	0	10	0	0	6	16	Potential	Streambed Simulation	2.00	No replacements required. Arch would work if change to be r

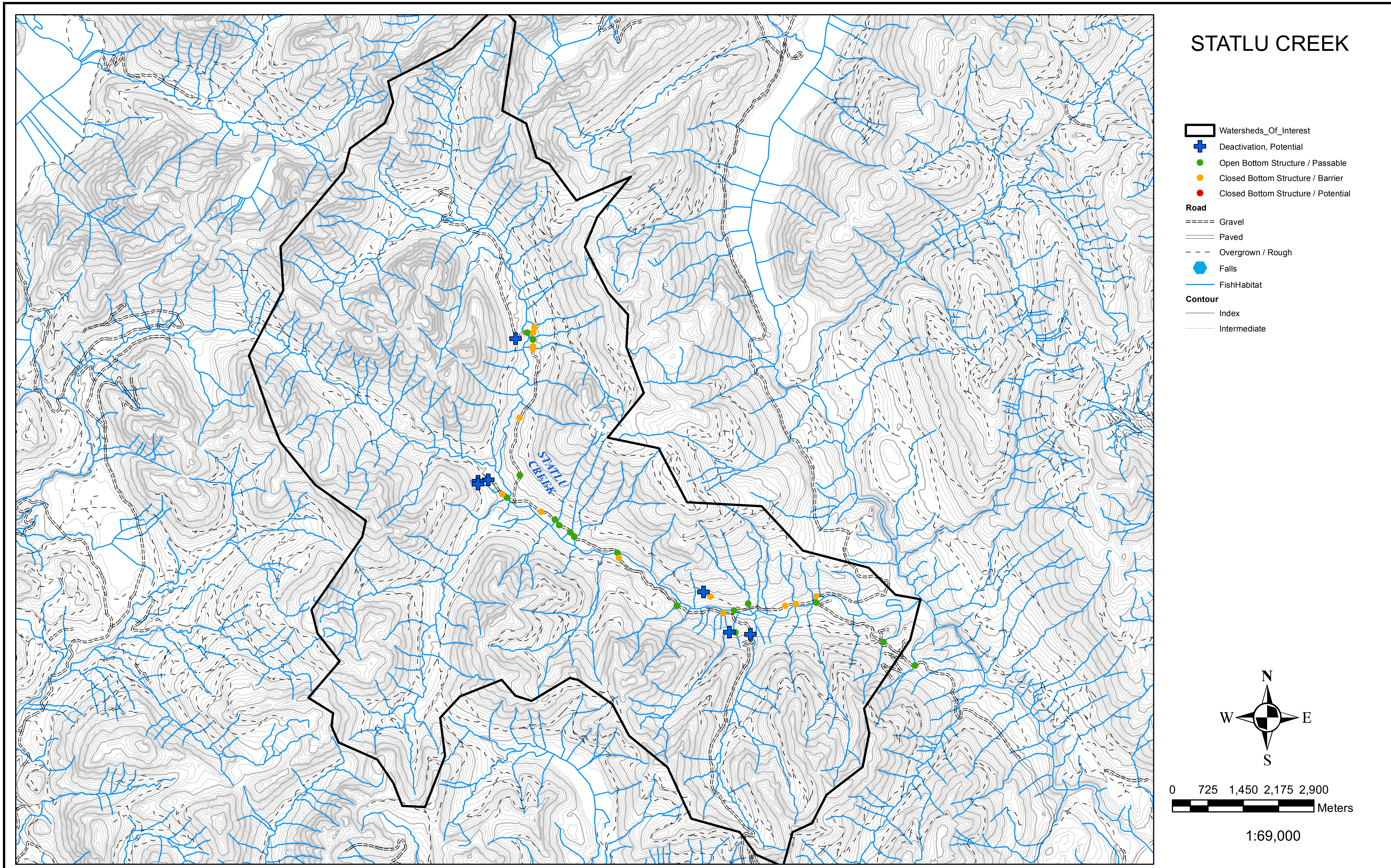
Appendix 2 – Figures

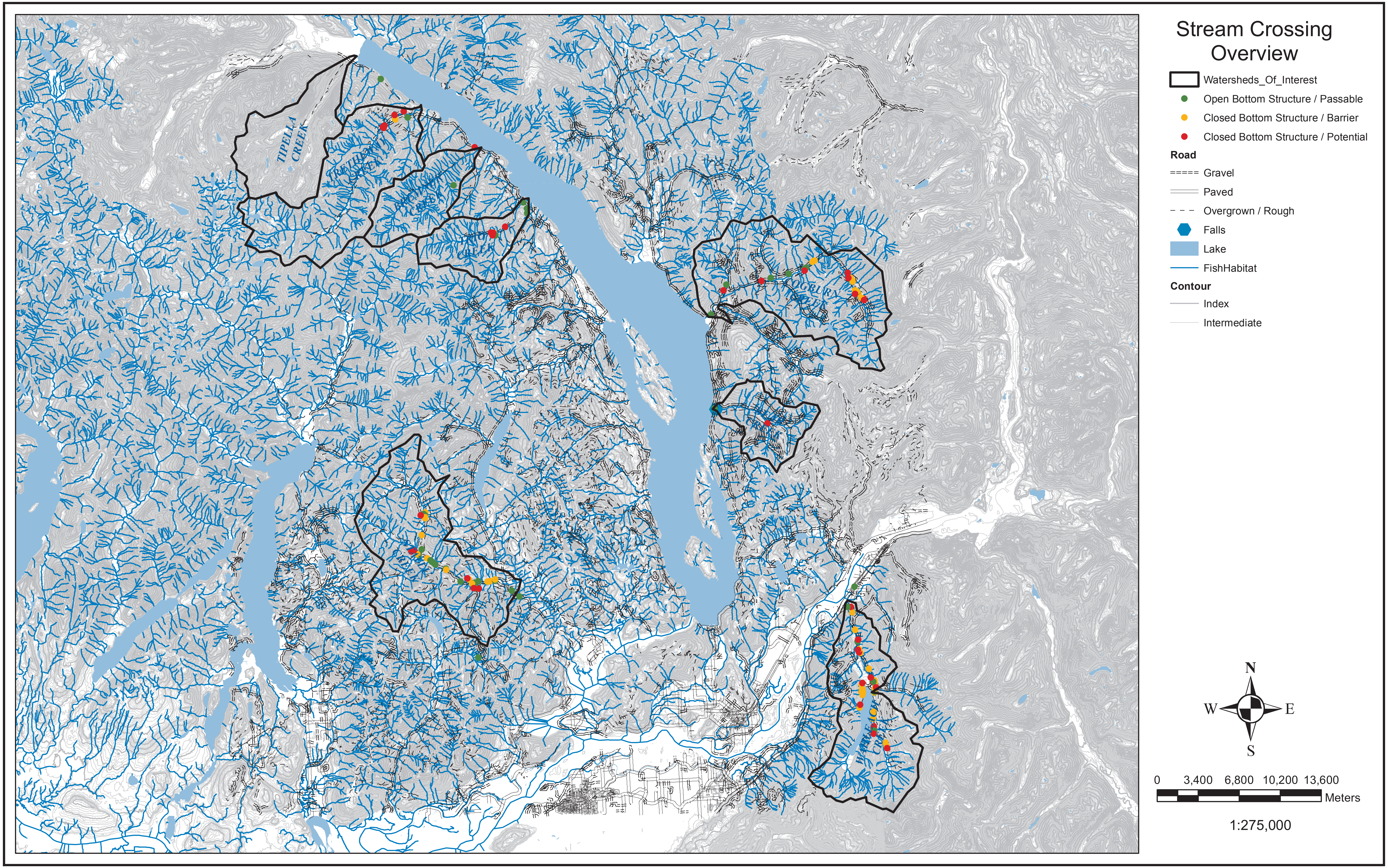

BEAR CREEK
BEAR CREEK
Watersheds_Of_Interest
Deactivation, Potential
Open Bottom Structure / Passable
Closed Bottom Structure / Barrier
Closed Bottom Structure / Potential
Road
Gravel
Paved
Overgrown / Rough
Falls
FishHabitat
Contour
Index
Intermediate
N
W
E
S
0 320 640 960 1,280
Meters
1:30,000

