

**NISGA'A LANDS  
FRESHWATER FISH AND FISH HABITAT  
TECHNICAL DATA REPORT  
FOR THE  
WESTCOAST CONNECTOR GAS TRANSMISSION PROJECT**

**August 2014**

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## TABLE OF CONTENTS

	<u>Page</u>
1.0 INTRODUCTION.....	1-1
1.1 Project Description.....	1-1
1.2 Objectives.....	1-3
1.3 Regulatory Standards and Guidelines.....	1-5
1.3.1 Federal Standards.....	1-5
1.3.2 Provincial Standards.....	1-7
1.3.3 Nisga'a Standards.....	1-9
1.4 Study Area Boundaries.....	1-10
1.4.1 Project Footprint.....	1-10
1.4.2 Local Study Area.....	1-10
1.4.3 Regional Study Area.....	1-10
2.0 ENVIRONMENTAL SETTING.....	2-1
2.1 Kitsault Route.....	2-1
2.1.1 Biogeoclimatic Zones.....	2-1
2.1.2 Seasonal Discharge Patterns.....	2-1
2.1.3 Fish Community.....	2-2
2.2 Nasoga Route.....	2-4
2.2.1 Biogeoclimatic Zones.....	2-4
2.2.2 Seasonal Discharge Patterns.....	2-4
2.2.3 Fish Community.....	2-4
2.3 Fish Species at Risk or of Special Management Interest.....	2-4
2.3.1 Sockeye Salmon and Kokanee.....	2-5
2.3.2 Pink Salmon.....	2-5
2.3.3 Chum Salmon.....	2-5
2.3.4 Coho Salmon.....	2-6
2.3.5 Chinook Salmon.....	2-6
2.3.6 Rainbow Trout and Steelhead.....	2-7
2.3.7 Coastal Cutthroat Trout.....	2-7
2.3.8 Bull Trout.....	2-8
2.3.9 Dolly Varden.....	2-8
2.3.10 Mountain Whitefish.....	2-9
2.3.11 Burbot.....	2-9
2.3.12 Green Sturgeon.....	2-9
2.3.13 Eulachon.....	2-10
2.3.14 Lamprey Species.....	2-10
3.0 METHODOLOGY.....	3-1
3.1 Pre-Field Work.....	3-1
3.1.1 Desktop Review.....	3-1
3.1.2 Permits.....	3-1
3.1.3 Field Crew Orientation.....	3-1
3.2 Literature Review.....	3-1
3.3 Field Data Collection.....	3-2
3.3.1 2012 Reconnaissance.....	3-2
3.3.2 Open Water Aquatic Assessments.....	3-2
3.3.3 Fish Inventory.....	3-4
3.3.4 Additional Sampling.....	3-4
3.4 Data Analysis.....	3-5
3.4.1 Stream Classification.....	3-5
3.4.2 Timing Windows of Least Risk.....	3-5
3.4.3 Sensitivity Ranking.....	3-6

4.0	RESULTS.....	4-1
4.1	Desktop and Literature Review.....	4-1
4.1.1	Kitsault Route.....	4-1
4.1.2	Nasoga Route.....	4-13
4.2	Results of Field Data Collection.....	4-25
4.2.1	Kitsault Route.....	4-25
4.2.2	Nasoga Route.....	4-26
5.0	CROSSING METHODS.....	5-1
5.1	Pipeline Crossing Construction Methods.....	5-1
5.1.1	Trenched Construction Methods.....	5-1
5.1.2	Trenchless Construction Methods.....	5-1
5.1.3	Selection of Pipeline Watercourse Crossing Methods.....	5-2
5.1.4	Proposed Pipeline Crossing Methods.....	5-6
5.1.5	Alternate Pipeline Crossing Methods.....	5-8
5.2	Temporary Vehicle and Equipment Crossing Methods.....	5-8
5.3	Recommendations for Riparian Area Management.....	5-10
6.0	REFERENCES.....	6-1
6.1	Personal Communications.....	6-1
6.2	Literature Cited.....	6-1
6.3	GIS and Data Mapping References.....	6-10

### LIST OF APPENDICES

Appendix A	Watercourse and Potential Fish-Bearing NCD Summary Table.....	A-1
Appendix B	NCD Summary Table.....	B-1
Appendix C	Watercourse and Potential Fish-Bearing NCD Site Records.....	C-1
Appendix D	NCD Photoplates.....	D-1
Appendix E	Water Quality Parameters and Mean Channel Characteristics Summary Table.....	E-1
Appendix F	Large River Habitat Mapping.....	F-1
Appendix G	Fish Habitat Potential Ratings Summary Table.....	G-1
Appendix H	Fish Sampling Efforts Summary Table.....	H-1
Appendix I	Fish-Bearing Status Assessment of Select Streams.....	I-1

### LIST OF FIGURES

Figure 1	Spatial Boundaries for Fish and Fish Habitat.....	1-2
Figure 2	Proposed Pipeline Route Options within Nisga'a Lands.....	1-4
Figure 3	Potential Watercourse Crossing Locations on Nisga'a Lands.....	4-2
Figure 4	Pipeline Watercourse Crossing Selection Flowchart Stage 1 – Initial Screening.....	5-4
Figure 5	Pipeline Watercourse Crossing Selection Flowchart Stage 2 – Review Sites.....	5-5
Figure 6	BC OGC Pipeline Stream Crossing Type Flow Chart.....	5-8
Figure 7	Flow Diagram Indicating Appropriate Structures for Vehicle and Equipment Access Crossings.....	5-10

**LIST OF TABLES**

Table 1	Fish Species That May Occur in the Nass River Watershed Within the Fish and Fish Habitat RSA.....	2-3
Table 2	Stream Classification and RMAs .....	3-5
Table 3	Skeena Region Timing Windows of Least Risk .....	3-6
Table 4	Fish and Fish Habitat Sensitivity Evaluation Criteria .....	3-6
Table 5	Previously Documented Fish Species in Watercourses Crossed by the Kitsault Route Within Nisga'a Lands.....	4-1
Table 6	Previously Documented Fish Species in Watercourses Crossed by the Nasoga Route Within Nisga'a Lands .....	4-14

### DEFINITIONS AND ACRONYM LIST

Definition/Acronym	Full Name
AMEC	AMEC Environment and Infrastructure
BC	British Columbia
BC EAO	British Columbia Environmental Assessment Office
BC MFLNRO	British Columbia Ministry of Forests, Lands and Natural Resource Operations
BC MOE	British Columbia Ministry of Environment
BC MOF	British Columbia Ministry of Forests
BC MOFR	British Columbia Ministry of Forests and Range
BC MWLAP	British Columbia Ministry of Water, Land and Air Protection
BC OGC	British Columbia Oil and Gas Commission
BGC	biogeoclimatic
BMPs	best management practices
CAPP	Canadian Association of Petroleum Producers
CCME	Canadian Council of Ministers of the Environment
CDC	Conservation Data Centre
CLIR	Cross Linked Information Resources
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CWH	Coastal Western Hemlock
DFO	Fisheries and Oceans Canada
DO	dissolved oxygen
EA	Environmental Assessment
EAA	<i>Environmental Assessment Act</i>
EcoCat	Ecological Reports Catalogue
EPMR	Environmental Protection and Management Regulation
EPMG	Environmental Protection and Management Guide
EMP	Environmental Management Plan
FIDQ	Fisheries Inventory Data Queries
FISS	Fisheries Information Summary System
<i>FRPA</i>	<i>Forest and Range Practices Act</i>
FSW	Fisheries Sensitive Watershed
HDD	horizontal directional drill
ICH	Interior Cedar-Hemlock
IFMP	Integrated Fisheries Management Plan
LNG	liquified natural gas
LGL Ltd.	LGL Limited Environmental Research Associates
LSA	Local Study Area
Mapster	DFO's Mapster v3.1
MH	Mountain Hemlock
Mitigation	The elimination, reduction or control of the adverse environmental effects of the Project, and includes restitution for any damage to the environment caused by such effects through replacement, restoration, offsetting or any other means
NCD	non-classified drainage
NFA	Nisga'a Final Agreement
<i>NFWA</i>	<i>Nisga'a Fisheries and Wildlife Act</i>
NFWD	Nisga'a Fish and Wildlife Department
NLG	Nisga'a Lisims Government
NVC	no visible channel
<i>NPA</i>	<i>Navigation Protection Act</i>
NPP	Navigation Protection Program
NPS	nominal pipe size
OGAA	<i>Oil and Gas Activities Act</i>
OS	Operational Statement

<b>Definition/Acronym</b>	<b>Full Name</b>
PSC	Pacific Salmon Commission
PWC	potential watercourse crossing
RISC	Resources Information Standards Committee
RMZ	Riparian Management Zone
RMA	Riparian Management Area
RRZ	Riparian Reserve Zone
RSA	Regional Study Area
<i>SARA</i>	<i>Species at Risk Act</i>
SKR	SKR Consultants Ltd.
Spectra Energy	Spectra Energy Transmission
spp.	species
TERA	TERA, a CH2M Hill Company
TSA	Timber Supply Area
USFWS	United States Fish and Wildlife Service
WHA	Wildlife Habitat Areas
WCGT	Westcoast Connector Gas Transmission Ltd.
ZOI	zone of influence

## 1.0 INTRODUCTION

TERA, a CH2M HILL Company (TERA), was commissioned by Westcoast Connector Gas Transmission Ltd. (WCGT) carrying on business as Spectra Energy Transmission (Spectra Energy) to conduct freshwater fish and fish habitat studies for the proposed Westcoast Connector Gas Transmission System (the proposed Project). An Application for an Environmental Assessment (EA) Certificate under the British Columbia (BC) *Environmental Assessment Act (EAA)* for the proposed Project was submitted to the BC Environmental Assessment Office (BC EAO) in April 2014. WCGT is also seeking permits to construct and operate the proposed Project pursuant to the BC *Oil and Gas Activities Act (OGAA)*. This report summarizes field data collected in 2014 for fish and fish habitat along the proposed Application corridors within Nisga'a Lands. Fish and fish habitat information and field results for the remainder of the proposed Project were collected in 2012 and 2013 and compiled in the Freshwater Fish and Fish Habitat Technical Data Report submitted as part of the EA Application (TERA Environmental Consultants 2014).

This report provides an outline of the environmental setting within the Nisga'a Lands Fish and Fish Habitat Regional Study Area (RSA) and describes the methods and approach for the literature review and field studies. General recommendations related to fish and fish habitat for the construction and restoration of watercourse crossings are provided in the Technical Data Report for the EA Application (TERA Environmental Consultants 2014). The results of this report do not identify residual environmental or socio-economic effects nor provide conclusions regarding significance. Results will be incorporated into the environmental approval process and used in the determination of potential adverse environment effects for the proposed Project. Standard and site-specific mitigation is outlined in the Terrestrial Environmental Management Plan (EMP), Appendix 2-S of the EA for the proposed Project.

### 1.1 Project Description

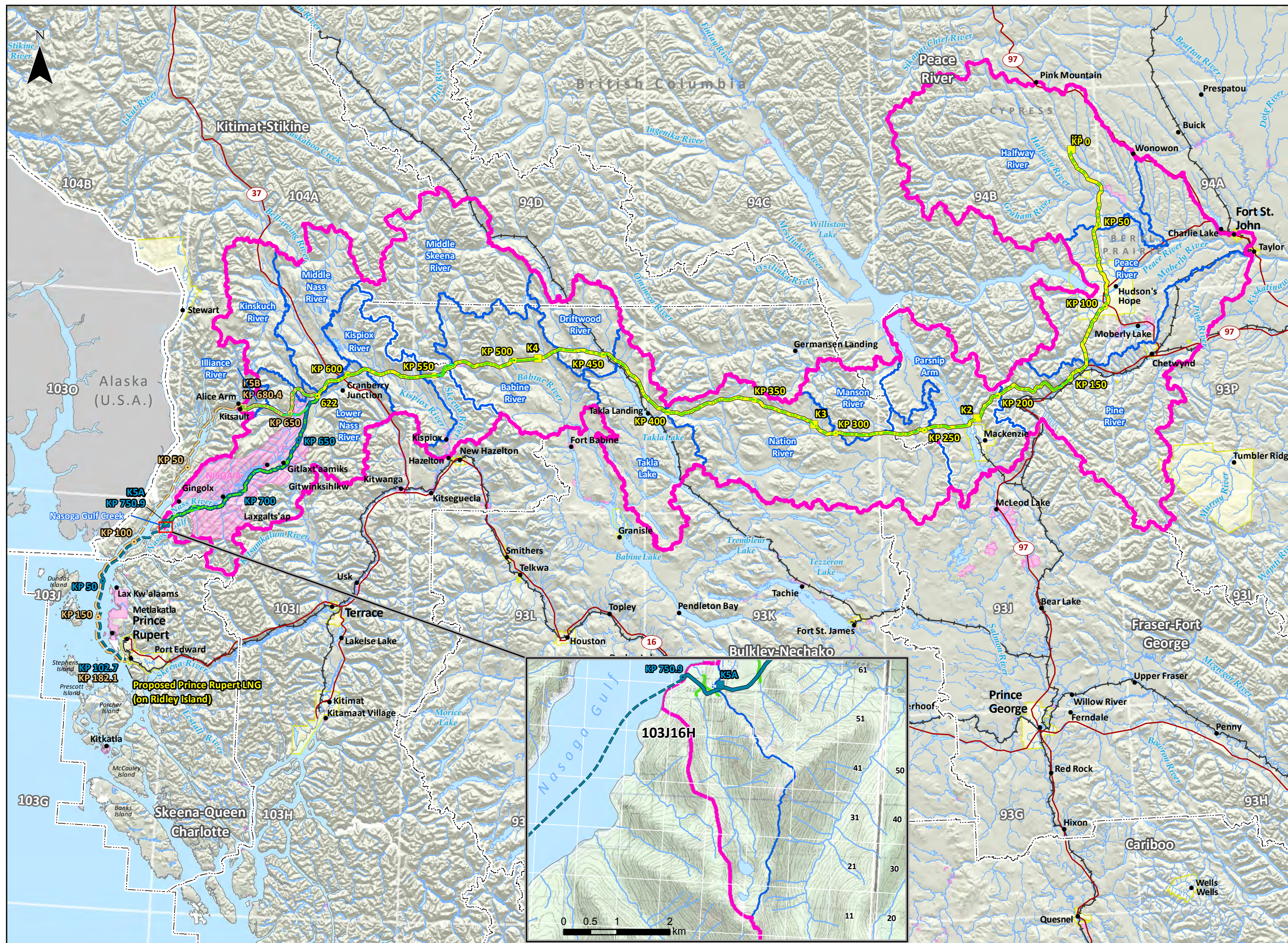
The proposed Project (Figure 1, Section 1.0 of the Application) is a proposed natural gas transmission system from the Cypress area of northeast BC (approximately 100 km northwest of Fort St. John and 210 km south of Fort Nelson) to Ridley Island, near Prince Rupert (referred to as the Application Corridor). The transmission system will transport sweet gas to a liquefied natural gas (LNG) plant. A single route option is being assessed from Cypress to west of Cranberry Junction (referred to as the Cypress to Cranberry route). Two route options with marine segments (referred to as the Kitsault and Nasoga routes) are being assessed west of Cranberry Junction, but only one of those will ultimately be used.

The following routes will be considered in the Application.

- From Cypress the route traverses south to Hasler Flats generally paralleling, both immediately adjacent to and offset by up to 1 km, the existing Spectra Energy pipeline right-of-way, west through the Pine Pass, across the Parsnip Reach of the Williston Reservoir immediately north of Mackenzie, west around the northern tip of Takla Lake and the upper Babine River near Kisgegas, across the headwaters of the Skeena River, the Kispiox River and into the Nass River watershed to Cranberry Junction.
- The Kitsault route traverses northwest from Cranberry Junction, across the Nass River to Kitsault, at the head of Alice Arm. From here, the Kitsault route continues offshore through Alice Arm, Observatory Inlet, Portland Inlet and Chatham Sound before terminating at Ridley Island.
- The Nasoga route traverses southwest from Cranberry Junction along the lower Nass River, continuing across Nisga'a Lands south of the Nass River. The Nasoga route parallels the south bank of the Nass River, then bears west and south to Echo Cove. The route then extends offshore through Iceberg Bay and onshore south of the Chambers Creek estuary before heading west, and terminating on vegetated land at the head of Nasoga Gulf. From the head of Nasoga Gulf, the route extends offshore through Nasoga Gulf, Portland Inlet and Chatham Sound before terminating at Ridley Island.
- The marine portions of the Kitsault and Nasoga routes share the same location from approximately south of where the Nasoga Gulf joins Portland Inlet to Ridley Island.

FIGURE 1  
SPATIAL BOUNDARIES FOR FISH  
AND FISH HABITAT  
PROPOSED WESTCOAST  
CONNECTOR GAS  
TRANSMISSION PROJECT

8018



Application Routes

- Cypress to Cranberry Route
- Kitsault Route
- Kitsault Marine Route
- Nasoga Route
- Nasoga Marine Route
- Alternate Route

Project Facilities

- ★ Prince Rupert LNG
- K1-K4 Compressor Stations
- K5B Compressor Station
- KSA Compressor Station

Highway

- Highway

Road

- Road

Railway

- Railway

Watercourse

- Watercourse

Waterbody

- Waterbody

Municipality

- Municipality

First Nation Land

- First Nation Land

Treaty Settlement Land

- Treaty Settlement Land

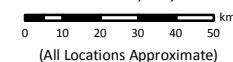
Fish and Fish Habitat

- Local Study Area (LSA)
- Regional Study Area (RSA)
- Sub-basin

Sub-basin

- Sub-basin

SCALE: 1:2,000,000



(All Locations Approximate)



NAD83 BC Albers Route current to February 5, 2014  
Hilshade: TERA Environmental Consultants, derived from Natural Resources Canada 2008; Highways/Roads: ESRI 2005; Railways: United States National Imagery and Mapping Agency 2000; Hydrography: IHS Inc. 2004; Municipalities and Regional Districts: BC Forests, Lands and Natural Resource Operations 2007; Populated Places: Natural Resources Canada 2010; First Nation Land: Government of Canada 2014; Treaty Settlement Land: IHS Inc. 2013; Local and Regional Study Areas: TERA Environmental Consultants 2014.

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

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The route will be approximately 854 km (Nasoga route) or 862 km (Kitsault route) in length (mostly buried or submerged pipeline) and is anticipated to have up to two pipelines, three metering stations and five compressor stations, as well as valve sites, barrel assemblies, tunnels, aerial crossing structures, associated permanent access and communications infrastructure along the route. In general, the diameter of the terrestrial pipelines will be up to 1,219 mm (NPS 48) and the diameter of the marine pipelines will be up to 1,067 mm (NPS 42). The diameter of the marine pipelines across Iceberg Bay will be up to 1,219 mm (NPS 48). The proposed Project will require temporary infrastructure during construction, such as access roads, equipment/vehicle watercourse crossings, pipe stockpile sites, borrow sites, equipment and material staging/storage yards, disposal sites and worker construction camps.

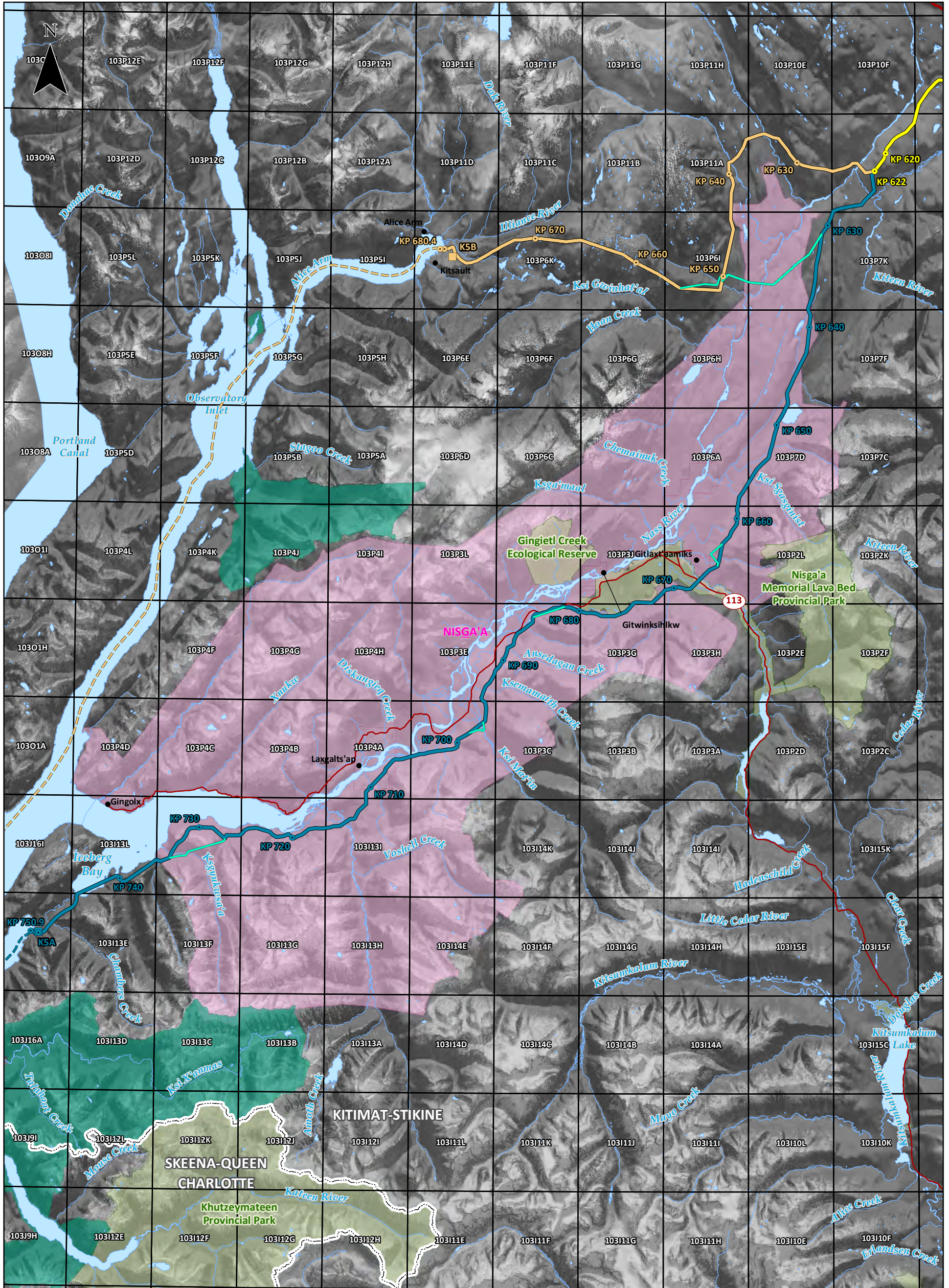
Initial plans are to develop a single pipeline within the 400 m Application Corridor that is being assessed, with potential to include a second pipeline within the same corridor, if and as commercial circumstances allow. If a second pipeline were developed it is currently anticipated that it would be constructed after the initial pipeline, require further permitting and would generally fall within the same 55 m right-of-way (with perhaps a few exceptions, but in all cases within the same 400 m Application Corridor that is being assessed). By completing the Application for up to two pipelines within the same 400 m Application Corridor and by continuing to engage with potential partners about the need for such additional pipeline capacity, the proposed Project can help facilitate the orderly development of LNG infrastructure in a manner that minimizes both potential Project effects and the proposed Project's contribution to cumulative effects.

A number of biophysical field studies have been conducted and are ongoing to support the permitting and licensing phase of the proposed Project, including freshwater fish and fish habitat studies. Several proposed route options and alternates are currently under consideration for the proposed Project, including some which pass through Nisga'a Lands as defined in the Nisga'a Final Agreement (NFA) (Figure 2). Freshwater fish habitat assessments and fish sampling were conducted for waterbodies on Nisga'a Lands during open water conditions 2014.

## 1.2 Objectives

The objectives of this freshwater fish and fish habitat technical data report are to:

- review and interpret existing information on freshwater fish and fish habitat for watercourses crossed by the corridors within the Nisga'a Lands Fish and Fish Habitat RSA;
- review relevant literature on freshwater fish species at risk or of special management interest, and/or sensitive fish habitat, located within the Nisga'a Lands Fish and Fish Habitat RSA;
- complete field surveys at potential watercourse crossings (PWCs) identified through desktop study, where accessible, on the ground or from the air during open water conditions to confirm whether potential watercourses crossed by the Application Corridor have defined bed and banks (*i.e.*, watercourses), are undefined non-classified drainages (NCDs) or have no visible channel (NVC);
- present the results of baseline field programs conducted to document fish use, aquatic habitat and fish habitat potential in the vicinity of the proposed watercourse and NCD crossings, including documenting fish-bearing status;
- incorporate the results of desktop and field studies to develop recommendations with the WCGT team concerning watercourse crossings with the objective of maintaining the productive capacity of the aquatic environment, including fish habitat, at proposed watercourse and NCD crossings; and
- collect additional data (*i.e.*, genetic tissue samples and population density) for Nisga'a Fish and Wildlife Department (NFWD);



Application Routes	Project Facilities	Infrastructure
Cypress to Cranberry Route	Prince Rupert LNG	Highway
Kitsault Route	K1-K4 Compressor Stations	Road
Kitsault Marine Route	K5B Compressor Station	Watercourse
Nasoga Route	KSA Compressor Station	Waterbody
Nasoga Marine Route		Treaty Settlement Land
Alternate Route		Conservancy Area
		Park/Protected Area

**Westcoast Connector Gas Transmission™**

**Spectra Energy**

SCALE: 1:350,000

0 2 4 6 8 10 km

(All Locations Approximate)

**FIGURE 2**  
**PROPOSED PIPELINE ROUTE OPTIONS**  
**WITHIN NISGA'A LANDS**  
**PROPOSED WESTCOAST CONNECTOR**  
**GAS TRANSMISSION PROJECT**



NAD83 UTM Zone 9N. Route current to February 5, 2014  
 Imagery: NASA Geospatial Interoperability Program 2005; Hillshade: TERA Environmental Consultants, derived from Natural Resources Canada 2008;  
 Populated Places: Natural Resources Canada 2010; Highways/Roads: Natural Resources Canada 2013; Hydrography, Conservancy Areas, Parks/Protected Areas: IHS Inc. 2004 and BC Forests, Lands and Natural Resource Operations 2008; Regional Districts: BC Forests, Lands and Natural Resource Operations 2007; Treaty Settlement Lands: IHS Inc. 2013.  
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### 1.3 Regulatory Standards and Guidelines

Regulatory standards in Canada for the construction of pipelines undertaken in proximity to watercourses vary according to the jurisdiction(s) where the Project is to be constructed. In BC, there are several federal and provincial acts and regulations that govern or provide guidelines on how pipeline watercourse crossing construction, operation and maintenance activities can be conducted. The Project will be subject to regulatory standards under the federal *Fisheries Act*, *Species at Risk Act (SARA)* and *Navigation Protection Act (NPA)*, as well as provincially under the *EAA*, the *OGAA*, the *Water Act* and the *Forest and Range Practices Act (FRPA)*. Regionally, the Project will also be subject to regulatory standards under the *NFA*. In addition, a number of guidelines, strategies and best practices have been developed by stakeholders in environmental resource management plans within the proposed Project RSA and are presented in Appendix A of the Fish and Fish Habitat Technical Data Report for the EA Application (TERA Environmental Consultants 2014).

The passing of Bill C-38 in June 2012 by the Government of Canada, as well as subsequent Cabinet orders in July 2012, resulted in several changes to the federal *Fisheries Act* and the regulations related to this act. In November 2013, amendments proposed to the *Fisheries Act* came into effect. New guidance and policy have been implemented to support the new fisheries protection provisions of the *Fisheries Act*, which will focus on the sustainability and ongoing productivity of recreational, commercial and Aboriginal fisheries (Fisheries and Oceans Canada [DFO] 2013a,b). In addition, in late 2012, Bill C-45 amended the *Navigable Waters Protection Act* and the renamed *NPA* received Royal Assent on December 14, 2012.

A proposal to update the provincial *Water Act* and replace it with the *Water Sustainability Act* was released in October 2013. Official announcement of the bill to the BC Legislative Assembly occurred in April 2014 and it is now officially considered an act. It is expected that the act will receive royal assent in the near future, taking full effect in April 2015.

As more information becomes available on the implementation of the regulatory changes associated with these acts, revisions to the federal and provincial standards discussed in Sections 1.3.1 and 1.3.2, and the pipeline construction and restoration recommendations (TERA Environmental Consultants 2014) may be necessary.

#### 1.3.1 Federal Standards

##### 1.3.1.1 Fisheries Act

Pipeline activities that have the potential to impact fish or fish habitat must be constructed and operated in compliance with the federal *Fisheries Act*. The *Fisheries Act* requires that projects avoid causing serious harm to fish unless authorized by the Minister of DFO. This applies to work being conducted in or near waterbodies that support fish that are part of or that support a commercial, recreational or Aboriginal fishery. The *Fisheries Act* defines serious harm to fish as “*the death of fish or permanent alteration to, or destruction of, fish habitat*” (DFO 2013a,b). The *Fisheries Act* also has provisions that: prohibit the deposition of deleterious substances into waters used by fish; ensure the safe passage of fish; require flow of water and passage of fish; and require water intakes and diversions to have a fish guard or fish screen.

DFO has introduced measures to facilitate its review process by allowing proponents to self-assess if projects near water require DFO review. The self-assessment process outlines the types of waterbodies and project activities, along with associated criteria, where DFO review may not be required. If a project takes place in a waterbody type listed in the DFO self-assessment or the activity associated with a project is included in the self-assessment and the criteria associated with that activity are met, review by DFO is not required (DFO 2013c). Proponents are still required to avoid causing serious harm to fish by providing mitigation such as those described in the Measures to Avoid Causing Harm to Fish and Fish Habitat (DFO 2013c).

If a project is unable to meet the above criteria, it must be submitted to DFO for review. Once reviewed, if it is determined that a project will not cause serious harm to fish, it may be allowed to proceed as planned or may be allowed to proceed with additional mitigation. If, however, it is determined that the project will cause serious harm to fish that are part of, or that support, a commercial, recreational or Aboriginal fishery, proponents may apply for a *Fisheries Act* authorization from the Minister of Fisheries and Oceans.

The authorization process will require proponents to demonstrate that measures and standards have been applied to first avoid, then mitigate, and then finally, offset any residual serious harm to fish that are part of or support a commercial, recreational or Aboriginal fishery.

### 1.3.1.2 *Navigation Protection Act*

The federal *NPA*, which came into force on April 1, 2014, is the result of the 2012 amendments to the *Navigable Waters Protection Act*. The *NPA* is administered by the Navigation Protection Program (NPP) of Transport Canada, and provides a legislative mechanism for the protection of navigation on public navigable waterways in Canada. This is accomplished through the authorization of constructed works and obstructions that could potentially interfere with navigation in scheduled navigable waters. The *NPA* includes a schedule that lists navigable waters for which regulatory approval is required for works that risk substantial interference with navigation. The schedule includes 3 oceans, 97 lakes and 62 rivers across Canada, including the busiest waterways that support commercial or recreational navigation. Scheduled Waters crossed by the Project include Williston Lake, the Pacific Ocean, and the Peace and Skeena rivers. *NPA* approval is not a requirement for waterways that are not listed on the schedule; however, the public right of navigation is protected in Canada by Common law regardless of whether the waterway is listed on the schedule or not. The *NPA* allows proponents of works on non-scheduled waterways to 'opt-in' for *NPA* assessment in order to proceed with the assurance that the proposed works interference with navigation is permissible under the regulation. However, the Minister of Transport can deny 'opt-in' requests.

Under the *NPA*, Notice to the Minister of Transport is a requirement for works on scheduled navigable waters (with the exception of works designated in the Minor Works Order). Notice to the Minister is to include a Notice of Works form as well as the required attachments and additional information so the NPP can identify any likely interference with the proposed works. Once Notice to the Minister is received by the appropriate regional office, it is screened to ensure that the proposed works are subject to the *NPA*, that the information provided is complete and that the work is not a designated work listed in the Minor Works Order. Subsequent to screening, the work is assessed by an NPP officer for its likelihood to interfere with navigation. Environmental review, Aboriginal consultation and public advertising may be required during the assessment process.

Based on the navigation impact assessment, a proposed work may be deemed a permitted work, or if it is expected to substantially interfere with navigation an application for ministerial approval is required. Section 9 of the *NPA* applies to works that are not expected to substantially interfere with navigation (*i.e.*, permitted works). Permitted works may proceed without the Minister's approval and are deemed compliant with the *NPA* if they meet the regulatory requirements, terms and conditions applicable to the project. Section 6 of the *NPA* applies to works that are expected to substantially interfere with navigation. An application for ministerial approval is required if the NPP assessment of impacts to navigation determines that works are likely to substantially interfere with navigation. Approval may be denied if the impacts to navigation are deemed to be unacceptable.

The Minor Works Order of the *NPA* allows certain classes of works to be built without Notice to the Minister if they meet applicable criteria, terms and conditions. Works meeting the assessment criteria are classed as *designated works* under the *NPA*. It is the responsibility of the owner to ensure that the proposed work meets the criteria established for its class and that all applicable requirements of the Minor Works Order are met. Classes of works established by the Minor Works Order include, but are not limited to: erosion-protection works; dredging; pipelines buried under the bed of navigable water; and pipelines, and power or communication cables attached to existing works. Transport Canada is also currently developing a Minor Works Repair Order, which is expected to come into force in fall 2014.

### 1.3.1.3 *Species at Risk Act*

*SARA* prohibits the killing, harming or harassing of listed species, trading in the parts of listed species and damaging or destroying the residence of an individual of a listed species. *SARA*'s Schedule 1 lists species as Extirpated, Endangered, Threatened or Special Concern. Species included on Schedule 1 are established by the Federal Cabinet and are based on recommendations by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and consultation with government, Aboriginal peoples and the public. An inter-jurisdictional agreement exists between the Province of BC and the Government of

Canada that recognizes the commitment of BC as well as the federal government to work cooperatively to protect and recover species at risk (*i.e.*, Canada-BC Agreement on Species at Risk).

Species that were designated At Risk by COSEWIC before the creation of SARA must be reassessed according to the new criteria of the act before they can be added to Schedule 1. These species are listed on Schedules 2 and 3, and are not yet officially protected under SARA.

### **1.3.2 Provincial Standards**

The BC EAO manages the assessment of proposed major projects in BC as required by the *EAA*. The OGAA is administered by the BC Oil and Gas Commission (BC OGC), the lead agency responsible for the review of provincially-regulated oil and gas projects. The Project is also subject to regulatory requirements under the BC Ministry of Environment (BC MOE) (*i.e.*, the *Water Act*) and BC Ministry of Forests, Lands and Natural Resource Operations (BC MFLNRO) (*i.e.*, *Forest Range and Practices Act*).

#### **1.3.2.1 Oil and Gas Activities Act**

The *Environmental Protection and Management Regulation (EPMR)* outlines the minimum legal requirements for environmental protection and management associated with BC OGC's legislative responsibilities (BC OGC 2013). The BC OGC has published a comprehensive guidance document titled *Environmental Protection and Management Guide (EPMG)* (BC OGC 2013) to assist proponents in understanding the requirements of the *EPMR*. The EPMG recommends best management practices (BMPs) for oil and gas-related watercourse crossing activities (*e.g.*, riparian management and crossing methods) that all proponents should follow. If the BMPs will not be implemented, an application for deviation from these practices is to be submitted to the BC OGC and an approval acquired (BC OGC 2013). The BC OGC acts as a one window regulator for provincially-regulated oil and gas projects, and a number of approvals must be acquired from BC OGC prior to the start of the applicable permitted construction activity.

The BC OGC also accepts alternative BMPs which are endorsed by DFO or BC MOE. Details of the proposed alternate BMPs should be outlined in the application to the BC OGC for deviation. The EPMG states that the Canadian Association of Petroleum Producers (CAPP) Pipeline Associated Watercourse Crossings 3rd Edition (CAPP *et al.* 2005) document is considered acceptable for watercourse crossing planning (BC OGC 2013).

A fish stream is defined by the *EPMR* as a stream that contains anadromous salmonids, select sportfish species or species listed as a Category of Species at Risk or as Regionally Identified Wildlife. Streams with a gradient of less than 20%, no documented natural barriers or if fish absence cannot be determined, are considered fish streams.

The *EPMR* allows for protection of designated Fisheries Sensitive Watersheds (FSWs), Wildlife Habitat Areas (WHAs), designated watersheds and temperature sensitive streams. Section 27 of the *EPMR* allows sensitive watersheds that have significant fisheries values to be designated as FSWs by order of the Deputy Minister of Forests, Lands and Natural Resource Operations. Approved FSWs are presented on the BC MOE website (BC MOE 2013a). To qualify as a FSW candidate, watersheds must meet two criteria: they must have significant fisheries values; and watershed sensitivity. Watersheds which meet the FSW criteria and that have been designated by way of an order as an FSW by the Minister require BC *Forest Act* agreement holders to establish results and strategies in their Forest Stewardship Plans consistent with the objective(s) set by the Minister. An FSW order established by the Minister sets out management direction to conserve important watershed level attributes protecting fisheries values. These attributes include: natural stream bed dynamics; stream channel integrity; quality, quantity and timing of water flow; and natural, watershed level, hydrological conditions and integrity.

Criteria have not yet been developed for other types of industrial activities such as oil and gas activities, that could potentially occur within a FSW and it is anticipated that where a pipeline is proposed to be constructed and operated within a FSW, that a management plan would be required to ensure the above listed attributes are conserved. Currently, the proposed Project does not cross through any approved FSWs within Nisga'a Lands.

Under Section 35 of the *EPMR*, designated watersheds, including community watersheds, are selected by the BC MFLNRO to protect quality, quantity and flow of water, and if necessary, to protect the watershed for human consumption purposes (BC MOE 2013b). The Application Corridor crosses through the Gitzyon Creek watershed within Nisga'a Lands, which is a designated community watershed. Temperature sensitive streams may also be designated under Section 28 of the *EPMR*, however, at this time, no streams have been officially designated as temperature sensitive streams (BC OGC 2013).

#### 1.3.2.2 *Water Act*

BC's *Water Act* is the main provincial statute regulating water resources in the province and is primarily administered by the Water Stewardship Division of BC MOE. The *Water Act* regulates the allocation and management of surface water and establishes protective measures for groundwater and wells. Section 9 of the *Water Act* regulates 'changes in or about a stream' and Part 7 of the *Water Act* regulation ensures that water quality, fish habitat and the rights of licensed water users are not compromised. The *Water Act* provides standards and mitigation measures for construction activities that require working in and around water (BC MOE 2009) in order to reduce disturbances to aquatic habitat and fauna that may result from instream activities associated with roads and other pipeline-related operations (BC MFLNRO *et al.* 2012).

Watercourse crossings for BC OGC-regulated projects require either approval from, or notification to, the BC OGC under Section 9 of the *Water Act* and Part 7 of the *Water Regulations*. Whether an activity requires notification or approval depends upon the nature of the work. The approval process requires proponents to provide BC OGC with channel characteristics, necessary habitat assessments, designs and plans for the proposed works required to assess the effects of the proposed works on channel stability, flood levels, fish and wildlife resources and downstream water licences.

Under Section 9 of the *Water Act*, the terms and conditions for 'changes in or about a stream' are regionally prepared. Regional terms and conditions for changes in or about a stream, including timing windows of least risk for instream activities (also known as instream work windows, timing windows, and reduced risk timing windows) have been developed. Approval must be obtained for instream construction contemplated to occur outside of the timing window of least risk. Timing windows of least risk may be subject to change by BC OGC or other provincial and federal agencies (BC OGC 2013). The timing windows of least risk relevant to the proposed Project are described in Section 3.5.2.

Several guidance documents have been developed in BC, including the User's Guide to Working In and Around Water (BC MOE 2009) and Standards and Best Practices for Instream Works (BC Ministry of Water, Land and Air Protection [BC MWLAP] 2004a, BC MOE 2013c). These guidance documents provide standards and recommended BMPs to reduce disturbance to aquatic habitat and fauna that may result from instream activities or other pipeline construction activities conducted in the vicinity of water.

#### 1.3.2.3 *Forest and Range Practices Act*

The *FRPA* is administered by BC MFLNRO and stipulates requirements for planning, road building, logging, reforestation and grazing in BC. The *FRPA* and its regulations were developed for the protection and maintenance of forest values, including watershed and habitat values. The *FRPA* requires that fish stream crossing procedures are implemented in a way that maintains fish passage and protects fish and fish habitat (BC MFLNRO *et al.* 2012). Through *FRPA* and its regulations, a number of provincial codes of practice, guidelines and BMPs have been developed that are applicable to pipeline associated watercourse crossings, these include: Fish stream Crossing Guidebook (BC MFLNRO *et al.* 2012); Riparian Management Area (RMA) Guidebook (BC Ministry of Forests [BC MOF] 1995); and Fish stream Identification Guidebook (BC MOF 1998).

#### 1.3.2.4 *British Columbia Species at Risk*

In BC, there is no single piece of legislation that provides protection for species at risk at the provincial level. The designation and protection of species at risk and their habitat is shared by several groups, acts and regulations. The *Wildlife Act* provides legal designation as Endangered or Threatened. Under the BC *OGAA EP MR*, the Minister responsible for the *Wildlife Act* may designate a species as a Category of Species at Risk or Regionally Important Wildlife (BC OGC 2013). Protection is provided to Identified Wildlife through the establishment of WHAs, as well as implementation of General Wildlife Measures,

WHA objectives and other management practices (BC MOE 2013d). Currently, the proposed Project does not cross through any approved WHAs.

The BC Conservation Data Centre (CDC) provides a list of species and ecological communities that are considered to be at risk. The BC CDC collects and displays information on species at risk and lists them as Yellow, Blue or Red. The Red list includes those species that are considered Extirpated, Endangered or Threatened in BC and may or may not be legally designated under the *Wildlife Act*. Red-listed species may also be considered as candidates for designation under the *Wildlife Act*. The Blue list includes those species that are considered Special Concern in BC (*i.e.*, not Extirpated, Endangered or Threatened) and have special characteristics that make them sensitive or vulnerable to human activities or natural events (BC CDC 2014). The Yellow list includes species that are considered to be secure and, therefore, are not at risk for extinction. The BC CDC ratings are used in this report to describe the provincial listings of fish species.

In July 2014, BC MOE and BC MFLNRO released a 5 year plan for Species at Risk in BC. Protecting Vulnerable Species: A Five-Year Plan for Species at Risk in BC is the result of the work of the Species at Risk Task Force and reflects many of its recommendations. The 5 year plan focuses on five key components that are consistent with the Canada-BC Agreement on Species at Risk: improving species conservation through ecosystem and landscape scale management; providing the best available information in support of identification, management and recovery of species; encouraging citizen stewardship of species at risk; consistently applying protection of species at risk across all sectors; and measuring and reporting on the government's investments in species at risk. The plan outlines management actions the provincial government plans to take over the next 5 years to improve species at risk management in balance with economic, environmental and social priorities.

### **1.3.3 Nisga'a Standards**

#### **1.3.3.1 Nisga'a Fisheries and Wildlife Act**

The NFA transferred approximately 2,000 km<sup>2</sup> of Crown land to Nisga'a Nation and provided substantial treaty rights throughout the Nass area, which covers nearly 27,000 km<sup>2</sup> (BC Ministry of Aboriginal Relations and Reconciliation 2013, Nisga'a Lisims Government [NLG] 2013a). The NFA provides certainty with respect to the rights and obligations of all parties within the Nass area as well as Nisga'a Nation's right of self-government, providing NLG law-making authority and jurisdiction over Nisga'a Lands as defined under the NFA (Centre for First Nations Governance 2013).

The *Nisga'a Fisheries and Wildlife Act (NFWA)* provides requirements for harvesting, sale, trade and barter of fish and wildlife, licensing requirements and parameters for fish and wildlife management in the Nass area. In addition, the *NFWA* outlines the joint management of both fish and wildlife resources between the provincial and federal governments and the Nisga'a Nation. The *NFWA* provides definitions of fish and wildlife fish, in which anadromous fish and marine species are considered separately from non-anadromous species. Under the *NFWA*, fish are managed under an annual fishing plan and wildlife fish are managed under an annual wildlife management plan.

