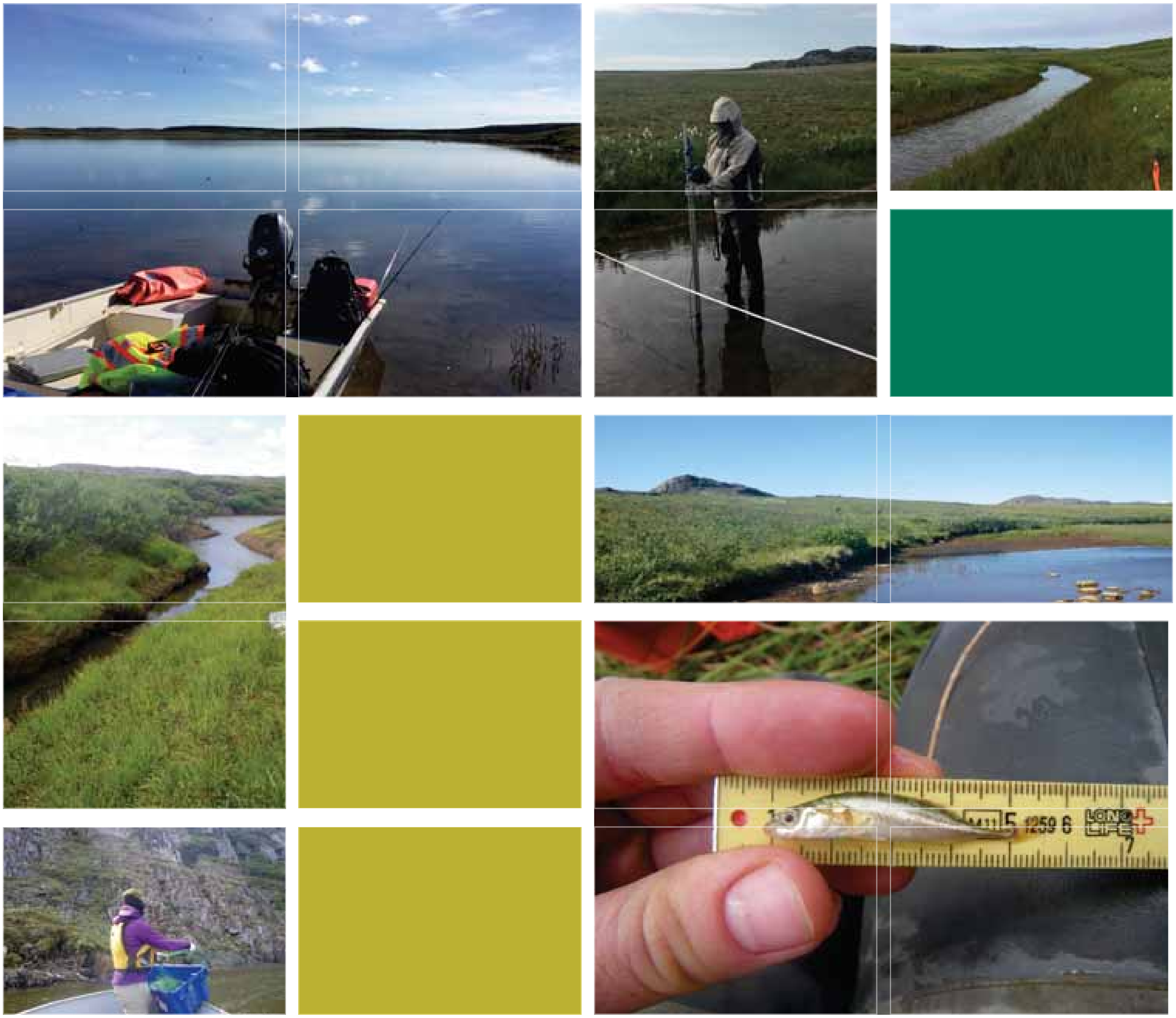
Appendix V5-6W

Hope Bay Project:
2017 Freshwater Fish and Fish Habitat Baseline Report

TMAC RESOURCES



Prepared for:

TMAC RESOURCES

HOPE BAY PROJECT

2017 Freshwater Fish and Fish Habitat Baseline Report

December 2017

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ERM

TMAC Resources Inc.

HOPE BAY PROJECT

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December 2017

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ERM
5120 49th Street, Suite 201
Yellowknife, NT
Canada X1A 1P8
T: (867) 920-2090
F: (867) 920-2015

EXECUTIVE SUMMARY

ERM Consultants Canada Ltd. (ERM) was retained by TMAC to collect baseline data to support continued planning and permitting for the Madrid-Boston component of the Hope Bay Project. The objective of the 2017 freshwater fisheries baseline assessment was to characterize fish habitat and fish communities in locations having the potential to interact with Madrid-Boston but where potential gaps existed in previously collected baseline data. Field work conducted in 2017 included fisheries assessments of waterbodies at proposed all-weather road crossing locations, and stream habitat mapping, hydraulic modeling, and fish population density estimation in streams that have the potential to interact with water withdrawal and use activities for Madrid-Boston. Fish community assessments in Imniagut and Stickleback lakes were also completed to augment existing datasets.

Fish habitat at 21 proposed road crossing locations was evaluated under high and low flow conditions in 2017. At high flow, eight sites had overall high habitat value, three had moderate habitat value, eight had low habitat value, and two were assessed as not providing any fish habitat. At low flow, six, five, and one sites were assessed as having overall high, moderate, and low habitat value, respectively. Nine sites were assessed to have no fish habitat at low flow.

Electrofishing surveys were conducted at eleven of the proposed road crossing sites during low flow conditions. The 2017 electrofishing data along with data from previous baseline surveys informed the determination of fish-bearing status for the proposed road crossing locations. Four sites were considered unlikely to be fish-bearing and an additional eight sites were predicted to have only Ninespine Stickleback present. The remaining nine sites were confirmed to have Ninespine Stickleback in addition to the presence of at least one species of large-bodied fish (Lake Trout, Lake Whitefish, Cisco, Arctic Grayling, Arctic Char, Burbot).

The habitat assessment of eight streams with potential for water withdrawal and use from Madrid-Boston found that glides were the predominant habitat type, accounting for 59% of the total stream length surveyed and representing 71% of habitat units. The glide habitat was used by Ninespine Stickleback, rearing adult Lake Trout and Lake Whitefish as well as rearing juvenile Arctic Grayling and young-of-the-year coregonids.

Overall, catch rates of fish in the eight streams were low, particularly for salmonids. The majority of fish captured were Ninespine Stickleback (all life stages) which were present in all streams. Adult Lake Trout were captured in Ogama Outflow and Ogama Inflow while a single adult Lake Whitefish was captured in Ogama Inflow during electrofishing surveys in July 2017. Juvenile Arctic Grayling were captured in Stickleback Outflow and *Coregonus* sp. fry were captured in Patch Outflow.

The fish community in Imniagut Lake was sampled using three methods (minnow trapping, gillnetting, and electrofishing) in July 2017. Ninespine Stickleback was the only species of fish captured in the lake. No fish were captured using gillnets.

The fish community in Stickleback Lake was sampled using two methods (angling and gillnetting) in July/August 2017. No fish were captured by angling or in gillnets. Although no electrofishing was conducted in the lake, Ninespine Stickleback were captured by electrofishing in Stickleback Lake Outflow, directly adjacent to the lake. Arctic Grayling and Slimy Sculpin were captured further downstream in Stickleback Outflow, downstream of a dry channel barrier that prevented access to Stickleback Lake on the survey date (July 30, 2017).

ACKNOWLEDGEMENTS

This report was prepared for TMAC Resources Inc. (TMAC) by ERM Consultants Canada Ltd. (ERM). The 2017 fieldwork was conducted by ERM scientists Kathryn Kuchapski (M.Sc., P.Biol.), Véronique Thériault (M.Sc., Ph.D.), and Stephen Jollymore (B.Sc.). Fieldwork was completed with the enthusiastic and competent support of TMAC field assistants Leonard Wingnek and Jamie Ihakkaq. The report was written by Kathryn Kuchapski (M.Sc., P. Biol.) and the report was reviewed by Genevieve Morinville (Ph.D.) and Nicole Bishop (B.Sc.) The program was managed by Erin Forster (B.Sc., R.P.Bio.) and Nicole Bishop (B.Sc.). Marc Wen (M.Sc., R.P.Bio.) was the Partner in Charge. Graphics production was coordinated by Francine Alford (B.F.A.), Geographical Information System (GIS) production was coordinated by Pieter van Leuzen (M.Sc.), and report publishing was coordinated by Agnes Untz (B.A.).

Field-related logistics support was provided by TMAC, Acasta HeliFlight, Braden Burry Expediting, and Nuna Logistics.

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ACRONYMS AND ABBREVIATIONS

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

AWR	All-weather road
CCME	Canadian Council of Ministers of the Environment
CPUE	Catch-Per-Unit-Effort
DEIS	Draft Environmental Impact Statement
DELT	Deformities, erosions, lesions and tumors
DO	Dissolved oxygen
ERM	ERM Consultants Canada Ltd.
FEIS	Final Environmental Impact Statement
FHAP	Fish Habitat Assessment Procedures
FL	Fork length
RISC	Resources Information Standards Committee
TMAC	TMAC Resources Inc.

1. INTRODUCTION

The Hope Bay Project is located approximately 135 km southwest of Cambridge Bay, Nunavut, on the south shore of Melville Sound (Figure 1-1). The nearest communities are Omingmaktok (75 km to the southwest), Cambridge Bay, and Kingaok (Bathurst Inlet; 160 km to the southwest).

The Hope Bay Project consists of a greenstone belt running in a north/south direction, approximately 80 km long, with three main gold deposit areas. The Doris and Madrid deposits are located in the northern portion of the belt, and the Boston deposit is located at the southern end. The northern portion of the belt consists of several watershed systems that drain into Roberts Bay, and a large river (Koignuk River) that drains into Hope Bay. Watersheds in the southern part of the belt ultimately drain into the upper Koignuk River, which drains into Hope Bay. The entire area lies within the Bathurst Inlet-Burnside Watershed.

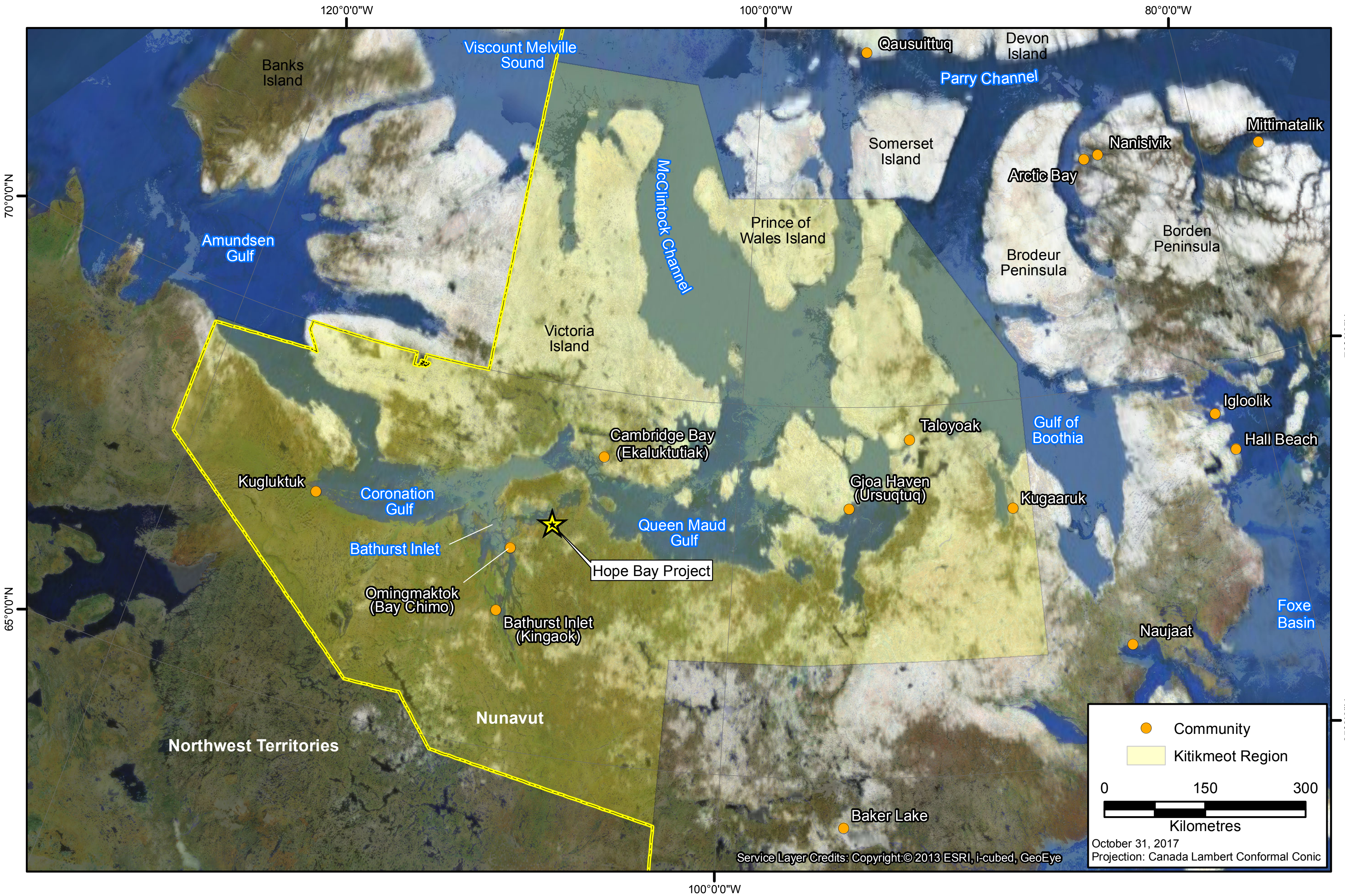
TMAC Resources Inc. (TMAC) currently owns and operates the Doris Gold Mine and is actively mining the Doris deposit. TMAC plans to develop the Madrid and Boston deposits and as part of the permitting process for these developments, submitted a Draft Environmental Impact Statement (DEIS) for Madrid-Boston (formerly Phase 2) to the Nunavut Impact Review Board in December 2016 (TMAC 2016). ERM Consultants Canada Ltd. (ERM) was retained by TMAC to collect additional baseline data to support continued planning and permitting for Madrid-Boston. The permitting process will continue with the submission of a Final Environmental Impact Statement (FEIS).

The objective of 2017 baseline freshwater fish and fish habitat assessment was to characterize fish habitat and fish communities in locations identified in the DEIS as having the potential to interact with Madrid-Boston but where potential gaps existed in previously collected baseline data. The following tasks were undertaken to meet the overall objective of the program:

1. Conduct assessments of waterbodies at road crossing locations along the Roberts Bay Cargo Dock Access Road, the Madrid North to Doris TIA all-weather road (AWR), the Madrid South AWR, and the Boston-Madrid AWR to classify fish habitat values, sample fish communities, and assess surface connectivity to other fish-bearing waterbodies.
2. Map stream habitats and estimate fish population densities in streams that have the potential to interact with water withdrawal and use activities for the Madrid and Boston projects.
3. Conduct fish community assessments in Imniagut and Stickleback lakes.

Fish habitat was defined as those environmental components that are required either directly or indirectly by fish to carry out their life processes, including spawning and rearing areas, food production areas, migration routes, and over-wintering areas. These areas included lakes, ponds, and streams. Fish communities were defined in terms of total number and number-by-species present at each sampling location, total Catch-Per-Unit-Effort (CPUE), and/or species-specific CPUE for each type of assessment gear. Biological features of fish such as length and weight were also measured.

Figure 1-1
Project Location



2. METHODS

2.1 ROAD CROSSING ASSESSMENTS

2.1.1 Fish Habitat

As part of the DEIS, proposed all-weather roads were plotted on topographic maps to identify locations where the routes bisect waterbodies. Historical fish community and habitat data were reviewed for waterbodies along and surrounding each road route to determine the proximity of known fish-bearing waterbodies to potential crossing sites. This information was used to predict or confirm the fish-bearing status and fish community assemblage at each crossing site.

In 2017, crossing locations identified in the DEIS were further assessed to confirm fish presence and habitat value to further support crossing design, mitigation planning, and permitting. Habitat assessments were conducted at high flow (June 7 to 11, 2017) and at low flow (July 18 to 30, 2017). Road crossing locations assessed for fish habitat in 2017 are listed in Table 2.1-1 and represented on Figures 2.1-1 and 2.1-2. At each visit, a preliminary assessment was completed to determine whether crossing locations contained habitats that could support fish (e.g., defined stream channels, ponds). Locations were categorized as “potential fish habitat” or as “no fish habitat” (e.g., dry channels, subsurface flow, surface water with no defined channel). Sites that did not contain fish habitat were not assessed further.

Table 2.1-1. Proposed Road Crossing Locations Assessed for Fish Habitat and Community, 2017

Access Road	Crossing ID	Location (UTM)		Watershed	Waterbody Name	Habitat Assessment	Electrofishing Survey
		Easting	Northing				
Roberts Bay Cargo Dock Access Road	C-CDR-01	432108	7562941	2 - Roberts Bay	Roberts Bay Inflow	X	NA
	C-CDR-02	431627	7563806	Windy	Glenn Outflow	X	X
Madrid North to Doris TIA AWR	C-TIA-01	433622	7552784	Doris	Patch Inflow	X	NA
	C-TIA-02	434781	7553327	Doris	Doris Inflow	X	NA
	C-TIA-03	435039	7553604	Doris	Doris Inflow	X	NA
	C-TIA-04	435094	7555505	Doris	Ogama Outflow	X	X
Madrid South AWR	C-MS-01	434760	7547111	Doris	Wolverine Outflow	X	NA
Boston-Madrid AWR	C-MBR-7	434964	7531135	Koignuk/ Aimaokatalok	Boulder Creek	X	X
	C-MBR-8	437979	7524706	Koignuk/ Aimaokatalok	Boulder Creek Tributary	X	X
	C-MBR-9	439158	7516576	Aimaokatalok	Aimaokatalok Inflow	X	X

(continued)

Table 2.1-1. Proposed Road Crossing Locations Assessed for Fish Habitat and Community, 2017 (completed)

Access Road	Crossing ID	Location (UTM)		Watershed	Waterbody Name	Habitat Assessment	Electrofishing Survey
		Easting	Northing				
Boston-Madrid AWR *(cont'd)*	C-MBR-10	439433	7515859	Aimaokatalok	Aimaokatalok Inflow	X	NA
	C-MBR-11	441626	7510781	Aimaokatalok	Aimaokatalok Inflow	X	X
	C-MBR-12	444365	7509635	Aimaokatalok	Aimaokatalok Inflow	X	-
	C-MBR-13	444444	7508833	Aimaokatalok	Aimaokatalok Inflow	X	NA
	C-MBR-14	444109	7508180	Aimaokatalok	Aimaokatalok Inflow	X	NA
	C-MBR-15	443420	7507037	Aimaokatalok	Aimaokatalok Inflow	X	X
	C-MBR-16	443649	7505485	Aimaokatalok	Aimaokatalok Inflow	X	X
	C-MBR-17	443490	7504607	Aimaokatalok	Aimaokatalok Inflow	X	X
	C-MBR-18	442718	7504389	Aimaokatalok	Aimaokatalok Inflow	X	NA
	C-MBR-19	442298	7504222	Aimaokatalok	Trout Outflow	X	X
	C-MBR-20	441941	7504209	Aimaokatalok	Stickleback Outflow	X	X

Notes:
X = assessment performed
NA = insufficient water in channel to perform survey
Dashes = assessment not performed due to time constraints
All UTM coordinates in Zone 13N

For sites categorized as potential fish habitat, additional habitat data were collected to determine the habitat value. Habitats were surveyed using methods based on the Fish Habitat Assessment Procedures (FHAP; Johnston and Slaney 1996). Representative sections of each reach within 100 m upstream and downstream of the crossing location were assessed. Habitats units were classified as:

- Cascade: high-energy, steep (gradient > 4%) sections of stream typically dominated by bedrock, boulders, and cobbles;
- Riffle: less steep than cascades, but still with turbulent, fast-flowing water. Riffles are usually shallow in water depth with gravel or cobble substrates that project above the water surface, causing surface turbulence;
- Glide: sections of stream with flowing, non-turbulent water. Glides have relatively flat bottoms in cross-section;
- Flat: Areas of still, often stagnant water. Substrate usually covered in silt or organic matter; or
- Pool: relatively deep, slow flowing sections of stream with a concave longitudinal streambed profile and a surface gradient near 0%.

Figure 2.1-1
Proposed Road Crossing Locations Assessed for Fish Habitat and Community, North Belt, 2017

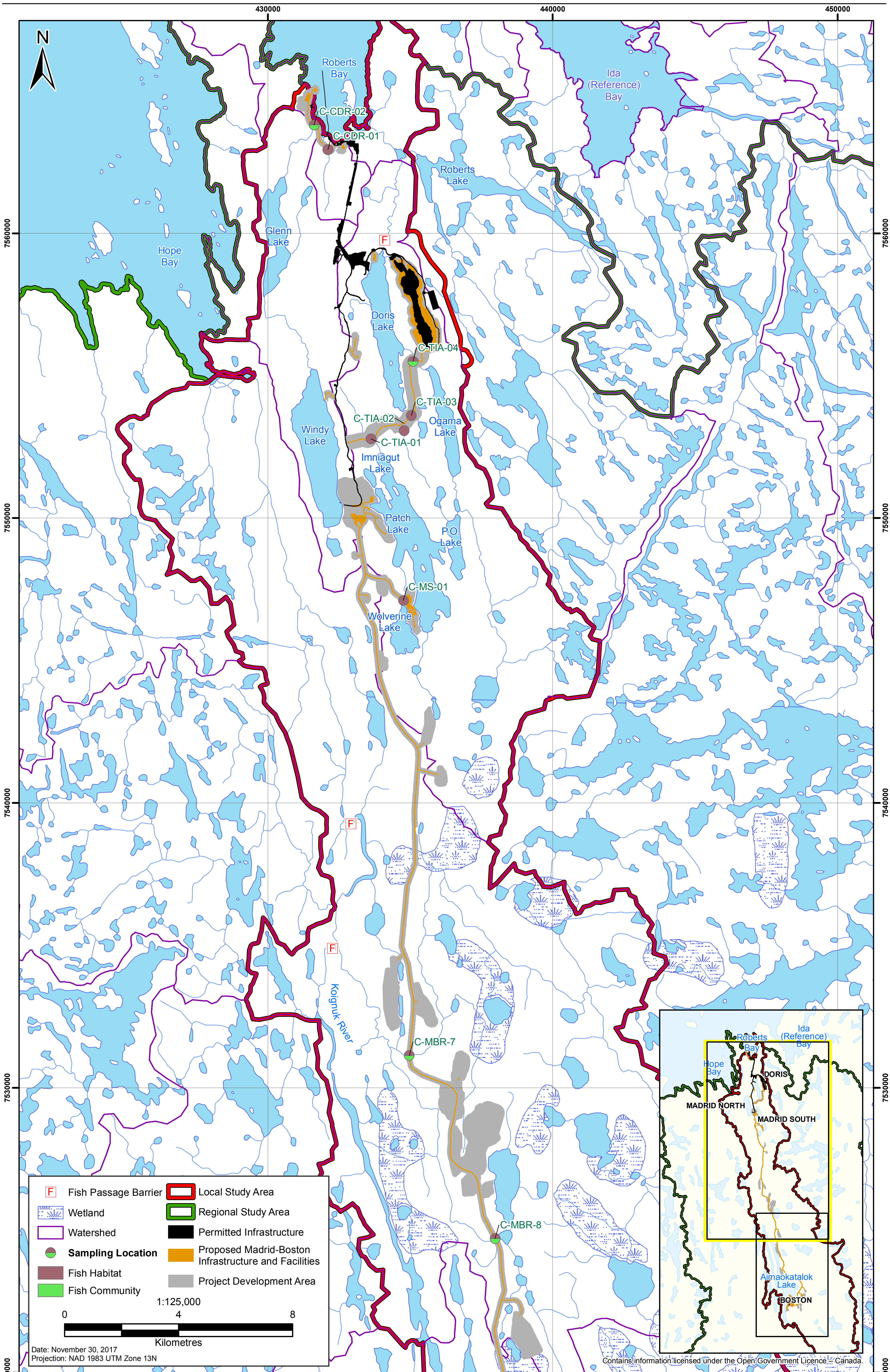
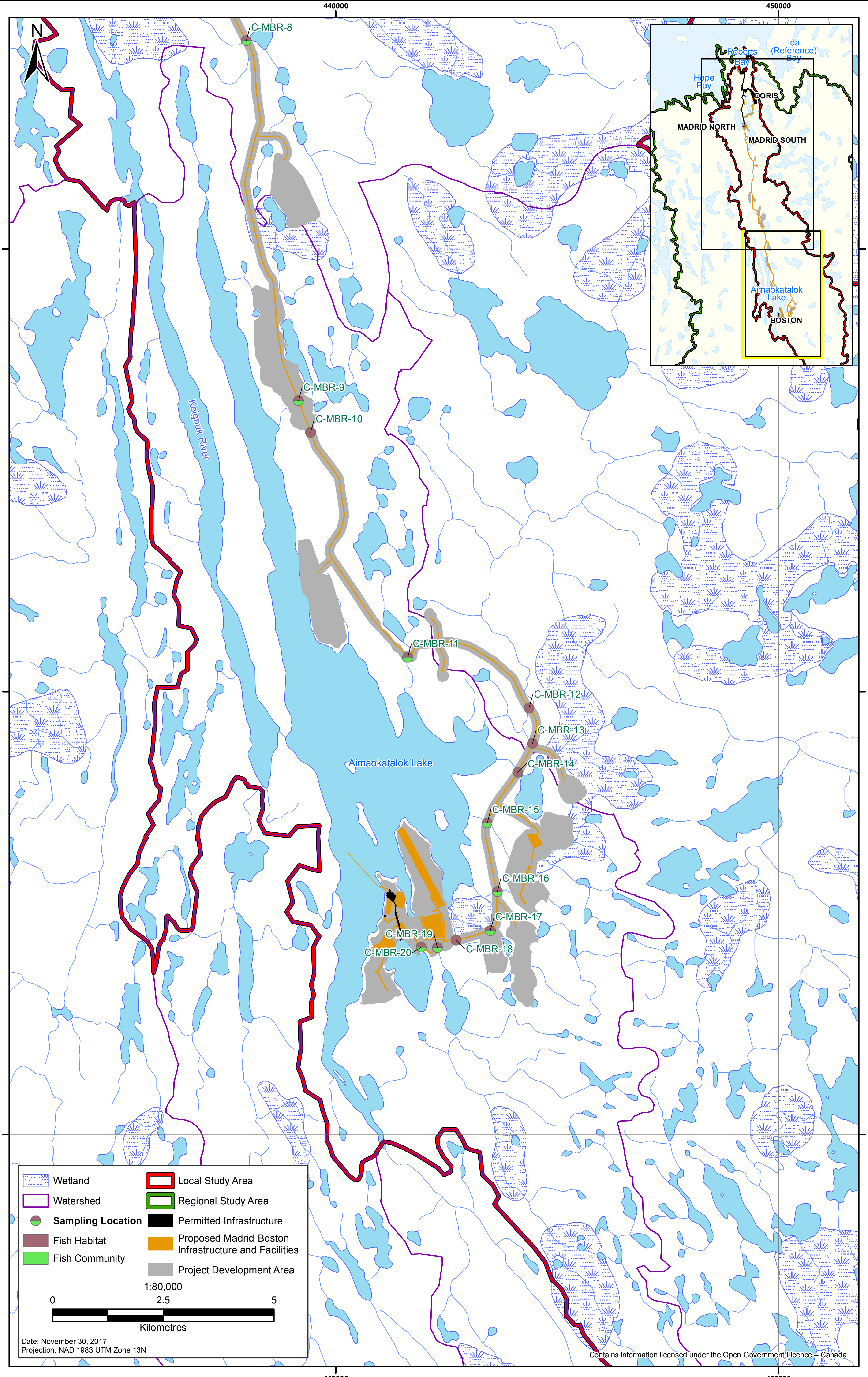


Figure 2.1-2
Proposed Road Crossing Locations Assessed for Fish Habitat and Community, South Belt, 2017



Individual habitat units were measured for length, width and depth (bankfull and wetted, gradient, substrate composition (% abundance of bedrock, boulders, cobble, gravel, and fines), residual pool depth, bank stability, bank height, and riparian and instream cover. Stream attributes were marked using a handheld GPS unit and representative photographs were taken. Barriers or seasonal restrictions to fish migration were also noted and measured, where appropriate. Habitat suitability for spawning, rearing, migration, and overwintering was described and an overall habitat quality ranking was applied (Table 2.1-2).

Table 2.1-2. Overall Habitat Quality Rankings and Criteria

	Habitat Quality Ranking			
	Good	**Fair**	**Poor**	**None**
Spawning	The presence of high-value spawning habitat (e.g., locations with an abundance of suitably sized spawning substrates for the fish species present).	The presence of suitable spawning habitat (e.g., locations with some suitably sized spawning substrates for the fish species present).	The presence of suitable spawning habitat but where another factor may limit spawning potential (e.g., access to suitably sized spawning substrates is limited by flow conditions).	The absence of suitable spawning habitat (e.g., little or no suitably sized spawning substrates for the fish species present).
Rearing	The presence of high-value rearing habitat (e.g., locations with an abundance of deep pools, undercut banks, or stable debris).	The presence of suitable rearing habitat (e.g., some locations that provide rearing cover such as deep pools, undercut banks, or stable debris).	The presence of suitable rearing habitat but where another factor may limit rearing potential (e.g., suitable flow conditions but limited cover).	The absence of suitable rearing habitat (e.g., water depth or flow conditions not suitable for rearing for the fish species present).
Migration	Stream conditions (e.g., depth, velocity, water quality, presence of barriers, etc.) allow for unimpeded fish passage on the survey date.	Stream conditions are suitable for fish passage on the survey date (e.g., may be impediments but no passage barriers).	Stream conditions are not suitable for fish passage on the survey date (e.g., inadequate depth or flow, presence of temporary passage barriers).	The absence of suitable migration habitat on the survey date (e.g., NDC, dry channel, permanent barrier).
	High	**Moderate**	**Low**	**None**
Overall Value	Habitat supports all life stage uses for fish.	Habitat supports fish but lacks at least one life stage use.	Habitat may support fish, but does not provide all life stage uses, or is seasonal in nature.	At least one parameter prevents the use of stream as habitat for any life stage (e.g., barriers, water level, temperature, conductivity, pH).

The connectivity of each stream to other fish-bearing waterbodies was assessed to help determine whether the stream might provide seasonal habitat to fish. Small, arctic streams flow seasonally; some flow only during freshet then become dry later in the summer, while others flow throughout the ice-free (open water) period but freeze to the substrate in winter. These seasonal streams are only of value to fish if they are connected to other habitat types where fish can overwinter, such as lakes or deep ponds, allowing fish to migrate from or into overwintering habitats during the open water season.

2.1.2 Fish Community

Fish sampling was completed to determine species distributions and relative abundance or population densities in habitat types throughout each stream section. Streams in this region freeze to the substrate during winter, at which time fish must inhabit lakes or deep ponds (> ~3 m) to survive. Juvenile and some adult fish (depending on species) emigrate from lakes to spawning and rearing habitats in streams during spring freshet, and then migrate back to overwintering lakes in the fall prior to freeze-up. Adult Arctic Grayling (*Thymallus arcticus*) enter streams typically only during freshet to spawn before returning to lakes and/or to travel between overwintering lakes when fish passage potential is greatest. Fish community sampling was conducted between July 26 and 30, 2017, after spring-outmigration and prior to fall migration back to lakes. It is expected that stream utilization by juvenile fish would be greatest at this time of year.

Backpack electrofishing was used to sample stream fish communities at road crossing locations (Table 2.1-1, Figures 2.1-1 and 2.1-2). A crew leader operated a Smith-Root LR-24 backpack electrofisher and was accompanied by one dip netter. An anode ring diameter of 28 cm and a dip net diameter of 21 cm with 3.2 mm mesh were used. A systematic sweep sampling approach was conducted moving in an upstream direction that covered the entire wetted width of the stream, including all channels where flow was braided. Electrofishing effort was not pre-determined because the primary objective was to determine whether fish were present in the stream and, if so, determine fish community composition. Electrofisher voltage (V), duty cycle (%) and frequency (Hz) settings were adapted at each site to maximize catch efficacy and minimize harm to fish.

Electrofishing effort was standardised as CPUE, which was calculated as the number of fish captured per 100 s of electrofishing effort. Observations of fish that were seen but not captured were recorded. All captured fish were placed immediately in a holding tank. Fish were identified to species, enumerated and given a unique sample number. Fork Length (FL) was measured to the nearest 1 mm with a measuring board and wet weight was measured to the nearest 0.1 g using an electronic scale for each fish. Where parasites or deformities, erosions, lesions, or tumors (DELTs) were observed, this information was recorded for each fish. Fish were then released back into the stream at the location of capture.

2.2 WATER WITHDRAWAL AND USE LOCATIONS

2.2.1 Fish Habitat

Fish habitats in streams that have the potential to interact with water withdrawal and use activities for Madrid-Boston were assessed in detail. Assessments will contribute to the determination of whether changes in stream structure and morphology would be likely to affect fish presence, abundance, and distribution. Stream locations assessed in 2017 are listed in Table 2.2-1 and represented on Figure 2.2-1. Habitat classifications and data collection methods followed FHAP (Johnston and Slaney 1996).

Habitat units were described with measurements of stream widths (wetted and bank-full widths), depths (wetted and bank-full depths), and streambed substrate was characterized (% abundance of bedrock, boulders, cobble, gravel, and fines; see Johnston and Slaney 1996 for details). Where stream width exceeded measuring tape length, a Bushnell 4x20 laser rangefinder was used. Where stream depth exceeded the depth that could safely be measured by wading, depth was not measured or was visually estimated. Individual habitat units were also measured/assessed for gradient, residual pool depth, bank stability, bank height, and riparian and instream cover. Barriers or seasonal restrictions to fish migration were noted and measured, where appropriate. Habitat suitability for spawning, rearing, migration, and overwintering was described and an overall habitat quality ranking was applied (Table 2.1-2). A series of digital photos and habitat notes were also collected to document other characteristics that might further describe each habitat unit (e.g., visual observations of fish, presence of unique or critical habitats).

Table 2.2-1. Fish Habitat and Community Assessment Locations in Streams with Potential Water Withdrawal and Use, 2017

Watershed	Waterbody Name	Location (UTM)		Habitat Assessment	Electrofishing Survey
		Easting	Northing		
Doris	Ogama Outflow	435058	7555576	X	X
Doris	Ogama Inflow	436585	7550895	X	X
Doris	P.O. Outflow	436640	7550179	X	-
Doris	Patch Outflow	436346	7548743	X	X
Doris	Wolverine Outlfow East	435625	7545963	X	X
Doris	Wolverine Outlfow	434790	7547279	X	-
Doris	Imniagut Outflow	433758	7551056	X	X
Aimaokatalok	Stickleback Outflow	441931	7594232	X	X

Notes:
X = assessment performed; Dashes = assessment not performed
All UTM coordinates in Zone 13N

In addition to fish habitat, data were collected to create hydraulic models of streams for which the greatest potential to interact with water withdrawal and use activities were predicted in the DEIS (TMAC 2016): Patch Outflow, Ogama Inflow, and Ogama Outflow. Hydraulic modelling results are presented in (ERM 2017)). To support future fish habitat assessments based on hydraulic models, fish habitats were mapped in these streams. Boundaries between habitat units were visually assessed, habitat type was classified, and coordinates were collected at the upstream and downstream boundaries of each habitat unit using a handheld GPS (Garmin® GPSmap 60Cx). Maps were plotted using ArcGIS® for projection NAD 1983 UTM Zone 13N. Each habitat unit was assigned a unique identifier during mapping.

2.2.2 Fish Community

2.2.2.1 Fish Sampling

Fish sampling was conducted at ten sites, including four sites in Ogama Inflow, two sites in Ogama Outflow, and one site in each of Patch Outflow, Wolverine Outflow East, Imniagut Outflow and Stickleback Outflow (Table 2.2-1; Figure 2.2-1). Sampling sites were between approximately 15 m and 40 m in length. They were selected to be representative of the habitat unit that they were within and in locations where sampling was not prevented by stream morphology (e.g., pools that exceeded safe wading depths of approximately 0.8 m). Site UTMs were recorded using a handheld GPS.

In order to specifically quantify fish habitat area within each electrofishing site, sampling sites were digitally photographed and the surface area was calculated by measuring dimensions using a metered tape along two lengths (left and right banks) and three widths (top, middle, and bottom). Three depth measurements were collected (left, mid, and right bank of channel) using a metered stick across each width transect. All other habitat characteristics for each site were assessed as described in Section 2.2-1.

A standard multiple-pass, depletion electrofishing method was used to collect fish at sample sites (Ptolemy 1993; Riley, Haedrich, and Gibson 1993; Peterson, Thurow, and Guzevich 2004; Rosenberger and Dunham 2005). Depletion estimates are particularly useful in small streams where the population to be estimated is relatively small (Zippin 1956). Historical sampling and experience indicated that the streams sampled were suitable candidates for this approach.

To collect fish from within a site, nets were installed at the upstream and downstream ends of the site to isolate it from the surrounding stream. Electrofishing passes were performed by two crew members (see Section 2.1.2 for description of equipment used). Electrofisher voltage (V), duty cycle (%) and frequency (Hz) settings were adapted at each site to maximize catch efficacy and minimize harm to fish. For sites where a multiple-pass removal was performed, a minimum of three passes were completed. To estimate the population, an adequate number of fish must be removed so there is a decline towards zero in each subsequent pass. A multiple-pass removal was not performed in Stickleback Outflow or Imniagut Outflow due to the presence of multiple channels and/or extensive instream vegetation that prevented isolation of the site using block nets. In Stickleback Outflow and Imniagut Outflow, a single electrofishing pass was conducted on an open stream reach resulting in species presence/absence and relative abundance data but no population estimate.

The number of fish of each species caught in each pass and the electrofishing effort (seconds) were recorded in addition to electrofisher settings including voltage, frequency, pulse width, and duty cycle.

According to Lockwood and Schneider (2000), depletion estimates require that a series of sampling conditions to be met. These conditions are presented below, as well as a description of how the conditions were satisfied:

1. Immigration and emigration must be prevented.

   Sites were isolated using 5 mm diameter mesh stop nets at upstream and downstream ends of each site. Nets were supported using rebar posts and the bottom of the net was held in place with boulders. Nets were checked between passes to ensure the site remained isolated.

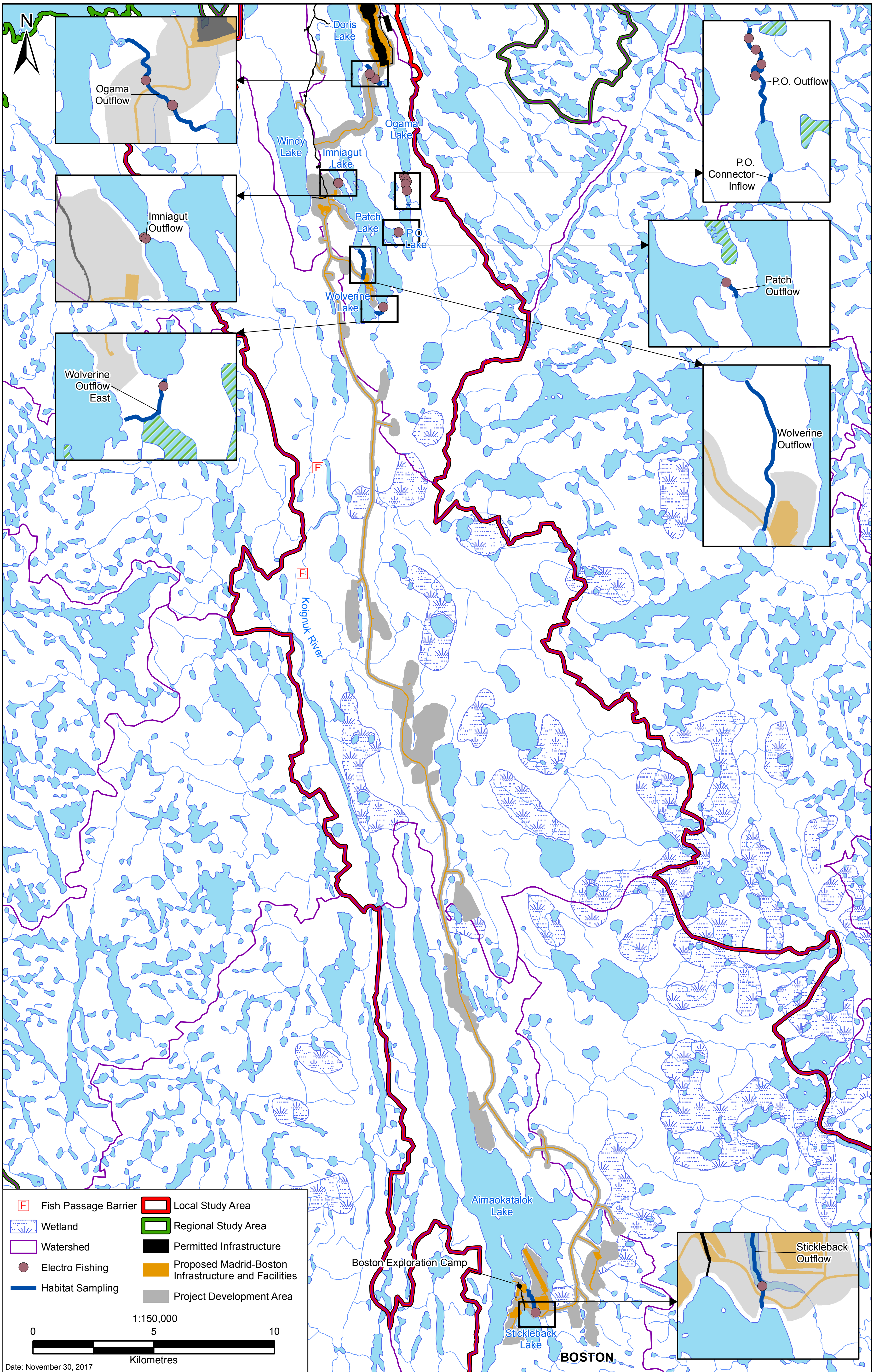
2. All fish must be equally vulnerable to capture during each pass.

   The vulnerability to capture varies by species, and even among different life stages of fish of the same species (e.g., juveniles compared to adults; Lockwood and Schneider 2000). Since this inequality cannot be avoided when sampling, fish were partitioned into groups by species and life stage of equal catch vulnerability for data analysis.

3. Vulnerability to capture must remain constant among passes.

   Between each pass, the site was left for a minimum of 30 minutes to allow fish to recover and return to normal behaviour. The purpose of this break was to ensure that fish were equally likely to be caught in each pass. The equality of the likelihood of capture among passes was assessed a posteriori by comparing each catch against the sum of the catch from previous passes.

Figure 2.2-1
Fish Habitat and Community Assessment Locations in Streams with Potential Water Withdrawal and Use, 2017



4. Collection effort must remain constant among passes.

   The level of effort (electrofishing seconds) was approximately the same for each pass at a site. In addition, the route fished and distribution of effort within the site was consistent among passes. A pass was initiated at the downstream net and consisted of a thorough search in an upstream direction.

5. Sampling conditions must remain constant among passes.

   The crew observed conditions within the site immediately prior to each pass to confirm that conditions (e.g., turbidity, discharge) had not changed to a degree that might affect fish capture rates.

All captured fish were identified to species, enumerated, and fork length and weight were recorded (see Section 2.1.2). Fish were released alive in the same location where they were captured after all sampling was complete at that site.

2.2.2.2 Data Analysis

Fish were partitioned into groups by species and life stage to ensure equal vulnerability of capture among cohorts within each group. The following definitions of life stage were used for salmonids:

- **Fry**. The free-swimming stage that emerges from spawning beds. Arctic grayling fry emerge in stream habitats in spring and rear throughout the first summer before migrating to overwintering habitat in fall. Lake Trout, whitefish and cisco fry emerge in lake habitats in spring and may migrate into stream habitats to during summer before returning to lakes prior to winter. For this analysis, the upper size limit for salmonids categorized as fry was 110 mm fork length because salmonids residing in the Arctic are usually less than this length at the end of their first summer. A fry is referred to as such until after its first winter of lake residence, at which time it becomes a juvenile;
- **Juvenile**. A sexually immature fish that is at least one year old. Juveniles spend winters in lakes, and some make excursions into streams during the spring and summer to rear. This life stage ends when fish reach sexual maturity; and
- **Adult**. The sexually mature life stage. For Arctic salmonids, size at first maturity varies among species and life history (e.g., anadromous versus resident fish), but generally these fish exceed 250 mm in length.

Because Ninespine Stickleback (*Pungitius pungitius*) mostly mature during their first summer and typically live less than four years, all fish of this species were placed in a single group for data analysis. Given that two distinct size ranges of salmonids were captured (24 to 47 mm and 371 mm to 720 mm), all fish were classified as fry or adults, respectively for data analysis. An insufficient number of Lake Trout (*Salvelinus namaycush*) and Lake Whitefish (*Coregonus clupeaformis*)/Cisco (Lake Cisco; *Coregonus artedi* and/or Least Cisco; *Coregonus sardinella*) were captured to complete meaningful population estimate calculations (three Lake Trout, one Lake Whitefish, and five Lake Whitefish/Cisco fry from nine sites). Therefore, population estimates were only possible for Ninespine Stickleback.

Population density estimates were calculated using a Bayesian/Maximum Weighted Likelihood method as described in Carle and Strub (1978) and Lockwood and Schneider (2000):

$$T = \sum_{i=1}^{k} C_i,$$

$$X = \sum_{i=1}^{k} (k-i)C_i,$$

where:

i = pass number,
k = number of passes,
C_i = catch in i^{th} sample,
X = an intermediate statistic,
T = total catch in all passes.

The maximum likelihood estimate of the population (N) was determined using an iterative process by substituting values for n until:

$$\left[\frac{n+1}{n-T+1}\right]\prod_{i=1}^{k}\left[\frac{kn-X-T+1+(k-i)}{kn-X+2+(k-i)}\right] \leq 1.0,$$

where n is the smallest integer satisfying the above equation. Since this method necessitates the use of integers, the model was applied to each pass assuming equal fishing effort. Probability of capture (p) was estimated by the following equation:

$$p = \frac{T}{kN = X},$$

and the variance and standard error of N were estimated as:

$$\text{Variance of } N = \frac{N(N-T)T}{T^2 - N(N-T)\left[\frac{(kp)^2}{(1-p)}\right]}$$

$$\text{Standard error of } N = \sqrt{\text{Variance of } N}.$$

The equality of p among passes must be verified to ensure that $p_1 = p_2 = p_3 = \ldots p_k = p$. This was done by plotting each catch against the sum of all previous passes then visually assessing the trend line to confirm that the decline was linear.

Density of fish (partitioned by species and life stage; fish/m^2) was calculated by dividing N by the surface area (calculated from site measurements described in Section 2.2.2.1) of the electrofished section. This is the conventional measure of stream fish density because electrofishing samples the entire depth of a stream hence it automatically integrates population abundance over the depth of the water column.

The analysis was performed in R version 3.1.3 (R Core Team 2016) using the package 'FSA' (Ogle 2016).

2.3 IMNIAGUT LAKE

Imniagut Lake is located in the Doris Creek watershed, 7 km south of Doris Camp and 500 m east of the Doris-Windy all-weather road (Figure 2.3-1). The lake drains into Patch Lake, flowing through P.O. Lake, Ogama Lake, Doris Lake, and Little Roberts Lake before meeting the ocean at Roberts Bay. A 4 m waterfall between Doris Lake and Little Roberts Lake marks the upstream limit for anadromous fish.