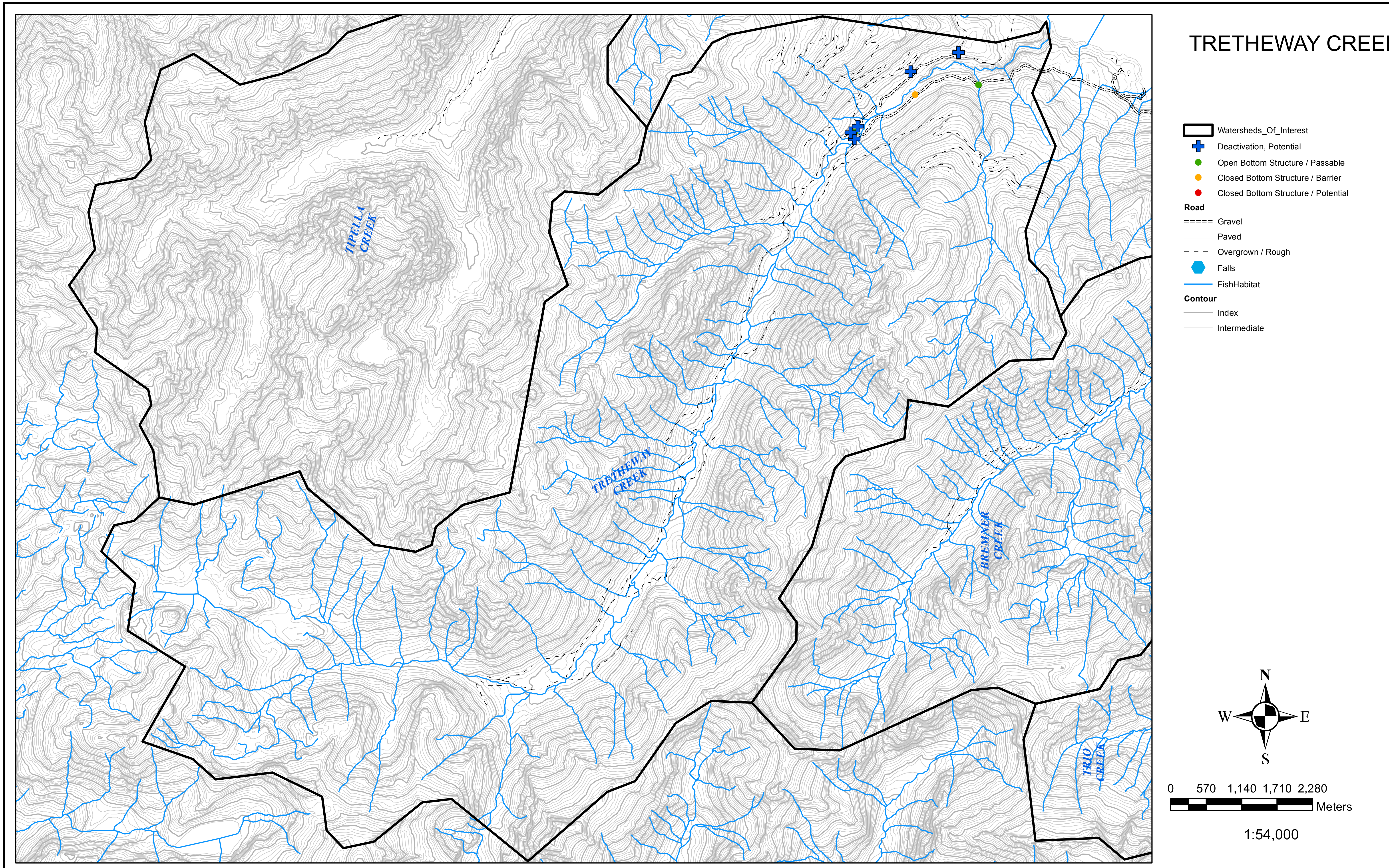
BREMNER CREEK



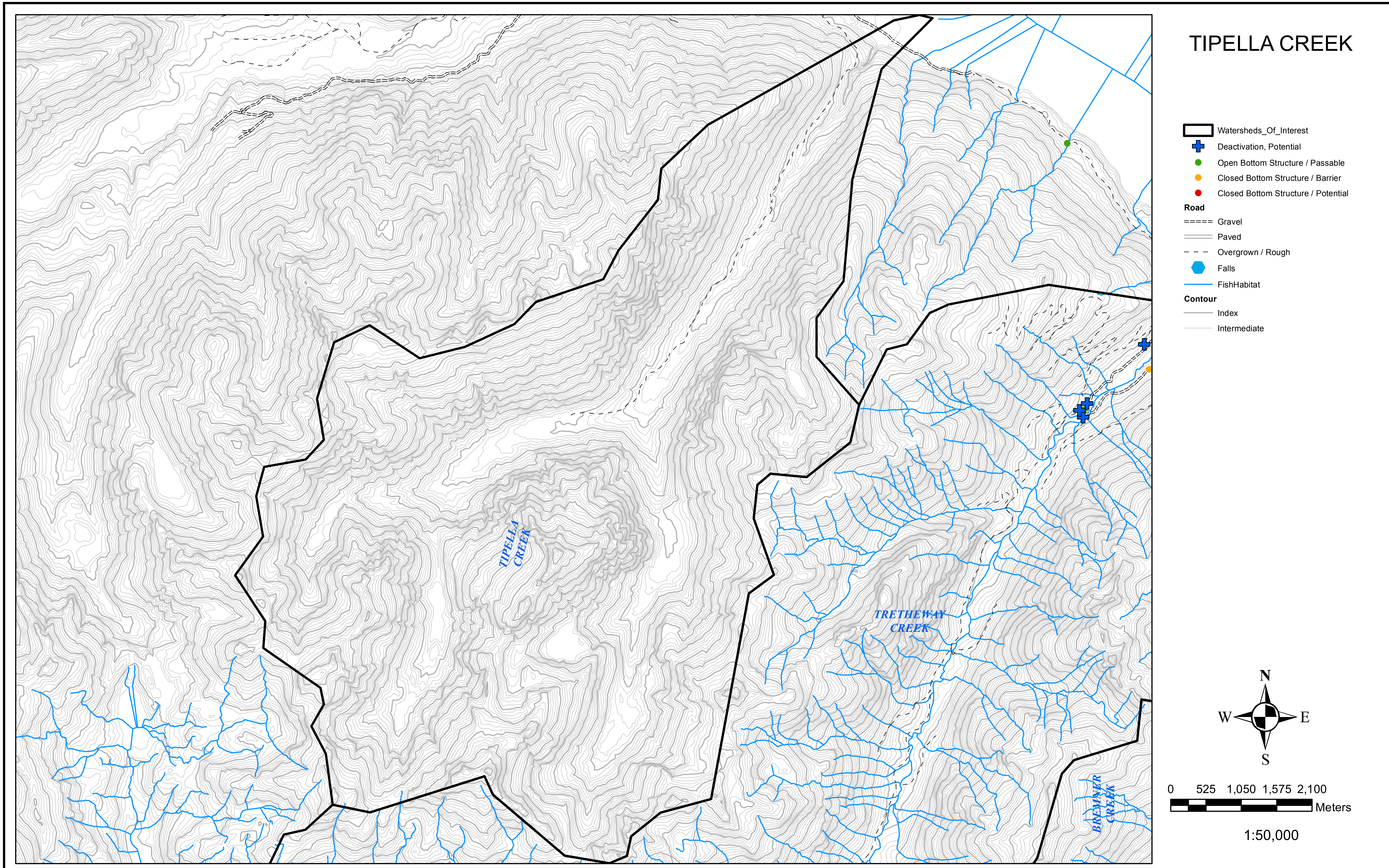

COGBURN CREEK
Watersheds_Of_Interest
Deactivation, Potential
Open Bottom Structure / Passable
Closed Bottom Structure / Barrier
Closed Bottom Structure / Potential
Road
Gravel
Paved
Overgrown / Rough
Falls
FishHabitat
Contour
Index
Intermediate
COGBURN CREEK
N
W
E
S
0 540 1,080 1,620 2,160
Meters
1:51,000