The *NFWA* defines fish as:

- fish, including anadromous fish;
- shellfish, crustaceans, and marine animals;
- the parts of fish, shellfish, crustaceans and marine animals; and
- the eggs, sperm, spawn, larvae, spat, juvenile stages and adult stages of fish, shellfish, crustaceans and marine animals.

The *NFWA* defines wildlife fish, a unique term not found in provincial or federal legislation, as:

- lampreys, crustaceans, mollusks, and non-anadromous fish, from or in non-tidal waters;

- the parts of lampreys, crustaceans, mollusks and non-anadromous fish, from or in non-tidal waters; and
- the eggs, sperm, spawn, larvae, spat, juvenile stages and adult stages of lampreys, crustaceans, mollusks and non-anadromous fish, from or in non-tidal waters.

#### **1.4 Study Area Boundaries**

Study area boundaries are used to evaluate the potential adverse effects of the proposed Project on the environment (Figure 1). The study areas used for the effects assessment of fish and fish habitat considered one or more of the following areas:

- a Project Footprint;
- a Fish and Fish Habitat Local Study Area (LSA); and
- a Fish and Fish Habitat RSA.

##### **1.4.1 Project Footprint**

The Project Footprint is the physical area that will be directly disturbed by the proposed Project construction activities, including associated physical works and activities.

##### **1.4.2 Local Study Area**

The Fish and Fish Habitat LSA is the zone of influence (ZOI) likely to be affected by direct disturbance during construction and operations, and includes an area extending 150 m upstream and a minimum of 300 m downstream from the proposed crossing. The ZOI is the reach of the watercourse that is expected to be affected by construction activities associated with a proposed pipeline or vehicle and equipment crossing. The ZOI may be increased at the discretion of a qualified Fish Biologist based on site-specific information. The Fish and Fish Habitat LSA also includes the area of riparian vegetation to a width of 30 m back from the top of each bank within the construction right-of-way.

##### **1.4.3 Regional Study Area**

The Fish and Fish Habitat RSA is the area where the direct and indirect influence of other land uses and activities could overlap with proposed Project-specific effects and cause cumulative effects on the fish and fish habitat indicator, and includes sub-basins potentially directly affected by the proposed Project.



## 2.0 ENVIRONMENTAL SETTING

The following section describes the environmental setting and the fish community within the Nisga'a Lands Fish and Fish Habitat RSA.

Within Nisga'a Lands, the proposed Project traverses the Nass River watershed which drains directly into the Pacific Ocean. The Nass River is approximately 400 km long, flowing from its headwaters in the Skeena Mountains in northwest BC to the Pacific Ocean at Portland Inlet draining an area of roughly 25,000 km<sup>2</sup> (Bocking *et al.* 2005). Nisga'a Lands are located completely within BC's Skeena (6) Fish and Wildlife Region (BC MFLNRO 2013a). There are two proposed routes considered within the Nisga'a Lands: the Kitsault and Nasoga routes which are described below.

### 2.1 Kitsault Route

The Kitsault route (Figure 1) is described in Section 1.1. Within Nisga'a Lands, the Kitsault route and alternates traverses BC's Lower Nass Watershed Group (BC MOE 2013e) within the Nass River watershed. The Kitsault route is located within the Kalum Forest District and Kalum and Nass Timber Supply Area (TSA) (BC MOF 2005). There are two alternate routes being considered along the Kitsault route, the Kitsault and Kshadin Creek Alternate routes.

#### 2.1.1 Biogeoclimatic Zones

Within the Nass River watershed, the Kitsault route is within the Interior Cedar-Hemlock (ICH) and Coastal Western Hemlock (CWH) Biogeoclimatic (BGC) zones (BC Ministry of Forests and Range [BC MOFR] 2006).

The ICH BGC Zone has the highest diversity of tree species of any zone in BC. Western red cedar (*Thuja plicata*) and western hemlock (*Tsuga heterophylla*) dominate mature climax forests. White spruce (*Picea glauca*), Engelmann spruce (*Picea engelmannii*), their hybrids (*Picea engelmannii* X *glauca*) and subalpine fir (*Abies lasiocarpa*) are common and can form part of climax stands with either western hemlock or western red cedar, especially in areas of cold air drainage and ponding or at higher elevations. Western larch (*Larix occidentalis*), Douglas-fir (*Pseudotsuga menziesii*) and white pine (*Pinus monticola*) are common seral species in the central and southern areas of this zone on mesic and drier sites. Ponderosa pine (*Pinus ponderosa*) occurs on dry and warm slopes in some areas. Engelmann spruce, white spruce, spruce hybrids, subalpine fir and black cottonwood (*Populus trichocarpa*) are dominant in moist to wet areas. Lodgepole pine (*Pinus contorta* var. *latifolia*), trembling aspen (*Populus tremuloides*) and paper birch (*Betula papyrifera*) are common in all areas. Wetlands are infrequent due to the mountainous terrain throughout most of the zone. Where they do occur, they are usually small transitional bogs, fens and skunk cabbage (*Lysichiton americanus*) swamps. Riparian and lakeshore marshes tend to be more common (Meidinger and Pojar 1991).

The CWH BGC Zone is the wettest BGC zone in BC. Western hemlock is the most common tree species in forested areas. Western red cedar occurs throughout the zone and Douglas-fir is abundant in drier areas. Amabilis fir (*Abies lasiocarpa*) and yellow-cedar (*Chamaecyparis nootkatensis*) are common in wetter areas. Shore pine (*Pinus contorta* var. *contorta*) is common on very dry or very boggy areas throughout the zone. Grand fir (*Abies grandis*), western white pine (*Pinus monticola*) and bigleaf maple (*Acer macrophyllum*) occur in warmer and drier southern parts of the zone. Red alder (*Alnus rubra*) grows in disturbed sites, such as logged areas, and black cottonwood occurs along large rivers with extensive flood plains. Sitka spruce (*Picea sitchensis*) occurs over a wide variety of habitats north of Vancouver Island, but is restricted to flood plains and exposed beaches in the south (Meidinger and Pojar 1991).

#### 2.1.2 Seasonal Discharge Patterns

The Water Survey of Canada maintains a hydrometric station on the Nass River in the vicinity of the Kitsault route. Hydrometric Station 08DB001 on the Nass River above Shumal Creek is located approximately 6 km north of the Nisga'a Village of Gitlaxt'aamiks (formerly New Aiyansh) and approximately 25 km downstream from the proposed crossing of the Nass River by the Kitsault route. Flow data were collected seasonally at this station in 1932, from 1935 to 1947 and 1956 to 1958, and year-round all other years between 1929 and 2013 (Environment Canada 2013). The hydrograph shows that flow is influenced by seasonal events (e.g., snowmelt). Mean monthly discharge begins to increase in

April, peaks in June (2,080 m<sup>3</sup>/s) and is lowest from November to April, with the lowest flows recorded in March (136 m<sup>3</sup>/s). On average, the discharge at this station during spring freshet peaks approximately 13 times its mean winter discharge.

AMEC Environment and Infrastructure (AMEC) were retained by WCGT to determine monthly flows associated with watercourse crossings along the Application Corridor. Preliminary mean monthly flows at proposed watercourse crossings were estimated using existing data and hydrological models (AMEC 2012). The results of hydrologic analysis conducted by AMEC (2012) indicate similar flow patterns at the Nass River crossing.

### **2.1.3 Fish Community**

in the Nass River watershed is an assemblage of primarily coldwater species (*e.g.*, salmonids), including both resident and anadromous populations. Salt-tolerant species are present within the lower reaches of the Nass River and its tributaries (McPhail and Carveth 1993). Table 1 provides a list of fish species that may occur in waterbodies within the Nass River watershed where suitable habitat conditions and connectivity occur.

One species listed on Schedule 1 of SARA (green sturgeon) is reported to occur in the Nass River watershed within the Nisga'a Lands Fish and Fish Habitat RSA. Green sturgeon are listed as Special Concern on Schedule 1 (SARA Public Registry 2014) and COSEWIC (2014a) and are Red-listed (BC CDC 2014). Green sturgeon have been recorded in the Nass River estuary, however, records of green sturgeon occurring in freshwater are rare and there is no evidence of a population occurring in the Nass River upstream from the estuary (McPhail 2007).

One species listed by COSEWIC as Special Concern (eulachon) occurs in the Nass River watershed within the Fish and Fish Habitat RSA (COSEWIC 2014a). Pink salmon, chum salmon, steelhead and Pacific lamprey are listed as high-priority candidates for a detailed assessment by COSEWIC, while coastal cutthroat trout are listed as a mid-priority candidate (COSEWIC 2014b). Eulachon, coastal cutthroat trout and bull trout are Blue-listed in BC (BC CDC 2014). Pacific populations of bull trout are listed as Not at Risk by COSEWIC (2014a).

Although there have been sporadic records of white sturgeon in the estuary and lower reaches of the Nass River, these reports were rare and were later confirmed to be green sturgeon (McPhail 2007, Ptolemy and Vennesland 2003).

Several fish species occurring within the Nisga'a Lands Fish and Fish Habitat RSA have been identified as being at risk or of special management interest and are indicated with an asterisk (\*) in Table 1. Fish species identified as at risk include provincially Red and Blue-listed species (*i.e.*, BC CDC), federally-listed species (*i.e.*, SARA or COSEWIC), and those that are considered to be of conservation concern in other planning documents (*e.g.*, regional land and water resource use plans, BC Conservation Framework, Aboriginal land and resource management plans, etc.). Fish species of special management interest include those that are important for recreation, cultural or traditional use and commercially important fish.

TABLE 1

## FISH SPECIES THAT MAY OCCUR IN THE NASS RIVER WATERSHED WITHIN THE FISH AND FISH HABITAT RSA

Common Name <sup>1</sup>	Scientific Name <sup>1</sup>	Species Code <sup>2</sup>	Spawning Season <sup>3</sup>	Provincial Status <sup>4</sup>	COSEWIC-Listed Species <sup>5</sup>	SARA-Listed Species Schedule 1 <sup>6</sup>
<b>SPORTFISH</b>						
sockeye salmon/kokanee*	<i>Oncorhynchus nerka</i>	KO/SK	fall	Yellow	Not listed	Not listed
pink salmon*	<i>Oncorhynchus gorbuscha</i>	PK	summer/fall	Yellow	Not listed	Not listed
chum salmon*	<i>Oncorhynchus keta</i>	CM	summer/fall	Yellow	Not listed	Not listed
coho salmon*	<i>Oncorhynchus kisutch</i>	CO	fall	Yellow	Not listed in study area	Not listed
Chinook salmon*	<i>Oncorhynchus tshawytscha</i>	CH	fall	Yellow	Not listed in study area	Not listed
rainbow trout/steelhead*	<i>Oncorhynchus mykiss</i>	RB/ST	spring	Yellow	Not listed	Not listed
coastal cutthroat trout*	<i>Oncorhynchus clarkii clarkii</i>	CCT	spring	Blue	Not listed	Not listed
bull trout*	<i>Salvelinus confluentus</i>	BT	fall	Blue	Not at Risk	Not listed
Dolly Varden*	<i>Salvelinus malma</i>	DV	fall	Yellow	Not listed	Not listed
mountain whitefish*	<i>Prosopium williamsoni</i>	MW	fall	Yellow	Not listed	Not listed
burbot*	<i>Lota lota</i>	BB	winter/spring	Yellow	Not listed	Not listed
green sturgeon*	<i>Acipenser medirostris</i>	GSG	winter	Red	Special Concern	Special Concern
<b>NON-SPORTFISH</b>						
eulachon*	<i>Thaleichthys pacificus</i>	EU	winter/spring	Blue	Special concern	No status
Pacific lamprey*	<i>Entosphenus tridentus</i>	PL	spring	Yellow	Not listed	Not listed
western river lamprey*	<i>Lampetra ayresii</i>	RL	spring	Yellow	Not listed	Not listed
western brook lamprey*	<i>Lampetra richardsoni</i>	BL	spring/summer	Yellow	Not listed in study area	Not listed
longnose sucker	<i>Catostomus catostomus</i>	LSU	spring	Yellow	Not listed	Not listed
largescale sucker	<i>Catostomus macrocheilus</i>	CSU	spring	Yellow	Not listed	Not listed
northern pikeminnow	<i>Ptychocheilus oregonensis</i>	NSC	spring	Yellow	Not listed	Not listed
longnose dace	<i>Rhinichthys cataractae</i>	LNC	spring/summer	Yellow	Not listed	Not listed
peamouth	<i>Mylocheilus caurinus</i>	PCC	spring	Yellow	Not listed	Not listed
redside shiner	<i>Richardsonius balteatus</i>	RSC	spring	Yellow	Not listed	Not listed
prickly sculpin	<i>Cottus asper</i>	CAS	spring	Yellow	Not listed	Not listed
coastrange sculpin	<i>Cottus aleuticus</i>	CAL	spring	Yellow	Not listed in study area	Not listed
threespine stickleback	<i>Gasterosteus aculeatus</i>	TSB	spring/summer	Yellow	Not listed in study area	Not listed

- Notes:**
- \* Fish species indicated with an asterisk (\*) have been identified to be at risk or of special management interest.
  - Although not considered a sportfish species, eulachon are an important food source for Aboriginal groups along the North Coast of BC.
  - 1 BC MOE 2013f.g, McPhail 2007, McPhail and Carveth 1993, Page *et al.* 2013.
  - 2 Desrochers 1997.
  - 3 McPhail 2007, Scott and Crossman 1973.
  - 4 BC CDC 2014.
  - 5 COSEWIC 2014a.
  - 6 SARA Public Registry 2014.

## 2.2 Nasoga Route

The Nasoga route (Figure 1) is described in Section 1.1. Within Nisga'a Lands, the Nasoga route is within the Nass River watershed and the Lower Nass River Watershed Group (BC MOE 2013e). It is located within the Kalum (Kalum TSA) and North Coast (North Coast TSA) forest districts (BC MOF 2005). Along the Nasoga route there are four alternate routes proposed: the Gitlaxt'aamiks; Nisga'a Highway Tunnel; Ksi Mat'in; and Nass Bay Tunnel alternate routes.

### 2.2.1 Biogeoclimatic Zones

The Nasoga route traverses the ICH, CWH and Mountain Hemlock (MH) BGC zones (BC MOFR 2006). The CWH and ICH BGC zones are described in Section 2.1.1.

The MH BGC Zone occurs at relatively high elevations (400-1,000 m) and is characterized by short, cool summers and long, cool, wet winters with heavy snow cover for several months (Pojar *et al.* 1991). The most common tree species in the zone are mountain hemlock (*Tsuga mertensiana*), amabilis fir and yellow cedar, although they do not grow in continuous stands and are largely confined to lower elevations. Other characteristics of the MH BGC zone are: the high occurrence of shrubs such as blueberries (*Vaccinium* spp.) and copperbush (*Elliottia pyroliflora*); relatively low importance of herbs; dominance of bryophytes; and high significance of advanced generation of amabilis fir and mountain hemlock (Pojar *et al.* 1991). Subalpine heather areas located at higher elevations are dominated by heathers (*Cassiope* spp.), partridge-foot (*Luetkea pectinata*), clubmoss (*Lycopodium* spp.) and liverworts.

### 2.2.2 Seasonal Discharge Patterns

The Water Survey of Canada has maintained hydrometric stations on the Nass River (see Section 2.1.2), Ansedagan Creek and a tributary to Ksedin Creek (Tributary No. 2). The hydrometric station on Ansedagan Creek near New Aiyansh (No. 08DB013) is located approximately 500 m downstream from the Nasoga route crossing of Ansedagan Creek and 20 km southwest of the Nisga'a Village of Gitlaxt'aamiks (formerly New Aiyansh). Discharge was recorded year-round from 1997 to 2013 (Environment Canada 2013). Seasonal changes in discharge at Ansedagan Creek are influenced by events such as spring freshet. Records indicate that discharge is lowest in February (0.243 m<sup>3</sup>/s), increasing in the spring to peak in June (2.44 m<sup>3</sup>/s). During spring freshet, peak discharge at Ansedagan Creek is approximately seven times greater than its mean winter discharge. Flows decrease rapidly through summer, occasionally increasing in late summer and decreasing from October through winter (Environment Canada 2013).

The hydrometric station on Ksedin Creek (Tributary No. 2) near New Aiyansh (Station 08DB014) is located approximately 27 km southwest of Nisga'a Village of Gitlaxt'aamiks (formerly New Aiyansh). The station is on a tributary to Ksi Mat'in (alias Ksedin Creek) approximately 7 km upstream from the Nasoga route crossing of Ksi Mat'in. Discharge was recorded year-round from 1997 to 2013 (Environment Canada 2013). Flow changes seasonally and is influenced by events such as spring freshet. Records indicate that discharge is lowest during the winter from February through March (0.124 m<sup>3</sup>/s) and increases in spring, peaking in June (1.64 m<sup>3</sup>/s). Peak discharge at this station is approximately nine times greater than mean winter discharge. Flows decrease sharply through the summer, increase slightly in September and October, and decrease during winter (Environment Canada 2013).

Results from AMEC (2012) indicate that seasonal flow patterns of watercourses crossed by the Nasoga route were generally bi-modal, with peak flows occurring in June associated with spring snowmelt and in October due to weather events. Minimum monthly flows for the Nass River watershed occur in late winter (February).

### 2.2.3 Fish Community

The fish community in the Nass River watershed is described in Section 2.1.3 and Table 1.

## 2.3 Fish Species at Risk or of Special Management Interest

The following species descriptions summarize the general life history and habitat use of fish species that have been identified as being at risk or of special management interest (Table 1).

### **2.3.1 Sockeye Salmon and Kokanee**

Both anadromous (sockeye salmon) and freshwater resident (kokanee) life history types of sockeye salmon are widely distributed throughout most of BC. Sockeye salmon and kokanee are Yellow-listed (BC CDC 2014). Kokanee are managed as a recreational fishery and sockeye salmon as both a commercial and recreational fishery.

Adult sockeye salmon spend one to four years in the ocean before returning to freshwater to spawn. In the Nass River watershed, spawning migrations occur from June to September and spawning occurs from September to October (Gordon and Bahr 2003). Spawning typically occurs in lakes near inlet or outlet streams or near spring-fed shoreline beaches in areas with upwelling (*i.e.*, subgravel flow) and gravel substrate (Gordon and Bahr 2003, McPhail 2007). Typically, sockeye salmon fry emerge in early spring and migrate downstream into a nursery lake (lake-type) (Cohen 2012, McPhail 2007), however, some rear in streams and rivers (river-type). Lake-type and river-type sockeye salmon spend 1 to 2 years in freshwater before migrating to the ocean between April and June. Sea-type sockeye salmon fry migrate into estuaries and eventually to the sea within 1 year of emergence (McPhail 2007).

Kokanee migrate to spawning sites (*i.e.*, streams and shorelines) in late July and spawn in fall when water temperatures drop below 12°C. Kokanee fry may occupy both offshore and littoral zones in their nursery lakes, while adults typically inhabit offshore zones (McPhail 2007). Like other Pacific salmon species, kokanee and sockeye salmon die after spawning.

Sockeye salmon have shown a steady decline in numbers and have been considered potential candidates for assessment by COSEWIC (Levy 2006a). Declines have been attributed to reduced marine survival, climate change, effects of logging, mixed stock fisheries interceptions and enhancement activities which may have adverse effects (Levy 2006a). DFO and BC MFLNRO have restrictive freshwater angling regulations for sockeye salmon and kokanee (BC MFLNRO 2013b, DFO 2013d). Sockeye salmon on the North Coast are managed as part of the Integrated Fisheries Management Plan (IFMP) for salmon in Northern BC (DFO 2013e).

### **2.3.2 Pink Salmon**

Pink salmon are Yellow-listed (BC CDC 2014) and a high-priority candidate for a detailed status assessment by COSEWIC (2014b). There are commercial and recreational fisheries for pink salmon in BC.

Pink salmon are anadromous and spawning migrations into freshwater occur from late July to August (McPhail 2007). While pink salmon have been documented as far inland as the Babine River counting fence in the Skeena River watershed, they are considered weak swimmers and generally spawn within 100 km of the sea (Hyatt *et al.* 2007, McPhail 2007). Spawning on the North Coast occurs from August to September in water temperatures between 5°C to 15°C (Hard *et al.* 1996, McPhail 2007). Preferred spawning sites have clean gravel substrate with subgravel flow, often in shallow riffles with moderate currents (Hard *et al.* 1996). Like other Pacific salmon species, pink salmon only spawn once and adults die after spawning. Pink salmon spend the least amount of time in freshwater of the five Pacific salmon species (Hyatt *et al.* 2007). Eggs incubate over winter for up to 3 months before alevin hatch. Fry emerge 3 to 5 months later and swim directly downstream to estuaries (McPhail 2007). Pink salmon mature at age two, resulting in isolated populations of even and odd-year spawners (Hard *et al.* 1996, Hyatt *et al.* 2007). On the North Coast, even-year spawning runs are generally stronger (Gordon and Bahr 2003).

In comparison to other Pacific salmon species, pink salmon are not as highly affected by human activities (McPhail 2007). However, there is concern that the growing appearance of sea lice infections is a result of aquaculture in some areas (Morton *et al.* 2004). Pink salmon on the North Coast are managed as part of the IFMP for salmon in Northern BC (DFO 2013e) and DFO has restrictive freshwater angling regulations for pink salmon within the Skeena Region (DFO 2013d).

### **2.3.3 Chum Salmon**

Chum salmon are Yellow-listed (BC CDC 2014) and a high-priority candidate for a detailed status assessment by COSEWIC (2014b). Within BC, there are commercial and recreational fisheries for chum

salmon. Chum salmon are anadromous and widely distributed along coastal regions of BC, including the Nass River watershed (McPhail 2007).

On BC's North Coast, chum salmon migrate to freshwater to spawn from July to September, earlier than southern populations (Hyatt *et al.* 2007, McPhail 2007). Spawning migrations are limited by obstructions and chum salmon generally spawn within 100 km of tidal waters (Hyatt *et al.* 2007, McPhail 2007). Spawning typically occurs from August to September, but may occur from July through October (Gordon and Bahr 2003). Chum salmon are successive spawners (*i.e.*, create more than one redd) and spawn in gravel substrate with preference for sites with upwelling (Geist *et al.* 2002, McPhail 2007). Eggs incubate through the winter and alevin hatch from late December to February (Gordon and Bahr 2003). Fry migrate downstream to the ocean from late April to May, returning to freshwater three to four years later to spawn (Gordon and Bahr 2003). Like other Pacific salmon species, chum salmon die after spawning.

DFO has restrictive freshwater angling regulations for chum salmon within the Skeena Region (DFO 2013d) and they are managed as part of the IFMP for salmon in Northern BC (DFO 2013e).

### **2.3.4 Coho Salmon**

Coho salmon are a Yellow-listed species (BC CDC 2014) widely distributed throughout large rivers and small streams along BC's North Coast, including the Nass River watershed (Hyatt *et al.* 2007, McPhail 2007). There are commercial and recreational fisheries for coho salmon in BC.

Coho salmon are anadromous, typically undergoing spawning migrations less than 250 km in length, although some populations migrate as far as the headwaters of the Skeena River (McPhail 2007). The timing of river entry is dependent on water temperature and flow. On BC's North Coast, coho salmon migrate to freshwater from August to October and spawn from August through December (Gordon and Bahr 2003). Coho salmon spawn in small (*i.e.*, less than 1 m wide) tributary streams with gravel substrate (Hyatt *et al.* 2007, McPhail 2007). Adults die shortly after spawning. Eggs incubate over winter and alevin hatch in April (Gordon and Bahr 2003). Fry emerge later in the spring and spend up to 2 years in freshwater. In freshwater, juvenile coho salmon prefer slow water habitat with cover (*e.g.*, large woody debris, cut banks and pools with root wads) such as side-channel habitat, drainage ditches and sloughs. Juveniles often overwinter in off-channel habitat (*e.g.*, beaver ponds and flooded wetlands) with suitable cover (Hyatt *et al.* 2007, McPhail 2007). Downstream migrations of coho salmon to the ocean occur in spring from April to June (McPhail 2007).

DFO has restrictive freshwater angling regulations for coho salmon within the Skeena Region (DFO 2013a) and they are managed as part of the IFMP for Salmon in Northern BC (DFO 2013e).

### **2.3.5 Chinook Salmon**

Chinook salmon are Yellow-listed (BC CDC 2014) and managed as a commercial and recreational fishery. Chinook salmon are anadromous and occur in most medium to large rivers along the BC coast, including the Nass River watershed.

Two life history types of Chinook salmon occur in BC. Stream-type Chinook salmon spend 1 or 2 years in freshwater (streams, rivers and large lakes) before making major offshore migrations in the ocean. Ocean-type Chinook salmon migrate from freshwater to the ocean within a year of emergence and spend most of their ocean life in inshore waters less than 1,000 km from their natal rivers (Healey 1991, Hyatt *et al.* 2007).

Chinook salmon are fall spawners and often spawn in streams and mainstem rivers with higher water velocities and larger substrate than other Pacific salmon species (Hyatt *et al.* 2007, McPhail 2007). On BC's North Coast, Chinook salmon typically migrate into freshwater from mid-June to August and spawn from August to October (Gordon and Bahr 2003). Like other Pacific salmon species, Chinook salmon die after spawning. Eggs incubate over the winter and hatch in the spring. In freshwater, juvenile Chinook salmon rear in shallow edge habitat with low water velocities and fine substrate, backwater areas, off-channel habitat and sloughs for up to 2 years (Healey 1991, Hyatt *et al.* 2007). Overwintering habitat includes pools and interstitial spaces between cobble and boulder substrate in large rivers. Juvenile Chinook salmon feed on terrestrial and aquatic insects in freshwater, while in the ocean they feed on small fish (*e.g.*, herring and sand lance) and invertebrates (Healey 1991, McPhail 2007).

DFO has restrictive freshwater angling regulations for Chinook salmon within the Skeena Region (DFO 2013a) and they are managed as part of the IFMP for Salmon in Northern BC (DFO 2013e).

### **2.3.6 Rainbow Trout and Steelhead**

Both freshwater resident rainbow trout and anadromous steelhead are Yellow-listed (BC CDC 2014) and steelhead are listed as a high-priority candidate for a detailed status assessment by COSEWIC (2014b). Rainbow trout and steelhead are managed as recreational fisheries within the province. Rainbow trout are ubiquitous in cool and cold freshwater environments throughout BC, while steelhead only occur where there is connectivity with marine environments.

Resident rainbow trout spawn during spring, migrating to spawning sites after ice-out from late April to May (Roberge *et al.* 2001, 2002). The timing of spawning depends on temperature, typically occurring when water temperatures are 8°C to 15°C, from late April to July (Ford *et al.* 1995). Rainbow trout spawn in small tributaries or inlet or outlet streams of lakes, at sites with gravel substrate often at pool tail-outs upstream from riffles or areas of upwelling. The egg incubation period and subsequent gravel emergence vary with temperature and population (Ford *et al.* 1995, McPhail 2007).

Two life history types of steelhead, relative to freshwater entry timing, occur in BC. Winter-run steelhead enter freshwater during fall and winter (*i.e.*, November to April) and summer-run steelhead migrate from spring through fall (*i.e.*, May to September) (Busby *et al.* 1996, Keefer *et al.* 2008, Withler 1966 cited in McPhail 2007). Migration timing is related to distance to spawning areas and seasonal flow patterns. Steelhead typically spawn in spring, when water temperature is between 4°C and 10°C. Steelhead spawning habitat preferences are similar to those of resident rainbow trout, although larger-bodied steelhead may spawn in faster and deeper water over larger substrate (Busby *et al.* 1996, McPhail 2007). Egg incubation time is dependent on water temperature. Juvenile steelhead spend 2 to 3 years rearing in streams before migrating to the ocean where they stay for 1 to 4 years before returning to freshwater to spawn. Unlike Pacific salmon, steelhead can spawn more than once, although only a small percentage live to spawn a second time (Busby *et al.* 1996, McPhail 2007). Steelhead adults that spawn and return to the ocean are known as kelts.

Freshwater habitat used by rainbow trout and steelhead is variable and includes lakes, large rivers and small streams (Ford *et al.* 1995, Roberge *et al.* 2001, 2002). In flowing water, they inhabit riffles, runs and pools. Juveniles are typically found in shallower and slower water than adults. In the fall, they move into large pools with cover to overwinter. Juveniles often use the substrate for cover during winter. In streams, fry and juveniles feed on aquatic insects. As they grow, terrestrial insects are added to the diet and some become piscivorous (Ford *et al.* 1995, McPhail 2007).

Rainbow trout have been widely introduced and stocked throughout BC, and are not considered a conservation concern (McPhail 2007). Steelhead on the North Coast of BC may be susceptible to high levels of fishing pressure, which may be cause for concern due to the relatively small size of some of the stocks (Gordon and Bahr 2003). BC MFLNRO (2013b) has restrictive angling regulations for steelhead and rainbow trout.

### **2.3.7 Coastal Cutthroat Trout**

The two subspecies of cutthroat trout in BC are coastal and westslope cutthroat trout (Roberge *et al.* 2002). Only coastal cutthroat trout are found within the Nisga'a Lands Fish and Fish Habitat RSA. Coastal cutthroat trout are Blue-listed (BC CDC 2014) and are a mid-priority candidate for a detailed status assessment by COSEWIC (2014b). Coastal cutthroat trout are managed as a recreational fishery in BC.

Coastal cutthroat trout have three life history types: anadromous; stream-resident; and lacustrine (McPhail 2007). They use many habitat types depending upon their life history form and stage (Costello 2008, McPhail 2007, Trotter 1989). Coastal cutthroat trout spawn in the spring in small, low gradient streams (Gordon and Bahr 2003). Timing of migration and spawning for anadromous coastal cutthroat trout is highly variable. Migrations to freshwater may occur from late summer to early fall (August to September) or later, from winter to early spring (February to March) (Johnson *et al.* 1999, McPhail 2007, Trotter 1989). Although peak spawning generally occurs in February, spawning may occur from October to May (Gordon and Bahr 2003, McPhail 2007). The timing of migration and spawning for

resident coastal cutthroat trout may also vary widely by population. Spawning has been documented in temperatures from 2°C to 17°C (McPhail 2007).

Fry emerge from the gravel between March and June (Johnson *et al.* 1999, McPhail 2007, Roberge *et al.* 2002). Anadromous populations spend up to four years in freshwater before migrating to the ocean in the spring (Gordon and Bahr 2003, McPhail 2007). Lacustrine juveniles spend up to 2 years in stream habitat before moving into lakes or large rivers. Juvenile coastal cutthroat trout are generally associated with small streams and prefer pools with large woody debris cover, gravel substrate and reaches of low to intermediate (0-5%) gradient (McPhail 2007, Roberge *et al.* 2002). Coastal cutthroat trout are often piscivorous and are effective open-water predators, while some feed primarily on insects (McPhail 2007).

Declines in coastal cutthroat trout populations in BC can be attributed to habitat loss and degradation (e.g., forestry and urbanization), overharvesting and hatchery releases of other species such as steelhead and coho salmon (Costello 2008, McPhail 2007). BC MFLNRO (2013b) has restrictive angling regulations for coastal cutthroat trout in the Skeena Region, but there are currently no known management plans for this species in BC. Native populations of coastal cutthroat trout and native populations of steelhead have a sympatric relationship and are known to hybridize (Campton and Utter 1985, Ostberg *et al.* 2004, Young *et al.* 2001). Interspecific hybridization with steelhead may also pose problems to population stability (Campton and Utter 1985, Costello 2008).

### **2.3.8 Bull Trout**

Bull trout are found in most large inland drainage systems in BC (BC MWLAP 2004b, McPhail 2007). They are Blue-listed (BC CDC 2014) and listed as Category of Species at Risk in BC's Identified Wildlife Management Strategy (BC MOE 2013d). Bull trout in the Nass River watershed (*i.e.*, Pacific populations) are listed as Not at Risk by COSEWIC (2014a).

Bull trout spawn from late summer to early fall when water temperatures are between 5°C and 9°C (Zevit 2010), often in close proximity to cover in small streams with low water velocity. They require clean gravel and groundwater inflow for spawning (McPhail and Baxter 1996). Fry emerge in spring (April and May) shortly after hatching in late winter to early spring (Zevit 2010). Juvenile bull trout rear in streams for 2 to 4 years, where they prefer pools and deep side channel habitat (McPhail 2007).

Bull trout are frequently referenced as having the most sensitive habitat requirements among trout and char species in western North America (see numerous references in Mackay *et al.* 1997, Brewin *et al.* 2001). They prefer cool, fast-flowing streams and rivers with good water quality and diverse habitat features (e.g., riffles and pools, coarse woody debris and medium to large substrate). Bull trout display several life history forms including resident (e.g., stream-resident or lacustrine) and anadromous forms (McPhail and Baxter 1996). They are often a top predator in the ecosystems where they occur. Their susceptibility to angler overharvest, slow maturity and sensitive habitat requirements, as well as competition from introduced non-native species and habitat fragmentation, are frequently cited as factors contributing to the species decline through most of their range in North America (e.g., Berry 1994, P. Brewin and M. Brewin 1997, McPhail 2007, Pollard and Down 2001, Post and Johnston 2002).

Although BC does not have a management or recovery plan for bull trout, a provincial management strategy for bull trout is available (Pollard and Down 2001). BC has also developed sustainable resource management and planning recommendations for watersheds where bull trout occur in the northern interior forests of BC (Hammond 2004). The Skeena Region has restrictive angling regulations for bull trout (BC MFLNRO 2013b). Bull trout management strategies are discussed in Pollard and Down (2001), BC MWLAP (2004b) and Martin *et al.* (2004).

### **2.3.9 Dolly Varden**

Dolly Varden are Yellow-listed (BC CDC 2014) and managed as a recreational fishery in BC. Dolly Varden are a genetically distinct species of char from bull trout (Dunham *et al.* 2008, Haas and McPhail 1991, Zevit 2010), although there is hybridization between Dolly Varden and bull trout where the species coexist (Baxter *et al.* 1997, Dunham *et al.* 2008, McPhail 2007, Roberge *et al.* 2002).

Freshwater resident (both stream-resident and adfluvial) and anadromous populations of Dolly Varden occur in BC (McPhail 2007, Roberge *et al.* 2002). Dolly Varden spawn during the fall in flowing water, commonly over gravel and cobble substrates (Dunham *et al.* 2008). Adfluvial and anadromous



populations migrate to spawning habitat in streams (Gill 2007, Jaecks 2010, McPhail 2007). Eggs incubate in the substrate for 3 months over winter and fry emerge in the spring (April or early May) (Evans *et al.* 2001). Juvenile Dolly Varden prefer shallow, slow-moving habitat with cover in runs, pools and side channels (Evans *et al.* 2001, McPhail 2007, Roberge *et al.* 2002).

Dolly Varden are abundant and are not heavily exploited throughout most of their range in coastal BC. Introduced brook trout are a threat to Dolly Varden through increased competition and hybridization. It can be difficult to find pure Dolly Varden in some areas where hybridization with brook trout occurs (McPhail 2007). Freshwater populations of Dolly Varden are provided some protection through restrictive angling regulations intended to protect bull trout (BC MFLNRO 2013b, McPhail 2007).

### **2.3.10 Mountain Whitefish**

Mountain whitefish are a Yellow-listed (BC CDC 2014) species found throughout BC's central and northern interior rivers and lakes (McPhail 2007). Mountain whitefish are managed as a recreational fishery in BC.

Mountain whitefish have three distinct life history forms: lacustrine; fluvial; and adfluvial. Some fluvial populations migrate to smaller streams to spawn, although some (*e.g.*, Peace River populations) spawn in the mainstem. Complex seasonal migrations (*i.e.*, pre and post-spawning, feeding and spawning) over 100 km are common in fluvial populations. Generally, mountain whitefish (fluvial and adfluvial) spawn in flowing water at the downstream end of riffles or pool inlets during fall when water temperatures are below 10°C (*i.e.*, October or November). Fry emerge from late June to early July. In fluvial populations, fry inhabit shallow, slow water over sand or silt substrate and juveniles rear in glides and runs with boulder substrate. Adults inhabit pools and runs with large woody debris and coarse gravel or cobble substrate (McPhail 2007). Adfluvial populations rear in lakes or reservoirs (Evans *et al.* 2002).

In lakes, adult mountain whitefish typically occur at shallow depths (*i.e.*, less than 20 m), however, vertical migrations occur seasonally, depending on water temperature. Lacustrine populations spawn in lakes near areas of upwelling. Fry remain in shallow water with fine gravel and sand substrate. Juveniles rear in shallow, inshore habitat with sand or coarse gravel substrate through spring and summer (McPhail 2007).

Mountain whitefish are abundant and widespread in BC and are not currently considered a conservation concern in the province, although they are susceptible to habitat degradation (McPhail 2007, BC CDC 2014).

### **2.3.11 Burbot**

Burbot are Yellow-listed (BC CDC 2014) and managed as a recreational fishery. They are abundant in northern BC, however, some southern populations are declining (McPhail 2007).

Burbot reside in cold lakes, rivers and small streams (McPhail and Paragamian 2000). Burbot aggregate for spawning during late winter and early spring (December to March) when water temperatures are 0°C to 5°C, including under ice (McPhail 1997, 2007). They broadcast spawn in low velocity areas over a variety of substrates including small gravel, sand and silt (Nelson and Paetz 1992). After fertilization, eggs take 30 to 60 days to hatch depending on temperature (McPhail and Paragamian 2000). Juvenile burbot generally feed on phytoplankton and amphipods during the night (Ryder and Pesendorfer 1992), living in quiet backwater areas with gravel substrate. Burbot mature between ages 7 and 15 depending on sex, food resources and location, and can live for up to 20 years reaching 700 mm in length (McPhail 2007). Adult burbot prey and scavenge on fish, fish eggs and insect larvae (McPhail 2007, McPhail and Paragamian 2000).

### **2.3.12 Green Sturgeon**

Green sturgeon are Red-listed (BC CDC 2014), listed as a species of Special Concern with COSEWIC (2014a) and listed on Schedule 1 of SARA as Special Concern (SARA Public Registry 2014). Green sturgeon are documented sporadically in the lower Nass River and estuary within the Fish and Fish Habitat RSA (McPhail 2007), however, they are likely not present near proposed watercourse crossings. Little is known about green sturgeon in BC, and there is currently no evidence of spawning sites within the province (McPhail 2007).

Based on information from populations in Oregon and California, green sturgeon spawn in deep pools with large cobble as well as clean sand or bedrock in high velocity river mainstems. Green sturgeon migrate into rivers and broadcast spawn along rocky substrate from May to June in temperatures below 20°C. Juveniles spend 1 to 4 years in freshwater off-channel and low flow habitat, moving deeper every year into brackish water, developing a tolerance to saltwater within 7 months (COSEWIC 2004).

Due to their life history, morphology and habitat requirements, green sturgeon are susceptible to negative effects of human activities including damming of spawning rivers, channelization, loss of deep pools and pollution. High demand for the eggs for caviar has also led to the exploitation of green sturgeon (COSEWIC 2004).

### **2.3.13 Eulachon**

Eulachon are a species of smelt that are Blue-listed (BC CDC 2014) and listed as Special Concern by COSEWIC (2014a). Recent studies have been conducted by DFO to provide scientific input into the eulachon recovery planning process (Levesque and Therriault 2011, Schweigert *et al.* 2012). Eulachon are an important fishery for Aboriginal groups along the Pacific coast. Due to conservation concerns, there is no recreational fishery for eulachon and the commercial fishery in the Nass River ended in the 1940s (DFO 2013f). However, the Nisga'a Nation harvests eulachon as part of an Aboriginal fishery. The Nass River eulachon fishery has been monitored by Nisga'a Fisheries since the late 1990s (NLG 2013a).

Eulachon are primarily a marine species. Only a small portion (less than 5%) of their life cycle occurs in freshwater during spawning, egg and larval stages (COSEWIC 2011, Hay and McCarter 2000). They spawn in a small number of large coastal rivers that are fed by glaciers or heavy snowpack with high flows and turbidity during spring freshet (COSEWIC 2011, Hay *et al.* 1997 cited in McPhail 2007, Hay and McCarter 2000). Within the Nass and Skeena rivers, eulachon spawn in late February and early March (McPhail 2007). They are weak swimmers and the timing of the spawning migration is often associated with high tides and low discharge (Moody 2008). Eulachon broadcast spawn over small gravel or sand substrate (Gordon and Bahr 2003, Moody 2008). Adults spend about 4 weeks in freshwater and die after spawning (Hay and McCarter 2000). Eggs incubate for 2 to 8 weeks in freshwater before they hatch and larvae are carried downstream to the estuary (Gordon and Bahr 2003, McPhail 2007).

Many potential threats to eulachon populations have been cited, including habitat degradation (*e.g.*, pollution, dredging and negative effects from forestry), predator-prey relationships, climate shifts, as well as negative effects from fisheries (directed at eulachon or as by-catch) (COSEWIC 2011, Levesque and Therriault 2011, Schweigert *et al.* 2012). As part of the recovery planning process, recent efforts to identify primary threats to eulachon populations have not been successful (Levesque and Therriault 2011, Schweigert *et al.* 2012).

### **2.3.14 Lamprey Species**

Three Yellow-listed lamprey species (BC CDC 2014) may occur within the Nisga'a Lands Fish and Fish Habitat RSA: Pacific lamprey; western river lamprey; and western brook lamprey. Pacific lamprey commonly occur in coastal rivers in BC and their distribution is well documented. The distribution of western river lamprey and western brook lamprey is not well documented in the Fish and Fish Habitat RSA, but, they may occur in coastal systems (McPhail 2007).

Lamprey have several life history types. There are parasitic (*e.g.*, western river lamprey) and non-parasitic lamprey (*e.g.*, western brook lamprey), as well as freshwater resident and anadromous species (*e.g.*, Pacific lamprey) (McPhail 2007). Pacific lamprey, an anadromous species found throughout most coastal systems in BC (McPhail 2007), are of ecological and cultural importance to Pacific coast Aboriginal groups and are harvested as a subsistence fishery (Close *et al.* 2002). Pacific lamprey are captured and tagged from the Nass River in Grease Harbour fish wheels operated by NLG as part of a stock assessment program for Pacific salmon (NLG 2013b). There is no confirmation that other lamprey species (*i.e.*, western river lamprey and western brook lamprey) are of importance to Aboriginal groups.

On the North Coast of BC, Pacific lamprey migrate into freshwater prior to maturity, from July to September, and spawn the following spring from April to July (Gordon and Bahr 2003). Pacific lamprey typically die within 2 weeks of spawning (Gordon and Bahr 2003, McPhail 2007), however, some live to spawn a second time (McPhail 2007). Egg incubation time ranges from 13 to 29 days and appears to be

dependent on water temperature (see numerous references in McPhail 2007). Pacific lamprey larvae (ammocoetes) remain in freshwater for 4 to 5 years, prior to metamorphosis and subsequent downstream migration to the marine environment as adults at age 5 or 6 years (Beamish and Levings 1991).

The distribution and biology of western river lamprey is not well known in BC (Gordon and Bahr 2003, McPhail 2007). Records in freshwater are scattered, indicating that anadromous western river lamprey likely occur in most large, coastal river basins (McPhail 2007). They spawn in the spring and die shortly after, and are documented making long migrations to spawn in freshwater (Gordon and Bahr 2003, McPhail 2007).

Information on western brook lamprey is also limited, however, they have been reported in the lower Nass River. They are a non-parasitic, resident freshwater species that spend most of their life history (approximately 4 years) as ammocoetes. Western brook lamprey develop into adults during the summer and bury into the substrate, emerging in spring to make migrations to gravel-riffle habitat for spawning (McPhail 2007). Adult western brook lamprey do not feed.

There are indications that Pacific lamprey have significantly declined in abundance and distribution throughout their range (United States Fish and Wildlife Service [USFWS] 2010). Several threats to Pacific lamprey have been identified, including artificial barriers to migration (*e.g.*, dams), habitat degradation (*e.g.*, dredging and dewatering), poor water quality, ocean conditions, predation by introduced species and a decline in prey species (Luzier *et al.* 2009). In BC, there are no management plans for lamprey species, however, the USFWS has identified BMPs for management of Pacific lamprey (USFWS 2010).

### **3.0 METHODOLOGY**

TERA, teamed with local subconsultant Stantec Consulting Ltd. in Terrace, BC to provide additional capacity and local expertise to complete the planning, reporting and field components of the proposed Project.