Some biophysical attributes of Imniagut Lake have been sampled previously: physical limnology, water quality, sediment quality, phytoplankton, zooplankton, and benthic invertebrate sampling were conducted in 2009 (Rescan 2010a); a bathymetric survey was conducted in 2010 (Rescan 2011a). Summer sampling in 2009 revealed that both temperature and dissolved oxygen profiles were stable throughout the water column; and although there was a slight decline in oxygen near the lake bottom, values remained above the Canadian Council of Ministers of the Environment (CCME) guidelines for early stage aquatic life (greater than 9.5 mg/L; CCME 1999). Under-ice dissolved oxygen (DO) profiles have not been collected; consequently, the extent to which the lake might experience fish winterkill due to depleted oxygen concentrations is uncertain.[1]

Imniagut Lake is adjacent to Patch Lake. The fish community in Patch Lake has been well documented, with fish community surveys conducted from 1995 to 1999 and from 2006 to 2009 (summarized in Rescan 2010b). Based on these studies, the fish community in Patch Lake is comprised of Lake Trout, Lake Whitefish, Cisco, and Ninespine Stickleback. In 2014, the fish community of Imniagut Lake was assessed by minnow traps, gillnets, and shoreline electrofishing surveys. The only fish species captured was Ninespine Stickleback (minnow traps and electrofishing surveys; ERM 2015). No large-bodied fish were captured in 7.6 hours of gill netting effort. The objective of the 2017 Imniagut Lake fish community assessment was to further sample the composition of the fish community with particular focus on increased gillnetting effort.

Minnow traps, gillnets, and an electrofisher were used to sample the fish community of Imniagut Lake in July 2017 (Figure 2.3-2). All captured fish were identified to species and enumerated. Fork length was measured to the nearest 1 mm with a measuring board and wet weight was measured to the nearest 0.1 g using an electronic scale for a subsample of fish. Where parasites or DELTs were observed, this information was recorded.

2.3.1 Minnow Trapping

Cylindrical minnow traps (43 cm long, 23 cm in diameter, with 6.5 mm mesh, entrance diameter 3 cm) were employed to sample small-bodied fish (Figure 2.3-2). Traps were baited with dry commercial crab bait and immersed on July 23, 2017 for approximately 24 hours before retrieval the following day. Minnow trapping data were standardised as CPUE, which was calculated as the number of fish captured per trap per 24 hours (Table 2.3-1).

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[1] An attempt was made to collect under-ice temperature and dissolved oxygen profiles in 2009, but insufficient water depth prevented the collection of under-ice profiles at the sampling location. A bathymetric survey conducted in 2010 identified deeper areas of the lake, but under-ice sampling has not occurred in these areas. The results of the bathymetric survey suggest that Imniagut Lake has adequate water depth to provide overwintering fish habitat, with a maximum depth of 4.91 m and an average depth of 2.65 m.

Figure 2.3-1

Imniagut Lake and the Doris Watershed, 2017

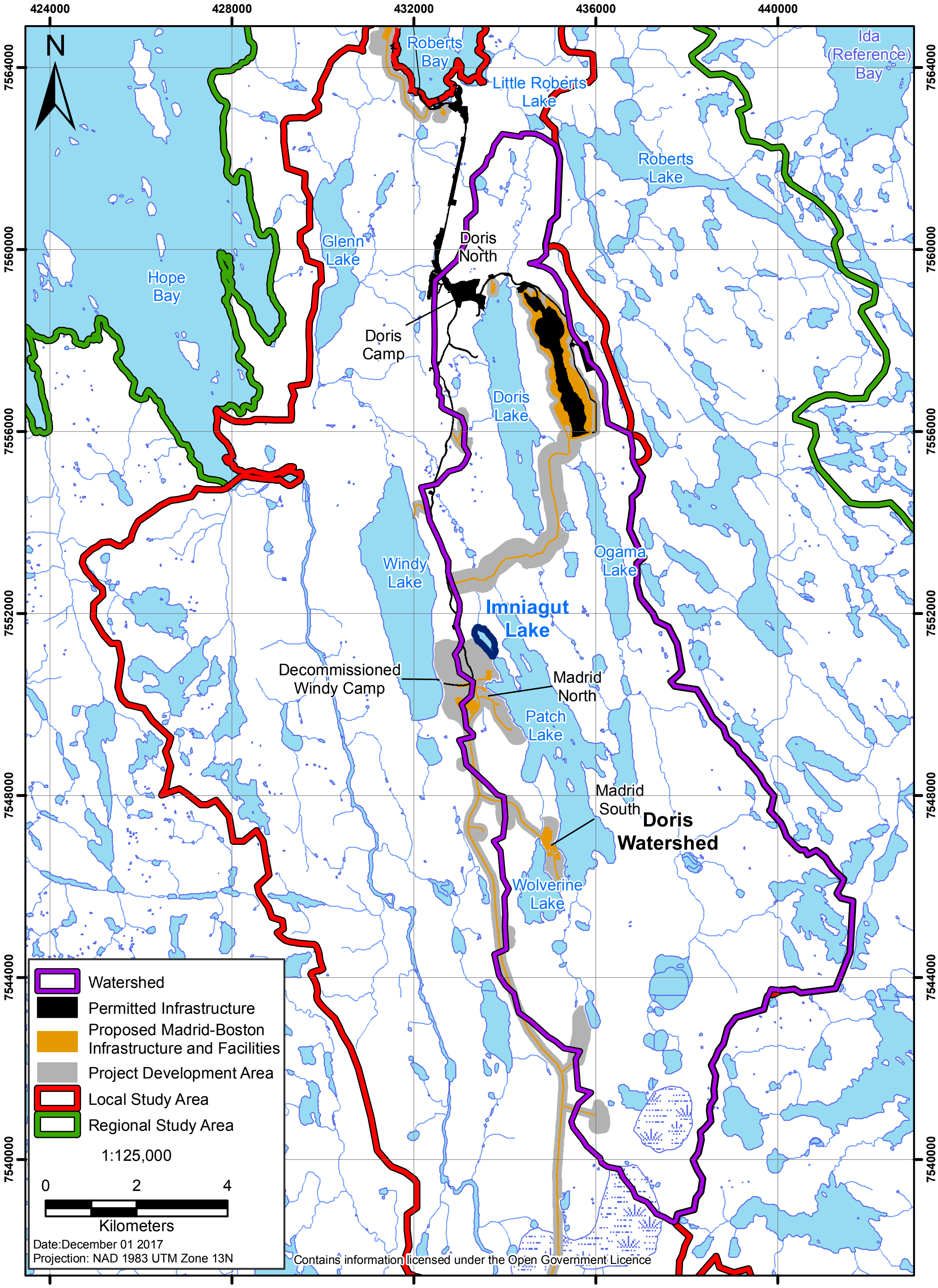


Figure 2.3-2

Fisheries Sampling Locations in Imniagut Lake, 2017

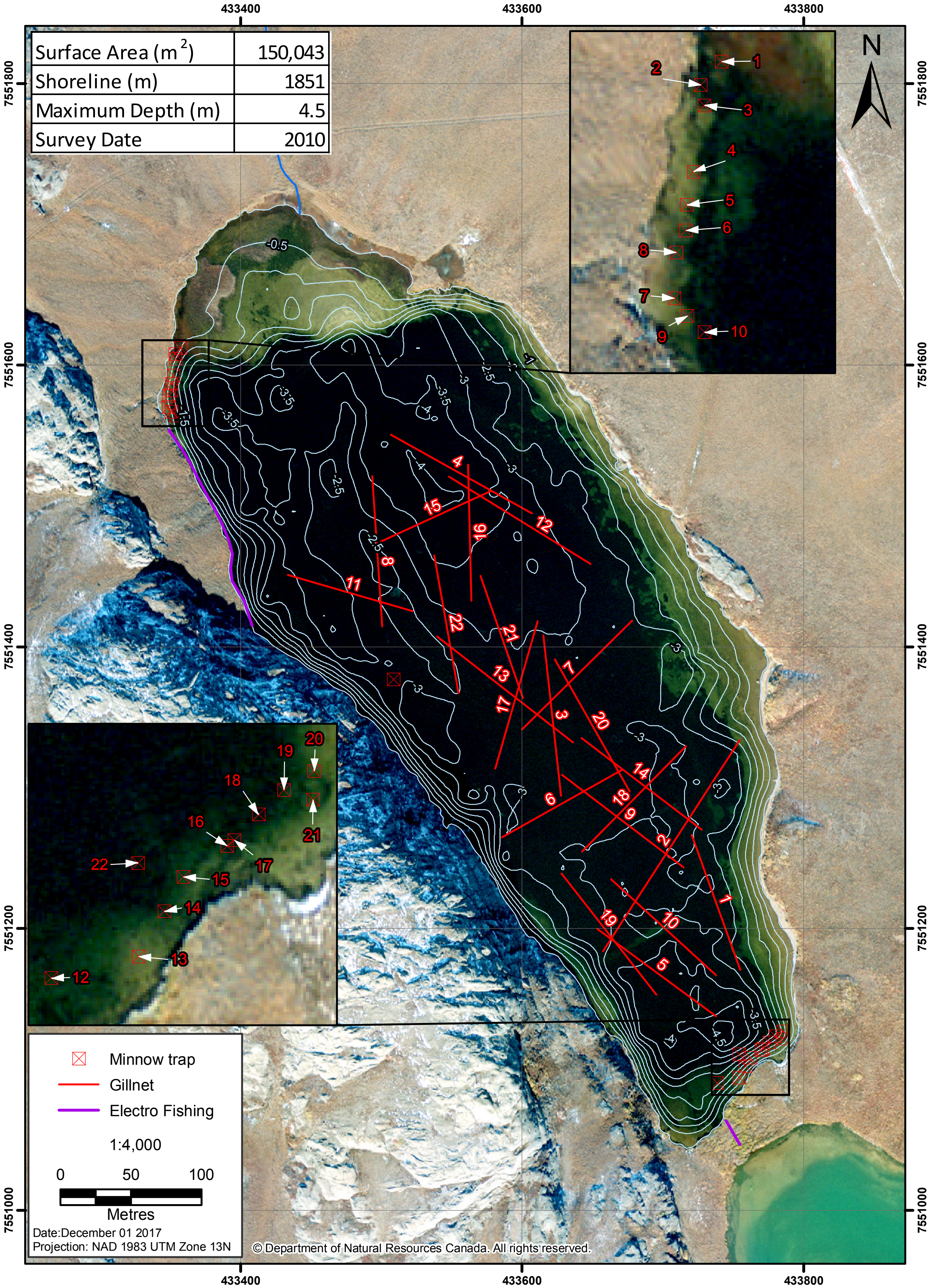


Table 2.3-1. Catch-Per-Unit-Effort Calculations

Sampling Gear	CPUE Calculation
Electrofisher	*CPUE = number of fish caught × [100/(electrofishing effort, s)]*
Minnow trap	*CPUE = number of fish caught per trap ×[(24 h / (set time, h)]*
Gill net	*CPUE = number of fish caught per net × [100 m^2/(total net area, m^2)] × [1 h/(set time, h)]*

Note: CPUE = Catch-Per-Unit-Effort

2.3.2 Gillnetting

A total of 22 gillnets were set on July 23 and 24, 2017; eleven sinking gangs and eleven floating gangs were deployed (Figure 2.3-2). Each gillnet consisted of a standard gang of six panels of different mesh sizes recommended by the Resources Information Standards Committee (25 mm, 76 mm, 51 mm, 89 mm, 38 mm and 64 mm; RISC 2001). Each panel was 15.2 m long, and the panels were sewn together to make a net that is 91.2 m long and 2.4 m deep. Nets were deployed by boat and set for up to two hours. Gill netting data were standardised as CPUE, which was calculated as the number of fish captured per 100 m^2 of net per hour (Table 2.3-1).

2.3.3 Electrofishing

Backpack electrofishing was conducted along the shoreline of Imniagut Lake and in the outflow that connects the lake to Patch Lake on July 24, 2017 and July 25, 2017, respectively (Figure 2.3-2). A systematic sweep sampling approach was conducted; the lake shoreline was sampled between the water's edge to the maximum safe wading depth (see Section 2.1.2 for description of equipment used). In the outflow, the entire wetted width was sampled in an upstream direction from Patch Lake to Imniagut Lake. Electrofishing effort was not pre-determined because the primary objective was to determine whether fish were present in the lake and, if so, determine fish community composition. Electrofisher voltage (V), duty cycle (%) and frequency (Hz) settings were adapted to maximize capture efficiency at each site.

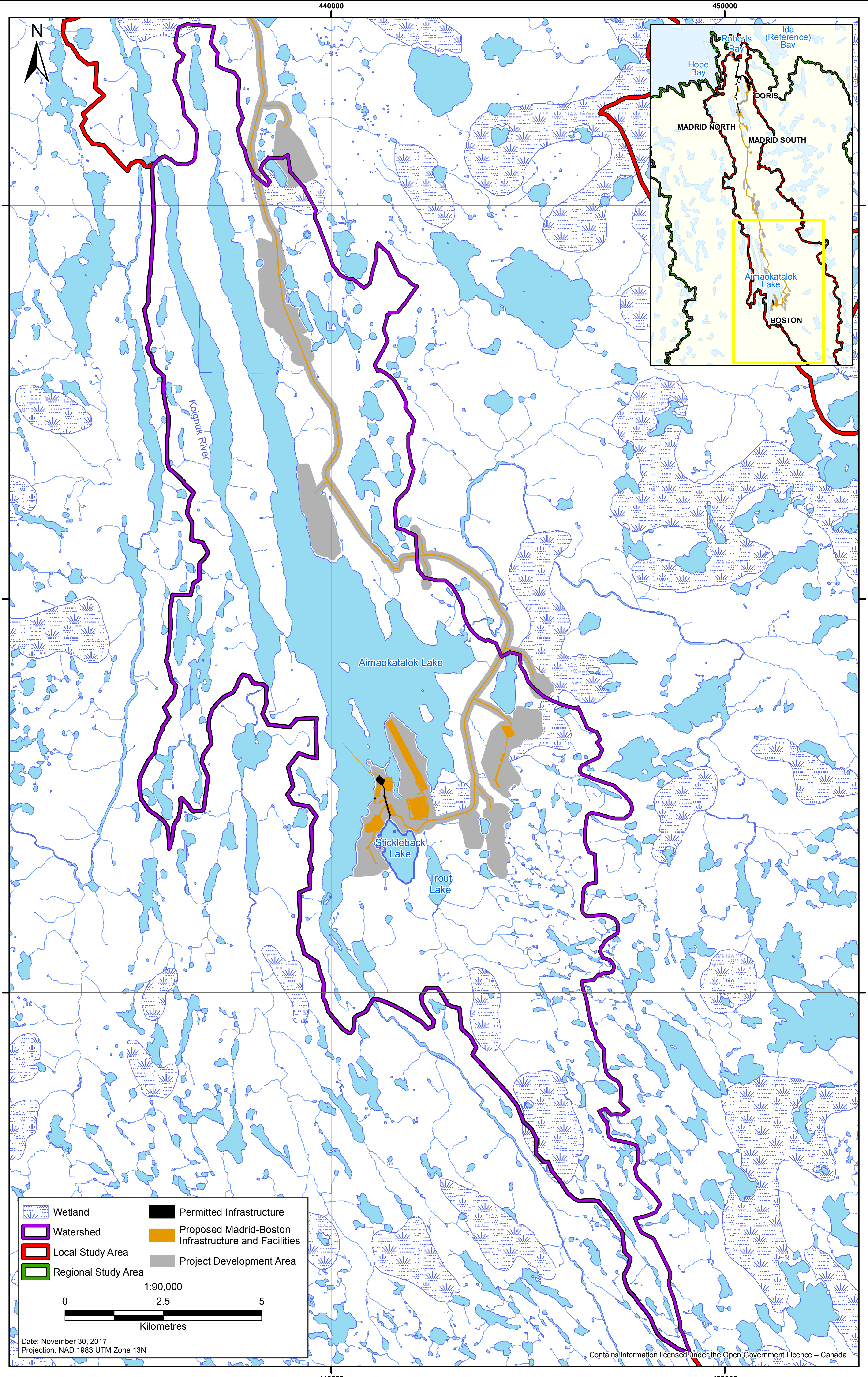
All captured fish were placed immediately in a holding tank for species identification, enumeration, and biological processing and then released back into the site once collection was complete. Electrofishing data were standardised as CPUE, which was calculated as the number of fish captured per 100 s of effort (Table 2.3-1).

2.4 STICKLEBACK LAKE

Stickleback Lake is located in the Aimaokatalok watershed, approximately 1 km south of Boston Camp (Figure 2.4-1). Stickleback Lake, as well as nearby Trout Lake which is located approximately 0.5 km to the east, drain into Aimaokatalok Lake via a long shallow bay (Figure 2.4-1).

Some biophysical attributes of Stickleback Lake have been sampled previously. Physical limnology, water quality, sediment quality, phytoplankton, zooplankton, and benthic invertebrate sampling was most recently conducted in 2010 (Rescan 2011a); a bathymetric survey was also conducted in 2010 (Rescan 2011a). The results of the bathymetric survey suggest that Stickleback Lake has adequate water depth to provide overwintering fish habitat, with a maximum depth of 4.1 m and an average depth of 2.5 m.

Figure 2.4-1
Stickleback Lake and the Aimaokatalok Watershed, 2017



Summer sampling in 2006 and 2007 (Golder Associates Ltd. 2008), and 2010 (Rescan 2011a) revealed that both temperature and DO profiles in Stickleback Lake were stable throughout the water column; and values remained above the CCME guidelines for aquatic life (greater than 9.5 mg/L for early life stages and 6.5 mg/L for other life stages; CCME 1999). Under-ice DO was also measured in 2006 and 2007 (Golder Associates Ltd. 2008), and 2010 (Rescan 2011a). In 2006, DO concentrations declined gradually with depth from over 8 mg/L near the bottom of the ice surface at 1.5 m depth to < 4.5 mg/L near the lake bottom at 3 m depth. While DO concentrations throughout the water column were below the CCME guideline for the protection of early life stages of aquatic life, they were above the guideline for other life stages except in the bottom 0.5 m of the water column. In 2007 and 2010, when the ice thickness in Stickleback Lake was greater than in 2006 (between 1.7 and 1.8 m), free water below the ice was near anoxic (between 0 and 0.5 mg/L in 2006 and 1.3 mg/L in 2010). Measured under-ice DO concentrations suggest the lake could experience fish winterkill due to depleted oxygen concentrations in some years but the frequency of such events is uncertain and may depend on multiple factors including ice thickness and duration of ice cover.

Stickleback Lake is adjacent to Aimaokatalok Lake. The fish community in Aimaokatalok Lake has been well documented, with fish community surveys conducted from 1995 to 1999 and from 2006 to 2009 (summarized in TMAC 2016). Based on these surveys, the fish community in Aimaokatalok Lake is comprised of Lake Trout, Arctic Grayling, Lake Whitefish, Cisco species, Slimy Sculpin (*Cottus cognatus*) and Ninespine Stickleback. Most recently, the fish community of Stickleback Lake was assessed in 2010 by minnow traps and gillnets (Rescan 2011b). Fish captured included 34 Ninespine Stickleback in minnow traps and one Arctic Grayling in five gill net sets. The purpose of 2017 fish community sampling in Stickleback Lake was to estimate the Arctic Grayling population size using a mark-recapture study.

The marking phase of the mark-recapture study was undertaken on July 30 and August 1 and 2, 2017. The objective of the marking phase was to mark approximately ten percent of the Arctic Grayling population using fin clips. To reduce handling stress and return fish to the lake in the best condition possible, angling was the preferred fish capture method for the marking phase. However, no fish were captured or observed (i.e., visual observations of fish or of fish rising) in 11 rod-hours of initial angling effort on July 30 and August 1, 2017. Therefore, gillnets were added to marking phase fish sampling efforts on August 1 and 2, 2017. Angling and gillnetting methods employed are described in detail in Sections 2.4.1 and 2.4.2.

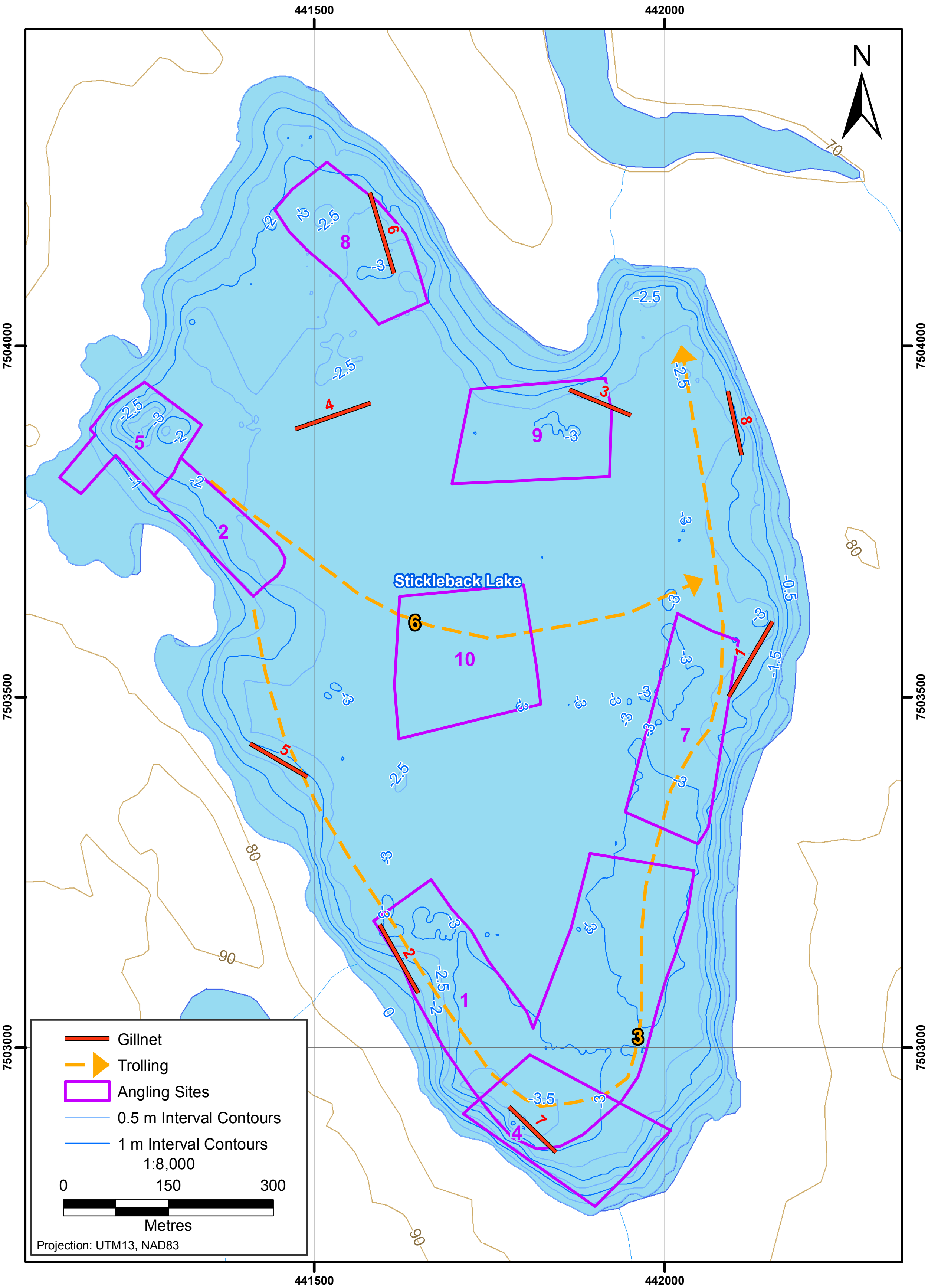
No fish were captured using angling and gillnetting or observed during the marking phase in Stickleback Lake. Based on this result, the mark recapture study was discontinued.

2.4.1 Angling

In an attempt to capture Arctic Grayling, angling methods were varied to target fish under different conditions. Angling efforts were conducted using two spinning rods simultaneously or one spinning rod and one fly fishing rod. Spinning rods were fished by spin casting or trolling with 1/16 oz. Panther Martin Spinners in various colours with barbless treble hooks. Fly rods were fished by streaming or trolling with various sinking fly patterns with size 10 - 14 barbless hooks. Fishing locations were marked on a bathymetric map (Figure 2.4-2) and duration of fishing effort at each location was recorded in the field.

Figure 2.4-2

Fisheries Sampling Locations in Stickleback Lake, 2017



2.4.2 Gillnetting

A total of eight gillnets were set on August 1 and 2, 2017 (Figure 2.4-2); only sinking gangs were deployed (mesh size, panel order and panel size were as described in Section 2.3.2). Nets were deployed by boat and set for up to three hours.

2.5 QUALITY ASSURANCE AND CONTROL

Quality assurance and quality control were implemented throughout the field program to ensure accurate data collection and analysis. All data were reviewed at the end of each field day to ensure that sampling was complete and that the data were collected properly.

During data entry, field notes were transcribed onto electronic spreadsheets then all records were independently checked for accuracy against the field forms. Statistical methodology, data analyses, and results were reviewed by a senior registered professional biologist.

3. RESULTS AND DISCUSSION

3.1 ROAD CROSSING LOCATIONS

3.1.1 Fish Habitat

A total of 21 road crossing sites were visited at high flow (June 7 to 11, 2017) and at low flow (July 18 to 30, 2017). At high flow, 18 sites were categorized as "potential fish habitat" and 3 sites were categorized as "not fish habitat" (Table 3.1-1). At low flow, 14 sites were categorized as "potential fish habitat" and 7 were categorized as "not fish habitat" (Table 3.1-1). Full habitat assessments were not conducted at sites that did not contain fish habitat. Photos of each site at both high flow and low flow are presented in Appendix 3.1-1.

For sites categorized as potential fish habitat, additional habitat data were collected and the habitat value for fish species known to be present in the watershed were assigned for each life process (spawning, rearing, and migration). Overwintering habitat was assumed to be negligible as the streams assessed freeze to the substrates in winter. The dominant habitat type in each assessment reach, the type and permanence of any barriers to fish passage, and the overall fish habitat value are presented in Table 3.1-1. Complete detailed habitat assessment data and photos of each crossing location at both high and low flow are presented in Appendices 3.1-1 and 3.1-2, respectively.

In general, small inflow streams in Roberts Bay and Doris watersheds had low habitat values during high flow when some temporary migration barriers were identified, no habitat for large-bodied fish was recorded and habitat quality for various life stages of Ninespine Stickleback varied (Table 3.1-1). At low flow, these proposed crossing locations were dry or had no defined channel (overland flow barriers) and therefore, had no fish habitat value.

Wolverine Outflow, proposed to be crossed at site C-MS-01, is not the main outflow channel from Wolverine Lake. Habitat value was categorized as low and none at high and low flows, respectively due to dry channel and overland flow barriers (Table 3.1-1).

Glenn Outflow (C-CDR-02) and Ogama Outflow (C-TIA-04) are outflow streams from large lakes in the Windy and Doris watersheds, respectively. Fish habitat value was high at both high and low flows with good overall habitat for Ninespine Stickleback and fair to good habitat for large-bodied fish (Table 3.1-1). Boulder Creek (C-MBR-7) and Boulder Creek Tributary (C-MBR-8) had high habitat value at both high and low flow, providing spawning, rearing, and migration habitat for Arctic Grayling and other large-bodied fish.

Inflows to Aimaokatalok Lake (C-MBR-9 to C-MBR-18) varied in fish habitat quality. Site C-MBR-12 was a single wide (up to approximately 20 m) high quality channel that reached depths of 0.5 m at high flow and provided abundant boulder cover (Appendix 3.1-2). Other Aimaokatalok inflows with moderate to high fish habitat quality displayed beaded tundra stream morphologies with deeper pool habitats connected by short glide sections (i.e., C-MBR-9, C-MBR-11, C-MBR-15, and C-MBR-16; Table 3.1-1).

Trout Outflow (C-MBR-19) and Stickleback Outflow (C-MBR-20) both provided high quality habitat at high flow, particularly spawning and migration habitat for Arctic Grayling. At low flows, temporary boulder garden, dry channel, and overland flow barriers interrupted migratory access between Trout and Stickleback lakes and Aimaokatalok Lake. The rest of the inflows to Aimaokatalok Lake that are proposed to be crossed by roads either had no habitat at high or low flow (non-classified drainages) or had low habitat quality at high flow but were dry by low flow.

3.1.2 Fish Community

Electrofishing surveys were conducted under low flow conditions (July 26 to 30, 2017) in streams that were assessed as "potential fish habitat" (Table 3.1-1), except at potential crossing site C-MBR-12 (Aimaokatalok Inflow) where fish presence was previously confirmed by historical sampling. Table 3.1-2 summarizes sample site information, electrofishing effort, fish species captured, and CPUE. Ninespine Stickleback were captured at all potential crossing locations where electrofishing surveys were conducted. Additionally, although electrofishing surveys were not performed at sites C-CDR-01 (Roberts Bay Inflow) and C-TIA-03 (Doris Inflow), dead Ninespine Stickleback were observed in the dry channel confirming seasonal use by fish. Fork length and weight summary statistics for species captured at each proposed crossing location are presented in Table 3.1-3. Complete survey and biological data for fish community assessments at potential road crossing locations are presented in Appendices 3.1-3 and 3.1-4, respectively.

Fish habitat, capture, and observation data from 2017 were used in combination with data from historical fisheries surveys to summarize the confirmed and/or assumed fish community at each crossing location (Table 3.1-4). Assumed fish community information takes into account fish species known to be present in upstream and downstream waterbodies as well as the habitat and connectivity information collected in fish habitat assessments historically, and in 2017.

3.2 WATER WITHDRAWAL AND USE LOCATIONS

3.2.1 Fish Habitat

Streams that have the potential to interact with water withdrawal and use for the Madrid-Boston were surveyed at both high and low flows. Complete survey data are presented in Appendix 3.2-1. Habitat types recorded during the low flow survey which represent stable stream conditions are summarized in Table 3.2-1 and mapped on Figure 3.2-1 (Ogama Outflow, Ogama Inflow, and Patch Outflow only).

A total of 77 habitat units were identified (Table 3.2-1). Glides were the most common habitat type both in number of units and by stream length. In streams where pools were present they were the most common habitat type based on relative areal contributions, except in Stickleback Outflow where glides contributed a greater area. In all of the surveyed streams, glides accounted for over half of the total stream length. Pools were the next most common habitat type and were present in all streams where more than one habitat type was observed.

Table 3.1-1. Fish Habitat Values at Proposed Road Crossing Locations, 2017

Crossing ID	Watershed	Waterbody Name	Survey Timing (Flow Level)	Potential Fish Habitat	Electrofishing Survey	Dominant Habitat Type	Barriers/Obstructions		Average Fish Habitat Value									Overall Habitat Value
									Ninespine Stickleback			Lake Trout/Whitefish/Cisco			Arctic Grayling*			
							Type	Permanence	Spawning	Rearing	Migration	Spawning	Rearing	Migration	Spawning	Rearing	Migration	
C-CDR-01	2 - Roberts Bay	Roberts Bay Inflow	High	Y	-	G	DC	T	P	P	P	N	N	N				Low
			Low	N	N	G	NCD	T	N	P	N	N	N	N				None
C-CDR-02	Windy	Glenn Outflow	High	Y	-	G	None	-										High
			Low	Y	Y	G	None	-	G	G	G	N	G	G				High
C-TIA-01	Doris	Patch Inflow	High	Y	-	G	None	-	F	G	G	N	N	N				Low
			Low	N	N	DC	DC	T	N	N	N	N	N	N				None
C-TIA-02	Doris	Doris Inflow	High	Y	-	G	None	-	G	G	G	N	N	N				Low
			Low	N	N	DC	DC	T	N	N	N	N	N	N				None
C-TIA-03	Doris	Doris Inflow	High	Y	-	F	OF	T	N	P	P	N	N	N				Low
			Low	N	N	DC	OF/DC	P	N	N	N	N	N	N				None
C-TIA-04	Doris	Ogama Outflow	High	Y	-	P	None	-	F	G	G	N	G	G				High
			Low	Y	Y	G	None	-	G	G	G	N	F	G				High
C-MS-01	Doris	Wolverine Outflow	High	Y	-	F	DC/OF	P	P	P	P	N	N	N				Low
			Low	N	N	DC	DC/NCD	P	N	N	N	N	N	N				None
C-MBR-7	Koignuk/ Aimaokatalok	Boulder Creek	High	Y	-	G	None	-			G			G			G	High
			Low	Y	Y	P/R	None	-	F	G	G	N	F	F	G	G	G	High
C-MBR-8	Koignuk/ Aimaokatalok	Boulder Creek Tributary	High	Y	-	G	None	-	G	G	G	N	G	G	P	G	G	High
			Low	Y	Y	G	None	-	G	G	G	N	P	F	N	G	G	High
C-MBR-9	Aimaokatalok	Aimaokatalok Inflow	High	Y	-	G/P	F	P	G	G	N	N	G	N	G	G	N	Moderate
			Low	Y	Y	G	F/OF	P/T	G	G	N	N	P	N	N	P	N	Moderate
C-MBR-10	Aimaokatalok	Aimaokatalok Inflow	High	N	-	NCD	DC/NCD	P	N	N	N	N	N	N	N	N	N	None
			Low	N	N	NCD	DC/NCD	P	N	N	N	N	N	N	N	N	N	None
C-MBR-11	Aimaokatalok	Aimaokatalok Inflow	High	Y	-	P/G	None	-	G	G	G	N	G	G	N	G	G	Moderate
			Low	Y	Y	P/G	None	-	G	G	G	N	F	F	N	F	F	Moderate
C-MBR-12	Aimaokatalok	Aimaokatalok Inflow	High	Y	-	G/R	None	-	P	F	F	N	G	G	F	G	G	High
			Low	Y	N	G	None	-	F	G	G	N	G	G	F	G	G	High
C-MBR-13	Aimaokatalok	Aimaokatalok Inflow	High	Y	-	G	None	-	G	G	G	N	P	F	N	F	G	Low
			Low	N	N	DC	DC	T	N	P	N	N	N	N	N	P	N	None
C-MBR-14	Aimaokatalok	Aimaokatalok Inflow	High	N	-	NCD	NCD/OF	P	N	N	N	N	N	N	N	N	N	None
			Low	N	N	NCD	NCD/OF	P	N	N	N	N	N	N	N	N	N	None
C-MBR-15	Aimaokatalok	Aimaokatalok Inflow	High	Y	-	P/G	None	-	G	G	G	N	G	G	P	G	G	Moderate
			Low	Y	Y	P	None	-	G	G	G	N	F	G	N	F	G	Moderate

(continued)

Table 3.1-1. Fish Habitat Values at Proposed Road Crossing Locations, 2017 (completed)

Crossing ID	Watershed	Waterbody Name	Survey Timing (Flow Level)	Potential Fish Habitat	Electrofishing Survey	Dominant Habitat Type	Barriers/Obstructions		Average Fish Habitat Value									Overall Habitat Value
									Ninespine Stickleback			Lake Trout/Whitefish/Cisco			Arctic Grayling*			
							Type	Permanence	Spawning	Rearing	Migration	Spawning	Rearing	Migration	Spawning	Rearing	Migration	
C-MBR-16	Aimaokatalok	Aimaokatalok Inflow	High	Y	-	G	None	-	F	G	G	N	G	G	F	G	G	High
			Low	Y	Y	G	BG/OF	T	G	G	G	N	P	P	N	F	F	High
C-MBR-17	Aimaokatalok	Aimaokatalok Inflow	High	Y	-	G	OF	P	F	G	G	N	N	N	N	P	P	Low
			Low	Y	Y	P	DC/OF	T/P	G	G	F	N	N	N	N	P	P	Low
C-MBR-18	Aimaokatalok	Aimaokatalok Inflow	High	Y	-	G	None	-	P	F	G	N	N	N	N	P	F	Low
			Low	N	N	DC/NCD	DC/NCD	T	N	N	N	N	N	N	N	N	N	None
C-MBR-19	Aimaokatalok	Trout Outflow	High	Y	-	G/R	None	-	F	G	G	N	G	G	F	G	G	High
			Low	Y	Y	G	BG	T	G	G	G	N	P	P	P	P	F	Moderate
C-MBR-20	Aimaokatalok	Stickleback Outflow	High	Y	-	G	None	-	P	G	G	N	P	F	P	G	G	High
			Low	Y	Y	G	DC/OF	T	G	G	G	N	N	N	P	P	P	Moderate

Notes:
CDR = Roberts Bay Cargo Dock Road; TIA = Madrid North to Boston TIA Road; MS = Madrid South All-Weather Road; MBR = Boston-Madrid All-Weather Road
Habitat Types: G = glide; F = flat; R = riffle; P = pool, DC = dry channel; NCD = non-classified drainage
Permanence: P = permanent; T = temporary
Habitat Values: N = none; P = poor; F = fair; G = good
Dashes = not applicable
Blanks = not assessed due to stream conditions on survey date
**Shaded cells = Habitat value for Arctic Grayling only assessed in watersheds where the species is present*

Table 3.1-2. Electrofishing Effort and Catch at Proposed Road Crossing Locations, 2017

Crossing ID	Watershed	Waterbody Name	Catch (No. of fish)				Effort (s)	CPUE (No. of fish/100 s)				Visual Observation	
			NSSB	ARGR	LKTR	SLSC		NSSB	ARGR	LKTR	SLSC	NSSB	ARGR
C-CDR-02	Windy	Glenn Outflow	2	0	1	1	200	1.00	0.00	0.50	0.50	-	-
C-TIA-04*	Doris	Ogama Outflow											
C-MBR-7	Koignuk/Aimaokatalok	Boulder Creek	2	16	0	0	748	0.27	2.14	0.00	0.00	-	-
C-MBR-8	Koignuk/Aimaokatalok	Boulder Creek Tributary	42	1	0	0	504	8.33	0.20	0.00	0.00	> 15	5.00
C-MBR-9 (Below Falls)	Aimaokatalok	Aimaokatalok Inflow	30	0	0	0	263	11.41	0.00	0.00	0.00	> 100	-
C-MBR-9 (Above Falls)	Aimaokatalok	Aimaokatalok Inflow	2	0	0	0	238	0.84	0.00	0.00	0.00	-	-
C-MBR-11	Aimaokatalok	Aimaokatalok Inflow	11	0	0	0	402	2.74	0.00	0.00	0.00	-	-
C-MBR-15	Aimaokatalok	Aimaokatalok Inflow	20	0	0	0	840	2.38	0.00	0.00	0.00	-	-
C-MBR-16	Aimaokatalok	Aimaokatalok Inflow	2	2	0	0	598	0.33	0.33	0.00	0.00	-	-
C-MBR-17	Aimaokatalok	Aimaokatalok Inflow	19	0	0	0	253	7.51	0.00	0.00	0.00	-	-
C-MBR-19	Aimaokatalok	Trout Outflow	26	1	0	0	702	3.70	0.14	0.00	0.00	> 300	-
C-MBR-20	Aimaokatalok	Stickleback Outflow	30	4	0	1	619	4.85	0.65	0.00	0.16	> 500	-

Notes:
CDR = Roberts Bay Cargo Dock Road; TIA = Madrid North to Boston TIA Road; MS = Madrid South All-Weather Road; MBR = Boston-Madrid All-Weather Road
NSSB = Ninespine Stickleback; ARGR = Arctic Grayling; LKTR = Lake Trout; SLSC = Slimy Sculpin
Dashes = no visual observations noted
**Shaded cells = fish population estimated by multiple pass electrofishing (see Table 3.2-2 for results)*
CPUE = Catch-Per-Unit-Effort

Table 3.1-3. Fork Length and Weight Summary Statistics of Fish Captured at Proposed Road Crossing Locations, 2017

				Fork Length (mm)					Weight (g)					Condition				
Crossing ID	Watershed	Waterbody Name	Species	n	Mean	SE	Min	Max	n	Mean	SE	Min	Max	n	Mean	SE	Min	Max
C-CDR-02	Windy	Glenn Outflow	NSSB	2	56.5	5.5	51	62	2	1.57	0.47	1.10	2.03	2	0.84	0.01	0.83	0.85
			LKTR	1	-	-	170	170	1	-	-	83.00	83.00	1	1.69	-	1.69	1.69
			SLSC	1	-	-	95	95	1	-	-	5.67	5.67	1	0.66	-	0.66	0.66
C-TIA-04*	Doris	Ogama Outflow																
C-MBR-7	Koignuk/ Aimaokatalok	Boulder Creek	NSSB	2	27.0	2.0	25	29	2	0.14	0.00	0.14	0.14	2	0.74	0.16	0.57	0.90
			ARGR	16	41.4	0.7	36	49	16	0.58	0.04	0.41	1.10	16	0.81	0.03	0.55	0.99
C-MBR-8	Koignuk/ Aimaokatalok	Boulder Creek Tributary	NSSB	10	45.3	3.7	31	63	10	0.83	0.17	0.24	1.67	10	0.82	0.06	0.56	1.06
			ARGR	1	-	-	220	220	-	-	-	-	-	-	-	-	-	-
C-MBR-9 (Below falls)	Aimaokatalok	Aimaokatalok Inflow	NSSB	10	50.4	1.6	45	60	10	0.92	0.08	0.67	1.29	10	0.71	0.04	0.57	0.90
C-MBR-9 (Above falls)	Aimaokatalok	Aimaokatalok Inflow	NSSB	2	39.0	0.0	39	39	2	0.32	0.03	0.29	0.34	2	0.53	0.04	0.49	0.57
C-MBR-11	Aimaokatalok	Aimaokatalok Inflow	NSSB	11	38.1	3.2	27	59	11	0.50	0.11	0.24	1.31	11	0.85	0.07	0.58	1.22
C-MBR-15	Aimaokatalok	Aimaokatalok Inflow	NSSB	12	29.0	3.3	19	58	8	0.43	0.18	0.09	1.54	8	1.10	0.11	0.79	1.66
C-MBR-16	Aimaokatalok	Aimaokatalok Inflow	NSSB	2	74.0	1.0	73	75	2	2.74	0.11	2.62	2.85	2	0.67	0.00	0.67	0.68
			ARGR	2	140.5	5.5	135	146	2	27.67	2.07	25.60	29.74	2	1.00	0.04	0.96	1.04
C-MBR-17	Aimaokatalok	Aimaokatalok Inflow	NSSB	19	60.3	1.1	50	67	19	1.18	0.06	0.69	1.74	19	0.53	0.01	0.43	0.64
C-MBR-19	Aimaokatalok	Trout Outflow	NSSB	21	35.6	3.3	19	65	21	0.53	0.12	0.06	1.62	20	0.80	0.03	0.59	1.02
			ARGR	1	-	-	131	131	1	-	-	24.37	24.37	1	1.08	-	1.08	1.08
C-MBR-20	Aimaokatalok	Stickleback Outflow	NSSB	26	43.7	3.1	20	65	16	1.12	0.12	0.15	2.39	16	0.64	0.05	0.09	0.87
			ARGR	4	98.0	3.3	92	107	4	10.66	0.78	9.41	12.95	4	1.13	0.04	1.06	1.21
			SLSC	1	-	-	71	71	1	-	-	2.85	2.85	1	0.80	-	0.80	0.80

Notes:
CDR = Roberts Bay Cargo Dock Road; TIA = Madrid North to Boston TIA Road; MS = Madrid South All-Weather Road; MBR = Boston-Madrid All-Weather Road
**Shaded cells = fish population sampled by multiple pass electrofishing, see Table 3.2-2 for results*
NSSB = Ninespine Stickleback; ARGR = Arctic Grayling; LKTR = Lake Trout; SLSC = Slimy Sculpin
Dashes = not applicable

Figure 3.2-1
Habitat Units in Ogama Outflow, Ogama Inflow, and Patch Outflow, July 2017

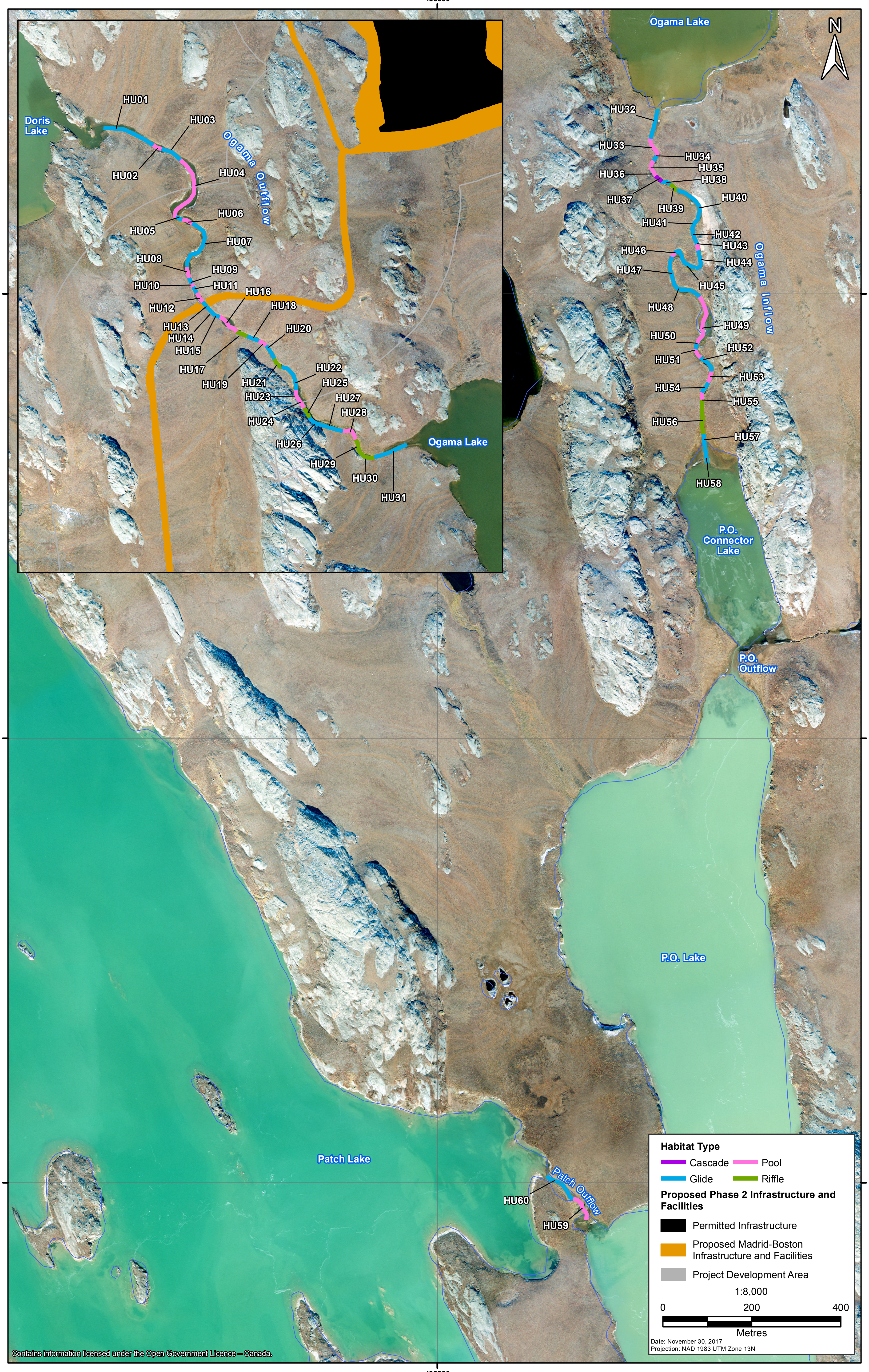


Table 3.1-4. Fish-bearing Status of Waterbodies at Proposed Road Crossing Locations, 2017

Crossing ID	Watershed	Waterbody Name	Fish-bearing Status	Confirmed or Potential Stream Fish Species*
C-CDR-01	2 - Roberts Bay	Roberts Bay Inflow	Fish-bearing	NSSB
C-CDR-02	Windy	Glenn Outflow	Fish-bearing	LKTR, ARCH, SLSC, NSSB, STFL
C-TIA-01	Doris	Patch Inflow	Assumed fish-bearing	*NSSB*
C-TIA-02	Doris	Doris Inflow	Fish-bearing	NSSB
C-TIA-03	Doris	Doris Inflow	Fish-bearing	NSSB
C-TIA-04	Doris	Ogama Outflow	Fish-bearing	LKTR, LKWH, CISC, NSSB
C-MS-01	Doris	Wolverine Outflow	Likely non-fish-bearing	-
C-MBR-7	Koignuk/ Aimaokatalok	Boulder Creek	Fish-bearing	ARGR, NSSB
C-MBR-8	Koignuk/ Aimaokatalok	Boulder Creek Tributary	Fish-bearing	ARGR, NSSB
C-MBR-9	Aimaokatalok	Aimaokatalok Inflow	Fish-bearing	NSSB
C-MBR-10	Aimaokatalok	Aimaokatalok Inflow	Likely non-fish-bearing	-
C-MBR-11	Aimaokatalok	Aimaokatalok Inflow	Fish-bearing	NSSB
C-MBR-12	Aimaokatalok	Aimaokatalok Inflow	Fish-bearing	NSSB, ARGR
C-MBR-13	Aimaokatalok	Aimaokatalok Inflow	Assumed fish-bearing	*NSSB, ARGR*
C-MBR-14	Aimaokatalok	Aimaokatalok Inflow	Likely non-fish-bearing	-
C-MBR-15	Aimaokatalok	Aimaokatalok Inflow	Fish-bearing	NSSB
C-MBR-16	Aimaokatalok	Aimaokatalok Inflow	Fish-bearing	NSSB, ARGR
C-MBR-17	Aimaokatalok	Aimaokatalok Inflow	Fish-bearing	NSSB
C-MBR-18	Aimaokatalok	Aimaokatalok Inflow	Likely non-fish-bearing	-
C-MBR-19	Aimaokatalok	Trout Outflow	Fish-bearing	LKTR, ARGR, BURB, SLSC, NSSB
C-MBR-20	Aimaokatalok	Stickleback Outflow	Fish-bearing	NSSB, SLSC, ARGR

Notes:
CDR = Roberts Bay Cargo Dock Road; TIA = Madrid North to Boston TIA Road; MS = Madrid South All-Weather Road; MBR = Boston-Madrid All-Weather Road; NSSB = Ninespine Stickleback; ARGR = Arctic Grayling; LKTR = Lake Trout; SLSC = Slimy Sculpin; BURB = Burbot; CISC = Cisco; ARCH = Arctic Char; STFL = Starry Flounder
**Predicted species italicized; based on habitat characterization and/or confirmed species presence in upstream or downstream waterbodies, additional species may be present.*

Riffles were recorded only in Ogama Outflow and Ogama Inflow and one cascade was recorded in Ogama Inflow (Figure 3.2-1; Table 3.2-1). In FHAP, cascades are differentiated from riffles by having a gradient in excess of 4%. Given the overall similarity in morphology among the riffle and cascade sites, slight differences in gradient are not likely to change the functionality of the habitat for fish. Ogama Outflow and Ogama Inflow were longer, wider, and deeper than the rest of the surveyed streams. Over their lengths, sections of steeper gradient provided habitat complexity in the form of riffle and cascade sections.