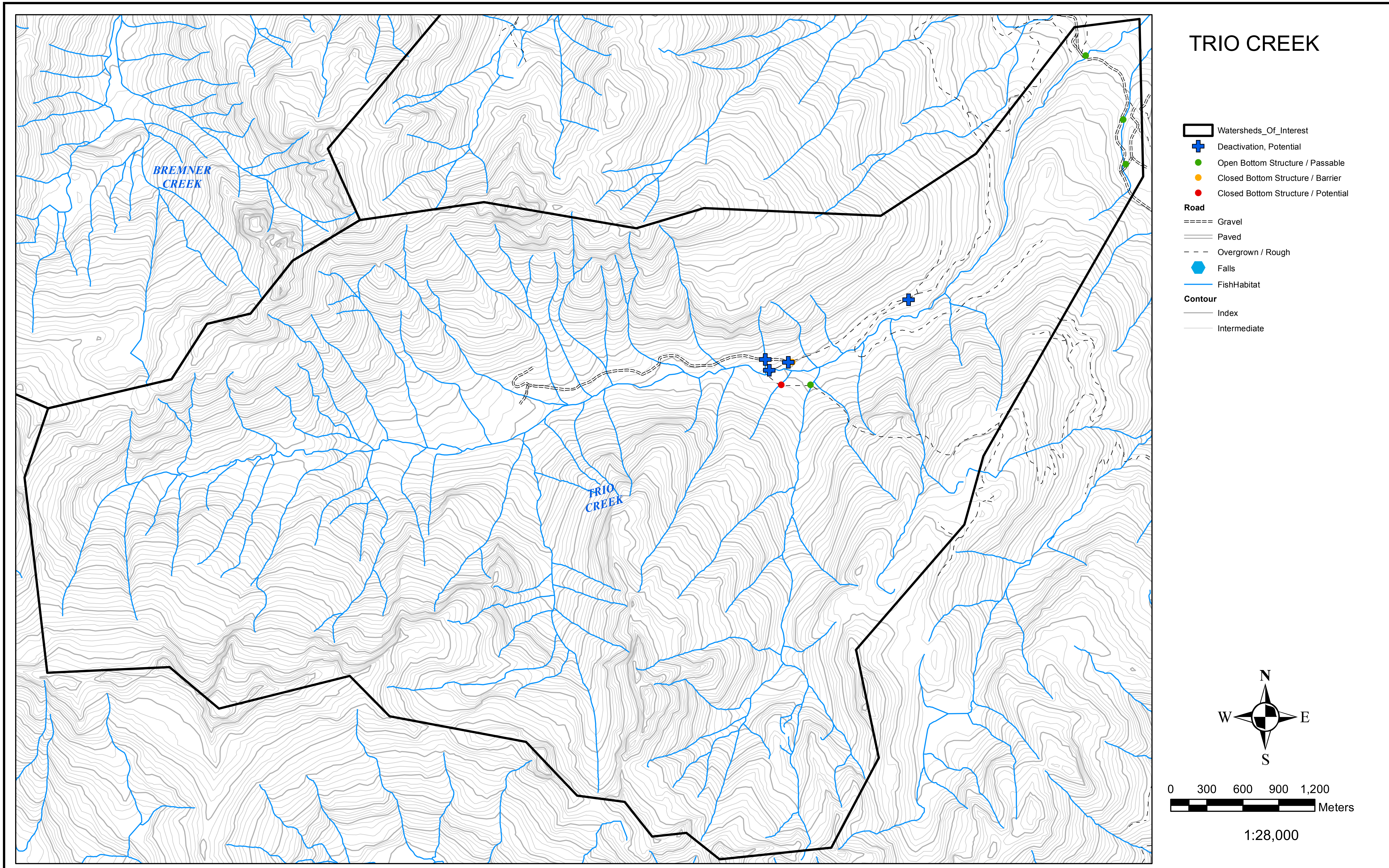

STATLU CREEK
Watersheds_Of_Interest
Deactivation, Potential
Open Bottom Structure / Passable
Closed Bottom Structure / Barrier
Closed Bottom Structure / Potential
Road
Gravel
Paved
Overgrown / Rough
Falls
FishHabitat
Contour
Index
Intermediate
STATLU CREEK
N
W
E
S
0 725 1,450 2,175 2,900
Meters
1:69,000


Stream Crossing Overview
Watersheds_Of_Interest
Open Bottom Structure / Passable
Closed Bottom Structure / Barrier
Closed Bottom Structure / Potential
Road
Gravel
Paved
Overgrown / Rough
Falls
Lake
FishHabitat
Contour
Index
Intermediate
TIPELA CREEK
N
W
E
S
0
3,400
6,800
10,200
13,600
Meters
1:275,000