#### **3.1 Pre-Field Work**

Prior to the start of field work the proposed Project was reviewed to identify PWCs, review existing fish information and determine access. Details of activities prior to field work are outlined below.

##### **3.1.1 Desktop Review**

A detailed desktop review was conducted to identify PWCs and existing fish and fish habitat data. PWCs were identified through a review of mapping and Geographic Information System digital data. Two hydrology datasets were used to identify potential watercourses crossed by the Application Corridor: Terrain Resource Information Mapping; and Freshwater Atlas (BC Crown Registry and Geographic Base Branch 2011, BC MOFR 2008). iMapBC was also reviewed and additional PWCs were identified.

Existing fish distribution and fish habitat information was reviewed to identify locations with documented fish presence. The following sources were reviewed: iMapBC; Fisheries Inventory Data Queries (FIDQ); Fisheries Information Summary System (FISS); Cross Linked Information Resources (CLIR); Ecological Reports Catalogue (EcoCat); and DFO's Mapster v3.-1 (Mapster). Other relevant data sources and reports were also reviewed as outlined in Section 3.2. The results of the desktop review assisted with field work planning.

Information collected through desktop review was compiled and used to prepare preliminary PWC summary tables which include all PWCs identified and existing fish presence data. The PWC tables were revised on an ongoing basis to reflect route revisions, alternate routes and unmapped watercourse crossings identified in the field, as well as results from preliminary field data.

##### **3.1.2 Permits**

A Fish Collection Permit and Scientific Licence issued by BC MFLNRO and DFO, respectively, were acquired prior to the start of field work. Permission to conduct field studies within Nisga'a Lands was acquired from the NLG.

##### **3.1.3 Field Crew Orientation**

Field crew orientation included a review of the Aquatics field program, fish inventory and fish habitat data collection standards and procedures developed for the field program, safety considerations, data management, reporting requirements and quality assurance/quality control procedures to ensure consistent data collection amongst crews. Field crews were provided with a Fish Habitat Sampling Field Guide as well as sampling permits and other resources.

#### **3.2 Literature Review**

A detailed literature review was conducted to identify locations with documented fish presence, sensitive habitat and information on fish species at risk or of special management interest. Information was gathered on the environmental setting within the proposed Project RSA, including fish and fish habitat information. This information was used to support the regulatory applications and to supplement field results in this report. The identification of watercourses with previously documented fish presence also reduced the need for additional fish sampling at some watercourses. Watershed codes from BC MFLNRO (2013c) were used during the desktop study to search for relevant fish information. Sources reviewed during the literature review included, but were not limited to, iMapBC, EcoCat, CLIR, FIDQ, FISS, COSEWIC database and status reports, SARA database, BC CDC and DFO's Waves Catalogue and Mapster. Discussions with the NLG, environmental consultants (e.g., LGL Limited Environmental Research Associates [LGL Ltd.]) and Provincial Biologists were also conducted to obtain relevant information sources. Results of the literature review are presented in Section 4.1.

### **3.3 Field Data Collection**

Freshwater fish and fish habitat data were collected along the Application Corridor during open water conditions in 2014. The methodology used during the field programs is described in the following sections.

#### **3.3.1 2012 Reconnaissance**

A reconnaissance flight was conducted in July 2012 to facilitate field work planning, logistics and resourcing. The reconnaissance flight was conducted by TERA's Project Aquatics discipline leads to gain familiarization with the general landscape and topography, to collect general data and aerial photographs at PWCs and to assess access to PWCs for field studies. Information collected during the reconnaissance flight was added to the PWC summary tables.

#### **3.3.2 Open Water Aquatic Assessments**

Open water aquatic assessments were conducted in June and July 2014, by crews of two or three trained personnel from TERA and/or Stantec Consulting Ltd., and were led by a qualified Fish Biologist. Nisga'a participants accompanied field crews during assessments. The PWCs investigated were accessed by helicopter, truck and by foot.

Field crews determined whether PWCs were on streams, as defined by the Fish Stream Identification Guidebook (BC MOF 1998) and *OGAA EPMPR*, or on NCDs lacking continuous defined bed and banks, or at locations determined to be NVC, where no evidence of a watercourse was found, indicating incorrect mapping or subsurface flow. Each PWC investigated was photo documented. The date, time and location (UTM NAD 83 coordinates) of the investigation were recorded along with a general description of the site.

Waterbodies with defined bed and banks (as determined by a qualified Fish Biologist) were assessed. Assessments involved an evaluation of aquatic habitat and fish inventory. Aquatic habitat assessment and fish inventory incorporated BC's Resources Information Standards Committee (RISC) standards and procedures (BC Fisheries Information Services Branch 2001) and guidance in the *OGAA EPMG* (BC OGC 2013). Some data required to meet the RISC standards were collected, however, are not included in this report. Record keeping practices were implemented to maintain field results for future reference.

NCDs lacking defined bed and banks were also documented. Aquatic habitat assessment and fish inventory were conducted at NCDs where the Fish Biologist believed that fish and fish habitat may be present. A modified aquatic habitat assessment was conducted at potentially fish-bearing NCDs as they lacked defined bed and banks (e.g., measurements of bankfull width and bank height were not applicable to NCDs). NCDs that were visited which had no fish habitat potential were photo documented and their locations recorded (UTM coordinates).

##### **3.3.2.1 Aquatic Habitat Inventory**

Aquatic habitat data were collected upstream, within and downstream from proposed watercourse crossings. At streams the study reach was generally a minimum 450 m in length (i.e., 150 m upstream and 300 m downstream from the proposed crossing). The length of the study reach, including the ZOI, was determined for each crossing in the field based on the professional experience and judgement of the Fish Biologist, who took into account a variety of factors (e.g., stream gradient, channel width, depth and morphology, flow velocity and discharge). If the length of the ZOI was determined to be greater than 300 m downstream from the proposed crossing, the assessment length was extended to include the entire ZOI. Assessments were conducted on foot or aerial assessments from a helicopter, based on conditions at the time of the assessment (e.g., water levels and access).

Physical channel characteristics were measured and recorded at a minimum of six transects located within the ZOI. At some watercourses, more than six transects were established, based on a number of factors including stream size and length of the ZOI. Transects were spaced a distance equal to the bankfull width apart as described by RISC (BC Fisheries Information Services Branch 2001) and BC OGC (2013). Measurements of bankfull and wetted width and bank height were recorded to the nearest 0.1 m. Water depth was recorded to the nearest 0.01 m. At larger waterbodies bankfull and wetted widths were measured to the nearest metre with a laser range finder and water depth was

measured to the nearest 0.1 m. Water depths greater than 1 m were estimated. Mean values were calculated for channel characteristic measurements (*i.e.*, bankfull and wetted width, water depth and bank height) recorded at transects. At each transect, substrate types were visually assessed based on substrate sizes listed in BC Fisheries Information Services Branch (2001) and Bain and Stevenson (1999).

Morphological and riparian vegetation characteristics that contribute to fish habitat potential within the study reach were described and photo documented. These included channel pattern, evidence of flooding, beaver activity and dominant cover types. Bank texture and shape were assessed qualitatively. Banks were referred to as left and right when facing downstream. Macro habitat units within the study reach were identified according to Alberta Transportation (2001), enumerated and measured for length. The large river habitat classification system described by RL&L Environmental Services (1994) cited in Alberta Transportation (2001) was, where applicable, incorporated into macro habitat unit delineation at large rivers.

Water quality parameters were measured where sufficient water was present. Dissolved oxygen (DO), conductivity, pH and water temperature were measured with YSI 650 Professional Plus digital water quality meters, Oxyguard Polaris DO meters and Hanna and Oakton Instruments pH and conductivity testers. Turbidity was visually assessed. Where sufficient laminar flow was encountered, water velocity was measured using a velocity meter (*i.e.*, Swoffer 2100, Global Flow Probe, Hach or Marsh McBirney) or the floating chip method, as described in Johnston and Slaney (1996), and used to calculate discharge.

Fish habitat was rated according to its potential to support spawning, rearing, wintering, migration and adult feeding and foraging. Fish habitat potential was rated hierarchically in decreasing order as 'essential', 'important', 'marginal' or 'unsuitable'. Fish habitat potential ratings were assigned for select fish species that may be present within the study reach of the waterbody. Ratings were based on the habitat quality present within the study reach and its potential to support fish populations. General descriptions of the habitat ratings adapted from BC OGC (2013) and DFO (1998) are described below.

- **'Essential'**: Habitat that is essential in sustaining a subsistence, commercial or recreational fishery, or a species of management concern (*i.e.*, Red and Blue-listed species, those designated by the COSEWIC or SARA-listed species). Essential habitat is rare or uncommon, exceptionally productive and has very high habitat values. Essential habitat is rare and will not be encountered often. Indicators of essential habitat include: the presence of exceptionally high value spawning or rearing habitat (*e.g.*, locations with an abundance of suitable spawning substrate, deep pools, undercut banks or stable debris) which are essential to the population present; or the presence of a SARA-listed species, its residence or essential habitat identified in a SARA recovery strategy or action plan.
- **'Important'**: Habitat that is used by fish for feeding, rearing, wintering and migration that is important to the fish population, however, is not deemed to be essential. This category of habitat usually contains a large amount of similar habitat that is readily available to fish. Important habitat provides the necessary physical and biological requirements for a fish species and life history stage. Generally, habitat with optimal or suboptimal habitat potential is important. Indicators of important habitat include: important migration corridors; the presence of suitable spawning and wintering habitat; and habitat with moderate rearing potential for the fish species present.
- **'Marginal'**: Habitat that has low productive capacity and contributes marginally to fish production. Marginal habitat provides limited habitat potential for fish life history requirements. Marginal habitat includes habitat that is not available to fish due to natural permanent barriers as well as habitat that is available to fish, however, supports limited fish use. Indicators of marginal habitat include: the absence of suitable spawning or wintering habitat; habitat with low rearing potential (*e.g.*, locations with a distinct absence of deep pools, undercut banks or stable debris with little or no suitable spawning substrate for the fish species present); and poor water quality and/or limiting hydrological or physical conditions.
- **'Unsuitable'**: No suitable habitat present for a specific fish species and/or life history stage. Indicators of unsuitable habitat include: a reach where habitat characteristics, such as water quality, were considered inadequate to support aquatic life (Canadian Council of Ministers of the Environment

[CCME] 2007); and/or physical attributes of the reach were insufficient to provide for the life history stage requirements of fish species that may be present within the study reach.

### **3.3.3 Fish Inventory**

Fish sampling was conducted using Smith-Root backpack (models LR-24, LR-20B and 12-B POW) and float (Model G.P.P. 2.5) electrofishers, baited Gee-type minnow traps and sample angling. The length of the fish sampling reach was a minimum of 100 m or 10 times the bankfull width, whichever was greater. RISC standards indicate two sampling methods should be used to ensure that sampling covers the range of habitat and potential fish species present in a stream (BC Fisheries Information Services Branch 2001). Two methods of fish sampling were used at most sites (*i.e.*, baited Gee-type minnow traps and backpack electrofishing). At some sites, the Fish Biologist determined one method of sampling was sufficient to effectively sample the habitat present, given favourable sampling conditions (*e.g.*, narrow and shallow watercourses with limited cover where backpack electrofishing was sufficient to sample the entire wetted width and allow observations of fish). In some cases, permit restrictions or site conditions (*e.g.*, insufficient water depth for minnow traps) did not allow for two methods of sampling.

Fish capture and processing were conducted in a manner that ensured maximum survival of fish. Fish captured were enumerated, identified to species and measured for length to the nearest millimetre. Fish were identified according to McPhail and Carveth (1993) and Pollard *et al.* (1997). In the Nass River watershed, both bull trout and Dolly Varden are known to occur, therefore, juvenile bull trout and Dolly Varden that were captured were identified as char. Similarly, in locations where both rainbow trout and steelhead occur, both steelhead and rainbow trout were identified as rainbow trout. Sex and life history stage were recorded, if externally discernible. Once processing was complete, fish were released back into the habitat from which they were captured. Catch-per-unit-effort was calculated based on the number of fish captured during the time spent actively electrofishing (*i.e.*, number of fish captured per 100 seconds of electrofishing effort) or minnow trapping (*i.e.*, number of fish captured per 1 hour of trapping effort).

Information collected during the literature review was used to identify watercourses with documented fish distribution information and is included in Section 4.1. To reduce the effect of sampling on fish, electrofishing was not conducted at watercourses where existing fish distribution information was adequate and it could be expected that fish species documented in the waterbody would occur near the proposed crossing.

### **3.3.4 Additional Sampling**

Additional studies were requested by the NLG and LGL Ltd. at select watercourses including population density estimates (*e.g.*, three pass removal) and tissue sample collection for genetic studies of salmon species.

Most sites where population density estimates were requested were too large or flows were too high to isolate, so population density estimates could not be conducted. A three-pass removal was conducted at one site by a crew of three, (PWC780.1) a constructed side channel of Ksi Mat'in (PWC781), using a backpack or float electrofisher. Prior to sampling, barrier nets were strung along the upstream and downstream boundaries of the site to isolate the sampling area. Electrofishing sweeps were conducted in a downstream to upstream direction. Fish captured were identified to species, and length was recorded before they were released back to the watercourse.

Non-lethal methods were used to collect tissue samples (*i.e.*, adipose or caudal fin clips) from salmon species for genetic studies. Caudal fin clips were used for coho salmon and Chinook salmon, while adipose fin clips were used for other salmon species. Adipose tissue was not used for Chinook salmon and coho salmon since adipose fins are commonly used for coded-wire tagging of these species in the Nass River watershed (Candy pers. comm.). Fin clips were collected using a hole punch, placed on a sheet of Whatman® Grade 1 Filter Paper and allowed to dry overnight. Sample sheets were labeled and sent to LGL Ltd. In addition to fin clips, species, length, weight, sex (if discernible externally) and stage of maturity were also recorded. Analysis of population density data and genetic studies was not within the scope of this study, will be carried out by NFWD and/or LGL Ltd., and results are not included in this report.

### 3.4 Data Analysis

Data collected through desktop/literature review and field programs (with the exception of additional sampling data described in Section 3.3.4) was used to determine stream classification, RMA width, timing windows of least risk and sensitivity. This also included a review of regional, provincial and federal regulatory frameworks and standards.

#### 3.4.1 Stream Classification

Fish presence and channel morphology data were used to determine stream classification and RMA width at watercourse crossings, as described in BC OGC (2013). Stream classification is based on mean channel width, documented fish presence and location within a community watershed (Table 2). RMA's are areas adjacent to waterbodies where special management is required to maintain water values and fish or wildlife habitat. The RMA typically consists of two zones: a Riparian Reserve Zone (RRZ), which borders both banks of a stream; and a Riparian Management Zone (RMZ), which borders both sides of the RRZ (BC OGC 2013).

**TABLE 2**

**STREAM CLASSIFICATION AND RMAS**

Stream Class	Average Channel Width (m)	RRZ Width (m)	RMZ Width (m)	Total RMA Width (m)
S1-A (fish stream)	> 100	50	50	100
S1-B (fish stream)	20-100	50	20	70
S2 (fish stream)	5-20	30	20	50
S3 (fish stream)	1.5-5	20	20	40
S4 (fish stream)	< 1.5	0	30	30
S5 (nonfish stream)	> 3	0	30	30
S6 (nonfish stream)	≤ 3	0	20	20

Source: BC OGC 2013

#### 3.4.2 Timing Windows of Least Risk

Timing windows of least risk represent a time period when there is a lower risk to fish and fish habitat from instream work activities. They are not to be considered as a time period during which there is no risk. Timing windows of least risk for instream activities were determined using regional terms and conditions developed for the Skeena Fish and Wildlife Region (BC MWLAP 2005). Preliminary timing windows of least risk have been identified for watercourse crossings based on existing fish distribution information and field data. Timing windows of least risk may be revised based on the results of supplemental studies and input from regulatory agencies and other stakeholders.

Timing windows of least risk for the Skeena Region are provided in BC MWLAP (2005) and vary by Forest District and TSA (Table 3). Date ranges listed in Table 3 represent times when the risk to aquatic resources is low and instream work is to be conducted.



**TABLE 3**  
**SKEENA REGION TIMING WINDOWS OF LEAST RISK**

BC MWLAP Timing Windows of Least Risk <sup>1,2</sup>		
Fish Species	Kalum Forest District (Kalum and Nass TSA)	North Coast Forest District (North Coast TSA)
Chinook salmon	June 1 to July 15	June 1 to July 15
coho salmon	June 15 to September 1	June 15 to August 31
pink salmon	May 15 to August 1	May 15 to August 1
chum salmon	May 15 to July 10	May 15 to July 15
sockeye salmon	June 1 to July 20	June 15 to July 31
kokanee	June 15 to August 15	June 15 to July 31
steelhead	August 15 to January 31	August 1 to December 31
rainbow trout	August 1 to January 31	August 15 to January 31
cutthroat trout	August 1 to January 31	August 15 to December 31
bull trout	June 1 to August 31	N/A
Dolly Varden	June 1 to August 31	June 15 to August 31
Whitefish spp.	June 1 to September 15	N/A

- Notes:**
- 1 BC MWLAP 2005.
  - 2 For Skeena Region (general), eulachon least risk timing window is from June 15 to February 15.

### 3.4.3 Sensitivity Ranking

Fish and fish habitat information collected during desktop and field studies were used to determine fish and fish habitat sensitivity at watercourses crossed by the Application Corridor (Table 4). Watercourses considered to have a 'high' sensitivity ranking may require additional regulatory applications such as a deviation through BC OGC, DFO *Fisheries Act* authorization, as well as site-specific mitigation or a site-specific restoration plan.

**TABLE 4**  
**FISH AND FISH HABITAT SENSITIVITY EVALUATION CRITERIA**

Evaluation Criteria		Sensitivity/Rank
Species Present	Habitat Potential	
Not a fish stream as defined by the BC OGAA <i>EPMR</i> or no fish captured or previously documented, or species present are not a species at risk or of special management interest (as defined in Section 4.5.2.1 of the Application).	Little to no fish habitat potential ( <i>i.e.</i> , fish habitat potential rated as 'unsuitable') or fish habitat with low productive capacity ( <i>i.e.</i> , fish habitat potential rated as 'marginal').	Low
Species present are species at risk or of special management interest (as defined in Section 4.5.2.1 of the Application) or a confirmed fish stream as defined by the BC OGAA <i>EPMR</i> .	Fish habitat potential for spawning, rearing, adult feeding/foraging or wintering rated as 'important' or 'essential' to the continued existence of a population (for a species at risk or of special management interest).	High

## 4.0 RESULTS

This section describes the results of the desktop and literature review (Section 4.1) and field data collection (Section 4.2). Results are presented in separate subsections for each corridor.

### 4.1 Desktop and Literature Review

The results of the desktop study and literature review conducted to identify proposed watercourse crossings with documented fish presence, sensitive habitat and information on fish species at risk or of special management interest are presented below. Locations of PWCs are presented in Figure 3.

In this section, the hierarchical 1:50,000 watershed codes described in BC Ministry of Environment and Parks (1988) are used to identify watercourses. Watershed codes also aided in collecting fish and fish habitat information using BC MOE's FIDQ tools (BC MOE 2013f).

#### 4.1.1 Kitsault Route

Within Nisga'a Lands, the Kitsault route crosses the Nass River and several of its unnamed tributaries. The Nass River has been extensively surveyed and fish distribution is well documented (Table 5).

**TABLE 5**  
**PREVIOUSLY DOCUMENTED FISH SPECIES IN**  
**WATERCOURSES CROSSED BY THE KITSALT ROUTE WITHIN NISGA'A LANDS**

Watercourse Crossing No.	Watercourse Name (Watershed Code)	Previously Documented Fish Species	References
PWC1038	Nass River (K'Alii Aksim Lisims) (500)	Sockeye salmon, pink salmon, Chinook salmon, chum salmon, coho salmon, steelhead, rainbow trout, coastal cutthroat trout, Dolly Varden, mountain whitefish, green sturgeon <sup>1</sup> , eulachon, lamprey spp., sculpin spp. and threespine stickleback	Alexander and Koski 1995, BC MOE 2013f,g, Bocking <i>et al.</i> 2005, Koski <i>et al.</i> 1996a,b, Levy 2006b, LGL Ltd. and Northwest Hydraulic Consultants 1996a, Link 1999, Link <i>et al.</i> 1996, Moody 2008, Parken 1997, Parken and Atagi 1998

**Note:** 1 Green sturgeon are only documented in the Nass River estuary and are not expected near the crossing investigated.

July 2014








FIGURE 3 - SHEET 1 OF 9

POTENTIAL WATERCOURSE  
CROSSING LOCATIONS ON  
NISGA'A LANDS














PROPOSED WESTCOAST  
CONNECTOR GAS  
TRANSMISSION PROJECT

8018

**Potential Application Components**

-  Cypress to Cranberry Route
-  Kitsault Route
-  Kitsault Marine Route
-  Nasoga Route
-  Nasoga Marine Route
-  Alternate Route
-  2 km Study Area Corridor
-  Compressor Station
-  Proposed Access Road

-  Potential Pipeline Watercourse Crossing
-  Potential Road Watercourse Crossing
-  Existing Facility
-  Existing Westcoast Pipeline
-  Other Existing Pipeline
-  Highway
-  Road
-  Access/Resource Road
-  Rough Trail/Overgrown Road
-  Transmission Line
-  Railway
-  Watercourse
-  Waterbody
-  City/Town
-  First Nation Land
-  Treaty Settlement Land
-  Park/Protected Area

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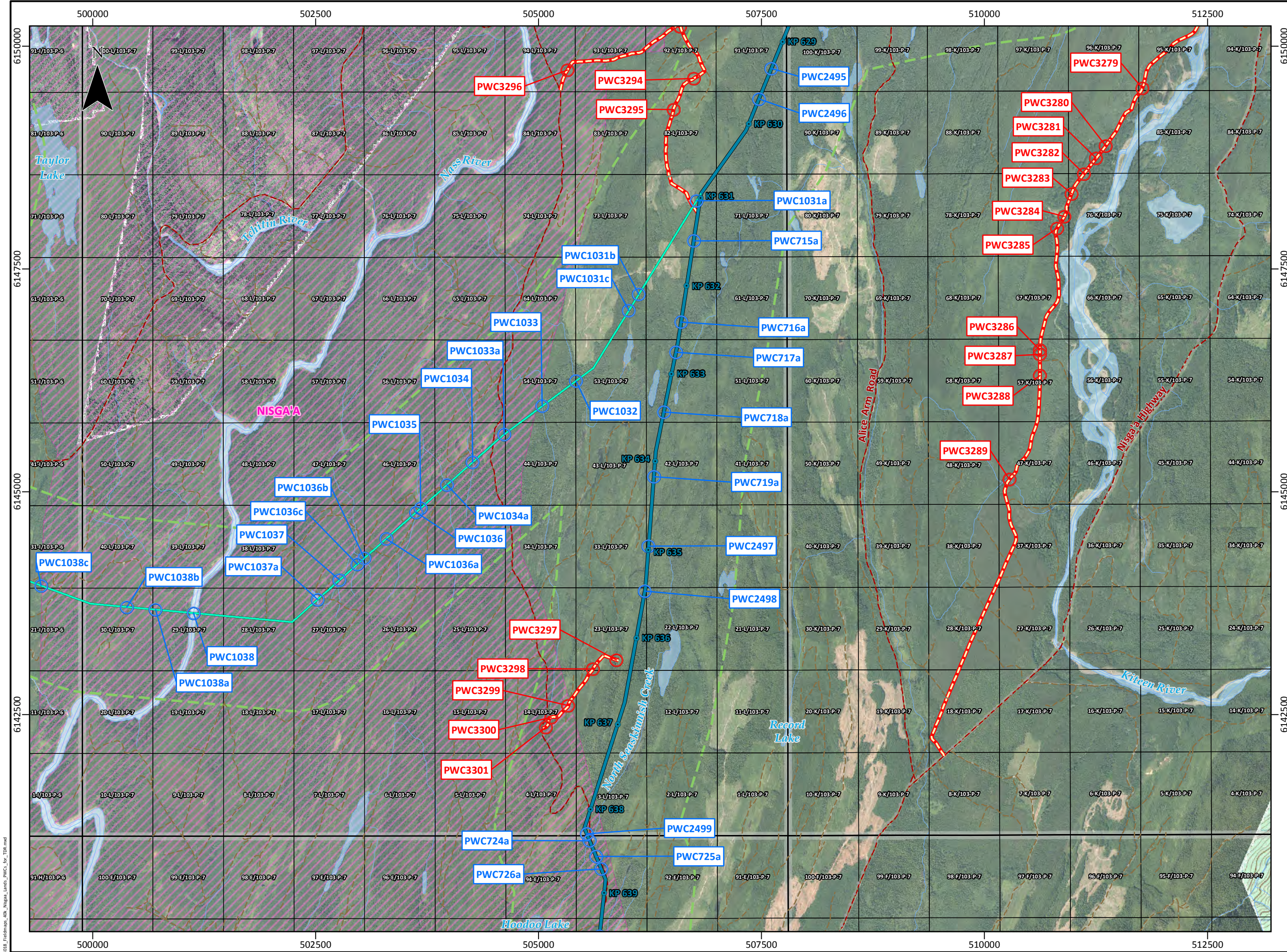
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FIGURE 3 - SHEET 2 OF 9  
POTENTIAL WATERCOURSE  
CROSSING LOCATIONS ON  
NISGA'A LANDS

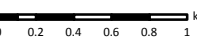
PROPOSED WESTCOAST  
CONNECTOR GAS  
TRANSMISSION PROJECT

8018

Potential Application Components

-  Cypress to Cranberry Route
-  Kitsault Route
-  Kitsault Marine Route
-  Nasoga Route
-  Nasoga Marine Route
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-  Railway
-  Watercourse
-  Waterbody
-  City/Town
-  First Nation Land
-  Treaty Settlement Land
-  Park/Protected Area

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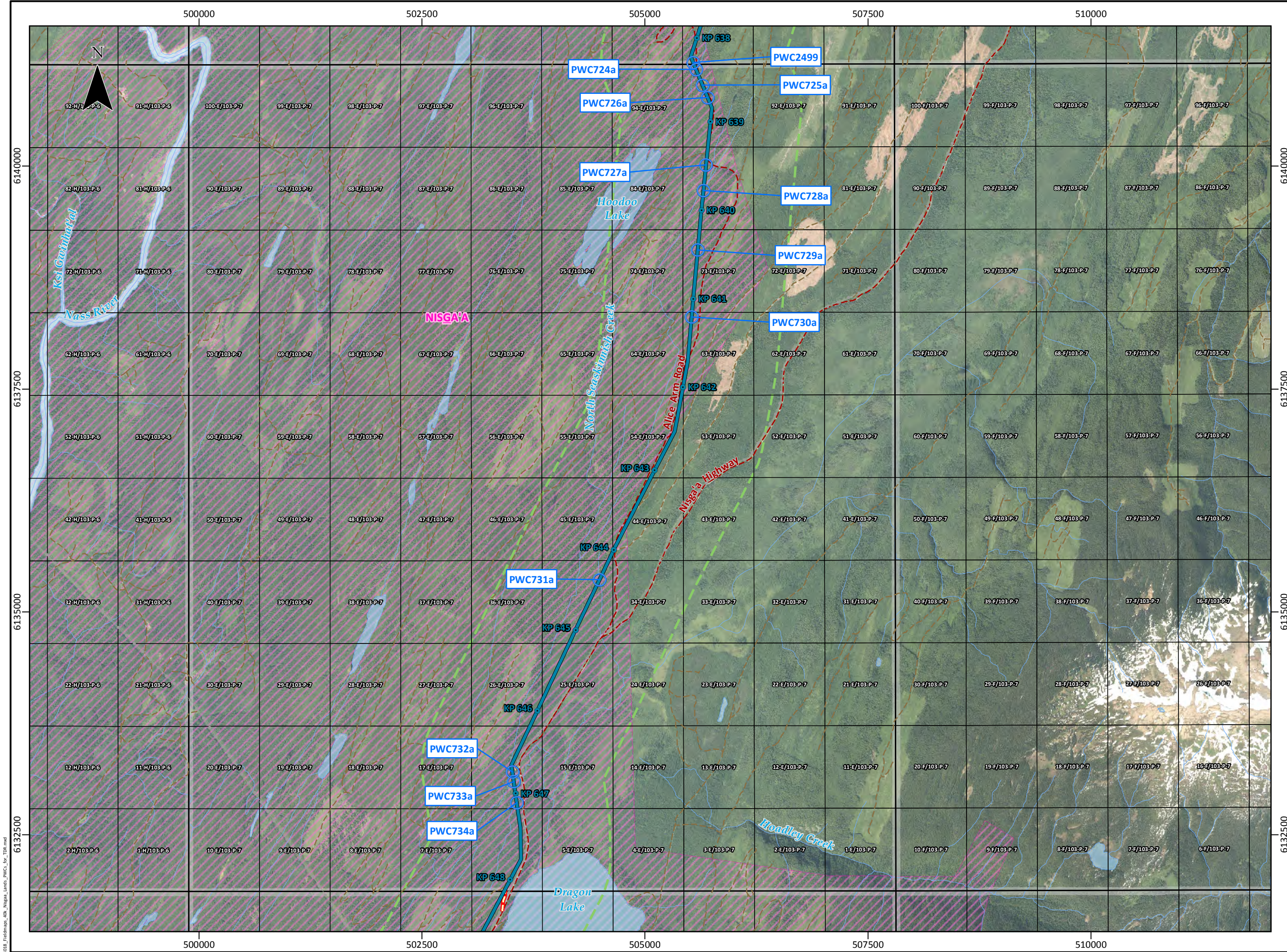
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FIGURE 3 - SHEET 3 OF 9  
POTENTIAL WATERCOURSE  
CROSSING LOCATIONS ON  
NISGA'A LANDS

PROPOSED WESTCOAST  
CONNECTOR GAS  
TRANSMISSION PROJECT

8018

Potential Application Components

- Cypress to Cranberry Route
- Kitsault Route
- Kitsault Marine Route
- Nasoga Route
- Nasoga Marine Route
- Alternate Route
- 2 km Study Area Corridor
- Compressor Station
- Proposed Access Road
- Potential Pipeline Watercourse Crossing
- Potential Road Watercourse Crossing
- Existing Facility
- Existing Westcoast Pipeline
- Other Existing Pipeline
- Highway
- Road
- Access/Resource Road
- Rough Trail/Overgrown Road
- Transmission Line
- Railway
- Watercourse
- Waterbody
- City/Town
- First Nation Land
- Treaty Settlement Land
- Park/Protected Area

SCALE: 1:40,000

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(All Locations Approximate)

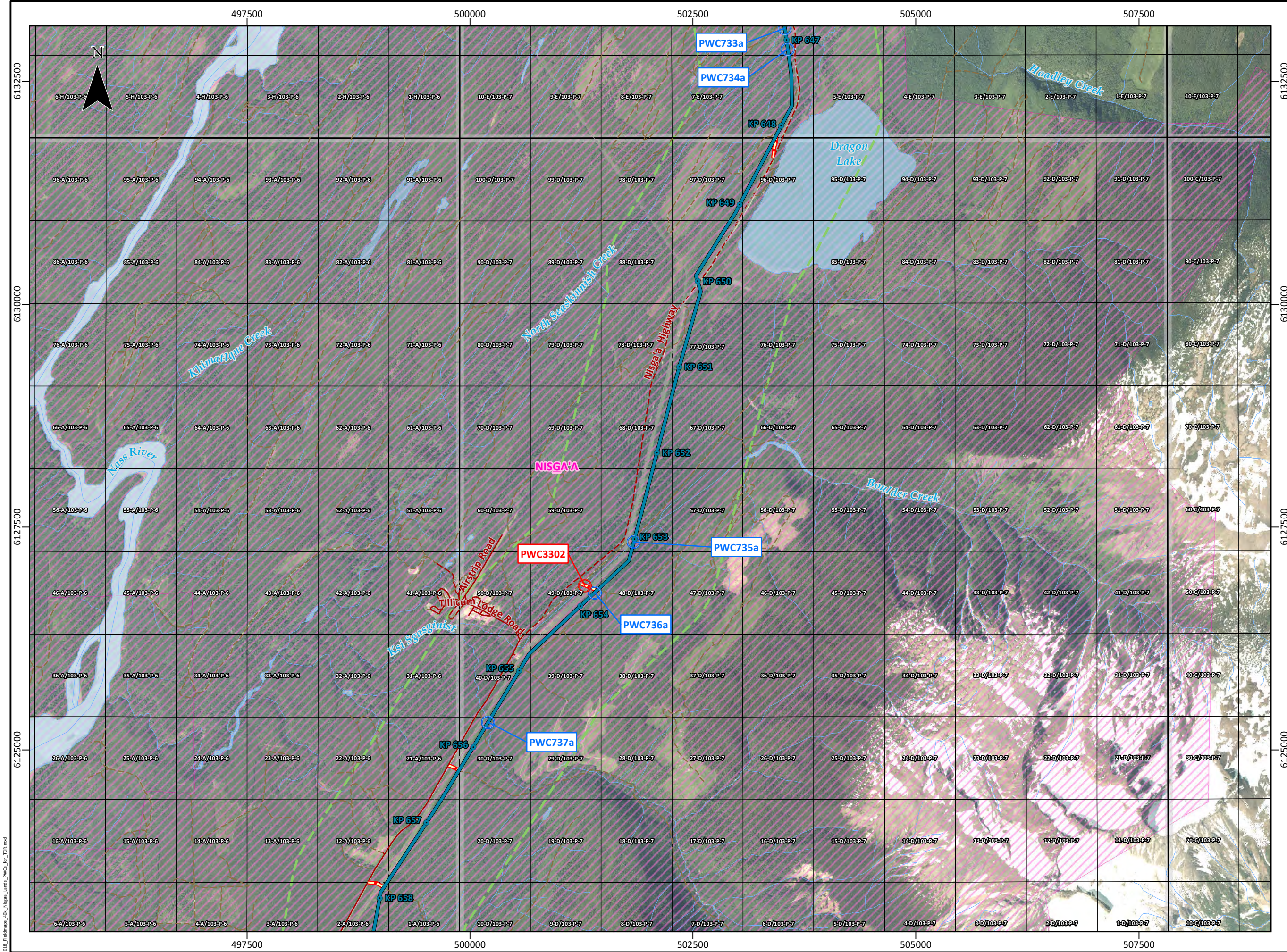


NAD83 UTM Zone 9N. Route current to February 5, 2014

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






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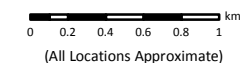


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Potential Application Components

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-  Kitsault Route
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-  Potential Road Watercourse Crossing
-  Existing Facility
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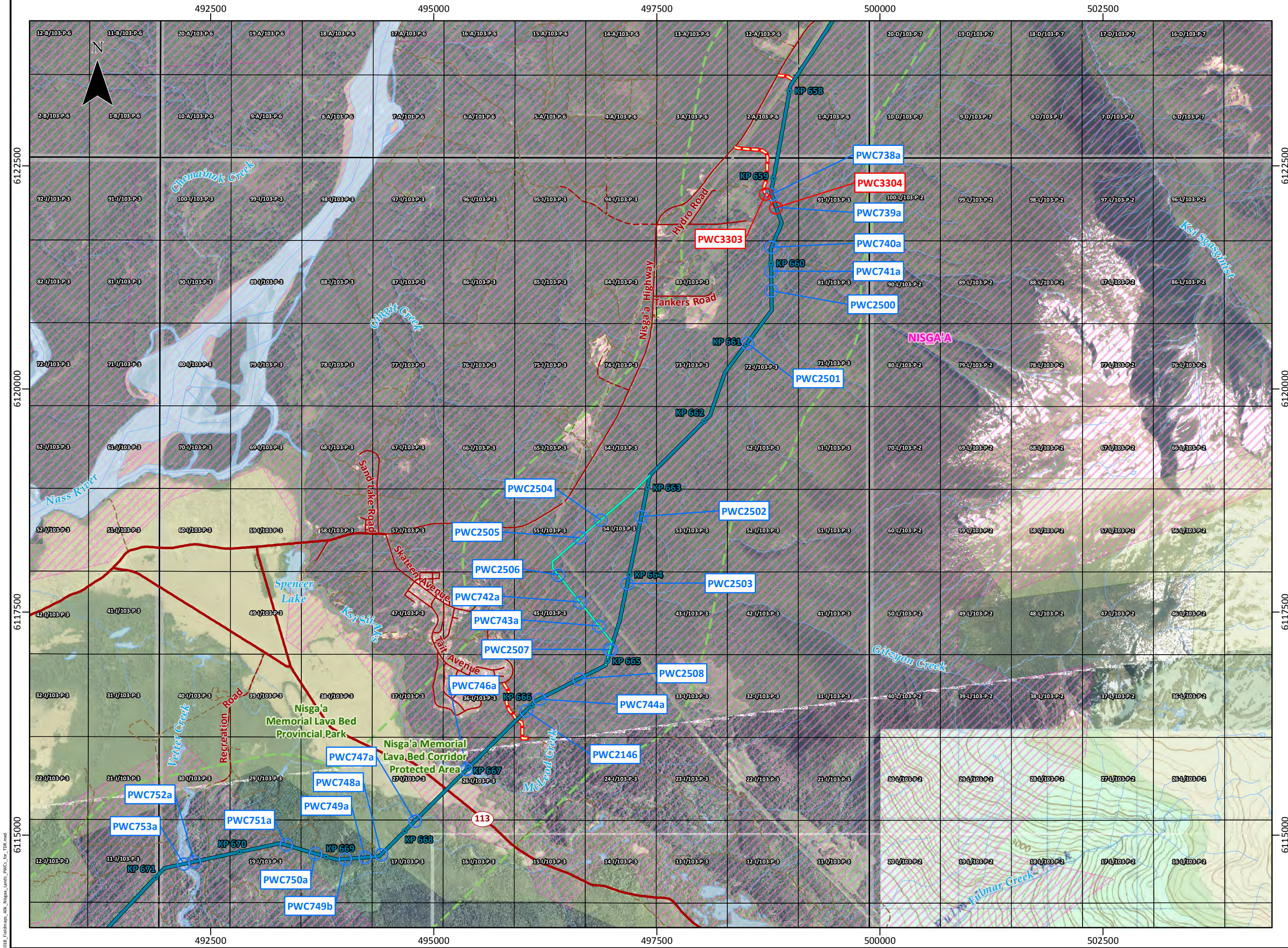
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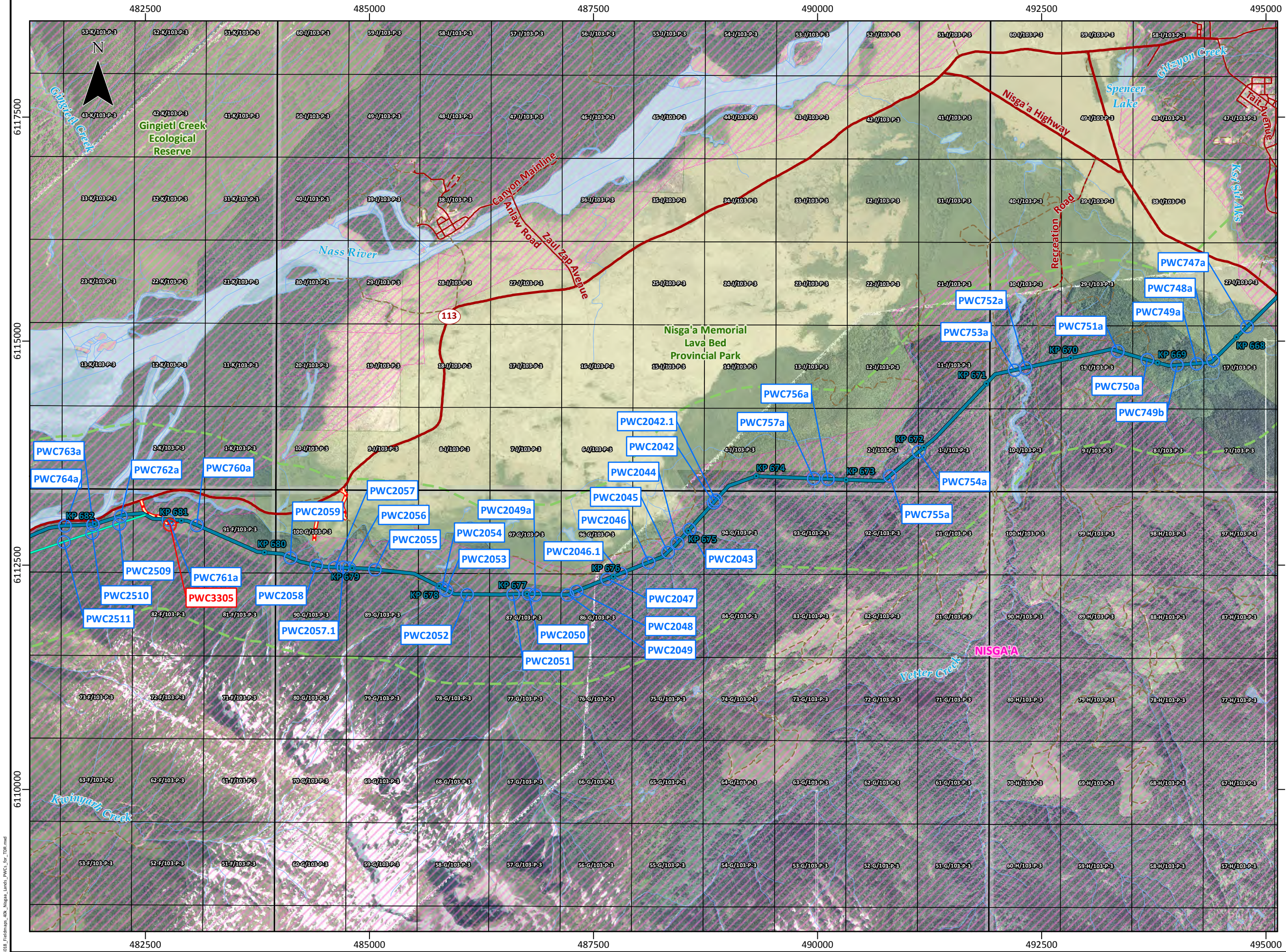


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FIGURE 3 - SHEET 5 OF 9  
POTENTIAL WATERCOURSE CROSSING LOCATIONS ON NISGA'A LANDS

PROPOSED WESTCOAST CONNECTOR GAS TRANSMISSION PROJECT

8018



- Potential Application Components
- Cypress to Cranberry Route
  - Kitsault Route
  - Kitsault Marine Route
  - Nasoga Route
  - Nasoga Marine Route
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  - Park/Protected Area

SCALE: 1:40,000  
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 (All Locations Approximate)



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FIGURE 3 - SHEET 6 OF 9  
POTENTIAL WATERCOURSE  
CROSSING LOCATIONS ON  
NISGA'A LANDS