Wolverine Outflow East and Stickleback Outflow are shorter, shallower streams with sections of low gradient. In these low gradient areas, flat habitats were recorded where very slow flowing channels were braided throughout grass and willow cover. One habitat unit in Stickleback Outflow, as well as the majority of Wolverine Outflow habitat units were dry on the low flow survey date. On habitat unit in Wolverine Outflow East had no defined channel on the survey date and was comprised of shallow water (< 0.05 m depth) dispersed through tall grasses and willows.

Glide habitat units have a U-shaped cross-section (steep banks and a flat bottom) with little structural complexity, laminar flow, little cover for predator avoidance, and poor quality substrate for rearing salmonids (primarily fine sediments). Pools provide slower flowing habitats with deep pool cover resulting in rearing and drift feeding opportunities for all life stages of salmonids. Riffles and cascades are higher quality habitats for juvenile rearing because they are structurally complex, well oxygenated, provide quality food sources, and provide refuge from predators. Due to shallow depths and low water velocities, flat habitat units provide little habitat to rearing salmonids but maintain stream connectivity and provide habitat for all life stages of small-bodied fish (e.g., Ninespine Stickleback and Slimy Sculpin).

3.2.2 Fish Community

In total, eight electrofishing sites were sampled by multiple-pass electrofishing and two sites were sampled by single-pass electrofishing in streams with potential for being impacted from water withdrawal and use. A total of 243 fish were captured (Table 3.2-2). Overall, Ninespine Stickleback were the dominant species captured, making up 94% of the catch. *Coregonus* sp. fry, Arctic Grayling, and Lake Trout comprised < 3%, < 2% and < 1% of the catch, respectively.

Total catch and biological characteristics of fish sampled in electrofishing surveys are presented in Appendices 3.2-2 and 3.2-3, respectively. Habitat characteristics of multiple-pass electrofishing sites are presented in Appendix 3.2-4.

A total of 201 Ninespine Stickleback were captured in multiple-pass removal surveys and an additional 31 Ninespine Stickleback were captured in single-pass surveys (Table 3.2-2). In the streams where multiple-pass surveys were performed and therefore, allowing for the density of Ninespine Stickleback to be calculated, densities ranged from 0.03 fish/m^2 at site Ogama OF #1 to 2.30 fish/m^2 at site Wolverine East #1 (Table 3.2-3). Although not captured in the single-pass electrofishing survey at Imniagut Outflow, two Ninespine Stickleback were visually observed in the mouth of the stream near Imniagut Lake. The presence and high relative abundance of Ninespine Stickleback in all of the surveyed streams indicates that this species is distributed across the Project area and thus able to occupy a broad range of habitat types.

In total, three Lake Trout were captured during low flow conditions; two in Ogama Outflow and one in Ogama Inflow (Table 3.2-2). The Lake Trout in Ogama Outflow were both captured in a riffle at site Ogama OF #2 while the Lake Trout in Ogama Inflow was captured in a glide at site Ogama IF #1. These were all adults and were the three largest fish captured of any species at all sites (643 mm, 705 mm, and 720 mm fork length; Appendix 3.2-3). One adult Lake Whitefish (fork length of 371 mm), was captured in a glide in site Ogama IF #3 (Table 3.2-2 and Appendix 3.2-3).

Table 3.2-1. Habitat Types in Streams with Potential Water Withdrawal and Use, 2017

Stream	Watershed	Habitat Type	No. of Units	Combined Stream Length (m)	Percent Composition (%)*	Mean Wetted Width (+1SE)	Total Area (m²)
Ogama Outflow	Doris	Glide	15	688	54	5.4 ± 0.5	4,153
		Pool	11	433	34	14.1 ± 2.0	8,543
		Riffle	5	155	12	5.2 ± 0.6	855
Ogama Inflow	Doris	Glide	16	639	64	4.9 ± 0.5	3,231
		Pool	8	239	24	12.2 ± 2.8	4,084
		Riffle	2	104	10	2.6 ± 0.2	273
		Cascade	1	16	2	3	48
P.O. Outflow	Doris	Glide	1	39	100	10.3	402
Patch Outflow	Doris	Glide	1	97	63	6.7	650
		Pool	1	58	37	20	1,160
Wolverine Outflow East	Doris	Glide	3	206	43	1.2 ± 0.4	172
		Pool	2	162	34	15.5 ± 3.0	496
		Flat	1	13	3	4	52
		NDC	1	94	20	0	0
Wolverine Outflow	Doris	Dry Channel	-	-	-	0	0
Imniagut Outflow	Doris	Glide	1	30	100	4	120
Stickleback Outflow	Aimaokatalok	Glide	5	160	61	1.6 ± 0.8	211
		Pool	1	35	13	0.5	17
		Flat	1	62	24	0.3	34
		Dry Channel	1	5	2	0	0

Notes:
NDC = No defined channel
**Percent composition is based on relative contribution of combined stream lengths of individual habitat types within each stream.*

In addition to the three adult Lake Trout and one adult Lake Whitefish captured in electrofishing surveys, large-bodied salmonids (> 40 cm length) were observed throughout Ogama Outflow and Ogama Inflow during detailed habitat assessment surveys (Appendix 3.2-2). Lake Trout are predaceous, transitioning their diet from invertebrates to fish by the time they reach 350 mm fork length (Scott and Crossman 1973; McPhail 2007). Adult Lake Whitefish consume a wide variety or bottom-living invertebrates, small fishes, zooplankton, and terrestrial insects while adult Cisco are generally planktivorous (Scott and Crossman 1973). The observation of large-bodied salmonids in Ogama Outflow and Ogama Inflow indicates that piscivorous Lake Trout and drift feeding adult Lake Whitefish and/or Cisco make use of these streams for rearing and/or migration under stable low flow conditions in the open-water season. The absence of salmonids less than 300 mm fork length in the surveyed streams indicates that juveniles rear elsewhere.

Seven *Coregonus* sp. young-of-year fish were captured in abundant macrophyte cover in a glide habitat of site Patch #1 (Table 3.2-2; Appendix 3.2-3). More fish of this species and size class were observed during the electrofishing survey but due to the abundant cover, capture efficiency was low. The small size of individuals prevented identification to species in the field. Coregonids spawn along lake shorelines (Scott and Crossman 1973) therefore the presence of rearing young-of-year fish suggests that fish migrated into the stream channel shortly following emergence.

Finally, four rearing juvenile Arctic Grayling (92 to 107 mm in fork length) and one adult Slimy Sculpin (71 mm total length) were captured in Stickleback Outflow (Table 3.2-2; Appendix 3.2-3). A dry channel barrier upstream of where they were captured would prevent upstream migration to Stickleback Lake on the and past the survey date. Relatively poor connectivity downstream may also limit migration potential to Aimaokatalok Lake during low flow conditions (Appendix 3.2-1).

3.3 IMNIAGUT LAKE

3.3.1 Minnow Trapping

A total of 22 minnow traps were set in the littoral zone of Imniagut Lake for 20 to 22 hours per trap, for a total effort of 510.4 hours. Minnow traps were deployed over fine sediments in depths from 0.3 to 2.7 m. Ninespine Stickleback was the only species of fish captured in minnow traps, with a CPUE ranging from 5.6 to 81.9 fish/24 h (Table 3.3-1). Biological characteristics of fish sampled in minnow traps are presented in Appendix 3.3-1.

Many fish were infested with a tapeworm parasite (thought to belong to the genus *Schistocephalus*). Infected fish had distended stomachs and dark spots along their bodies (Plate 3.3-1). The percent of Ninespine Stickleback in each trap with parasites ranged between 11% and 57% and was 34% overall in fish captured.

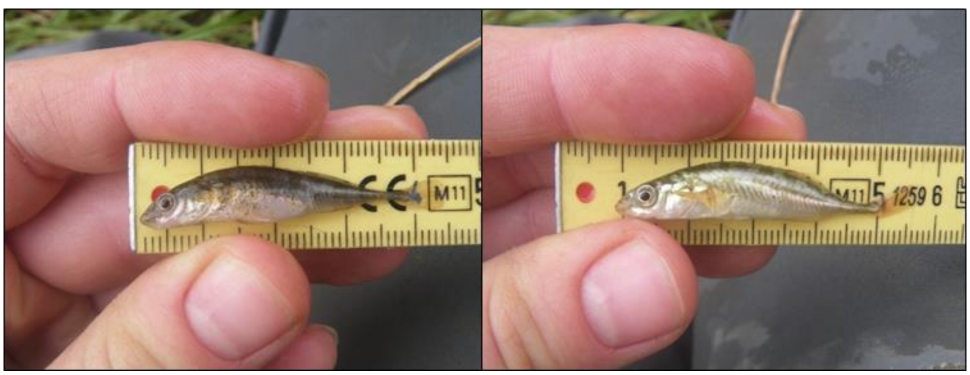


Plate 3.3-1. Ninespine Stickleback with (left) and without (right) tapeworm parasites captured in minnow traps in Imniagut Lake, July 24, 2017.

3.3.2 Gillnetting

No fish were captured in gillnets set in Imniagut Lake. A total of eleven sinking gangs were set for a combined total of 22.3 hours, and eleven floating gangs were set for a combined total of 24.9 hours (Table 3.3-2).

3.3.3 Electrofishing

An electrofishing survey along the southern shoreline of Imniagut Lake captured Ninespine Stickleback. A total of 20 Ninespine Stickleback were captured in 1,025 s of electrofishing effort (CPUE of 1.95 fish/100 s). Thirteen of the Ninespine Stickleback captured in the electrofishing survey had parasites (Appendix 3.3-1).

Table 3.2-2. Effort and Catch from Electrofishing Surveys in Streams with Potential Water Withdrawal and Use, 2017

Stream	Sampling Date	Site	Habitat Type	No. of Passes	Total Fishing Effort (s)	Mean Effort (s/pass)	Survey Area (m^2)	Catch (no. of fish)						
								NSSB	ARGR	LKTR	LKWH	*Coregonus* sp.	SLSC	Total
Ogama Outflow	20-Jul	1	Glide	3	1,758	586	57.1	7	0	0	0	0	0	7
	21-Jul	2	Glide/Riffle/Glide	3	3,136	1045	159.6	23	0	2	0	0	0	25
Ogama Inflow	19-Jul	1	Glide	3	1,048	349	60.9	2	0	1	0	0	0	3
	19-Jul	2	Riffle/Glide	4	1,378	345	63.0	11	0	0	0	0	0	11
	20-Jul	3	Glide	3	2,347	782	85.2	28	0	0	1	0	0	29
	20-Jul	4	Glide	3	2,325	775	67.4	21	0	0	0	0	0	21
Patch Outflow	21-Jul	1	Glide	3	2,026	675	94.4	29	0	0	0	7	0	36
Wolverine Outflow East	22-Jul	1	Glide	3	810	270	34.7	80	0	0	0	0	0	80
Imniagut Outflow	25-Jul	1	Glide	1	250	250	-	0	0	0	0	0	0	0
Stickleback Outflow	30-Jul	1	Glide	1	619	619	-	31	4	0	0	0	1	36
Total	**19 to 30-Jul**	**10**			**15,697**			**232**	**4**	**3**	**1**	**7**	**1**	**248**

Note:
NSSB = Ninespine Stickleback; ARGR = Arctic Grayling; LKTR = Lake Trout; LKWH = Lake Whitefish; SLSC = Slimy Sculpin

Table 3.2-3. Number and Density of Ninespine Stickleback from Multiple-pass Electrofishing Surveys in Streams with Potential Water Withdrawal and Use, 2017

Stream	Sampling Date	Site	Habitat Type	No. of Passes	Total Fishing Effort (s)	Total No. of NSSB Captured	Estimated No. of NSSB	Lower Confidence Limit	Upper Confidence Limit	Survey Area (m^2)	Estimated Density of NSSB (no. of fish/m^2)
Ogama Outflow	20-Jul	1	Glide	3	1,758	7	7	6	8	57.1	0.12
	21-Jul	2	Glide/Riffle/Glide	3	3,136	23	25	19	31	159.6	0.14
Ogama Inflow	19-Jul	1	Glide	3	1,048	2	2	-	-	60.9	0.03
	19-Jul	2	Riffle/Glide	4	1,378	11	24	-49	97	63.0	0.17
	20-Jul	3	Glide	3	2,347	28	30	25	35	85.2	0.33
	20-Jul	4	Glide	3	2,325	21	22	18	26	67.4	0.31
Patch Outflow	21-Jul	1	Glide	3	2,026	29	45	7	83	94.4	0.31
Wolverine Outflow East	22-Jul	1	Glide	3	810	80	88	77	99	34.7	2.30

Note:
NSSB = Ninespine Stickleback

Table 3.3-1. Minnow Trap Data from Imniagut Lake, 2017

Trap No.	Location (UTM)		Depth (m)	Set		Pulled		Effort (decimal h)	Fish			
	Easting	Northing		Date	Time	Date	Time		NSSB	CPUE	NSSB with Parasites	Parasitism (%)
1	433357	7551612	0.6	23-Jul	13:55	24-Jul	11:28	21.6	24	26.7	7	29
2	433354	7551608	0.6	23-Jul	13:55	24-Jul	11:32	21.6	5	5.6	1	20
3	433354	7551605	0.7	23-Jul	13:56	24-Jul	11:36	21.7	9	10.0	1	11
4	433352	7551593	0.7	23-Jul	13:56	24-Jul	11:40	21.7	44	48.6	14	32
5	433351	7551587	0.6	23-Jul	13:57	24-Jul	11:44	21.8	33	36.4	11	33
6	433351	7551582	0.7	23-Jul	13:58	24-Jul	11:48	21.8	21	23.1	8	38
7	433349	7551579	0.4	23-Jul	13:58	24-Jul	11:52	21.9	62	67.9	20	32
8	433349	7551570	0.3	23-Jul	13:59	24-Jul	11:56	21.9	11	12.0	6	55
9	433351	7551567	0.6	23-Jul	13:59	24-Jul	11:58	22.0	38	41.5	11	29
10	433354	7551564	1.0	23-Jul	14:00	24-Jul	12:00	22.0	13	14.2	3	23
11	433509	7551377	1.3	23-Jul	14:20	24-Jul	14:04	23.7	22	22.2	9	41
12	433739	7551090	1.5	23-Jul	14:20	24-Jul	14:11	23.9	43	43.3	6	14
13	433754	7551094	0.7	23-Jul	14:21	24-Jul	14:19	24.0	28	28.0	16	57
14	433759	7551102	1.2	23-Jul	14:21	24-Jul	14:26	24.1	51	50.8	13	25
15	433762	7551108	1.3	23-Jul	14:22	24-Jul	14:34	24.2	52	51.6	15	29
16	433770	7551114	0.7	23-Jul	14:22	24-Jul	14:41	24.3	83	81.9	41	49
17	433771	7551115	0.6	23-Jul	14:23	24-Jul	14:49	24.4	10	9.8	5	50
18	433776	7551120	1.5	23-Jul	14:23	24-Jul	14:56	24.5	79	77.2	22	28
19	433780	7551124	2.0	23-Jul	14:24	24-Jul	15:04	24.7	46	44.8	13	28
20	433785	7551127	0.4	23-Jul	14:24	24-Jul	15:11	24.8	36	34.9	13	36
21	433785	7551122	1.1	23-Jul	14:25	24-Jul	15:18	24.9	77	74.3	36	47
22	433754	7551111	2.7	23-Jul	14:25	24-Jul	15:20	24.9	41	39.5	12	29

Notes:
CPUE = Catch-Per-Unit-Effort (fish/trap/24 h)
NSSB = Ninespine Stickleback
The start and end times for trap removal were recorded; all times in between are estimates.
All UTM coordinates in Zone 13N

Table 3.3-2. Gillnet Data from Imniagut Lake, 2017

Gillnet Number	Net Type	Start Location (UTM)		End Location (UTM)		Set		Pulled		Effort (decimal h)	Fish	
		Easting	Northing	Easting	Northing	Date	Time In	Date	Time Out		No. Caught	CPUE
1	Sinking	433755	7551171	433720	7551267	23-Jul-17	11:15	23-Jul-17	12:27	1.2	0	0.0
2	Sinking	433657	7551184	433755	7551334	23-Jul-17	11:31	23-Jul-17	12:40	1.2	0	0.0
3	Floating	433628	7551294	433615	7551408	23-Jul-17	11:43	23-Jul-17	12:55	1.2	0	0.0
4	Floating	433607	7551495	433507	7551551	23-Jul-17	11:57	23-Jul-17	13:08	1.2	0	0.0
5	Sinking	433653	7551200	433738	7551138	23-Jul-17	12:33	23-Jul-17	14:35	1.0	0	0.0
6	Sinking	433586	7551265	433671	7551313	23-Jul-17	12:44	23-Jul-17	15:02	2.3	0	0.0
7	Floating	433678	7551419	433600	7551342	23-Jul-17	12:58	23-Jul-17	16:10	3.2	0	0.0
8	Floating	433494	7551522	433501	7551415	23-Jul-17	13:15	23-Jul-17	16:25	3.2	0	0.0
9	Sinking	433628	7551310	433715	7551244	23-Jul-17	15:57	23-Jul-17	17:12	1.3	0	0.0
10	Sinking	433663	7551235	433738	7551167	23-Jul-17	16:00	23-Jul-17	17:24	1.4	0	0.0
11	Sinking	433434	7551451	433522	7551426	24-Jul-17	9:33	24-Jul-17	12:30	3.0	0	0.0
12	Sinking	433548	7551521	433649	7551459	24-Jul-17	9:47	24-Jul-17	12:43	2.9	0	0.0
13	Floating	433540	7551408	433636	7551332	24-Jul-17	9:59	24-Jul-17	13:00	3.0	0	0.0
14	Floating	433642	7551336	433728	7551270	24-Jul-17	10:00	24-Jul-17	13:15	3.3	0	0.0
15	Sinking	433509	7551377	433500	7551475	24-Jul-17	12:36	24-Jul-17	16:00	3.4	0	0.0
16	Sinking	433564	7551433	433562	7551529	24-Jul-17	12:51	24-Jul-17	15:48	3.0	0	0.0
17	Floating	433581	7551314	433611	7551418	24-Jul-17	13:10	24-Jul-17	15:34	2.4	0	0.0
18	Floating	433642	7551255	433717	7551330	24-Jul-17	13:21	24-Jul-17	15:20	2.0	0	0.0
19	Floating	433770	7551114	433628	7551239	24-Jul-17	15:27	24-Jul-17	17:27	2.0	0	0.0
20	Floating	433677	7551298	433623	7551391	24-Jul-17	15:40	24-Jul-17	17:32	1.9	0	0.0
21	Sinking	433601	7551364	433570	7551451	24-Jul-17	15:54	24-Jul-17	17:39	1.8	0	0.0
22	Floating	433555	7551367	433538	7551465	24-Jul-17	16:04	24-Jul-17	17:45	1.7	0	0.0

Notes:
CPUE = Catch-Per-Unit-Effort (fish/100 m^2/h)
All UTM coordinates in Zone 13N

3.4 STICKLEBACK LAKE

No fish were captured by angling in Stickleback Lake over a total of 12.66 rod-hours. Angling effort data are presented in Table 3.4-1. No fish were captured in gillnets set in Stickleback Lake. A total of 8 sinking gangs were set for a combined total of 17.0 hours (Table 3.4-2). Given that no fish were captured or observed during marking phase angling and gill netting efforts in Stickleback Lake, the mark-recapture study was discontinued. Based on the lack of fish captures in Stickleback Lake, the Arctic Grayling population density (if present) is too low to be estimated by mark-recapture methods.

Table 3.4-1. Angling Data from Stickleback Lake, 2017

Pass Number	Method	Set Date	Time		Effort (decimal h)	Fish	
			Start	End		No. Caught	CPUE
1	Casting	1-Aug-17	9:00	10:00	1.0	0	0.0
2	Casting	1-Aug-17	10:30	11:00	0.5	0	0.0
3	Trolling	1-Aug-17	11:00	12:00	1.0	0	0.0
4	Casting	1-Aug-17	13:00	13:40	0.7	0	0.0
5	Casting	1-Aug-17	14:00	14:15	0.3	0	0.0
6	Trolling	1-Aug-17	14:15	14:35	0.3	0	0.0
7	Casting	1-Aug-17	14:35	15:00	0.4	0	0.0
8	Casting	2-Aug-17	13:40	14:00	0.3	0	0.0
9	Casting	2-Aug-17	15:55	16:15	0.3	0	0.0
10	Casting	2-Aug-17	16:15	16:45	0.5	0	0.0

Notes:
CPUE = Catch-Per-Unit-Effort (fish/100 m²/h)
Locations of each Pass presented on Figure 2.4-2.

Table 3.4-2. Gillnet Data from Stickleback Lake, 2017

Gillnet Number	Net Type	Start Location (UTM)		End Location (UTM)		Set		Pulled		Effort (decimal h)	Fish	
		Easting	Northing	Easting	Northing	Date	Time In	Date	Time Out		No. Caught	CPUE
1	Sinking	442153	7503609	442091	7503502	1-Aug-17	15:41	1-Aug-17	16:57	1.3	0	0.0
2	Sinking	441648	7503079	441593	7503176	1-Aug-17	15:52	1-Aug-17	17:14	1.4	0	0.0
3	Sinking	441863	7503939	441951	7503903	2-Aug-17	9:33	2-Aug-17	11:45	2.2	0	0.0
4	Sinking	441472	7503883	441580	7503920	2-Aug-17	9:41	2-Aug-17	12:00	2.3	0	0.0
5	Sinking	441408	7503435	441490	7503387	2-Aug-17	11:54	2-Aug-17	14:50	2.9	0	0.0
6	Sinking	441580	7504219	441614	7504104	2-Aug-17	12:10	2-Aug-17	15:10	3.0	0	0.0
7	Sinking	441844	7502852	441777	7502917	2-Aug-17	15:00	2-Aug-17	16:59	2.0	0	0.0
8	Sinking	442109	7503846	442089	7503937	2-Aug-17	15:15	2-Aug-17	17:09	1.9	0	0.0

Notes:
CPUE = Catch-Per-Unit-Effort (fish/100 m^2/h)
All UTM coordinates in Zone 13N

4. SUMMARY

4.1 ROAD CROSSING LOCATIONS

Fish habitat at 21 proposed road crossing locations was evaluated under high and low flow conditions in 2017. At high flow, eight sites had overall high habitat value, three had moderate habitat value, eight had low habitat value, and two were assessed not to be fish habitat. At low flow, six, five, and one sites were assessed as having overall high, moderate, and low habitat value, respectively. Nine sites were assessed to have no fish habitat at low flow.

Electrofishing surveys were conducted at eleven of the proposed road crossing sites during low flow conditions. The 2017 electrofishing data along with data from previous baseline surveys informed the determination of fish-bearing status for the proposed road crossing locations. Four sites were considered unlikely to be fish-bearing and an additional eight sites were predicted to have only Ninespine Stickleback present. The remaining nine sites were confirmed to have Ninespine Stickleback in addition to at least one species of large-bodied fish present (Lake Trout, Lake Whitefish, Cisco, Arctic Grayling, Arctic Char, Burbot).

4.2 WATER WITHDRAWAL AND USE LOCATIONS

The habitat assessment of eight streams with potential to interact with water withdrawal and use activities from Madrid-Boston found that glides were the predominant habitat type, accounting for 59% of the total stream length surveyed and representing 71% of habitat units. The glide habitat was used by Ninespine Stickleback, rearing adult Lake Trout and Lake Whitefish as well as rearing juvenile Arctic Grayling and young-of-year coregonids.

Overall, catch rates of fish in the eight streams were low, particularly for salmonids. The majority of fish captured were Ninespine Stickleback (all life stages), which were present in all streams. Adult Lake Trout were captured in Ogama Outflow and Ogama Inflow while a single adult Lake Whitefish was captured in Ogama Inflow. Juvenile Arctic Grayling were captured in Stickleback Outflow and *Coregonus* sp. fry were captured in Patch Outflow.

4.3 IMNIAGUT LAKE

The fish community in Imniagut Lake was sampled using three methods (minnow trapping, gillnetting, and electrofishing) in July 2017. Ninespine Stickleback was the only species of fish captured in the lake. No fish were captured in gillnets.

4.4 STICKLEBACK LAKE

The fish community in Stickleback Lake was sampled using two methods (angling and gillnetting) in July/August 2017. No fish were captured by angling or in gill nets. Although no electrofishing was conducted in the lake, Ninespine Stickleback were captured by electrofishing in Stickleback Lake Outflow, directly adjacent to the lake. Arctic Grayling and Slimy Sculpin were captured further downstream in Stickleback Outflow, downstream of a dry channel barrier that prevented access to Stickleback Lake on the survey date (July 30, 2017).

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Appendix 3.1-1

Road Crossing Photos

APPENDIX 3.1-1. ROAD CROSSING PHOTOS

C-CDR-01 – Roberts Bay Inflow; Roberts Bay Watershed

High Flow 7-Jun-17; Habitat Value – Low

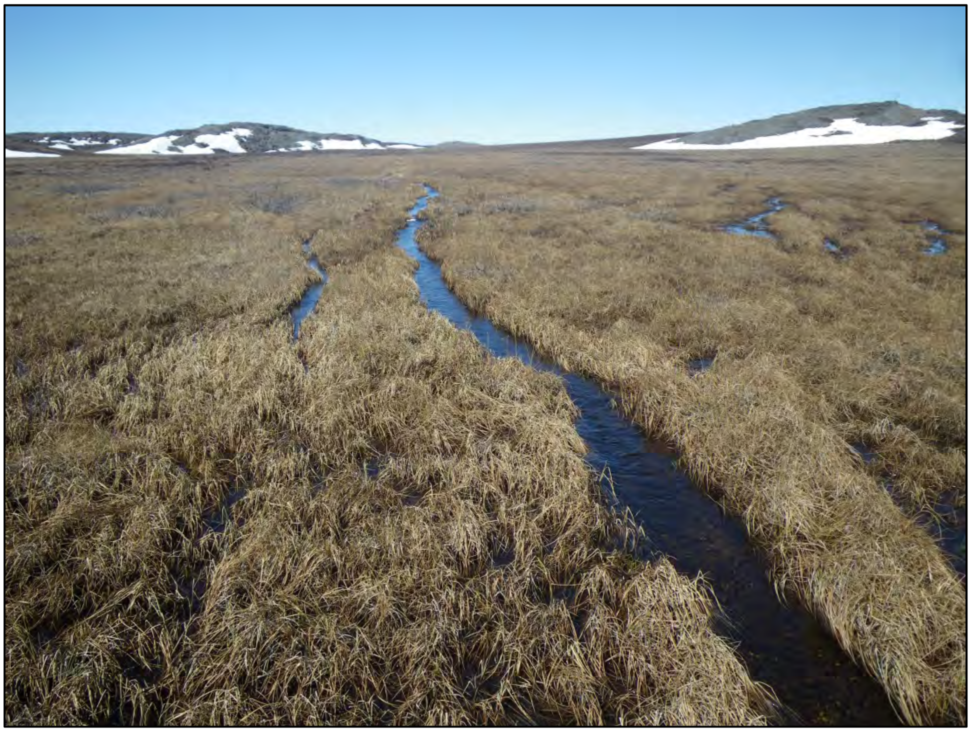
Low Flow 18-Jul-17; Habitat Value – None

C-CDR-02 – Glenn Outflow; Windy Watershed

High Flow 7-Jun-17; Habitat Value – High

Low Flow 26-Jul-17; Habitat Value – High

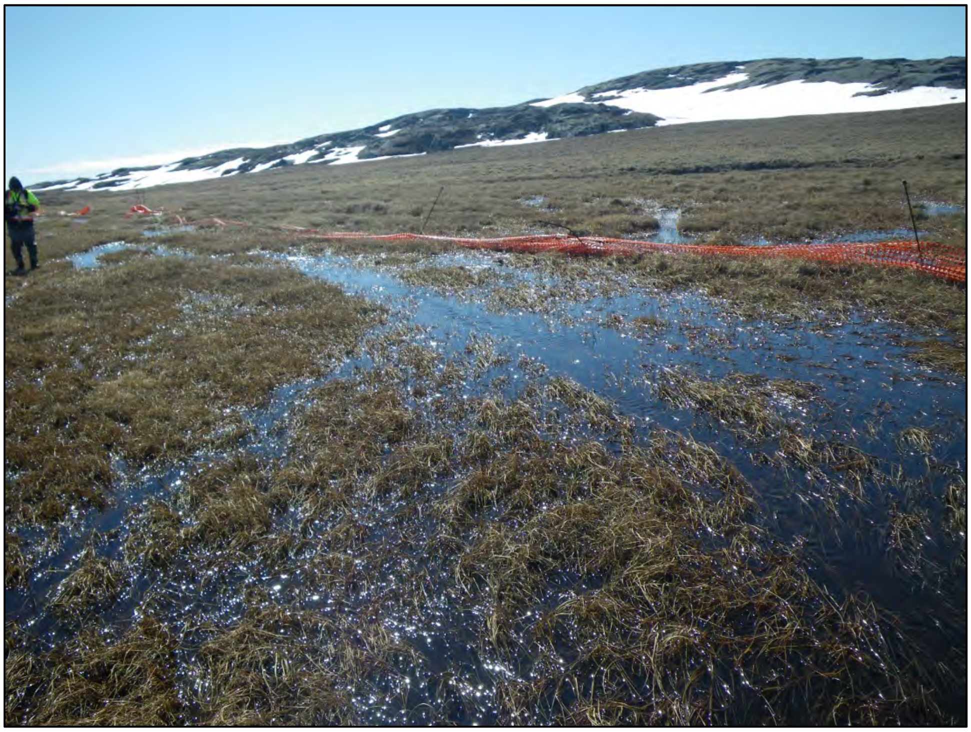
C-TIA-01 – Patch Inflow; Doris Watershed



High Flow 7-Jun-17; Habitat Value – Low

Low Flow 18-Jul-17; Habitat Value – None

C-TIA-02 – Doris Inflow; Doris Watershed



High Flow 7-Jun-17; Habitat Value – Low

Low Flow 18-Jul-17; Habitat Value – None

C-TIA-03 – Doris Inflow; Doris Watershed

High Flow 7-Jun-17; Habitat Value – Low

Low Flow 18-Jul-17; Habitat Value – None

C-TIA-04 – Ogama Outflow; Doris Watershed

High Flow 9-Jun-17; Habitat Value – High

Low Flow 25-Jul-17; Habitat Value – High

C-MS-01 – Wolverine Outflow; Doris Watershed

High Flow 9-Jun-17; Habitat Value – Low

Low Flow 25-Jul-17; Habitat Value – None

C-MBR-7 – Boulder Creek; Aimaokatalok/Koignuk Watershed

High Flow 11-Jun-17; Habitat Value – High

Low Flow 27-Jul-17; Habitat Value – High

C-MBR-8 – Boulder Creek Trib; Aimaokatalok/Koignuk Watershed

High Flow 11-Jun-17; Habitat Value – High

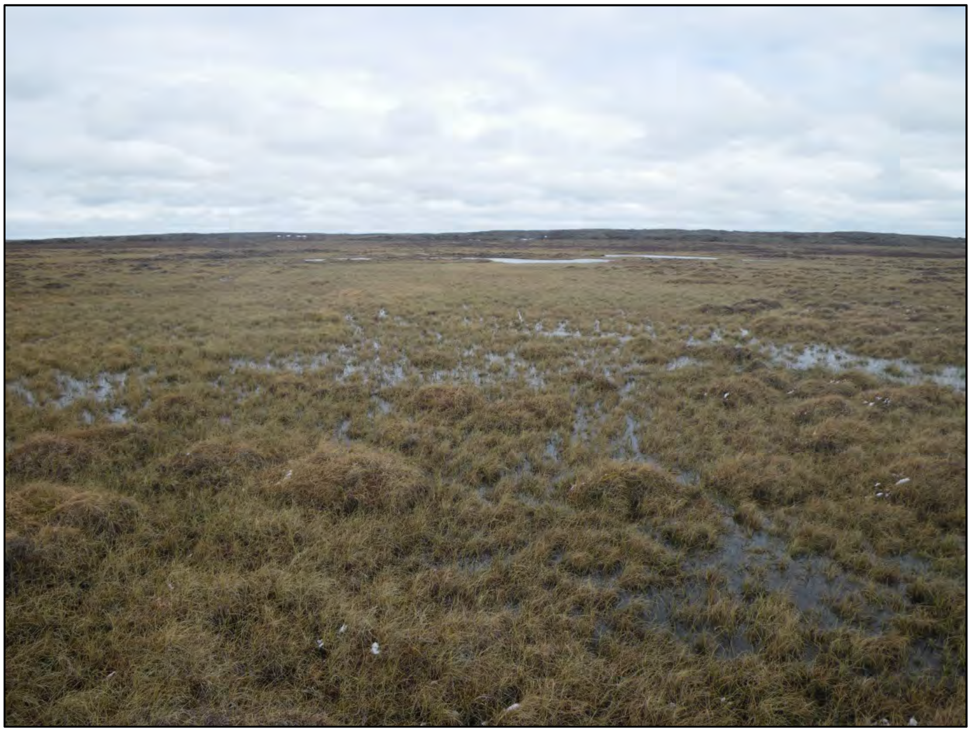
Low Flow 27-Jul-17; Habitat Value – High

C-MBR-9 – Aimaokatalok Inflow; Aimaokatalok Watershed

High Flow 11-Jun-17; Habitat Value – Moderate

Low Flow 29-Jul-17; Habitat Value – Moderate

C-MBR-10 – Aimaokatalok Inflow; Aimaokatalok Watershed

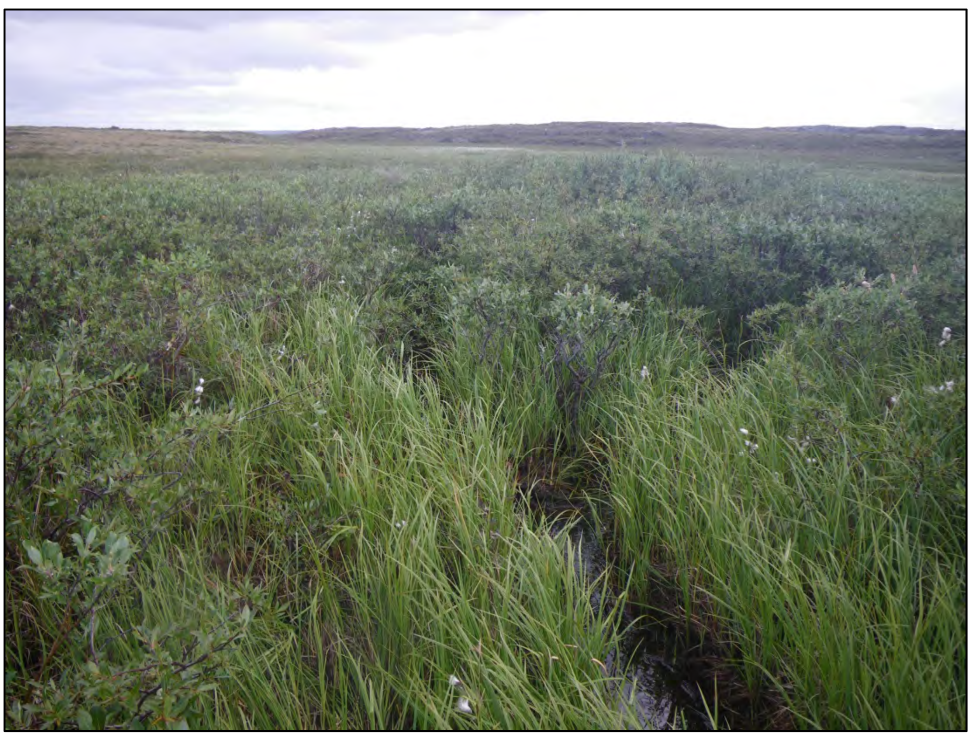


High Flow 11-Jun-17; Habitat Value – None

Low Flow 26-Jul-17; Habitat Value – None

C-MBR-11 – Aimaokatalok Inflow; Aimaokatalok Watershed

High Flow 11-Jun-17; Habitat Value – Moderate



Low Flow 27-Jul-17; Habitat Value – Moderate

C-MBR-12 – Aimaokatalok Inflow; Aimaokatalok Watershed

High Flow 11-Jun-17; Habitat Value – High

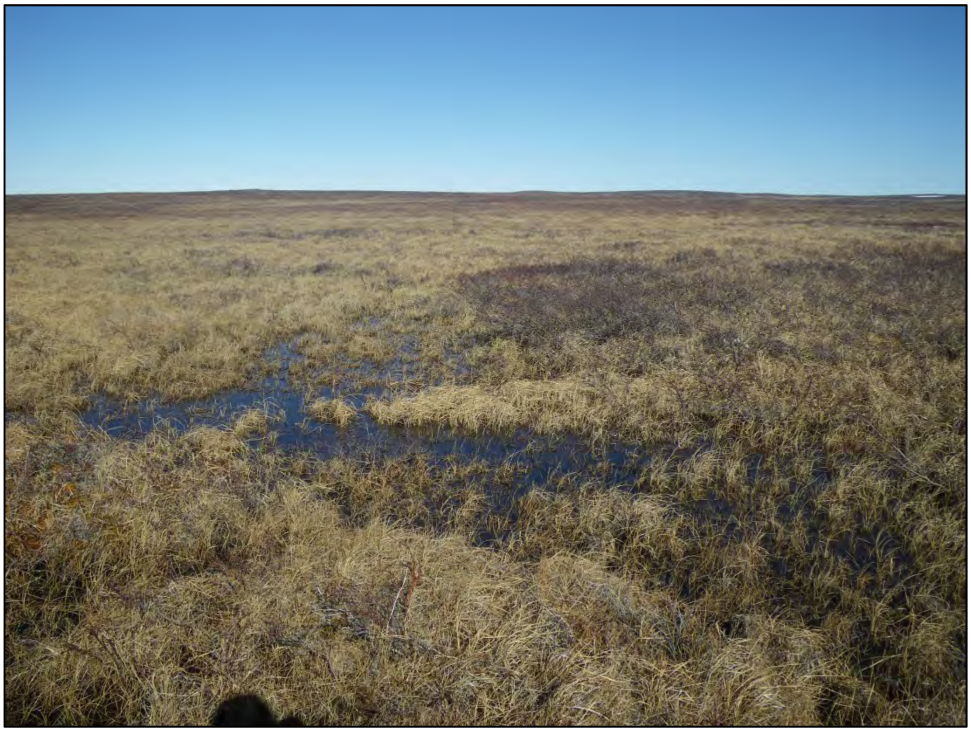
Low Flow 27-Jul-17; Habitat Value – High

C-MBR-13 – Aimaokatalok Inflow; Aimaokatalok Watershed

High Flow 11-Jun-17; Habitat Value – Low

Low Flow 27-Jul-17; Habitat Value – None

C-MBR-14 – Aimaokatalok Inflow; Aimaokatalok Watershed



High Flow 8-Jun-17; Habitat Value – None

Low Flow 26-Jul-17; Habitat Value – None

C-MBR-15 – Aimaokatalok Inflow; Aimaokatalok Watershed

High Flow 8-Jun-17; Habitat Value – Moderate

Low Flow 26-Jul-17; Habitat Value – Moderate

C-MBR-16 – Aimaokatalok Inflow; Aimaokatalok Watershed

High Flow 8-Jun-17; Habitat Value – High

Low Flow 26-Jul-17; Habitat Value – High

C-MBR-17 – Aimaokatalok Inflow; Aimaokatalok Watershed

High Flow 8-Jun-17; Habitat Value – Low

Low Flow 26-Jul-17; Habitat Value – Low

C-MBR-18 – Aimaokatalok Inflow; Aimaokatalok Watershed

High Flow 8-Jun-17; Habitat Value – Low

Low Flow 26-Jul-17; Habitat Value – None

C-MBR-19 – Trout Outflow; Aimaokatalok Watershed

High Flow 8-Jun-17; Habitat Value – High

Low Flow 30-Jul-17; Habitat Value – Moderate

C-MBR-20 – Stickleback Outflow; Aimaokatalok Watershed

High Flow 8-Jun-17; Habitat Value – High

Low Flow 30-Jul-17; Habitat Value – Moderate

Appendix 3.1-2

Detailed Habitat Assessment Data at Proposed Road Crossing Sites, 2017

Appendix 3.1-2. Detailed Habitat Assessment Data at Proposed Road Crossing Sites, 2017

Stream Name	Site Name	Date	Habitat Unit (Field)	Assessment Type	Crew	Site Length (m)	Fish Form (Y/N)	Water Quality			General				Downstream End		Upstream End		Habitat Type	Unit Length (m)	Grad. (%)
								Temp	pH	Conductivity	Discharge	No Vis. Chan.	Dry/Int.	Trib.	Easting	Northing	Easting	Northing			
High Flow																					
Rob Bay Inflow	C-CDR-01	7-Jun-17	1	Road Crossing	KK, LW	150	N	7.2	7.2	208	H	N	N	N	432069	7563040	432112	7562908	G3	47	2
	C-CDR-01	7-Jun-17	2	Road Crossing	KK, LW	150	N	7.2	7.2	208	H	N	N	N	432069	7563040	432112	7562908	DC	30	2
	C-CDR-01	7-Jun-17	3	Road Crossing	KK, LW	150	N	7.2	7.2	208	H	N	N	N	432069	7563040	432112	7562908	F3	23	2
	C-CDR-01	7-Jun-17	4	Road Crossing	KK, LW	150	N	7.2	7.2	208	H	N	N	N	432069	7563040	432112	7562908	F3	50	0
Glenn Outflow	C-CDR-02	7-Jun-17	1	Road Crossing	KK, LW	-	N	-	-	-	H	N	N	N	431683	7563873	431605	7568710	G1	-	-
	C-CDR-02	7-Jun-17	2	Road Crossing	KK, LW	-	N	-	-	-	H	N	N	N	431683	7563873	431605	7568710	crossing location	-	-
	C-CDR-02	7-Jun-17	3	Road Crossing	KK, LW	-	N	-	-	-	H	N	N	N	431683	7563873	431605	7568710	G1	-	-
	C-CDR-02	7-Jun-17	4	Road Crossing	KK, LW	-	N	-	-	-	H	N	N	N	431683	7563873	431605	7568710	R	-	-
	C-CDR-02	7-Jun-17	5	Road Crossing	KK, LW	-	N	-	-	-	H	N	N	N	431683	7563873	431605	7568710	G1	-	-
	C-CDR-02	7-Jun-17	6	Road Crossing	KK, LW	-	N	-	-	-	H	N	N	N	431683	7563873	431605	7568710	R	-	-
	C-CDR-02	7-Jun-17	7	Road Crossing	KK, LW	-	N	-	-	-	H	N	N	N	431683	7563873	431605	7568710	G1	-	-
	C-CDR-02	7-Jun-17	8	Road Crossing	KK, LW	-	N	-	-	-	H	N	N	N	431683	7563873	431605	7568710	Ca	-	-
	C-CDR-02	7-Jun-17	9	Road Crossing	KK, LW	-	N	-	-	-	H	N	N	N	431683	7563873	431605	7568710	G1	-	-
	C-CDR-02	7-Jun-17	10	Road Crossing	KK, LW	-	N	-	-	-	H	N	N	N	431683	7563873	431605	7568710	P1	-	-
	C-CDR-02	7-Jun-17	11	Road Crossing	KK, LW	-	N	-	-	-	H	N	N	N	431683	7563873	431605	7568710	G1	-	-
Aimaokatalok Inflow	C-MBR-10	11-Jun-17	1	Road Crossing	KK, LW	-	N	-	-	-	H	Y	Y	N	439432	7515871	-	-	F3	-	-
	C-MBR-11	11-Jun-17	1	Road Crossing	KK, LW	220	N	2	7.6	139	H	N	N	N	441585	7510690	441652	7510885	G2	41	1
	C-MBR-11	11-Jun-17	2	Road Crossing	KK, LW	220	N	2	7.6	139	H	N	N	N	441585	7510690	441652	7510885	P1	5	0
	C-MBR-11	11-Jun-17	3	Road Crossing	KK, LW	220	N	2	7.6	139	H	N	N	N	441585	7510690	441652	7510885	G2	7	0
	C-MBR-11	11-Jun-17	4	Road Crossing	KK, LW	220	N	2	7.6	139	H	N	N	N	441585	7510690	441652	7510885	P1	17	0
	C-MBR-11	11-Jun-17	5	Road Crossing	KK, LW	220	N	2	7.6	139	H	N	N	N	441585	7510690	441652	7510885	G3	23	1
	C-MBR-11	11-Jun-17	6	Road Crossing	KK, LW	220	N	2	7.6	139	H	N	N	N	441585	7510690	441652	7510885	R/G	63	3
	C-MBR-11	11-Jun-17	7	Road Crossing	KK, LW	220	N	2	7.6	139	H	N	N	N	441585	7510690	441652	7510885	P1	32	1
	C-MBR-11	11-Jun-17	8	Road Crossing	KK, LW	220	N	2	7.6	139	H	N	N	N	441585	7510690	441652	7510885	G2/P1	32	1
	C-MBR-12	11-Jun-17	1	Road Crossing	KK, LW	400	N	-	-	-	H	N	N	N	444329	7509402	444456	7509701	G1	65	0.5
	C-MBR-12	11-Jun-17	2	Road Crossing	KK, LW	400	N	-	-	-	H	N	N	N	444329	7509402	444456	7509701	R	117	0.5
	C-MBR-12	11-Jun-17	3	Road Crossing	KK, LW	400	N	-	-	-	H	N	N	N	444329	7509402	444456	7509701	G1	81	1
	C-MBR-12	11-Jun-17	4	Road Crossing	KK, LW	400	N	-	-	-	H	N	N	N	444329	7509402	444456	7509701	R	75	-
	C-MBR-12	11-Jun-17	5	Road Crossing	KK, LW	400	N	-	-	-	H	N	N	N	444329	7509402	444456	7509701	P1	13	0
	C-MBR-12	11-Jun-17	6	Road Crossing	KK, LW	400	N	-	-	-	H	N	N	N	444329	7509402	444456	7509701	Ca	47	3.5
	C-MBR-13	11-Jun-17	1	Road Crossing	KK, LW	210	N	3	7.6	112	H	N	N	N	444381	7508924	444533	7508811	P1	6	0
	C-MBR-13	11-Jun-17	2	Road Crossing	KK, LW	210	N	3	7.6	112	H	N	N	N	444381	7508924	444533	7508811	G3	10	2
	C-MBR-13	11-Jun-17	3	Road Crossing	KK, LW	210	N	3	7.6	112	H	N	N	N	444381	7508924	444533	7508811	P1	17	1
	C-MBR-13	11-Jun-17	4	Road Crossing	KK, LW	210	N	3	7.6	112	H	N	N	N	444381	7508924	444533	7508811	F3	33	0.5
	C-MBR-13	11-Jun-17	5	Road Crossing	KK, LW	210	N	3	7.6	112	H	N	N	N	444381	7508924	444533	7508811	G3	46	2
	C-MBR-13	11-Jun-17	6	Road Crossing	KK, LW	210	N	3	7.6	112	H	N	N	N	444381	7508924	444533	7508811	F3		
	C-MBR-13	11-Jun-17	7	Road Crossing	KK, LW	210	N	3	7.6	112	H	N	N	N	444381	7508924	444533	7508811	F3/G3	45	1
	C-MBR-13	11-Jun-17	8	Road Crossing	KK, LW	210	N	3	7.6	112	H	N	N	N	444381	7508924	444533	7508811	P1	12	0
	C-MBR-13	11-Jun-17	9	Road Crossing	KK, LW	210	N	3	7.6	112	H	N	N	N	444381	7508924	444533	7508811	G3	18	1.5
	C-MBR-13	11-Jun-17	10	Road Crossing	KK, LW	210	N	3	7.6	112	H	N	N	N	444381	7508924	444533	7508811	P1	9	0
	C-MBR-13	11-Jun-17	11	Road Crossing	KK, LW	210	N	3	7.6	112	H	N	N	N	444381	7508924	444533	7508811	R/Ca	13	5
	C-MBR-14	8-Jun-17	1	Road Crossing	KK, LW	100	N	11.6	7.4	52	H	Y	N	N	444143	7508235	444051	7508158	F3	-	-
	C-MBR-15	8-Jun-17	1	Road Crossing	KK, LW	150	N	7.1	7.7	50	H	N	N	N	443339	7507054	443443	7504011	P1	19	1
	C-MBR-15	8-Jun-17	2	Road Crossing	KK, LW	150	N	7.1	7.7	50	H	N	N	N	443339	7507054	443443	7504011	G2	27	0.5
	C-MBR-15	8-Jun-17	3	Road Crossing	KK, LW	150	N	7.1	7.7	50	H	N	N	N	443339	7507054	443443	7504011	P1	34	0.5
	C-MBR-15	8-Jun-17	4	Road Crossing	KK, LW	150	N	7.1	7.7	50	H	N	N	N	443339	7507054	443443	7504011	G2	6	1
	C-MBR-15	8-Jun-17	5	Road Crossing	KK, LW	150	N	7.1	7.7	50	H	N	N	N	443339	7507054	443443	7504011	P1	8	1
	C-MBR-15	8-Jun-17	6	Road Crossing	KK, LW	150	N	7.1	7.7	50	H	N	N	N	443339	7507054	443443	7504011	G2	10	1
	C-MBR-15	8-Jun-17	7	Road Crossing	KK, LW	150	N	7.1	7.7	50	H	N	N	N	443339	7507054	443443	7504011	P1	21	0
	C-MBR-15	8-Jun-17	8	Road Crossing	KK, LW	150	N	7.1	7.7	50	H	N	N	N	443339	7507054	443443	7504011	G2	9	1