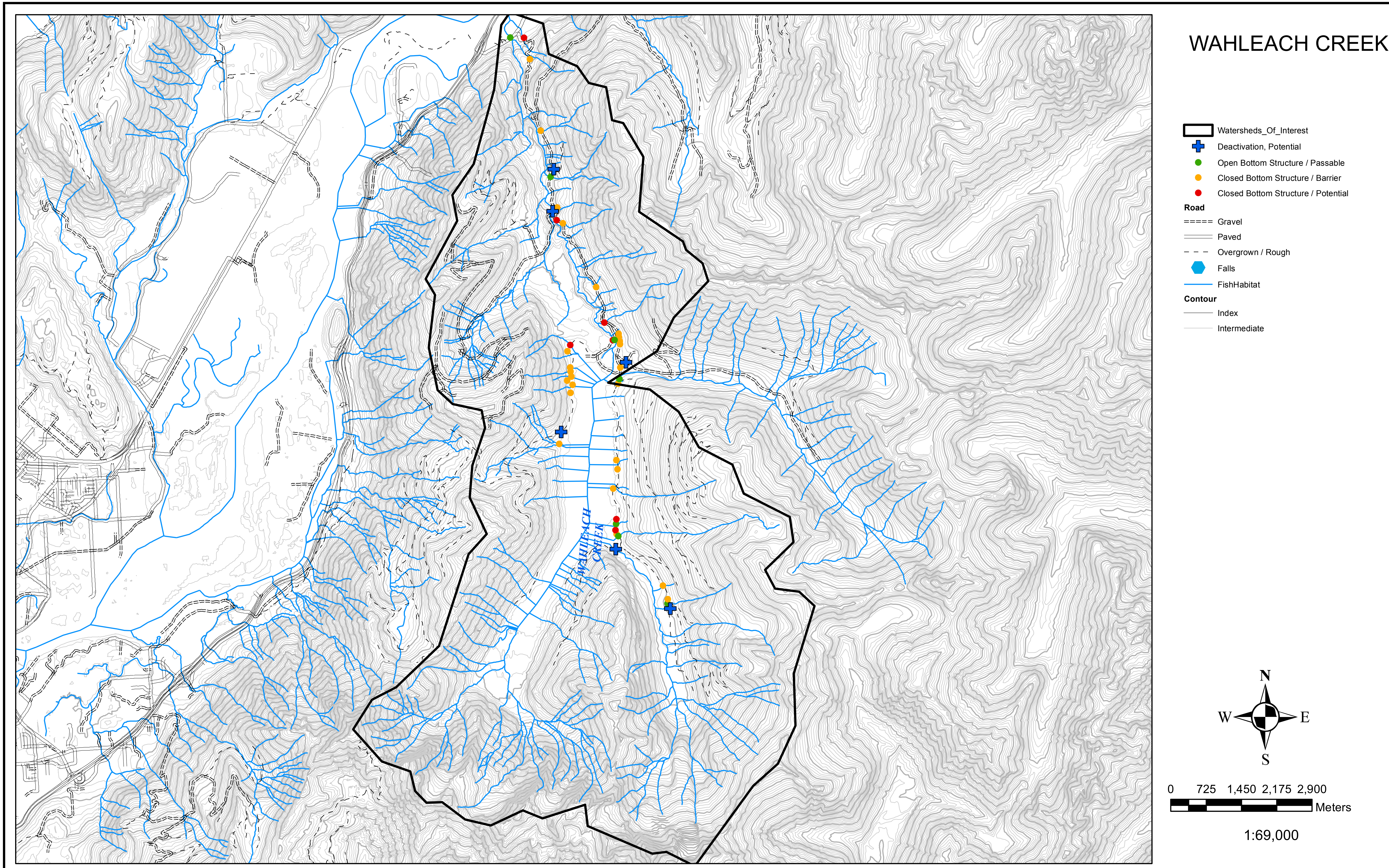

TRETHEWAY CREEK
TIPELLA CREEK
TRETHEWAY CREEK
BREMNER CREEK
TRIO CREEK
Watersheds_Of_Interest
Deactivation, Potential
Open Bottom Structure / Passable
Closed Bottom Structure / Barrier
Closed Bottom Structure / Potential
Road
Gravel
Paved
Overgrown / Rough
Falls
FishHabitat
Contour
Index
Intermediate
N
W
E
S
0 570 1,140 1,710 2,280
Meters
1:54,000

TIPELLA CREEK





TRIO CREEK
BREMNER CREEK
TRIO CREEK
Watersheds_Of_Interest
Deactivation, Potential
Open Bottom Structure / Passable
Closed Bottom Structure / Barrier
Closed Bottom Structure / Potential
Road
Gravel
Paved
Overgrown / Rough
Falls
FishHabitat
Contour
Index
Intermediate
N
W
E
S
0 300 600 900 1,200
Meters
1:28,000


WAHLEACH CREEK
WAHLEACH CREEK
Watersheds_Of_Interest
Deactivation, Potential
Open Bottom Structure / Passable
Closed Bottom Structure / Barrier
Closed Bottom Structure / Potential
Road
Gravel
Paved
Overgrown / Rough
Falls
FishHabitat
Contour
Index
Intermediate
N
W
E
S
0 725 1,450 2,175 2,900
Meters
1:69,000