PROPOSED WESTCOAST  
CONNECTOR GAS  
TRANSMISSION PROJECT

8018

Potential Application Components

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SCALE: 1:40,000

0 0.2 0.4 0.6 0.8 1 km

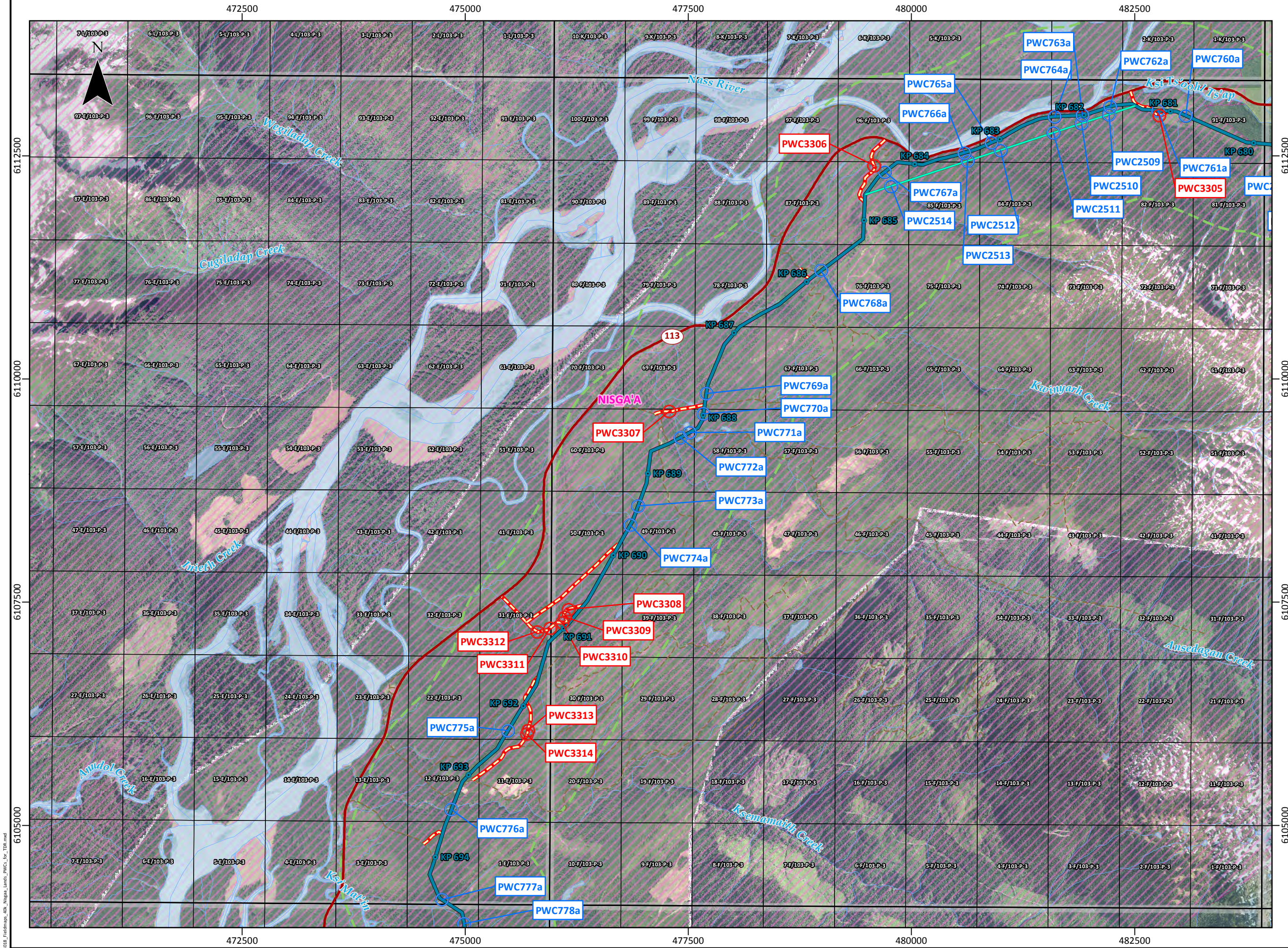
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July 2014

FIGURE 3 - SHEET 7 OF 9

POTENTIAL WATERCOURSE CROSSING LOCATIONS ON NISGA'A LANDS

PROPOSED WESTCOAST CONNECTOR GAS TRANSMISSION PROJECT

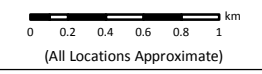
8018

Potential Application Components

- Cypress to Cranberry Route
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- Kitsault Marine Route
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- Transmission Line
- Railway
- Watercourse
- Waterbody
- City/Town
- First Nation Land
- Treaty Settlement Land
- Park/Protected Area

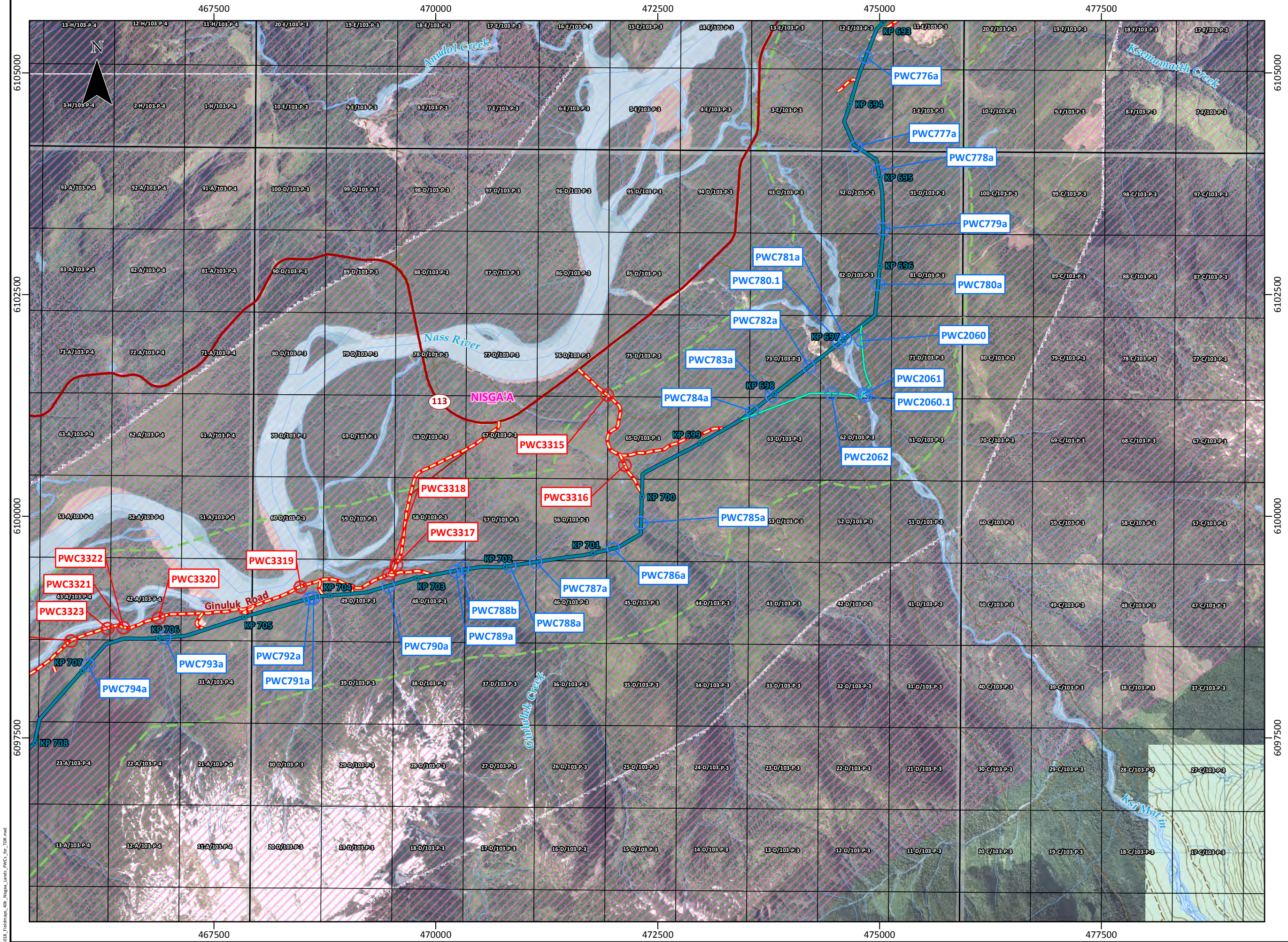
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July 2014

FIGURE 3 - SHEET 8 OF 9  
POTENTIAL WATERCOURSE  
CROSSING LOCATIONS ON  
NISGA'A LANDS

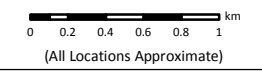
PROPOSED WESTCOAST  
CONNECTOR GAS  
TRANSMISSION PROJECT

8018

Potential Application Components

-  Cypress to Cranberry Route
-  Kitsault Route
-  Kitsault Marine Route
-  Nasoga Route
-  Nasoga Marine Route
-  Alternate Route
-  2 km Study Area Corridor
-  Compressor Station
-  Proposed Access Road
-  Potential Pipeline Watercourse Crossing
-  Potential Road Watercourse Crossing
-  Existing Facility
-  Existing Westcoast Pipeline
-  Other Existing Pipeline
-  Highway
-  Road
-  Access/Resource Road
-  Rough Trail/Overgrown Road
-  Transmission Line
-  Railway
-  Watercourse
-  Waterbody
-  City/Town
-  First Nation Land
-  Treaty Settlement Land
-  Park/Protected Area

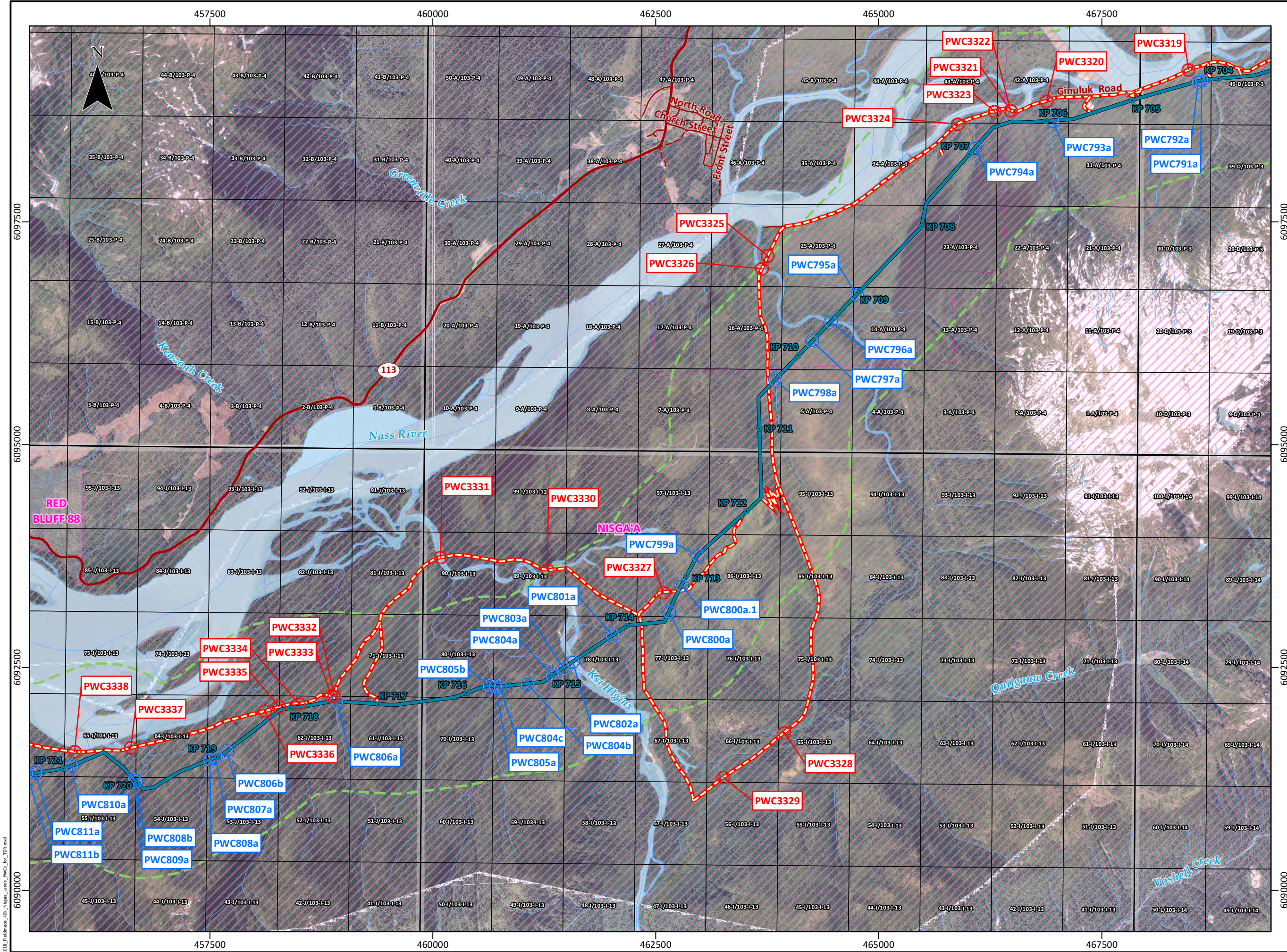
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 Pipelines/Facilities: IHS Inc. 2014; Rough Trails/Overgrown Roads:  
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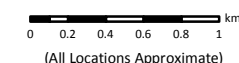


B018\_Fieldsmap\_40k\_Nisga'a\_Lands\_PWC\_Inv\_TDR.mxd

Potential Application Components

-  Cypress to Cranberry Route
-  Kitsault Route
-  Kitsault Marine Route
-  Nasoga Route
-  Nasoga Marine Route
-  Alternate Route
-  2 km Study Area Corridor
-  Compressor Station
-  Proposed Access Road
-  Potential Pipeline Watercourse Crossing
-  Potential Road Watercourse Crossing
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-  Railway
-  Watercourse
-  Waterbody
-  City/Town
-  First Nation Land
-  Treaty Settlement Land
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July 2014

FIGURE 3 - SHEET 1 OF 2  
POTENTIAL WATERCOURSE  
CROSSING LOCATIONS ON  
NISGA'A LANDS

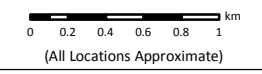
PROPOSED WESTCOAST  
CONNECTOR GAS  
TRANSMISSION PROJECT

8018

Potential Application Components

-  Cypress to Cranberry Route
-  Kitsault Route
-  Kitsault Marine Route
-  Nasoga Route
-  Nasoga Marine Route
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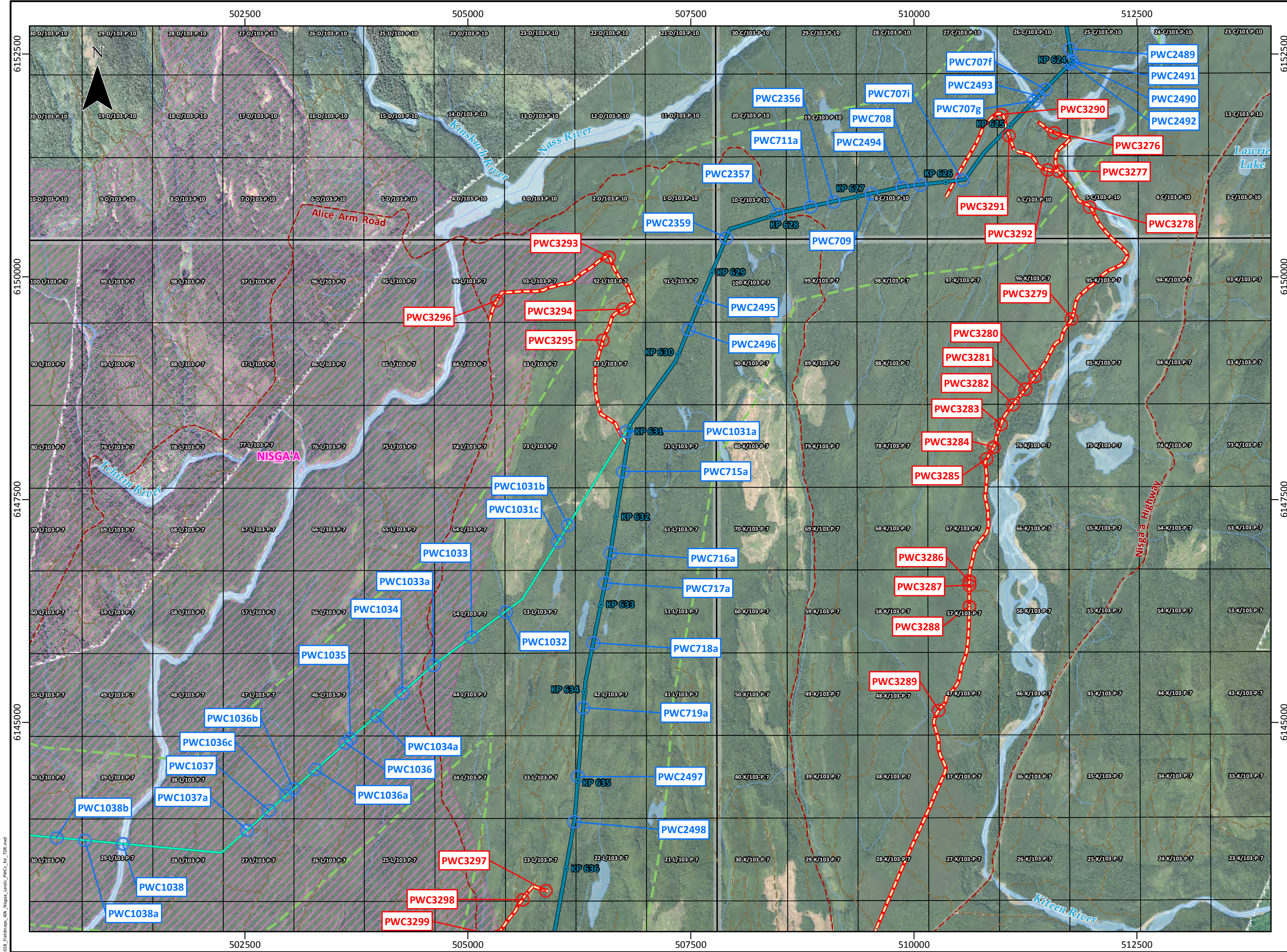
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Operations 2008; Treaty Settlement Lands: IHS 2004.

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July 2014

FIGURE 3 - SHEET 2 OF 2  
POTENTIAL WATERCOURSE  
CROSSING LOCATIONS ON  
NISGA'A LANDS

PROPOSED WESTCOAST  
CONNECTOR GAS  
TRANSMISSION PROJECT

8018

Potential Application Components

- Cypress to Cranberry Route
- Kitsault Route
- Kitsault Marine Route
- Nasoga Route
- Nasoga Marine Route
- Alternate Route
- 2 km Study Area Corridor
- Compressor Station
- Proposed Access Road
- Potential Pipeline Watercourse Crossing
- Potential Road Watercourse Crossing
- Existing Facility
- Existing Westcoast Pipeline
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- Transmission Line
- Railway
- Watercourse
- Waterbody
- City/Town
- First Nation Land
- Treaty Settlement Land
- Park/Protected Area

SCALE: 1:40,000

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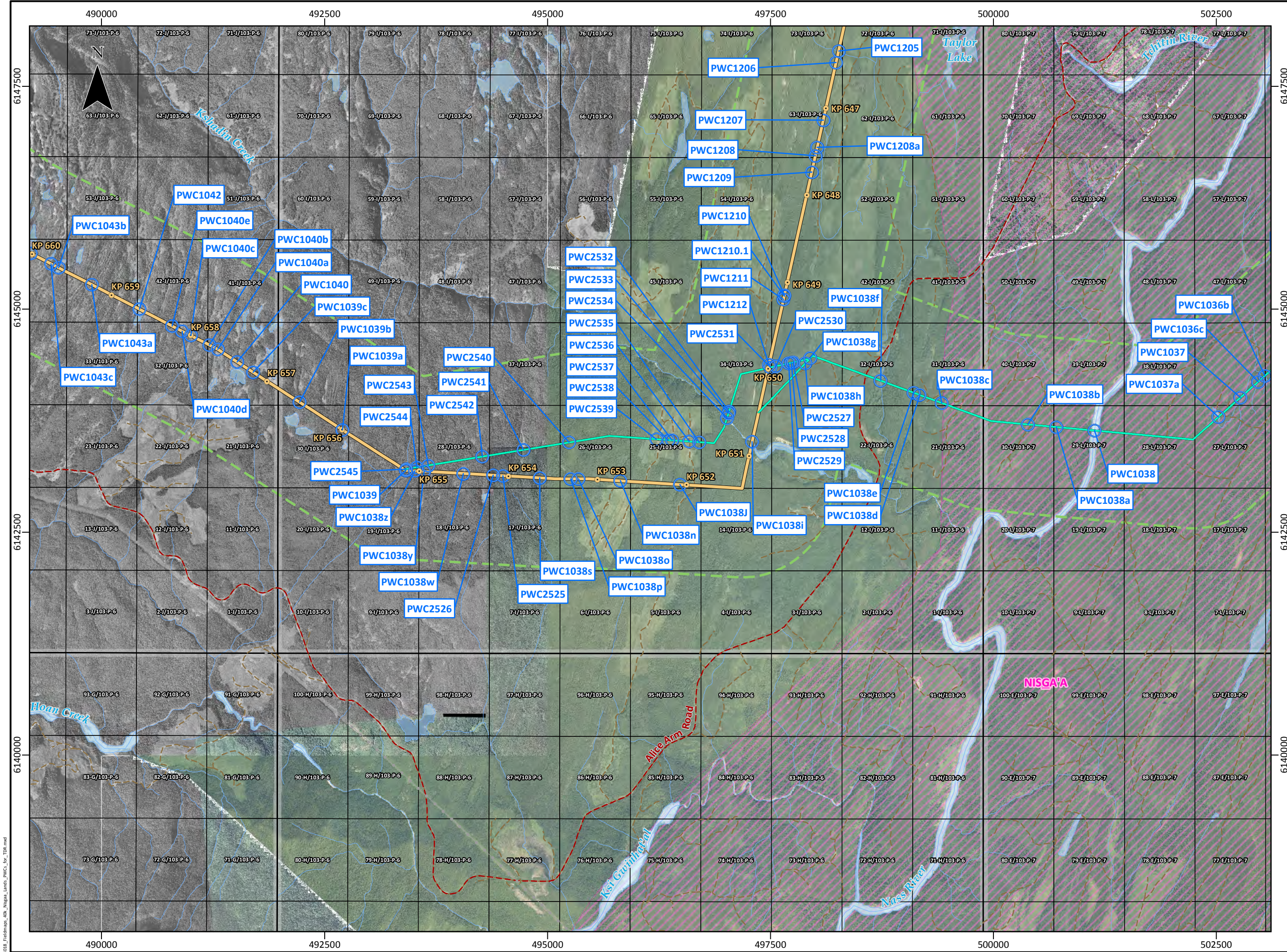
(All Locations Approximate)



NAD83 UTM Zone 9N. Route current to February 5, 2014  
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### *Nass River (PWC1038)*

The Kitsault Alternate route crosses the Nass River (PWC1038) approximately 2 km upstream from its confluence with Kshadin Creek. Within the study area, the Nass River is a major migration corridor for anadromous salmon spawning in the Nass River and its tributary sub-basins (e.g., Kinskuch, Tchitin and Cranberry River sub-basins). Other anadromous (e.g., lamprey species) and resident (e.g., rainbow trout) fish species are present in the Lower Nass River Watershed Group (BC MOE 2013f,g) (Table 5).

Coho salmon, pink salmon and chum salmon are present in the Nass River near the proposed crossing. Coho salmon occur throughout the Nass River, spawning in approximately 37 streams within the watershed (Levy 2006b). Several of these, including the Cranberry, Meziadin and Tchitin rivers, are upstream of PWC1038 and support more than 250 spawners (Levy 2006b). Pink salmon and chum salmon that spawn in upstream tributaries such as the Tchitin, Kinskuch and Cranberry River sub-basins also use the Nass River as a migration corridor. Information for these species in the Nass River is limited and Levy (2006b) indicated that pink salmon occur in relatively low numbers in the Nass River watershed.

Both ocean and stream-type Chinook salmon occur in the Nass River, and proportions of each vary from year to year (Koski *et al.* 1996a,b). Spawning run timing of Chinook salmon also varies, with several different runs occurring in any given year (Levy 2006b). Radio-tagging studies targeting Chinook salmon were conducted in the Nass River in 1992 and 1993 (Koski *et al.* 1996a,b). Chinook salmon use the Nass River near the proposed crossing to migrate to upstream spawning areas (e.g., Cranberry and Meziadin rivers). They hold for several days within the Nass River at the confluences with spawning tributaries (Koski *et al.* 1996a,b). The Cranberry River, which flows into the Nass River upstream of PWC1038, was the most important spawning tributary for Chinook salmon in 1992 and 1993 (Koski *et al.* 1996a,b).

Sockeye salmon are the most abundant Pacific salmon species in the Nass River watershed (LGL Ltd. and Northwest Hydraulic Consultants 1996a) and eight distinct populations are known to occur (Levy 2006b). Six of these populations spawn and rear in the upper Nass River upstream of the proposed crossing, including the Meziadin Lake sockeye salmon population, which has consistently accounted for over 75% of sockeye salmon production in the Nass River watershed (Levy 2006b, Link 1999, Link *et al.* 1996). These populations use the Nass River near the proposed crossing during upstream and downstream migrations.

Both winter and summer-run steelhead occur in the Nass River and have been extensively studied within the watershed (Alexander and Koski 1995, Bocking *et al.* 2005, Parken 1997, Parken and Atagi 1998). Summer-run steelhead overwinter, spawn and rear in tributaries (e.g., Cranberry River) upstream of the Nass River canyon (*i.e.*, near PWC1038). Winter-run stocks occur downstream of the canyon at Grease Harbour (Bocking *et al.* 2005, Parken 1997). Radiotelemetry studies in the Nass River targeted summer-run steelhead in 1992, 1993 and 1994 (Alexander and Koski 1995). The timing of arrival in the Nass River depended on spawning destination (e.g., steelhead destined for the upper most tributaries entered first). Steelhead destined for the Cranberry River traveled through the Nass River from August to early October (Alexander and Koski 1995). Migration up the Nass River was relatively quick and steelhead were not observed holding for long periods at the mouths of natal tributaries. The Nass River appeared to provide good overwintering habitat for steelhead and it was suggested that spawning may occur within the mainstem or side-channels (Alexander and Koski 1995).

The Nass River supports one of the largest eulachon runs in BC. Eulachon usually enter the Nass River for spawning in early March and are heavily fished by Aboriginal groups. Nisga'a fishermen indicate a second eulachon run starting in early April (Moody 2008). Adult eulachon only occur in the Nass River during the spawning period and they have been observed in lower sections of the Nass River mainstem, downstream from its confluence with Ksi Hlginx (BC MOE 2013g). Eulachon typically do not spawn near the proposed crossing (BC MOE 2013g).

#### **4.1.2 Nasoga Route**

Within Nisga'a Lands, the Nasoga route traverses the Lower Nass River Watershed Group. The Nasoga route does not cross the Nass River, however, it parallels the east side of the Nass River for approximately 120 km and crosses many of its tributaries. The Nasoga route crosses North Seaskinnish, Gingit, Gitzyon, McLeod, Vetter, Kwinyarh, Ansedagan, Ksemamaith, Ginlulak, Quilgauw and Monkley (alias) creeks and Ksi Sgasginist (Seaskinnish), Ksi Sii Aks (Tseax), Ksi Ts'oohl Ts'ap, Ksi Mat'in and

Ksguykwsa'a (alias Burton/Barton). Fish and fish habitat studies have been conducted at watercourses crossed by the Nasoga route within Nisga'a Lands in relation to forestry, as well as studies of salmonid life history characteristics for commercial, recreational or Aboriginal fisheries and stock assessment (Table 6).

**TABLE 6**  
**PREVIOUSLY DOCUMENTED FISH SPECIES IN**  
**WATERCOURSES CROSSED BY THE NASOGA ROUTE WITHIN NISGA'A LANDS**

<b>Watercourse Crossing No.</b>	<b>Watercourse Name (Watershed Code)</b>	<b>Previously Documented Fish Species</b>	<b>References</b>
PWC724a/PWC732a/ PWC733a	North Seaskinnish Creek (500-201900-24100)	Coho salmon, Chinook salmon, steelhead, rainbow trout, threespine stickleback and coarse or non-game fish	BC MOE 2013f,g, Klein and Heathman 1972
PWC737a	Ksgasginist (Seaskinnish River) (500-201900)	Sockeye salmon, pink salmon, chum salmon, coho salmon, Chinook salmon, steelhead, rainbow trout, coastal cutthroat trout, Dolly Varden, sculpin, stickleback and lamprey spp.	BC MOE 2013f,g, Bocking <i>et al.</i> 2005, DFO 2013g, Hancock and Marshall 1984, Koski <i>et al.</i> 1996a,b, Nass 1996
PWC740a	Gingit Creek (500-185700-00300)	Sockeye salmon, pink salmon, chum salmon, coho salmon, Chinook salmon, coastal cutthroat trout, bull trout and Dolly Varden	BC MOE 2013f,g, Bocking pers. comm., Cox-Rogers 2012, Hancock and Marshall 1984, Levy 2006a, NLG 2012, 2013a, Pacific Salmon Commission (PSC) 1986, SKR Consultants Ltd. (SKR) 1999
PWC743a/PWC2503	Gitzyon Creek (500-185700-05200)	Sockeye salmon, pink salmon, chum salmon, coho salmon, Chinook salmon, rainbow trout and Dolly Varden	BC MOE 2013f,g, DFO 2013g, Hancock and Marshall 1984, NLG 2012
PWC746a	Ksi Sii Aks (Ganor Creek, Tseax River) (500-185700)	Sockeye salmon, pink salmon, chum salmon, coho salmon, Chinook salmon, steelhead, coastal cutthroat trout, Dolly Varden, sculpin spp. and lamprey spp.	Alexander and Bocking 1994, Alexander and Koski 1995, BC MOE 2013f,g, Bocking <i>et al.</i> 2005, Hancock and Marshall 1984, Jantz <i>et al.</i> cited in Koski <i>et al.</i> 1996a,b, NLG 2012, Murray and Bocking 1997a, SKR 1999
PWC747a/PWC753a	Vetter Creek (unnamed tributary to Lower Vetter) (500-185700-16700)	Rainbow trout/steelhead, Dolly Varden and bull trout	BC MOE 2013f,g, Bocking and English 1993, Gordon pers. comm., Hancock and Marshall 1984, Murray and Bocking 1997a, SKR 1999
PWC2051	Ksi Ts'oohl Ts'ap (Zolzap Creek) (500-155400)	Sockeye salmon, pink salmon, chum salmon, coho salmon, Chinook salmon, steelhead, coastal cutthroat trout, Dolly Varden, lamprey spp., sculpin spp. and threespine stickleback	Baxter and Stephens 2002a,b,c, BC MOE 2013f,g, David Bustard and Associates 1991, 2000, David Bustard and Associates 1992 cited in BC MOE 2013f, DFO 2013g, Hancock and Marshall 1984, Koski <i>et al.</i> 1996a,b, Nass 1996, NLG 2012, Simpson 1991
PWC2059	Unnamed tributary to Ksi Ts'oohl Ts'ap (500-155400-24300)	Coho salmon, Dolly Varden and threespine stickleback	BC MOE 2013f,g
PWC761a	Unnamed tributary to Ksi Ts'oohl Ts'ap (no watershed code)	Coho salmon	David Bustard and Associates 2000
PWC767a/PWC2514	Unnamed tributary to Kwinyarh Creek (North Kwinyarh Creek) (500-136800-06100)	Coastal cutthroat trout	Baxter and Bocking 1998a, Bocking 2013a
PWC768a	Kwinyarh Creek (500-136800)	Pink salmon, chum salmon, coho salmon, steelhead, coastal cutthroat trout, Dolly Varden, stickleback spp. and sculpin spp.	Baxter and Bocking 1998a, BC MOE 2013f, Bocking 2013a, DFO 2013g, David Bustard and Associates 1991, 1999, Hancock and Marshall 1984
PWC771a	Unnamed tributary to Ansedagan Creek (500-134700-06000)	No fish captured	Baxter and Bocking 1998a

**TABLE 6 Cont'd**

Watercourse Crossing No.	Watercourse Name (Watershed Code)	Previously Documented Fish Species	References
PWC772a	Ansedagan Creek (500-134700)	Pink salmon, chum salmon, coho salmon, steelhead, coastal cutthroat trout, Dolly Varden and stickleback spp.	Baxter and Bocking 1998a, Bocking <i>et al.</i> 2005, David Bustard and Associates 1991, 1999, DFO 2013g, Murray 2001, Murray and Bocking 1997a,b, Murray and Gaboury 1999, LGL Ltd. 2005 cited in NLG 2007, LGL Ltd. and Northwest Hydraulic Consultants 1996b, NLG 2007
PWC776a	Ksemamaith Creek (Kseaden Creek) (500-114800)	Pink salmon, chum salmon, coho salmon, rainbow trout, steelhead and Dolly Varden	BC MOE 2013f,g, Baxter and Bocking 1998a, David Bustard and Associates 1991, DFO 2013g
PWC781a/PWC2061	Ksi Mat'in (Ksedin Creek, Kwiniak Creek) (500-112000)	Pink salmon, chum salmon, coho salmon, Chinook salmon, steelhead, rainbow trout, anadromous coastal cutthroat trout, Dolly Varden and sculpin spp.	Baxter and Bocking 1998a, BC MOE 2013f, David Bustard and Associates 1991, DFO 2013g, Golder 2012 cited in BC MOE 2013g, Hancock and Marshall 1984, Koski <i>et al.</i> 1996a,b
PWC785a	Unnamed tributary to Ginlulak Creek (East Ginlulak Creek) (500-090500-23900)	Pink salmon, chum salmon, coho salmon and Dolly Varden	BC MOE 2013f,g, Baxter and Bocking 1998a, Bocking 2013b, Bocking <i>et al.</i> 2005, Murray 2013, Nass 1996
PWC787a	Ginlulak Creek (500-090500)	Pink salmon, chum salmon, coho salmon, coastal cutthroat trout, Dolly Varden, lamprey spp., sculpin spp. and stickleback spp.	Baxter and Bocking 1998a, BC MOE 2013g, Bocking 2013b, Bocking <i>et al.</i> 2005, DFO 2013g, Hancock and Marshall 1984, Nass 1996
PWC791a	Unnamed tributary to the Nass River (500-090000)	Coarse or non-game fish	BC MOE 2013f,g
PWC793a	Unnamed tributary to the Nass River (500-084900)	Coho salmon and Dolly Varden	BC MOE 2013f,g
PWC796a	Quilgauw Creek (500-075000)	Pink salmon, chum salmon, coho salmon, coastal cutthroat trout, stickleback spp. and other coarse or non-gamefish	BC MOE 2013f,g, Bocking <i>et al.</i> 2005, DFO 2013g, Hancock and Marshall 1984
PWC801a/PWC802a	Ksi Hlginx (Ishkeenickh River) (510)	Sockeye salmon, pink salmon, chum salmon, coho salmon, Chinook salmon, steelhead, rainbow trout, coastal cutthroat trout, Dolly Varden, eulachon, lamprey spp. and threespine stickleback	BC MOE 2013f, Bocking <i>et al.</i> 2005, David Bustard and Associates 1991 cited in BC MOE 2013f,g, David Bustard and Associates 1998 cited in BC MOE 2013f, DFO 2013g, Hancock and Marshall 1984, Jantz <i>et al.</i> cited in Koski <i>et al.</i> 1996a,b, Koski <i>et al.</i> 1996a,b, Levy 2006b, NLG 2007
PWC806a	Unnamed tributary to the Nass River (500-058200)	Coho salmon and Dolly Varden	BC MOE 2013f,g
PWC807a	Unnamed tributary to the Nass River (500-055100)	Coho salmon and Dolly Varden	BC MOE 2013f,g
PWC812a	Unnamed tributary to the Nass River (Monkley Creek, unnamed tributary to Monkley Creek) (500-050900)	Pink salmon, coho salmon, Chinook salmon, rainbow trout, Dolly Varden, and sculpin spp.	Baxter and Bocking 1998b, Bocking <i>et al.</i> 2005
PWC2523/PWC826a	Ksgyukwsa'a (Burton/Barton Creek) (500-018500)	Pink salmon, chum salmon, coho salmon, rainbow trout and Dolly Varden (Dolly Varden are the only species confirmed above a documented barrier and near the crossing investigated)	Baxter and Bocking 1998b, Bocking <i>et al.</i> 2005, Hancock and Marshall 1984, Williams <i>et al.</i> 1994
PWC829a	Unnamed tributary to Ksgyukwsa'a (500-018500-06000)	Dolly Varden	Baxter and Bocking 1998b

**North Seaskinnish Creek (PWC724a, PWC732a and PWC733a)**

North Seaskinnish Creek is a tributary to Ksi Sgasginist (Seaskinnish River) crossed by the Nasoga route at three locations, 18 km [PWC724a], 8.8 km [PWC732a] and 8.6 km [PWC733a], upstream from its confluence with Ksi Sgasginist. Fish and fish habitat is not well documented in North Seaskinnish Creek.



BC MOE (2013f,g) indicates an 8 m high falls approximately 6 km upstream of the mouth that is considered to be a barrier to fish passage.

Klein and Heathman (1972) found resident rainbow trout, white sucker, redbreasted sunfish and spoonhead sculpin in Dragon Lake, which drains into North Seaskinnish Creek. An unnamed outlet stream of Dragon Lake (500-201900-24100-42600) drains into North Seaskinnish Creek within 100 m of PWC732a and PWC733a. This waterbody was sampled in 2007 by Rescan Environmental Services (BC MOE 2013f,g) and threespine stickleback were captured.

### *Ksi Sgasginist (alias Seaskinnish River) (PWC737a)*

Ksi Sgasginist (500-201900) flows south through the Nass River valley and is a direct tributary to the Nass River (Nass 1996). It is crossed by the Nasoga route approximately 3 km upstream from its confluence with North Seaskinnish Creek, and 8 km upstream from the Nass River (PWC737a).

Ksi Sgasginist supports all five species of Pacific salmon and steelhead. Several obstructions to fish migration are documented approximately 5 km (2 m high falls) to 9 km (8 m high falls) upstream from its mouth (Bocking *et al.* 2005, Hancock and Marshall 1984). The 8 m high falls is a barrier to anadromous fish. PWC737a is located downstream of the barriers in habitat accessible to anadromous fish. Sockeye salmon spawn in Ksi Sgasginist (DFO 2013g), possibly as far upstream as the impassable falls. Spawning migrations occur from early to late July and fish spawn from mid-July to mid-August (BC MOE 2013f). A small number of odd-year pink salmon spawn in the lower reaches of Ksi Sgasginist, arriving from early to mid-August and spawning in early August to mid-September (BC MOE 2013f,g, Hancock and Marshall 1984).

Coho salmon spawn in Ksi Sgasginist up to the impassable falls. Migration into Ksi Sgasginist occurs from mid-August to late October with spawning from mid-October to late November (BC MOE 2013f, DFO 2013g). A juvenile coho salmon study found that out-migration of smolts occurred in mid to late May, during spring freshet. Juvenile coho salmon were primarily age 2 during migration to sea (Nass 1996).

Chinook salmon migrate into Ksi Sgasginist up to the impassable falls from late June to mid-August (DFO 2013g). Spawning occurs from mid-July to late September. A spawning site has been indicated approximately 8 km upstream from the confluence with the Nass River, which is immediately downstream of PWC737a (BC MOE 2013f,g, Hancock and Marshall 1984). During radio-tagging studies in 1992 and 1993, Chinook salmon tagged in the Nass River spawned in Ksi Sgasginist, although at relatively lower rates than other Nass River tributaries such as the Cranberry River (Koski *et al.* 1996a,b). The confluence of Ksi Sgasginist and North Seaskinnish Creek, 3 km downstream from the proposed crossing, is an important Chinook salmon holding area and a popular fishing location for local anglers (BC MOE 2013f).

Information about chum salmon and steelhead in Ksi Sgasginist is limited. Chum salmon are documented to spawn in the lower reaches (Hancock and Marshall 1984). During studies targeting coho salmon, Nass (1996) identified large numbers of juvenile steelhead in Ksi Sgasginist.

### *Gingit Creek (PWC740a)*

Gingit Creek (500-201900-16900) flows into Ksi Sii Aks (Tseax River) approximately 750 m upstream from the confluence of Ksi Sii Aks and the Nass River (SKR 1999). The Nasoga route crosses Gingit Creek approximately 9 km upstream from Ksi Sii Aks (PWC740a).

No barriers to fish migration are documented in Gingit Creek, however, SKR (1999) indicated that highway upgrading activities and sub-surface flow in some areas of the sub-basin may limit fish access to tributaries. SKR (1999) also reported that reaches within Gingit Creek provide good habitat for salmonid spawning, rearing and overwintering. Juvenile bull trout/Dolly Varden were captured and pink salmon were observed spawning in Gingit Creek (SKR 1999). Dolly Varden were captured near PWC740a.

Gingit Creek is an important sockeye salmon stream, having critical habitat for both spawning and rearing. Spawning was documented near the proposed crossing (Bocking pers. comm., Hancock and Marshall 1984). Gingit Creek sockeye salmon are ocean-type, spending less than one year in freshwater before migrating to the Pacific Ocean (NLG 2012, PSC 1986). Recent information indicates that the

population in Gingit Creek is stable, resulting in high escapement estimates in recent years (Cox-Rogers 2012, Levy 2006a, NLG 2012, 2013a).

Although not as well documented, pink salmon, coho salmon and chum salmon use Gingit Creek for spawning (Hancock and Marshall 1984, SKR 1999). Coho salmon migrate into Gingit Creek from mid-September to mid-October. Spawning occurs in the lower 4.8 km of Gingit Creek from mid-October to mid-November (BC MOE 2013f,g, Hancock and Marshall 1984). Pink salmon and chum salmon also spawn in the lower reaches of Gingit Creek (Hancock and Marshall 1984).

#### *Gitzyon Creek (PWC743a/PWC2503)*

Gitzyon Creek (500-185700-05200), a second order tributary to Ksi Sii Aks, is crossed by the Nasoga route approximately 5 km upstream of Ksi Sii Aks (PWC2503). The Gitlaxt'aamiks Alternate route crosses Gitzyon Creek approximately 600 m downstream of the Nasoga route (PWC743a). Gitzyon Creek is a designated community watershed (BC MOE 2013g).

Hancock and Marshall (1984) indicated that limited spawning gravel and regular flash flood events result in generally low fish production in Gitzyon Creek. Nevertheless, salmonid spawning has been documented, however, information appears to be limited to the lower 1.3 km (BC MOE 2013f,g). Chum salmon spawn from mid-August to late September within the lower reaches (Hancock and Marshall 1984). Although Chinook salmon have been documented using Gitzyon Creek, records are limited to a few years with low escapement estimates (DFO 2013g).

Sockeye salmon migration in Gitzyon Creek begins in mid-July and spawning primarily occurs within the lower reaches, from late July to early September, peaking in early August (Hancock and Marshall 1984). Escapement estimates have been sporadic and consistently less than 100 fish (DFO 2013g). In 2012, the NFWD conducted an exploratory survey in late August. Spawning sockeye salmon were identified, including fish tagged in the lower Nass River, and they concluded that ocean-type sockeye salmon spawn in Gitzyon Creek (NLG 2012).

Odd and even-year pink salmon spawn in the lower reaches of Gitzyon Creek. Spawning takes place from mid-August to late September, peaking from late August to mid-September (Hancock and Marshall 1984). The highest pink salmon escapement estimates reached 1,500 fish in the 1950s (DFO 2013g).

#### *Ksi Sii Aks (alias Ganor Creek, Tseax River) (PWC746a)*

Ksi Sii Aks (500-185700), a sixth order tributary to the Nass River, flows north to northwest from its headwaters in the Hazleton Mountains (SKR 1999). The Nasoga route crosses Ksi Sii Aks approximately 400 m downstream from its confluence with McLeod Creek and approximately 6 km upstream from its mouth at the Nass River (PWC746a). Tseax Lake/Spencer Lake is located approximately 3 km upstream from the mouth and may provide rearing habitat for salmonids.

Ksi Sii Aks near PWC746a has been heavily influenced by volcanic activity, flowing through lava beds at several locations (Alexander and Bocking 1994, SKR 1999). Several obstructions are indicated in Ksi Sii Aks, including a passable falls downstream from PWC746a at approximately 2 km upstream from the mouth (Alexander and Bocking 1994). In addition, a series of cascades/falls upstream from PWC746a at 8.4 km upstream from the Nass River may limit anadromous fish distribution, although steelhead may pass this barrier (Alexander and Bocking 1994, BC MOE 2013f, Murray and Bocking 1997a, SKR 1999). SKR (1999) indicated that the habitat downstream of this barrier should be considered important for salmon spawning and rearing. The author also suggested that the Ksi Sii Aks slough near the Nass River should be considered as a potential fisheries sensitive zone (SKR 1999). Lower sections of the river are popular fishing destinations (BC MOE 2013f).

Chinook salmon spawning is documented in Ksi Sii Aks with a few records above the falls (Hancock and Marshall 1984). Hancock and Marshall (1984) is the only reference to Chinook salmon spawning above the falls, and it is unclear if they are able to pass the falls. Ksi Sii Aks Chinook salmon are the latest spawning run of Chinook salmon within the Nass River watershed with most entering the system in mid-October (Jantz *et al.* 1989 cited in Koski *et al.* 1996b). In 1992, the peak spawning period for Chinook salmon occurred in early October (Koski *et al.* 1996a).