Appendix 3.1-2. Detailed Habitat Assessment Data at Proposed Road Crossing Sites, 2017

			Habitat	Assessment		Site Length	Fish Form	Water Quality			General				Downstream End		Upstream End			Unit Length	Grad.
Stream Name	Site Name	Date	Unit (Field)	Type	Crew	(m)	(Y/N)	Temp	pH	Conductivity	Discharge	No Vis. Chan.	Dry/Int.	Trib.	Easting	Northing	Easting	Northing	Habitat Type	(m)	(%)
	C-MBR-15	8-Jun-17	9	Road Crossing	KK, LW	150	N	7.1	7.7	50	H	N	N	N	443339	7507054	443443	7504011	P1	15	0.5
	C-MBR-16	8-Jun-17	1	Road Crossing	KK, LW	150	N	8.2	7.3	66	H	N	N	N	443573	7505459	443691	7505550	G2	23	2
	C-MBR-16	8-Jun-17	2	Road Crossing	KK, LW	150	N	8.2	7.3	66	H	N	N	N	443573	7505459	443691	7505550	P1	10	1
	C-MBR-16	8-Jun-17	3	Road Crossing	KK, LW	150	N	8.2	7.3	66	H	N	N	N	443573	7505459	443691	7505550	R	6.7	1
	C-MBR-16	8-Jun-17	4	Road Crossing	KK, LW	150	N	8.2	7.3	66	H	N	N	N	443573	7505459	443691	7505550	G1	14	3
	C-MBR-16	8-Jun-17	5	Road Crossing	KK, LW	150	N	8.2	7.3	66	H	N	N	N	443573	7505459	443691	7505550	R	22	4
	C-MBR-16	8-Jun-17	6	Road Crossing	KK, LW	150	N	8.2	7.3	66	H	N	N	N	443573	7505459	443691	7505550	G2	16	3
	C-MBR-16	8-Jun-17	7	Road Crossing	KK, LW	150	N	8.2	7.3	66	H	N	N	N	443573	7505459	443691	7505550	G3	51	3
	C-MBR-16	8-Jun-17	8	Road Crossing	KK, LW	150	N	8.2	7.3	66	H	N	N	N	443573	7505459	443691	7505550	P1	6.4	0
	C-MBR-17	8-Jun-17	1	Road Crossing	KK, LW	120	N	3	7.9	51	H	N	N	N	443455	7504552	443564	7504586	F3	0	-
	C-MBR-17	8-Jun-17	2	Road Crossing	KK, LW	120	N	3	7.9	51	H	N	N	N	443455	7504552	443564	7504586	G3	61	2
	C-MBR-17	8-Jun-17	3	Road Crossing	KK, LW	120	N	3	7.9	51	H	N	N	N	443455	7504552	443564	7504586	G3	58	3
	C-MBR-17	8-Jun-17	4	Road Crossing	KK, LW	120	N	3	7.9	51	H	N	N	N	443455	7504552	443564	7504586	P2	1.6	0
	C-MBR-17	8-Jun-17	5	Road Crossing	KK, LW	120	N	3	7.9	51	H	N	N	N	443455	7504552	443564	7504586	P2	4	0
	C-MBR-18	8-Jun-17	1	Road Crossing	KK, LW	160	N	5.9	-	75	H	N	N	N	442722	7504439	442841	7504328	G3	36	0.5
	C-MBR-18	8-Jun-17	2	Road Crossing	KK, LW	160	N	5.9	-	75	H	N	N	N	442722	7504439	442841	7504328	F3	38	0.5
	C-MBR-18	8-Jun-17	3	Road Crossing	KK, LW	160	N	5.9	-	75	H	N	N	N	442722	7504439	442841	7504328	G3	83	0.5
Trout Outflow	C-MBR-19	8-Jun-17	1	Road Crossing	KK, LW	130	N	2.9	7.3	65	H	N	N	N	442261	7504235	442334	7504134	G1	51	0.5
	C-MBR-19	8-Jun-17	2	Road Crossing	KK, LW	130	N	2.9	7.3	65	H	N	N	N	442261	7504235	442334	7504134	R	27	0.5
	C-MBR-19	8-Jun-17	3	Road Crossing	KK, LW	130	N	2.9	7.3	65	H	N	N	N	442261	7504235	442334	7504134	G1	18	0.5
	C-MBR-19	8-Jun-17	4	Road Crossing	KK, LW	130	N	2.9	7.3	65	H	N	N	N	442261	7504235	442334	7504134	R	35	1
Stickleback Outflow	C-MBR-20	8-Jun-17	1	Road Crossing	KK, LW	120	N	1.5	7.7	79	H	N	N	N	441940	7504223	441931	7504131	G2	12.8	0
	C-MBR-20	8-Jun-17	2	Road Crossing	KK, LW	120	N	1.5	7.7	79	H	N	N	N	441940	7504223	441931	7504131	G3	15	0
	C-MBR-20	8-Jun-17	3	Road Crossing	KK, LW	120	N	1.5	7.7	79	H	N	N	N	441940	7504223	441931	7504131	P1	3.5	0
	C-MBR-20	8-Jun-17	4	Road Crossing	KK, LW	120	N	1.5	7.7	79	H	N	N	N	441940	7504223	441931	7504131	G3	26.5	3
	C-MBR-20	8-Jun-17	5	Road Crossing	KK, LW	120	N	1.5	7.7	79	H	N	N	N	441940	7504223	441931	7504131	G?	40	-
	C-MBR-20	8-Jun-17	6	Road Crossing	KK, LW	120	N	1.5	7.7	79	H	N	N	N	441940	7504223	441931	7504131	G2	4.6	4
	C-MBR-20	8-Jun-17	7	Road Crossing	KK, LW	120	N	1.5	7.7	79	H	N	N	N	441940	7504223	441931	7504131	G3		4
	C-MBR-20	8-Jun-17	8	Road Crossing	KK, LW	120	N	1.5	7.7	79	H	N	N	N	441940	7504223	441931	7504131	P3	1.8	0
	C-MBR-20	8-Jun-17	9	Road Crossing	KK, LW	120	N	1.5	7.7	79	H	N	N	N	441940	7504223	441931	7504131	G2	15.2	1
Boulder Creek	C-MBR-7	11-Jun-17	1	Road Crossing	KK, LW	170	N	5	7.9	122	H	N	N	N	434845	7531134	435009	7531134	G1	70	1
	C-MBR-7	11-Jun-17	2	Road Crossing	KK, LW	170	N	5	7.9	122	H	N	N	N	434845	7531134	435009	7531134	P1	45	0
	C-MBR-7	11-Jun-17	3	Road Crossing	KK, LW	170	N	5	7.9	122	H	N	N	N	434845	7531134	435009	7531134	R	26	0.5
	C-MBR-7	11-Jun-17	4	Road Crossing	KK, LW	170	N	5	7.9	122	H	N	N	N	434845	7531134	435009	7531134	G1	25	0.5
Boulder Creek Trib	C-MBR-8	11-Jun-17	1	Road Crossing	KK, LW	160	N	3.1	8.3	115	H	N	N	N	437905	7524640	438000	7524728	G1	124	1
	C-MBR-8	11-Jun-17	2	Road Crossing	KK, LW	160	N	3.1	8.3	115	H	N	N	N	437905	7524640	438000	7524728	G2	34	0.5
Aimaokatalok Inflow	C-MBR-9	11-Jun-17	1	Road Crossing	KK, LW	180	N	4.3	7.9	70	H	N	N	N	439103	7516541	439257	7516602	G2	29	2
	C-MBR-9	11-Jun-17	2	Road Crossing	KK, LW	180	N	4.3	7.9	70	H	N	N	N	439103	7516541	439257	7516602	Ca	6	3
	C-MBR-9	11-Jun-17	3	Road Crossing	KK, LW	180	N	4.3	7.9	70	H	N	N	N	439103	7516541	439257	7516602	P1	18	0
	C-MBR-9	11-Jun-17	4	Road Crossing	KK, LW	180	N	4.3	7.9	70	H	N	N	N	439103	7516541	439257	7516602	P1	18	0
	C-MBR-9	11-Jun-17	5	Road Crossing	KK, LW	180	N	4.3	7.9	70	H	N	N	N	439103	7516541	439257	7516602	G2/F3	25	1.5
	C-MBR-9	11-Jun-17	6	Road Crossing	KK, LW	180	N	4.3	7.9	70	H	N	N	N	439103	7516541	439257	7516602	P2	19	2
	C-MBR-9	11-Jun-17	7	Road Crossing	KK, LW	180	N	4.3	7.9	70	H	N	N	N	439103	7516541	439257	7516602	Fa	24	10
	C-MBR-9	11-Jun-17	8	Road Crossing	KK, LW	180	N	4.3	7.9	70	H	N	N	N	439103	7516541	439257	7516602	P2/G2	19	0
	C-MBR-9	11-Jun-17	9	Road Crossing	KK, LW	180	N	4.3	7.9	70	H	N	N	N	439103	7516541	439257	7516602	G2	25	1
Wolverine to Patch	C-MS-01	7-Jun-17	1	Road Crossing	KK, LW	200	N	9.3	6.8	1246	H	Y	Y	N	434749	7547063	434779	7547209	F3	88	< 1
	C-MS-01	7-Jun-17	2	Road Crossing	KK, LW	200	N	9.3	6.8	1246	H	Y	Y	N	434749	7547063	434779	7547209	P3	16	2
	C-MS-01	7-Jun-17	3	Road Crossing	KK, LW	200	N	9.3	6.8	1246	H	Y	Y	N	434749	7547063	434779	7547209	G3	26.1	1
	C-MS-01	7-Jun-17	4	Road Crossing	KK, LW	200	N	9.3	6.8	1246	H	Y	Y	N	434749	7547063	434779	7547209	DC	22.7	2

Appendix 3.1-2. Detailed Habitat Assessment Data at Proposed Road Crossing Sites, 2017

			Habitat	Assessment		Site Length	Fish Form	Water Quality			General				Downstream End		Upstream End			Unit Length	Grad.
Stream Name	Site Name	Date	Unit (Field)	Type	Crew	(m)	(Y/N)	Temp	pH	Conductivity	Discharge	No Vis. Chan.	Dry/Int.	Trib.	Easting	Northing	Easting	Northing	Habitat Type	(m)	(%)
Patch IF N	C-TIA-01	7-Jun-17	1	Road Crossing	KK, LW	200	N	7.2	7.5	71	H	N	N	N	433678	7552723	433558	7552807	F3	20.7	<1
	C-TIA-01	7-Jun-17	2	Road Crossing	KK, LW	200	N	7.2	7.5	71	H	N	N	N	433678	7552723	433558	7552807	G3	71	1
	C-TIA-01	7-Jun-17	3	Road Crossing	KK, LW	200	N	7.2	7.5	71	H	N	N	N	433678	7552723	433558	7552807	G3	98	1
Doris Inflow	C-TIA-02	7-Jun-17	1	Road Crossing	KK, LW	124	N	12.4	7.4	61	H	N	N	N	434751	7553365	434764	7553242	G/F3	42	1
	C-TIA-02	7-Jun-17	2	Road Crossing	KK, LW	124	N	12.4	7.4	61	H	N	N	N	434751	7553365	434764	7553242	G/F3	82	1
	C-TIA-03	7-Jun-17	1	Road Crossing	KK, LW	170	N	NA	NA	NA	H	N	Y	N	434998	7553634	435078	7553581	F3/DC	170	5
Ogama Outflow	C-TIA-04	9-Jun-17	5	Road Crossing	KK, LW	200	N	7	7.7	73	H	N	N	Y	435038	7555711	435060	755572	G1	71	0.5
	C-TIA-04	9-Jun-17	6	Road Crossing	KK, LW	200	N	7	7.7	73	H	N	N	Y	435038	7555711	435060	755572	P1	31	0.5
	C-TIA-04	9-Jun-17	7	Road Crossing	KK, LW	200	N	7	7.7	73	H	N	N	Y	435038	7555711	435060	755572	P1	39	0.5
	C-TIA-04	9-Jun-17	8	Road Crossing	KK, LW	200	N	7	7.7	73	H	N	N	Y	435038	7555711	435060	755572	R	19	1.5
	C-TIA-04	9-Jun-17	9	Road Crossing	KK, LW	200	N	7	7.7	73	H	N	N	Y	435038	7555711	435060	755572	P1	40	1
Low Flow																					
Rob Bay Trib	C-CDR-01	18-Jul-17	1	Road Crossing	KK, JI	240	N	-	-	-	L	N	Y	N	432048	7563075	432109	7562904	G	20	-
	C-CDR-01	18-Jul-17	2	Road Crossing	KK, JI	240	N	-	-	-	L	N	Y	N	432048	7563075	432109	7562904	G	20	-
	C-CDR-01	18-Jul-17	3	Road Crossing	KK, JI	240	N	-	-	-	L	N	Y	N	432048	7563075	432109	7562904	G	170	-
	C-CDR-01	18-Jul-17	4	Road Crossing	KK, JI	240	N	-	-	-	L	N	Y	N	432048	7563075	432109	7562904	NDC	30	-
Glenn OF	C-CDR-02	26-Jul-17	1	Road Crossing	KK, SJ	200	Y	12.3	8.6	483	M	N	N	N	431683	7563873	437587	7563642	G	200	
Aimaokatalok Inflow	C-MBR-10	26-Jul-17	-	Road Crossing	KK, SJ	-	N	-	-	-	L	Y	Y	N	439412	7515859	-	-	-	-	-
	C-MBR-11	27-Jul-17	1	Road Crossing	KK, SJ	107	Y	8.1	8.4	135	M	N	N	N	441616	7510734	441630	7510819	P	9.4	0.0
	C-MBR-11	27-Jul-17	2	Road Crossing	KK, SJ	107	Y	8.1	8.4	135	M	N	N	N	441616	7510734	441630	7510819	P	10	0.5
	C-MBR-11	27-Jul-17	3	Road Crossing	KK, SJ	107	Y	8.1	8.4	135	M	N	N	N	441616	7510734	441630	7510819	G	54.5	2.0
	C-MBR-11	27-Jul-17	4	Road Crossing	KK, SJ	107	Y	8.1	8.4	135	M	N	N	N	441616	7510734	441630	7510819	G	33.3	1.5
	C-MBR-12	27-Jul-17	1	Road Crossing	KK, SJ	154	N	10.4	8.8	112	M	N	N	N	444332	7509582	444419	7509805	G	83	0.5
	C-MBR-12	27-Jul-17	2	Road Crossing	KK, SJ	154	N	10.4	8.8	112	M	N	N	N	444332	7509582	444419	7509805	R	29.2	1.5
	C-MBR-12	27-Jul-17	3	Road Crossing	KK, SJ	154	N	10.4	8.8	112	M	N	N	N	444332	7509582	444419	7509805	G	42.3	0.5
	C-MBR-13	27-Jul-17	1	Road Crossing	KK, SJ	160	N	-	-	-	L	N	Y	N	444393	7508901	444510	7508827	G	100	-
	C-MBR-13	28-Jul-17	2	Road Crossing	KK, SJ	161	N	-	-	-	L	N	Y	N	444393	7508901	444510	7508827	P/G	60	-
	C-MBR-14	26-Jul-17	-	Road Crossing	KK, SJ	100	N	-	-	-	L	Y	Y	N	444106	7508234	444157	7508184	-	-	-
	C-MBR-15	26-Jul-17	1	Road Crossing	KK, SJ	136	Y	10.8	9.1	126	M	N	N	N	443338	7507044	443451	7507008	G	27.3	0.0
	C-MBR-15	26-Jul-17	2	Road Crossing	KK, SJ	136	Y	10.8	9.1	126	M	N	N	N	443338	7507044	443451	7507008	P	31	0.0
	C-MBR-15	26-Jul-17	3	Road Crossing	KK, SJ	136	Y	10.8	9.1	126	M	N	N	N	443338	7507044	443451	7507008	P	13.8	0.0
	C-MBR-15	26-Jul-17	4	Road Crossing	KK, SJ	136	Y	10.8	9.1	126	M	N	N	N	443338	7507044	443451	7507008	G	9.3	1.0
	C-MBR-15	26-Jul-17	5	Road Crossing	KK, SJ	136	Y	10.8	9.1	126	M	N	N	N	443338	7507044	443451	7507008	P	18.3	0.0
	C-MBR-15	26-Jul-17	6	Road Crossing	KK, SJ	136	Y	10.8	9.1	126	M	N	N	N	443338	7507044	443451	7507008	G	8.4	1.0
	C-MBR-15	26-Jul-17	7	Road Crossing	KK, SJ	136	Y	10.8	9.1	126	M	N	N	N	443338	7507044	443451	7507008	P	14.2	0.0
	C-MBR-15	26-Jul-17	8	Road Crossing	KK, SJ	136	Y	10.8	9.1	126	M	N	N	N	443338	7507044	443451	7507008	G	3.8	2.5
	C-MBR-15	26-Jul-17	9	Road Crossing	KK, SJ	136	Y	10.8	9.1	126	M	N	N	N	443338	7507044	443451	7507008	P	11	0.0
	C-MBR-16	26-Jul-17	1	Road Crossing	KK, SJ	156	Y	9.4	8.5	159	M	N	N	N	443573	7505459	443683	7505545	G	37	2.0
	C-MBR-16	26-Jul-17	2	Road Crossing	KK, SJ	156	Y	9.4	8.5	159	M	N	N	N	443573	7505459	443683	7505545	P	6.4	0.0
	C-MBR-16	26-Jul-17	3	Road Crossing	KK, SJ	156	Y	9.4	8.5	159	M	N	N	N	443573	7505459	443683	7505545	G	14.9	2.5
	C-MBR-16	26-Jul-17	4	Road Crossing	KK, SJ	156	Y	9.4	8.5	159	M	N	N	N	443573	7505459	443683	7505545	P	5.2	0.0
	C-MBR-16	26-Jul-17	5	Road Crossing	KK, SJ	156	Y	9.4	8.5	159	M	N	N	N	443573	7505459	443683	7505545	G	18.7	3.0
	C-MBR-16	26-Jul-17	6	Road Crossing	KK, SJ	156	Y	9.4	8.5	159	M	N	N	N	443573	7505459	443683	7505545	G	28.7	2.5
	C-MBR-16	26-Jul-17	7	Road Crossing	KK, SJ	156	Y	9.4	8.5	159	M	N	N	N	443573	7505459	443683	7505545	G	45.5	2.0
	C-MBR-17	26-Jul-17	1	Road Crossing	KK, SJ	50	Y	6.3	9	126	M	N	Y	N	443525	7504599	443566	7504588	G	27	~ 1.5
	C-MBR-17	26-Jul-17	2	Road Crossing	KK, SJ	50	Y	6.3	9	126	M	N	Y	N	443525	7504599	443566	7504588	P	1.5	~ 1.5
	C-MBR-17	26-Jul-17	3	Road Crossing	KK, SJ	50	Y	6.3	9	126	M	N	Y	N	443525	7504599	443566	7504588	G	10.6	~ 1.5
	C-MBR-17	26-Jul-17	4	Road Crossing	KK, SJ	50	Y	6.3	9	126	M	N	Y	N	443525	7504599	443566	7504588	P	4.4	~ 1.5
	C-MBR-17	26-Jul-17	5	Road Crossing	KK, SJ	50	Y	6.3	9	126	M	N	Y	N	443525	7504599	443566	7504588	G	4.2	~ 1.5
	C-MBR-17	26-Jul-17	6	Road Crossing	KK, SJ	50	Y	6.3	9	126	M	N	Y	N	443525	7504599	443566	7504588	P	2.1	~ 1.5

Appendix 3.1-2. Detailed Habitat Assessment Data at Proposed Road Crossing Sites, 2017

			Habitat	Assessment		Site Length	Fish Form	Water Quality			General				Downstream End		Upstream End			Unit Length	Grad.
Stream Name	Site Name	Date	Unit (Field)	Type	Crew	(m)	(Y/N)	Temp	pH	Conductivity	Discharge	No Vis. Chan.	Dry/Int.	Trib.	Easting	Northing	Easting	Northing	Habitat Type	(m)	(%)
	C-MBR-17	26-Jul-17	7	Road Crossing	KK, SJ	50	Y	6.3	9	126	M	N	Y	N	443525	7504599	443566	7504588	G	3.2	~ 1.5
	C-MBR-17	26-Jul-17	8	Road Crossing	KK, SJ	50	Y	6.3	9	126	M	N	Y	N	443525	7504599	443566	7504588	P	3.1	~ 1.5
	C-MBR-18	26-Jul-17	-	Road Crossing	KK, SJ	200	N	-	-	-	L	Y	Y	N	442803	7504364	442692	7504483	-	200	-
Trout Outflow	C-MBR-19	30-Jul-17	1	Road Crossing	KK, LW	110	Y	8.9	7.6	103	L	N	Y	N	442225	7504273	442345	7504183	G	21.6	1.0
	C-MBR-19	30-Jul-17	2	Road Crossing	KK, LW	110	Y	8.9	7.6	103	L	N	Y	N	442225	7504273	442345	7504183	BG	15.8	2.0
	C-MBR-19	30-Jul-17	3	Road Crossing	KK, LW	110	Y	8.9	7.6	103	L	N	Y	N	442225	7504273	442345	7504183	G	20.4	0.5
	C-MBR-19	30-Jul-17	4	Road Crossing	KK, LW	110	Y	8.9	7.6	103	L	N	Y	N	442225	7504273	442345	7504183	G	30.6	0.5
	C-MBR-19	30-Jul-17	5	Road Crossing	KK, LW	110	Y	8.9	7.6	103	L	N	Y	N	442225	7504273	442345	7504183	BG	21.2	2.0
Stickleback Outflow	C-MBR-20	30-Jul-17	1	Road Crossing	KK, LW	200	Y	10.9	8.7	249	L	N	N	Y	441928	7504297	441931	7504131	G	30	0.5
	C-MBR-20	30-Jul-17	2	Road Crossing	KK, LW	200	Y	10.9	8.7	249	L	N	N	Y	441928	7504297	441931	7504131	G	27.5	0.5
	C-MBR-20	30-Jul-17	3	Road Crossing	KK, LW	200	Y	10.9	8.7	249	L	N	N	Y	441928	7504297	441931	7504131	G/Fl	30.6	2.0
	C-MBR-20	30-Jul-17	4	Road Crossing	KK, LW	200	Y	10.9	8.7	249	L	N	N	Y	441928	7504297	441931	7504131	G/P	35	2.5
	C-MBR-20	30-Jul-17	5	Road Crossing	KK, LW	200	Y	10.9	8.7	249	L	N	N	Y	441928	7504297	441931	7504131	G	56.9	1.5
	C-MBR-20	30-Jul-17	6	Road Crossing	KK, LW	200	Y	10.9	8.7	249	L	N	N	Y	441928	7504297	441931	7504131	DC	5.3	0.0
	C-MBR-20	30-Jul-17	7	Road Crossing	KK, LW	200	Y	10.9	8.7	249	L	N	N	Y	441928	7504297	441931	7504131	G/Fl	62.2	1.5
	C-MBR-20	30-Jul-17	8	Road Crossing	KK, LW	200	Y	10.9	8.7	249	L	N	N	Y	441928	7504297	441931	7504131	G	15	1.0
Boulder Creek	C-MBR-7	27-Jul-17	1	Road Crossing	KK, SJ	110	Y	10.1	9	317	M	N	N	N	434890	7531132	434996	7531140	R	11.9	2.0
	C-MBR-7	27-Jul-17	2	Road Crossing	KK, SJ	110	Y	10.1	9	317	M	N	N	N	434890	7531132	434996	7531140	P	50.5	0.5
	C-MBR-7	27-Jul-17	3	Road Crossing	KK, SJ	110	Y	10.1	9	317	M	N	N	N	434890	7531132	434996	7531140	P	13.3	0.0
	C-MBR-7	27-Jul-17	4	Road Crossing	KK, SJ	110	Y	10.1	9	317	M	N	N	N	434890	7531132	434996	7531140	R/G	35.3	2.0
Boulder Creek Trib	C-MBR-8	27-Jul-17	1	Road Crossing	KK, SJ	67	Y	11.9	9	180	M	N	N	N	437949	7524660	438002	7524694	G	67.4	0.5
Aimaokatalok Inflow	C-MBR-9	29-Jul-17	1	Road Crossing	KK, SJ	121	Y	10	8.7	125	M	N	N	N	439095	7516542	439198	7516565	G	25.7	0.5
	C-MBR-9	29-Jul-17	2	Road Crossing	KK, SJ	121	Y	10	8.7	125	M	N	N	N	439095	7516542	439198	7516565	P	7.5	0.0
	C-MBR-9	29-Jul-17	3	Road Crossing	KK, SJ	121	Y	10	8.7	125	M	N	N	N	439095	7516542	439198	7516565	P	12.1	0.0
	C-MBR-9	29-Jul-17	4	Road Crossing	KK, SJ	121	Y	10	8.7	125	M	N	N	N	439095	7516542	439198	7516565	G	4.2	5.0
	C-MBR-9	29-Jul-17	5	Road Crossing	KK, SJ	121	Y	10	8.7	125	M	N	N	N	439095	7516542	439198	7516565	Fa	17.4	20.0
	C-MBR-9	29-Jul-17	6	Road Crossing	KK, SJ	121	Y	10	8.7	125	M	N	N	N	439095	7516542	439198	7516565	G	24.1	1.5
	C-MBR-9	29-Jul-17	7	Road Crossing	KK, SJ	121	Y	10	8.7	125	M	N	N	N	439095	7516542	439198	7516565	G	31.2	2.0
Wolverine Outflow	C-MS-01	22-Jul-17	-	Road Crossing	KK, SJ	-	N	-	-	-	L	N	Y	N	434759	7547112	-	-	-	-	-
Patch Inflow	C-TIA-01	18-Jul-17	1	Road Crossing	KK, JI	200	N	-	-	-	L	N	Y	N	433671	7552717	433541	7552818	NA	170	
Doris Inflow	C-TIA-02	18-Jul-17	1	Road Crossing	KK, JI	50	N	-	-	-	L	N	Y	N	434735	7553411	434749	7553271	NA	50	
	C-TIA-03	18-Jul-17	1	Road Crossing	KK, JI	100	N	-	-	-	L	Y	Y	N	434998	7553633	435077	7553574	NA	100	-
Ogama Outflow	C-TIA-04	25-Jul-17	11	Road Crossing	KK, SJ	189	Y	12.8	9.1	228	M	N	N	N	435063	7555565.55	435196	7555440.59	G	26.7	1.0
	C-TIA-04	25-Jul-17	12	Road Crossing	KK, SJ	189	Y	12.8	9.1	228	M	N	N	N	435063	7555565.55	435196	7555440.59	P	26.7	0.0
	C-TIA-04	25-Jul-17	13	Road Crossing	KK, SJ	189	Y	12.8	9.1	228	M	N	N	N	435063	7555565.55	435196	7555440.59	R/G	11.8	0.5
	C-TIA-04	25-Jul-17	14	Road Crossing	KK, SJ	189	Y	12.8	9.1	228	M	N	N	N	435063	7555565.55	435196	7555440.59	G	30.4	0.0
	C-TIA-04	25-Jul-17	15	Road Crossing	KK, SJ	189	Y	12.8	9.1	228	M	N	N	N	435063	7555565.55	435196	7555440.59	R/G	14.3	0.5
	C-TIA-04	25-Jul-17	16	Road Crossing	KK, SJ	189	Y	12.8	9.1	228	M	N	N	N	435063	7555565.55	435196	7555440.59	P	57.1	0.0
	C-TIA-04	25-Jul-17	17	Road Crossing	KK, SJ	189	Y	12.8	9.1	228	M	N	N	N	435063	7555565.55	435196	7555440.59	R/Ca	22	3.5

Discharge: L = low, M = medium, H = high
Habitat Type: F = flat, Fa = falls, C = cascade, R = riffle, G = glide, BG = boulder garden, P = pool
Residual pool depth = (max depth - crest height)
Substrate: F = Fines (< 2 mm), G = Gravel (2 - 64 mm), C = Cobble (64 - 256), B = Boulders (256 - 4000 mm), R = Bedrock (>4000 mm), O = Other
Bank Shape: U = undercut, V = vertical, S = sloping, O = overhanging
Bank Texture: dominant substrate type
Barriers: F = impassable falls, BG = impassable boulder garden, D = dry channel, OF = overland flow, SF = subsurface flow, WQ = water quality barrier, G - gradient, O = other (list in Comments column)
Classification: list barriers as either T = temporary or P = permanent
Instream cover: Total cover = % cover for entire unit
Riparian cover: Canopy % = cover within 1 m of surface of water, Type = dominant vegetation; G = grass, S = shrub, M = moss, Ma = macrophyte
Overall Habitat: S = spawning, R = rearing, O = overwintering, M = migration; Classifications: N = none, P = poor, F = fair, G = good
NA = not applicable; Dashes = data not collected

Appendix 3.1-2. Detailed Habitat Assessment Data at Proposed Road Crossing Sites, 2017

			Habitat	Width (m)		Depth (m)		Residual Pool	Substrate Composition (%)						Bank Height (m)		Bank		Barriers							
Stream Name	**Site Name**	**Date**	**Unit (Field)**	**Wetted**	**Bankfull**	**Wetted**	**Bankfull**	**Depth (m)**	**O**	**F**	**G**	**C**	**B**	**R**	**Left**	**Right**	**Shape**	**Texture**	**F**	**BG**	**D**	**OF**	**SF**	**WQ**	**G**	**O**
High Flow																										
Rob Bay Inflow	C-CDR-01	7-Jun-17	1	0.24	15.4	0.24	0.3	-	0	100	0	0	0	0	0.04	0.06	S	F				T				
	C-CDR-01	7-Jun-17	2	0	0	0	0	-	0	100	0	0	0	0	0	0	-	-			T					
	C-CDR-01	7-Jun-17	3	0.65	7.7	0.23	0.28	-	0	100	0	0	0	0	0.06	0.05	S	F				T				
	C-CDR-01	7-Jun-17	4	NA	23	0.11	0.15	-	0	100	0	0	0	0	0.04	0.04	S	F				P				
Glenn Outflow	C-CDR-02	7-Jun-17	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
	C-CDR-02	7-Jun-17	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
	C-CDR-02	7-Jun-17	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
	C-CDR-02	7-Jun-17	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
	C-CDR-02	7-Jun-17	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
	C-CDR-02	7-Jun-17	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
	C-CDR-02	7-Jun-17	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
	C-CDR-02	7-Jun-17	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
	C-CDR-02	7-Jun-17	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
	C-CDR-02	7-Jun-17	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
	C-CDR-02	7-Jun-17	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
Aimaokatalok Inflow	C-MBR-10	11-Jun-17	1	-	-	-	-	-	-	D	-	-	-	-	-	-	-	-			P					
	C-MBR-11	11-Jun-17	1	5	5	0.45	0.51	-	0	100	0	0	0	0	0.04	0.05	V	F								
	C-MBR-11	11-Jun-17	2	5	5	1.2	1.2	0.9	0	100	0	0	0	0	0	0	V	F								
	C-MBR-11	11-Jun-17	3	6	6	0.43	0.53	-	0	100	0	0	0	0	0.1	0.11	S	F								
	C-MBR-11	11-Jun-17	4	8	8	>1.5	>1.5	>1.1	0	100	0	0	0	0	0	0	V	F								
	C-MBR-11	11-Jun-17	5	5	5	0.3	0.42	-	0	100	0	0	0	0	0.11	0.13	S	F								
	C-MBR-11	11-Jun-17	6	5	13	0.65	0.9	-	0	100	0	0	0	0	0.3	0.2	S/V	F								
	C-MBR-11	11-Jun-17	7	9	14	>1.5	>1.5	>1.2	0	100	0	0	0	0	0.13	-	V	F								
	C-MBR-11	11-Jun-17	8	4	6	0.6	0.9	-	0	90	5	5	0	0	-	-	S/V	F								
	C-MBR-12	11-Jun-17	1	35	39	0.6	1	-	0	5	10	35	50	0	0.4	-	S	F								
	C-MBR-12	11-Jun-17	2	23	26	0.45	0.88	-	0	0	5	25	70	0	0.43	-	S	F								
	C-MBR-12	11-Jun-17	3	16	21	>1	>1.5	-	0	15	15	30	40	0	0.48	-	V	F								
	C-MBR-12	11-Jun-17	4	17	27	>1	>1.5	-	-	-	-	-	-	0	0.5	-	V	B/F								
	C-MBR-12	11-Jun-17	5	10	16	>2	>2.5	-	-	-	0	0	-	-	0.5	-	V	B/F								
	C-MBR-12	11-Jun-17	6	16	21	>1	>1.5	-	0	5	0	5	25	65	6	-	S	B/F								
	C-MBR-13	11-Jun-17	1	12	12	>1	>1	>0.9	0	100	0	0	0	0	0.08	0.09	S	F								
	C-MBR-13	11-Jun-17	2	1.4	5	0.21	0.49	-	0	100	0	0	0	0	0.28	0.28	S	F								
	C-MBR-13	11-Jun-17	3	9	14	>1.5	>1.5	>1.3	0	100	0	0	0	0	0.22	0.15	S	F								
	C-MBR-13	11-Jun-17	4	12	14	0.31	0.39	-	0	100	0	0	0	0	0	0.14	S	F								
	C-MBR-13	11-Jun-17	5	10	12	0.19	0.32	-	0	100	0	0	0	0	0.16	0.12	S	F								
	C-MBR-13	11-Jun-17	6					-																		
	C-MBR-13	11-Jun-17	7	8	15	0.15	0.31	-	0	100	0	0	0	0	0.17	0.16	S	F								
	C-MBR-13	11-Jun-17	8	13	19	>1.5	>1.5	>1.3	0	100	0	0	0	0	0.13	0.15	V	F								
	C-MBR-13	11-Jun-17	9	5	7	0.3	0.55	-	0	100	0	0	0	0	0.22	0.28	S	F								
	C-MBR-13	11-Jun-17	10	7	7	>1.5	>1.5	>1.3	0	95	0	5	0	0	0.12	0.12	V	F								
	C-MBR-13	11-Jun-17	11	0.55	5	0.23	0.46	-	0	100	0	0	0	0	0.23	0.23	V	F								
	C-MBR-14	8-Jun-17	1	-	-	-	-	-	-	D	-	-	-	-	-	-	-	-								
	C-MBR-15	8-Jun-17	1	12	15	<1.5	<1.8	-	0	100	0	0	0	0	0.3	0.39	S	F								
	C-MBR-15	8-Jun-17	2	6.9	10.2	0.25	0.5	-	0	100	0	0	0	0	0.26	0.24	S	F								
	C-MBR-15	8-Jun-17	3	22	29	<2	<2	-	0	100	0	0	0	0	0.45	0.45	S	F								
	C-MBR-15	8-Jun-17	4	6	7	0.88	-	-	0	100	0	0	0	0	0.39	0.45	S	F								
	C-MBR-15	8-Jun-17	5	17	17	<3	<3	-	0	90	0	0	10	0	0.2	0.18	S	F								
	C-MBR-15	8-Jun-17	6	1.2	3.9	0.27	0.48	-	0	100	0	0	0	0	0.21	0.23	S	F								
	C-MBR-15	8-Jun-17	7	21	22	<2	<2	-	0	100	0	0	0	0	0.35	0.39	S	F								
	C-MBR-15	8-Jun-17	8	3.7	7	0.28	0.32	-	0	100	0	0	0	0	0.23	0.35	S	F								

Appendix 3.1-2. Detailed Habitat Assessment Data at Proposed Road Crossing Sites, 2017

			Habitat	Width (m)		Depth (m)		Residual Pool	Substrate Composition (%)						Bank Height (m)		Bank		Barriers							
Stream Name	**Site Name**	**Date**	**Unit (Field)**	**Wetted**	**Bankfull**	**Wetted**	**Bankfull**	**Depth (m)**	**O**	**F**	**G**	**C**	**B**	**R**	**Left**	**Right**	**Shape**	**Texture**	**F**	**BG**	**D**	**OF**	**SF**	**WQ**	**G**	**O**
	C-MBR-15	8-Jun-17	9	20	21	<1.5	<1.5	-	0	100	0	0	0	0	0.45	0.31	S	F								
	C-MBR-16	8-Jun-17	1	1.9	6.3	0.2	0.38	-	0	100	0	0	0	0	0.16	0.21	S	F								
	C-MBR-16	8-Jun-17	2	6.8	8.4	0.69	0.89	0.42	0	85	5	10	0	0	0.24	0.17	S/U	F								
	C-MBR-16	8-Jun-17	3	3	4.3	0.39	0.54	-	0	25	0	70	5	0	0.3	0.11	V	F								
	C-MBR-16	8-Jun-17	4	1.6	3.7	0.46	0.61	-	0	20	0	60	20	0	0.15	0.15	V	F								
	C-MBR-16	8-Jun-17	5	1.8	12.1	0.34	0.49	-	0	0	0	20	80	0	0.1	0.21	U/V	F								
	C-MBR-16	8-Jun-17	6	1	5.8	0.41	0.5	-	0	30	10	0	60	0	0.08	0.1	U/V	F								
	C-MBR-16	8-Jun-17	7	11.4	11.4	0.16	0.2	-	0	75	0	5	20	0	0.02	0.05	S	F								
	C-MBR-16	8-Jun-17	8	4.1	5.5	0.97	1.06	0.69	0	100	0	0	0	0	0.08	0.07	S	F								
	C-MBR-17	8-Jun-17	1	-	-	-	-	-		-					-	-						P				
	C-MBR-17	8-Jun-17	2	0.19	0.19	0.09	0.15	-	0	100	0	0	0	0	0.06	0.06	S	F								
	C-MBR-17	8-Jun-17	3	0.26	0.28	0.13	0.23	-	0	100	0	0	0	0	0.05	0.14	S	F								
	C-MBR-17	8-Jun-17	4	1.2	4.6	0.57	0.64	0.44	0	80	0	20	0	0	0.07	0.07	U	F								
	C-MBR-17	8-Jun-17	5	0.7	2.9	0.58	0.65	0.36	0	85	0	15	0	0	0.08	0.05	U	F								
	C-MBR-18	8-Jun-17	1	0.72	5.1	0.25	0.35	-	0	100	0	0	0	0	0.1	0.1	S	F								
	C-MBR-18	8-Jun-17	2	2.6	2.6	0.2	0.3	-	0	100	0	0	0	0	0.11	0.08	S	F								
	C-MBR-18	8-Jun-17	3	2.9	3.6	0.18	0.23	-	0	100	0	0	0	0	0.05	0.05	S	F								
Trout Outflow	C-MBR-19	8-Jun-17	1	21	22.1	0.65	0.77	-	0	75	0	0	25	0	0.14	0.12	S/V	F								
	C-MBR-19	8-Jun-17	2	8.6	10.9	0.4	0.65	-	0	60	0	0	40	0	0.2	0.3	S/V	F								
	C-MBR-19	8-Jun-17	3	4.6	7.8	0.55	0.95	-	0	40	0	0	60	0	0.28	0.5	V/S	F								
	C-MBR-19	8-Jun-17	4	6.9	11	0.65	0.77	-	0	50	0	0	50	0	0.25	0.4	V/S	F								
Stickleback Outflow	C-MBR-20	8-Jun-17	1	6.6	9.2	0.45	0.7	-	0	100	0	0	0	0	0.5	0	S	F								
	C-MBR-20	8-Jun-17	2	2.5	4.1	0.2	0.39	-	0	100	0	0	0	0	0.17	0.21	S/U	F								
	C-MBR-20	8-Jun-17	3	2.6	3.4	0.8	0.95	0.7	0	20	80	0	0	0	0.13	0.2	U	F								
	C-MBR-20	8-Jun-17	4	6.4	7.9	0.25	0.32	-	0	90	10	0	0	0	0	0.13	V/U	F								
	C-MBR-20	8-Jun-17	5	-	-	-	-	-		-	-	-	-	-	-	-	-	-								
	C-MBR-20	8-Jun-17	6	1.1	1.7	0.27	0.43	-	0	35	60	5	0	0	0.17	0.15	V/U	F								
	C-MBR-20	8-Jun-17	7	2.6	6.5	0.07	0.22	-	0	35	60	5	0	0	0.33	0.2	S	F								
	C-MBR-20	8-Jun-17	8	3.4	4.4	0.39	0.57	0.36	0	75	25	0	0	0	0.17	0.17	U	F								
	C-MBR-20	8-Jun-17	9	2.7	5	0.21	0.43	-	0	100	0	0	0	0	0.14	0.22	S	F								
Boulder Creek	C-MBR-7	11-Jun-17	1	12	21	>1 ?	-	-	-	-	-	-	-	-	1.2	-	-	F								
	C-MBR-7	11-Jun-17	2	31	37	>2?	-	-	-	-	-	-	-	-	1.2	-	S	F								
	C-MBR-7	11-Jun-17	3	11	16	>1?	-	-	-	-	-	-	-	-	1.2	-	S	F								
	C-MBR-7	11-Jun-17	4	13	17	>1?	-	-	-	-	-	-	-	-	1.5	-	S	F								
Boulder Creek Trib	C-MBR-8	11-Jun-17	1	26	39	0.66	0.99	-	0	100	0	0	0	0	0.32	-	S	F								
	C-MBR-8	11-Jun-17	2	27	37	0.35	0.6	-	0	100	0	0	0	0	0.2	0.31	S	F								
Aimaokatalok Inflow	C-MBR-9	11-Jun-17	1	7	7	0.2	0.44	-	0	100	0	0	0	0	0.23	0.25	S	F								
	C-MBR-9	11-Jun-17	2	4	6	0.32	0.52	-	0	0	0	5	35	60	0.27	0.16	S	R								
	C-MBR-9	11-Jun-17	3	7	12	~1.5	~1.8	~1.35	0	10	0	20	30	40	0.38	0.26	U/S	R/F								
	C-MBR-9	11-Jun-17	4	6	7	0.9	1.15	0.9	0	10	0	0	0	90	0.25	0.33	U	F								
	C-MBR-9	11-Jun-17	5	8	16	0.27	0.57	-	0	100	0	0	0	0	0.36	0.3	U/S	F								
	C-MBR-9	11-Jun-17	6	11	11	0.45	0.6	0.4	0	5	0	0	15	80	0.21	0.38	U/S	R/F								
	C-MBR-9	11-Jun-17	7	6	7	0.3	1	-	0	0	0	0	10	90	0.62	0.86	V	R	P							
	C-MBR-9	11-Jun-17	8	12	16	0.65	0.95	-	0	0	5	25	70	0	0.28	-	S	R								
	C-MBR-9	11-Jun-17	9	1.45	18	0.38	0.79	-	0	10	20	30	40	0	0.43	0.39	S	F								
Wolverine to Patch	C-MS-01	7-Jun-17	1	1.62	23	0.11	0.11	-	0	100	0	0	0	0	0	0	S	F			T	T				
	C-MS-01	7-Jun-17	2	8	9.9	0.16	0.19	-	0	100	0	0	0	0	0.03	0.02	S	F			T					
	C-MS-01	7-Jun-17	3	1	1	0.08	0.013	-	0	100	0	0	0	0	0.07	0.05	S	F			T					
	C-MS-01	7-Jun-17	4	-	-	-	-	-	0	100	0	0	0	0	-	-	S	F			T					

Appendix 3.1-2. Detailed Habitat Assessment Data at Proposed Road Crossing Sites, 2017