Coho salmon in Ksi Sii Aks have consistently been one of the largest and most productive stocks within the lower Nass River watershed (Alexander and Bocking 1994). They migrate into Ksi Sii Aks from mid-August through November and spawn from early November to early or mid-January (BC MOE 2013f). Alexander and Bocking (1994) indicated that downstream migration of coho salmon smolts occurs during the spring freshet from March to mid-July, peaking in July. Enhancement activities have been conducted in Ksi Sii Aks to release coho salmon on several occasions (Alexander and Bocking 1994).

Hancock and Marshall (1984) indicated that sockeye salmon spawning in the Ksi Sii Aks sub-basin occurs mainly in the lake tributaries, however, it is unclear which lake is referred to. NLG (2012) suggests that sockeye salmon observed spawning in the side-channels of Ksi Sii Aks in 2012 are likely ocean-type sockeye salmon similar to those in Gingit Creek.

Chum salmon and pink salmon spawn in Ksi Sii Aks. Chum salmon spawn in the lower 2 km (Hancock and Marshall 1984) and have been documented in a lower tributary to the Ksi Sii Aks slough. Pink salmon have been documented 1.7 km upstream from PWC746a (BC MOE 2013g). Pink salmon likely use the Ksi Sii Aks as a short migration corridor to reach spawning areas in its tributaries.

The Ksi Sii Aks provides spawning habitat for steelhead from the lower Nass River. Both summer and winter-run steelhead occur in Ksi Sii Aks (Bocking *et al.* 2005). In 1993 and 1994, a radio-tagging program documented steelhead migrating to spawning locations in the Ksi Sii Aks during early September (Alexander and Koski 1995). The last known position of the tagged steelhead was approximately 5 km downstream of PWC746a, downstream from Spencer Lake. Steelhead are documented in the lower 8 km of Ksi Sii Aks, and a spawning location was identified approximately 2 km upstream from PWC746a (BC MOE 2013f,g).

#### *Vetter Creek (PWC747a and PWC753a)*

Vetter Creek (500-185700-16700), within the Ksi Sii Aks sub-basin, is affected by the lava bed and flow direction has been difficult to determine in the past (SKR 1999). Vetter Creek is spring-fed in the upper reaches, and is an overflow channel from Ksi Sii Aks during high flow events (Gordon pers. comm.). The lava bed in the lower Vetter Creek sub-basin and near the Nass River is a barrier to fish migration from the Nass River, where Vetter Creek flows sub-surface (Gordon pers. comm., Hancock and Marshall 1984, SKR 1999). The Nasoga route crosses Vetter Creek at two locations (PWC747a and PWC753a).

Vetter Falls (approximately 3.6 m high) is considered a barrier to fish migration to Ksi Sii Aks (SKR 1999, Murray and Bocking 1997a). Although no anadromous fish species have been documented in Vetter Creek, steelhead from Ksi Sii Aks are documented in this system. In some cases, steelhead kelts that have spawned in the upper reaches of Ksi Sii Aks inadvertently swim into Vetter Creek and over Vetter falls during their downstream migration. These fish become trapped in Vetter Creek as they are unable to swim back upstream over Vetter Falls and the lava bed is a barrier to downstream migration into the Nass River (Gordon pers. comm.). In addition to rainbow trout/steelhead, Dolly Varden are documented in Vetter Creek (BC MOE 2013f,g). Bull trout were also captured in Vetter Creek in 1999, however, they were not captured during previous studies (SKR 1999). Bocking and English (1993) described sections of Vetter Creek to have moderate fish rearing habitat, good cover with good spawning gravel present.

#### *Ksi Ts'oohl Ts'ap (alias Zolzap Creek) (PWC2051)*

Ksi Ts'oohl Ts'ap (500-155400) is a second order stream that originates in the Kitimat Mountain Range and flows northwest for 9 km into the Nass River (BC MOE 2013g, Nass 1996). Ksi Ts'oohl Ts'ap was influenced by volcanic activity and is groundwater fed within the lava beds (Hancock and Marshall 1984). The Nasoga route crosses Ksi Ts'oohl Ts'ap approximately 6 km upstream from the Nass River (PWC2051).

Ksi Ts'oohl Ts'ap is an important coho salmon spawning and rearing stream (David Bustard and Associates 1991). Coho salmon have been studied extensively in Ksi Ts'oohl Ts'ap, including a counting fence targeting adults approximately 500 m upstream from the Nass River that is operated by the NLG (Simpson 1991, Nass 1996, Baxter and Stephens 2002a,b,c, NLG 2012). A smolt fence has also been in operation during periods of downstream migration (NLG 2012). Adult coho salmon migrate into Ksi Ts'oohl Ts'ap from mid-September to late October, and spawn from early October to late November throughout the system, both upstream and downstream of the proposed crossing (BC MOE 2013f, David

Bustard and Associates 1991, 2000, DFO 2013g). The slough at the confluence of Ksi Ts'oohl Ts'ap and the Nass River has been identified as an important area for coho salmon spawning (Baxter and Stephens 2002a,b,c). Adults have also been reported holding in this section of Ksi Ts'oohl Ts'ap during periods of low flows, waiting for higher flows in order to pass to spawning sites within upper reaches of Ksi Ts'oohl Ts'ap (Baxter and Stephens 2002c). Baxter and Stephens (2002c) suggested that timing of spawning may be related to flow levels.

A small population of chum salmon spawn in Ksi Ts'oohl Ts'ap. This population spawns later (late October and early November) than those in other lower Nass River tributaries (August to early September) (David Bustard and Associates 2000). Chum salmon spawning was documented downstream from the proposed crossing, near the Highway 113 crossing (David Bustard and Associates 2000). Chum salmon escapements in Ksi Ts'oohl Ts'ap in 2012 were estimated to be only three fish (DFO 2013g, NLG 2012).

Chinook salmon, sockeye salmon and pink salmon occur in Ksi Ts'oohl Ts'ap. Adult Chinook salmon tagged in the Nass River have been documented in Ksi Ts'oohl Ts'ap (Koski *et al.* 1996a,b) and David Bustard and Associates (2000) reported the presence of juvenile Chinook salmon. David Bustard and Associates (1992) cited in BC MOE (2013f) indicated that sockeye salmon migrate into Ksi Ts'oohl Ts'ap in July, and spawn from July through August. Sockeye salmon are generally not counted in the counting fence on Ksi Ts'oohl Ts'ap due to run-timing (NLG 2012). Pink salmon spawn from mid to late August to late September in Ksi Ts'oohl Ts'ap (BC MOE 2013f). Pink salmon spawning has been documented downstream from PWC2051, near the Ksi Ts'oohl Ts'ap culvert (David Bustard and Associates 2000).

Dolly Varden and coastal cutthroat trout also occur in Ksi Ts'oohl Ts'ap. Coastal cutthroat trout in Ksi Ts'oohl Ts'ap are likely anadromous (David Bustard and Associates 1991). Adult coastal cutthroat trout and Dolly Varden are suspected to overwinter approximately 2.5 km upstream of the Nass River, and during late April to June they move downstream. Juvenile coastal cutthroat trout have not been documented in Ksi Ts'oohl Ts'ap, suggesting they spawn elsewhere (David Bustard and Associates 2000).

#### *Unnamed Tributaries to Ksi Ts'oohl Ts'ap (PWC2059 and PWC761a)*

PWC2059 is located approximately 300 m upstream from Ksi Ts'oohl Ts'ap on an unnamed tributary (500-155400-24300) which has documented fish presence (Table 6). BC MOE (2013f,g) indicates this watercourse was surveyed by David Bustard in 1992, although the report was not available for review.

An unnamed tributary (no watershed code) is crossed (PWC761a) approximately 200 m upstream from its confluence with Ksi Ts'oohl Ts'ap. David Bustard and Associates (2000) identified coho salmon spawning in this watercourse, however, the location was not indicated.

#### *Unnamed Tributary to Kwinyarh Creek (alias North Kwinyarh Creek) (PWC767a and PWC2514)*

North Kwinyarh Creek (500-136800-06100) is a first order stream crossed by the Nasoga route (PWC767a) approximately 1.6 km upstream from its confluence with Kwinyarh Creek. The Nisga'a Highway Alternate route crosses this tributary (PWC2514) approximately 100 m upstream of PWC767a. Baxter and Bocking (1998a) described this creek as having fair habitat value, despite the presence of a dewatered section at the time of the study. Coastal cutthroat trout were the only fish species captured upstream of PWC767a (Baxter and Bocking 1998a). North Kwinyarh Creek flows into a *Carex sp.* marsh approximately 500 m downstream of the Nasoga route, which is documented to provide juvenile rearing habitat (Bocking 2013a).

#### *Kwinyarh Creek (PWC768a)*

Kwinyarh Creek (500-136800) is a third order stream crossed approximately 700 m upstream from its confluence with the Nass River. Kwinyarh Creek flows for 7 km in a northwest direction into the Nass River (Baxter and Bocking 1998a). Fish and fish habitat inventories have been conducted in Kwinyarh Creek in relation to road upgrading activities (David Bustard and Associates 1991, 1999) and land use management and restoration activities in the sub-basin (Table 6) (Baxter and Bocking 1998a, Bocking 2013a). Sampling targeting juvenile fish in Kwinyarh Creek (e.g., near the Highway 113 crossing approximately 600 m downstream of PWC768a) documented low numbers of juvenile Dolly Varden and

steelhead (David Bustard and Associates 1991). Chum salmon and pink salmon were documented once in Kwinyarh Creek (Baxter and Bocking 1998a).

Kwinyarh Creek is considered important for coho salmon, and they are the only consistently documented species in the creek (Baxter and Bocking 1998a). Coho salmon escapement was recorded from 1974 to 1985 (DFO 2013g). They migrate into Kwinyarh Creek from mid-September to mid-October and spawn until mid-November, with peak spawning generally from mid to late October (BC MOE 2013f, DFO 2013g, Hancock and Marshall 1984). David Bustard and Associates (1991) indicated that spawning habitat may be limited and upstream spawning migrations may be restricted by periods of low flow. Rearing habitat for juvenile coho salmon is considered abundant throughout the lower 1 km of the creek, near PWC768a, and within upstream ponds and wetlands (David Bustard and Associates 1991).

Instream restoration work was conducted at Kwinyarh Creek in the late 1990's following logging in the sub-basin from the 1960s to the 1980s (Bocking 2013a). Restoration work included construction of a new channel and a berm to protect the channel, as well as creating complex habitat structures including large woody debris, spawning gravel and riffle structures within the channel. Diking a section to prevent further avulsion was also conducted (Bocking 2013a).

#### *Unnamed Tributary to Ansedagan Creek (PWC771a)*

The Nasoga route crosses an unnamed first order tributary to Ansedagan Creek (500-134700-06000) which was surveyed in 1998 (Baxter and Bocking 1998a). PWC771a is approximately 300 m upstream from Ansedagan Creek and at the time of the 1998 assessment sections of the creek upstream of PWC771a were reported to be dewatered and fish sampling was not possible in most reaches. In reaches where electrofishing was possible no fish were captured (Baxter and Bocking 1998a).

#### *Ansedagan Creek (PWC772a)*

Ansedagan Creek is a fourth order stream flowing into the Nass River 13 km from its headwaters (Baxter and Bocking 1998a). The Nasoga route crosses the creek approximately 2 km upstream from the Nass River and 1 km upstream from the Highway 113 crossing. Fish and fish habitat studies have been conducted at Ansedagan Creek related to highway upgrading (David Bustard and Associates 1991, 1999) and restoration (Murray 2001, Murray and Bocking 1997a,b, Murray and Gaboury 1999). NLG has also collected information as part of stock assessment and land use management planning (e.g., Baxter and Bocking 1998a, NLG 2007). A 12 m high impassable falls, approximately 2.5 km upstream from the Nass River and upstream of PWC772a, limits fish distribution in Ansedagan Creek (Bocking *et al.* 2005, David Bustard and Associates 1991).

Ansedagan Creek supports salmonids (Table 6), however, in recent years, only populations of coho salmon and pink salmon have been observed (LGL Ltd. and Northwest Hydraulic Consultants 1996b). Coho salmon and pink salmon numbers were historically low in the 1990s (LGL Ltd. and Northwest Hydraulic Consultants 1996b). Lower sections of Ansedagan Creek are considered important spawning areas and are known to produce a larger number of pink salmon relative to other species (David Bustard and Associates 1991, LGL Ltd. and Northwest Hydraulic Consultants 1996b). Pink salmon escapement was recorded from 1965 to 1992 (DFO 2013g). During this period, pink salmon generally migrated into Ansedagan Creek in late August, and peak spawning took place from early to mid-September (DFO 2013g).

Ansedagan Creek supports coho salmon spawning and rearing (David Bustard and Associates 1991). Coho salmon generally arrive in Ansedagan Creek in late September, with peak spawning occurring from late October to early November (DFO 2013g). Coho salmon redds have been documented near PWC772a, however, most coho salmon spawn upstream of Highway 113. Juvenile coho salmon, Dolly Varden and steelhead were also captured near the Highway 113 crossing (David Bustard and Associates 1991).

Chum salmon spawning is documented in lower sections of Ansedagan Creek and commonly near Highway 113 (David Bustard and Associates 1991), approximately 1.3 km downstream from PWC772a. Chum salmon escapement was last recorded in 1980 (DFO 2013g). In the 1960s and 1970s, chum salmon were recorded arriving at Ansedagan Creek in late August and peak spawning occurred from

early to mid-September. No chum salmon were observed in the 1990s (David Bustard and Associates 1991, LGL Ltd. and Northwest Hydraulic Consultants 1996b).

Steelhead have been captured in Ansedagan Creek (David Bustard and Associates 1991). The Nass River Steelhead Model as described in Bocking *et al.* (2005) predicted steelhead presence based on accessible area and calculated mean annual discharge. Bocking *et al.* (2005) predicted that steelhead juveniles could be within Ansedagan Creek using this model.

Following logging within the riparian area, a WRP was developed for Ansedagan Creek (LGL Ltd. and Northwest Hydraulic Consultants 1996b, Murray 2001, Murray and Bocking 1997a,b, Murray and Gaboury 1999). Structures (e.g., large woody debris) were constructed near the Highway 113 crossing and within the lower 800 m of Ansedagan Creek (Murray 2001). A monitoring report describing the success of the structures by LGL Ltd. (2005) cited in NLG (2007) prescribed maintenance on failing restoration structures. However, further surveys conducted by NLG (2007) suggested that no maintenance was required as the structures seemed to be working well.

#### *Ksemamaith Creek (alias Kseaden Creek) (PWC776a)*

Ksemamaith Creek (500-114800) is a fourth order stream approximately 17 km in length from its headwaters to the Nass River (Baxter and Bocking 1998a). It is locally known as Kseaden Creek which causes some confusion in historic data records (David Bustard and Associates 1991). The Nasoga route crosses Ksemamaith Creek approximately 1.5 km upstream from the Nass River. An 8 m high falls on Ksemamaith Creek approximately 2 km upstream from the Nass River is a barrier to anadromous fish (David Bustard and Associates 1991), however, this is upstream of PWC776a. Pink salmon, coho salmon and chum salmon use the lower 2 km of Ksemamaith Creek for spawning (BC MOE 2013f, David Bustard and Associates 1991). Spawning is often concentrated in the lower sections near the Highway 113 crossing (David Bustard and Associates 1991).

Ksemamaith Creek is considered an important pink salmon spawning system (David Bustard and Associates 1991). Pink salmon migrate from early August to mid-September and spawn from mid-August to early October, with peak spawning generally in late September. A major spawning location for pink salmon was identified immediately upstream from PWC776a (BC MOE 2013f,g).

Coho salmon spawning in Ksemamaith Creek was recorded from the 1960s to the early 1990s (DFO 2013g). Coho salmon migrate from late August to early October, spawn from early September through mid-November and peak spawning generally occurs in mid-October (DFO 2013g). A major spawning location for coho salmon was identified immediately upstream from PWC776a (BC MOE 2013f,g).

Populations of chum salmon in Ksemamaith Creek have declined in recent years relative to historic data (BC MOE 2013f, David Bustard and Associates 1991). Spawning is restricted to the lower 2 km, and is often concentrated in the lower sections near Highway 113 (David Bustard and Associates 1991). A major spawning location for chum salmon was identified immediately upstream from PWC776a (BC MOE 2013f,g). Spawning migrations occur from early to late August, with spawning from mid-August to late September.

#### *Ksi Mat'in (alias Ksedin Creek or Kwiniak Creek) (PWC781a and PWC2061)*

Ksi Mat'in (500-112000) is a fifth order stream that originates in the Kitimat Mountain Range and flows for 32 km to the Nass River (Baxter and Bocking 1998a). The Nasoga route crosses Ksi Mat'in approximately 3.5 km upstream from the Nass River (PWC781a). The Ksi Mat'in Alternate route (PWC2061) crosses approximately 4.2 km upstream from the Nass River. During periods of high flow, overflow channels support fish (David Bustard and Associates 1991). Ksi Mat'in supports all species of Pacific salmon with the exception of sockeye salmon, which are not documented.

Ksi Mat'in is considered an important coho salmon spawning system (Baxter and Bocking 1998a, David Bustard and Associates 1991). Spawning occurs throughout the lower 8 km of the Ksi Mat'in sub-basin, primarily in small gravel patches and small creeks draining from wetlands and beaver impoundments. Coho salmon arrive in Ksi Mat'in from early to mid-October. Spawning generally occurs between mid-October and mid-December, peaking from early to mid-November (DFO 2013g).

The lower 4 km of Ksi Mat'in provides important spawning habitat for pink salmon (David Bustard and Associates 1991, Hancock and Marshall 1984). Data from the 1990s indicate that pink salmon have consistently higher numbers than other salmon species in Ksi Mat'in (Baxter and Bocking 1998a, DFO 2013g). Habitat at the Highway 113 crossing, downstream of the proposed crossings, has been identified as having high concentrations of pink salmon spawners (David Bustard and Associates 1991). Pink salmon arrive in Ksi Mat'in in early August and begin spawning from early or late August to late August or late September. Peak spawning occurs from mid-August to early September (Hancock and Marshall 1984).

There is limited information on Chinook salmon and chum salmon in Ksi Mat'in. Chinook salmon spawn in Ksi Mat'in (Baxter and Bocking 1998a, Koski *et al.* 1996a,b), and juveniles are documented in the system (David Bustard and Associates 1991, Golder 2012 cited in BC MOE 2013g). Limited numbers of chum salmon migrate into Ksi Mat'in from mid to late August, spawning from mid-August to mid-September (BC MOE 2013f, David Bustard and Associates 1991).

During a fish salvage program for the Northwest Transmission Line Project in 2012, Golder (2012) cited in BC MOE (2013g) captured Chinook salmon, coho salmon, Dolly Varden, sculpin species and threespine stickleback immediately upstream of PWC781a. Chinook salmon, coho salmon and Dolly Varden captured were fry and juveniles, indicating use of Ksi Mat'in near PWC781a for rearing habitat.

#### *Unnamed Tributary to Ginlulak Creek (alias East Ginlulak Creek) (PWC785a)*

East Ginlulak Creek (500-090500-23900) is a second order stream crossed by the Nasoga route approximately 500 m from its confluence with Ginlulak Creek. An 8 m high falls is documented on East Ginlulak Creek approximately 3 km upstream from the mouth (approximately 2.5 km upstream from PWC785a) and is impassable by anadromous fish (Baxter and Bocking 1998a, BC MOE 2013g, Bocking *et al.* 2005). Dolly Varden are the only fish species reported upstream of the falls (Baxter and Bocking 1998a, BC MOE 2013g, Nass 1996).

East Ginlulak Creek provides spawning and rearing habitat for coho salmon. It flows into a *Carex sp.* marsh near its confluence with Ginlulak Creek which is indicated to provide habitat for rearing juvenile coho salmon (Bocking 2013b, Murray 2013). Mainstem and off-channel habitat in East Ginlulak Creek provide spawning habitat for coho salmon (Bocking 2013b) and a spawning location has been identified approximately 700 m upstream from PWC785a (BC MOE 2013f).

Logging in the East Ginlulak Creek sub-basin within riparian areas occurred from the 1950s to the 1970s. Instream restoration work was conducted in the late 1990s (Bocking 2013b, Murray 2013). Restoration work included creating complex habitat structures by placing large woody debris and boulders in the stream, construction of pool-riffle and off-channel habitat and dyking to prevent further avulsion (Murray 2013).

#### *Ginlulak Creek (PWC787a)*

Ginlulak Creek (500-090500) is a second order stream that originates from the Kitimat Mountain Range and flows north for 7 km to the Nass River (Nass 1996). It is crossed by the Nasoga route approximately 4 km upstream from the Nass River (PWC787a). Fish distribution appears to be limited to below PWC787a (BC MOE 2013g). Large numbers of Dolly Varden are reported in the Ginlulak Creek sub-basin (Baxter and Bocking 1998a, BC MOE 2013g, Nass 1996).

Coho salmon are the most prevalent anadromous fish species in Ginlulak Creek, regularly spawning in the system. Historically, the creek was subject to heavy sportfishing pressure during the spawning migration (Hancock and Marshall 1984). Recent runs (*i.e.*, 2009 and 2010) occurred in October and spawning occurred from late October to early December, peaking in the first 10 days of November (DFO 2013g). Coho salmon smolts were monitored in Ginlulak Creek using a rotary trap in 1992 and 1993 in order to enumerate and document timing, size and age distribution (Nass 1996). Coho salmon smolts migrated downstream at approximately age 2 and 3, and were considered small at the time of migration (Nass 1996). Peak migration occurred on May 25, however, high water levels were experienced that may have affected data collected (Nass 1996). The author indicated that Ginlulak Creek was a good producer of juvenile coho salmon.

In addition to coho salmon, low numbers of chum salmon and pink salmon were documented in Ginlulak Creek in the late 1970s. However, more recent records have not been indicated (DFO 2013g, Hancock and Marshall 1984, Bocking 2013b).

Based on accessible area and calculated mean annual discharge using the Nass River Steelhead Model, Bocking *et al.* (2005) predicted that steelhead juveniles could be within Ginlulak Creek, although this has not been confirmed.

#### *Unnamed Tributaries to the Nass River (PWC791a and PWC793a)*

The Nasoga route crosses two unnamed tributaries to the Nass River (PWC791a and PWC793a) with previously documented fish information (Table 6). Although no recent inventory work is indicated, BC MOE (2013f,g) reports information from 1976. PWC791a is located on a first order stream documented to contain coarse or non-game fish. Coho salmon and Dolly Varden are reported in the first order stream crossed at PWC793a, 200 m upstream from its confluence with the Nass River, near PWC793a.

#### *Quilgauw Creek (PWC796a)*

Quilgauw Creek (500-075000) is a second order tributary crossed by the Nasoga route approximately 2 km upstream from the Nass River. Tidal fluctuations affect the lower 3 km of Quilgauw Creek (Hancock and Marshall 1984).

Coho salmon and chum salmon spawning is reported in Quilgauw Creek (BC MOE 2013g, DFO 2013g). The most recent escapement records for coho salmon are from the 1980s (DFO 2013g). Coho salmon arrive from late September to mid-October and spawn approximately 5 km upstream from the mouth (BC MOE 2013f,g, Hancock and Marshall 1984). Spawning occurs from mid to late October to early December, peaking in mid-November (DFO 2013g, Hancock and Marshall 1984). Chum salmon were only documented during one year (1973) and escapement was estimated at 400 fish (DFO 2013g).

Based on the accessible area and calculated mean annual discharge using the Nass River Steelhead Model, Bocking *et al.* (2005) predicted that steelhead juveniles could be found within Quilgauw Creek, however, this has not been confirmed.

#### *Ksi Hlginx (Ishkeenickh River) (PWC801a/PWC802a)*

Ksi Hlginx (510) is a fourth order, 44 km long tributary to the Nass River (BC MOE 2013f). The Nasoga route crosses Ksi Hlginx (PWC802a) and a side channel (PWC801a) approximately 5 km upstream from its mouth. Bocking *et al.* (2005) reported known barriers to steelhead approximately 14 km (5 m height) and 30 km (2 m height) upstream from the mouth, though these barriers were not indicated in other reports. Eulachon spawning is reported in lower sections of the river, downstream of PWC802a (David Bustard and Associates 1991 cited in BC MOE 2013f,g).

Several studies have been conducted targeting Chinook salmon in Ksi Hlginx (Koski *et al.* 1996a,b, NLG 2007). Hancock and Marshall (1984) reported Chinook salmon spawning distribution throughout Ksi Hlginx, but mainly in the upper river and did not describe any barriers or inaccessible reaches. Chinook salmon migrate into Ksi Hlginx from mid-June to mid-August, spawning from mid-July to the end of September (BC MOE 2013f). The peak spawning period is late August (Jantz *et al.* 1989 cited in Koski *et al.* 1996a,b).

Ksi Hlginx is a major producer of pink salmon during odd-run years, which consistently have approximately 15,000 pink salmon. The even-year pink salmon population is approximately half that of the odd-year population (Levy 2006b). Pink salmon migrate into Ksi Hlginx from mid-July to mid-August, spawning from early August to mid-September (BC MOE 2013f). Spawning is concentrated in the lower reaches and tributaries (Hancock and Marshall 1984).

Coho salmon and chum salmon are documented in Ksi Hlginx. Adult coho salmon migrate into Ksi Hlginx from early September to mid-October, spawning from early October to mid-December (BC MOE 2013f). Coho salmon spawn throughout the Ksi Hlginx sub-basin from 1.6 km to 26 km upstream of the Nass River (BC MOE 2013f, Hancock and Marshall 1984). Chum salmon are reported spawning in the lower 8 km of Ksi Hlginx (Hancock and Marshall 1984), however, recent escapement has not been estimated (DFO 2013g). In the 1970s and 1980s, chum salmon runs occurred from early to mid-August and



spawning took place from early August to mid-September. Peak spawning was late August to early September (BC MOE 2013f, DFO 2013g).

Using the Nass River Steelhead Model, among confirmed winter-run steelhead populations, Ksi Hlginx and tributaries have the largest potential number of winter-run steelhead spawners (approximately 34%) in the Lower Nass River watershed (Bocking *et al.* 2005). Observations of steelhead spawning are reported in Ksi Hlginx approximately 8 km and 20 km upstream from the Nass River (BC MOE 2013f).

Low numbers of sockeye salmon have been observed within side channels and in the lower Ksi Hlginx (Hancock and Marshall 1984). However, recent escapement has not been estimated (DFO 2013g).

#### *Unnamed Tributaries to the Nass River (PWC806a, PWC807a and PWC812a)*

BC MOE (2013f,g) indicate that two unnamed tributaries to the Nass River crossed by the Nasoga route, PWC806a (500-058200) and PWC807a (500-055100), were sampled in 1976. Coho salmon and Dolly Varden are reported near PWC806a, 500 m upstream from the confluence with the Nass River. Both species are also documented near PWC807a, 200 m upstream from the confluence with the Nass River (BC MOE 2013f,g).

Monkley Creek (alias) (500-050900) is a tributary to the Nass River crossed by the Nasoga route approximately 800 m upstream from its mouth (PWC812a). Forestry activities have affected the lower reaches of Monkley Creek (Baxter and Bocking 1998b). A 30 m high falls approximately 30 m upstream from PWC812a restricts anadromous fish distribution. Anadromous fish occur downstream of the falls, near PWC812a (Table 6). Pink salmon spawning was observed within the lower reaches of Monkley Creek near the confluence with the Nass River (Baxter and Bocking 1998b). In addition to the fish species documented, Bocking *et al.* (2005) predicted that steelhead juveniles may occur in Monkley Creek. Steelhead have not been confirmed in Monkley Creek, however, juvenile rainbow trout documented in the creek may be steelhead.

Resident Dolly Varden and rainbow trout populations are documented in Monkley Creek upstream of the falls (Baxter and Bocking 1998b). Surveys conducted by Baxter and Bocking (1998b) indicate that Dolly Varden were the most abundant species in Monkley Creek.

#### *Ksgyukwsa'a (alias Burton/Barton Creek) (PWC2523 and PWC826a)*

Ksgyukwsa'a (500-018500), a fifth order, 20 km long stream, flows into the mouth of the Nass River at Nass Bay (Pacific Ocean). It is crossed by the Nasoga route approximately 1 km upstream from its mouth (PWC2523) and by the Nass Bay Tunnel Alternate route approximately 3 km upstream from its mouth (PWC826a).

A 10 m high impassable falls on Ksgyukwsa'a approximately 500 m upstream from its mouth is the upper limit of anadromous fish distribution (Baxter and Bocking 1998b, Bocking *et al.* 2005, Hancock and Marshall 1984). Dolly Varden is the only species reported upstream of this barrier and near the proposed crossings (Baxter and Bocking 1998b). Downstream of the barrier, pink salmon, coho salmon, chum salmon and rainbow trout are documented (Baxter and Bocking 1998b, Hancock and Marshall 1984, Williams *et al.* 1994). Historic data suggest that chum salmon use the lower reaches for spawning, however, this has not been observed in recent years (Baxter and Bocking 1998b).

#### *Unnamed Tributary to Ksgyukwsa'a (PWC829a)*

The Nasoga route crosses unnamed tributaries that flow into Ksgyukwsa'a upstream of the barrier to anadromous fish. PWC829a is located approximately 300 m upstream from its confluence with Ksgyukwsa'a. Baxter and Bocking (1998b) sampled several tributaries in the Ksgyukwsa'a sub-basin, including the first order stream crossed by the Nass Bay Tunnel Alternate route (500-018500-06000) at PWC829a. Baxter and Bocking (1998b) captured Dolly Varden near PWC829a and in most tributaries surveyed (Table 6). Sections of the creek were dry at the time of the assessment (August 1998), and Baxter and Bocking (1998b) rated the stream as having good rearing and overwintering habitat, however, poor spawning habitat.

## 4.2 Results of Field Data Collection

This subsection describes results of the field studies within the Nisga'a Lands. A summary table of watercourse and fish-bearing NCD crossings investigated is presented in Appendix A. A results summary and photographs of the watercourse and potentially fish-bearing NCD crossings investigated is presented in Appendix C. A summary table and photographs of nonfish-bearing NCD crossings are provided in Appendices B and D, respectively.

Stream classifications were assigned to watercourses. Where fish presence was unknown, it was assumed watercourses were fish streams and default fish-bearing classifications were assigned. Additional sampling may be required to determine the fish-bearing status of these streams.

### 4.2.1 Kitsault Route

Aquatic assessments were conducted at four watercourses along the Kitsault Alternate route within Nisga'a Lands from July 9 to 10, 2014 (Figure 3). Based on the results of the literature review and field studies, only one of these sites, the Nass River (PWC1038), was found to support fish. One watercourse was classified as an S1-B stream; two were classified as default S3 streams; and one as a default S4 stream.

#### *Open Water Aquatic Habitat Results*

A summary of channel characteristics and water quality parameters is provided in Appendix E. At the time of the assessment, PWC1034a was dry and water quality data was not collected. Water quality data was also not collected from the Nass River (PWC1038) because the field crew could not access the crossing location on the ground. Water quality was measured at two sites. The pH measured at both watercourses (PWC1033a and PWC1034) was within the CCME (2007) preferred range (6.5 to 9.0). At PWC1033a and PWC1034, DO was above the CCME guideline for coolwater species at all life stages and coldwater species at life stages other than early (*i.e.*, 6.5-9.5 mg/L).

#### *Large River Habitat Classification*

Large river habitat mapping was completed during the aerial survey of the Nass River (PWC1038) (Appendix F). At PWC1038 the river is entrenched in a canyon with high, vertical bedrock banks. Functional riparian vegetation was limited within the canyonized section of the river. Instream habitat was primarily deeps runs, with sections of rapids, deep pools and backwater areas noted downstream from PWC1038. Cover types were limited to depth, turbidity and boulders. The substrate was primarily rock throughout the surveyed section. Several tributary confluences were noted in the study reach.

#### *Habitat Potential*

Fish habitat potential was rated for select sportfish species that may occur within the ZOI of the crossings investigated (Appendix G). Habitat potential was rated for coho salmon, trout species and char species. Ratings for 'trout' refer to rainbow trout and coastal cutthroat trout, while the ratings for 'char' refer to bull trout and Dolly Varden. The following summarizes locations where fish habitat potential was rated as 'essential' or 'important'.

Fish habitat potential was rated as 'important' or 'essential' at the Nass River (PWC1038). Adult habitat potential was rated as 'important' for trout and char. For coho salmon, trout and char, wintering habitat potential was rated as 'important' and migration habitat potential was rated as 'essential'.

#### *Fish Inventory*

Fish sampling was conducted at two watercourses on July 9 and 10, 2014 (Appendix H). The Nass River (PWC1038) was not sampled due to previously documented fish presence (Section 4.1.1). Dry conditions precluded fish sampling at PWC1034a. No fish were captured near PWC1033a and PWC1034, the two watercourses sampled. Obstructions to fish migration were identified downstream from PWC1033a. High stream gradient (*i.e.*, 39%), falls, chutes and dry sections were observed along the watercourse crossed at PWC1033a. A review of provincial databases and other relevant reports indicated no site-specific fish presence information at, or near, the locations where fish were not captured (BC MOE 2013f,g). Supplemental studies may be conducted at some waterbodies to confirm fish-bearing status.

### *Timing Windows of Least Risk*

Preliminary timing windows of least risk were determined based on the results of the literature review, field studies and BC MWLAP (2005) in the Kalum Forest District (Appendix A). Based on the fish species documented in the Nass River, PWC1038 has no timing window of least risk. At the remaining watercourses where no fish presence is documented, the timing windows of least risk are 'open', however, this may change based on the results of supplemental studies.

### *Sensitivity Ranking*

Based on the results of the literature review, field studies and criteria listed in Table 4, sensitivity rankings were assigned to watercourse crossings (Appendix C). A 'high' sensitivity ranking was assigned to the Nass River (PWC1038) while the remaining three sites (PWC1033a, PWC1034 and PWC1034a) were assigned a 'low' sensitivity ranking.

## **4.2.2 Nasoga Route**

Aquatic assessments were conducted along the Nasoga route from June 9 to July 19, 2014. Within Nisga'a Lands, 114 watercourse and fish-bearing drainage crossings were investigated (Figure 3). Due to access restrictions, nine PWCs were not investigated on the ground. At these PWCs, stream widths were estimated using LIDAR imagery and preliminary stream classifications were assigned. These stream classifications may change based on the results of additional studies.

Nine PWCs (PWC2516 to PWC2522, PWC820a and PWC2524) were classified as S5 or S6 nonfish-bearing. These sites were not visited on the ground during the field program, but were classified as nonfish-bearing based on desktop assessment and aerial surveys (Appendix I). Stream classifications for these watercourses were assigned based on stream widths estimated using LIDAR imagery.

Of the watercourses assessed, 10 were classified as S1-B streams and 34 were classified as S2 streams, 3 of which were default classifications. Forty-four watercourses were classified as S3 streams, 18 of which were default classifications. Six watercourses were assigned a default S4 classification. Based on stream widths estimated from LIDAR data, six PWCs were assigned an S5 classification and three were assigned an S6 classification. The 11 potentially fish-bearing NCDs identified do not meet the BC OGC (2013) definition of a fish stream.

### *Open Water Aquatic Habitat Results*

A summary of channel characteristics and water quality parameters is provided in Appendix E. Beaver activity was noted at 22 sites and may influence the crossing locations at the time of construction. At the time of the assessment, six sites were dry. Water quality data were not collected from dry watercourses or where water depth was insufficient.

The pH measured at the locations investigated was within the CCME (2007) preferred range (6.5 to 9.0), with the exception of 11 sites (PWC754a, PWC2056, PWC2057.1, PWC2057, PWC775a, PWC779a, PWC788a, PWC813a, PWC815a, PWV816a and PWC830a).

The DO measured at most sites (*i.e.*, 72 sites) met the CCME (2007) guideline for coolwater and coolwater species at all life stages (*i.e.*, greater than 9.5 mg/L). At 9 sites (PWC780.1, PWC781a, PWC2061, PWC785a, PWC790a, PWC796a, PWC804b, PWC815a and PWC828a) DO was above the CCME guideline for coolwater species at all life stages and coldwater species at life stages other than early (*i.e.*, 6.5-9.5 mg/L). The DO measured at four sites (PWC724a, PWC748a, PWC771a and PWC800a.1) did not meet the CCME guideline for coldwater species at any life stage, but was above the guideline for coolwater species at early life stages (*i.e.*, 6.0-6.5 mg/L). At PWC741a, DO met the CCME guideline for coolwater species at life stages other than early (*i.e.*, 5.5-6.0 mg/L). At nine sites (PWC2146, PWC754a, PWC2055, PWC2056, PWC2057.1, PWC2057, PWC777a, PWC798a and PWC808a) DO was below the CCME guideline for coolwater and coldwater species at any life stage (*i.e.*, below 5.5 mg/L).

### *Large River Habitat Classification*

Quilquaw Creek (PWC796a) was assessed using large river habitat classification (Appendix F). The system was irregularly meandering and consisted almost exclusively of flat habitat. Both left and right banks were stable, heavily vegetated, low, and primarily consisted of fines substrate. A large functional riparian habitat was noted, surrounded by a large marsh and muskeg lowland. Woody debris and abundant instream vegetation were present throughout the study reach. The location was tidally influenced, with water levels fluctuating accordingly. The substrate at PWC796a was predominately organics and fines. Multiple tributaries and springs were observed within the study reach.

Large river habitat mapping was completed during the assessment of Ksi Hlginx (PWC802a) (Appendix F). The study reach was irregularly meandering and contained complex sequences of channel geomorphic units and habitat types. The reach contained abundant riffle, run, pool sequences as well as multiple islands, side channels and sneys. At the crossing, the right bank was depositional with gravels and cobbles, while the left bank was armored and stable. Depositional banks were frequent on inside meander bends, while armored and stable banks were conversely observed on most outside meanders. Functional riparian habitat was moderate despite low approach slopes. Large gravel and cobble were the dominant substrate at PWC802a, however, boulders, small gravels and fines were also observed. Stream gradient and water velocity were reduced as the system nears the Nass River, providing deeper and slower moving runs and pools. Multiple tributaries were present throughout the assessment length.

### *Habitat Potential*

Fish habitat potential was rated for select sportfish species that may occur within the ZOI of the crossings investigated (Appendix G). Habitat was rated for coho salmon, trout species and char species. Ratings for 'trout' refer to rainbow trout and coastal cutthroat trout, while the ratings for 'char' refer to bull trout and Dolly Varden. The following summarizes locations where fish habitat potential was rated as 'essential' or 'important'.

Spawning habitat potential was rated as 'important' or 'essential' at 38 sites. At Ksi Sii Aks (PWC746a) it was rated as 'essential'. At the remaining 37 sites 'important' spawning habitat potential was identified (PWC733a, PWC738a, PWC740a, PWC2501, PWC743a, PWC747a, PWC753a, PWC756a, PWC757a, PWC2054, PWC2514, PWC768a, PWC772a, PWC776a, PWC780.1, PWC2060.1, PWC785a, PWC788a, PWC792a, PWC794a, PWC801a, PWC802a, PWC803a, PWC804b, PWC804c, PWC805a, PWC805b, PWC806a, PWC806b, PWC815a, PWC817a, PWC818a, PWC2523, PWC819a, PWC826a, PWC831a and PWC832a).

Rearing habitat potential was rated as 'important' or 'essential' at 54 sites. Ksi Sii Aks (PWC746a) was rated as having 'essential' rearing habitat. 'Important' rearing habitat potential was identified at 53 sites (PWC733a, PWC738a, PWC740a, PWC2500, PWC2501, PWC743a, PWC747a, PWC753a, PWC756a, PWC757a, PWC2054, PWC761a, PWC2514, PWC768a, PWC771a, PWC772a, PWC776a, PWC777a, PWC780.1, PWC781a, PWC2060, PWC2060.1, PWC2061, PWC785a, PWC787a, PWC788a, PWC790a, PWC791a, PWC792a, PWC794a, PWC796a, PWC798a, PWC799a, PWC801a, PWC802a, PWC803a, PWC804b, PWC804c, PWC805a, PWC805b, PWC806a, PWC806b, PWC808a, PWC810a, PWC811b, PWC814a, PWC815a, PWC816a, PWC817a, PWC818a, PWC2523, PWC819a and PWC826a).

Wintering habitat potential was rated as 'important' or 'essential' at 20 sites. It was rated as 'essential' at Ksi Sii Aks (PWC746a). At 19 sites (PWC733a, PWC747a, PWC753a, PWC2514, PWC772a, PWC777a, PWC2060, PWC794a, PWC798a, PWC801a, PWC802a, PWC803a, PWC806b, PWC817a, PWC2523, PWC819a, PWC826a, PWC831a and PWC832a) wintering habitat potential was rated as 'important'.

Adult feeding/foraging habitat potential was rated as 'important' for trout or char at 23 sites. At Ksi Sii Aks (PWC746a), it was rated as 'essential'. Adult habitat potential was rated as 'important' at PWC733a, PWC747a, PWC753a, PWC2514, PWC772a, PWC776a, PWC781a, PWC2061, PWC788a, PWC792a, PWC794a, PWC801a, PWC802a, PWC803a, PWC806a, PWC806b, PWC817a, PWC2523, PWC819a, PWC826a, PWC831a and PWC832a.

Migration habitat potential was rated as 'essential' or 'important' at 20 sites. It was rated as 'essential' at 4 sites (PWC746a, PWC768a, PWC796a and PWC802a) and 'important' at 19 sites (PWC733a,

PWC740a, PWC2501, PWC768a [char], PWC772a, PWC776a, PWC781a, PWC2061, PWC785a, PWC796a [char], PWC801a, PWC802a [char], PWC803a, PWC804b, PWC804c, PWC805a, PWC806b, PWC826a [char] and PWC831a).

### *Fish Inventory*

Fish sampling was conducted at 85 sites in June and July, 2014 (Appendix H). Ksi Sii Aks (PWC746a) and Vetter Creek (PWC747a) were not sampled because the crossing locations are within Nisga'a Memorial Lava Bed Provincial Park. Dry or shallow water conditions precluded fish sampling at some locations. Previously documented fish species are included in Appendix A and Section 4.1.2.

Fish were captured or observed at 71 of the sites sampled and included the following species: Chinook salmon; sockeye salmon; coho salmon; rainbow trout; coastal cutthroat trout; char; mountain whitefish; lamprey spp.; reaside shiner; sculpin spp.; and stickleback spp. Rainbow trout were captured at PWC732a. No sportfish were captured from PWC733a, however, given the close proximity to PWC732 and observation of small salmonids, it is assumed that rainbow trout are also present near PWC733a. PWC2056 was not sampled, but given the close proximity to PWC2057 and PWC2057.1, it is assumed that the waterbody near PWC2056 also supports coho salmon and threespine stickleback.

No fish were captured from the remaining 14 sites sampled (PWC724a, PWC2503, PWC744a, PWC2146, PWC748a, PWC754a, PWC757a, PWC2043, PWC2047, PWC2049a, PWC775a, PWC788b, PWC813a and PWC2518). With the exception of PWC724a and PWC2503, a review of provincial databases and other relevant reports indicated no fish presence information at, or near, the remaining locations where fish were not captured (BC MOE 2013f,g). PWC724a is located on upper North Seaskinnish Creek, and fish presence has not been documented near this location. Dolly Varden were captured from Gitzyon Creek approximately 550 m downstream from PWC2503, within the sampled reach of PWC743a. Potential barriers (*i.e.*, falls, chute and high gradient) were identified on Gitzyon Creek between PWC2503 and the Dolly Varden capture location. Supplemental studies may be conducted at some waterbodies to confirm fish-bearing status.

### *Timing Windows of Least Risk*

Preliminary timing windows of least risk were determined based on the results of the literature review, field studies and BC MWLAP (2005) for the Kalum (Kalum TSA) and North Coast (North Coast TSA) Forest districts. Timing windows of least risk are included in Appendices A and C for each watercourse and fish-bearing drainage crossing. At watercourses where no fish presence was documented, the timing window of least risk is 'open', however, this may change based on the results of additional studies.

### *Sensitivity Ranking*

Based on the results of the literature review, field studies and criteria listed in Table 4, sensitivity rankings were assigned to watercourse and potentially fish-bearing NCD crossings (Appendix C). 'High' sensitivity rankings were assigned to 77 sites (PWC732a, PWC733a, PWC737a, PWC738a, PWC740a, PWC2500, PWC2501, PWC2503, PWC743a, PWC746a, PWC747a, PWC753a, PWC756a, PWC757a, PWC2051, PWC2053, PWC2054, PWC2056, PWC2057, PWC2057.1, PWC2059, PWC760a, PWC761a, PWC767a, PWC2514, PWC768a, PWC771a, PWC772a, PWC776a, PWC777a, PWC779a, PWC780.1, PWC781a, PWC2060, PWC2060.1, PWC2061, PWC785a, PWC787a, PWC788a, PWC790a, PWC791a, PWC792a, PWC793a, PWC794a, PWC796a, PWC798a, PWC799a, PWC800a.1, PWC801a, PWC802a, PWC803a, PWC804b, PWC804c, PWC805a, PWC805b, PWC806a, PWC806b, PWC808a, PWC808b, PWC809a, PWC810a, PWC811b, PWC812a, PWC814a, PWC815a, PWC816a, PWC817a, PWC818a, PWC2515, PWC2523, PWC819a, PWC826a, PWC829a, PWC830a, PWC830a.1, PWC831a and PWC832a).

'Low' sensitivity rankings were assigned to 37 sites (PWC724a, PWC741a, PWC2508, PWC744a, PWC2146, PWC748a, PWC749b, PWC754a, PWC2042, PWC2042.1, PWC2043, PWC2044, PWC2045, PWC2046, PWC2046.1, PWC2047, PWC2048, PWC2049a, PWC2055, PWC762a, PWC2509, PWC773a, PWC775a, PWC786a, PWC788b, PWC789a, PWC813a, PWC2516, PWC2517, PWC2518, PWC2519, PWC2520, PWC2521, PWC2522, PWC820a, PWC2524 and PWC828a).

## **5.0 CROSSING METHODS**

The proposed pipeline and vehicle crossing methods for watercourse crossings are discussed in the following sections and summarized in Appendix A. Pending regulatory approval, construction of the Project is scheduled to occur over 11 years from 2016 to 2027. Construction of watercourse crossings within Nisga'a lands would occur during open water conditions (*i.e.*, summer).

Information in this section is based on TERA's, current understanding of existing federal and provincial regulatory requirements, environmental sensitivity, proven BMPs and mitigation strategies. Given the duration of the construction period and recent regulatory changes, a review of crossing methods and current regulatory requirements should be conducted prior to construction of watercourse crossings to ensure compliance with policies at that time. Additional studies will be conducted prior to construction as required, to support permitting.

### **5.1 Pipeline Crossing Construction Methods**

The pipeline watercourse crossing methods described below were considered by WCGT for use on the Project. Typical drawings of crossing methods are included in Section 7 of the Terrestrial EMP. Detailed design drawings will be prepared for select watercourse crossings, as required.

#### **5.1.1 Trenched Construction Methods**

##### **5.1.1.1 Open Cut Method**

An open cut crossing method allows for excavation of the pipeline trench without isolation of the instream workspace from the rest of the channel. This method is most often used on small watercourses that are either dry or frozen to bottom at the time of construction. In some cases this method can also be used on larger watercourses where an isolation or trenchless crossing method is determined to be unfeasible. An open cut trenched crossing can also be utilized across a standing body of water that is nonfish-bearing. Open cut crossings will not be used on flowing watercourses on this Project unless specifically authorized.

##### **5.1.1.2 Isolation Method**

An isolation method establishes a dry construction area for trench excavation within a watercourse by isolating it from the natural stream flow. Techniques used to achieve isolation of the instream workspace include dam and pump, high volume dam and pump, flume, superflume, coffer dam and channel diversion. These techniques are intended to prevent stream flow from entering the instream workspace using dams to isolate the construction area and conveying flows around or through the workspace using pumps, flumes and/or diversions. Isolation methods are often used at small or medium sized watercourses. One or more super flumes may be used to undertake an isolation method on larger watercourses. Isolation methods are proposed for small to medium sized flowing watercourses, unless they have technical considerations that preclude this method or at some watercourses where high fish and fish habitat sensitivity has been identified.

#### **5.1.2 Trenchless Construction Methods**

Trenchless methods include techniques intended to install a pipeline under or over a watercourse, with reduced or no disturbance to the streambed, banks and/or riparian areas. Trenchless methods are typically used at medium to large watercourses with high fish and fish habitat sensitivity, construction concerns, channel stability concerns or technical considerations that preclude the use of trenched crossing methods.

##### **5.1.2.1 Underground Trenchless Methods**

###### **Horizontal Directional Drilling Method**

Horizontal Directional Drilling (HDD) is a widely used underground trenchless installation technique that uses specialized equipment to drill a long deep path underneath a watercourse. Cutting heads are subsequently used to successively ream the path to a large enough diameter to pull the pipe through.

This method is used to cross sensitive and large watercourses with the added benefit of maintaining riparian vegetation between the drill entry and exit locations. Additional workspace is typically required to accommodate the pipeline pull section which does not always align with the pipeline right-of-way at the watercourse crossing. Geotechnical investigations are conducted to determine the feasibility of an HDD method which depends on a number of factors, such as the type of substrate and watercourse crossing geometry.

### Auger Boring Method

Auger Boring is a trenchless method used for installation of pipe sections under obstacles. The bore is formed from a launch pit by means of a rotating cutting head. The soil is removed back to the launch pit by helical auger flight sections and the steel casing is jacked into place. The rotating head is pushed forward by an auger boring machine, travelling on tracks, powered by a hydraulic power pack located outside of the launch pit. This method offers limited steering capabilities and is used when precision and accuracy are not crucial. Advantages of this method are that it causes little or no surface disruption and the spoil is removed by augers which is a dry method. The disadvantages of this method include the limited lengths and inability to steer around obstacles in the bore path.

### Microtunnel Method

Microtunneling is considered at crossings where an HDD may not be feasible and where other conditions preclude a trenched crossing. Microtunneling is a process by which a remote controlled tunneling machine is driven from a drive shaft to a receiving shaft by means of a hydraulic jack. The tunneling machine is launched from the pit through an entrance ring which isolates the ground from the pit. Excavated soil is carried by a slurry mixture back to the surface pit. Ground pressures are equalized with slurry and jacking pressure. As the tunneling machine is driven forward, jacking pipe is added onto the back of the machine. Steering is accomplished by means of laser and hydraulic steering jacks inside the tunneling machine. Microtunneling can be used where grade must be maintained and where the installation is deep. Types of microtunneling being considered for the Project include DIRECT PIPE™ and Microtunnel boring.

#### **5.1.2.2 Above Ground Trenchless Method (Aerial)**

An aerial pipeline crossing requires the construction of a supporting structure or bridge to carry the pipe over the watercourse. WCGT prefers to use underground pipeline watercourse crossing methods over aerial methods where practical, to reduce operation and maintenance costs and security risks. However, where underground trenchless crossing techniques are not feasible and fish and fish habitat sensitivity and flows preclude trenched crossing methods, aerial crossings are selected. The type of aerial pipeline crossing to be used depends on the configuration of the watercourse crossing location and the span distances involved. Long watercourse crossings require either single span suspension style pipeline crossings or multiple spans using a suspension or truss configuration. Smaller spans can be made with single span truss configurations. For aerial crossings, the preferred crossing location is a narrow part of the watercourse with stable and incised banks providing both bank stability and protection from flooding.

#### **5.1.3 Selection of Pipeline Watercourse Crossing Methods**

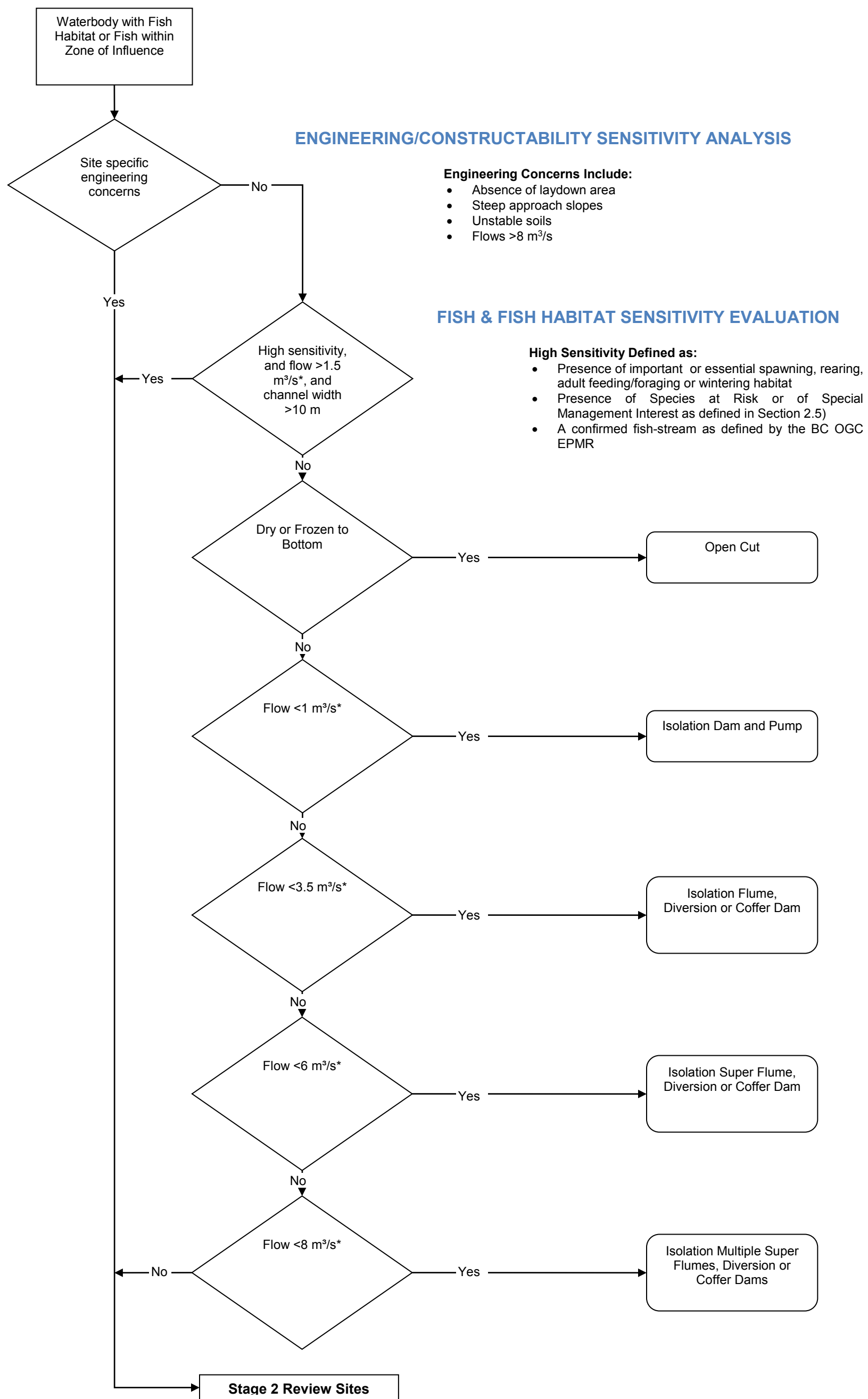
Selection of pipeline watercourse crossing methods considered a number of factors (Figures 4 and 5), including:

- fish species and life stages anticipated to be present within the ZOI of the watercourse crossing and construction timing;
- fish habitat potential within the ZOI of the watercourse crossing;
- hydrotechnical concerns such as stream flow, volume, depth of scour and lateral channel stability;
- geotechnical concerns including crossing method feasibility and bank and approach slope stability;

- constructability concerns, including safety, risk, complexity, access, schedule, timing and cost;
- operational concerns, including pipeline integrity, maintenance and accessibility;
- input from BC EAO Working Group members, regulators, Aboriginal groups, community members and stakeholders;
- reliability, robustness, cost and maintenance concerns over the life of the pipelines; and
- professional judgement of the Project Team.



Figure 4 Pipeline Watercourse Crossing Selection Flowchart Stage 1 – Initial Screening

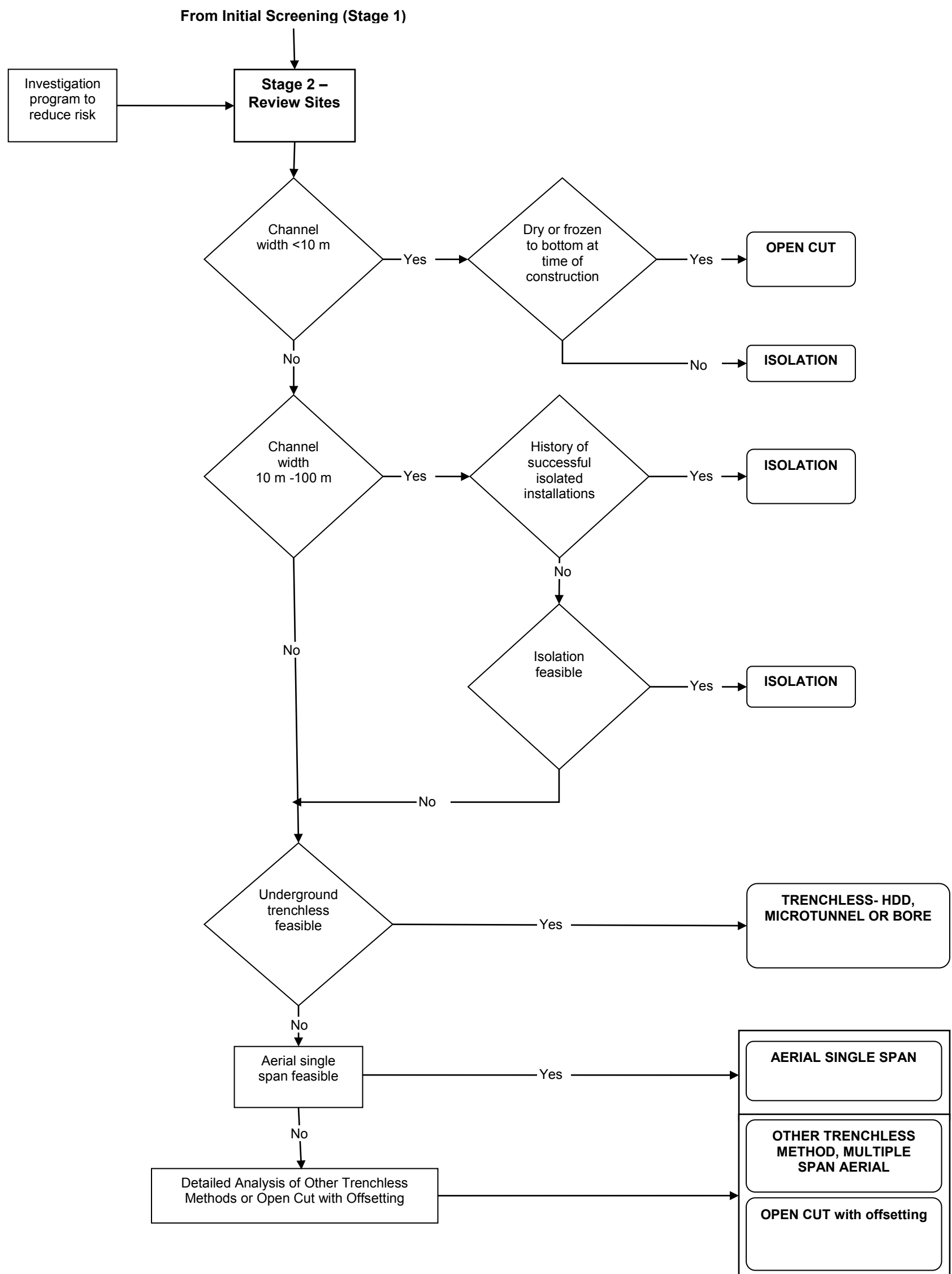


**Sources:** Adapted from Enbridge Northern Gateway Pipeline Project 2010

**Notes:** \* Flow rates are approximate and may be adjusted based on site-specific conditions.

Figure 5

Pipeline Watercourse Crossing Selection Flowchart Stage 2 – Review Sites



**Sources:** Adapted from Enbridge Northern Gateway Pipeline Project 2010

- Notes:**
- 1 This decision flowchart applies to sites with high fish and fish habitat sensitivity.
  - 2 For this analysis, **feasible** encompasses the following aspects.
    - Environmental – using best professional judgement, the crossing is likely to meet environmental requirements and is not expected to have significant residual adverse environmental effects.
    - Constructability – using best professional judgement, the crossing has a high probability of success without endangering human health and safety, project schedule or commercial viability.
    - Consultation – input from regulators, aboriginal communities and other stakeholders indicate that the crossing is appropriate.
  - 3 The investigation program is used to identify preferred crossing locations and site-specific mitigation measures in order to reduce environmental and constructability risks.
  - 4 Selection of proposed and alternate methods for each crossing site reviewed will be finalized during detailed design.

#### **5.1.4 Proposed Pipeline Crossing Methods**

Based on the results of desktop and field studies, watercourse crossings were assigned either a 'low' or 'high' fish and fish habitat sensitivity ranking (Table 4). Watercourses assigned a 'low' sensitivity ranking are expected to have low sensitivity to watercourse crossing construction if the mitigation and restoration measures outlined in the Project EMP and applicable legislation and guidelines are successfully implemented. Watercourses considered to have a 'high' sensitivity ranking may require additional regulatory applications such as BC OGC and DFO review or potential *Fisheries Act* Authorization, as well as a site-specific restoration plan or other site-specific mitigation, depending on the proposed crossing construction method and timing. Additional studies will be conducted at select watercourses with a 'high' sensitivity ranking as required, to support regulatory applications and develop appropriate site-specific mitigation and restoration plans.

Based on the factors discussed in Section 5.1.3 and Figures 4 and 5, WCGT's Project team has selected preliminary crossing methods for the watercourses crossed by the Project (Appendix A). Trenched construction methods are proposed for most small to medium sized watercourses, except where technical or environmental considerations preclude this method. Isolated trenched methods will be used if water is present and open cut methods will be used if a site is dry or frozen to bottom at the time of construction. Isolation methods are proposed at watercourses where it is anticipated that flow can be successfully diverted and the instream workspace dewatered (Figures 4 and 5).

It is recommended that trenched crossings be constructed during the timing window of least risk to reduce potential impacts to fish and fish habitat. However, due to constructability concerns, WCGT is proposing construction of trenched crossings outside of timing windows of least risk at some sites. The use of isolated and bottom lay methods outside of the timing window of least risk is subject to DFO and BC OGC review. Timing windows of least risk generally do not apply to watercourse crossings that are dry or frozen to bottom at the time of construction (BC MOE 2010), however, confirmation should be made with the appropriate regulatory agencies.

Isolated trenched construction methods are included under the Water Diversion and Dewatering project activity in the DFO self-assessment process. If the associated criteria for this activity are met and best practices, including DFO's *Measures to Avoid Causing Serious Harm to Fish and Fish Habitat* are followed, this activity would not require review by DFO (DFO 2013c). Isolated trenched crossings are to be constructed in a manner that adheres to the applicable mitigation discussed in the Project EMP. At waterbodies that support fish, fish salvages are to be conducted prior to dewatering of the work site. It is recommended that WCGT assess whether watercourse or fish-bearing drainage crossings require beaver dam removal prior to isolated trenched construction. Beaver dam removal may be recommended to reduce water levels during construction and facilitate the successful use of isolation techniques.

Trenched pipeline crossings constructed in dry or frozen to bottom conditions are not currently included in DFO's self-assessment process or *Measures to Avoid Causing Serious Harm to Fish and Fish Habitat*. However, recent information provided by DFO has instructed proponents to follow the previously issued Operational Statements (OSs) when existing measures are not available. Until further guidance is provided, when the conditions and measures included in DFO's Pacific Region *Operational Statement for Dry Open-Cut Stream Crossings* (DFO 2007a) are met, in addition to the *Measures to Avoid Causing Serious Harm to Fish and Fish Habitat* (DFO 2013c), DFO review is not required.

Trenchless crossing methods are proposed where flows are anticipated to be too great to successfully implement isolated trenched crossing methods and at select watercourses where high sensitivity fish and fish habitat has been identified. Trenchless pipeline crossings are currently not included in DFO's self-assessment process or *Measures to Avoid Causing Serious Harm to Fish and Fish Habitat*. However, based on recent information provided by DFO, when the conditions and measures included in DFO's Pacific Region *Operational Statement for Directional Drilling* (DFO 2007b) or *Operational Statement for Punch and Bore Crossings* (DFO 2007c) are met, in addition to the *Measures to Avoid Causing Serious Harm to Fish and Fish Habitat* (DFO 2013c), DFO review is not required. Discussions with DFO are required to confirm if other trenchless methods (e.g., aerial) require DFO review. Timing windows of least risk generally do not apply to trenchless construction methods, however, confirmation should be made with the appropriate regulatory agencies.

Each proposed watercourse crossing and associated activities (e.g., beaver dam removal) should be assessed in accordance with the criteria provided in DFO's self-assessment tools and guidance documents (e.g., applicable Pathway of Effects diagrams) to determine if DFO review is required. Documentation of the results of the self assessment, including demonstration of how the *Measures to Avoid Causing Harm to Fish and Fish Habitat* (DFO 2013c) will be successfully met, as well as the incorporation of any site-specific mitigation measures, is recommended. The self-assessment documentation for each crossing should be provided to the Environmental Inspector and/or construction personnel to retain on-site during construction of the crossing.

Based on current understanding of DFO policy and WCGT's proposed watercourse crossing methods and construction timing, select crossings associated with the Project will require submission to DFO for review. Once reviewed, if it is determined that Project activities will not cause serious harm to fish, they may be allowed to proceed as planned, or may be allowed to proceed with additional mitigation. If, however, it is determined that Project activities will cause serious harm to fish that are part of, or that support, a commercial, recreational or Aboriginal fishery, WCGT may apply for a *Fisheries Act* Authorization (Paragraph 35(2)(b) *Fisheries Act* Authorization from the Minister of Fisheries and Oceans). The authorization process would require WCGT to demonstrate that measures and standards have been applied to first avoid, then mitigate and then finally, offset any residual serious harm to fish that are part of or support a commercial, recreational or Aboriginal fishery. It is recommended that consultation is initiated with DFO to review watercourse crossing methods and confirm appropriate mitigation measures.

Under the BC *Water Act* and BC OGC's EPMP, applications for proposed pipeline watercourse crossings are to be submitted to BC OGC prior to the start of construction, and the guidance and applicable BMPs outlined in BC OGC's EPMP and EPMG (BC OGC 2013) are to be followed. Watercourse crossing construction methods selected in accordance with the BC OGC (2013) flow diagram (Figure 6) that adhere to applicable BMPs are considered routine stream crossings. If crossing methods are not selected in accordance with the EPMG, or if another crossing technique is proposed (e.g., aerial) or BMPs cannot be implemented, proponents may request to deviate from the guidance provided (BC OGC 2013). Proposed watercourse crossings that do not follow the guidance in the EPMG are considered non-routine and proponents are to submit a mitigation strategy, which includes the rationale for choosing the alternate practice, with the request for deviation. It is recommended that consultation is initiated with BC OGC to review watercourse crossing methods, confirm appropriate mitigation measures and application requirements.

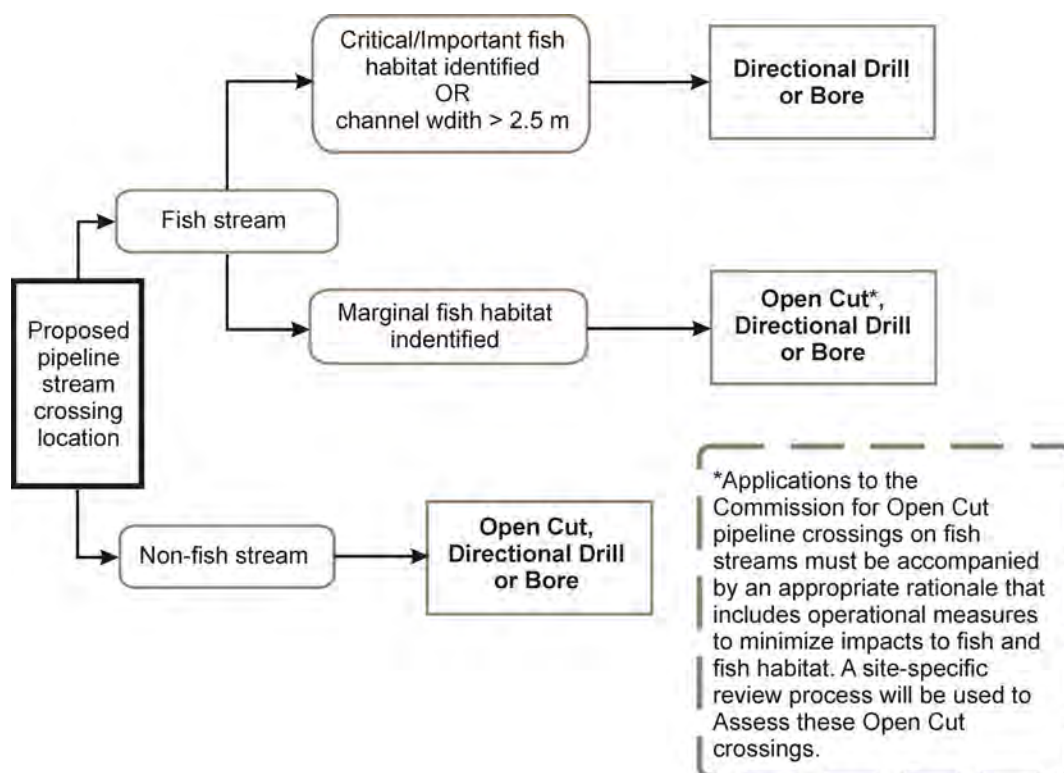
Trenched construction methods at fish streams with 'important' or 'essential' habitat or channel width greater than 2.5 m are considered non-routine and a request for a deviance should be made through the BC OGC (BC OGC 2013). Directional drill and bore crossing methods are considered routine. Trenchless crossing techniques proposed that are not included in BC OGC (2013) guidance are considered non-routine (e.g., aerial) and a request for a deviance should be submitted.

Site-specific restoration plans should be developed as required for proposed crossings where high sensitivity fish and fish habitat has been identified or where applicable mitigation measures provided in the Project EMP and regulatory documents cannot be successfully implemented.

The watercourses crossed by the Project within Nisga'a Lands are not scheduled navigable waters under the *NPA* and do not require Transport Canada review for construction of pipeline crossings.

At proposed NCD crossings, lacking defined bed and banks with no fish presence, fish habitat potential or connectivity to fish habitat, trenched crossing methods with appropriate mitigation can be used. With respect to crossing nonfish-bearing NCDs there are no anticipated regulatory requirements associated with notification or application to DFO, Transport Canada, or BC OGC. Regulatory applications may be required for NCDs if they are identified as wetlands. A list of wetlands is provided in the Wetland Assessment Report (Appendix 2-M in the Application).

Figure 6 BC OGC Pipeline Stream Crossing Type Flow Chart



Source: BC OGC 2013

### 5.1.5 Alternate Pipeline Crossing Methods

Alternate pipeline crossing methods are proposed for watercourses should the primary proposed methods be determined unfeasible based on the results of additional field studies and evaluations. Preliminary alternate pipeline watercourse crossing methods are included in Appendix A. Where a trenchless method is planned, but is subsequently determined to be unfeasible or is attempted and unsuccessful, and flows are too great for an isolated trenched crossing method, it is recommended that another trenchless technique (e.g., bore, microtunnel or aerial) be evaluated as an alternate method to construct the crossing. At some watercourses with lower flows where trenchless crossing methods are proposed, isolated trenched methods may be feasible as an alternate method.

If alternate crossing methods are to be implemented, plans may need to be submitted to DFO, BC OGC and Transport Canada for review as described in Section 5.1.4. Site-specific restoration plans may need to be developed to ensure that the productive capacity of the aquatic environment at the watercourse crossing is maintained and that there is no serious harm to fish that are part of, or that support, a commercial, recreational or Aboriginal fishery.

It is anticipated that proposed isolated trenched and open cut when dry or frozen to bottom construction methods will be successful and alternate methods are not generally proposed for these crossings. However, trenchless methods could be used with the appropriate regulatory review and successful implementation of applicable mitigation.

### 5.2 Temporary Vehicle and Equipment Crossing Methods

Construction of the pipeline will require the installation, maintenance and removal of temporary crossing structures on watercourses and NCDs capable of supporting vehicle and equipment traffic. Wherever practical, it is recommended that vehicles and equipment use existing bridges, culverts and roads. Once constructed, the pipeline right-of-way will be the primary access, however, in some cases additional

access roads (*i.e.*, shooflies) may be required, particularly where terrain conditions at the pipeline watercourse crossing are unsuitable for vehicle crossings. Where additional access roads require the construction of watercourse crossings outside of the Application Corridor, additional field work may be required. The preliminary temporary vehicle and equipment crossing methods proposed are included in Appendix A.

Construction of temporary clear span bridges is included under the Bridges, Causeways and Culverts project activity in the DFO self-assessment process. Providing the associated criteria for these activities are met and all conditions and measures outlined in the *Measures to Avoid Causing Harm to Fish and Fish Habitat* (DFO 2013c) are followed, these crossing methods would not require review by DFO.

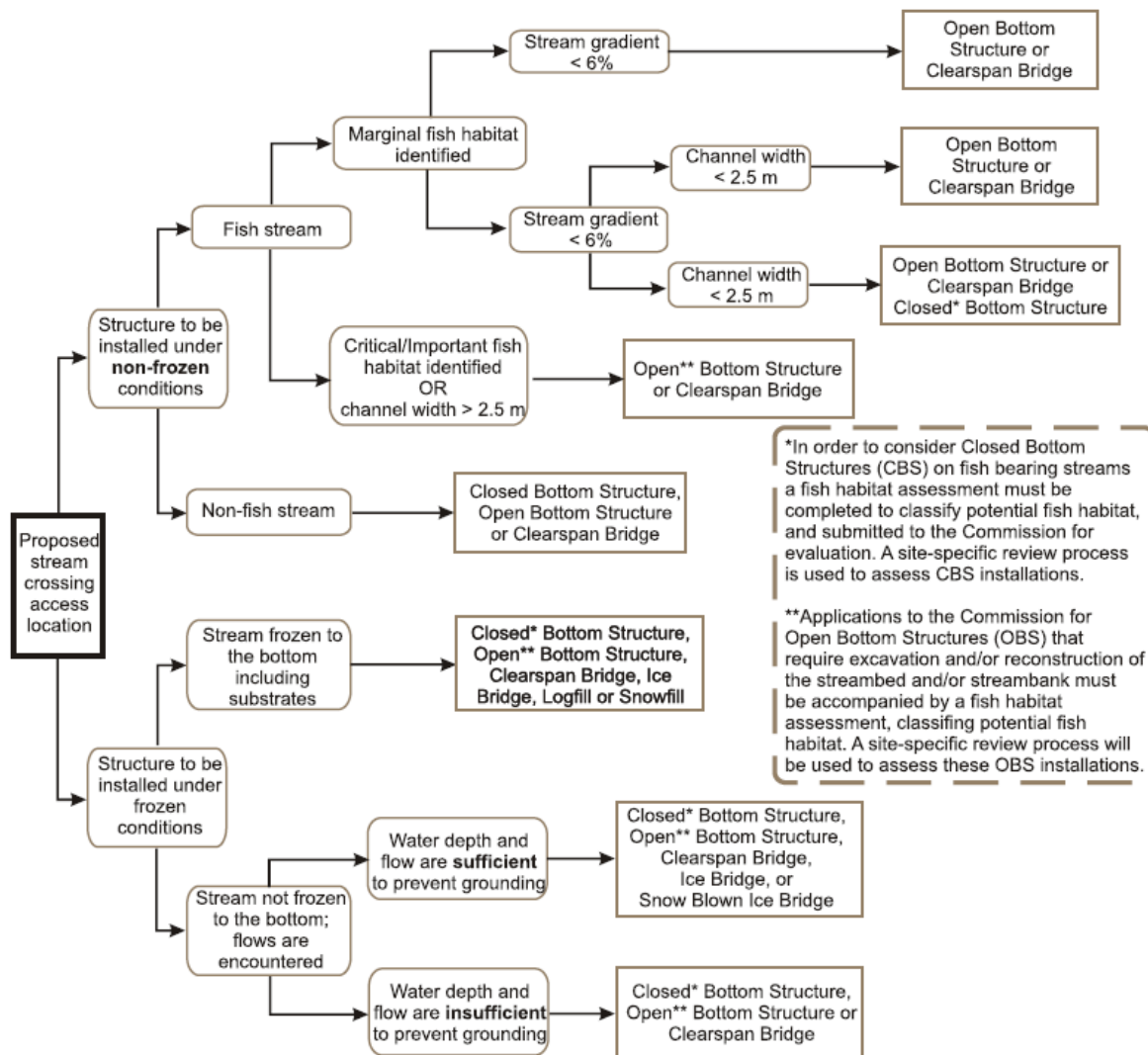
Construction of new multi-span bridge, culvert and logfill crossings are not included in the DFO self-assessment process. If these crossing types, or any other crossing methods not specified in DFO's self-assessment process, are to be installed at fish-bearing watercourses to facilitate access, DFO review may be required. Maintenance, repair, replacement and removal of existing culverts are included under the DFO self-assessment process and these activities would not require review by DFO where all the criteria and *Measures to Avoid Causing Harm to Fish and Fish Habitat* (DFO 2013c) are met. In addition, the applicable mitigation in the Project EMP should be adhered to, to ensure compliance with the *Fisheries Act*.

Under the BC *Water Act* and BC OGC's EPMP, applications for proposed vehicle and equipment crossings are to be submitted to BC OGC prior to the start of construction, and guidance and applicable BMPs outlined in BC OGC's EPMP and EPMG (BC OGC 2013) are to be followed. If crossing structure selection does not follow the guidance provided in BC OGC (2013) (Figure 7) or BMPs cannot be implemented, the crossing would be considered non-routine and a request for a deviation would need to be made through the BC OGC application process.

The watercourses crossed by the Project within Nisga'a Lands are not scheduled navigable waters under the *NPA* and do not require Transport Canada review for construction of temporary vehicle and equipment crossings.

With the successful implementation of appropriate mitigation measures, temporary bridge, culvert, snowfill, logfill or swamp mat crossings can be installed at crossings that were determined to be NCDs lacking defined bed and banks with no fish presence, fish habitat potential or connectivity to fish habitat. There are no anticipated regulatory requirements associated with notification or application to DFO, Transport Canada or BC OGC for vehicle crossings of nonfish-bearing NCDs. Regulatory applications may be required for NCD crossings if they are identified as wetlands. A list of wetlands is provided in the Wetland Assessment Report (Appendix 2-M in the Application).

Figure 7 Flow Diagram Indicating Appropriate Structures for Vehicle and Equipment Access Crossings



Source: BC OGC 2013

### 5.3 Recommendations for Riparian Area Management

It is recommended that disturbance within riparian areas surrounding each waterbody be limited to the amount of right-of-way and workspace considered essential to implement the pipeline and/or vehicle crossing while ensuring that appropriate space is available for safety, and that disturbed areas are revegetated. Mitigation measures and BMPs outlined in the EMP for the Project, BC OGC's EPMG (BC OGC 2013), the *Fish-Stream Crossing Guidebook* (BC MFLNRO et al. 2012), *Riparian Management Area Guidebook* (BC MOF 1995), *Standards and Best Practices for Instream Works* (BC MWLAP 2004a, BC MOE 2013c), *DFO Measures to Avoid Harm to Fish and Fish Habitat* (DFO 2013a) and any applicable DFO OSs (DFO 2007a,b,c), should be implemented, where practical, in riparian areas. It is recommended that site-specific restoration plans be developed for watercourses as required, in order to mitigate the potential effects on riparian areas arising from pipeline and vehicle watercourse crossing construction.

The RMA typically consists of two zones: a RRZ which borders both banks of a stream; and the RMZ which borders both sides of the RRZ. The RMAs listed in Table 2 indicate the area where pipeline

construction activities must take into consideration the RMA objectives (BC MOF 1995). The primary objectives of the RMA are to provide protection and management of fish and fish habitat, important wildlife habitat (e.g., wildlife trees, structural diversity) and water quality associated with classified streams (BC OGC 2013).

Activities within the RMZ should be restricted to pipeline and vehicle watercourse crossings. Where it is not practical to work outside an RMA, BC OGC (2013) provides BMPs for activities within the RMA. If these BMPs cannot be achieved or alternative measures are proposed to mitigate potential effects, proponents may request to deviate from the EPMG guidance (BC OGC 2013). At trenchless watercourse crossings, riparian clearing is not generally permitted between the drill entry and exit points, and machinery is not permitted between these points, except to cross the stream where authorized to do so through permit approval from BC OGC. Entry and exit locations for underground trenchless crossings can vary depending on crossing method, the geometry of the crossing location and the design requirements. Generally for HDD crossings the drill entry and exit locations are set quite far apart and outside the RMA. Other trenchless crossing techniques, such as bore, microtunnel or aerial may require disturbance and infrastructure to be located closer to the banks of the watercourse and within the RMA.

Disturbance within riparian areas should be limited in order to reduce the movement of sediment and avoid contamination of waterbodies. Efforts will be made to restrict riparian clearing (e.g., only within the construction right-of-way and prohibit the use of temporary workspace for activities not considered essential to the construction of the pipeline or vehicle watercourse crossing in riparian areas). Activities that could affect water quality in or habitat conditions along, the watercourses to be crossed by the proposed pipeline should be appropriately mitigated.



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TERA wishes to acknowledge those people identified in the Personal Communications for their assistance in supplying information and comments incorporated into this report.