			Habitat	Width (m)		Depth (m)		Residual Pool	Substrate Composition (%)						Bank Height (m)		Bank		Barriers							
Stream Name	Site Name	Date	Unit (Field)	Wetted	Bankfull	Wetted	Bankfull	Depth (m)	O	F	G	C	B	R	Left	Right	Shape	Texture	F	BG	D	OF	SF	WQ	G	O
Patch IF N	C-TIA-01	7-Jun-17	1	2.8	19.6	-	-	-	0	100	0	0	0	0	-	-	S	F								
	C-TIA-01	7-Jun-17	2	0.24	1.65	0.26	0.31	-	0	100	0	0	0	0	0.06	0.05	S	F								
	C-TIA-01	7-Jun-17	3	0.68	1	0.23	0.31	-	0	100	0	0	0	0	0.09	0.08	S	F								
Doris Inflow	C-TIA-02	7-Jun-17	1	75	36	0.12	0.21	-	0	100	0	0	0	0	0.08	0.09	S	F								
	C-TIA-02	7-Jun-17	2	21	27.1	0.1	0.15	-	0	100	0	0	0	0	0.05	0.05	S	F								
	C-TIA-03	7-Jun-17	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			P	P				
Ogama Outflow	C-TIA-04	9-Jun-17	5	8	12	>1.5	-	-	0	100	0	0	0	0	-	0.33	S	F								
	C-TIA-04	9-Jun-17	6	21	25	>1.5	-	-	0	100	0	0	0	0	-	0.32	S	F								
	C-TIA-04	9-Jun-17	7	22	23	>1.5	-	-	0	100	0	0	0	0	-	0.25	S	F								
	C-TIA-04	9-Jun-17	8	13	12	>1.5	-	-	-	-	-	-	-	-	-	0.35	S	F								
	C-TIA-04	9-Jun-17	9	21	25	>1	-	-		100	0	0	0	0	-	0.24	S	F								
Low Flow																										
Rob Bay Trib	C-CDR-01	18-Jul-17	1	0.15	0.32	0.07	0.31	-	-	100	-	-	-	-	-	-	-	-			T					
	C-CDR-01	18-Jul-17	2	0.26	0.5	0.04	0.18	-	-	100	-	-	-	-	-	-	-	-			T					
	C-CDR-01	18-Jul-17	3	0.13	0.2	0.04	0.18	-	-	100	-	-	-	-	-	-	-	-			T					
	C-CDR-01	18-Jul-17	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			T					
Glenn OF	C-CDR-02	26-Jul-17	1	14	21	1.3	1.8	-	0	80	0	10	10	0	0.45	-	S	F								
Aimaokatalok Inflow	C-MBR-10	26-Jul-17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			T					
	C-MBR-11	27-Jul-17	1	8.2	12.2	1.5	1.7	-	0	100	0	0	0	0	0.2	0.17	S	F								
	C-MBR-11	27-Jul-17	2	4.2	6.7	1.22	1.56	-	0	100	0	0	0	0	0.36	0.37	S	F								
	C-MBR-11	27-Jul-17	3	0.32	4.8	0.21	0.68	-	0	100	0	0	0	0	0.38	0.42	S	F								
	C-MBR-11	27-Jul-17	4	0.48	7.1	0.15	0.44	-	0	100	0	0	0	0	0.28	0.36	S	F								
	C-MBR-12	27-Jul-17	1	19.5	22.2	0.48	1.09	-	0	10	10	30	50	0	0.45	0.66	V	F/B								
	C-MBR-12	27-Jul-17	2	11.2	15.1	0.24	0.44	-	0	0	0	10	90	0	0.3	0.52	S	B/F								
	C-MBR-12	27-Jul-17	3	8.7	14.6	0.45	1.01	-	0	0	5	10	70	15	0.51	0.47	V	R/B								
	C-MBR-13	27-Jul-17	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			T					
	C-MBR-13	28-Jul-17	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			T	T				
	C-MBR-14	26-Jul-17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			T	T				
	C-MBR-15	26-Jul-17	1	2.2	9.1	0.15	0.28	-	0	100	0	0	0	0	0.13	0.11	S	F								
	C-MBR-15	26-Jul-17	2	20.1	29.1	>2		-	0	100	0	0	0	0	0.7	0.65	S	F								
	C-MBR-15	26-Jul-17	3	14.3	15	~1.3	~2	>1.5	0	100	0	0	0	0	0.35	0.73	S	F								
	C-MBR-15	26-Jul-17	4	0.2	1.3	0.09	0.28	-	0	100	0	0	0	0	0.19	0.17	S	F								
	C-MBR-15	26-Jul-17	5	14.2	15.5	1.5	~2	>1.5	0	100	0	0	0	0	0.35	0.5	S	F								
	C-MBR-15	26-Jul-17	6	0.7	7.2	0.09	0.63	-	0	100	0	0	0	0	0.56	0.38	S	F								
	C-MBR-15	26-Jul-17	7	15.3	17.1	~1.5	~1.8	>1.5	0	100	0	0	0	0	0.35	0.3	S	F								
	C-MBR-15	26-Jul-17	8	0.06	2.67	0.04	0.5	-	0	100	0	0	0	0	0.61	0.31	S	F								
	C-MBR-15	26-Jul-17	9	3.3	5.2	0.75	1.35	1.1	0	100	0	0	0	0	0.69	0.51	S	F								
	C-MBR-16	26-Jul-17	1	0.29	1.41	0.06	0.14	-	0	100	0	0	0	0	0.14	0.12	V	F								
	C-MBR-16	26-Jul-17	2	3.1	5.6	0.39	0.55	0.42	0	90	0	10	0	0	0.18	0.15	S	F								
	C-MBR-16	26-Jul-17	3	0.22	0.92	0.11	0.39	-	0	20	20	60	0	0	0.3	0.27	V	F								
	C-MBR-16	26-Jul-17	4	1.03	1.8	0.2	0.4	0.36	0	10	0	60	30	0	0.19	0.2	V	F								
	C-MBR-16	26-Jul-17	5	1.33	1.6	0.09	0.39	-	0	0	5	20	75	0	0.18	0.4	U	F		T						
	C-MBR-16	26-Jul-17	6	0.24	1.32	0.05	0.32	-	0	0	10	60	30	0	0.28	0.26	U	F				T				
	C-MBR-16	26-Jul-17	7	2.75	10	0.1	0.28	-	0	100	0	0	0	0	0.22	0.16	S	F								
	C-MBR-17	26-Jul-17	1	0.16	0.32	0.03	0.17	-	0	100	0	0	0	0	0.14	0.14	S	F			T	T				
	C-MBR-17	26-Jul-17	2	0.72	0.9	0.2	0.27	-	0	100	0	0	0	0	0.07	0.07	S	F								
	C-MBR-17	26-Jul-17	3	0.35	0.48	0.1	0.16	-	0	100	0	0	0	0	0.04	0.05	S	F			T	T				
	C-MBR-17	26-Jul-17	4	1.1	1.23	0.45	0.53	-	0	100	0	0	0	0	0.08	0.08	S	F								
	C-MBR-17	26-Jul-17	5	0.1	0.6	0.02	0.15	-	0	100	0	0	0	0	0.15	0.15	S	F			T	T				
	C-MBR-17	26-Jul-17	6	0.72	0.95	0.3	0.36	-	0	100	0	0	0	0	0.14	0	S	F								

Appendix 3.1-2. Detailed Habitat Assessment Data at Proposed Road Crossing Sites, 2017

			Habitat	Width (m)		Depth (m)		Residual Pool	Substrate Composition (%)						Bank Height (m)		Bank		Barriers							
Stream Name	Site Name	Date	Unit (Field)	Wetted	Bankfull	Wetted	Bankfull	Depth (m)	O	F	G	C	B	R	Left	Right	Shape	Texture	F	BG	D	OF	SF	WQ	G	O
	C-MBR-17	26-Jul-17	7	0.12	0.28	0.03	0.2	-	0	100	0	0	0	0	0.16	0.19	S	F			T	T				
	C-MBR-17	26-Jul-17	8	1.06	1.4	0.65	0.76	-	0	100	0	0	0	0	0.1	0.12	S	F								
	C-MBR-18	26-Jul-17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			T	T				
Trout Outflow	C-MBR-19	30-Jul-17	1	5.5	12.5	0.21	0.41	-	0	0	30	60	10	0	0.35	0.43	S	B/F								
	C-MBR-19	30-Jul-17	2	1.06	5	0.05	0.49	-	0	0	10	60	30	0	0.42	0.51	V/S	F		T						
	C-MBR-19	30-Jul-17	3	2.03	13.6	0.32	0.88	-	0	0	20	40	40	0	0.62	0.58	V	F								
	C-MBR-19	30-Jul-17	4	1.55	17.5	0.15	0.5	-	0	0	20	40	40	0	0.44	0.45	V	F								
	C-MBR-19	30-Jul-17	5	1.9	9.7	0.06	0.8	-	0	0	20	50	30	0	0.71	0.76	V	F		T						
Stickleback Outflow	C-MBR-20	30-Jul-17	1	0.92	-	0.06	-	-	0	100	0	0	0	0	-	-	S	F								
	C-MBR-20	30-Jul-17	2	4.55	20.9	0.21	0.61	-	0	95	5	0	0	0	0.42	0.41	S/U	F								
	C-MBR-20	30-Jul-17	3	0.55	25.6	0.2	0.63	-	0	100	0	0	0	0	0.32	0.54	S/V	F				T				
	C-MBR-20	30-Jul-17	4	0.49	4.5	0.3	0.89	-	0	100	0	0	0	0	0.59	0.59	V/U	F	T							
	C-MBR-20	30-Jul-17	5	0.28	2.6	0.12	0.6	-	0	100	0	0	0	0	0.51	0.45	V	F			T	T				
	C-MBR-20	30-Jul-17	6	0	4.7	0	0.32	-	0	10	90	0	0	0	0.32	0.32	S	F			T					
	C-MBR-20	30-Jul-17	7	0.54	7	0.14	0.54	-	0	100	0	0	0	0	0.45	0.38	S	F				T				
	C-MBR-20	30-Jul-17	8	1.7	4.4	0.15	0.5	-	0	85	15	0	0	0	0.31	0.41	S	F								
Boulder Creek	C-MBR-7	27-Jul-17	1	2	11.1	0.05	1.46	-	0	0	90	5	5	0	1.14	1.25	V/U	F								
	C-MBR-7	27-Jul-17	2	14.7	23.2	0.85	2.15	-	0	100	0	0	0	0	1.3	1.3	S	F								
	C-MBR-7	27-Jul-17	3	4.5	9	0.9	2.05	-	0	100	0	0	0	0	1.21	1.1	S	F								
	C-MBR-7	27-Jul-17	4	2.1	9.7	0.23	1.41	-	0	0	65	10	25	0	1.19	1.16	V/U	F								
Boulder Creek Trib	C-MBR-8	27-Jul-17	1	1.7	14.4	0.2	0.59	-	0	100	0	0	0	0	0.5	0.36	S	F								
Aimaokatalok Inflow	C-MBR-9	29-Jul-17	1	1.1	2.4	0.05	0.43	-	0	10	20	50	20	0	0.35	0.28	S	F/B								
	C-MBR-9	29-Jul-17	2	4.3	4.7	0.29	0.4	-	0	0	0	10	30	60	0.21	0.29	S	R/F								
	C-MBR-9	29-Jul-17	3	5	6.8	0.42	0.64	-	0	20	0	0	20	60	0.21	0.41	S	R/F								
	C-MBR-9	29-Jul-17	4	0.9	2	0.05	0.33	-	0	0	0	10	15	75	0.28	0.42	V	R	T							
	C-MBR-9	29-Jul-17	5	1.1	2.3	0.15	0.62	-	0	0	0	0	25	75	0.51	0.45	V	R	P							
	C-MBR-9	29-Jul-17	6	0.65	1.5	0.15	0.49	-	0	70	0	0	30	0	0.28	0.23	S	F				T				
	C-MBR-9	29-Jul-17	7	0.31	1.6	0.11	0.28	-	0	100	0	0	0	0	0.17	0.16	S	F				T				
Wolverine Outflow	C-MS-01	22-Jul-17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			T	T				
Patch Inflow	C-TIA-01	18-Jul-17	1	0.06	0.34	0.01	0.28	-	-	-	-	-	-	-	-	-	-	-			T					
Doris Inflow	C-TIA-02	18-Jul-17	1	0	0.47	0	0.09	-	-	100	-	-	-	-	-	-	-	-			T					
	C-TIA-03	18-Jul-17	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			T					
Ogama Outflow	C-TIA-04	25-Jul-17	11	3.8	8.7	0.45	0.75	-	0	40	40	10	10	0	0.5	0.36	S	F								
	C-TIA-04	25-Jul-17	12	14.8	15.9	1.15	1.55	-	0	100	0	0	0	0	0.43	0.35	S	F								
	C-TIA-04	25-Jul-17	13	3.1	16.6	0.35	0.77	-	0	25	40	20	15	0	0.4	0.38	S	F								
	C-TIA-04	25-Jul-17	14	5.6	7	1.3	1.54	-	0	70	30	0	0	0	0.47	0.29	V	F								
	C-TIA-04	25-Jul-17	15	3.2	5.1	0.27	0.6	-	0	10	60	20	10	0	0.43	0.35	V/U	F								
	C-TIA-04	25-Jul-17	16	19.2	28	1.5	1.93	-	0	100	0	0	0	0	0.43	0.43	S/V	F								
	C-TIA-04	25-Jul-17	17	3.9	6.5	0.32	0.72	-	0	5	25	35	35	0	0.38	0.31	S	F								

Discharge: L = low, M = medium, H = high
Habitat Type: F = flat, Fa = falls, C = cascade, R = riffle, G = glide, BG = boulder garden, P = pool
Residual pool depth = (max depth - crest height)
Substrate: F = Fines (< 2 mm), G = Gravel (2 - 64 mm), C = Cobble (64 - 256), B = Boulders (256 - 4000 mm), R = Bedrock (>4000 mm), O = Other
Bank Shape: U = undercut, V = vertical, S = sloping, O = overhanging
Bank Texture: dominant substrate type
Barriers: F = impassable falls, BG = impassable boulder garden, D = dry channel, OF = overland flow, SF = subsurface flow, WQ = water quality barrier, G - gradient, O = other (list in Comments column)
Classification: list barriers as either T = temporary or P = permanent
Instream cover: Total cover = % cover for entire unit
Riparian cover: Canopy % = cover within 1 m of surface of water, Type = dominant vegetation; G = grass, S = shrub, M = moss, Ma = macrophyte
Overall Habitat: S = spawning, R = rearing, O = overwintering, M = migration; Classifications: N = none, P = poor, F = fair, G = good
NA = not applicable; Dashes = data not collected

Appendix 3.1-2. Detailed Habitat Assessment Data at Proposed Road Crossing Sites, 2017

			Habitat	Instream Cover (%)							Riparian Cover		Photographs			Overall Habitat - NSSB				Overall Habitat - Large-bodied			
Stream Name	**Site Name**	**Date**	**Unit (Field)**	**Total**	**OV**	**IV**	**DP**	**U**	**B**	**OD**	**Canopy (%)**	**Type**	**US**	**DS**	**Across**	**S**	**R**	**O**	**M**	**S**	**R**	**O**	**M**
High Flow																							
Rob Bay Inflow	C-CDR-01	7-Jun-17	1	80	20	60	0	0	0	0	20	G	136	164	165	P	F	N	F				
	C-CDR-01	7-Jun-17	2	-	-	-	-	-	-	-	-	-	166	167	168	N	N	N	N				
	C-CDR-01	7-Jun-17	3	90	20	70	0	0	0	0	20	G	169	170	171	P	P	N	P				
	C-CDR-01	7-Jun-17	4	10	10	90	0	0	0	0	10	G	172	173	174	N	N	N	P				
Glenn Outflow	C-CDR-02	7-Jun-17	1	-	-	-	-	-	-	-	-	-	175	176	177								
	C-CDR-02	7-Jun-17	2	-	-	-	-	-	-	-	-	-	178	179	181								
	C-CDR-02	7-Jun-17	3	-	-	-	-	-	-	-	-	-	182	183	184								
	C-CDR-02	7-Jun-17	4	-	-	-	-	-	-	-	-	-	185	186	187								
	C-CDR-02	7-Jun-17	5	-	-	-	-	-	-	-	-	-	188	189	190								
	C-CDR-02	7-Jun-17	6	-	-	-	-	-	-	-	-	-	191	192	193								
	C-CDR-02	7-Jun-17	7	-	-	-	-	-	-	-	-	-	194	195									
	C-CDR-02	7-Jun-17	8	-	-	-	-	-	-	-	-	-	196	197									
	C-CDR-02	7-Jun-17	9	-	-	-	-	-	-	-	-	-	199										
	C-CDR-02	7-Jun-17	10	-	-	-	-	-	-	-	-	-			200								
	C-CDR-02	7-Jun-17	11	-	-	-	-	-	-	-	-	-	201	202									
Aimaokatalok Inflow	C-MBR-10	11-Jun-17	1	M	-	Yes	-	-	-	-	-	G	872	873	874	N	N	N	N	N	N	N	N
	C-MBR-11	11-Jun-17	1	90	0	80	0	10	0	0	0	G	752	753	754	G	G	N	G	N	F	N	G
	C-MBR-11	11-Jun-17	2	100	0	20	80	0	0	0	0	G	755	756	757	F	G	N	G	N	G	N	G
	C-MBR-11	11-Jun-17	3	90	0	80	0	10	0	0	0	G	758	759	760	G	G	N	G	N	F	N	G
	C-MBR-11	11-Jun-17	4	100	0	20	80	0	0	0	0	G	758	759	760	G	G	N	G	F	G	N	G
	C-MBR-11	11-Jun-17	5	80	0	80	0	10	0	0	0	G	761	762	763	G	G	N	G	N	F	N	G
	C-MBR-11	11-Jun-17	6	100	45	45	0	10	0	0	65	S	764	765	766	G	G	N	G	F	G	N	G
	C-MBR-11	11-Jun-17	7	100	0	15	80	5	0	0	0	G	768	769	770	G	G	N	G	F	G	N	G
	C-MBR-11	11-Jun-17	8	100	0	40	50	10	0	0	0	G	771	772	773	G	G	N	G	G	G	N	G
	C-MBR-12	11-Jun-17	1	55	0	5	0	0	50	0	0	G	780	781	782	F	F	N	F	F	G	N	G
	C-MBR-12	11-Jun-17	2	75	0	0	5	0	70	0	0	G	783	784	785	P	F	N	F	G	G	N	G
	C-MBR-12	11-Jun-17	3	55	5	5	0	5	40	0	5	S	786	787	788	F	F	N	F	F	G	N	G
	C-MBR-12	11-Jun-17	4	75	5	0	0	0	70	0	5	S	789	790	791	N	P	N	P	F	G	N	G
	C-MBR-12	11-Jun-17	5	100	0	0	100	0	0	0	5	S	792	793	784	N	P	N	P	F	G	N	G
	C-MBR-12	11-Jun-17	6	90	10	20	0	0	60	0	10	S	792	793	785	N	N	N	N	N	N	N	F
	C-MBR-13	11-Jun-17	1	75	0	25	50	0	0	0	0	G	822	823	824	G	G	N	G	N	G	N	G
	C-MBR-13	11-Jun-17	2	100	0	100	0	0	0	0	0	G	825	826	827	G	G	N	G	N	F	N	G
	C-MBR-13	11-Jun-17	3	70	0	20	40	10	0	0	0	G	828	829	830	G	G	N	G	N	G	N	G
	C-MBR-13	11-Jun-17	4	90	0	90	0	0	0	0	0	G	831	832	833	G	G	N	G	N	P	N	F
	C-MBR-13	11-Jun-17	5	90	0	85	0	5	0	0	0	G	834	835	836	G	G	N	G	N	P	N	F
	C-MBR-13	11-Jun-17	6	100	0	100	0	0	0	0	0	G	837	838	839	G	G	N	G	N	P	N	F
	C-MBR-13	11-Jun-17	7	90	0	85	0	5	0	0	0	G	840	841	-	G	G	N	G	N	P	N	F
	C-MBR-13	11-Jun-17	8	60	0	10	50	0	0	0	0	G	-	-	-	G	G	N	G	N	G	N	G
	C-MBR-13	11-Jun-17	9	90	0	85	0	5	0	0	0	G	842	843	844	G	G	N	G	N	P	N	F
	C-MBR-13	11-Jun-17	10	70	0	20	50	5	0	0	0	G	845	846	847	G	G	N	G	N	G	N	G
	C-MBR-13	11-Jun-17	11	100	0	100	0	0	0	0	0	G	848	849	850	P	F	N	F	N	P	N	G
	C-MBR-14	8-Jun-17	1	-	-	-	-	-	-	-	-	-	402	403	404	N	N	N	N	N	N	N	N
	C-MBR-15	8-Jun-17	1	95	0	5	90	0	0	0	0	G/S	364	365	366	G	G	N	G	F	G	N	G
	C-MBR-15	8-Jun-17	2	75	0	0	75	0	0	0	0	G	368	369	370	G	G	N	G	P	F	N	F
	C-MBR-15	8-Jun-17	3	100	0	5	95	0	0	0	5	G	371	372	373	G	G	N	G	P	G	N	G
	C-MBR-15	8-Jun-17	4	65	5	50	10	0	0	0	5	S			374	G	G	N	G	P	G	N	G
	C-MBR-15	8-Jun-17	5	85	0	5	80	0	0	0	35	S			375	G	G	P	G	P	G	N	G
	C-MBR-15	8-Jun-17	6	75	0	75	0	0	0	0	0	G	376	377	378	G	G	N	G	P	P	N	G
	C-MBR-15	8-Jun-17	7	90	0	10	80	0	0	0	0	G	380	379		G	G	N	G	P	G	N	G
	C-MBR-15	8-Jun-17	8	95	0	95	0	0	0	0	0	G	384	385	386	F	G	N	G	P	F	N	G

Appendix 3.1-2. Detailed Habitat Assessment Data at Proposed Road Crossing Sites, 2017

			Habitat	Instream Cover (%)							Riparian Cover		Photographs			Overall Habitat - NSSB				Overall Habitat - Large-bodied			
Stream Name	Site Name	Date	Unit (Field)	Total	OV	IV	DP	U	B	OD	Canopy (%)	Type	US	DS	Across	S	R	O	M	S	R	O	M
	C-MBR-15	8-Jun-17	9	95	5	40	40	0	0	0	5	G	381	382	383	G	G	N	G	P	G	N	G
	C-MBR-16	8-Jun-17	1	80	5	75	0	0	0	0	5	G	340	341	342	G	G	N	G	F	G	N	G
	C-MBR-16	8-Jun-17	2	65	0	40	10	5	10	0	0	G	343	344	345	G	G	N	G	F	G	N	G
	C-MBR-16	8-Jun-17	3	65	0	10	0	5	50	0	0	G	346	347	348	F	G	N	G	F	G	N	G
	C-MBR-16	8-Jun-17	4	65	0	10	0	5	40	0	0	G	349	350	351	F	G	N	G	F	G	N	G
	C-MBR-16	8-Jun-17	5	85	0	0	0	5	80	0	0	G	352	353	354	F	E	N	G	G	E	N	G
	C-MBR-16	8-Jun-17	6	75	0	0	5	10	60	0	0	G	355	356	357	G	G	N	G	G	G	N	G
	C-MBR-16	8-Jun-17	7	70	5	60	0	0	5	0	5	G	358	359	360	F	G	N	G	P	G	N	G
	C-MBR-16	8-Jun-17	8	50	0	20	30	0	0	0	0	G	361	362	363	P	G	N	G	P	G	N	G
	C-MBR-17	8-Jun-17	1	-	-	-	-	-	-	-	-		314	312	313	N	P	N	P				
	C-MBR-17	8-Jun-17	2	80	10	70	0	0	0	0	10	G				P	F	N	G				
	C-MBR-17	8-Jun-17	3	80	10	70	0	0	0	0	10	G	315	316	317	F	G	N	G				
	C-MBR-17	8-Jun-17	4	80	10	30	0	40	0	0	10	G			318	F	G	N	G				
	C-MBR-17	8-Jun-17	5	60	0	10	30	20	0	0	0	G	319			F	G	N	G				
	C-MBR-18	8-Jun-17	1	90	10	80	0	0	0	0	10	G		293	294	P	F	N	G				
	C-MBR-18	8-Jun-17	2	90	10	80	0	0	0	0	10	G	295	296	297	P	F	N	G				
	C-MBR-18	8-Jun-17	3	90	10	80	0	0	0	0	10	G	298	299	300	P	F	N	G				
Trout Outflow	C-MBR-19	8-Jun-17	1	100	10	60	0	5	25	0	10	S	265	266	268	F	G	N	G	F	G	N	G
	C-MBR-19	8-Jun-17	2	100	30	30	0	0	40	0	30	S	271	272	273	F	G	N	G	F	G	N	G
	C-MBR-19	8-Jun-17	3	100	10	30	0	0	60	0	10	S	274	275	276	F	G	N	G	F	G	N	G
	C-MBR-19	8-Jun-17	4	100	20	30	0	0	50	0	20	S	277	278	279	F	G	N	G	F	G	N	G
Stickleback Outflow	C-MBR-20	8-Jun-17	1	100	15	85	0	0	0	0	15	G	242	243	244	P	G	N	G	P	G	N	G
	C-MBR-20	8-Jun-17	2	100	10	80	0	10	0	0	10	G/S	245	246	247	P	F	N	G	P	F	N	G
	C-MBR-20	8-Jun-17	3	100	5	5	60	30	0	0	5	G			248	G	G	N	G	G	G	N	G
	C-MBR-20	8-Jun-17	4	100	0	60	0	40	0	0	0	G	249	250	251	F	G	N	G	F	G	N	G
	C-MBR-20	8-Jun-17	5	-	-	-	-	-	-	-	-	-	252	253	254	-	-	-	-	-	-	-	-
	C-MBR-20	8-Jun-17	6	45	5	15	0	25	0	0	5	G	255	256	257	E	E	N	E	E	E	N	E
	C-MBR-20	8-Jun-17	7	15	0	15	0	0	0	0	0	G	258	259	260	P	P	N	G	P	P	N	G
	C-MBR-20	8-Jun-17	8	40	0	10	10	20	0	0	0	G			261	F	G	N	G	F	G	N	G
	C-MBR-20	8-Jun-17	9	35	15	15	0	5	0	0	15	G	262	263	264	P	G	N	G	P	G	N	G
Boulder Creek	C-MBR-7	11-Jun-17	1	-	15	-	-	-	-	-	15	S	402	403	404	-	-	-	G	-	-	-	G
	C-MBR-7	11-Jun-17	2	-	5	-	-	-	-	-	5	S	405	406	407	-	-	-	G	-	-	-	G
	C-MBR-7	11-Jun-17	3	-	15	-	-	-	-	-	15	S	408	409	410	-	-	-	G	-	-	-	G
	C-MBR-7	11-Jun-17	4	-	15	-	-	-	-	-	15	S	411	412	412	-	-	-	G	-	-	-	G
Boulder Creek Trib	C-MBR-8	11-Jun-17	1	90	0	90	0	0	0	0	0	G	918	919	920	G	G	N	G	F	G	N	G
	C-MBR-8	11-Jun-17	2	50	0	50	0	0	0	0	0	G	923	924	925	G	G	N	G	P	F	N	G
Aimaokatalok Inflow	C-MBR-9	11-Jun-17	1	100	0	100	0	0	0	0	0	G	875	876	877	G	G	N	G	P	G	N	G
	C-MBR-9	11-Jun-17	2	50	0	0	0	0	50	0	0	G	878	879	880	P	F	N	F	G	G	N	G
	C-MBR-9	11-Jun-17	3	60	0	10	30	5	15	0	0	G	881	882	883	F	G	N	G	F	G	N	G
	C-MBR-9	11-Jun-17	4	100	0	25	65	10	0	0	0	G	884	885	886	G	G	N	G	F	G	N	G
	C-MBR-9	11-Jun-17	5	100	20	70	0	10	0	0	20	G	887	888	889	G	G	N	G	P	F	N	G
	C-MBR-9	11-Jun-17	6	20	10	0	0	10	0	0	10	S	890	891	892	P	G	N	N	F	G	N	P
	C-MBR-9	11-Jun-17	7	100	20	0	0	0	80	0	20	S	894	893	895/896	N	N	N	N	N	N	N	N
	C-MBR-9	11-Jun-17	8	70	10	30	0	0	30	0	10	S	897	898	899	G	G	N	G	G	G	N	G
	C-MBR-9	11-Jun-17	9	80	0	35	0	5	40	0	0	G	900	901	902	G	G	N	G	G	G	N	G
Wolverine to Patch	C-MS-01	7-Jun-17	1	90	20	70	0	0	0	0	20	G	91	90		P	P	N	P	P	P	N	P
	C-MS-01	7-Jun-17	2	75	5	70	0	0	0	0	5	G	94			P	P	N	P	P	P	N	P
	C-MS-01	7-Jun-17	3	90	20	70	0	0	0	0	20	G	95		96	P	P	N	P	P	P	N	P
	C-MS-01	7-Jun-17	4	-	-	-	-	-	-	-	-	G	97	98	99	N	N	N	N	N	N	N	N

Appendix 3.1-2. Detailed Habitat Assessment Data at Proposed Road Crossing Sites, 2017

			Habitat	Instream Cover (%)							Riparian Cover		Photographs			Overall Habitat - NSSB				Overall Habitat - Large-bodied			
Stream Name	Site Name	Date	Unit (Field)	Total	OV	IV	DP	U	B	OD	Canopy (%)	Type	US	DS	Across	S	R	O	M	S	R	O	M
Patch IF N	C-TIA-01	7-Jun-17	1	90	15	75	0	0	0	0	15	G				F	F	N	G				
	C-TIA-01	7-Jun-17	2	55	35	10	0	10	0	0	35	G	114	115	116	F	G	N	G				
	C-TIA-01	7-Jun-17	3	55	35	10	0	10	0	0	35	G	117	118	119	F	G	N	G				
Doris Inflow	C-TIA-02	7-Jun-17	1	95	10	85	0	0	0	0	10	G	128	127	129	G	G	N	G				
	C-TIA-02	7-Jun-17	2	95	10	85	0	0	0	0	10	G	133	132	134	G	G	N	G				
	C-TIA-03	7-Jun-17	1	NA	-	-	-	-	-	-	100	S/G	138/135	139/143	137/140	N	N	N	P				
Ogama Outflow	C-TIA-04	9-Jun-17	5	50	0	20	30	0	0	0	0	S	533	534	535	F	G	N	G	N	F	N	G
	C-TIA-04	9-Jun-17	6	55	0	10	45	0	0	0	0	S	536	537	538	F	F	N	G	N	P	N	G
	C-TIA-04	9-Jun-17	7	80	0	10	70	0	0	0	0	S	539	540	541	F	F	N	G	N	P	N	G
	C-TIA-04	9-Jun-17	8	55	5	10	40	0	0	0	5	S	542	543	544	F	G	N	G	N	F	N	G
	C-TIA-04	9-Jun-17	9	90	0	15	75	0	0	0	0	S	545	546	547	F	G	N	G	N	F	N	G
Low Flow																							
Rob Bay Trib	C-CDR-01	18-Jul-17	1	100	80	20	0	0	0	0	100	G/S	1090	1091	1092	N	P	N	N				
	C-CDR-01	18-Jul-17	2	100	0	100	0	0	0	0	100	G	1093	1094	1095	N	P	N	P				
	C-CDR-01	18-Jul-17	3	100	0	100	0	0	0	0	100	G	1096	1097	1098	N	N	N	N				
	C-CDR-01	18-Jul-17	4	-	-	-	-	-	-	-	-	-	1099	1100	1101	N	N	N	N				
Glenn OF	C-CDR-02	26-Jul-17	1	95	0	5	90	0	0	0	0	G	1607	1608	1609	G	G	N	G	F	G	N	G
Aimaokatalok Inflow	C-MBR-10	26-Jul-17	-	-	-	-	-	-	-	-	-	-	1594	1595	1596/1597	N	N	N	N				
	C-MBR-11	27-Jul-17	1	95	0	25	70	0	0	0	0	G	1700	1701	1702	G	G	N	G	N	F	N	G
	C-MBR-11	27-Jul-17	2	70	0	40	30	0	0	0	0	G	1703	1704	1705	G	G	N	G	N	F	N	G
	C-MBR-11	27-Jul-17	3	100	50	50	0	0	0	0	50	S/G	1706	1707	1708	G	G	N	G	N	P	N	P
	C-MBR-11	27-Jul-17	4	100	30	70	0	0	0	0	30	G	1709	1710	1711	G	G	N	G	N	P	N	P
	C-MBR-12	27-Jul-17	1	100	2	50	0	0	48	0	0	S/G	1689	1690	1641/1642	G	G	N	G	N	G	N	G
	C-MBR-12	27-Jul-17	2	90	0	0	0	0	90	0	0	S/G	1693	1694	1695	F	F	N	G	N	G	N	G
	C-MBR-12	27-Jul-17	3	70	0	0	0	0	70	0	0	G/S	1696	1697/1698	1699	F	G	N	G	N	G	N	G
	C-MBR-13	27-Jul-17	1	-	-	-	-	-	-	-	-	-	1671	1672	1673/1674/1675	N	P	N	N	N	N	N	N
	C-MBR-13	28-Jul-17	2	-	-	-	-	-	-	-	-	-	1681	1682	1683/1684/1685	P	P	N	N	N	N	N	N
	C-MBR-14	26-Jul-17	-	-	-	-	-	-	-	-	-	-	1579	1582	1583/1584/1585	N	P	N	N				
	C-MBR-15	26-Jul-17	1	100	0	100	0	0	0	0	0	G	1547	1548	1550/1549	G	G	N	G	N	P	N	F
	C-MBR-15	26-Jul-17	2	90	0	15	75	0	0	0	0	G	1551	1552	1553/1554	G	G	N	G	N	F	N	G
	C-MBR-15	26-Jul-17	3	100	0	50	50	0	0	0	0	G	1555	1556	1557	G	G	N	G	N	F	N	G
	C-MBR-15	26-Jul-17	4	70	60	10	0	0	0	0	60	G	1558	1559	1560	G	G	N	G	N	P	N	F
	C-MBR-15	26-Jul-17	5	90	0	40	50	0	0	0	0	S	1564	1565	1566	G	G	N	G	N	F	N	G
	C-MBR-15	26-Jul-17	6	100	0	100	0	0	0	0	0	G	1567	1568	1569	F	F	N	F	N	P	N	P
	C-MBR-15	26-Jul-17	7	90	0	60	30	0	0	0	0	G/S	1570	1571	1572	G	G	N	G	N	F	N	G
	C-MBR-15	26-Jul-17	8	100	0	100	0	0	0	0	0	G	1573	1574	1575	P	P	N	P	N	N	N	N
	C-MBR-15	26-Jul-17	9	40	0	10	30	0	0	0	0	G	1576	1577	1578	G	G	N	G	N	F	N	G
	C-MBR-16	26-Jul-17	1	50	30	10	0	10	0	0	30	G	1517	1518	1519	G	G	N	G				
	C-MBR-16	26-Jul-17	2	40	10	30	0	0	0	0	10	G	1520	1521	1522/1523	G	G	N	G				
	C-MBR-16	26-Jul-17	3	50	30	0	0	20	0	0	30	G	1524	1525	1526	G	G	N	G				
	C-MBR-16	26-Jul-17	4	50	0	0	0	20	30	0	0	G	1527	1528	1529	G	G	N	G				
	C-MBR-16	26-Jul-17	5	85	0	0	0	10	75	0	0	G	1531	1532	1533	F	G	N	F				
	C-MBR-16	26-Jul-17	6	85	10	0	0	15	60	0	10	G	1534	1535	1536	F	F	N	F				
	C-MBR-16	26-Jul-17	7	90	60	30	0	0	0	0	60	G	1537	1538	1539/1540	G	G	N	G				
	C-MBR-17	26-Jul-17	1	100	50	50	0	0	0	0	50	G				G	G	N	F				
	C-MBR-17	26-Jul-17	2	70	20	50	0	0	0	0	20	G	1509	1510	1511	G	G	N	G				
	C-MBR-17	26-Jul-17	3	100	50	50	0	0	0	0	50	G				G	G	N	F				
	C-MBR-17	26-Jul-17	4	70	20	50	0	0	0	0	20	G	1506	1507	1508	G	G	N	G				
	C-MBR-17	26-Jul-17	5	100	50	50	0	0	0	0	50	G				G	G	N	F				
	C-MBR-17	26-Jul-17	6	50	10	40	0	0	0	0	10	G	1503	1504	1505	G	G	N	G				

Appendix 3.1-2. Detailed Habitat Assessment Data at Proposed Road Crossing Sites, 2017

			Habitat	Instream Cover (%)							Riparian Cover		Photographs			Overall Habitat - NSSB				Overall Habitat - Large-bodied			
Stream Name	Site Name	Date	Unit (Field)	Total	OV	IV	DP	U	B	OD	Canopy (%)	Type	US	DS	Across	S	R	O	M	S	R	O	M
	C-MBR-17	26-Jul-17	7	100	50	50	0	0	0	0	50	G				G	G	N	F				
	C-MBR-17	26-Jul-17	8	45	10	5	30	0	0	0	10	G	1500	1501	1502	G	G	N	G				
	C-MBR-18	26-Jul-17	-	-	-	-	-	-	-	-	-	-	1475	1476	1477	N	N	N	N				
Trout Outflow	C-MBR-19	30-Jul-17	1	40	0	10	0	0	30	0	0	G	1864	1865	1866	G	G	N	G	N	F	N	G
	C-MBR-19	30-Jul-17	2	55	15	0	0	0	40	0	15	G/S	1867	1868	1869	P	F	N	F	N	N	N	N
	C-MBR-19	30-Jul-17	3	70	5	15	0	0	50	0	5	G/S	1870	1871	1872	G	G	N	G	N	F	N	G
	C-MBR-19	30-Jul-17	4	80	0	30	0	0	50	0	0	G	1873	1874	1875	G	G	N	G	N	P	N	F
	C-MBR-19	30-Jul-17	5	75	40	5	0	0	30	0	40	S/G	1876	1877	1878, 1879	P	F	N	F	N	P	N	N
Stickleback Outflow	C-MBR-20	30-Jul-17	1	20	0	20	0	0	0	0	0	M	1886	1887	1888	G	G	N	G				
	C-MBR-20	30-Jul-17	2	65	10	50	0	5	0	0	10	M	1889	1890	1891	G	G	N	G				
	C-MBR-20	30-Jul-17	3	100	60	30	10	0	0	0	60	G/S	1892	1893	1894	G	G	N	G				
	C-MBR-20	30-Jul-17	4	80	35	30	10	5	0	0	35	G/S	1895	1896	1897	G	G	N	G				
	C-MBR-20	30-Jul-17	5	80	60	20	0	0	0	0	60	G/S	1898	1899	1900	N	P	N	N				
	C-MBR-20	30-Jul-17	6	-	-	-	-	-	-	-	10	G	1902	1903	1904	N	N	N	N				
	C-MBR-20	30-Jul-17	7	80	60	20	0	0	0	0	60	G/S				F	G	N	F				
	C-MBR-20	30-Jul-17	8	50	10	30	0	10	0	0	10	G/S	1905	1906	1907	G	G	N	G				
Boulder Creek	C-MBR-7	27-Jul-17	1	25	0	10	0	10	5	0	0	M	1620	1621	1622/1623	G	G	N	G				
	C-MBR-7	27-Jul-17	2	50	0	0	50	0	0	0	5	M/S	1625	1626	1627	F	F	N	G				
	C-MBR-7	27-Jul-17	3	50	0	0	50	0	0	0	0	M/S	1628	1629	1630/1631	F	F	N	G				
	C-MBR-7	27-Jul-17	4	40	0	0	5	10	25	0	0	G	1632	1633	1634	G	G	N	G				
Boulder Creek Trib	C-MBR-8	27-Jul-17	1	90	0	90	0	0	0	0	0	G	1641	1642	1643	G	G	N	G	N	P	N	F
Aimaokatalok Inflow	C-MBR-9	29-Jul-17	1	70	25	35	0	0	10	0	25	G	1651	1652	1653	G	G	N	G	N	P	N	F
	C-MBR-9	29-Jul-17	2	20	10	0	0	0	10	0	10	G	1654	1655	1656	G	G	N	G	N	F	N	G
	C-MBR-9	29-Jul-17	3	50	0	10	10	0	30	0	0	G	1657	1658	1659	G	G	N	G	N	F	N	G
	C-MBR-9	29-Jul-17	4	50	20	0	0	0	30	0	20	S				F	F	N	N	N	N	N	N
	C-MBR-9	29-Jul-17	5	80	40	0	0	0	40	0	40	S	1660/1661	1662	1663	N	N	N	N	N	N	N	N
	C-MBR-9	29-Jul-17	6	50	10	40	0	0	0	0	10	G	1665	1666	1667	G	G	N	F	N	P	N	P
	C-MBR-9	29-Jul-17	7	100	80	20	0	0	0	0	80	G/S	1668	1669	1670	G	G	N	F	N	P	N	P
Wolverine Outflow	C-MS-01	22-Jul-17	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N	N	N	N	N	N
Patch Inflow	C-TIA-01	18-Jul-17	1	-	-	-	-	-	-	-	-	-	1038	1037	1039	N	N	N	N	N	N	N	N
Doris Inflow	C-TIA-02	18-Jul-17	1	-	-	-	-	-	-	-	-	-	1046	1047	1048	N	N	N	N	N	N	N	N
	C-TIA-03	18-Jul-17	1	-	-	-	-	-	-	-	-	-	1055	1056	1057	N	N	N	N	N	N	N	N
Ogama Outflow	C-TIA-04	25-Jul-17	11	25	0	20	0	0	5	0	0	G/S	1371	1372	1373/1374	G	G	N	G	N	F	N	G
	C-TIA-04	25-Jul-17	12	80	0	10	70	0	0	0	0	S	1375	1376	1377	G	G	N	G	N	G	N	G
	C-TIA-04	25-Jul-17	13	35	5	20	0	0	10	0	5	S/G	1378	1379	1380/1381	G	G	N	G	N	F	N	G
	C-TIA-04	25-Jul-17	14	45	5	10	30	0	0	0	5	S	1382	1383	1384/1385/186	G	G	N	G	N	G	N	G
	C-TIA-04	25-Jul-17	15	15	0	0	0	5	10	0	0	S/G	1387	1388	1389/1390	F	G	N	G	N	F	N	G
	C-TIA-04	25-Jul-17	16	90	0	30	60	0	0	0	0	M/S	1392	1393	1394	G	G	N	G	N	G	N	G
	C-TIA-04	25-Jul-17	17	40	0	0	0	5	35	0	0	G	1400	1401	1402	F	G	N	G	N	F	N	G

Discharge: L = low, M = medium, H = high
Habitat Type: F = flat, Fa = falls, C = cascade, R = riffle, G = glide, BG = boulder garden, P = pool
Residual pool depth = (max depth - crest height)
Substrate: F = Fines (< 2 mm), G = Gravel (2 - 64 mm), C = Cobble (64 - 256), B = Boulders (256 - 4000 mm), R = Bedrock (>4000 mm), O = Other
Bank Shape: U = undercut, V = vertical, S = sloping, O = overhanging
Bank Texture: dominant substrate type
Barriers: F = impassable falls, BG = impassable boulder garden, D = dry channel, OF = overland flow, SF = subsurface flow, WQ = water quality barrier, G - gradient, O = other (list in Comments column)
Classification: list barriers as either T = temporary or P = permanent
Instream cover: Total cover = % cover for entire unit
Riparian cover: Canopy % = cover within 1 m of surface of water, Type = dominant vegetation; G = grass, S = shrub, M = moss, Ma = macrophyte
Overall Habitat: S = spawning, R = rearing, O = overwintering, M = migration; Classifications: N = none, P = poor, F = fair, G = good
NA = not applicable; Dashes = data not collected

Appendix 3.1-2. Detailed Habitat Assessment Data at Proposed Road Crossing Sites, 2017

Stream Name	Site Name	Date	Habitat Unit (Field)	Overall Habitat - ARGR S	R	O	M	Comments
High Flow								
Rob Bay Inflow	C-CDR-01	7-Jun-17	1					
	C-CDR-01	7-Jun-17	2					Flow through grass
	C-CDR-01	7-Jun-17	3					Poorly defined Channel
	C-CDR-01	7-Jun-17	4					Pooled water in grass, no flow
Glenn Outflow	C-CDR-02	7-Jun-17	1					
	C-CDR-02	7-Jun-17	2					Bank instability, sloughing with ice
	C-CDR-02	7-Jun-17	3					
	C-CDR-02	7-Jun-17	4					
	C-CDR-02	7-Jun-17	5					
	C-CDR-02	7-Jun-17	6					
	C-CDR-02	7-Jun-17	7					Cascade - check for barrier @ low flow
	C-CDR-02	7-Jun-17	8					
	C-CDR-02	7-Jun-17	9					
	C-CDR-02	7-Jun-17	10					
	C-CDR-02	7-Jun-17	11					
Aimaokatalok Inflow	C-MBR-10	11-Jun-17	1	N	N	N	N	No defined channel - wet area d/s of 2 small ponds. No connection to Aim Lake.
	C-MBR-11	11-Jun-17	1	N	F	N	G	HU 1 = u/s end
	C-MBR-11	11-Jun-17	2	N	G	N	G	
	C-MBR-11	11-Jun-17	3	N	F	N	G	
	C-MBR-11	11-Jun-17	4	F	G	N	G	Crossing location through area where stream is braided with heavy willow cover - the channels are incised and there are several small pools and deep glide sections ~ 1 m deep.
	C-MBR-11	11-Jun-17	5	N	F	N	G	
	C-MBR-11	11-Jun-17	6	F	G	N	G	
	C-MBR-11	11-Jun-17	7	F	G	N	G	
	C-MBR-11	11-Jun-17	8	G	G	N	G	Beaded stream section; pools ww = 4 m, glides ww= 4 m; incised channel <1 m.
	C-MBR-12	11-Jun-17	1	F	G	N	G	
	C-MBR-12	11-Jun-17	2	G	G	N	G	
	C-MBR-12	11-Jun-17	3	F	G	N	G	Crossing location is in glide section w/ regular banks.
	C-MBR-12	11-Jun-17	4	F	G	N	G	
	C-MBR-12	11-Jun-17	5	F	G	N	G	Fast flowing, wide channel. No side channels/eddies with slower water for sm bod fish in reach surveyed.
	C-MBR-12	11-Jun-17	6	N	N	N	F	
	C-MBR-13	11-Jun-17	1	N	G	N	G	HU1 = u/s end
	C-MBR-13	11-Jun-17	2	N	F	N	G	Connected to other trib to Aim Lake (Stream crossed @ C-MBR-12)
	C-MBR-13	11-Jun-17	3	N	G	N	G	Beaded Stream, braided with 'flat' habitat units and deep pools connected by shallow glides.
	C-MBR-13	11-Jun-17	4	N	P	N	F	
	C-MBR-13	11-Jun-17	5	N	P	N	F	
	C-MBR-13	11-Jun-17	6	N	P	N	F	
	C-MBR-13	11-Jun-17	7	N	P	N	F	
	C-MBR-13	11-Jun-17	8	N	G	N	G	
	C-MBR-13	11-Jun-17	9	N	P	N	F	
	C-MBR-13	11-Jun-17	10	N	G	N	G	
	C-MBR-13	11-Jun-17	11	N	P	N	G	
	C-MBR-14	8-Jun-17	1	N	N	N	N	Wet areas with water pooled in grassy vegetation. No visible downstream connection to Aim Lake from aerial photos.
	C-MBR-15	8-Jun-17	1	F	G	N	G	
	C-MBR-15	8-Jun-17	2	P	F	N	F	
	C-MBR-15	8-Jun-17	3	P	G	N	G	
	C-MBR-15	8-Jun-17	4	P	G	N	G	
	C-MBR-15	8-Jun-17	5	P	G	N	G	
	C-MBR-15	8-Jun-17	6	P	P	N	G	Crossing Location - at glide section between two large pools
	C-MBR-15	8-Jun-17	7	P	G	N	G	Beaded stream w/large deep pools.
	C-MBR-15	8-Jun-17	8	P	F	N	G	

Appendix 3.1-2. Detailed Habitat Assessment Data at Proposed Road Crossing Sites, 2017

Stream Name	Site Name	Date	Habitat Unit (Field)	Overall Habitat - ARGR				Comments
				S	R	O	M	
	C-MBR-15	8-Jun-17	9	P	G	N	G	
	C-MBR-16	8-Jun-17	1	F	G	N	G	
	C-MBR-16	8-Jun-17	2	F	G	N	G	
	C-MBR-16	8-Jun-17	3	F	G	N	G	
	C-MBR-16	8-Jun-17	4	F	G	N	G	Beautiful tundra stream @ crossing site, aerial photos indicate some lower quality habitat downstream towards Aim Lake.
	C-MBR-16	8-Jun-17	5	G	E	N	G	Crossing location - NSSB observed
	C-MBR-16	8-Jun-17	6	G	G	N	G	Stream is connected to Aim Lake from crossing site
	C-MBR-16	8-Jun-17	7	P	G	N	G	Very braided
	C-MBR-16	8-Jun-17	8	P	G	N	G	
	C-MBR-17	8-Jun-17	1					Not measured - photos only
	C-MBR-17	8-Jun-17	2					
	C-MBR-17	8-Jun-17	3					
	C-MBR-17	8-Jun-17	4					Beaded stream section w/ similar step pools. Continues 50 m u/s from end of survey.
	C-MBR-17	8-Jun-17	5					
	C-MBR-18	8-Jun-17	1					
	C-MBR-18	8-Jun-17	2					
	C-MBR-18	8-Jun-17	3					
Trout Outflow	C-MBR-19	8-Jun-17	1	F	G	N	G	At C-MBR-19 crossing location - main channel is deeply incised.
	C-MBR-19	8-Jun-17	2	F	G	N	G	At time of survey, stream was overbank and flowing through willow and grass on each side.
	C-MBR-19	8-Jun-17	3	F	G	N	G	Evidence of higher flow earlier this season.
	C-MBR-19	8-Jun-17	4	F	G	N	G	
Stickleback Outflow	C-MBR-20	8-Jun-17	1	P	G	N	G	
	C-MBR-20	8-Jun-17	2	P	F	N	G	
	C-MBR-20	8-Jun-17	3	G	G	N	G	
	C-MBR-20	8-Jun-17	4	F	G	N	G	
	C-MBR-20	8-Jun-17	5	-	-	-	-	Not evaluated - still under ice cover
	C-MBR-20	8-Jun-17	6	E	E	N	E	
	C-MBR-20	8-Jun-17	7	P	P	N	G	
	C-MBR-20	8-Jun-17	8	F	G	N	G	
	C-MBR-20	8-Jun-17	9	P	G	N	G	
Boulder Creek	C-MBR-7	11-Jun-17	1	-	-	-	G	
	C-MBR-7	11-Jun-17	2	-	-	-	G	
	C-MBR-7	11-Jun-17	3	-	-	-	G	At time of survey, water was very turbid. Could not determine substrate types, depth, cover or habitat quality. No barriers to fish migration were apparent except potentially water quality.
	C-MBR-7	11-Jun-17	4	-	-	-	G	Crossing @ location of winter road (Snow Fence Still Resent) relatively deeply incised (bank heights ~1.5 m).
Boulder Creek Trib	C-MBR-8	11-Jun-17	1					Gently sloping banks, incised channel only approx 5 m width but water to 25 m width on survey date and bankfull width up to 40 m.
	C-MBR-8	11-Jun-17	2					Beaded tundra stream
Aimaokatalok Inflow	C-MBR-9	11-Jun-17	1					
	C-MBR-9	11-Jun-17	2					
	C-MBR-9	11-Jun-17	3					
	C-MBR-9	11-Jun-17	4					
	C-MBR-9	11-Jun-17	5					Crossing Location = HU 5&6. Two incised channels near LB ~ 20 m W, 3.0 m D, rest of wetted area = F3 habitat, flow through grass
	C-MBR-9	11-Jun-17	6					Step pools, several small ones with drops up to 0.4 m between
	C-MBR-9	11-Jun-17	7					Impassible falls (upstream barrier to migration) - just d/s of crossing location.
	C-MBR-9	11-Jun-17	8	E	E	E	E	
	C-MBR-9	11-Jun-17	9	E	E	E	E	
Wolverine to Patch	C-MS-01	7-Jun-17	1					Braided, multiple channels and ponded areas
	C-MS-01	7-Jun-17	2					Ponded area @ crossing site - no flow at time of survey
	C-MS-01	7-Jun-17	3					Poor connectivity
	C-MS-01	7-Jun-17	4					Dry channel - stream flows away from crossing site into Wolverine Lake but is dry bw lake and crossing site.

Appendix 3.1-2. Detailed Habitat Assessment Data at Proposed Road Crossing Sites, 2017

Stream Name	Site Name	Date	Habitat Unit (Field)	Overall Habitat - ARGR				Comments
				S	R	O	M	
Patch IF N	C-TIA-01	7-Jun-17	1					Flows into pond adjacent to main channel
	C-TIA-01	7-Jun-17	2					Main channel is narrow channel that full detailed hab assess was done on. To the west (20 m) are multiple low spots b/w tundra hummocks resulting in overland flow channels. Some areas are deep due to permafrost slumping. Connected to main channel through sections of flow through grass.
	C-TIA-01	7-Jun-17	3					
Doris Inflow	C-TIA-02	7-Jun-17	1					Visual observation of NSSB
	C-TIA-02	7-Jun-17	2					25 m width, wetted area w/ some distinct braided channels at the time of survey. Riparian habitat = grass, Substrate = fines
	C-TIA-03	7-Jun-17	1					Dry channel - intermittant overland flow. Some sections with defined channel over 15-25 m then splits up and flows through grass and willows. Thick willow cover.
Ogama Outflow	C-TIA-04	9-Jun-17	5					
	C-TIA-04	9-Jun-17	6					
	C-TIA-04	9-Jun-17	7					Crossing location in small pool w/ narrower glide u/s
	C-TIA-04	9-Jun-17	8					
	C-TIA-04	9-Jun-17	9					
Low Flow								
Rob Bay Trib	C-CDR-01	18-Jul-17	1					Very little flow, some areas dry, intermittant. Dead NSSB found in dry channel.
	C-CDR-01	18-Jul-17	2					
	C-CDR-01	18-Jul-17	3					Dry w/ stagnant pools at crossing location
	C-CDR-01	18-Jul-17	4					NDC
Glenn OF	C-CDR-02	26-Jul-17	1					Very turbid, poor visibility to substrates, depth estimated. Substrates determined by walking in and feeling bottom with ruler.
Aimaokatalok Inflow	C-MBR-10	26-Jul-17	-					Assessment only at crossing location, NDC/DC
	C-MBR-11	27-Jul-17	1					
	C-MBR-11	27-Jul-17	2					
	C-MBR-11	27-Jul-17	3					Crossing location
	C-MBR-11	27-Jul-17	4					
	C-MBR-12	27-Jul-17	1	F	G	N	G	
	C-MBR-12	27-Jul-17	2	F	G	N	G	No barriers. Crossing location, VO of fish rising
	C-MBR-12	27-Jul-17	3	F	G	N	G	Lots of algae
	C-MBR-13	27-Jul-17	1	N	N	N	N	Small amount of stagnant water in channel. Dry channel between this location and crossing site.
	C-MBR-13	28-Jul-17	2	N	N	N	N	
	C-MBR-14	26-Jul-17	-					NDC/DC, wet area
	C-MBR-15	26-Jul-17	1					
	C-MBR-15	26-Jul-17	2					
	C-MBR-15	26-Jul-17	3					Large pools (>1 m in depth) with shallow glides w/ lots of veg between them (<10 cm depth)
	C-MBR-15	26-Jul-17	4					
	C-MBR-15	26-Jul-17	5					Crossing location - large pool
	C-MBR-15	26-Jul-17	6					Slow flowing, low gradient
	C-MBR-15	26-Jul-17	7					
	C-MBR-15	26-Jul-17	8					
	C-MBR-15	26-Jul-17	9					
	C-MBR-16	26-Jul-17	1	N	P	N	F	
	C-MBR-16	26-Jul-17	2	N	F	N	G	
	C-MBR-16	26-Jul-17	3	N	P	N	F	Shallow beaded stream. Steeper gradient and moderate rock substrates provide habitat for ARGR.
	C-MBR-16	26-Jul-17	4	N	G	N	G	Low flows may isolate area from Aim Lake later in season.
	C-MBR-16	26-Jul-17	5	N	G	N	F	
	C-MBR-16	26-Jul-17	6	N	F	N	F	Crossing location
	C-MBR-16	26-Jul-17	7	N	P	N	P	
	C-MBR-17	26-Jul-17	1					Crossing location, poor connectivity d/s, stream dries up in grasses
	C-MBR-17	26-Jul-17	2					
	C-MBR-17	26-Jul-17	3					
	C-MBR-17	26-Jul-17	4					
	C-MBR-17	26-Jul-17	5					
	C-MBR-17	26-Jul-17	6					

Appendix 3.1-2. Detailed Habitat Assessment Data at Proposed Road Crossing Sites, 2017

Stream Name	Site Name	Date	Habitat Unit (Field)	Overall Habitat - ARGR S	R	O	M	Comments
	C-MBR-17	26-Jul-17	7					
	C-MBR-17	26-Jul-17	8					Upstream connectivity to pond unknown.
	C-MBR-18	26-Jul-17	-					NDC/DC, dry on survey date, evidence of small channels through grass @ high flow
Trout Outflow	C-MBR-19	30-Jul-17	1	P	G	N	G	
	C-MBR-19	30-Jul-17	2	P	P	N	P	Stream flow is low. Slow moving water in glides separated by boulder garden habitat.
	C-MBR-19	30-Jul-17	3	F	G	N	G	Some boulder gardens appear dry (temporary barriers) while some have small amount of water between rocks.
	C-MBR-19	30-Jul-17	4	P	P	N	F	Crossing location
	C-MBR-19	30-Jul-17	5	P	P	N	P	
Stickleback Outflow	C-MBR-20	30-Jul-17	1	N	P	N	F	
	C-MBR-20	30-Jul-17	2	P	F	N	F	Braided, multiple channels in mud
	C-MBR-20	30-Jul-17	3	P	P	N	P	Poor connectivity in HU 3 - braided with flow through grass
	C-MBR-20	30-Jul-17	4	P	F	N	F	Crossing location. Shallow glides in grass connecting deeper pools. Some small drops, trib comes in from RB.
	C-MBR-20	30-Jul-17	5	N	N	N	N	Channel stagnant, DC Barriers
	C-MBR-20	30-Jul-17	6	N	N	N	N	Channel dry
	C-MBR-20	30-Jul-17	7	P	P	N	P	Temporary overland flow barriers. Alternate channel next to dry one (HU 5&6) spreads out and flows through grasses.
	C-MBR-20	30-Jul-17	8	P	F	N	G	
Boulder Creek	C-MBR-7	27-Jul-17	1	G	G	N	G	
	C-MBR-7	27-Jul-17	2	N	F	N	G	
	C-MBR-7	27-Jul-17	3	N	F	N	G	
	C-MBR-7	27-Jul-17	4	G	G	N	G	Crossing location. Riffle/glide sections provide complex, good quality ARGR habitat for rearing fry. Lots of spawning gravel, deeper pools (not in surveyed reach) but throughout stream may provide overwintering habitat.
Boulder Creek Trib	C-MBR-8	27-Jul-17	1	N	F	N	G	Long glide with lots of macrophytic cover, near outlet of a lake
Aimaokatalok Inflow	C-MBR-9	29-Jul-17	1					NSSB above falls (barrier) and below falls
	C-MBR-9	29-Jul-17	2					
	C-MBR-9	29-Jul-17	3					VO of 100+ NSSB in reach d/s of falls
	C-MBR-9	29-Jul-17	4					Some drops >0.15 cm
	C-MBR-9	29-Jul-17	5					Crossing location. Shallow flow through grasses and willows directly above falls
	C-MBR-9	29-Jul-17	6					
	C-MBR-9	29-Jul-17	7					Some locations of temporary overland flow barriers u/s of falls.
Wolverine Outflow	C-MS-01	22-Jul-17	-					Channel visibly dry from heli, some wet swampy areas but no flow, dry between C-MS-01 road crossing location and Wolverine Lake.
Patch Inflow	C-TIA-01	18-Jul-17	1	N	N	N	N	Channels that were flowing in June are now dry. Multiple visible channels.
Doris Inflow	C-TIA-02	18-Jul-17	1	N	N	N	N	Channel dry. No fish habitat at time of survey. Small pond <1 m depth approx 50 m d/s of crossing location.
	C-TIA-03	18-Jul-17	1	N	N	N	N	Dry with no visible channel on survey date. Was wet/flowing in June is now dry and overgrown by willows and grass. Dead NSSB stranded in small pool near crossing site (n=3).
Ogama Outflow	C-TIA-04	25-Jul-17	11					
	C-TIA-04	25-Jul-17	12					Depth estimated - too deep
	C-TIA-04	25-Jul-17	13					
	C-TIA-04	25-Jul-17	14					C-TIA-04 Road Crossing. Across fairly wide, deep glide. Confined to channel w/ steep banks. Bridge crossing (clean span) ok.
	C-TIA-04	25-Jul-17	15					
	C-TIA-04	25-Jul-17	16					
	C-TIA-04	25-Jul-17	17					

Discharge: L = low, M = medium, H = high
Habitat Type: F = flat, Fa = falls, C = cascade, R = riffle, G = glide, BG = boulder garden, P = pool
Residual pool depth = (max depth - crest height)
Substrate: F = Fines (< 2 mm), G = Gravel (2 - 64 mm), C = Cobble (64 - 256), B = Boulders (256 - 4000 mm), R = Bedrock (>4000 mm), O = Other
Bank Shape: U = undercut, V = vertical, S = sloping, O = overhanging
Bank Texture: dominant substrate type
Barriers: F = impassable falls, BG = impassable boulder garden, D = dry channel, OF = overland flow, SF = subsurface flow, WQ = water quality barrier, G - gradient, O = other (list in Comments column)
Classification: list barriers as either T = temporary or P = permanent
Instream cover: Total cover = % cover for entire unit
Riparian cover: Canopy % = cover within 1 m of surface of water, Type = dominant vegetation; G = grass, S = shrub, M = moss, Ma = macrophyte
Overall Habitat: S = spawning, R = rearing, O = overwintering, M = migration; Classifications: N = none, P = poor, F = fair, G = good
NA = not applicable; Dashes = data not collected

Appendix 3.1-3

Electrofishing Effort and Catch Data at Proposed Road Crossing Sites, 2017

Appendix 3.1-3. Electrofishing Effort and Catch Data at Proposed Road Crossing Sites, 2017

			Upstream End (UTM)		Downstream End (UTM)		Freq	Duty Cycle	Voltage	Water Temp	Cond.		Effort	Number					
Stream	Site	Date	Easting	Northing	Easting	Northing	(Hz)	(%)	(V)	(°C)	(uS/cm)	Pass	(seconds)	NNSB	ARGR	LKTR	SLSC	Total	Comments
Glenn Outflow	C-CDR-02	26-Jul-17	431581	7563642	431576	7563611	30	12	160	12.3	483	1	200	2	0	1	1	4	
Boulder Creek	C-MBR-7	27-Jul-17	434890	7531137	434998	7531140	30	12	200	10.1	317	1	748	2	16	0	0	18	
Boulder Creek Trib	C-MBR-8	27-Jul-17	437949	7524660	437995	7524689	30	12	220	11.9	180	1	504	42	1	0	0	43	
Aimaokatalok Inflow	C-MBR-9	27-Jul-17	439095	7516542	439143	7516560	30	12	250	8.7	125	1	263	30	0	0	0	30	Below falls
Aimaokatalok Inflow	C-MBR-9	27-Jul-17	439143	7516560	439198	7516565	30	12	250	8.7	125	1	238	2	0	0	0	2	Above falls
Aimaokatalok Inflow	C-MBR-11	27-Jul-17	441616	7510734	441630	7510819	30	12	265	8.1	135	1	402	11	0	0	0	11	
Aimaokatalok Inflow	C-MBR-15	26-Jul-17	443338	7507044	443451	7507008	30	12	180-200	10.5	126	1	840	20	0	0	0	20	
Aimaokatalok Inflow	C-MBR-16	26-Jul-17	443573	7505459	443683	7505545	30	12	250-500	9.4	159	1	598	2	2	0	0	4	
Aimaokatalok Inflow	C-MBR-17	26-Jul-17	443525	1504599	443566	1504588	30	12	165-200	6.3	126	1	253	19	0	0	0	19	
Trout Outflow	C-MBR-19	30-Jul-17	442225	7504273	442315	7504183	30	12	350	8.9	103	1	702	26	1	0	0	27	
Stickleback Outflow	C-MBR-20	30-Jul-17	441928	7504297	441931	7504134	30	12	240	10.9	249	1	619	31	4	0	0	35	

Notes:

Species Code: NSSB = Ninespine Stickleback, ARGR = Arctic Grayling, LKTR = Lake Trout, SLSC = Slimy Sculpin

All UTM coordinates in Zone 13N

Appendix 3.1-4

Biological Characteristics of Fish Sampled in Electrofishing Surveys at Proposed Road Crossing Sites, 2017

Appendix 3.1-4. Biological Characteristics of Fish Sampled in Electrofishing Surveys at Proposed Road Crossing Sites, 2017

Stream	Date	Electrofishing Site	Electrofishing Pass	Species Code	Fork Length (mm)	Weight (g)	Sex	Maturity	Comments
Glenn Outflow	26-Jul-17	C-CDR-02	1	SLSC	95	5.67	-	-	
	26-Jul-17	C-CDR-02	1	NSSB	51	1.1	-	-	
	26-Jul-17	C-CDR-02	1	NSSB	62	2.03	-	-	
	26-Jul-17	C-CDR-02	1	LKTR	170	83	-	-	
Aimaokatalok Inflow	27-Jul-17	C-MBR-07	1	ARGR	41	0.59	-	-	Mortality
	27-Jul-17	C-MBR-7	1	ARGR	43	0.44	-	-	
	27-Jul-17	C-MBR-7	1	ARGR	42	0.53	-	-	
	27-Jul-17	C-MBR-7	1	ARGR	41	0.6	-	-	
	27-Jul-17	C-MBR-7	1	ARGR	43	0.66	-	-	
	27-Jul-17	C-MBR-7	1	ARGR	41	0.57	-	-	
	27-Jul-17	C-MBR-7	1	ARGR	41	0.57	-	-	
	27-Jul-17	C-MBR-7	1	ARGR	38	0.42	-	-	
	27-Jul-17	C-MBR-7	1	ARGR	49	1.1	-	-	
	27-Jul-17	C-MBR-7	1	ARGR	43	0.61	-	-	External Parasite
	27-Jul-17	C-MBR-7	1	ARGR	43	0.55	-	-	
	27-Jul-17	C-MBR-7	1	ARGR	42	0.57	-	-	
	27-Jul-17	C-MBR-7	1	ARGR	40	0.52	-	-	
	27-Jul-17	C-MBR-7	1	ARGR	41	0.68	-	-	
	27-Jul-17	C-MBR-7	1	ARGR	36	0.45	-	-	
	27-Jul-17	C-MBR-7	1	ARGR	38	0.41	-	-	
	27-Jul-17	C-MBR-7	1	NSSB	29	0.14	-	-	
	27-Jul-17	C-MBR-7	1	NSSB	25	0.14	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	50	0.7	-	-	Parasite
	27-Jul-17	C-MBR-8	1	NSSB	57	1.67	-	-	Parasite
	27-Jul-17	C-MBR-8	1	NSSB	39	0.63	-	-	Parasite
	27-Jul-17	C-MBR-8	1	NSSB	46	0.74	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	32	0.33	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	57	1.49	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	32	0.33	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	46	0.66	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	63	1.48	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	31	0.24	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	

Appendix 3.1-4. Biological Characteristics of Fish Sampled in Electrofishing Surveys at Proposed Road Crossing Sites, 2017

		Electrofishing		Species	Fork Length	Weight			
Stream	Date	Site	Pass	Code	(mm)	(g)	Sex	Maturity	Comments
Aimaokatalok Inflow	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
(cont'd)	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	NSSB	-	-	-	-	
	27-Jul-17	C-MBR-8	1	ARGR	~220	-	-	-	
	27-Jul-17	C-MBR-9	1	NSSB	51	0.75	-	-	Below falls

Appendix 3.1-4. Biological Characteristics of Fish Sampled in Electrofishing Surveys at Proposed Road Crossing Sites, 2017

		Electrofishing		Species	Fork Length	Weight			
Stream	Date	Site	Pass	Code	(mm)	(g)	Sex	Maturity	Comments
Aimaokatalok Inflow	27-Jul-17	C-MBR-9	1	NSSB	49	0.71	-	-	Below falls
(cont'd)	27-Jul-17	C-MBR-9	1	NSSB	47	0.71	-	-	Below falls
	27-Jul-17	C-MBR-9	1	NSSB	46	0.67	-	-	Below falls
	27-Jul-17	C-MBR-9	1	NSSB	60	1.29	-	-	Below falls
	27-Jul-17	C-MBR-9	1	NSSB	45	0.75	-	-	Below falls
	27-Jul-17	C-MBR-9	1	NSSB	57	1.2	-	-	Below falls
	27-Jul-17	C-MBR-9	1	NSSB	53	1.16	-	-	Below falls
	27-Jul-17	C-MBR-9	1	NSSB	46	0.8	-	-	Below falls
	27-Jul-17	C-MBR-9	1	NSSB	50	1.12	-	-	Below falls
	27-Jul-17	C-MBR-9	1	NSSB	-	-	-	-	Below falls
	27-Jul-17	C-MBR-9	1	NSSB	-	-	-	-	Below falls
	27-Jul-17	C-MBR-9	1	NSSB	-	-	-	-	Below falls
	27-Jul-17	C-MBR-9	1	NSSB	-	-	-	-	Below falls
	27-Jul-17	C-MBR-9	1	NSSB	-	-	-	-	Below falls
	27-Jul-17	C-MBR-9	1	NSSB	-	-	-	-	Below falls
	27-Jul-17	C-MBR-9	1	NSSB	-	-	-	-	Below falls
	27-Jul-17	C-MBR-9	1	NSSB	-	-	-	-	Below falls
	27-Jul-17	C-MBR-9	1	NSSB	-	-	-	-	Below falls
	27-Jul-17	C-MBR-9	1	NSSB	-	-	-	-	Below falls
	27-Jul-17	C-MBR-9	1	NSSB	-	-	-	-	Below falls
	27-Jul-17	C-MBR-9	1	NSSB	-	-	-	-	Below falls
	27-Jul-17	C-MBR-9	1	NSSB	-	-	-	-	Below falls
	27-Jul-17	C-MBR-9	1	NSSB	-	-	-	-	Below falls
	27-Jul-17	C-MBR-9	1	NSSB	-	-	-	-	Below falls
	27-Jul-17	C-MBR-9	1	NSSB	-	-	-	-	Below falls
	27-Jul-17	C-MBR-9	1	NSSB	-	-	-	-	Below falls
	27-Jul-17	C-MBR-9	1	NSSB	-	-	-	-	Below falls
	27-Jul-17	C-MBR-9	1	NSSB	-	-	-	-	Below falls
	27-Jul-17	C-MBR-9	2	NSSB	39	0.34	-	-	Above falls
	27-Jul-17	C-MBR-9	2	NSSB	39	0.29	-	-	Above falls
	27-Jul-17	C-MBR-11	1	NSSB	59	1.31	-	-	Above falls
	27-Jul-17	C-MBR-11	1	NSSB	57	1.1	-	-	Above falls

Appendix 3.1-4. Biological Characteristics of Fish Sampled in Electrofishing Surveys at Proposed Road Crossing Sites, 2017

Stream	Date	Electrofishing Site	Electrofishing Pass	Species Code	Fork Length (mm)	Weight (g)	Sex	Maturity	Comments
Aimaokatalok Inflow	27-Jul-17	C-MBR-11	1	NSSB	39	0.41	-	-	Parasite
(cont'd)	27-Jul-17	C-MBR-11	1	NSSB	36	0.27	-	-	
	27-Jul-17	C-MBR-11	1	NSSB	37	0.45	-	-	
	27-Jul-17	C-MBR-11	1	NSSB	33	0.3	-	-	
	27-Jul-17	C-MBR-11	1	NSSB	29	0.27	-	-	Parasite
	27-Jul-17	C-MBR-11	1	NSSB	37	0.41	-	-	
	27-Jul-17	C-MBR-11	1	NSSB	31	0.32	-	-	
	27-Jul-17	C-MBR-11	1	NSSB	34	0.38	-	-	
	27-Jul-17	C-MBR-11	1	NSSB	27	0.24	-	-	
	26-Jul-17	C-MBR-15	1	NSSB	47	0.84	-	-	
	26-Jul-17	C-MBR-15	1	NSSB	58	1.54	-	-	
	26-Jul-17	C-MBR-15	1	NSSB	27	0.21	-	-	
	26-Jul-17	C-MBR-15	1	NSSB	22	0.14	-	-	
	26-Jul-17	C-MBR-15	1	NSSB	24	0.23	-	-	
	26-Jul-17	C-MBR-15	1	NSSB	25	0.14	-	-	
	26-Jul-17	C-MBR-15	1	NSSB	28	0.21	-	-	
	26-Jul-17	C-MBR-15	1	NSSB	19	0.09	-	-	
	26-Jul-17	C-MBR-15	1	NSSB	25	-	-	-	Too windy to weigh
	26-Jul-17	C-MBR-15	1	NSSB	25	-	-	-	Too windy to weigh
	26-Jul-17	C-MBR-15	1	NSSB	23	-	-	-	Too windy to weigh
	26-Jul-17	C-MBR-15	1	NSSB	25	-	-	-	Too windy to weigh
	26-Jul-17	C-MBR-15	1	NSSB	19-28 mm	-	-	-	Too windy to weigh
	26-Jul-17	C-MBR-15	1	NSSB	19-28 mm	-	-	-	Too windy to weigh
	26-Jul-17	C-MBR-15	1	NSSB	19-28 mm	-	-	-	Too windy to weigh
	26-Jul-17	C-MBR-15	1	NSSB	19-28 mm	-	-	-	Too windy to weigh
	26-Jul-17	C-MBR-15	1	NSSB	19-28 mm	-	-	-	Too windy to weigh
	26-Jul-17	C-MBR-15	1	NSSB	19-28 mm	-	-	-	Too windy to weigh
	26-Jul-17	C-MBR-15	1	NSSB	19-28 mm	-	-	-	Too windy to weigh
	26-Jul-17	C-MBR-15	1	NSSB	19-28 mm	-	-	-	Too windy to weigh
	26-Jul-17	C-MBR-16	1	NSSB	75	2.85	-	-	
	26-Jul-17	C-MBR-16	1	NSSB	73	2.62	-	-	
	26-Jul-17	C-MBR-16	1	ARGR	146	29.74	U	IM	
	26-Jul-17	C-MBR-16	1	ARGR	135	25.6	U	IM	

Appendix 3.1-4. Biological Characteristics of Fish Sampled in Electrofishing Surveys at Proposed Road Crossing Sites, 2017

		Electrofishing		Species	Fork Length	Weight			
Stream	**Date**	**Site**	**Pass**	**Code**	**(mm)**	**(g)**	**Sex**	**Maturity**	**Comments**
Aimaokatalok Inflow	26-Jul-17	C-MBR-17	1	NSSB	65	1.18	-	-	
(cont'd)	26-Jul-17	C-MBR-17	1	NSSB	60	1.24	-	-	Parasite
	26-Jul-17	C-MBR-17	1	NSSB	67	1.62	-	-	
	26-Jul-17	C-MBR-17	1	NSSB	65	1.34	-	-	
	26-Jul-17	C-MBR-17	1	NSSB	56	1.1	-	-	Parasite
	26-Jul-17	C-MBR-17	1	NSSB	65	1.34	-	-	
	26-Jul-17	C-MBR-17	1	NSSB	58	0.95	-	-	
	26-Jul-17	C-MBR-17	1	NSSB	65	1.32	-	-	
	26-Jul-17	C-MBR-17	1	NSSB	62	1.28	-	-	
	26-Jul-17	C-MBR-17	1	NSSB	50	0.69	-	-	
	26-Jul-17	C-MBR-17	1	NSSB	65	1.44	-	-	
	26-Jul-17	C-MBR-17	1	NSSB	60	1.15	-	-	
	26-Jul-17	C-MBR-17	1	NSSB	55	0.85	-	-	
	26-Jul-17	C-MBR-17	1	NSSB	55	1.07	-	-	
	26-Jul-17	C-MBR-17	1	NSSB	60	1.02	-	-	Parasite
	26-Jul-17	C-MBR-17	1	NSSB	65	1.74	-	-	
	26-Jul-17	C-MBR-17	1	NSSB	61	1.19	-	-	
	26-Jul-17	C-MBR-17	1	NSSB	60	1.1	-	-	
	26-Jul-17	C-MBR-17	1	NSSB	52	0.81	-	-	
Trout Outflow	30-Jul-17	C-MBR-19	1	ARGR	131	24.37	U	IM	
	30-Jul-17	C-MBR-19	1	NSSB	59	1.51	-	-	
	30-Jul-17	C-MBR-19	1	NSSB	65	1.62	-	-	
	30-Jul-17	C-MBR-19	1	NSSB	58	1.32	-	-	
	30-Jul-17	C-MBR-19	1	NSSB	50	0.97	-	-	
	30-Jul-17	C-MBR-19	1	NSSB	46	0.74	-	-	
	30-Jul-17	C-MBR-19	1	NSSB	40	0.43	-	-	
	30-Jul-17	C-MBR-19	1	NSSB	47	0.73	-	-	
	30-Jul-17	C-MBR-19	1	NSSB	50	0.95	-	-	
	30-Jul-17	C-MBR-19	1	NSSB	50	0.97	-	-	
	30-Jul-17	C-MBR-19	1	NSSB	23	0.1	-	-	
	30-Jul-17	C-MBR-19	1	NSSB	27	0.2	-	-	
	30-Jul-17	C-MBR-19	1	NSSB	27	0.18	-	-	
	30-Jul-17	C-MBR-19	1	NSSB	29	0.16	-	-	External Parasite (leech)

Appendix 3.1-4. Biological Characteristics of Fish Sampled in Electrofishing Surveys at Proposed Road Crossing Sites, 2017

Stream	Date	Electrofishing Site	Electrofishing Pass	Species Code	Fork Length (mm)	Weight (g)	Sex	Maturity	Comments
Trout Outflow	30-Jul-17	C-MBR-19	1	NSSB	21	0.09	-	-	
(cont'd)	30-Jul-17	C-MBR-19	1	NSSB	27	0.16	-	-	
	30-Jul-17	C-MBR-19	1	NSSB	21	-	-	-	
	30-Jul-17	C-MBR-19	1	NSSB	24	0.11	-	-	
	30-Jul-17	C-MBR-19	1	NSSB	21	0.08	-	-	
	30-Jul-17	C-MBR-19	1	NSSB	21	0.09	-	-	
	30-Jul-17	C-MBR-19	1	NSSB	22	0.1	-	-	
	30-Jul-17	C-MBR-19	1	NSSB	19	0.06	-	-	
	30-Jul-17	C-MBR-19	1	NSSB	< 30 mm	-	-	-	
	30-Jul-17	C-MBR-19	1	NSSB	< 30 mm	-	-	-	
	30-Jul-17	C-MBR-19	1	NSSB	< 30 mm	-	-	-	
	30-Jul-17	C-MBR-19	1	NSSB	< 30 mm	-	-	-	
	30-Jul-17	C-MBR-19	1	NSSB	< 30 mm	-	-	-	VO of +300 NSSB < 30 mm
Stickleback Outflow	30-Jul-17	C-MBR-20	2	NSSB	-	-	-	-	Directly adjacent to Stickleback Lake
	30-Jul-17	C-MBR-20	2	NSSB	-	-	-	-	Directly adjacent to Stickleback Lake
	30-Jul-17	C-MBR-20	2	NSSB	-	-	-	-	Directly adjacent to Stickleback Lake
	30-Jul-17	C-MBR-20	2	NSSB	-	-	-	-	Directly adjacent to Stickleback Lake
	30-Jul-17	C-MBR-20	1	ARGR	98	10.14	-	-	
	30-Jul-17	C-MBR-20	1	ARGR	107	12.95	-	-	
	30-Jul-17	C-MBR-20	1	ARGR	92	9.41	-	-	
	30-Jul-17	C-MBR-20	1	ARGR	95	10.15	-	-	
	30-Jul-17	C-MBR-20	1	NSSB	65	2.39	-	-	Parasite
	30-Jul-17	C-MBR-20	1	NSSB	65	1.71	-	-	
	30-Jul-17	C-MBR-20	1	NSSB	53	0.89	-	-	
	30-Jul-17	C-MBR-20	1	NSSB	50	0.96	-	-	
	30-Jul-17	C-MBR-20	1	NSSB	49	0.83	-	-	
	30-Jul-17	C-MBR-20	1	NSSB	55	0.15	-	-	
	30-Jul-17	C-MBR-20	1	NSSB	59	1.48	-	-	Parasite
	30-Jul-17	C-MBR-20	1	NSSB	47	0.86	-	-	
	30-Jul-17	C-MBR-20	1	NSSB	55	1.07	-	-	
	30-Jul-17	C-MBR-20	1	NSSB	57	1.27	-	-	
	30-Jul-17	C-MBR-20	1	NSSB	54	1.28	-	-	
	30-Jul-17	C-MBR-20	1	NSSB	55	1.23	-	-	

Appendix 3.1-4. Biological Characteristics of Fish Sampled in Electrofishing Surveys at Proposed Road Crossing Sites, 2017

Stream	Date	Electrofishing Site	Electrofishing Pass	Species Code	Fork Length (mm)	Weight (g)	Sex	Maturity	Comments
Stickleback Outflow	30-Jul-17	C-MBR-20	1	NSSB	61	1.14	-	-	
(cont'd)	30-Jul-17	C-MBR-20	1	NSSB	58	1.11	-	-	Parasite
	30-Jul-17	C-MBR-20	1	NSSB	51	0.75	-	-	
	30-Jul-17	C-MBR-20	1	NSSB	50	0.72	-	-	
	30-Jul-17	C-MBR-20	1	NSSB	21	-	-	-	
	30-Jul-17	C-MBR-20	1	NSSB	26	-	-	-	
	30-Jul-17	C-MBR-20	1	NSSB	21	-	-	-	
	30-Jul-17	C-MBR-20	1	NSSB	24	-	-	-	
	30-Jul-17	C-MBR-20	1	NSSB	27	-	-	-	
	30-Jul-17	C-MBR-20	1	NSSB	30	-	-	-	
	30-Jul-17	C-MBR-20	1	NSSB	31	-	-	-	
	30-Jul-17	C-MBR-20	1	NSSB	20	-	-	-	
	30-Jul-17	C-MBR-20	1	NSSB	22	-	-	-	
	30-Jul-17	C-MBR-20	1	NSSB	29	-	-	-	
	30-Jul-17	C-MBR-20	1	SLSC	71	2.85	-	-	Length = total length
	30-Jul-17	C-MBR-20	1	NSSB	< 30 mm	-	-	-	
	30-Jul-17	C-MBR-20	1	NSSB	< 30 mm	-	-	-	
	30-Jul-17	C-MBR-20	1	NSSB	< 30 mm	-	-	-	
	30-Jul-17	C-MBR-20	1	NSSB	< 30 mm	-	-	-	
	30-Jul-17	C-MBR-20	1	NSSB	< 30 mm	-	-	-	
	30-Jul-17	C-MBR-20	1	NSSB	< 30 mm	-	-	-	VO of +500 NSSB < 30 mm at lower end of site near confluence with Trout OF/Aim Lake

Notes:

Species Code: NSSB = Ninespine Stickleback, ARGR = Arctic Grayling, LKTR = Lake Trout, SLSC = Slimy Sculpin

Sex: U = unknown

Maturity: IM = immature

Dashes = data not collected

Appendix 3.2-1

Detailed Habitat Assessment Data in Streams with Potential Water Withdrawal and Use, 2017

Appendix 3.2-1. Detailed Habitat Assessment Data in Streams with Potential Water Withdrawal and Use, 2017

		Habitat Unit	Assessment		Site Length	Fish Form	Water Quality			General				Downstream End (UTM)		Upstream End (UTM)		Habitat	Unit Length	Grad.
Stream Name	Date	(Field)	Type	Crew	(m)	(Y/N)	Temp	pH	Conductivity	Discharge	No Vis. Chan.	Dry/Int.	Trib.	Easting	Northing	Easting	Northing	Type	(m)	(%)
High Flow																				
Imniagut Inflow	7-Jun-17	1	Water Use	LL, LW	30	N	-	-	-	H	N	N	N	-	-	-	-	G	30	-
	7-Jun-17	1	Water Use	KK, LW	25	N	0.4	7	246	H	N	N	N	433757	7551046	433743	7551063	R	25	3
Ogama Outflow	9-Jun-17	1	Water Use	KK, LW	1173	N	7	7.7	73	H	N	N	Y	434889	7555917	435338	7555265	G1	129	0.5
	9-Jun-17	2	Water Use	KK, LW	1173	N	7	7.7	73	H	N	N	Y	434889	7555917	435338	7555265	G1	56	0.5
	9-Jun-17	3	Water Use	KK, LW	1173	N	7	7.7	73	H	N	N	Y	434889	7555917	435338	7555265	P1	122	0
	9-Jun-17	4	Water Use	KK, LW	1173	N	7	7.7	73	H	N	N	Y	434889	7555917	435338	7555265	P1	31	1
	9-Jun-17	5	Water Use	KK, LW	1173	N	7	7.7	73	H	N	N	Y	434889	7555917	435338	7555265	G1	71	0.5
	9-Jun-17	6	Water Use	KK, LW	1173	N	7	7.7	73	H	N	N	Y	434889	7555917	435338	7555265	P1	31	0.5
	9-Jun-17	7	Water Use	KK, LW	1173	N	7	7.7	73	H	N	N	Y	434889	7555917	435338	7555265	P1	39	0.5
	9-Jun-17	8	Water Use	KK, LW	1173	N	7	7.7	73	H	N	N	Y	434889	7555917	435338	7555265	R	19	1.5
	9-Jun-17	9	Water Use	KK, LW	1173	N	7	7.7	73	H	N	N	Y	434889	7555917	435338	7555265	P1	40	1
	9-Jun-17	10	Water Use	KK, LW	1173	N	7	7.7	73	H	N	N	Y	434889	7555917	435338	7555265	R/G1	55	0.5
	9-Jun-17	11	Water Use	KK, LW	1173	N	7	7.7	73	H	N	N	Y	434889	7555917	435338	7555265	P	60	0.5
	9-Jun-17	12	Water Use	KK, LW	1173	N	7	7.7	73	H	N	N	Y	434889	7555917	435338	7555265	R	16	1.5
	9-Jun-17	13	Water Use	KK, LW	1173	N	7	7.7	73	H	N	N	Y	434889	7555917	435338	7555265	G1	84	1
	9-Jun-17	14	Water Use	KK, LW	1173	N	7	7.7	73	H	N	N	Y	434889	7555917	435338	7555265	R	19	1
	9-Jun-17	15	Water Use	KK, LW	1173	N	7	7.7	73	H	N	N	Y	434889	7555917	435338	7555265	G1	55	0.5
	9-Jun-17	16	Water Use	KK, LW	1173	N	7	7.7	73	H	N	N	Y	434889	7555917	435338	7555265	P1	57	0
	9-Jun-17	17	Water Use	KK, LW	1173	N	7	7.7	73	H	N	N	Y	434889	7555917	435338	7555265	Ca/R	32	1.5
	10-Jun-17	18	Water Use	KK, LW	1173	N	-	-	-	H	N	N	Y	435338	7555265	435338	7555265	G1	18	1.5
	10-Jun-17	19	Water Use	KK, LW	1173	N	-	-	-	H	N	N	Y	435338	7555265	435338	7555265	G1	79	1.5
	10-Jun-17	20	Water Use	KK, LW	1173	N	-	-	-	H	N	N	Y	435338	7555265	435338	7555265	R	85	1
	10-Jun-17	21	Water Use	KK, LW	1173	N	-	-	-	H	N	N	Y	435338	7555265	435338	7555265	G1	75	0
Ogama Inflow	9-Jun-17	1	Water Use	KK, LW	922	N	4.6	7.7	219	H	N	N	N	436498	7551398	436618	7750625	G1	42	0.5
	9-Jun-17	2	Water Use	KK, LW	922	N	4.6	7.7	219	H	N	N	N	436498	7551398	436618	7750625	G1	33	0.5
	9-Jun-17	3	Water Use	KK, LW	922	N	4.6	7.7	219	H	N	N	N	436498	7551398	436618	7750625	P1	25	0.5
	9-Jun-17	4	Water Use	KK, LW	922	N	4.6	7.7	219	H	N	N	N	436498	7551398	436618	7750625	G1	17	0.5
	9-Jun-17	5	Water Use	KK, LW	922	N	4.6	7.7	219	H	N	N	N	436498	7551398	436618	7750625	P1	30	1
	9-Jun-17	6	Water Use	KK, LW	922	N	4.6	7.7	219	H	N	N	N	436498	7551398	436618	7750625	Ca	12	2
	9-Jun-17	7	Water Use	KK, LW	922	N	4.6	7.7	219	H	N	N	N	436498	7551398	436618	7750625	G1	58	1
	9-Jun-17	8	Water Use	KK, LW	922	N	4.6	7.7	219	H	N	N	N	436498	7551398	436618	7750625	G1	18	0.5
	9-Jun-17	9	Water Use	KK, LW	922	N	4.6	7.7	219	H	N	N	N	436498	7551398	436618	7750625	G1	43	0.5
	9-Jun-17	10	Water Use	KK, LW	922	N	4.6	7.7	219	H	N	N	N	436498	7551398	436618	7750625	G1	36	1
	9-Jun-17	11	Water Use	KK, LW	922	N	4.6	7.7	219	H	N	N	N	436498	7551398	436618	7750625	G1	73	0.5
	9-Jun-17	12	Water Use	KK, LW	922	N	4.6	7.7	219	H	N	N	N	436498	7551398	436618	7750625	G1	17	0.5
	9-Jun-17	13	Water Use	KK, LW	922	N	4.6	7.7	219	H	N	N	N	436498	7551398	436618	7750625	P1	33	0
	9-Jun-17	14	Water Use	KK, LW	922	N	4.6	7.7	219	H	N	N	N	436498	7551398	436618	7750625	R	83	0.5
	9-Jun-17	15	Water Use	KK, LW	922	N	4.6	7.7	219	H	N	N	N	436498	7551398	436618	7750625	G1	24	0.5
	9-Jun-17	16	Water Use	KK, LW	922	N	4.6	7.7	219	H	N	N	N	436498	7551398	436618	7750625	G1	40	0.5
	9-Jun-17	17	Water Use	KK, LW	922	N	4.6	7.7	219	H	N	N	N	436498	7551398	436618	7750625	P1/G1	32	0
	9-Jun-17	18	Water Use	KK, LW	922	N	4.6	7.7	219	H	N	N	N	436498	7551398	436618	7750625	P1	56	0.5
	9-Jun-17	19	Water Use	KK, LW	922	N	4.6	7.7	219	H	N	N	N	436498	7551398	436618	7750625	G1	31	0
	9-Jun-17	20	Water Use	KK, LW	922	N	4.6	7.7	219	H	N	N	N	436498	7551398	436618	7750625	P1	31	0.5
	9-Jun-17	21	Water Use	KK, LW	922	N	4.6	7.7	219	H	N	N	N	436498	7551398	436618	7750625	R/G1	24	0.5
	9-Jun-17	22	Water Use	KK, LW	922	N	4.6	7.7	219	H	N	N	N	436498	7551398	436618	7750625	G1	21	1
	9-Jun-17	23	Water Use	KK, LW	922	N	4.6	7.7	219	H	N	N	N	436498	7551398	436618	7750625	R/G1	46	1
	9-Jun-17	24	Water Use	KK, LW	922	N	4.6	7.7	219	H	N	N	N	436498	7551398	436618	7750625	R/G1	41	1.5
	9-Jun-17	25	Water Use	KK, LW	922	N	4.6	7.7	219	H	N	N	N	436498	7551398	436618	7750625	R	34	0.5
	9-Jun-17	26	Water Use	KK, LW	922	N	4.6	7.7	219	H	N	N	N	436498	7551398	436618	7750625	G1	22	0.5

Appendix 3.2-1. Detailed Habitat Assessment Data in Streams with Potential Water Withdrawal and Use, 2017

		Habitat Unit	Assessment		Site Length	Fish Form	Water Quality			General				Downstream End (UTM)		Upstream End (UTM)		Habitat	Unit Length	Grad.
Stream Name	Date	(Field)	Type	Crew	(m)	(Y/N)	Temp	pH	Conductivity	Discharge	No Vis. Chan.	Dry/Int.	Trib.	Easting	Northing	Easting	Northing	Type	(m)	(%)
Patch Outflow	10-Jun-17	1	Water Use	KK, LW	130	N	3.7	7.9	162	H	N	N	N	436348	7548933	436289	7549028	P1	37	0.5
	10-Jun-17	2	Water Use	KK, LW	130	N	3.7	7.9	162	H	N	N	N	436348	7548933	436289	7549028	G1	91	0.5
Wolverine Outflow East	10-Jun-17	1	Water Use	KK, LW	565	N	5	8	97	H	Y	N	N	435619	7545961	435302	7545650	R	33	2
	10-Jun-17	2	Water Use	KK, LW	565	N	5	8	97	H	Y	N	N	435619	7545961	435302	7545650	P2	21	0
	10-Jun-17	3	Water Use	KK, LW	565	N	5	8	97	H	Y	N	N	435619	7545961	435302	7545650	G3	46	3
	10-Jun-17	4	Water Use	KK, LW	565	N	5	8	97	H	Y	N	N	435619	7545961	435302	7545650	G2	64	2
	10-Jun-17	5	Water Use	KK, LW	565	N	5	8	97	H	Y	N	N	435619	7545961	435302	7545650	P2	15	0
	10-Jun-17	6	Water Use	KK, LW	565	N	5	8	97	H	Y	N	N	435619	7545961	435302	7545650	G2	65	1
	10-Jun-17	7	Water Use	KK, LW	565	N	5	8	97	H	Y	N	N	435619	7545961	435302	7545650	F2	119	0.5
	10-Jun-17	8	Water Use	KK, LW	565	N	5	8	97	H	Y	N	N	435619	7545961	435302	7545650	F2	35	1
	10-Jun-17	9	Water Use	KK, LW	565	N	5	8	97	H	Y	N	N	435619	7545961	435302	7545650	F2	55	1
	10-Jun-17	10	Water Use	KK, LW	565	N	5	8	97	H	Y	N	N	435619	7545961	435302	7545650	F2	112	2
Wolverine Outflow	7-Jun-17	1	Water Use	KK, LW	697	N	4.6	7.1	62	H	N	N	N	434617	7548287	434685	7548190	G3	10.6	4.5
	7-Jun-17	2	Water Use	KK, LW	697	N	4.6	7.1	62	H	N	N	N	434617	7548287	434685	7548190	P2	3.4	0
	7-Jun-17	3	Water Use	KK, LW	697	N	4.6	7.1	62	H	N	N	N	434617	7548287	434685	7548190	G3	11.2	9
	7-Jun-17	4	Water Use	KK, LW	697	N	4.6	7.1	62	H	N	N	N	434617	7548287	434685	7548190	P2	4.8	2
	7-Jun-17	5	Water Use	KK, LW	697	N	4.6	7.1	62	H	N	N	N	434617	7548287	434685	7548190	G3	40	3
	7-Jun-17	6	Water Use	KK, LW	697	N	4.6	7.1	62	H	N	N	N	434617	7548287	434685	7548190	G3	57	2
	7-Jun-17	7	Water Use	KK, LW	697	N	4.6	7.1	62	H	N	N	N	434617	7548287	434685	7548190	P3	20	0
	7-Jun-17	8	Water Use	KK, LW	697	N	4.6	7.1	62	H	N	N	N	434617	7548287	434685	7548190	F3	90	2
	7-Jun-17	9	Water Use	KK, LW	697	N	4.6	7.1	62	H	N	N	N	434617	7548287	434685	7548190	G3	190	3
	7-Jun-17	10	Water Use	KK, LW	697	N	4.6	7.1	62	H	N	N	N	434617	7548287	434685	7548190	F3	25	2
	7-Jun-17	11	Water Use	KK, LW	697	N	4.6	7.1	62	H	N	N	N	434617	7548287	434685	7548190	G3	125	2
	7-Jun-17	12	Water Use	KK, LW	697	N	4.6	7.1	62	H	N	N	N	434617	7548287	434685	7548190	F2	120	1.5
	7-Jun-17	13	Water Use	KK, LW	697	N	4.6	7.1	62	H	N	N	N	434617	7548287	434685	7548190	F3		2
Stickleback Outflow	8-Jun-17	1	Water Use	KK, LW	120	N	1.5	7.7	79	H	N	N	N	441940	7504223	441931	7504131	G2	12.8	0
	8-Jun-17	2	Water Use	KK, LW	120	N	1.5	7.7	79	H	N	N	N	441940	7504223	441931	7504131	G3	15	0
	8-Jun-17	3	Water Use	KK, LW	120	N	1.5	7.7	79	H	N	N	N	441940	7504223	441931	7504131	P1	3.5	0
	8-Jun-17	4	Water Use	KK, LW	120	N	1.5	7.7	79	H	N	N	N	441940	7504223	441931	7504131	G3	26.5	3
	8-Jun-17	5	Water Use	KK, LW	120	N	1.5	7.7	79	H	N	N	N	441940	7504223	441931	7504131	G?	40	-
	8-Jun-17	6	Water Use	KK, LW	120	N	1.5	7.7	79	H	N	N	N	441940	7504223	441931	7504131	G2	4.6	4
	8-Jun-17	7	Water Use	KK, LW	120	N	1.5	7.7	79	H	N	N	N	441940	7504223	441931	7504131	G3		4
	8-Jun-17	8	Water Use	KK, LW	120	N	1.5	7.7	79	H	N	N	N	441940	7504223	441931	7504131	P3	1.8	0
	8-Jun-17	9	Water Use	KK, LW	120	N	1.5	7.7	79	H	N	N	N	441940	7504223	441931	7504131	G2	15.2	1
Low Flow																				
Imniagut Outflow	22-Jul-17	1	Water Use	KK, SJ	30	Y	12.6	8.5	259	M	N	N	N	433755	7551047	433745	7551064	G	30	4.0
Ogama Outflow	25-Jul-17	1	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	N	434873	7555933	435562	7555210	G	129	0.5
	25-Jul-17	2	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	N	434873	7555933	435562	7555210	P	26	0.0
	25-Jul-17	3	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	N	434873	7555933	435562	7555210	G	39	0.5
	25-Jul-17	4	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	N	434873	7555933	435562	7555210	P	170	0.0
	25-Jul-17	5	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	N	434873	7555933	435562	7555210	G	11.6	0.0
	25-Jul-17	6	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	N	434873	7555933	435562	7555210	P	30	0.5
	25-Jul-17	7	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	N	434873	7555933	435562	7555210	G	111.4	0.5
	25-Jul-17	8	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	N	434873	7555933	435562	7555210	P	29	0.0
	25-Jul-17	9	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	N	434873	7555933	435562	7555210	G	7.1	0.5
	25-Jul-17	10	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	N	434873	7555933	435562	7555210	P	7	0.5
	25-Jul-17	11	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	N	434873	7555933	435562	7555210	G	26.7	1.0
	25-Jul-17	12	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	N	434873	7555933	435562	7555210	P	26.7	0.0