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### 6.3 GIS and Data Mapping References

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## **APPENDIX A**

### **WATERCOURSE AND POTENTIAL FISH-BEARING NCD SUMMARY TABLE**

**WATERCOURSE AND FISH-BEARING NCD SUMMARY TABLE**

PWC Site	Waterbody Type	Stream Name (Alias) (Watershed Code)	UTM Co-ordinates (NAD 83) (Easting, Northing, Zone)	Preliminary Stream Classification	Preliminary Timing Window of Least Risk	Mean Channel Morphology (m)			Fish Species Captured Or Observed	Previously Documented Fish Species	Beaver Activity Observed	Preliminary Pipeline Crossing Method		Preliminary Vehicle and Equipment Crossing Method	
						CW	WW	WD				Option A	Option B	Option A	Option B
724a	Watercourse	North Seaskinnish Creek (500-201900-24100)	505576, 6141089, 9 U	S3	Open	4.0	3.7	0.52	None	Chinook salmon, coarse or non-game fish, coho salmon, rainbow trout, steelhead, threespine stickleback	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
732a	Watercourse	North Seaskinnish Creek (500-201900-24100)	503517, 6133203, 9 U	S3	August 1 to January 31	2.9	2.3	0.11	Rainbow trout, sculpin	Chinook salmon, coarse or non-game fish, coho salmon, rainbow trout, steelhead, threespine stickleback	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
733a	Watercourse	North Seaskinnish Creek (500-201900-24100)	503526, 6133099, 9 U	S2	August 1 to January 31	11.2	10.9	0.54	Prickly sculpin, redbreast shiner, threespine stickleback	Chinook salmon, coarse or non-game fish, coho salmon, rainbow trout, steelhead, threespine stickleback	Yes	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
737a	Watercourse	Ksi Sgasginist (Seaskinnish River) (500-201900)	500207, 6125317, 9 U	S2	No window	10.5	7.4	0.36	Char	Chinook salmon, chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, lamprey, pink salmon, rainbow trout, sculpin, sockeye salmon, steelhead, stickleback	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
738a	Watercourse	Unnamed tributary to Gingit Creek (no watershed code)	498784, 6122179, 9 U	S3	June 1 to August 31	3.7	3.3	0.15	Char	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
740a	Watercourse	Gingit Creek (500-185700-00300)	498844, 6121718, 9 U	S2	No window	8.1	4.7	0.17	Char	Bull trout, Chinook salmon, chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, pink salmon, sockeye salmon	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
741a	Watercourse	Unnamed tributary to Gingit Creek (no watershed code)	498774, 6121317, 9 U	S4*	Open	1.2	0.6	0.07	Not sampled	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2500	Watercourse	Unnamed tributary to Gingit Creek (no watershed code)	498773, 6121105, 9 U	S3	June 1 to August 31	3.0	2.3	0.19	Char	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2501	Watercourse	Unnamed tributary to Gingit Creek (no watershed code)	498511, 6120506, 9 U	S3	June 1 to August 31	2.0	1.8	0.12	Char	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2503	Watercourse	Gitzyon Creek (500-185700-05200)	497170, 6117827, 9 U	S2	No Window	6.6	7.0	0.43	None	Chinook salmon, chum salmon, coho salmon, Dolly Varden, pink salmon, rainbow trout, sockeye salmon	No	Underground trenchless	Underground trenchless	Culvert	Clear span bridge
2508	Watercourse	Unnamed tributary to Mcleod Creek (no watershed code)	496759, 6116822, 9 U	S3*	Open	2.0	1.2	0.08	Not sampled	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
743a	Watercourse	Gitzyon Creek (500-185700-05200)	496847, 6117352, 9 U	S3	No window	4.4	3.7	0.50	Char	Chinook salmon, chum salmon, coho salmon, Dolly Varden, pink salmon, rainbow trout, sockeye salmon	No	Underground trenchless	Aerial	None	Not applicable
744a	Watercourse	Unnamed tributary to Mcleod Creek (no watershed code)	496185, 6116527, 9 U	S4*	Open	1.2	1.2	0.14	None	None	Yes	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2146	Non-classified drainage	Mcleod Creek (no watershed code)	496033, 6116396, 9 U	NCD	Open	n/a	58.0	0.67	None	None	Yes	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
746a	Watercourse	Ksi Sii Aks (Ganor Creek, Tseax River) (500-185700)	495370, 6115736, 9 U	S1-B	No window	62.5	62.2	0.76	Not sampled	Chinook salmon, chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, lamprey, pink salmon, sculpin, sockeye salmon, steelhead	No	Underground trenchless	Not applicable	None	Not applicable
747a	Watercourse	Vetter Creek (unnamed tributary to Lower Vetter) (500-185700-16700)	494800, 6115171, 9 U	S1-B	August 15 to August 31	28.5	21.0	1.23	Not sampled	Bull trout, Dolly Varden, rainbow trout, steelhead	No	Underground trenchless	Not applicable	None	Not applicable
748a	Non-classified drainage	Unnamed tributary to Vetter Creek (no watershed code)	494412, 6114785, 9 U	NCD	Open	n/a	100.0	1.17	None	None	Yes	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
749b	Watercourse	Unnamed tributary to Vetter Creek (no watershed code)	494008, 6114733, 9 U	S3*	Open	4.0	Dry Channel	n/a	Not sampled	None	Yes	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
753a	Watercourse	Vetter Creek (unnamed tributary to Lower Vetter) (500-185700-16700)	492198, 6114679, 9 U	S1-B	August 15 to August 31	36.3	15.2	0.48	Char, coastal cutthroat trout	Bull trout, Dolly Varden, rainbow trout, steelhead	Yes	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
754a	Watercourse	Unnamed tributary to Vetter Creek (no watershed code)	491129, 6113773, 9 U	S4*	Open	1.1	0.8	0.21	None	None	Yes	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
756a	Watercourse	Unnamed tributary to Vetter Creek (no watershed code)	490112, 6113464, 9 U	S3*	Open	2.0	1.7	0.04	Not sampled	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
757a	Watercourse	Unnamed tributary to Ts'ooihl Ts'ap (no watershed code)	489955, 6113469, 9 U	S4*	Open	0.9	0.8	0.05	None	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2042.1	Watercourse	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	488863, 6113228, 9 U	S3*	Open	2.3	Dry Channel	n/a	Not sampled	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2042	Watercourse	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	488816, 6113283, 9 U	S4*	Open	1.0	0.4	0.01	Not sampled	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2043	Watercourse	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	488568, 6112901, 9 U	S3*	Open	3.1	2.2	0.04	None	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2044	Watercourse	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	488433, 6112750, 9 U	S3*	Open	3.0	0.3	0.07	Not sampled	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge

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						CW	WW	WD				Option A	Option B	Option A	Option B
2045	Watercourse	Unnamed tributary to Ksi Ts'oolh Ts'ap (no watershed code)	488330, 6112649, 9 U	S2*	Open	6.2	1.8	0.05	Not sampled	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2046	Watercourse	Unnamed tributary to Ksi Ts'oolh Ts'ap (no watershed code)	488115, 6112533, 9 U	S3*	Open	3.4	0.2	0.01	Not sampled	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2046.1	Watercourse	Unnamed tributary to Ksi Ts'oolh Ts'ap (no watershed code)	487806, 6112411, 9 U	S4*	Open	1.1	0.7	0.03	Not sampled	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2047	Watercourse	Unnamed tributary to Ksi Ts'oolh Ts'ap (no watershed code)	487752, 6112397, 9 U	S3*	Open	2.7	1.7	0.03	None	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2048	Watercourse	Unnamed tributary to Ksi Ts'oolh Ts'ap (no watershed code)	487304, 6112214, 9 U	S3*	Open	3.8	Dry Channel	n/a	Not sampled	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2049a	Watercourse	Unnamed tributary to Ksi Ts'oolh Ts'ap (no watershed code)	486850, 6112169, 9 U	S2*	Open	6.3	1.9	0.08	None	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2051	Watercourse	Ksi Ts'oolh Ts'ap (Zolzap Creek) (500-155400)	486602, 6112179, 9 U	S2	No window	7.7	6.4	0.40	Char, coho salmon	Chinook salmon, chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, lamprey, pink salmon, sculpin, sockeye salmon, steelhead, threespine stickleback	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2053	Watercourse	Unnamed tributary to Ksi Ts'oolh Ts'ap (no watershed code)	485856, 6112726, 9 U	S3	August 1 to August 31	3.6	Dry Channel	n/a	Char, coastal cutthroat trout	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2054	Watercourse	Unnamed tributary to Ksi Ts'oolh Ts'ap (no watershed code)	485810, 6112249, 9 U	S2	August 1 to August 31	6.3	3.5	0.19	Char, coastal cutthroat trout	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2055	Non-classified drainage	Unnamed tributary to Ksi Ts'oolh Ts'ap (no watershed code)	485060, 6112454, 9 U	NCD	Open	n/a	16.0	0.63	Threespine stickleback	None	Yes	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2056	Non-classified drainage	Unnamed tributary to Ksi Ts'oolh Ts'ap (no watershed code)	484770, 6112472, 9 U	NCD	June 15 to September 1	n/a	35.0	0.15	Not sampled	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2057.1	Non-classified drainage	Unnamed tributary to Ksi Ts'oolh Ts'ap (no watershed code)	484710, 6112482, 9 U	NCD	June 15 to September 1	n/a	35.0	0.15	Coho salmon, threespine stickleback	None	Yes	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2057	Non-classified drainage	Unnamed tributary to Ksi Ts'oolh Ts'ap (no watershed code)	484613, 6112479, 9 U	NCD	June 15 to September 1	n/a	35.0	0.15	Coho salmon, threespine stickleback	None	Yes	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2059	Watercourse	Unnamed tributary to Ksi Ts'oolh Ts'ap (no watershed code)	484111, 6112603, 9 U	S2	June 15 to July 20	7.1	3.9	0.10	Char, coho salmon, sockeye salmon, threespine stickleback	Coho salmon, Dolly Varden, threespine stickleback	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
760a	Watercourse	Unnamed tributary to Ksi Ts'oolh Ts'ap (no watershed code)	483085, 6112940, 9 U	S3	June 15 to August 31	4.5	3.4	0.10	Char, coho salmon, salmonid	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
761a	Watercourse	Unnamed tributary to Ksi Ts'oolh Ts'ap (no watershed code)	482754, 6113013, 9 U	S3	June 15 to August 31	2.1	1.2	0.08	Char, coho salmon	Coho salmon	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
762a	Watercourse	Unnamed tributary to Ksi Ts'oolh Ts'ap (no watershed code)	482240, 6113061, 9 U	S3*	Open	3.5	Dry Channel	n/a	Not sampled	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
767a	Watercourse	Unnamed tributary to Kwinyarh Creek (North Kwinyarh Creek) (no watershed code)	479684, 6112310, 9 U	S3	August 1 to January 31	4.6	3.0	0.15	Coastal cutthroat trout	Coastal cutthroat trout	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2509	Watercourse	Unnamed tributary to Ksi Ts'oolh Ts'ap (500-155000)	482211, 6112966, 9 U	S3*	Open	1.8	0.9	0.10	Not sampled	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2514	Watercourse	Unnamed tributary to Kwinyarh Creek (North Kwinyarh Creek) (no watershed code)	479757, 6112221, 9 U	S3	August 1 to January 31	4.2	1.7	0.12	Coastal cutthroat trout	Coastal cutthroat trout	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
768a	Watercourse	Kwinyarh Creek (500-136800)	478989, 6111215, 9 U	S2	No window	10.3	6.0	0.17	Chinook salmon, coastal cutthroat trout, coastrange sculpin, coho salmon, prickly sculpin, salmon	Chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, pink salmon, sculpin, steelhead, stickleback	Yes	Underground trenchless	Aerial	None	Not applicable
771a	Non-classified drainage	Unnamed tributary to Ansedagan Creek (500-134700-06000)	477515, 6109403, 9 U	NCD	August 1 to August 31	n/a	34.7	1.10	Char, coastal cutthroat trout, coho salmon	None	Yes	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
772a	Watercourse	Ansedagan Creek (500-134700)	477408, 6109346, 9 U	S2	No window	11.7	8.1	0.27	Char, coastal cutthroat trout, coho salmon, rainbow trout	Chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, pink salmon, steelhead, stickleback	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
773a	Watercourse	Unnamed tributary to Nass River (no watershed code)	476935, 6108579, 9 U	S3*	Open	2.7	0.3	0.02	Not sampled	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
775a	Watercourse	Unnamed tributary to Ksemamaith Creek (no watershed code)	475465, 6106057, 9 U	S3*	Open	3.2	2.8	0.34	None	None	Yes	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge

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						CW	WW	WD				Option A	Option B	Option A	Option B
776a	Watercourse	Ksemamaith Creek (Kseaden Creek) (500-114800)	474847, 6105185, 9 U	S2	No window	13.7	10.5	0.38	Char, Chinook salmon, coastal cutthroat trout, coastrange sculpin, coho salmon, prickly sculpin	Chum salmon, coho salmon, Dolly Varden, pink salmon, rainbow trout, steelhead	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
777a	Non-classified drainage	Unnamed tributary to Ksi Mat'in (no watershed code)	474747, 6104157, 9 U	NCD	June 1 to August 31	n/a		0.35	Char	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
779a	Watercourse	Unnamed tributary to Ksi Mat'in (no watershed code)	475049, 6103238, 9 U	S3	August 1 to January 31	3.1	1.2	0.15	Coastal cutthroat trout, lamprey, salmonid	None	Yes	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
780.1	Non-classified drainage	Ksi Mat'in (no watershed code)	474536, 6101964, 9 U	NCD	No window	n/a	45.0	0.90	Char, Chinook salmon, coastal cutthroat trout, coastrange sculpin, coho salmon, salmon, sculpin, stickleback, threespine stickleback	None	Yes	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Clear span bridge	Multi span bridge
781a	Watercourse	Ksi Mat'in (Ksedin Creek, Kwiniak Creek) (500-112000)	474430, 6101864, 9 U	S1-B	No window	50.8	29.0	0.76	Char, Chinook salmon, coastrange sculpin, coho salmon, sculpin	Chinook salmon, chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, pink salmon, rainbow trout, sculpin, steelhead	No	Underground trenchless	Not applicable	Culvert	Clear span bridge
2060	Watercourse	Unnamed tributary to Ksi Mat'in (no watershed code)	474797, 6102025, 9 U	S3	August 1 to August 31	4.9	2.5	0.09	Char, coastal cutthroat trout, unidentified species	None	Yes	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2060.1	Watercourse	Unnamed tributary to Ksi Mat'in (no watershed code)	474840, 6101360, 9 U	S3	August 1 to August 31	2.2	2.4	0.22	Char, coastal cutthroat trout	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2061	Watercourse	Ksi Mat'in (Ksedin Creek, Kwiniak Creek) (500-112000)	474830, 6101371, 9 U	S1-B	No window	37.5	37.0	0.71	Char, Chinook salmon, coastrange sculpin, coho salmon, sculpin	Chinook salmon, chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, pink salmon, rainbow trout, sculpin, steelhead	No	Aerial	Not applicable	None	Not applicable
785a	Watercourse	Unnamed tributary to Ginlulak Creek (East Ginlulak Creek) (no watershed code)	472294, 6100075, 9 U	S2	June 15 to July 10	11.1	5.5	0.15	Coho salmon, salmonid	Chum salmon, coho salmon, Dolly Varden, pink salmon	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
786a	Watercourse	Unnamed tributary to Ginlulak Creek (no watershed code)	471999, 6099638, 9 U	S2*	Open	5.8	0.6	0.06	Not sampled	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
787a	Watercourse	Ginlulak Creek (500-090500)	471119, 6099496, 9 U	S2	No window	10.5	7.7	0.44	Char, coho salmon	Chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, lamprey, pink salmon, sculpin, stickleback	Yes	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
788a	Watercourse	Unnamed tributary to Ginlulak Creek (no watershed code)	470833, 6099439, 9 U	S3	June 1 to August 31	2.1	1.5	0.08	Char	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
788b	Watercourse	Unnamed tributary to Ginlulak Creek (no watershed code)	470303, 6099424, 9 U	S3*	Open	2.1	0.8	0.07	None	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
789a	Watercourse	Unnamed tributary to Ginlulak Creek (no watershed code)	470225, 6099387, 9 U	S3*	Open	2.7	Dry Channel	n/a	Not sampled	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
790a	Watercourse	Unnamed tributary to Ginlulak Creek (no watershed code)	469473, 6099190, 9 U	S2	June 15 to August 31	6.6	3.9	0.15	Char, coho salmon	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
791a	Watercourse	Unnamed tributary to Nass River (500-090000)	468600, 6099084, 9 U	S2	June 1 to August 31	14.8	13.6	0.32	Char, sculpin	Coarse or non-game fish	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
792a	Watercourse	Unnamed tributary to Nass River (no watershed code)	468576, 6099076, 9 U	S3	August 1 to August 31	3.3	3.3	0.24	Char, rainbow trout, threespine stickleback	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
793a	Watercourse	Unnamed tributary to Nass River (500-084900)	466944, 6098638, 9 U	S2	June 15 to August 31	5.8	3.6	0.16	Char	Coho salmon, Dolly Varden	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
794a	Watercourse	Unnamed tributary to Nass River (no watershed code)	466062, 6098328, 9 U	S3	August 15 to August 31	3.3	2.5	0.15	Char, coastal cutthroat trout, coho salmon, sculpin, threespine stickleback	None	Yes	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
796a	Watercourse	Quilgaw Creek (500-075000)	464461, 6096380, 9 U	S1-B	No window	28.8	28.8	0.94	Chinook salmon, coastal cutthroat trout, coho salmon, prickly sculpin, stickleback, threespine stickleback, western river lamprey	Chum salmon, coarse or non-game fish, coastal cutthroat trout, coho salmon, pink salmon, stickleback	Yes	Underground trenchless	Not applicable	Culvert	Clear span bridge



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						CW	WW	WD				Option A	Option B	Option A	Option B
798a	Non-classified drainage	Unnamed tributary to Quilgaw Creek (no watershed code)	463836, 6095731, 9 U	NCD	June 15 to July 15	n/a	19.8	1.28	Chinook salmon, coho salmon, threespine stickleback	None	Yes	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
799a	Watercourse	Unnamed tributary to Ksi Hlginx (no watershed code)	468966, 6093759, 9 U	S3	June 15 to August 31	1.9	0.8	0.12	Char, coho salmon	None	Yes	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
800a.1	Non-classified drainage	Unnamed tributary to Ksi Hlginx (no watershed code)	462792, 6093422, 9 U	NCD	June 15 to September 1	n/a			Coho salmon, salmonid, stickleback	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
801a	Watercourse	Ksi Hlginx Side Channel (Ishkeenickh River) (510)	462015, 6092863, 9 U	S2	No window	18.2	14.7	0.53	Char, Chinook salmon, coastal cutthroat trout, coho salmon, lamprey, rainbow trout, sculpin	Chinook salmon, chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, eulachon, lamprey, pink salmon, rainbow trout, sockeye salmon, steelhead, threespine stickleback	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	None	Not applicable
802a	Watercourse	Ksi Hlginx (Ishkeenickh River) (510)	461567, 6092563, 9 U	S1-B	No window	84.2	76.2	0.78	Char, Chinook salmon, coastrange sculpin, coho salmon, mountain whitefish	Chinook salmon, chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, eulachon, lamprey, pink salmon, rainbow trout, sockeye salmon, steelhead, threespine stickleback	No	Underground trenchless	Isolate if water present/open cut if dry or frozen to bottom	Culvert	Clear span bridge
803a	Watercourse	Unnamed tributary to Ksi Hlginx (no watershed code)	461457, 6092516, 9 U	S2	June 15 to September 1	13.9	12.5	0.53	Coho salmon	None	Yes	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
804b	Watercourse	Unnamed tributary to Ksi Hlginx (no watershed code)	461061, 6092318, 9 U	S3	August 1 to August 31	3.3	1.0	0.07	Char, coastal cutthroat trout, coho salmon	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
804c	Watercourse	Unnamed tributary to Ksi Hlginx (no watershed code)	460755, 6092285, 9 U	S3	August 1 to August 31	3.8	2.7	0.15	Char, coastal cutthroat trout, coho salmon, lamprey	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
805a	Watercourse	Unnamed tributary to Ksi Hlginx (no watershed code)	460673, 6092287, 9 U	S2	August 1 to August 31	8.0	3.0	0.15	Char, coastal cutthroat trout, coho salmon	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
805b	Watercourse	Unnamed tributary to Ksi Hlginx (no watershed code)	460635, 6092292, 9 U	S3*	Open	1.8	1.1	0.08	Not sampled	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
806a	Watercourse	Unnamed tributary to Nass River (500-058200)	458922, 6092121, 9 U	S2	August 1 to August 31	7.2	3.5	0.14	Char, coastal cutthroat trout	Coho salmon, Dolly Varden	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
806b	Watercourse	Unnamed tributary to Nass River (no watershed code)	457689, 6091563, 9 U	S2	August 1 to August 31	7.5	4.9	0.20	Char, coastal cutthroat trout, coho salmon	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
808a	Watercourse	Unnamed tributary to Nass River (no watershed code)	457500, 6091468, 9 U	S3	June 15 to September 1	1.5	0.9	0.08	Coho salmon	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
808b	Watercourse	Unnamed tributary to Nass River (no watershed code)	456667, 6091222, 9 U	S2	August 1 to August 31	7.5	4.4	0.21	Char, coastal cutthroat trout	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
809a	Watercourse	Unnamed tributary to Nass River (500-053700)	456620, 6091294, 9 U	S2	June 1 to August 31	6.7	5.4	0.22	Char	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
810a	Watercourse	Unnamed tributary to Nass River (500-051800)	455951, 6091398, 9 U	S3	June 15 to August 31	4.7	2.1	0.08	Char, coho salmon	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
811b	Watercourse	Unnamed tributary to Nass River (no watershed code)	455444, 6091310, 9 U	S3	August 1 to August 31	2.6	1.8	0.16	Char, coastal cutthroat trout, coho salmon	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
812a	Watercourse	Unnamed tributary to Nass River (Monkley Creek, unnamed tributary to Monkley Creek) (500-050900)	454975, 6091431, 9 U	S2	No window	18.0	16.0	0.52	Char, rainbow trout, sculpin, sockeye salmon	Chinook salmon, coho salmon, Dolly Varden, pink salmon, rainbow trout, sculpin	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
813a	Watercourse	Unnamed tributary to Nass River (no watershed code)	453814, 6091989, 9 U	S3*	Open	4.3	1.3	0.09	None	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
814a	Watercourse	Unnamed tributary to Nass River (500-047000)	453643, 6092034, 9 U	S2	August 1 to August 31	5.5	2.8	0.10	Char, coastal cutthroat trout, coho salmon, sculpin, unidentified species	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
815a	Watercourse	Unnamed tributary to Nass River (no watershed code)	452404, 6092012, 9 U	S3	June 15 to July 15	2.2	1.3	0.09	Char, Chinook salmon, coho salmon	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
816a	Watercourse	Unnamed tributary to Nass River (500-038600)	452049, 6091746, 9 U	S2	June 15 to July 15	9.3	1.5	0.13	Char, Chinook salmon, coho salmon, sculpin	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
817a	Watercourse	Unnamed tributary to Nass River (500-038000)	451728, 6091468, 9 U	S2	August 1 to August 31	8.8	7.3	0.22	Char, coastal cutthroat trout, coho salmon	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge

PWC Site	Waterbody Type	Stream Name (Alias) (Watershed Code)	UTM Co-ordinates (NAD 83) (Easting, Northing, Zone)	Preliminary Stream Classification	Preliminary Timing Window of Least Risk	Mean Channel Morphology (m)			Fish Species Captured Or Observed	Previously Documented Fish Species	Beaver Activity Observed	Preliminary Pipeline Crossing Method		Preliminary Vehicle and Equipment Crossing Method	
						CW	WW	WD				Option A	Option B	Option A	Option B
						818a	Watercourse	Unnamed tributary to Nass River (500-036300)				450562, 6091444, 9 U	S2	June 15 to August 31	8.8
2515	Watercourse	Unnamed tributary to Nass River (500-034500)	450246, 6091184, 9 U	S3	June 1 to August 31	3.0	2.6	0.12	Char	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2516	Watercourse	Unnamed tributary to Nass River (no watershed code)	450231, 6091198, 9 U	S5	Open		NR		Not sampled	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2517	Watercourse	Unnamed tributary to Nass River (no watershed code)	449667, 6091754, 9 U	S6	Open		NR		Not sampled	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2518	Watercourse	Unnamed tributary to Nass River (500-030700)	448230, 6092255, 9 U	S6	Open		NR		None	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2519	Watercourse	Unnamed tributary to Nass River (no watershed code)	447747, 6092286, 9 U	S6	Open		NR		Not sampled	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2520	Watercourse	Unnamed tributary to Nass River (500-029400)	447109, 6092185, 9 U	S5	Open		NR		Not sampled	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2521	Watercourse	Unnamed tributary to Nass River (500-018500-08500)	446702, 6091835, 9 U	S5	Open		NR		Not sampled	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2522	Watercourse	Unnamed tributary to Ksgyukwsa'a (no watershed code)	446540, 6091498, 9 U	S5	Open		NR		Not sampled	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2523	Watercourse	Ksgyukwsa'a (Burton/Barton Creek) (500-018500)	445180, 6089609, 9 U	S1-B	No window	22.4	19.3	0.33	Char, coho salmon, sculpin	Chum salmon, coho salmon, Dolly Varden, pink salmon, rainbow trout	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
819a	Watercourse	Unnamed tributary to Nass River (500-034500)	450123, 6090895, 9 U	S3	June 1 to August 31	2.8	2.6	0.21	Char	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
820a	Watercourse	Unnamed tributary to Nass River (no watershed code)	449512, 6090630, 9 U	S5	Open		NR		Not sampled	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
2524	Watercourse	Unnamed tributary to Ksgyukwsa'a (no watershed code)	447233, 6090001, 9 U	S5	Open		NR		Not sampled	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
826a	Watercourse	Ksgyukwsa'a (Burton/Barton Creek) (500-018500)	446786, 6089806, 9 U	S1-B	No window	31.0	27.3	0.51	Char	Chum salmon, coho salmon, Dolly Varden, pink salmon, rainbow trout	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
828a	Watercourse	Unnamed tributary to Ksgyukwsa'a (no watershed code)	445952, 6089476, 9 U	S3*	Open	2.0	1.2	0.10	Not sampled	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
829a	Watercourse	Unnamed tributary to Ksgyukwsa'a (no watershed code)	445483, 6089391, 9 U	S2	June 15 to August 31	8.0	4.2	0.22	Char	Dolly Varden	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
830a.1	Watercourse	Unnamed tributary to Ksgyukwsa'a (no watershed code)	444916, 6089246, 9 U	S2	June 15 to August 31	5.3	1.9	0.10	Char	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
830a	Watercourse	Unnamed tributary to Ksgyukwsa'a (no watershed code)	444889, 6089244, 9 U	S2	June 15 to August 31	8.5	1.9	0.05	Char	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
831a	Watercourse	Unnamed tributary to Welda Creek (no watershed code)	444112, 6089032, 9 U	S2	No window	16.2	14.1	0.35	Char, coastal cutthroat trout, sculpin	Coho salmon, Dolly Varden, pink salmon, sculpin, stickleback	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
832a	Watercourse	Welda Creek (500-016300)	444043, 6089059, 9 U	S1-B	No window	26.7	17.4	0.29	Coastal cutthroat trout, coho salmon, sculpin	Coho salmon, Dolly Varden, pink salmon, sculpin, stickleback	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
1033a	Watercourse	Unnamed tributary to Nass River (no watershed code)	504620, 6145640, 9 U	S3*	Open	3.8	1.0	0.13	None	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
1034	Watercourse	Unnamed tributary to Nass River (no watershed code)	504263, 6145342, 9 U	S4*	Open	1.2	1.4	0.40	None	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
1034a	Watercourse	Unnamed tributary to Nass River (500-262200)	503964, 6145079, 9 U	S3*	Open	1.7	Dry Channel	n/a	Not sampled	None	No	Isolate if water present/open cut if dry or frozen to bottom	Not applicable	Culvert	Clear span bridge
1038	Watercourse	Nass River (500)	501117, 6143681, 9 U	S1-B	No window	82.5	82.5	1.67	Not sampled	Chinook salmon, chum salmon, coho salmon, cutthroat trout, Dolly Varden, eulachon, lamprey, mountain whitefish, pink salmon, rainbow trout, sculpin, sockeye salmon, steelhead, threespine stickleback	No	Aerial	Underground trenchless	None	Not applicable

**APPENDIX B**  
**NCD SUMMARY TABLE**

**NCD SUMMARY TABLE**

<b>PWC Site</b>	<b>UTM Coordinates (NAD 83) (Easting, Northing, Zone)</b>	<b>Wetland Classification</b>
2499	505542, 6141156, 9 U	
725a	505637, 6140904, 9 U	
726a	505698, 6140766, 9 U	Beaver pond
727a	505682, 6140018, 9 U	
728a	505660, 6139730, 9 U	Swamp
729a	505684, 6139056, 9 U	
730a	505519, 6138306, 9 U	Beaver pond
731a	504499, 6135360, 9 U	
734a	503536, 6132854, 9 U	
735a	501824, 6127349, 9 U	
2502	497316, 6118558, 9 U	
2504	496870, 6118533, 9 U	
2506	496400, 6117909, 9 U	
742a	496643, 6117615, 9 U	
751a	493349, 6114889, 9 U	
755a	490804, 6113489, 9 U	
2049	487207, 6112173, 9 U	
763a	481914, 6112957, 9 U	
764a	481548, 6112936, 9 U	
765a	480896, 6112650, 9 U	
766a	480616, 6112537, 9 U	
2510	481922, 6112870, 9 U	
2511	481568, 6112762, 9 U	
2512	480997, 6112566, 9 U	
2513	480644, 6112453, 9 U	
769a	477700, 6109838, 9 U	
770a	477666, 6109612, 9 U	
774a	476848, 6108366, 9 U	Swamp
780a	474981, 6102614, 9 U	
782a	474219, 6101708, 9 U	
783a	473796, 6101355, 9 U	
784a	473569, 6101169, 9 U	
2062	474455, 6101380, 9 U	
811a	455545, 6091317, 9 U	
1036	503627, 6144771, 9 U	Fen
1037	502752, 6144007, 9 U	Beaver pond
1037a	502522, 6143793, 9 U	Beaver pond
1038b	500384, 6143709, 9 U	
1038c	499425, 6143949, 9 U	

**APPENDIX C**  
**WATERCOURSE AND POTENTIAL FISH-BEARING NCD SITE RECORDS**

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): North Seaskinnish Creek (WC 724a)**

**UTM (Zone 9 U):** 505576 E, 6141089 N

**Field Crew:** E. Lennert, J. McNeice

**Stream Classification:** S3

**Survey Date:** June 27, 2014

**Sensitivity:** Low

**Habitat Survey Length (m):** 300

**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Unconfined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	4.0, 0.8-6.4
Wetted Width (m); Mean, Range	3.7, 0.8-6.2
Water Depth (m); Mean, Range	0.52, 0.10-2.00
Ordinary High Water Mark (m); Mean	0.13
Discharge (m³/s)	0.02
Stream Gradient (%)	1
Embeddedness	Highly Embedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Fines/Small Gravel	Fines/Small Gravel
Mean Bank Height (m); Mean, Range	2.5, 2.0-3.0	3.2, 2.1-5.0
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	73
Fines (<2mm)	18
Small Gravel (2-16 mm)	4
Large Gravel (17-64 mm)	3
Cobble (65-256 mm)	2
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Impoundment	2	100	27	0.00, 0 - 0
No defined channel	2	155	42	0.00, 0 - 0
Riffle	1	115	31	0.00

Cover Type	m²
Depth	800
Woody Debris	200

Water Quality Parameters	
Water Temperature (°C)	12.5
pH	7.1
Dissolved Oxygen (mg/L)	6.4
Conductivity (uS/cm)	66.2
Turbidity (visual)	Stained

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
No fish captured				Chinook salmon, coarse or non-game fish, coho salmon, rainbow trout, steelhead, threespine stickleback

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	June 27, 2014	100	204 s	0	0.00
Minnow Trapping	June 26, 2014	5	105 hrs	0	0.00

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.

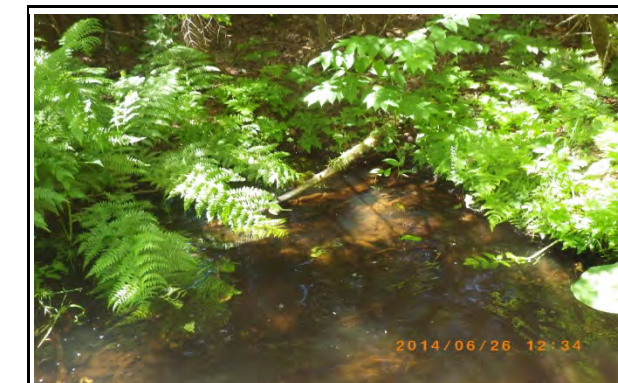


Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 100m upstream looking downstream at an impoundment.

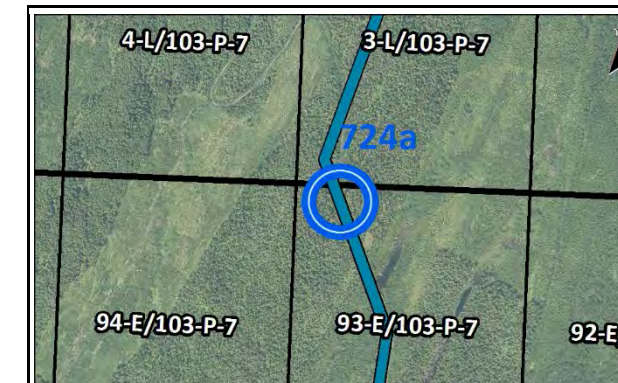


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): North Seaskinnish Creek (WC 732a)**  
**UTM (Zone 9 U):** 503517 E, 6133203 N  
**Field Crew:** E. Lennert, A. Kemprath  
**Stream Classification:** S3

**Survey Date:** July 12, 2014  
**Sensitivity:** High  
**Habitat Survey Length (m):** 200  
**Timing Window of Least Risk:** August 1 - January 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	2.9, 2.0-4.0
Wetted Width (m); Mean, Range	2.3, 1.0-2.8
Water Depth (m); Mean, Range	0.11, 0.05-0.20
Ordinary High Water Mark (m); Mean	0.11
Discharge (m³/s)	0.05
Stream Gradient (%)	3
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Rock/Boulders	Rock/Boulders
Mean Bank Height (m); Mean, Range	3.1, 1.0-3.6	3.1, 1.0-3.6
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	25	25
Dominant Riparian Vegetation Type	Deciduous	Deciduous

Substrate	%
Organics	3
Fines (<2mm)	5
Small Gravel (2-16 mm)	8
Large Gravel (17-64 mm)	16
Cobble (65-256 mm)	19
Boulder (256-400 mm)	16
Rock (>400 mm)	33

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	1	5	2	0.40
Flat	5	67	29	0.03, 0.01 - 0.05
Pool	2	12	5	0.01, 0.01 - 0.01
Riffle	9	149	64	0.15, 0.1 - 0.17

Cover Type	m²
Boulders	30
Depth	29
Instream Vegetation	2
Overhanging Vegetation	86
Under Cut Banks	2
Woody Debris	17

Water Quality Parameters	
Water Temperature (°C)	18.0
pH	7.8
Dissolved Oxygen (mg/L)	12.0
Conductivity (uS/cm)	101.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Marginal	Unsuitable	Unsuitable	Marginal
Char	Unsuitable	Marginal	Unsuitable	Unsuitable	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Rainbow trout	9	0	101, 70-135	Chinook salmon, coarse or non-game fish, coho salmon, rainbow trout, steelhead, threespine stickleback
Sculpin	2	0	48, 40-55	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Minnow Trapping	July 12, 2014	5	20 hrs	11	0.55

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 127m downstream looking downstream at the confluence with North Seaskinnish Creek.

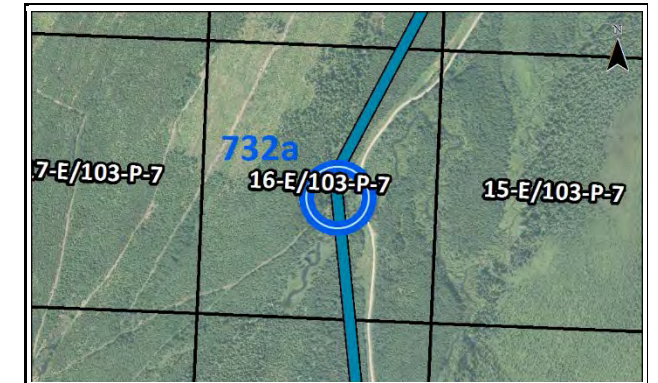


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): North Seaskinnish Creek (WC 733a)**  
**UTM (Zone 9 U):** 503526 E, 6133099 N  
**Field Crew:** E. Lennert, A. Kemprath  
**Stream Classification:** S2

**Survey Date:** July 11, 2014  
**Sensitivity:** High  
**Habitat Survey Length (m):** 1150  
**Timing Window of Least Risk:** August 1 - January 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Unconfined
Channel Pattern	Irregular, Wandering
Channel Width (m); Mean, Range	11.2, 10.0-14.0
Wetted Width (m); Mean, Range	10.9, 10.0-13.5
Water Depth (m); Mean, Range	0.54, 0.20-1.20
Ordinary High Water Mark (m); Mean	0.54
Discharge (m³/s)	1.04
Stream Gradient (%)	5
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	Yes	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Fines/Small Gravel	Fines/Small Gravel
Mean Bank Height (m); Mean, Range	1.5, 1.2-2.3	1.6, 1.2-2.3
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Shrub	Shrub

Substrate	%
Organics	11
Fines (<2mm)	17
Small Gravel (2-16 mm)	38
Large Gravel (17-64 mm)	34
Cobble (65-256 mm)	0
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Flat	4	139	12	0.16, 0.1 - 0.3
Pool	4	137	12	0.15, 0.1 - 0.2
Riffle	4	225	20	0.27, 0.2 - 0.3
Run	11	649	56	0.36, 0.28 - 0.45

Cover Type	m²
Boulders	610
Depth	2760
Instream Vegetation	5310
Overhanging Vegetation	794
Under Cut Banks	295
Woody Debris	620

Water Quality Parameters	
Water Temperature (°C)	21.5
pH	8.3
Dissolved Oxygen (mg/L)	10.5
Conductivity (uS/cm)	217.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Important	Important	Unsuitable	Important	Important
Trout	Important	Important	Important	Important	Important
Char	Important	Important	Important	Important	Important

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Prickly sculpin	60	0	99, 57-133	Chinook salmon, coarse or non-game fish, coho salmon, rainbow trout, steelhead, threespine stickleback
Redside shiner	78	200	90, 35-122	
Threespine stickleback	2	0	68, 65-71	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 11, 2014	200	349 s	31	8.88
Minnow Trapping	July 12, 2014	6	114 hrs	109	0.96
Observation	July 11, 2014	n/a	n/a	200	n/a

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 480m downstream looking upstream.

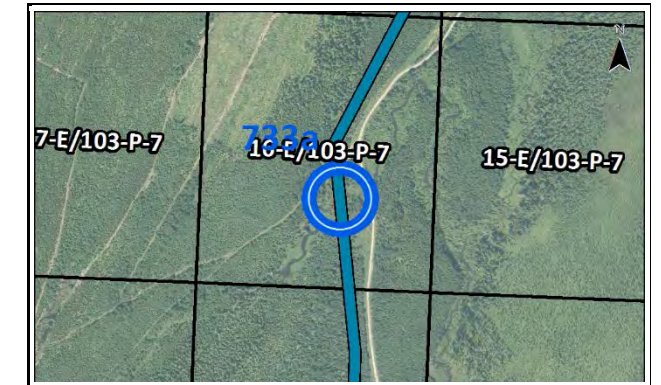


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**





Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Ksi Sgasginist (WC 737a)**

UTM (Zone 9 U): 500207 E, 6125317 N

Field Crew: B. Rudmik, S. Whiteside

Stream Classification: S2

Survey Date: July 14, 2014

Sensitivity: High

Habitat Survey Length (m): 400

Timing Window of Least Risk: No window

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Occasionally Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	10.5, 8.0-13.0
Wetted Width (m); Mean, Range	7.4, 6.3-8.5
Water Depth (m); Mean, Range	0.36, 0.15-0.50
Ordinary High Water Mark (m); Mean	0.49
Discharge (m³/s)	1.23
Stream Gradient (%)	4
Embeddedness	Moderately Embedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Undercut
Bank Texture (Dominant/Subdominant)	Cobble/Fines	Cobble/Fines
Mean Bank Height (m); Mean, Range	0.9, 0.8-1.0	0.8, 0.7-0.9
Grade Of Approach Slopes (%)	Moderate (4-14)	Moderate (4-14)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	0
Fines (<2mm)	8
Small Gravel (2-16 mm)	10
Large Gravel (17-64 mm)	12
Cobble (65-256 mm)	59
Boulder (256-400 mm)	10
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Rapid	1	400	100	1.75

Cover Type	m²
Boulders	25
Depth	5
Instream Vegetation	0
Overhanging Vegetation	20
Under Cut Banks	45
Woody Debris	15

Water Quality Parameters	
Water Temperature (°C)	9.0
pH	7.5
Dissolved Oxygen (mg/L)	11.2
Conductivity (uS/cm)	119.0
Turbidity (visual)	High

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Marginal	Marginal	Unsuitable	Unsuitable	Marginal
Trout	Marginal	Marginal	Marginal	Unsuitable	Marginal
Char	Marginal	Marginal	Marginal	Unsuitable	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	1	0	95	Chinook salmon, chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, lamprey, pink salmon, rainbow trout, sculpin, sockeye salmon, steelhead, stickleback

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 14, 2014	150	210 s	1	0.48

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.

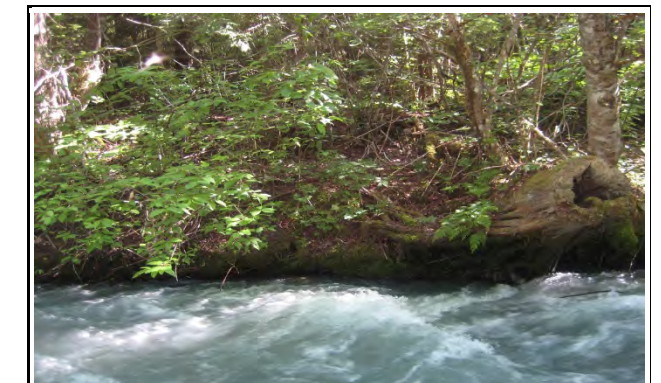


Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 300m downstream looking upstream.



Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Gingit Creek (WC 738a)**

**Survey Date:** June 12, 2014

**UTM (Zone 9 U):** 498784 E, 6122179 N

**Sensitivity:** High

**Field Crew:** J. Beblow, S. Whiteside

**Habitat Survey Length (m):** 400

**Stream Classification:** S3

**Timing Window of Least Risk:** June 1 - August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Occasionally Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	3.7, 2.8-4.7
Wetted Width (m); Mean, Range	3.3, 2.7-4.3
Water Depth (m); Mean, Range	0.15, 0.04-0.26
Ordinary High Water Mark (m); Mean	0.28
Discharge (m³/s)	0.12
Stream Gradient (%)	2
Embeddedness	Moderately Embedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Undercut	Sloping
Bank Texture (Dominant/Subdominant)	Fines/Small Gravel	Fines/Small Gravel
Mean Bank Height (m); Mean, Range	0.8, 0.5-1.1	0.7, 0.6-0.9
Grade Of Approach Slopes (%)	High (>14)	Moderate (4-14)
Riparian Area Width (m)	15	15
Dominant Riparian Vegetation Type	Coniferous	Deciduous

Substrate	%
Organics	17
Fines (<2mm)	39
Small Gravel (2-16 mm)	20
Large Gravel (17-64 mm)	9
Cobble (65-256 mm)	14
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Flat	6	151	88	0.42, 0.35 - 0.43
Pool	1	3	2	0.27
Riffle	4	17	10	0.74, 0.6 - 0.87

Cover Type	m²
Depth	15
Instream Vegetation	4
Overhanging Vegetation	136
Under Cut Banks	7
Woody Debris	64

Water Quality Parameters	
Water Temperature (°C)	12.2
pH	7.8
Dissolved Oxygen (mg/L)	10.2
Conductivity (uS/cm)	210.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Marginal	Important	Unsuitable	Marginal	Marginal
Trout	Important	Important	Marginal	Marginal	Marginal
Char	Important	Important	Marginal	Marginal	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	29	0	97, 74-135	None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	June 12, 2014	100	229 s	0	0.00
Minnow Trapping	June 12, 2014	5	93 hrs	29	0.31

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 57m upstream looking upstream at potential spawning habitat.

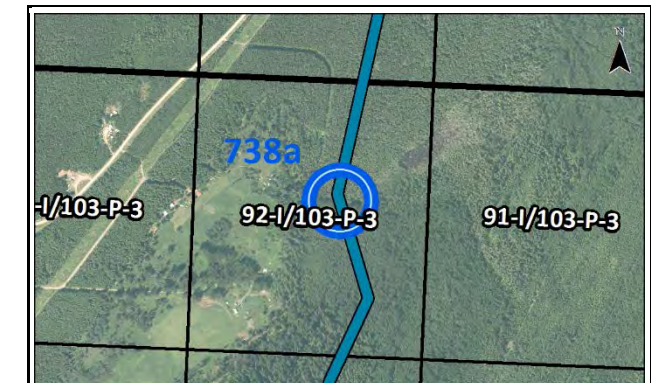


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Gingit Creek (WC 740a)**

UTM (Zone 9 U): 498844 E, 6121718 N

Field Crew: J. Beblow, N. Postma, S. Whiteside

Stream Classification: S2

Survey Date: June 18, 2014

Sensitivity: High

Habitat Survey Length (m): 400

Timing Window of Least Risk: No window

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Frequently Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	8.1, 5.1-11.0
Wetted Width (m); Mean, Range	4.7, 3.5-5.6
Water Depth (m); Mean, Range	0.17, 0.00-0.35
Ordinary High Water Mark (m); Mean	0.25
Discharge (m³/s)	0.50
Stream Gradient (%)	6
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Large Gravel/Fines	Large Gravel/Small Gravel
Mean Bank Height (m); Mean, Range	1.3, 0.8-1.9	1.1, 0.8-1.4
Grade Of Approach Slopes (%)	Moderate (4-14)	Moderate (4-14)
Riparian Area Width (m)	30	30
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	0
Fines (<2mm)	20
Small Gravel (2-16 mm)	30
Large Gravel (17-64 mm)	33
Cobble (65-256 mm)	17
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Pool	4	15	5	0.35, 0.3 - 0.5
Riffle	4	263	90	0.68, 0.5 - 1
Run	2	15	5	0.65, 0.3 - 1

Cover Type	m²
Boulders	1
Overhanging Vegetation	22
Under Cut Banks	29
Woody Debris	51

Water Quality Parameters	
Water Temperature (°C)	9.9
pH	7.9
Dissolved Oxygen (mg/L)	10.6
Conductivity (uS/cm)	175.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Important	Important	Unsuitable	Marginal	Important
Trout	Important	Important	Marginal	Marginal	Important
Char	Important	Important	Marginal	Marginal	Important

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	11	0	90, 64-110	Bull trout, Chinook salmon, chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, pink salmon, sockeye salmon

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	June 18, 2014	100	250 s	2	0.80
Minnow Trapping	June 18, 2014	3	54 hrs	9	0.17

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

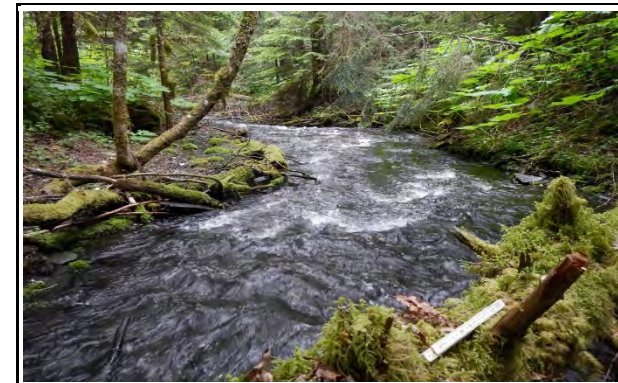


Plate 5 Photograph taken at 100m upstream looking downstream.

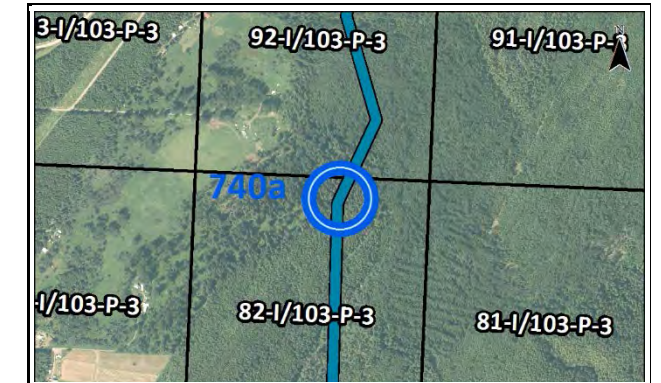


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Gingit Creek (WC 741a)**

**Survey Date:** June 14, 2014

**UTM (Zone 9 U):** 498774 E, 6121317 N

**Sensitivity:** Low

**Field Crew:** J. Beblow, S. Whiteside

**Habitat Survey Length (m):** 366

**Stream Classification:** S4\*

**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Confined
Channel Pattern	Straight
Channel Width (m); Mean, Range	1.2, 0.5-2.1
Wetted Width (m); Mean, Range	0.6, 0.4-0.8
Water Depth (m); Mean, Range	0.07, 0.06-0.09
Ordinary High Water Mark (m); Mean	0.28
Discharge (m³/s)	NR
Stream Gradient (%)	3
Embeddedness	Highly Embedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Vertical	Vertical
Bank Texture (Dominant/Subdominant)	Cobble/Boulders	Cobble/Boulders
Mean Bank Height (m); Mean, Range	0.5, 0.4-0.6	0.4, 0.4-0.5
Grade Of Approach Slopes (%)	High (>14)	High (>14)
Riparian Area Width (m)	32	26
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	38
Fines (<2mm)	50
Small Gravel (2-16 mm)	0
Large Gravel (17-64 mm)	0
Cobble (65-256 mm)	12
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Flat	1	366	100	0.00

Cover Type	m²
Boulders	0
Depth	0
Instream Vegetation	0
Overhanging Vegetation	140
Under Cut Banks	0
Woody Debris	125

Water Quality Parameters	
Water Temperature (°C)	9.6
pH	7.3
Dissolved Oxygen (mg/L)	5.9
Conductivity (uS/cm)	59.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Marginal	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Marginal	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.