Appendix 3.2-1. Detailed Habitat Assessment Data in Streams with Potential Water Withdrawal and Use, 2017

							Water Quality			General				Downstream End (UTM)		Upstream End (UTM)				
Stream Name	Date	Habitat Unit (Field)	Assessment Type	Crew	Site Length (m)	Fish Form (Y/N)	Temp	pH	Conductivity	Discharge	No Vis. Chan.	Dry/Int.	Trib.	Easting	Northing	Easting	Northing	Habitat Type	Unit Length (m)	Grad. (%)
Ogama Outflow	25-Jul-17	13	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	N	434873	7555933	435562	7555210	G	11.8	0.5
(cont'd)	25-Jul-17	14	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	N	434873	7555933	435562	7555210	G	30.4	0.0
	25-Jul-17	15	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	N	434873	7555933	435562	7555210	G	14.3	0.5
	25-Jul-17	16	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	N	434873	7555933	435562	7555210	P	57.1	0.0
	25-Jul-17	17	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	N	434873	7555933	435562	7555210	R	22	3.5
	25-Jul-17	18	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	N	434873	7555933	435562	7555210	G	29	1.0
	25-Jul-17	19	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	N	434873	7555933	435562	7555210	P	10	0.0
	25-Jul-17	20	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	N	434873	7555933	435562	7555210	G	43.6	0.0
	25-Jul-17	21	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	Y	434873	7555933	435562	7555210	R	24.6	1.5
	25-Jul-17	22	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	Y	434873	7555933	435562	7555210	G	55.5	0.5
	25-Jul-17	23	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	Y	434873	7555933	435562	7555210	P	23.7	0.5
	25-Jul-17	24	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	Y	434873	7555933	435562	7555210	P	21.4	0.5
	25-Jul-17	25	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	Y	434873	7555933	435562	7555210	R	26	2.0
	25-Jul-17	26	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	Y	434873	7555933	435562	7555210	G	24.4	0.0
	25-Jul-17	27	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	Y	434873	7555933	435562	7555210	G	66.6	0.0
	25-Jul-17	28	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	Y	434873	7555933	435562	7555210	P	31.7	0.0
	25-Jul-17	29	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	Y	434873	7555933	435562	7555210	R	33.5	1.5
	25-Jul-17	30	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	Y	434873	7555933	435562	7555210	R	48.7	1.0
	25-Jul-17	31	Water Use	KK, SJ	1275	Y	12.8	9.1	228	M	N	N	Y	434873	7555933	435562	7555210	G	87.7	0.5
P.O. Outflow	25-Jul-17	1	Water Use	KK, SJ	39	-	11.8	9	286	M	N	N	N	436672	7550207	436653	7550166	G	39	0.5
Patch Outflow	22-Jul-17	1	Water Use	KK, SJ	155	Y	13.4	8.6	310	M	N	N	N	436340	7548921	436255	7549016	P	58	0.0
	22-Jul-17	2	Water Use	KK, SJ	155	Y	13.4	8.6	310	M	N	N	N	436340	7548921	436255	7549016	G	97	0.0
Ogama Inflow	19-Jul-17	1	Water Use	KK, JI	998	Y	10.9	7.6	276	M	N	N	N	436498	7551398	436618	7750625	G	56	1.0
	19-Jul-17	2	Water Use	KK, JI	998	Y	10.9	7.6	276	M	N	N	N	436498	7551398	436618	7750625	P	21	0.0
	19-Jul-17	3	Water Use	KK, JI	998	Y	10.9	7.6	276	M	N	N	N	436498	7551398	436618	7750625	G	12	0.0
	19-Jul-17	4	Water Use	KK, JI	998	Y	10.9	7.6	276	M	N	N	N	436498	7551398	436618	7750625	P	39	0.0
	19-Jul-17	5	Water Use	KK, JI	998	Y	10.9	7.6	276	M	N	N	N	436498	7551398	436618	7750625	Ca	16	4.0
	19-Jul-17	6	Water Use	KK, JI	998	Y	10.9	7.6	276	M	N	N	N	436498	7551398	436618	7750625	G	26	0.5
	25-Jul-17	7	Water Use	KK, SJ	998	Y	10.9	7.6	276	M	N	N	N	436498	7551398	436618	7750625	R	22.7	1.0
	25-Jul-17	8	Water Use	KK, SJ	998	Y	10.9	7.6	276	M	N	N	N	436498	7551398	436618	7750625	G	17.8	0.5
	25-Jul-17	9	Water Use	KK, SJ	998	Y	10.9	7.6	276	M	N	N	N	436498	7551398	436618	7750625	G	61.5	0.5
	25-Jul-17	10	Water Use	KK, SJ	998	Y	10.9	7.6	276	M	N	N	N	436498	7551398	436618	7750625	G	45	0.5
	28-Jul-17	11	Water Use	KK, SJ	998	Y	10.9	7.6	276	M	N	N	N	436498	7551398	436618	7750625	G	32.6	0.0
	28-Jul-17	12	Water Use	KK, SJ	998	Y	10.9	7.6	276	M	N	N	N	436498	7551398	436618	7750625	P	6.6	0.0
	28-Jul-17	13	Water Use	KK, SJ	998	Y	10.9	7.6	276	M	N	N	N	436498	7551398	436618	7750625	G	39.9	0.0
	28-Jul-17	14	Water Use	KK, SJ	998	Y	10.9	7.6	276	M	N	N	N	436498	7551398	436618	7750625	G	53.3	0.5
	31-Jul-17	15	Water Use	KK, LW	998	Y	11.3	9.3	290	M	N	N	N	436498	7551398	436618	7750625	P	25.5	0.0
	31-Jul-17	16	Water Use	KK, LW	998	Y	11.3	9.3	290	M	N	N	N	436498	7551398	436618	7750625	G	91.7	0.5
	31-Jul-17	17	Water Use	KK, LW	998	Y	11.3	9.3	290	M	N	N	N	436498	7551398	436618	7750625	G	60.4	0.0
	31-Jul-17	18	Water Use	KK, LW	998	Y	11.3	9.3	290	M	N	N	N	436498	7551398	436618	7750625	P	75.3	0.0
	31-Jul-17	19	Water Use	KK, LW	998	Y	11.3	9.3	290	M	N	N	N	436498	7551398	436618	7750625	G	21.6	0.0
	31-Jul-17	20	Water Use	KK, LW	998	Y	11.3	9.3	290	M	N	N	N	436498	7551398	436618	7750625	P	36.6	0.0
	31-Jul-17	21	Water Use	KK, LW	998	Y	11.3	9.3	290	M	N	N	N	436498	7551398	436618	7750625	G	22.4	2.0
	31-Jul-17	22	Water Use	KK, LW	998	Y	11.3	9.3	290	M	N	N	N	436498	7551398	436618	7750625	P	25.4	0.5
	31-Jul-17	23	Water Use	KK, LW	998	Y	11.3	9.3	290	M	N	N	N	436498	7551398	436618	7750625	G	28	1.0

Appendix 3.2-1. Detailed Habitat Assessment Data in Streams with Potential Water Withdrawal and Use, 2017

							Water Quality			General				Downstream End (UTM)		Upstream End (UTM)				
Stream Name	Date	Habitat Unit (Field)	Assessment Type	Crew	Site Length (m)	Fish Form (Y/N)	Temp	pH	Conductivity	Discharge	No Vis. Chan.	Dry/Int.	Trib.	Easting	Northing	Easting	Northing	Habitat Type	Unit Length (m)	Grad. (%)
Ogama Inflow	31-Jul-17	24	Water Use	KK, LW	998	Y	11.3	9.3	290	M	N	N	N	436498	7551398	436618	7750625	P	9.8	0.0
(cont'd)	31-Jul-17	25	Water Use	KK, LW	998	Y	11.3	9.3	290	M	N	N	N	436498	7551398	436618	7750625	R	80.9	2.0
	31-Jul-17	26	Water Use	KK, LW	998	Y	11.3	9.3	290	M	N	N	N	436498	7551398	436618	7750625	G	28.2	0.5
	31-Jul-17	27	Water Use	KK, LW	998	Y	11.3	9.3	290	M	N	N	N	436498	7551398	436618	7750625	G	43	0.0
Stickleback Outflow	30-Jul-17	1	Water Use	KK, LW	200	Y	10.9	8.7	249	L	N	N	Y	441928	7504297	441931	7504131	G	30	0.5
	30-Jul-17	2	Water Use	KK, LW	200	Y	10.9	8.7	249	L	N	N	Y	441928	7504297	441931	7504131	G	27.5	0.5
	30-Jul-17	3	Water Use	KK, LW	200	Y	10.9	8.7	249	L	N	N	Y	441928	7504297	441931	7504131	G	30.6	2.0
	30-Jul-17	4	Water Use	KK, LW	200	Y	10.9	8.7	249	L	N	N	Y	441928	7504297	441931	7504131	P	35	2.5
	30-Jul-17	5	Water Use	KK, LW	200	Y	10.9	8.7	249	L	N	N	Y	441928	7504297	441931	7504131	G	56.9	1.5
	30-Jul-17	6	Water Use	KK, LW	200	Y	10.9	8.7	249	L	N	N	Y	441928	7504297	441931	7504131	DC	5.3	0.0
	30-Jul-17	7	Water Use	KK, LW	200	Y	10.9	8.7	249	L	N	N	Y	441928	7504297	441931	7504131	F	62.2	1.5
	30-Jul-17	8	Water Use	KK, LW	200	Y	10.9	8.7	249	L	N	N	Y	441928	7504297	441931	7504131	G	15	1.0
Wolverine Outflow East	22-Jul-17	1	Water Use	KK, SJ	620	Y	11.2	-	366	L	Y	Y	Y	435625	7545963	435315	7545641	G	33	-
	22-Jul-17	2	Water Use	KK, SJ	620	Y	11.2	-	366	L	Y	Y	Y	435625	7545963	435315	7545641	P	17	0.0
	22-Jul-17	3	Water Use	KK, SJ	620	Y	11.2	-	366	L	Y	Y	Y	435625	7545963	435315	7545641	G	112	2.5
	22-Jul-17	4	Water Use	KK, SJ	620	Y	11.2	-	366	L	Y	Y	Y	435625	7545963	435315	7545641	P	14.5	0.0
	22-Jul-17	5	Water Use	KK, SJ	620	Y	11.2	-	366	L	Y	Y	Y	435625	7545963	435315	7545641	G	61	0.5
	22-Jul-17	6	Water Use	KK, SJ	620	Y	11.2	-	366	L	Y	Y	Y	435625	7545963	435315	7545641	F	13	0.0
	22-Jul-17	7	Water Use	KK, SJ	620	Y	11.2	-	366	L	Y	Y	Y	435625	7545963	435315	7545641	G	85	-
	22-Jul-17	8	Water Use	KK, SJ	620	Y	11.2	-	366	L	Y	Y	Y	435625	7545963	435315	7545641	NCD	94	-
	26-Jul-17	9	Water Use	KK, SJ	620	Y	11.2	-	366	L	Y	Y	Y	435625	7545963	435315	7545641	G	60	-

Discharge: L = low, M = medium, H = high
Habitat Type: F = flat, Fa = falls, C = cascade, R = riffle, G = glide, BG = boulder garden, P = pool
Residual pool depth = (max depth - crest height)
Substrate: F = Fines (< 2 mm), G = Gravel (2 - 64 mm), C = Cobble (64 - 256), B = Boulders (256 - 4000 mm), R = Bedrock (>4000 mm), O = Other
Bank Shape: U = undercut, V = vertical, S = sloping, O = overhanging
Bank Texture: dominant substrate type
Barriers: F = impassable falls, BG = impassable boulder garden, D = dry channel, OF = overland flow, SF = subsurface flow, WQ = water quality barrier, G - gradient, O = other (list in Comments column)
Classification: list barriers as either T = temporary, P = permanent
Instream cover: Total cover = % cover for entire unit
Riparian cover: Canopy % = cover within 1m of surface of water, Type = dominant vegetation; G = grass, S = shrub, M = moss, Ma = macrophyte.
Overall Habitat: S = spawning, R = rearing, O = overwintering, M = migration; Classifications: N = none, P = poor, F = fair, G = good
NA = not applicable
Dashes = data not collected

Appendix 3.2-1. Detailed Habitat Assessment Data in Streams with Potential Water Withdrawal and Use, 2017

		Habitat Unit	Width (m)		Depth (m)		Residual Pool	Substrate Composition (%)						Bank Height (m)		Bank		Barriers							
Stream Name	**Date**	**(Field)**	**Wetted**	**Bankfull**	**Wetted**	**Bankfull**	**Depth (m)**	**O**	**F**	**G**	**C**	**B**	**R**	**Left**	**Right**	**Shape**	**Texture**	**F**	**BG**	**D**	**OF**	**SF**	**WQ**	**G**	**O**
High Flow																									
Imniagut Inflow	7-Jun-17	1	0.29	0.42	0.1	0.22	-	-	D/SD	-	-	-	-	-	-	-	-								
	7-Jun-17	1	5	5	0.21	0.42	-	0	100	0	0	0	0	0.17	0.21	S	F								
Ogama Outflow	9-Jun-17	1	18	23	>1.5	-	-	0	100	0	0	0	0	-	0.35	S	F								
	9-Jun-17	2	15	17	>1.5	-	-	0	100	0	0	0	0	-	0.31	S/V	F								
	9-Jun-17	3	35	35	>2	-	-	0	100	0	0	0	0	-	0.25	S	F								
	9-Jun-17	4	21	21	>1.5	-	-	0	100	0	0	0	0	-	0.45	S	F								
	9-Jun-17	5	8	12	>1.5	-	-	0	100	0	0	0	0	-	0.33	S	F								
	9-Jun-17	6	21	25	>1.5	-	-	0	100	0	0	0	0	-	0.32	S	F								
	9-Jun-17	7	22	23	>1.5	-	-	0	100	0	0	0	0	-	0.25	S	F								
	9-Jun-17	8	10	12	>1	-	-	-	-	-	-	-	-	-	0.35	S	F								
	9-Jun-17	9	21	25	>2	-	-	-	100	0	0	0	0	-	0.24	S	F								
	9-Jun-17	10	7	9	>1	-	-	-	100	0	0	0	0	-	0.36	S	F								
	9-Jun-17	11	16	16	>2	-	-	-	-	-	-	-	-	-	0.39	S	F								
	9-Jun-17	12	7	10	~1.5	-	-	-	-	-	-	-	-	-	0.4	V	F								
	9-Jun-17	13	12	12	~1	-	-	-	-	-	-	-	-	-	0.23	S	F								
	9-Jun-17	14	7	15	>1	-	-	-	-	-	-	-	-	-	0.34	V	F								
	9-Jun-17	15	9	12	>1.5	-	-	-	-	-	-	-	-	-	0.25	S	F								
	9-Jun-17	16	15	19	>2	-	-	-	-	-	-	-	-	-	0.33	S	F								
	9-Jun-17	17	9	14	~1	-	-	-	-	-	-	-	-	-	0.28	V	F								
	10-Jun-17	18	16	21	>1	-	-	-	-	-	-	-	-	-	0.36	V	F								
	10-Jun-17	19	18	23	>1.5	-	-	-	-	-	-	-	-	-	0.41	V	F/R								
	10-Jun-17	20	12	20	>1	-	-	-	-	-	-	-	-	-	0.26	V	F/R								
	10-Jun-17	21	15	21	~1	-	-	-	-	-	-	-	-	-	0.24	S	F								
Ogama Inflow	9-Jun-17	1	12	15	>1.5	-	-	0	100	0	0	0	0	-	0.21	V	F								
	9-Jun-17	2	8	13	~1	-	-	0	50	0	0	50	0	-	0.24	V	F								
	9-Jun-17	3	16	20	>2	-	-	0	100	0	0	0	0	-	0.25	S	F								
	9-Jun-17	4	8	15	~1.5	-	-	0	40	0	0	60	0	-	0.3	U	F								
	9-Jun-17	5	19	26	>2	-	-	-	-	-	-	-	-	-	0.28	S	F								
	9-Jun-17	6	5	25	>0.8	-	-	0	0	0	10	90	0	-	-	V	F								
	9-Jun-17	7	15	15	~1.6	-	-	0	60	0	10	30	0	-	0.1	V	F								
	9-Jun-17	8	17	26	~1.5	-	-	0	100	0	0	0	0	-	0.3	V/U	F								
	9-Jun-17	9	16	32	~1.5	-	-	0	80	0	0	20	0	-	0.21	V/U	F								
	9-Jun-17	10	12	31	~1.5	-	-	0	30	0	0	70	0	-	0.4	V/U	F								
	9-Jun-17	11	13	15	~1.2	-	-	0	20	40	30	10	0	-	0.35	V/U	F								
	9-Jun-17	12	13	21	~1.5	-	-	0	70	0	0	30	0		0.5	S/U	F								
	9-Jun-17	13	21	25	>2	-	-	-	-	-	-	-	-	-	0.21	S/V	F								
	9-Jun-17	14	15	24	~1	-	-	0	10	10	15	65	0	-	0.16	V/S	F								
	9-Jun-17	15	12	21	~1.5	-	-	0	60	0	5	35	0	-	0.14	V	F								
	9-Jun-17	16	22	26	>2	-	-	-	-	-	-	-	-	-	0.15	S	F								
	9-Jun-17	17	25	29	>2	-	-	-	-	-	-	-	-	-	0.18	S	F								
	9-Jun-17	18	~40	~45	>1	-	-	-	-	-	-	-	-	-	0.29	S	F								
	9-Jun-17	19	12	15	>1	-	-	-	-	-	-	-	-	-	0.27	V	F								
	9-Jun-17	20	23	29	>2	-	-	-	-	-	-	-	-	-	0.17	S	F								
	9-Jun-17	21	15	17	~ 1.2	-	-	0	60	0	0	40	0	-	0.15	V	F								
	9-Jun-17	22	21	25	> 2	-	-	-	-	-	-	-	-	-	0.15	S	F								
	9-Jun-17	23	9	12	~ 1.5	-	-	-	-	-	-	-	-	-	0.18	S	F								
	9-Jun-17	24	6	10	~ 1	-	-	0	50	0	0	50	0	-	0.3	V/U	F								
	9-Jun-17	25	16	18	~ 1	-	-	0	40	0	0	60	0	-	0.16	V/U	F								
	9-Jun-17	26	21	29	~ 0.8	-	-	0	10	65	15	10	0	-	-	S/V	F								

Appendix 3.2-1. Detailed Habitat Assessment Data in Streams with Potential Water Withdrawal and Use, 2017

		Habitat Unit	Width (m)		Depth (m)		Residual Pool	Substrate Composition (%)						Bank Height (m)		Bank		Barriers							
Stream Name	**Date**	**(Field)**	**Wetted**	**Bankfull**	**Wetted**	**Bankfull**	**Depth (m)**	**O**	**F**	**G**	**C**	**B**	**R**	**Left**	**Right**	**Shape**	**Texture**	**F**	**BG**	**D**	**OF**	**SF**	**WQ**	**G**	**O**
Patch Outflow	10-Jun-17	1	51	58	> 1.5	-	-	0	100	0	0	0	0	0.25	-	S	F								
	10-Jun-17	2	12	17	0.45	-	-	0	60	20	10	10	0	0.17	-	-	-								
Wolverine Outflow East	10-Jun-17	1	8	12	0.21	0.42	-	0	100	0	0	0	0	0.2	0.23	S	F								
	10-Jun-17	2	21	24	0.88	1.28	-	0	100	0	0	0	0	0.3	0.35	V	F								
	10-Jun-17	3	21	25	0.21	0.41	-	0	100	0	0	0	0	0.17	0.24	S	F								
	10-Jun-17	4	19	21	0.27	0.45	-	0	100	0	0	0	0	0.13	0.23	S	F								
	10-Jun-17	5	21	28	>1	>1.2	-	0	100	0	0	0	0	0.11	0.14	S	F								
	10-Jun-17	6	19	21	0.33	0.53	-	0	100	0	0	0	0	0.17	0.26	S	F								
	10-Jun-17	7	24	28	0.3	-	-	0	100	0	0	0	0	0.14	0.2	S	F								
	10-Jun-17	8	35	35	0.3	0.48	-	0	100	0	0	0	0	0.14	0.2	S	F								
	10-Jun-17	9	16	16	0.32	0.52	-	0	100	0	0	0	0	0.22	0.17	S	F								
	10-Jun-17	10	7	12	0.25	0.35	-	0	100	0	0	0	0	0.1	0.1	S	F				T				
Wolverine Outflow	7-Jun-17	1	0.36	1.85	0.14	0.25	-	0	100	0	0	0	0	0.28	0.39	S	F								
	7-Jun-17	2	1.7	2.7	0.57	0.82	0.42	0	100	0	0	0	0	0.25	0.27	S	F								
	7-Jun-17	3	0.3	2.2	0.18	0.37	-	0	100	0	0	0	0	0.18	0.19	S	F								
	7-Jun-17	4	1.3	2.7	0.33	0.46	0.34	0	100	0	0	0	0	0.13	0.12	S	F								
	7-Jun-17	5	0.55	0.78	0.17	0.27	-	0	100	0	0	0	0	0.11	0	S	F								
	7-Jun-17	6	0.75	7.3	0.1	0.25	-	0	100	0	0	0	0	0.11	0.21	S	F								
	7-Jun-17	7	-	-	0.4	-	-	0	100	0	0	0	0	-	-	S	F								
	7-Jun-17	8	-	-	0.2	-	-	0	100	0	0	0	0	-	-	S	F								
	7-Jun-17	9	-	-	0.2	-	-	0	100	0	0	0	0	-	-	S	F								
	7-Jun-17	10	-	-	-	-	-	0	100	0	0	0	0	-	-	S	F				T				
	7-Jun-17	11	-	-	-	-	-	0	100	0	0	0	0	-	-	S	F								
	7-Jun-17	12	-	-	-	-	-	0	100	0	0	0	0	-	-	S	F								
	7-Jun-17	13	-	-	-	-	-	0	100	0	0	0	0	-	-	S	F				T				
Stickleback Outflow	8-Jun-17	1	6.6	9.2	0.45	0.7	-	0	100	0	0	0	0	0.5	0	S	F								
	8-Jun-17	2	2.5	4.1	0.2	0.39	-	0	100	0	0	0	0	0.17	0.21	S/U	F								
	8-Jun-17	3	2.6	3.4	0.8	0.95	0.7	0	20	80	0	0	0	0.13	0.2	U	F								
	8-Jun-17	4	6.4	7.9	0.25	0.32	-	0	90	10	0	0	0	0	0.13	V/U	F								
	8-Jun-17	5	-	-	-	-	-		-	-	-	-	-	-	-	-	-								
	8-Jun-17	6	1.1	1.7	0.27	0.43	-	0	35	60	5	0	0	0.17	0.15	V/U	F								
	8-Jun-17	7	2.6	6.5	0.07	0.22	-	0	35	60	5	0	0	0.33	0.2	S	F								
	8-Jun-17	8	3.4	4.4	0.39	0.57	0.36	0	75	25	0	0	0	0.17	0.17	U	F								
	8-Jun-17	9	2.7	5	0.21	0.43	-	0	100	0	0	0	0	0.14	0.22	S	F								
Low Flow																									
Imniagut Outflow	22-Jul-17	1	4	6.7	0.1	0.38	-	0	100	0	0	0	0	0.15	0.18	S	F				T	T			
Ogama Outflow	25-Jul-17	1	5.9	12.1	0.62	0.84	-	0	60	0	40	0	0	0.33	0.26	S/V	F								
	25-Jul-17	2	16.1	19.1	0.93	1.24	0.4	0	100	0	0	0	0	0.4	0.15	S	F								
	25-Jul-17	3	8.3	11.4	0.76	1.14	-	0	60	0	20	20	0	0.5	0.23	S	F								
	25-Jul-17	4	28	37	0.85	1.51	-	0	60	0	40	0	0	0.48	0.48	S	F								
	25-Jul-17	5	7	12.6	0.63	0.91	-	0	45	30	20	5	0	0.47	0.33	S	F								
	25-Jul-17	6	15.5	18.8	1.4	1.66	-	0	100	0	0	0	0	0.26	0.26	S	F								
	25-Jul-17	7	5.7	9.5	0.68	1.23	-	0	85	0	10	5	0	0.55	0.46	S/V	F								
	25-Jul-17	8	16.7	17.5	1.6	1.99	-	0	100	0	0	0	0	0.33	0.33	S	F								
	25-Jul-17	9	5.2	8.8	0.51	0.66	-	0	20	60	10	10	0	0.27	0.28	V	F								
	25-Jul-17	10	5.7	7.7	0.9	1.2	-	0	20	60	10	10	0	0.37	0.31	S	F								
	25-Jul-17	11	3.8	8.7	0.45	0.75	-	0	40	40	10	10	0	0.5	0.36	S	F								
	25-Jul-17	12	14.8	15.9	1.15	1.55	-	0	100	0	0	0	0	0.43	0.35	S	F								

Appendix 3.2-1. Detailed Habitat Assessment Data in Streams with Potential Water Withdrawal and Use, 2017

Stream Name	Date	Habitat Unit (Field)	Width (m) Wetted	Width (m) Bankfull	Depth (m) Wetted	Depth (m) Bankfull	Residual Pool Depth (m)	Substrate Composition (%) O	F	G	C	B	R	Bank Height (m) Left	Right	Bank Shape	Bank Texture	Barriers F	BG	D	OF	SF	WQ	G	O
Ogama Outflow	25-Jul-17	13	3.1	16.6	0.35	0.77	-	0	25	40	20	15	0	0.4	0.38	S	F								
(cont'd)	25-Jul-17	14	5.6	7	1.3	1.54	-	0	70	30	0	0	0	0.47	0.29	V	F								
	25-Jul-17	15	3.2	5.1	0.27	0.6	-	0	10	60	20	10	0	0.43	0.35	V/U	F								
	25-Jul-17	16	19.2	28	1.5	1.93	-	0	100	0	0	0	0	0.43	0.43	S/V	F								
	25-Jul-17	17	3.9	6.5	0.32	0.72	-	0	5	25	35	35	0	0.38	0.31	S	F								
	25-Jul-17	18	3.5	7.3	0.52	0.84	-	0	50	30	10	10	0	0.35	0.41	V/U	F		Potential barrier w/ water loss						
	25-Jul-17	19	4.9	7.6	1.3	1.55	-	0	10	60	20	10	0	0.4	0.25	V	F								
	25-Jul-17	20	6.1	9.5	0.62	0.76	-	0	40	30	10	20	0	0.3	0.18	S	F								
	25-Jul-17	21	4.4	9.7	0.26	0.5	-	0	10	40	20	20	0	0.38	0.29	V/U	F		Potential BG/D barrier @ reduced flow						
	25-Jul-17	22	3.9	7.9	0.52	0.8	-	0	80	10	5	5	0	0.31	0.41	S	F								
	25-Jul-17	23	15.7	18.4	1.3	1.5	-	0	75	0	0	5	20	0.3	0.3	S/V	F/R								
	25-Jul-17	24	11.7	12.6	0.5	0.7	-	0	30	5	20	40	5	0.23	0.41	S	F/R								
	25-Jul-17	25	5.9	8.2	0.19	0.46	-	0	0	0	30	60	10	0.33	0.33	V	F		Potential BG/D barrier @ reduced flow						
	25-Jul-17	26	3.5	5.6	0.34	0.75	-	0	30	0	15	40	15	0.56	0.41	V	F								
	25-Jul-17	27	6.1	14.2	0.24	0.5	-	0	70	20	5	5	0	0.27	0.26	S	F								
	25-Jul-17	28	6.7	7.7	1.4	1.75	-	0	80	0	0	10	10	0.3	0.47	S/V	F/R								
	25-Jul-17	29	4.7	6.8	0.2	0.35	-	0	40	10	10	40	0	0.27	0.22	S	F		Potential BG/D barrier @ reduced flow						
	25-Jul-17	30	7.2	15.7	0.35	0.66	-	0	20	0	20	50	10	0.31	0.35	V	F/R								
	25-Jul-17	31	10.1	14.7	0.6	0.7	-	0	100	0	0	0	0	0.24	0.14	S	F								
P.O. Outflow	25-Jul-17	1	10.3	23.7	0.45	0.75	-	0	100	0	0	0	0	0.3	0.3	S	F								
Patch Outflow	22-Jul-17	1	~ 20		~0.5	pools	>1	0	100	0	0	0	0	0	0	S	F								
	22-Jul-17	2	6.7	11.3	0.25	0.43	-	0	75	15	9	1	0	0.21	0.31	S	F								
Ogama Inflow	19-Jul-17	1	2.9	6.1	0.72	0.94	-	0	50	0	0	50	0	0.12	0.12	V	F								
	19-Jul-17	2	12	14	~1.3	~1.6	0.6	0	100	0	0	0	0	0.3	0.3	V	F								
	19-Jul-17	3	4.2	6.9	0.44	0.86	-	0	15	5	0	80	0	0.15	0.3	S	F								
	19-Jul-17	4	11.7	12.1	0.96	1.41	0.51	0	90	0	0	10	0	0.45	0.25	S	F								
	19-Jul-17	5	3	3.3	0.28	0.49	-	0	0	25	0	75	0	0.14	0.28	V	F								
	19-Jul-17	6	3.1	7.1	0.56	0.72	-	0	20	20	50	10	0	0.28	0.17	V/U	F								
	25-Jul-17	7	2.4	2.4	0.22	0.48	-	0	10	30	40	20	0	0.38	0.29	V/U	F								
	25-Jul-17	8	4	8	0.42	0.58	-	0	5	80	0	15	0	0.19	0.3	V	F								
	25-Jul-17	9	7	12.2	0.37	0.64	-	0	45	45	10	0	0	0.4	0.37	S	F/G								
	25-Jul-17	10	5.3	10	0.55	0.83	-	0	25	25	25	25	0	0.36	0.3	S/U	F								
	28-Jul-17	11	3.7	7.4	0.5	0.87	-	0	0	90	5	5	0	0.43	0.47	V	F								
	28-Jul-17	12	4.7	8.3	1.09	1.43	0.86	0	0	100	0	0	0	0.33	0.39	S	F								
	28-Jul-17	13	4.1	8.6	0.44	0.81	-	0	0	70	25	5	0	0.39	0.5	V	F								
	28-Jul-17	14	3.8	6.5	0.84	0.9	-	0	25	25	25	25	0	0.38	0.4	S	F								
	31-Jul-17	15	11.5	19.8	0.77	1.08	-	0	100	0	0	0	0	0.63	0.3	S	F								
	31-Jul-17	16	3.2	13.8	0.36	0.63	-	0	5	30	30	35	0	0.3	0.29	V/U	F								
	31-Jul-17	17	9.8	18.6	0.91	1.17	-	0	100	0	0	0	0	0.6	0.39	S	F								
	31-Jul-17	18	30	37.4	0.77	1.27	-	0	90	0	0	10	0	0.53	0.48	S	F/R								
	31-Jul-17	19	6.4	11	0.58	0.98	-	0	100	0	0	0	0	0.56	0.53	S	F								
	31-Jul-17	20	14.4	23	0.82	1.23	-	0	100	0	0	0	0	0.35	0.65	S	F								
	31-Jul-17	21	2.9	18.6	0.54	1.05	-	0	40	10	35	15	0	0.63	0.49	V/U	F								
	31-Jul-17	22	8.5	13.3	0.85	1.12	-	0	25	25	25	25	0	0.53	0.47	S	F								
	31-Jul-17	23	3.9	11.4	0.59	0.97	-	0	10	40	30	20	0	0.53	0.57	V	F								

Appendix 3.2-1. Detailed Habitat Assessment Data in Streams with Potential Water Withdrawal and Use, 2017

		Habitat Unit	Width (m)		Depth (m)		Residual Pool	Substrate Composition (%)						Bank Height (m)		Bank		Barriers							
Stream Name	Date	(Field)	Wetted	Bankfull	Wetted	Bankfull	Depth (m)	O	F	G	C	B	R	Left	Right	Shape	Texture	F	BG	D	OF	SF	WQ	G	O
Ogama Inflow	31-Jul-17	24	5.1	9.5	0.63	1.18	-	0	10	20	45	25	0	0.71	0.55	S	F								
(cont'd)	31-Jul-17	25	2.7	9.1	0.17	0.49	-	0	10	60	15	15	0	0.33	0.31	V/U	F								
	31-Jul-17	26	6	27.7	0.24	0.73	-	0	50	50	0	0	0	0.49	0.55	S	F								
	31-Jul-17	27	8	~40	0.35	0.85	-	0	100	0	0	0	0	~0.5	~0.5	S	F								
Stickleback Outflow	30-Jul-17	1	0.92	-	0.06	-	-	0	100	0	0	0	0	-	-	S	F								
	30-Jul-17	2	4.55	20.9	0.21	0.61	-	0	95	5	0	0	0	0.42	0.41	S/U	F								
	30-Jul-17	3	0.55	25.6	0.2	0.63	-	0	100	0	0	0	0	0.32	0.54	S/V	F				T				
	30-Jul-17	4	0.49	4.5	0.3	0.89	-	0	100	0	0	0	0	0.59	0.59	V/U	F	T (NSSB only)							
	30-Jul-17	5	0.28	2.6	0.12	0.6	-	0	100	0	0	0	0	0.51	0.45	V	F			T	T				
	30-Jul-17	6	0	4.7	0	0.32	-	0	10	90	0	0	0	0.32	0.32	S	F			T					
	30-Jul-17	7	0.54	7	0.14	0.54	-	0	100	0	0	0	0	0.45	0.38	S	F				T				
	30-Jul-17	8	1.7	4.4	0.15	0.5	-	0	85	15	0	0	0	0.31	0.41	S	F								
Wolverine Outflow East	22-Jul-17	1	-	-	-	-	-	0	100	0	0	0	0	-	-	S	F				T				
	22-Jul-17	2	18.5	26.5	~0.5	-	~1	0	100	0	0	0	0	-	-	S	F								
	22-Jul-17	3	0.5	24.8	0.05	0.17	-	0	100	0	0	0	0	0.15	0.21	V	F				T				
	22-Jul-17	4	12.5	30	>1	?	>1	0	100	0	0	0	0	-	-	V	F								
	22-Jul-17	5	1.9	27	0.18	0.27	-	0	100	0	0	0	0	0.09	0.09	V	F								
	22-Jul-17	6	4	31	0.2	0.38	-	0	100	0	0	0	0	0.1	0.18	S	F			T	T				
	22-Jul-17	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
	22-Jul-17	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				T				
	26-Jul-17	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				T				

Discharge: L = low, M = medium, H = high
Habitat Type: F = flat, Fa = falls, C = cascade, R = riffle, G = glide, BG = boulder garden, P = pool
Residual pool depth = (max depth - crest height)
Substrate: F = Fines (< 2 mm), G = Gravel (2 - 64 mm), C = Cobble (64 - 256), B = Boulders (256 - 4000 mm), R = Bedrock (>4000 mm), O = Other
Bank Shape: U = undercut, V = vertical, S = sloping, O = overhanging
Bank Texture: dominant substrate type
Barriers: F = impassable falls, BG = impassable boulder garden, D = dry channel, OF = overland flow, SF = subsurface flow, WQ = water quality barrier, G - gradient, O = other (list in Comments column)
Classification: list barriers as either T = temporary, P = permanent
Instream cover: Total cover = % cover for entire unit
Riparian cover: Canopy % = cover within 1m of surface of water, Type = dominant vegetation; G = grass, S = shrub, M = moss, Ma = macrophyte.
Overall Habitat: S = spawning, R = rearing, O = overwintering, M = migration; Classifications: N = none, P = poor, F = fair, G = good
NA = not applicable
Dashes = data not collected

Appendix 3.2-1. Detailed Habitat Assessment Data in Streams with Potential Water Withdrawal and Use, 2017

		Habitat Unit	Instream Cover (%)							Riparian Cover		Photographs			Overall Habitat - NSSB				Overall Habitat - Large-bodied			
Stream Name	Date	(Field)	Total	OV	IV	DP	U	B	OD	Canopy (%)	Type	US	DS	Across	S	R	O	M	S	R	O	M
High Flow																						
Imniagut Inflow	7-Jun-17	1	M	-	Yes	-	-	-	-	-	G	57	59	58/60	G	G	N	G	N	N	N	P
	7-Jun-17	1	90	60	30	0	0	0	0	80	S	51	52	53/54/55/56	G	G	N	G	N	N	N	F
Ogama Outflow	9-Jun-17	1	62	2	10	50	0	0	0	2	S	521	522	523	F	G	N	G	N	F	N	G
	9-Jun-17	2	57	2	5	50	0	0	0	2	S	524	252	526	F	G	N	G	N	F	N	G
	9-Jun-17	3	90	0	5	85	0	0	0	0	S	527	528	529	F	G	N	G	N	P	N	G
	9-Jun-17	4	90	0	5	85	0	0	0	0	S	530	531	532	F	F	N	G	N	P	N	G
	9-Jun-17	5	50	0	20	30	0	0	0	0	S	533	534	535	F	G	N	G	N	F	N	G
	9-Jun-17	6	55	0	10	45	0	0	0	0	S	536	537	538	F	F	N	G	N	P	N	G
	9-Jun-17	7	80	0	10	70	0	0	0	0	S	539	540	541	F	F	N	G	N	P	N	G
	9-Jun-17	8	55	5	10	40	0	0	0	5	S	542	543	544	F	G	N	G	N	F	N	G
	9-Jun-17	9	90	0	15	75	0	0	0	0	S	545	546	547	F	G	N	G	N	F	N	G
	9-Jun-17	10	75	0	15	60	0	0	0	0	S	548	549	550	F	G	N	G	N	G	N	G
	9-Jun-17	11	100	5	15	80	0	0	0	5	S	551	552	553	F	G	N	G	N	G	N	G
	9-Jun-17	12	55	5	20	30	0	0	0	5	S	554	555	556	P	F	N	G	N	F	N	G
	9-Jun-17	13	75	5	30	40	0	0	0	5	S	557	558	559	F	G	N	G	N	G	N	G
	9-Jun-17	14	40	0	20	20	0	0	0	0	S	560	561	562	P	F	N	G	N	G	N	G
	9-Jun-17	15	60	0	30	30	0	0	0	0	G	563	564	565	G	G	N	G	N	G	N	G
	9-Jun-17	16	80	5	15	60	0	0	0	5	G	566	567	568	F	F	N	G	N	G	N	G
	9-Jun-17	17	100	5	20	0	0	75	0	5	S	569	570	571	N	F	N	G	N	F	N	G
	10-Jun-17	18	75	15	30	20	5	5	0	15	S	595	596	597	G	G	N	G	N	G	N	G
	10-Jun-17	19	65	0	35	20	10	0	0	0	G	598	599	600	G	G	N	G	N	G	N	G
	10-Jun-17	20	100	5	0	0	15	80	0	5	S	601	602	603	F	G	N	G	N	G	N	G
	10-Jun-17	21	25	5	10	10	0	0	0	5	G	604	605	606	G	G	N	G	N	G	N	G
Ogama Inflow	9-Jun-17	1	80	0	50	20	10	0	0	0	G	439	440	441	G	G	N	G	N	G	N	G
	9-Jun-17	2	95	15	10	0	20	50	0	15	S	442	443	444	F	G	N	G	N	G	N	G
	9-Jun-17	3	100	10	20	70	0	0	0	10	S	445	446	447	F	G	N	G	N	G	N	G
	9-Jun-17	4	100	10	10	10	10	60	0	10	S	448	449	450	P	G	N	G	N	G	N	G
	9-Jun-17	5	95	0	5	90	0	0	0	5	S	451	452	453	P	G	N	G	N	G	N	G
	9-Jun-17	6	100	20	0	0	10	70	0	20	S	454/459	455/460	-	N	P	N	F	N	P	N	F
	9-Jun-17	7	90	15	40	0	5	30	0	15	S	461	462	463	F	G	N	G	N	G	N	G
	9-Jun-17	8	70	0	40	20	10	0	0	0	G	464	465	466	G	G	N	G	N	G	N	G
	9-Jun-17	9	65	5	35	20	5	0	0	5	S	467	468	469	G	G	N	G	N	G	N	G
	9-Jun-17	10	45	15	10	10	10	0	0	15	S	470	471	472	F	G	N	G	N	G	N	G
	9-Jun-17	11	30	0	10	10	10	0	0	0	G/S	473	474	475	G	G	N	G	F	G	N	G
	9-Jun-17	12	70	0	20	20	5	25	0	0	G/S	476	477	478	G	G	N	G	P	G	N	G
	9-Jun-17	13	100	0	30	65	5	0	0	0	S	479	480	481	G	G	N	G	N	G	N	G
	9-Jun-17	14	90	0	25	5	5	55	0	0	S	482	483	484	G	G	N	G	P	G	N	G
	9-Jun-17	15	55	0	0	10	10	35	0	0	G	485	486	487	G	G	N	G	P	G	N	G
	9-Jun-17	16	100	0	30	70	0	0	0	0	S	488	489	490	G	G	N	G	F	G	N	G
	9-Jun-17	17	100	0	40	55	0	5	0	0	S	491	492	493	G	G	N	G	N	G	N	G
	9-Jun-17	18	100	0	20	80	0	0	0	0	G/S	494	495	496	G	G	N	G	N	G	N	G
	9-Jun-17	19	100	10	15	75	0	0	0	10	S	497	498	499	G	G	N	G	N	G	N	G
	9-Jun-17	20	100	10	10	80	0	0	0	10	S	500	501	502	F	G	N	G	N	G	N	G
	9-Jun-17	21	70	5	15	0	10	40	0	5	S	503	504	505	G	G	N	G	N	G	N	G
	9-Jun-17	22	100	5	25	70	0	0	0	5	S	506	507	508	G	G	N	G	N	G	N	G
	9-Jun-17	23	60	15	0	40	5	0	0	15	S	509	510	511	P	F	N	G	N	G	N	G
	9-Jun-17	24	90	5	15	0	20	50	0	5	S	512	513	514	P	F	N	G	N	G	N	G
	9-Jun-17	25	95	0	15	0	20	60	0	0	G	515	516	517	P	F	N	G	N	G	N	G
	9-Jun-17	26	35	0	30	0	5	0	0	0	G	518	519	520	G	G	N	G	F	G	N	G

Appendix 3.2-1. Detailed Habitat Assessment Data in Streams with Potential Water Withdrawal and Use, 2017

		Habitat Unit	Instream Cover (%)							Riparian Cover		Photographs			Overall Habitat - NSSB				Overall Habitat - Large-bodied			
Stream Name	**Date**	**(Field)**	**Total**	**OV**	**IV**	**DP**	**U**	**B**	**OD**	**Canopy (%)**	**Type**	**US**	**DS**	**Across**	**S**	**R**	**O**	**M**	**S**	**R**	**O**	**M**
Patch Outflow	10-Jun-17	1	70	20	40	10	0	0	0	20	S	634	635	636	G	G	N	G	F	G	N	G
	10-Jun-17	2	70	0	60	0	0	10	0	0	G	637	638	639	G	G	N	G	G	G	N	G
Wolverine Outflow East	10-Jun-17	1	100	0	100	0	0	0	0	0	G	648	649	650	G	G	N	G				
	10-Jun-17	2	100	0	40	60	0	0	0	0	G	651	652	653	G	G	N	G				
	10-Jun-17	3	100	0	100	0	0	0	0	0	G	654	655	656	G	G	N	G				
	10-Jun-17	4	100	0	100	0	0	0	0	0	G	657	658	659	G	G	N	G				
	10-Jun-17	5	90	0	30	60	0	0	0	0	G	660	661	662	G	G	N	G				
	10-Jun-17	6	100	0	100	0	0	0	0	0	G	663	664	665	G	G	N	G				
	10-Jun-17	7	100	0	100	0	0	0	0	0	G	666	667	668	G	G	N	G				
	10-Jun-17	8	100	0	100	0	0	0	0	0	S	669	670	671	G	G	N	G				
	10-Jun-17	9	100	0	100	0	0	0	0	0	S	672	673	674	G	G	N	G				
	10-Jun-17	10	100	40	60	0	0	0	0	40	S	675	676	677	G	G	N	G				
Wolverine Outflow	7-Jun-17	1	95	10	85	0	0	0	0	10	G	-	-	-	F	G	N	G	F	G	N	G
	7-Jun-17	2	15	0	15	0	0	0	0	0	G	72	73	-	F	G	N	G	F	G	N	G
	7-Jun-17	3	80	20	60	0	0	0	0	20	G	-	-	-	F	F	N	G	F	F	N	G
	7-Jun-17	4	20	5	15	0	0	0	0	5	G	74	-	-	F	G	N	G	F	G	N	G
	7-Jun-17	5	25	5	20	0	0	0	0	5	G	-	75	76	F	G	N	G	F	G	N	G
	7-Jun-17	6	20	5	15	0	0	0	0	5	G	77	78	-	F	G	N	G	F	G	N	G
	7-Jun-17	7	10	5	5	0	0	0	0	5	G	79	-	-	G	G	N	F	G	G	N	F
	7-Jun-17	8	80	10	70	0	0	0	0	10	G	81	-	-	F	F	N	F	F	F	N	F
	7-Jun-17	9	80	10	70	0	0	0	0	10	G	82	-	-	F	F	N	G	F	F	N	G
	7-Jun-17	10	85	5	80	0	0	0	0	5	G	83	-	84	P	P	N	F	P	P	N	F
	7-Jun-17	11	85	5	8	0	0	0	0	5	G	-	-	-	F	F	N	G	F	F	N	G
	7-Jun-17	12	60	10	50	0	0	0	0	10	G	85	-	-	F	G	N	G	F	G	N	G
	7-Jun-17	13	70	10	60	0	0	0	0	10	G	86	-	-	P	P	N	P	P	P	N	P
Stickleback Outflow	8-Jun-17	1	100	15	85	0	0	0	0	15	G	242	243	244	P	G	N	G	P	G	N	G
	8-Jun-17	2	100	10	80	0	10	0	0	10	G/S	245	246	247	P	F	N	G	P	F	N	G
	8-Jun-17	3	100	5	5	60	30	0	0	5	G			248	G	G	N	G	G	G	N	G
	8-Jun-17	4	100	0	60	0	40	0	0	0	G	249	250	251	F	G	N	G	F	G	N	G
	8-Jun-17	5	-	-	-	-	-	-	-	-	-	252	253	254	-	-	-	-	-	-	-	-
	8-Jun-17	6	45	5	15	0	25	0	0	5	G	255	256	257	E	E	N	E	E	E	N	E
	8-Jun-17	7	15	0	15	0	0	0	0	0	G	258	259	260	P	P	N	G	P	P	N	G
	8-Jun-17	8	40	0	10	10	20	0	0	0	G			261	F	G	N	G	F	G	N	G
	8-Jun-17	9	35	15	15	0	5	0	0	15	G	262	263	264	P	G	N	G	P	G	N	G
Low Flow																						
Imniagut Outflow	22-Jul-17	1	100	80	20	0	0	0	0	80	S	308/309	306	311/312/313/314	F	G	N	G	N	N	N	P
Ogama Outflow	25-Jul-17	1	55	0	25	30	0	0	0	0	M	1332	1333	1334	G	G	N	G	N	G	N	G
	25-Jul-17	2	55	0	10	45	0	0	0	0	S/G	1335	1336	1337/1338	G	G	N	G	N	G	N	G
	25-Jul-17	3	65	0	25	30	0	10	0	0	S/G	1339	1340	1341	G	G	N	G	N	G	N	G
	25-Jul-17	4	75	0	45	30	0	0	0	0	S	1343	1344	1345	G	G	N	G	N	G	N	G
	25-Jul-17	5	35	0	30	0	0	5	0	0	M	1346	1347	1348	G	G	N	G	N	G	N	G
	25-Jul-17	6	55	0	15	40	0	0	0	0	S	1349	1350	1351	G	G	N	G	N	G	N	G
	25-Jul-17	7	45	0	40	0	0	5	0	0	S/G	1354	1355	1356	G	G	N	G	N	G	N	G
	25-Jul-17	8	60	0	30	30	0	0	0	0	S/G	1361	1363	1364	G	G	N	G	N	G	N	G
	25-Jul-17	9	10	0	0	0	5	5	0	0	S	1365	1366	1367	F	G	N	G	N	G	N	G
	25-Jul-17	10	80	0	10	70	0	0	0	0	S	1368	1369	1370	F	G	N	G	N	G	N	G
	25-Jul-17	11	25	0	20	0	0	5	0	0	G/S	1371	1372	1373/1374	G	G	N	G	N	F	N	G
	25-Jul-17	12	80	0	10	70	0	0	0	0	S	1375	1376	1377	G	G	N	G	N	G	N	G

Appendix 3.2-1. Detailed Habitat Assessment Data in Streams with Potential Water Withdrawal and Use, 2017

		Habitat Unit	Instream Cover (%)							Riparian Cover		Photographs			Overall Habitat - NSSB				Overall Habitat - Large-bodied			
Stream Name	**Date**	**(Field)**	**Total**	**OV**	**IV**	**DP**	**U**	**B**	**OD**	**Canopy (%)**	**Type**	**US**	**DS**	**Across**	**S**	**R**	**O**	**M**	**S**	**R**	**O**	**M**
Ogama Outflow	25-Jul-17	13	35	5	20	0	0	10	0	5	S/G	1378	1379	1380/1381	G	G	N	G	N	F	N	G
(cont'd)	25-Jul-17	14	45	5	10	30	0	0	0	5	S	1382	1383	1384/1385/186	G	G	N	G	N	G	N	G
	25-Jul-17	15	15	0	0	0	5	10	0	0	S/G	1387	1388	1389/1390	F	G	N	G	N	F	N	G
	25-Jul-17	16	90	0	30	60	0	0	0	0	M/S	1392	1393	1394	G	G	N	G	N	G	N	G
	25-Jul-17	17	40	0	0	0	5	35	0	0	G	1400	1401	1402	F	G	N	G	N	F	N	G
	25-Jul-17	18	40	0	10	10	10	10	0	0	G	1403	1404	1405	G	G	N	G	N	G	N	G
	25-Jul-17	19	50	5	0	40	0	5	0	0	G	1406	1407	1408	G	G	N	G	G	G	N	G
	25-Jul-17	20	45	0	5	15	5	20	0	0	G	1409	1410	1411	G	G	N	G	G	G	N	G
	25-Jul-17	21	60	5	20	5	10	20	0	5	G/S	1412	1413	1414	F	G	N	G	N	G	N	F
	25-Jul-17	22	45	10	15	15	0	5	0	10	G	1415	1416	1417	G	G	N	G	N	G	N	G
	25-Jul-17	23	75	0	40	30	0	5	0	0	M	1418	1419	1420	G	G	N	G	N	G	N	G
	25-Jul-17	24	70	0	15	5	0	40	0	0	G/S	1421	1422	1423/1424/1425/1426	G	G	N	G	N	G	N	G
	25-Jul-17	25	65	0	0	0	5	60	0	0	G/S	1435	1436	1437/1440	P	F	N	G	N	G	N	F
	25-Jul-17	26	55	5	0	10	0	40	0	5	S/G	1441	1442	1443	G	G	N	G	N	G	N	G
	25-Jul-17	27	55	0	25	30	0	0	0	0	G	1444	1445	1446	G	G	N	G	N	G	N	G
	25-Jul-17	28	65	5	20	40	0	0	0	5	G/S	1447	1448	1449	F	G	N	G	N	G	N	G
	25-Jul-17	29	70	0	20	10	0	40	0	0	G	1450/1451	1452	1453	F	F	N	G	N	G	N	F
	25-Jul-17	30	80	0	20	10	0	50	0	0	G	1454	1455	1456	G	G	N	G	N	G	N	G
	25-Jul-17	31	60	0	50	10	0	0	0	0	S	1457	1458	1459	G	G	N	G	N	G	N	G
P.O. Outflow	25-Jul-17	1	80	0	80	0	0	0	0	0	G	1328/1329	1327	1	G	G	N	G	N	G	N	G
Patch Outflow	22-Jul-17	1	75	0	5	70	0	0	0	5	S	1195	1196	1197	G	G	N	G	P	G	N	G
	22-Jul-17	2	41	0	0	40	0	0	1	0	G	1198	1199	1200	G	G	N	G	N	G	N	G
Ogama Inflow	19-Jul-17	1	65	5	0	0	10	50	0	5	G/S	1116	1117	1118	G	G	N	G	N	G	N	G
	19-Jul-17	2	85	0	25	60	0	0	0	0	G/S	1119	1120	1121	G	G	N	G	N	G	N	G
	19-Jul-17	3	90	5	5	0	0	80	0	5	G/S	1122	1123	1124	G	G	N	G	N	G	N	G
	19-Jul-17	4	70	5	15	40	0	10	0	5	S/G	1125	1126	1127	G	G	N	G	N	G	N	G
	19-Jul-17	5	90	10	0	0	5	75	0	10	S/G	1128	1129	1130	P	P	N	G	N	F	N	G
	19-Jul-17	6	25	5	5	0	10	5	0	5	G	1131	1132	1133	G	G	N	G	N	F	N	G
	25-Jul-17	7	45	15	0	0	10	20	0	15	G/S	1461	1462	1463	P	G	N	G	N	F	N	G
	25-Jul-17	8	40	5	30	0	0	5	0	5	G	1465	1466	1467	G	G	N	G	N	G	N	G
	25-Jul-17	9	10	0	10	0	0	0	0	0	G	1468	1469	1470/1471	F	G	N	G	N	F	N	G
	25-Jul-17	10	50	5	10	0	10	25	0	5	G	1472	1473	1474	G	G	N	G	N	G	N	G
	28-Jul-17	11	15	0	10	0	0	5	0	0	G	1712	1713	1714	G	G	N	G	N	G	N	G
	28-Jul-17	12	50	10	0	40	0	0	0	10	G	1715	1716	1717	G	G	N	G	N	G	N	G
	28-Jul-17	13	10	5	0	0	0	5	0	5	G	1718	1719	1720/1721	G	G	N	G	N	G	N	G
	28-Jul-17	14	70	0	40	0	0	30	0	0	G	1722	1723	1724	G	G	N	G	N	F	N	G
	31-Jul-17	15	80	0	60	20	0	0	0	0	G	1936	1937	1938	G	G	N	G	N	G	N	G
	31-Jul-17	16	50	0	10	0	5	35	0	0	G	1939	1940	1941	G	G	N	G	N	G	N	G
	31-Jul-17	17	85	0	75	10	0	0	0	0	G	1942	1943	1944	G	G	N	G	N	G	N	G
	31-Jul-17	18	85	0	75	10	0	0	0	0	G/M	1945	1946	1947	G	G	N	G	N	G	N	G
	31-Jul-17	19	80	0	80	0	0	0	0	0	G	1948	1949	1950	G	G	N	G	N	G	N	G
	31-Jul-17	20	85	0	45	40	0	0	0	0	S	1951	1952	1953	G	G	N	G	N	G	N	G
	31-Jul-17	21	45	0	35	0	10	0	0	0	G	1954	1955	1956	G	G	N	G	N	G	N	G
	31-Jul-17	22	50	0	25	0	0	25	0	0	G	1957	1958	1959	G	G	N	G	N	G	N	G
	31-Jul-17	23	35	5	20	0	0	10	0	0	S/G	1960	1961	1962	G	G	N	G	N	G	N	G

Appendix 3.2-1. Detailed Habitat Assessment Data in Streams with Potential Water Withdrawal and Use, 2017

		Habitat Unit	Instream Cover (%)							Riparian Cover		Photographs			Overall Habitat - NSSB				Overall Habitat - Large-bodied			
Stream Name	Date	(Field)	Total	OV	IV	DP	U	B	OD	Canopy (%)	Type	US	DS	Across	S	R	O	M	S	R	O	M
Ogama Inflow	31-Jul-17	24	45	5	0	15	0	25	0	0	S/G	1963	1964	1965	F	F	N	G	N	G	N	G
(cont'd)	31-Jul-17	25	35	5	10	0	5	15	0	5	G/S	1966	1967	1968	F	F	N	G	N	G	N	G
	31-Jul-17	26	35	0	35	0	0	0	0	0	G	1969	1970	1971	G	G	N	G	N	F	N	G
	31-Jul-17	27	95	0	95	0	0	0	0	0	Ma	1972	1973	1974	G	G	N	G	N	F	N	G
Stickleback Outflow	30-Jul-17	1	20	0	20	0	0	0	0	0	M	1886	1887	1888	G	G	N	G				
	30-Jul-17	2	65	10	50	0	5	0	0	10	M	1889	1890	1891	G	G	N	G				
	30-Jul-17	3	100	60	30	10	0	0	0	60	G/S	1892	1893	1894	G	G	N	G				
	30-Jul-17	4	80	35	30	10	5	0	0	35	G/S	1895	1896	1897	G	G	N	G				
	30-Jul-17	5	80	60	20	0	0	0	0	60	G/S	1898	1899	1900	N	P	N	N				
	30-Jul-17	6	-	-	-	-	-	-	-	10	G	1902	1903	1904	N	N	N	N				
	30-Jul-17	7	80	60	20	0	0	0	0	60	G/S	-	-	-	F	G	N	F				
	30-Jul-17	8	50	10	30	0	10	0	0	10	G/S	1905	1906	1907	G	G	N	G				
Wolverine Outflow East	22-Jul-17	1	100	0	100	0	0	0	0	5	G	1208	1209	1211	G	G	N	G	N	N	N	N
	22-Jul-17	2	90	0	80	10	0	0	0	0	G	1208	1209	1211	G	G	N	G	N	N	N	P
	22-Jul-17	3	70	40	30	0	0	0	0	40	G/S	1212	1213	1214	G	G	N	G	N	N	N	N
	22-Jul-17	4	100	0	30	70	0	0	0	0	G	1216	1217	1219	G	G	N	G	N	G	N	G
	22-Jul-17	5	85	5	80	0	0	0	0	5	G	1220	1221	1222	G	G	N	G	N	N	N	P
	22-Jul-17	6	100	40	60	0	0	0	0	40	G	1223	1224	1225	G	G	N	P	N	N	N	N
	22-Jul-17	7	-	-	-	-	-	-	-	-	-	-	-	-	G	G	N	G	N	N	N	P
	22-Jul-17	8	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N	N	N	N	N	N
	26-Jul-17	9	-	-	-	-	-	-	-	-	-	-	-	-	P	P	N	P	N	N	N	N

Discharge: L = low, M = medium, H = high
Habitat Type: F = flat, Fa = falls, C = cascade, R = riffle, G = glide, BG = boulder garden, P = pool
Residual pool depth = (max depth - crest height)
Substrate: F = Fines (< 2 mm), G = Gravel (2 - 64 mm), C = Cobble (64 - 256), B = Boulders (256 - 4000 mm), R = Bedrock (>4000 mm), O = Other
Bank Shape: U = undercut, V = vertical, S = sloping, O = overhanging
Bank Texture: dominant substrate type
Barriers: F = impassable falls, BG = impassable boulder garden, D = dry channel, OF = overland flow, SF = subsurface flow, WQ = water quality barrier, G - gradient, O = other (list in Comments column)
Classification: list barriers as either T = temporary, P = permanent
Instream cover: Total cover = % cover for entire unit
Riparian cover: Canopy % = cover within 1m of surface of water, Type = dominant vegetation; G = grass, S = shrub, M = moss, Ma = macrophyte.
Overall Habitat: S = spawning, R = rearing, O = overwintering, M = migration; Classifications: N = none, P = poor, F = fair, G = good
NA = not applicable
Dashes = data not collected

Appendix 3.2-1. Detailed Habitat Assessment Data in Streams with Potential Water Withdrawal and Use, 2017

Stream Name	Date	Habitat Unit (Field)	Overall Habitat - ARGR S	R	O	M	Comments
High Flow							
Imniagut Inflow	7-Jun-17	1					Flow through grasses, braided channel, inflow to Imniagut Lake
	7-Jun-17	1					Small channel, very braided. Area of heavy willow cover. Flow through grasses and willow.
Ogama Outflow	9-Jun-17	1					
	9-Jun-17	2					
	9-Jun-17	3					
	9-Jun-17	4					
	9-Jun-17	5					
	9-Jun-17	6					
	9-Jun-17	7					
	9-Jun-17	8					
	9-Jun-17	9					
	9-Jun-17	10					
	9-Jun-17	11					Trib inflow
	9-Jun-17	12					
	9-Jun-17	13					
	9-Jun-17	14					
	9-Jun-17	15					
	9-Jun-17	16					
	9-Jun-17	17					
	10-Jun-17	18					
	10-Jun-17	19					
	10-Jun-17	20					
	10-Jun-17	21					
Ogama Inflow	9-Jun-17	1					
	9-Jun-17	2					
	9-Jun-17	3					Widths are approximate (measured with range finder). Depth is estimate for most cases as too deep to cross.
	9-Jun-17	4					
	9-Jun-17	5					
	9-Jun-17	6					
	9-Jun-17	7					
	9-Jun-17	8					
	9-Jun-17	9					
	9-Jun-17	10					
	9-Jun-17	11					
	9-Jun-17	12					
	9-Jun-17	13					
	9-Jun-17	14					
	9-Jun-17	15					
	9-Jun-17	16					
	9-Jun-17	17					
	9-Jun-17	18					
	9-Jun-17	19					
	9-Jun-17	20					
	9-Jun-17	21					
	9-Jun-17	22					
	9-Jun-17	23					
	9-Jun-17	24					
	9-Jun-17	25					
	9-Jun-17	26					

Appendix 3.2-1. Detailed Habitat Assessment Data in Streams with Potential Water Withdrawal and Use, 2017

Stream Name	Date	Habitat Unit (Field)	Overall Habitat - ARGR S	R	O	M	Comments
Patch Outflow	10-Jun-17	1					
	10-Jun-17	2					Large-bodied fish observed near Patch Lake (probably LKTR)
Wolverine Outflow East	10-Jun-17	1					
	10-Jun-17	2					
	10-Jun-17	3					Very braided, flow through grass with multiple channels
	10-Jun-17	4					
	10-Jun-17	5					
	10-Jun-17	6					One main channel, other flat areas with the majority of flow dispersed through grass
	10-Jun-17	7					
	10-Jun-17	8					
	10-Jun-17	9					
	10-Jun-17	10					Poor connectivity closest to wolverine lake, improves when it joins w/trib flowing out of pond located to E.
Wolverine Outflow	7-Jun-17	1					
	7-Jun-17	2					
	7-Jun-17	3					
	7-Jun-17	4					
	7-Jun-17	5					
	7-Jun-17	6					Small pond on channel
	7-Jun-17	7					
	7-Jun-17	8					
	7-Jun-17	9					
	7-Jun-17	10					
	7-Jun-17	11					
	7-Jun-17	12					
	7-Jun-17	13					HU 13 UTM 434791 7547494 - channel becomes very poorly defined. No Full Barriers to passage but most wetted area is overland flow, flat habitat. Poor migration potential. Still connected and potentially migratory habitat but very little flow. U/S of HU13 channel has some overland flow barriers.
Stickleback Outflow	8-Jun-17	1	P	G	N	G	
	8-Jun-17	2	P	F	N	G	
	8-Jun-17	3	G	G	N	G	
	8-Jun-17	4	F	G	N	G	
	8-Jun-17	5	-	-	-	-	Not evaluated - still under ice cover
	8-Jun-17	6	E	E	N	E	
	8-Jun-17	7	P	P	N	G	
	8-Jun-17	8	F	G	N	G	
	8-Jun-17	9	P	G	N	G	
Low Flow							
Imniagut Outflow	22-Jul-17	1					Braided channel through willows. Connected to u/s imniagut Lake. Slow flowing. Wetted w/ little flow all the way to Patch Lake. Subsurface flow barrier directly at Patch Lake but would be connected at higher flow.
Ogama Outflow	25-Jul-17	1					Tributary: dry on suvey date
	25-Jul-17	2					VO Lg Bod Fish rising
	25-Jul-17	3					
	25-Jul-17	4					
	25-Jul-17	5					VO Lg Bod Fish Rising = depth is estimated, too deep to measure
	25-Jul-17	6					
	25-Jul-17	7					VO NSSB
	25-Jul-17	8					depth estimated, too deep to measure
	25-Jul-17	9					
	25-Jul-17	10					Scour pool, VO 70+cm LKTR
	25-Jul-17	11					
	25-Jul-17	12					Depth estimated - too deep

Appendix 3.2-1. Detailed Habitat Assessment Data in Streams with Potential Water Withdrawal and Use, 2017

Stream Name	Date	Habitat Unit (Field)	Overall Habitat - ARGR S	R	O	M	Comments
Ogama Outflow	25-Jul-17	13					
(cont'd)	25-Jul-17	14					
	25-Jul-17	15					
	25-Jul-17	16					
	25-Jul-17	17					
	25-Jul-17	18					
	25-Jul-17	19					
	25-Jul-17	20					
	25-Jul-17	21					Cascade ~ 10 m in middle of riffle HU
	25-Jul-17	22					
	25-Jul-17	23					Lg-bod Fish VO - multiple species juvenile fish. LKTR ~25 cm, LKWH and/or CLSC 20-40 cm.
	25-Jul-17	24					Two 40+cm LKTR VO
	25-Jul-17	25					Potential barrier if flows reduced
	25-Jul-17	26					
	25-Jul-17	27					
	25-Jul-17	28					
	25-Jul-17	29					Cascade at lower end of riffle HU
	25-Jul-17	30					VO of large LKTR jumping
	25-Jul-17	31					
P.O. Outflow	25-Jul-17	1					Max depth = 0.65. Short Channel conneting P.O. Lake to P.O. Connector Lake. - adundant macrophyte cover w/ central channel ~ 0.6 m. Near P.O. Lake channel disappears into area of full macrophyte cover at lake edge.
Patch Outflow	22-Jul-17	1					VO of LKTR ~30cm
	22-Jul-17	2					d/s end chanlized, Glide/Pool habitat with lots of instream veg.
Ogama Inflow	19-Jul-17	1					
	19-Jul-17	2					
	19-Jul-17	3					
	19-Jul-17	4					
	19-Jul-17	5					
	19-Jul-17	6					
	25-Jul-17	7					
	25-Jul-17	8					VO ~ 40 cm LKTR
	25-Jul-17	9					VO ~30 cm LKWH or CISC
	25-Jul-17	10					
	28-Jul-17	11					
	28-Jul-17	12					
	28-Jul-17	13					
	28-Jul-17	14					
	31-Jul-17	15					
	31-Jul-17	16					
	31-Jul-17	17					
	31-Jul-17	18					
	31-Jul-17	19					
	31-Jul-17	20					
	31-Jul-17	21					VO 60+cm LKTR
	31-Jul-17	22					
	31-Jul-17	23					

Appendix 3.2-1. Detailed Habitat Assessment Data in Streams with Potential Water Withdrawal and Use, 2017

Stream Name	Date	Habitat Unit (Field)	Overall Habitat - ARGR				Comments
			S	R	O	M	
Ogama Inflow	31-Jul-17	24					VO 5 LKWH (30-40 cm)
(cont'd)	31-Jul-17	25					
	31-Jul-17	26					
	31-Jul-17	27					
Stickleback Outflow	30-Jul-17	1	N	P	N	F	
	30-Jul-17	2	P	F	N	F	Braided, multiple channels in mud
	30-Jul-17	3	P	P	N	P	Poor connectivity in HU 3 - braided with flow through grass
	30-Jul-17	4	P	F	N	F	Crossing location . Shallow glides in grass connecting deeper pools. Some small drops, trib comes in from RB.
	30-Jul-17	5	N	N	N	N	Channel stagnant, DC Barriers
	30-Jul-17	6	N	N	N	N	Channel Dry
	30-Jul-17	7	P	P	N	P	Temporary overland flow barriers. Alternate channel next to dry one (HU 5&6) spreads out and flows through grasses.
	30-Jul-17	8	P	F	N	G	
Wolverine Outflow East	22-Jul-17	1					
	22-Jul-17	2					
	22-Jul-17	3					OF/DC barrier @ top end of HU, just below pool
	22-Jul-17	4					
	22-Jul-17	5					VO of multiple NSSB, one dead.
	22-Jul-17	6					Channel stagnant/dry at u/s end of flat habitat - limit of u/s migration from Patch Lake and no channel flowing d/s from Wolverine Lake.
	22-Jul-17	7					
	22-Jul-17	8					
	26-Jul-17	9					Flow from Wolverine Lake. Defined channel through grass for approx 30 m then NDC but wetted through grasses and willows until it reaches low area of confluence with trib coming in from southeast. Water contributes to NSSB habitat d/s nearer to Patch Lake.

Discharge: L = low, M = medium, H = high
Habitat Type: F = flat, Fa = falls, C = cascade, R = riffle, G = glide, BG = boulder garden, P = pool
Residual pool depth = (max depth - crest height)
Substrate: F = Fines (< 2 mm), G = Gravel (2 - 64 mm), C = Cobble (64 - 256), B = Boulders (256 - 4000 mm), R = Bedrock (>4000 mm), O = Other
Bank Shape: U = undercut, V = vertical, S = sloping, O = overhanging
Bank Texture: dominant substrate type
Barriers: F = impassable falls, BG = impassable boulder garden, D = dry channel, OF = overland flow, SF = subsurface flow, WQ = water quality barrier, G - gradient, O = other (list in Comments column)
Classification: list barriers as either T = temporary, P = permanent
Instream cover: Total cover = % cover for entire unit
Riparian cover: Canopy % = cover within 1m of surface of water, Type = dominant vegetation; G = grass, S = shrub, M = moss, Ma = macrophyte.
Overall Habitat: S = spawning, R = rearing, O = overwintering, M = migration; Classifications: N = none, P = poor, F = fair, G = good
NA = not applicable
Dashes = data not collected

Appendix 3.2-2

Electrofishing Effort and Catch Data in Streams with Potential Water Withdrawal and Use, 2017

Appendix 3.2-2. Electrofishing Effort and Catch Data in Streams with Potential Water Withdrawal and Use, 2017

			Upstream End (UTM)		Downstream End (UTM)									Number						
Stream	Site	Date	Easting	Northing	Easting	Northing	Freq (Hz)	Duty Cycle (%)	Voltage (V)	Water Temp (°C)	Cond. (uS/cm)	Pass	Effort (seconds)	NSSB	ARGR	LKWH	LKTR	SLSC	UNK (LKWH?)	Total
Ogama Outflow	Ogama OF #1	20-Jul-17	435127	7555477	435117	7555485	30-40	12	190	13.2	226	1	663	6	0	0	0	0	0	6
		20-Jul-17					30-40	12	190	13.2	226	2	585	0	0	0	0	0	0	0
		20-Jul-17					30-40	12	190	13.2	226	3	510	1	0	0	0	0	0	1
	Ogama OF #2	21-Jul-17	435279	7555367	435259	7555394	30	12	215	13.4	226	1	1232	12	0	0	0	0	0	12
		21-Jul-17					30	12	215	13.4	226	2	938	8	0	0	2	0	0	10
		21-Jul-17					30	12	215	13.4	226	3	966	3	0	0	0	0	0	3
Ogama Inflow	Ogama IF #1	19-Jul-17	436485	7551326	436482	7551349	35	12	180	8.4	225	1	349	2	0	0	0	0	0	2
		19-Jul-17					35	12	180	8.4	225	2	359	0	0	0	1	0	0	1
		19-Jul-17					35	12	180	8.4	225	3	340	0	0	0	0	0	0	0
	Ogama IF #2	19-Jul-17	436544	7551232	436521	7551242	30	12	185	10.9	276	1	338	1	0	0	0	0	0	1
		19-Jul-17					30	12	185	10.9	276	2	309	1	0	0	0	0	0	1
		19-Jul-17					30	12	185	10.9	276	3	362	6	0	0	0	0	0	6
		19-Jul-17					30	12	185	10.9	276	4	369	3	0	0	0	0	0	3
	Ogama IF #3	20-Jul-17	436588	7551111	436578	7551128	30	12	180	11.2	278	1	819	15	0	0	0	0	0	15
		20-Jul-17					30	12	180	11.2	278	2	760	11	0	1	0	0	0	12
		20-Jul-17					30	12	180	11.2	278	3	768	2	0	0	0	0	0	2
	Ogama IF #4	20-Jul-17	436538	7551016	436533	7551026	30	12	185	12.5	277	1	796	12	0	0	0	0	0	12
		20-Jul-17					30	12	185	12.5	277	2	817	6	0	0	0	0	0	6
		20-Jul-17					30	12	185	12.5	277	3	712	3	0	0	0	0	0	3
Patch Outflow	Patch #1	21-Jul-17	436256	7549014	436267	7549006	30	12	200	15.7	308	1	777	8	0	0	0	0	2	10
		21-Jul-17					30	12	200	15.7	308	2	661	16	0	0	0	0	5	21
		21-Jul-17					30	12	200	15.7	308	3	588	5	0	0	0	0	0	5
Wolverine Outflow East	Wolverine East #1	22-Jul-17	435612	7545924	435625	7545963	30	12	135	11.8	366	1	289	48	0	0	0	0	0	48
		22-Jul-17					30	12	135	11.8	366	2	272	20	0	0	0	0	0	20
		22-Jul-17					30	12	135	11.8	366	3	249	12	0	0	0	0	0	12
Imniagut Outflow	Imniagut #1	25-Jul-17	433745	7551064	433755	7551047	30	12	165	12.6	259	1	250	0	0	0	0	0	0	0
Stickleback Outflow	Stickleback #1	30-Jul-17	441928	7504297	441931	7504134	30	12	240	10.9	249	1	619	31	4	0	0	1	0	36

Notes:

Species Code: NSSB = Ninespine Stickleback, ARGR = Arctic Grayling, LKTR = Lake Trout, SLSC = Slimy Sculpin, LKWH = Lake Whitefish, UNK = Unknown

Appendix 3.2-3

Biological Characteristics of Fish Sampled in Electrofishing Surveys in Streams with Potential Water Withdrawal and Use, 2017

Appendix 3.2-3. Biological Characteristics of Fish Sampled in Electrofishing Surveys in Streams with Potential Water Withdrawal and Use, 2017

Stream	Date	Electrofishing Site	Electrofishing Pass	Fish Sample Number	Species Code	Fork Length (mm)	Weight (g)	Comments
Ogama Outflow	21-Jul-17	Ogama OF #1	1	1	NSSB	78	2.80	
			1	2	NSSB	65	2.45	
			1	3	NSSB	66	2.30	
			1	4	NSSB	69	2.14	
			1	5	NSSB	19	-	Too small to weigh
			1	6	NSSB	14	-	Too small to weigh
			3	7	NSSB	65	2.28	
		Ogama OF #2	1	1	NSSB	69	2.18	
			1	2	NSSB	50	1.45	
			1	3	NSSB	70	2.03	
			1	4	NSSB	55	1.14	
			1	5	NSSB	71	2.45	
			1	6	NSSB	73	2.69	
			1	7	NSSB	64	2.25	
			1	8	NSSB	67	2.46	
			1	9	NSSB	72	2.27	
			1	10	NSSB	59	1.67	
			1	11	NSSB	68	2.36	
			1	12	NSSB	47	0.91	
			2	13	NSSB	-	-	
			2	14	NSSB	-	-	
			2	15	LKTR	705	3453	
			2	16	LKTR	720	3955	
			2	17	NSSB	72	2.25	
			2	18	NSSB	74	2.48	
			2	19	NSSB	77	2.49	
			2	20	NSSB	72	2.19	
			2	21	NSSB	59	1.37	
			2	22	NSSB	51	1.07	
			3	23	NSSB	74	2.34	
			3	24	NSSB	54	0.92	
			3	25	NSSB	37	0.30	

Appendix 3.2-3. Biological Characteristics of Fish Sampled in Electrofishing Surveys in Streams with Potential Water Withdrawal and Use, 2017

Stream	Date	Electrofishing Site	Electrofishing Pass	Fish Sample Number	Species Code	Fork Length (mm)	Weight (g)	Comments
Ogama Inflow	19-Jul-17	Ogama IF #1	1	1	NSSB	36	0.34	
			1	2	NSSB	58	1.30	
			2	3	LKTR	643	2064	
		Ogama IF #2	1	1	NSSB	70	2.92	
			2	2	NSSB	45	1.63	
			3	3	NSSB	54	0.98	
			3	4	NSSB	55	1.39	
			3	5	NSSB	57	1.40	
			3	6	NSSB	63	1.45	
			3	7	NSSB	51	0.81	
			3	8	NSSB	48	0.69	
			4	9	NSSB	57	1.27	
			4	10	NSSB	62	1.58	
			4	11	NSSB	45	0.92	
	20-Jul-17	Ogama IF #3	1	1	NSSB	65	1.92	
			1	2	NSSB	53	1.66	
			1	3	NSSB	52	1.27	
			1	4	NSSB	54	1.33	
			1	5	NSSB	57	1.26	
			1	6	NSSB	50	1.22	
			1	7	NSSB	45	0.66	
			1	8	NSSB	57	1.36	
			1	9	NSSB	48	1.02	
			1	10	NSSB	56	1.54	
			1	11	NSSB	51	0.92	
			1	12	NSSB	46	0.83	
			1	13	NSSB	67	1.84	
			1	14	NSSB	53	1.29	
			1	15	NSSB	44	0.65	
			2	16	LKWH	371	575	
			2	17	NSSB	55	1.16	
			2	18	NSSB	56	1.26	
			2	19	NSSB	48	1.22	

Appendix 3.2-3. **Biological Characteristics of Fish Sampled in Electrofishing Surveys in Streams with Potential Water Withdrawal and Use, 2017**

Stream	Date	Electrofishing Site	Electrofishing Pass	Fish Sample Number	Species Code	Fork Length (mm)	Weight (g)	Comments
Ogama Inflow	20-Jul-17	Ogama IF #3	2	20	NSSB	56	1.30	
(cont'd)			2	21	NSSB	51	1.09	
			2	22	NSSB	58	1.69	
			2	23	NSSB	55	1.28	
			2	24	NSSB	53	1.19	
			2	25	NSSB	47	0.66	
			2	26	NSSB	51	0.93	
			2	27	NSSB	55	1.33	
			3	28	NSSB	45	0.85	
			3	29	NSSB	59	1.79	
	20-Jul-17	Ogama IF #4	1	1	NSSB	55	1.25	
			1	2	NSSB	68	1.90	
			1	3	NSSB	58	1.80	
			1	4	NSSB	55	1.30	
			1	5	NSSB	57	1.54	
			1	6	NSSB	45	0.94	
			1	7	NSSB	54	1.18	
			1	8	NSSB	56	1.40	
			1	9	NSSB	50	1.04	
			1	10	NSSB	68	2.10	
			1	11	NSSB	57	1.03	
			1	12	NSSB	56	1.05	
			2	13	NSSB	60	1.24	
			2	14	NSSB	59	1.34	
			2	15	NSSB	53	1.00	
			2	16	NSSB	44	0.50	
			2	17	NSSB	56	1.30	
			2	18	NSSB	48	0.69	
			2	19	NSSB	45	0.68	
			3	20	NSSB	54	1.49	
			3	21	NSSB	62	1.77	
			3	22	NSSB	56	1.49	

Appendix 3.2-3. Biological Characteristics of Fish Sampled in Electrofishing Surveys in Streams with Potential Water Withdrawal and Use, 2017

Stream	Date	Electrofishing Site	Electrofishing Pass	Fish Sample Number	Species Code	Fork Length (mm)	Weight (g)	Comments
Patch Outflow	21-Jul-17	Patch #1	1	1	UNK	28	0.09	LKWH or CISC
			1	2	UNK	24	-	LKWH or CISC; Mortality
			1	3	NSSB	53	0.87	
			1	4	NSSB	49	0.99	
			1	5	NSSB	57	1.46	
			1	6	NSSB	56	1.12	
			1	7	NSSB	49	1.02	
			1	8	NSSB	44	0.68	
			1	9	NSSB	46	0.75	
			1	10	NSSB	39	0.53	
			2	11	UNK	43	-	LKWH or Cisco
			2	12	UNK	37	0.34	LKWH or Cisco; Mortality
			2	13	UNK	45	0.50	LKWH or Cisco; Mortality
			2	14	UNK	44	0.63	LKWH or Cisco
			2	15	UNK	47	0.76	LKWH or Cisco
			2	16	NSSB	53	1.56	
			2	17	NSSB	47	1.00	
			2	18	NSSB	56	1.17	
			2	19	NSSB	47	0.59	
			2	20	NSSB	56	1.42	
			2	21	NSSB	45	0.77	
			2	22	NSSB	55	1.07	
			2	23	NSSB	51	0.99	
			2	24	NSSB	47	0.81	
			2	25	NSSB	42	0.41	
			2	26	NSSB	43	0.56	
			2	27	NSSB	41	0.56	
			2	28	NSSB	47	0.72	
			2	29	NSSB	57	1.42	
			2	30	NSSB	48	0.86	
			2	31	NSSB	44	0.69	
			3	32	NSSB	45	0.61	
			3	33	NSSB	54	1.15	
			3	34	NSSB	50	0.83	
			3	35	NSSB	49	0.81	
			3	36	NSSB	46	0.36	

Appendix 3.2-3. Biological Characteristics of Fish Sampled in Electrofishing Surveys in Streams with Potential Water Withdrawal and Use, 2017

Stream	Date	Electrofishing Site	Electrofishing Pass	Fish Sample Number	Species Code	Fork Length (mm)	Weight (g)	Comments
Wolverine Outflow East	22-Jul-17	Wolverine East #1	1	1	NSSB	51	0.62	
			1	2	NSSB	43	0.65	
			1	3	NSSB	56	1.12	
			1	4	NSSB	47	0.78	
			1	5	NSSB	44	0.62	
			1	6	NSSB	36	0.30	
			1	7	NSSB	57	1.13	
			1	8	NSSB	47	0.94	
			1	9	NSSB	32	0.39	
			1	10	NSSB	42	0.64	
			1	11	NSSB	53	1.36	
			1	12	NSSB	58	1.60	
			1	13	NSSB	36	0.38	
			1	14	NSSB	43	0.84	
			1	15	NSSB	47	1.09	
			1	16	NSSB	-	-	
			1	17	NSSB	-	-	
			1	18	NSSB	-	-	
			1	19	NSSB	-	-	
			1	20	NSSB	-	-	
			1	21	NSSB	-	-	
			1	22	NSSB	-	-	
			1	23	NSSB	-	-	
			1	24	NSSB	-	-	
			1	25	NSSB	-	-	
			1	26	NSSB	-	-	
			1	27	NSSB	-	-	
			1	28	NSSB	-	-	
			1	29	NSSB	-	-	
			1	30	NSSB	-	-	
			1	31	NSSB	-	-	
			1	32	NSSB	-	-	
			1	33	NSSB	-	-	
			1	34	NSSB	-	-	

Appendix 3.2-3. Biological Characteristics of Fish Sampled in Electrofishing Surveys in Streams with Potential Water Withdrawal and Use, 2017

Stream	Date	Electrofishing Site	Electrofishing Pass	Fish Sample Number	Species Code	Fork Length (mm)	Weight (g)	Comments
Wolverine Outflow East *(cont'd)*	22-Jul-17	Wolverine East #1	1	35	NSSB	-	-	
			1	36	NSSB	-	-	
			1	37	NSSB	-	-	
			1	38	NSSB	-	-	
			1	39	NSSB	-	-	
			1	40	NSSB	-	-	
			1	41	NSSB	-	-	
			1	42	NSSB	-	-	
			1	43	NSSB	-	-	
			1	44	NSSB	-	-	
			1	45	NSSB	-	-	
			1	46	NSSB	-	-	
			1	47	NSSB	-	-	
			1	48	NSSB	-	-	
			2	49	NSSB	44	0.79	
			2	50	NSSB	61	1.56	
			2	51	NSSB	45	0.84	
			2	52	NSSB	41	0.52	
			2	53	NSSB	39	0.48	
			2	54	NSSB	49	0.75	
			2	55	NSSB	50	0.96	
			2	56	NSSB	36	0.38	
			2	57	NSSB	37	0.53	
			2	58	NSSB	46	0.82	
			2	59	NSSB	-	-	
			2	60	NSSB	-	-	
			2	61	NSSB	-	-	
			2	62	NSSB	-	-	
			2	63	NSSB	-	-	
			2	64	NSSB	-	-	
			2	65	NSSB	-	-	
			2	66	NSSB	-	-	
			2	67	NSSB	-	-	
			2	68	NSSB	-	-	

Appendix 3.2-3. Biological Characteristics of Fish Sampled in Electrofishing Surveys in Streams with Potential Water Withdrawal and Use, 2017

Stream	Date	Electrofishing		Fish Sample Number	Species Code	Fork Length (mm)	Weight (g)	Comments
		Site	Pass					
Wolverine Outflow East	22-Jul-17	Wolverine East #1	3	69	NSSB	41	0.66	
(cont'd)			3	70	NSSB	45	0.63	
			3	71	NSSB	44	0.64	
			3	72	NSSB	39	0.40	
			3	73	NSSB	52	0.94	
			3	74	NSSB	36	0.42	
			3	75	NSSB	46	0.66	
			3	76	NSSB	43	0.68	
			3	77	NSSB	39	0.60	
			3	78	NSSB	47	0.81	
			3	79	NSSB	-	-	
			3	80	NSSB	-	-	
Imniagut Outflow	25-Jul-07	Imniagut #1	1	-	-	-	-	VO of 2 NSSB near confluence with Imniagut Lake
Stickleback Outflow	30-Jul-17	Stickleback #1	1	1	NSSB	-	-	
			1	2	NSSB	-	-	
			1	3	NSSB	-	-	
			1	4	NSSB	-	-	
			1	5	ARGR	98	10	
			1	6	ARGR	107	13	
			1	7	ARGR	92	9	
			1	8	ARGR	95	10	
			1	9	NSSB	65	2	
			1	10	NSSB	65	2	
			1	11	NSSB	53	1	
			1	12	NSSB	50	1	
			1	13	NSSB	49	1	
			1	14	NSSB	55	0	
			1	15	NSSB	59	1	
			1	16	NSSB	47	1	
			1	17	NSSB	55	1	
			1	18	NSSB	57	1	
			1	19	NSSB	54	1	
			1	20	NSSB	55	1	
			1	21	NSSB	61	1	

Appendix 3.2-3. Biological Characteristics of Fish Sampled in Electrofishing Surveys in Streams with Potential Water Withdrawal and Use, 2017

Stream	Date	Electrofishing Site	Electrofishing Pass	Fish Sample Number	Species Code	Fork Length (mm)	Weight (g)	Comments
Stickleback Outflow	30-Jul-17	Stickleback #1	1	22	NSSB	58	1	
(cont'd)			1	23	NSSB	51	1	
			1	24	NSSB	50	1	
			1	25	NSSB	21	-	
			1	26	NSSB	26	-	
			1	27	NSSB	21	-	
			1	28	NSSB	24	-	
			1	29	NSSB	27	-	
			1	30	NSSB	30	-	
			1	31	NSSB	31	-	
			1	32	NSSB	20	-	
			1	33	NSSB	22	-	
			1	34	NSSB	29	-	
			1	35	SLSC	71	3	
			1	36	NSSB	< 30 mm	-	
			1	37	NSSB	< 30 mm	-	
			1	38	NSSB	< 30 mm	-	
			1	39	NSSB	< 30 mm	-	
			1	40	NSSB	< 30 mm	-	
			1	41	NSSB	< 30 mm	-	

Notes:

Species Code: NSSB = Ninespine Stickleback, ARGR = Arctic Grayling, LKTR = Lake Trout, SLSC = Slimy Sculpin, LKWH = Lake Whitefish, UNK = Unknown

Dashes = data not collected

Appendix 3.2-4

Habitat Characteristics of Multiple-pass Electrofishing Sites in Streams with Potential Water Withdrawal and Use, 2017

Appendix 3.2-4. Habitat Characteristics of Multiple-pass Electrofishing Sites in Streams with Potential Water Withdrawal and Use, 2017

			Length (m)		Wetted Width (m)			Bankfull Width (m)			Wetted Depth (m)			Bankfull Depth (m)			Substrates		Photos		
Stream	Site	Habitat Type	Right Bank	Left Bank	Top	Middle	Bottom	Top	Middle	Bottom	Top	Middle	Bottom	Top	Middle	Bottom	Dominant	Sub-dominant	DS from US End	US from DS End	Substrates
Ogama Outflow	Ogama OF #1	Glide	-	14.4	5	3.7	3.2	7	5.4	7	0.37	0.26	0.39	0.6	0.61	0.72	B	C/F	1158/1159/1160	1161	1162/1163
Ogama Outflow	Ogama OF #2	Glide/Riffle/Glide	38	-	3.9	4.7	4	7.4	7	5	0.45	0.24	0.54	0.67	0.42	0.76	F/C/F	B/G/B	1174	1170	1171/1172/1173
Ogama Inflow	Ogama IF #1	Glide	17	19	3.85	3.4	2.9	6	4.7	6.1	0.59	0.48	0.76	0.87	0.68	0.93	B	F	1111	1112	1113
Ogama Inflow	Ogama IF #2	Riffle/Glide	22	21.7	3.6	2.6	2.45	4.5	5.2	4.9	0.39	0.41	0.31	0.56	0.65	0.57	B	F	1115/1134	1135	1136/1137
Ogama Inflow	Ogama IF #3	Glide	19.5	-	4.6	5	3.5	7.8	7.1	6.6	0.33	0.32	0.55	0.65	0.52	0.79	G	B	1147	1148	1150/1149
Ogama Inflow	Ogama IF #4	Glide	17	-	4.7	4.1	3.1	10.2	12.2	14	0.33	0.3	0.34	0.47	0.45	0.62	C	B	1151	1152	1153/1154
Patch Outflow	Patch #1	Glide	14.3	-	7.5	5.8	6.5	9.6	10.3	11.6	0.31	0.26	0.19	0.54	0.43	0.29	F	G	1191	1190	1192/1193/1194
Wolverine Outflow East	Wolverine East #1	Glide	33.6	-	1.3	0.8	1	25.5	18	11	0.11	0.07	0.03	0.31	0.39	0.21	F	G	1207	1202	1203/1204/1205/1206

Note:
Dashes = data not collected

Appendix 3.3-1

Biological Characteristics of Fish Sampled in Imniagut Lake, 2017

Appendix 3.3-1. Biological Characteristics of Fish Sampled in Imniagut Lake, 2017

Date	Gear	Pass/Trap	Species Code	Fork Length (mm)	Weight (g)	Comments
24-Jul-17	EF	1	NSSB	47	0.81	Parasite
		1	NSSB	55	0.87	
		1	NSSB	50	0.94	Parasite
		1	NSSB	55	1.11	Parasite
		1	NSSB	51	0.86	
		1	NSSB	43	0.48	Parasite
		1	NSSB	46	0.71	Parasite
		1	NSSB	52	0.44	Parasite (emerged)
		1	NSSB	46	0.43	Parasite
		1	NSSB	49	0.75	
		1	NSSB	44	0.57	Parasite
		1	NSSB	50	0.89	Parasite
		1	NSSB	44	0.62	Parasite
		1	NSSB	43	0.55	Parasite
		1	NSSB	39	0.6	Parasite
		1	NSSB	44	0.64	Parasite
		1	NSSB	48	0.75	
		1	NSSB	46	0.55	
		1	NSSB	49	0.66	
		1	NSSB	48	0.64	
	MT	10	NSSB	48	0.56	
		10	NSSB	51	0.92	Parasite
		10	NSSB	50	0.85	
		10	NSSB	67	1.97	
		10	NSSB	65	1.74	
		10	NSSB	48	0.89	Parasite
		10	NSSB	56	1.08	
		10	NSSB	42	0.63	Parasite
		10	NSSB	54	1.03	
		10	NSSB	53	0.87	
		10	NSSB	50	0.93	
		10	NSSB	51	0.81	
		10	NSSB	47	0.8	
		22	NSSB	43	-	Parasite/Mortality
		22	NSSB	48	0.73	
		22	NSSB	60	1.11	Parasite
		22	NSSB	43	0.67	
		22	NSSB	59	1.13	
		22	NSSB	64	1.75	
		22	NSSB	55	0.91	Parasite
		22	NSSB	62	1.16	
		22	NSSB	53	0.75	
		22	NSSB	46	0.95	Parasite
		22	NSSB	55	0.92	
		22	NSSB	50	0.93	Parasite

Appendix 3.3-1. Biological Characteristics of Fish Sampled in Imniagut Lake, 2017

Date	Gear	Pass/Trap	Species Code	Fork Length (mm)	Weight (g)	Comments
24-Jul-17 *(cont'd)*	MT	22	NSSB	57	0.98	
		22	NSSB	54	1	
		22	NSSB	62	1.12	
		22	NSSB	49	0.73	Parasite
		22	NSSB	52	0.92	Parasite
		22	NSSB	53	0.93	
		22	NSSB	48	0.8	
		22	NSSB	52	0.82	

Notes:

Species Code: NSSB = Ninespine Stickleback

Gear Code: EF = Electrofishing, MT = Minnow trap

Dashes = data not collected