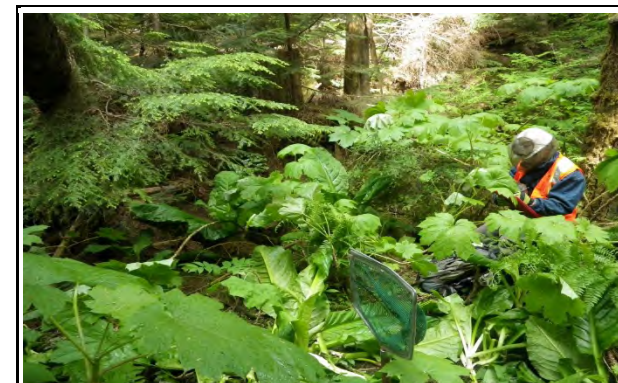


Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 100m upstream looking downstream at dry channel.

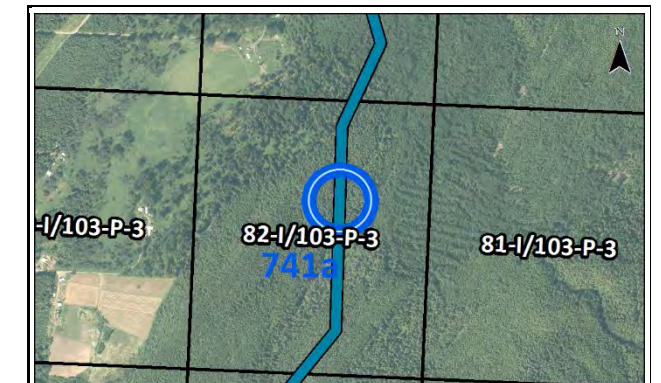


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Gingit Creek (WC 2500)**

**Survey Date:** June 14, 2014

**UTM (Zone 9 U):** 498773 E, 6121105 N

**Sensitivity:** High

**Field Crew:** J. Beblow, S. Whiteside

**Habitat Survey Length (m):** 200

**Stream Classification:** S3

**Timing Window of Least Risk:** June 1 - August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Unconfined
Channel Pattern	Irregular, Meandering
Channel Width (m); Mean, Range	3.0, 2.6-3.3
Wetted Width (m); Mean, Range	2.3, 1.6-2.8
Water Depth (m); Mean, Range	0.19, 0.07-0.33
Ordinary High Water Mark (m); Mean	0.30
Discharge (m³/s)	0.06
Stream Gradient (%)	1
Embeddedness	Highly Embedded

Channel and Flow Conditions Continued			
Beaver Dams	No		
Native Channel Width (m)	n/a		
Bank Conditions		Left Bank	Right Bank
Bank Shape	Sloping		Sloping
Bank Texture (Dominant/Subdominant)	Fines/Organics		Fines/Organics
Mean Bank Height (m); Mean, Range	0.4, 0.4-0.5		0.4, 0.4-0.4
Grade Of Approach Slopes (%)	Low (<4)		Low (<4)
Riparian Area Width (m)	40		50
Dominant Riparian Vegetation Type	Deciduous		Deciduous

Substrate	%
Organics	30
Fines (<2mm)	70
Small Gravel (2-16 mm)	0
Large Gravel (17-64 mm)	0
Cobble (65-256 mm)	0
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Flat	2	200	100	0.18, 0.15 - 0.21

Cover Type	m²
Boulders	0
Depth	0
Instream Vegetation	10
Overhanging Vegetation	270
Under Cut Banks	5
Woody Debris	180

Water Quality Parameters	
Water Temperature (°C)	7.5
pH	7.9
Dissolved Oxygen (mg/L)	10.0
Conductivity (uS/cm)	289.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Important	Unsuitable	Marginal	Marginal
Trout	Marginal	Important	Marginal	Marginal	Marginal
Char	Marginal	Important	Marginal	Marginal	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	3	0	72, 68-74	None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	June 14, 2014	100	266 s	3	1.13

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 100m upstream looking downstream.

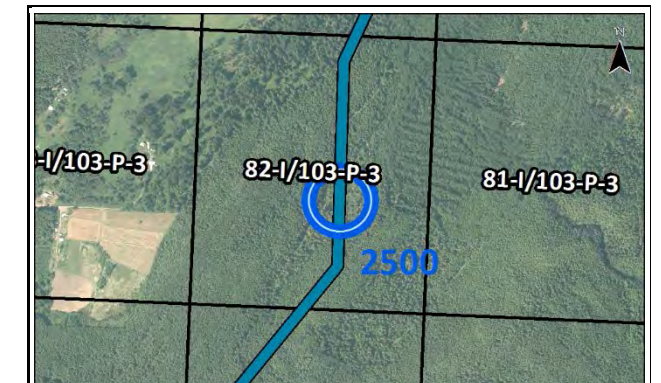


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Gingit Creek (WC 2501)**

**Survey Date:** June 20, 2014

**UTM (Zone 9 U):** 498511 E, 6120506 N

**Sensitivity:** High

**Field Crew:** N. Postma, S. Whiteside

**Habitat Survey Length (m):** 400

**Stream Classification:** S3

**Timing Window of Least Risk:** June 1 - August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Frequently Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	2.0, 1.2-2.4
Wetted Width (m); Mean, Range	1.8, 1.2-2.5
Water Depth (m); Mean, Range	0.12, 0.05-0.23
Ordinary High Water Mark (m); Mean	0.14
Discharge (m³/s)	0.04
Stream Gradient (%)	5
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Undercut	Sloping
Bank Texture (Dominant/Subdominant)	Fines/Small Gravel	Fines/Small Gravel
Mean Bank Height (m); Mean, Range	0.5, 0.3-0.9	0.5, 0.4-0.8
Grade Of Approach Slopes (%)	Moderate (4-14)	Low (<4)
Riparian Area Width (m)	4	20
Dominant Riparian Vegetation Type	Shrub	Shrub

Substrate	%
Organics	3
Fines (<2mm)	46
Small Gravel (2-16 mm)	37
Large Gravel (17-64 mm)	14
Cobble (65-256 mm)	1
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Pool	6	14	33	0.17, 0.1 - 0.3
Riffle	7	25	58	0.36, 0.3 - 0.4
Run	1	4	9	0.20

Cover Type	m²
Overhanging Vegetation	20
Under Cut Banks	14
Woody Debris	8

Water Quality Parameters	
Water Temperature (°C)	7.8
pH	8.7
Dissolved Oxygen (mg/L)	10.8
Conductivity (uS/cm)	294.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Marginal	Important	Unsuitable	Marginal	Marginal
Trout	Important	Important	Marginal	Marginal	Important
Char	Important	Important	Marginal	Marginal	Important

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	12	0	60, 51-87	None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	June 20, 2014	100	619 s	12	1.94

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 60m downstream looking right at a confluence entering on the left bank.

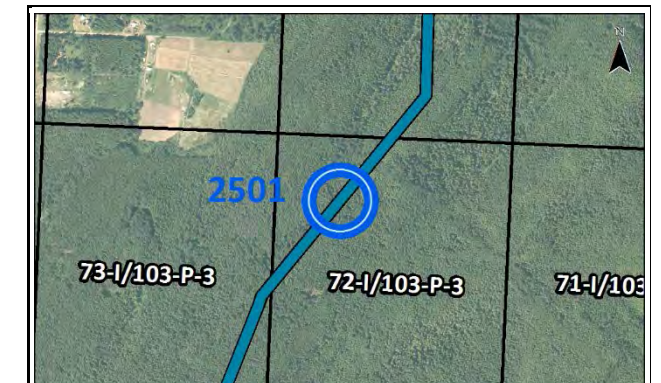


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Gitzyon Creek (WC 2503)**

UTM (Zone 9 U): 497170 E, 6117827 N

Field Crew: B. Rudmik, S. Whiteside

Stream Classification: S2

Survey Date: July 15, 2014

Sensitivity: High

Habitat Survey Length (m): 400

Timing Window of Least Risk: No Window

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Frequently Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	6.6, 5.5-8.5
Wetted Width (m); Mean, Range	7.0, 4.5-8.5
Water Depth (m); Mean, Range	0.43, 0.20-0.68
Ordinary High Water Mark (m); Mean	0.82
Discharge (m³/s)	NR
Stream Gradient (%)	19
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Vertical
Bank Texture (Dominant/Subdominant)	Boulders/Rock	Rock/Boulders
Mean Bank Height (m); Mean, Range	1.2, 0.8-1.8	2.7, 1.9-3.5
Grade Of Approach Slopes (%)	Moderate (4-14)	High (>14)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	0
Fines (<2mm)	5
Small Gravel (2-16 mm)	8
Large Gravel (17-64 mm)	13
Cobble (65-256 mm)	23
Boulder (256-400 mm)	25
Rock (>400 mm)	26

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	2	300	75	0.99, 0.98 - 1
Chute	1	100	25	1.80

Cover Type	m²
Boulders	50
Depth	35
Instream Vegetation	0
Overhanging Vegetation	45
Under Cut Banks	11
Woody Debris	23

Water Quality Parameters	
Water Temperature (°C)	11.8
pH	7.4
Dissolved Oxygen (mg/L)	10.3
Conductivity (uS/cm)	79.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Char	Marginal	Marginal	Marginal	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
No fish captured				Chinook salmon, chum salmon, coho salmon, Dolly Varden, pink salmon, rainbow trout, sockeye salmon

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 15, 2014	120	192 s	0	0.00

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

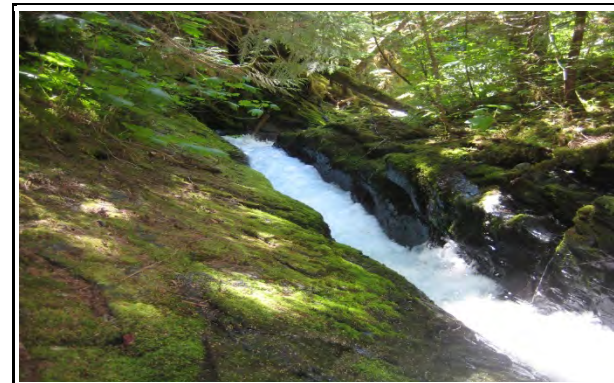


Plate 5 Photograph taken at 78m downstream looking upstream at a chute.

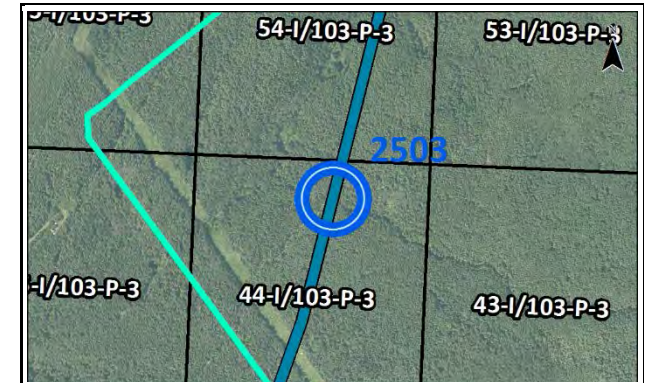


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Underground trenchless
Preliminary Pipeline Crossing Method Option B	Underground trenchless
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Mcleod Creek (WC 2508)**

**Survey Date:** June 15, 2014

**UTM (Zone 9 U):** 496759 E, 6116822 N

**Sensitivity:** Low

**Field Crew:** M. Henry, S. Whiteside

**Habitat Survey Length (m):** 320

**Stream Classification:** S3\*

**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Unconfined
Channel Pattern	Irregular, Wandering
Channel Width (m); Mean, Range	2.0, 1.2-3.0
Wetted Width (m); Mean, Range	1.2, 0.7-2.1
Water Depth (m); Mean, Range	0.08, 0.00-0.15
Ordinary High Water Mark (m); Mean	0.18
Discharge (m³/s)	Negligible
Stream Gradient (%)	3
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Fines/Fines	Fines/Fines
Mean Bank Height (m); Mean, Range	0.4, 0.3-0.6	0.4, 0.3-0.4
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	3	3
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	0
Fines (<2mm)	74
Small Gravel (2-16 mm)	8
Large Gravel (17-64 mm)	10
Cobble (65-256 mm)	8
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Flat	2	210	70	0.00, 0 - 0
No defined channel	1	20	7	0.00
Other	1	70	23	0.00

Cover Type	m²
Boulders	0
Depth	0
Instream Vegetation	0
Overhanging Vegetation	10
Under Cut Banks	0
Woody Debris	14

Water Quality Parameters	
Water Temperature (°C)	8.7
pH	7.6
Dissolved Oxygen (mg/L)	12.0
Conductivity (uS/cm)	117.9
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Marginal	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Marginal	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 200m downstream looking upstream at dry channel.

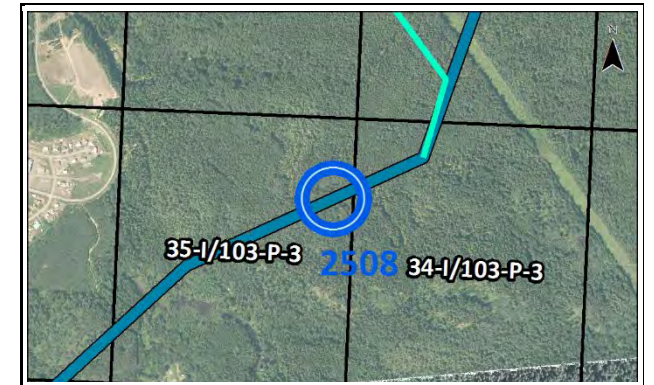


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company



Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Gitzyon Creek (WC 743a)**

UTM (Zone 9 U): 496847 E, 6117352 N

Field Crew: B. Rudmik, S. Whiteside

Stream Classification: S3

Survey Date: July 11, 2014

Sensitivity: High

Habitat Survey Length (m): 700

Timing Window of Least Risk: No window

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	4.4, 4.0-5.0
Wetted Width (m); Mean, Range	3.7, 2.5-4.5
Water Depth (m); Mean, Range	0.50, 0.15-0.90
Ordinary High Water Mark (m); Mean	0.70
Discharge (m³/s)	0.75
Stream Gradient (%)	10
Embeddedness	Unembedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Rock/Boulders	Rock/Boulders
Mean Bank Height (m); Mean, Range	1.7, 1.2-2.1	1.1, 0.7-1.5
Grade Of Approach Slopes (%)	High (>14)	Moderate (4-14)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	0
Fines (<2mm)	1
Small Gravel (2-16 mm)	3
Large Gravel (17-64 mm)	3
Cobble (65-256 mm)	3
Boulder (256-400 mm)	8
Rock (>400 mm)	81

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	4	570	81	0.90, 0.85 - 0.95
Chute	1	50	7	1.10
Riffle	2	80	11	0.83, 0.8 - 0.85

Cover Type	m²
Boulders	158
Depth	117
Instream Vegetation	0
Overhanging Vegetation	81
Under Cut Banks	98
Woody Debris	56

Water Quality Parameters	
Water Temperature (°C)	12.8
pH	7.6
Dissolved Oxygen (mg/L)	10.0
Conductivity (uS/cm)	84.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Marginal	Marginal	Unsuitable	Unsuitable	Unsuitable
Trout	Marginal	Marginal	Unsuitable	Unsuitable	Unsuitable
Char	Important	Important	Marginal	Marginal	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	10	3	71, 59-113	Chinook salmon, chum salmon, coho salmon, Dolly Varden, pink salmon, rainbow trout, sockeye salmon

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 11, 2014	145	283 s	10	3.53

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments

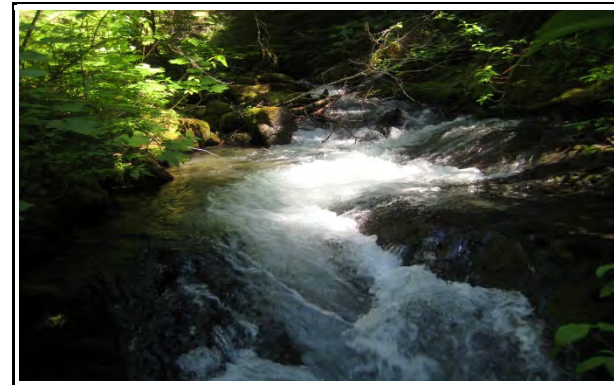


Plate 1 Photograph taken at right-of-way looking upstream.

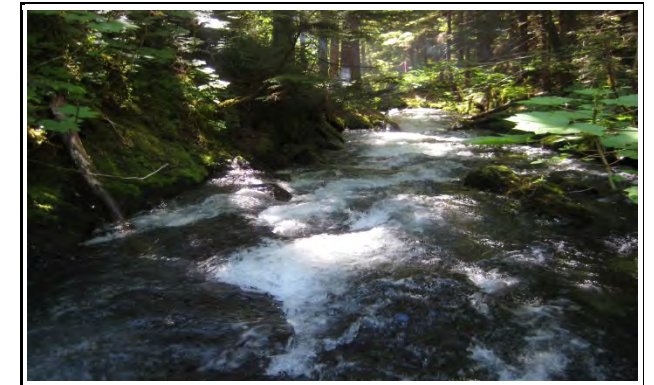


Plate 2 Photograph taken at right-of-way looking downstream.

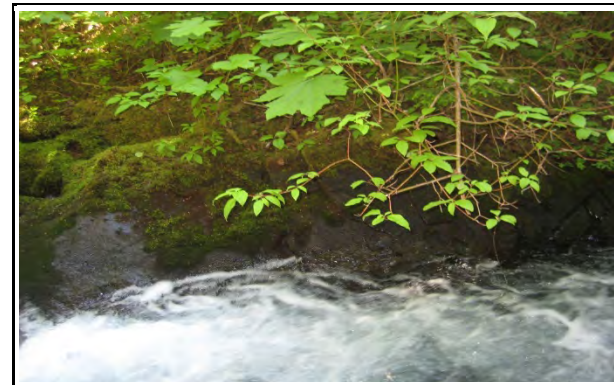


Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 300m downstream looking upstream.

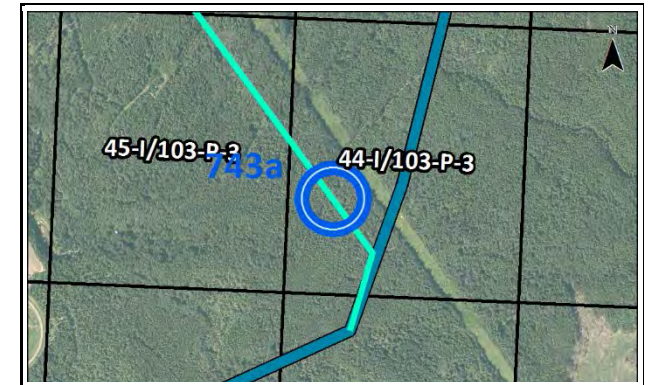


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Underground trenchless
Preliminary Pipeline Crossing Method Option B	Aerial
Preliminary Vehicle and Equipment Crossing Method Option A	None
Preliminary Vehicle and Equipment Crossing Method Option B	Not applicable

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Mcleod Creek (WC 744a)

**Survey Date:** June 14, 2014

**UTM (Zone 9 U):** 496185 E, 6116527 N

**Sensitivity:** Low

**Field Crew:** M. Henry, N. Glover

**Habitat Survey Length (m):** 200

**Stream Classification:** S4\*

**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Unconfined
Channel Pattern	Irregular, Wandering
Channel Width (m); Mean, Range	1.2, 0.4-1.9
Wetted Width (m); Mean, Range	1.2, 0.6-2.0
Water Depth (m); Mean, Range	0.14, 0.06-0.24
Ordinary High Water Mark (m); Mean	0.18
Discharge (m³/s)	0.01
Stream Gradient (%)	4
Embeddedness	Not Applicable

Channel and Flow Conditions Continued		
Beaver Dams	Yes	
Native Channel Width (m)	n/a	
Bank Conditions		
	Left Bank	Right Bank
Bank Shape	Vertical	Vertical
Bank Texture (Dominant/Subdominant)	Fines/Organics	Fines/Organics
Mean Bank Height (m); Mean, Range	0.6, 0.4-0.8	0.7, 0.5-0.8
Grade Of Approach Slopes (%)	Moderate (4-14)	Low (<4)
Riparian Area Width (m)	10	11
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	38
Fines (<2mm)	62
Small Gravel (2-16 mm)	0
Large Gravel (17-64 mm)	0
Cobble (65-256 mm)	0
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Flat	2	120	86	0.00, 0 - 0
No defined channel	1	10	7	0.00
Pool	1	10	7	0.00

Cover Type	m²
Overhanging Vegetation	15
Under Cut Banks	15
Woody Debris	60

Water Quality Parameters	
Water Temperature (°C)	7.8
pH	7.1
Dissolved Oxygen (mg/L)	11.8
Conductivity (uS/cm)	108.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Marginal
Trout	Unsuitable	Marginal	Marginal	Unsuitable	Marginal
Char	Unsuitable	Marginal	Marginal	Unsuitable	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
No fish captured				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	June 14, 2014	107	295 s	0	0.00

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 60m downstream looking upstream at an active beaver dam.



Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Mcleod Creek (NCD 2146)**

**UTM (Zone 9 U):** 496033 E, 6116396 N

**Field Crew:** M. Henry, N. Glover

**Stream Classification:** NCD

**Survey Date:** June 14, 2014

**Sensitivity:** Low

**Habitat Survey Length (m):** 280

**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 2)	
Confinement	
Channel Pattern	
Channel Width (m); Mean, Range	n/a
Wetted Width (m); Mean, Range	58.0, 40.0-76.0
Water Depth (m); Mean, Range	0.67, 0.11-1.00
Ordinary High Water Mark (m); Mean	n/a
Discharge (m³/s)	Negligible
Stream Gradient (%)	3
Embeddedness	

Channel and Flow Conditions Continued			
Beaver Dams	Yes		
Native Channel Width (m)	n/a		
Bank Conditions		Left Bank	Right Bank
Bank Shape		n/a	n/a
Bank Texture (Dominant/Subdominant)		n/a	n/a
Mean Bank Height (m); Mean, Range		n/a	n/a
Grade Of Approach Slopes (%)		Low (<4)	Low (<4)
Riparian Area Width (m)		13	13
Dominant Riparian Vegetation Type		Wetland	Wetland

Substrate	%
Organics	100
Fines (<2mm)	0
Small Gravel (2-16 mm)	0
Large Gravel (17-64 mm)	0
Cobble (65-256 mm)	0
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Impoundment	2	255	91	0.00, 0 - 0
Other	1	25	9	0.00

Cover Type	m²
Boulders	0
Depth	240
Instream Vegetation	0
Overhanging Vegetation	0
Under Cut Banks	0
Woody Debris	0

Water Quality Parameters	
Water Temperature (°C)	14.7
pH	7.0
Dissolved Oxygen (mg/L)	4.3
Conductivity (uS/cm)	126.4
Turbidity (visual)	Stained

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Marginal	Unsuitable	Marginal	Marginal
Trout	Unsuitable	Marginal	Marginal	Marginal	Marginal
Char	Unsuitable	Marginal	Marginal	Marginal	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
No fish captured				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Minnow Trapping	June 14, 2014	7	164 hrs	0	0.00

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments	



Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at right-of-way looking downslope at a beaver dam complex.

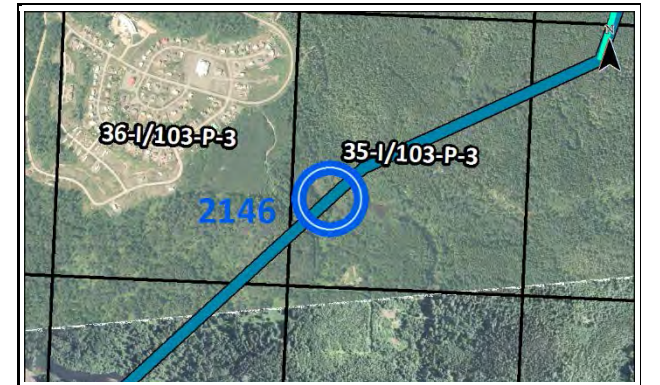


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Ksi Sii Aks (WC 746a)**

UTM (Zone 9 U): 495370 E, 6115736 N

Field Crew: E. Lennert, A. Kemprath, C. Sinclair, J. McNeice

Stream Classification: S1-B

Survey Date: July 15, 2014

Sensitivity: High

Habitat Survey Length (m): 1200

Timing Window of Least Risk: No window

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	62.5, 40.0-85.0
Wetted Width (m); Mean, Range	62.2, 40.0-84.0
Water Depth (m); Mean, Range	0.76, 0.30-1.50
Ordinary High Water Mark (m); Mean	1.06
Discharge (m³/s)	NR
Stream Gradient (%)	3
Embeddedness	Moderately Embedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Rock/Boulders	Boulders/Cobble
Mean Bank Height (m); Mean, Range	1.8, 1.2-2.5	9.0, 1.9-25.0
Grade Of Approach Slopes (%)	Low (<4)	Moderate (4-14)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Mixed C and D	Shrub

Substrate	%
Organics	0
Fines (<2mm)	25
Small Gravel (2-16 mm)	28
Large Gravel (17-64 mm)	24
Cobble (65-256 mm)	8
Boulder (256-400 mm)	6
Rock (>400 mm)	7

Habitat	No.	Length (m)	%	Velocity (m/s)
Chute	1	10	1	3.50
Pool	2	65	8	1.25, 0.5 - 2
Rapid	2	184	22	3.25, 3 - 3.5
Run	5	559	68	1.80, 1 - 3

Cover Type	m²
Boulders	1700
Depth	9170
Instream Vegetation	500
Overhanging Vegetation	1210
Under Cut Banks	673
Woody Debris	920

Water Quality Parameters	
Water Temperature (°C)	13.5
pH	7.5
Dissolved Oxygen (mg/L)	12.8
Conductivity (uS/cm)	50.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Essential	Essential	Unsuitable	Essential	Essential
Trout	Essential	Essential	Essential	Essential	Essential
Char	Essential	Essential	Essential	Essential	Essential

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				Chinook salmon, chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, lamprey, pink salmon, sculpin, sockeye salmon, steelhead

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

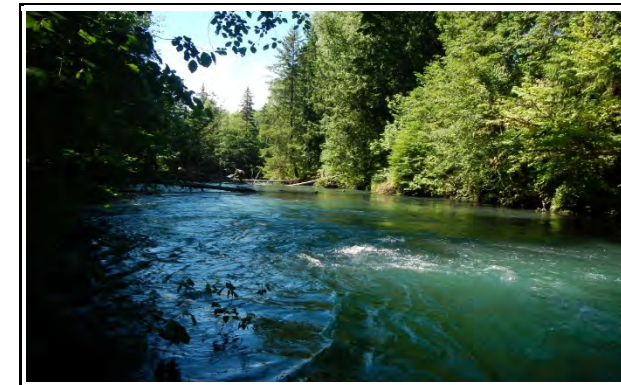


Plate 5 Photograph taken at 650m downstream looking left.

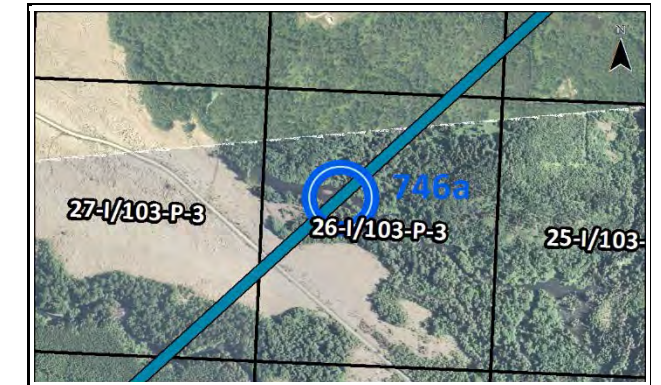


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Underground trenchless
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	None
Preliminary Vehicle and Equipment Crossing Method Option B	Not applicable

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Vetter Creek (WC 747a)**

UTM (Zone 9 U): 494800 E, 6115171 N

Field Crew: K. Gasser, N. Pilgrim

Stream Classification: S1-B

Survey Date: July 15, 2014

Sensitivity: High

Habitat Survey Length (m): 500

Timing Window of Least Risk: August 15 - August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Occasionally Confined
Channel Pattern	Irregular, Wandering
Channel Width (m); Mean, Range	28.5, 22.0-41.0
Wetted Width (m); Mean, Range	21.0, 16.0-24.0
Water Depth (m); Mean, Range	1.23, 0.42-2.50
Ordinary High Water Mark (m); Mean	2.16
Discharge (m³/s)	NR
Stream Gradient (%)	2
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Vertical	Sloping
Bank Texture (Dominant/Subdominant)	Large Gravel/Fines	Large Gravel/Cobble
Mean Bank Height (m); Mean, Range	19.4, 2.5-30.0	2.7, 1.6-4.3
Grade Of Approach Slopes (%)	High (>14)	Low (<4)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Coniferous	Deciduous

Substrate	%
Organics	0
Fines (<2mm)	7
Small Gravel (2-16 mm)	16
Large Gravel (17-64 mm)	39
Cobble (65-256 mm)	36
Boulder (256-400 mm)	1
Rock (>400 mm)	0

Water Quality Parameters	
Water Temperature (°C)	12.0
pH	7.2
Dissolved Oxygen (mg/L)	11.0
Conductivity (uS/cm)	46.5
Turbidity (visual)	Clear

Habitat	No.	Length (m)	%	Velocity (m/s)
Pool	4	75	15	0.00, 0 - 0
Run	5	425	85	0.36, 0 - 1.82

Cover Type	m²
Boulders	2
Depth	338
Instream Vegetation	2
Overhanging Vegetation	6
Under Cut Banks	30
Woody Debris	333

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Important	Important	Important	Important	Marginal
Char	Important	Important	Important	Important	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				Bull trout, Dolly Varden, rainbow trout, steelhead

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments

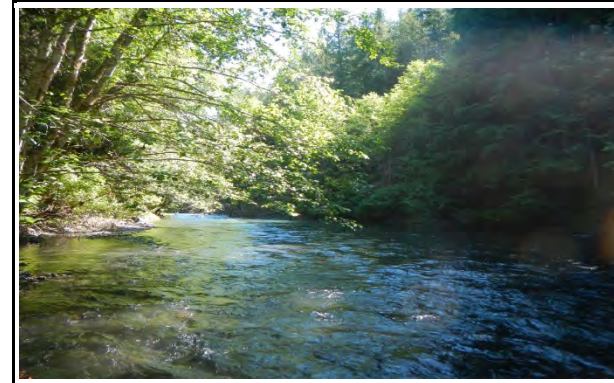


Plate 1 Photograph taken at right-of-way looking upstream.

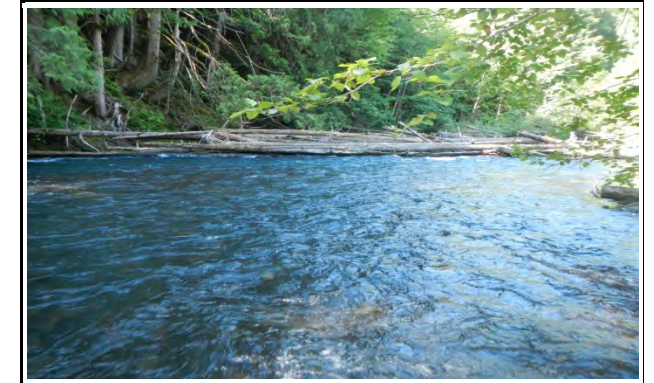


Plate 2 Photograph taken at right-of-way looking downstream.

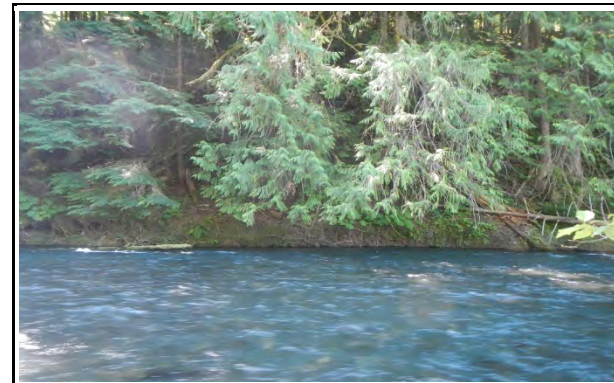


Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 15m downstream looking downstream at a logjam.



Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Underground trenchless
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	None
Preliminary Vehicle and Equipment Crossing Method Option B	Not applicable

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Vetter Creek (NCD 748a)**  
**UTM (Zone 9 U):** 494412 E, 6114785 N  
**Field Crew:** M. Bahr, N. Postma, S. Courtney, D. Cooper  
**Stream Classification:** NCD

**Survey Date:** June 30, 2014  
**Sensitivity:** Low  
**Habitat Survey Length (m):** 230  
**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 1)	
Confinement	Unconfined
Channel Pattern	Irregular, Wandering
Channel Width (m); Mean, Range	n/a
Wetted Width (m); Mean, Range	100.0, 100.0-100.0
Water Depth (m); Mean, Range	1.17, 1.00-1.50
Ordinary High Water Mark (m); Mean	n/a
Discharge (m³/s)	Negligible
Stream Gradient (%)	0
Embeddedness	Not Applicable

Channel and Flow Conditions Continued			
Beaver Dams	Yes		
Native Channel Width (m)	n/a		
Bank Conditions		Left Bank	Right Bank
Bank Shape		n/a	n/a
Bank Texture (Dominant/Subdominant)		n/a	n/a
Mean Bank Height (m); Mean, Range		n/a	n/a
Grade Of Approach Slopes (%)		Low (<4)	Low (<4)
Riparian Area Width (m)		100	100
Dominant Riparian Vegetation Type		Deciduous	Deciduous

Substrate	%
Organics	100
Fines (<2mm)	0
Small Gravel (2-16 mm)	0
Large Gravel (17-64 mm)	0
Cobble (65-256 mm)	0
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Dry	1	50	22	0.00
Impoundment	2	180	78	0.00, 0 - 0

Cover Type	m²
Not recorded	

Water Quality Parameters	
Water Temperature (°C)	12.3
pH	6.8
Dissolved Oxygen (mg/L)	6.2
Conductivity (uS/cm)	76.0
Turbidity (visual)	Stained

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Marginal	Unsuitable	Marginal	Unsuitable
Trout	Unsuitable	Marginal	Marginal	Marginal	Unsuitable
Char	Unsuitable	Marginal	Marginal	Marginal	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
No fish captured				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	June 30, 2014	60	215 s	0	0.00
Minnow Trapping	June 30, 2014	7	138 hrs	0	0.00

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 62m upstream looking downslope at a 0.8 m high historic beaver dam.

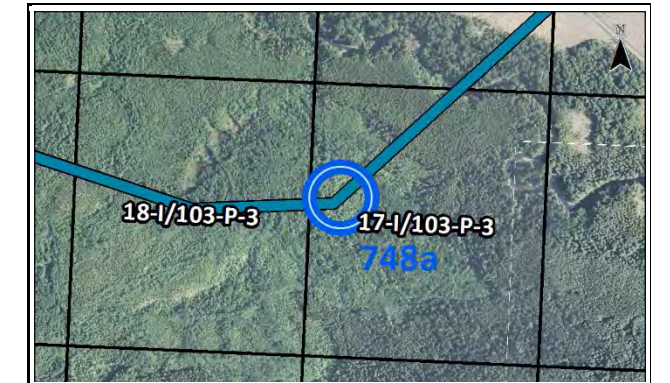


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Vetter Creek (WC 749b)**

**Survey Date:** June 30, 2014

**UTM (Zone 9 U):** 494008 E, 6114733 N

**Sensitivity:** Low

**Field Crew:** N. Postma, D. Cooper

**Habitat Survey Length (m):**

**Stream Classification:** S3\*

**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Unconfined
Channel Pattern	Irregular, Wandering
Channel Width (m); Mean, Range	4.0, 3.4-4.4
Wetted Width (m); Mean, Range	Dry Channel
Water Depth (m); Mean, Range	n/a
Ordinary High Water Mark (m); Mean	0.23
Discharge (m³/s)	n/a
Stream Gradient (%)	2
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued			
Beaver Dams	Yes		
Native Channel Width (m)	n/a		
Bank Conditions		Left Bank	Right Bank
Bank Shape	Sloping		Sloping
Bank Texture (Dominant/Subdominant)	Fines/Cobble		Fines/Cobble
Mean Bank Height (m); Mean, Range	0.6, 0.5-0.7		0.5, 0.4-0.9
Grade Of Approach Slopes (%)	Moderate (4-14)		Moderate (4-14)
Riparian Area Width (m)	5		3
Dominant Riparian Vegetation Type	Mixed C and D		Mixed C and D

Substrate	%
Organics	0
Fines (<2mm)	1
Small Gravel (2-16 mm)	9
Large Gravel (17-64 mm)	27
Cobble (65-256 mm)	45
Boulder (256-400 mm)	18
Rock (>400 mm)	0

Water Quality Parameters	
Water Temperature (°C)	
pH	
Dissolved Oxygen (mg/L)	
Conductivity (uS/cm)	
Turbidity (visual)	

Habitat	No.	Length (m)	%	Velocity (m/s)
Not applicable				

Cover Type	m²
Overhanging Vegetation	0

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 40m downstream looking upstream.

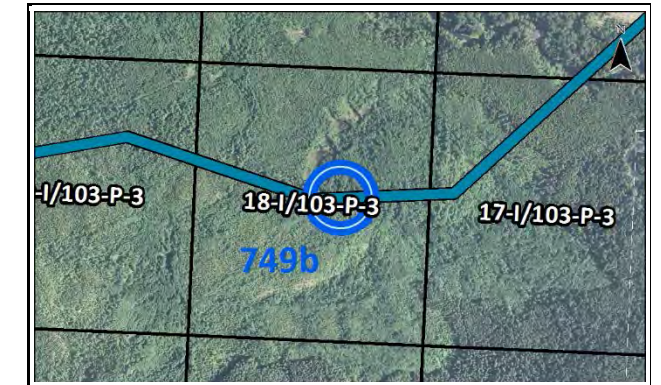


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Vetter Creek (WC 753a)**

**UTM (Zone 9 U):** 492198 E, 6114679 N

**Field Crew:** B. Stitt, C. Jerney, R. Ball

**Stream Classification:** S1-B

**Survey Date:** July 09, 2014

**Sensitivity:** High

**Habitat Survey Length (m):** 400

**Timing Window of Least Risk:** August 15 - August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Occasionally Confined
Channel Pattern	Irregular, Wandering
Channel Width (m); Mean, Range	36.3, 22.0-60.0
Wetted Width (m); Mean, Range	15.2, 12.0-18.0
Water Depth (m); Mean, Range	0.48, 0.26-0.65
Ordinary High Water Mark (m); Mean	0.60
Discharge (m³/s)	4.12
Stream Gradient (%)	4
Embeddedness	Unembedded

Channel and Flow Conditions Continued		
Beaver Dams	Yes	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Cobble/Large Gravel	Cobble/Large Gravel
Mean Bank Height (m); Mean, Range	1.0, 0.7-1.3	1.3, 1.1-1.5
Grade Of Approach Slopes (%)	Moderate (4-14)	Moderate (4-14)
Riparian Area Width (m)	27	20
Dominant Riparian Vegetation Type	Deciduous	Deciduous

Substrate	%
Organics	0
Fines (<2mm)	8
Small Gravel (2-16 mm)	14
Large Gravel (17-64 mm)	18
Cobble (65-256 mm)	39
Boulder (256-400 mm)	20
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Rapid	1	375	94	1.55
Run	1	25	6	1.02

Cover Type	m²
Boulders	77
Depth	2
Overhanging Vegetation	37
Under Cut Banks	5
Woody Debris	10

Water Quality Parameters	
Water Temperature (°C)	8.2
pH	NR
Dissolved Oxygen (mg/L)	NR
Conductivity (uS/cm)	
Turbidity (visual)	Moderate

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Marginal	Marginal	Unsuitable	Marginal	Unsuitable
Trout	Marginal	Important	Important	Important	Unsuitable
Char	Important	Important	Important	Important	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	25	1	89, 34-155	Bull trout, Dolly Varden, rainbow trout, steelhead
Coastal cutthroat trout	5	0	116, 76-130	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 09, 2014	150	526 s	21	3.99
Minnow Trapping	July 09, 2014	6	108 hrs	9	0.08

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.

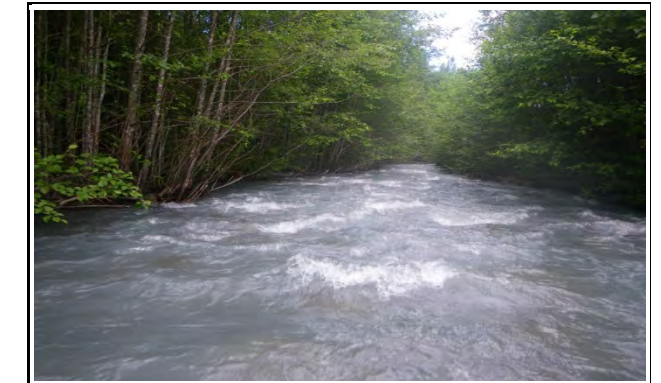


Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 245m downstream looking left at a snye.

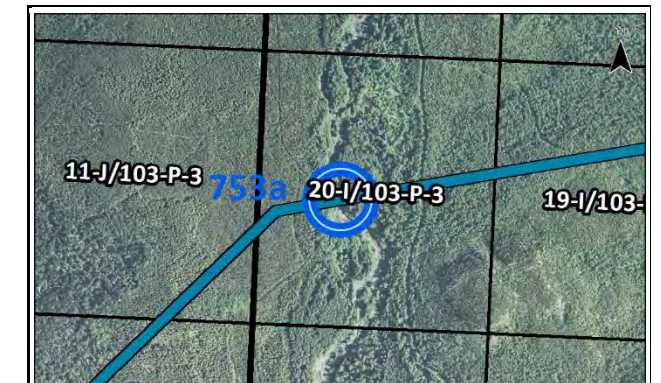


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



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Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Vetter Creek (WC 754a)**

**Survey Date:** June 21, 2014

**UTM (Zone 9 U):** 491129 E, 6113773 N

**Sensitivity:** Low

**Field Crew:** N. Postma, S. Whiteside

**Habitat Survey Length (m):** 400

**Stream Classification:** S4\*

**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Unconfined
Channel Pattern	Irregular, Wandering
Channel Width (m); Mean, Range	1.1, 0.8-1.4
Wetted Width (m); Mean, Range	0.8, 0.5-1.2
Water Depth (m); Mean, Range	0.21, 0.08-0.40
Ordinary High Water Mark (m); Mean	0.21
Discharge (m³/s)	NR
Stream Gradient (%)	0
Embeddedness	Not Applicable

Channel and Flow Conditions Continued		
Beaver Dams	Yes	
Native Channel Width (m)	n/a	
Bank Conditions		
Bank Shape	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Organics/Organics	Organics/Organics
Mean Bank Height (m); Mean, Range	0.4, 0.4-0.6	0.4, 0.4-0.5
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	31	31
Dominant Riparian Vegetation Type	Grass	Grass

Substrate	%
Organics	100
Fines (<2mm)	0
Small Gravel (2-16 mm)	0
Large Gravel (17-64 mm)	0
Cobble (65-256 mm)	0
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Flat	1	70	23	0.00
Impoundment	1	100	33	0.00
Riffle	1	130	43	0.00

Cover Type	m²
Depth	520
Instream Vegetation	135
Overhanging Vegetation	260
Under Cut Banks	35
Woody Debris	50

Water Quality Parameters	
Water Temperature (°C)	13.3
pH	6.4
Dissolved Oxygen (mg/L)	0.4
Conductivity (uS/cm)	66.0
Turbidity (visual)	Stained

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Marginal	Unsuitable	Marginal	Marginal
Trout	Unsuitable	Marginal	Marginal	Marginal	Marginal
Char	Unsuitable	Marginal	Marginal	Marginal	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
No fish captured				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Minnow Trapping	June 21, 2014	5	100 hrs	0	0.00

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 100m downstream looking downstream at a beaver impoundment.

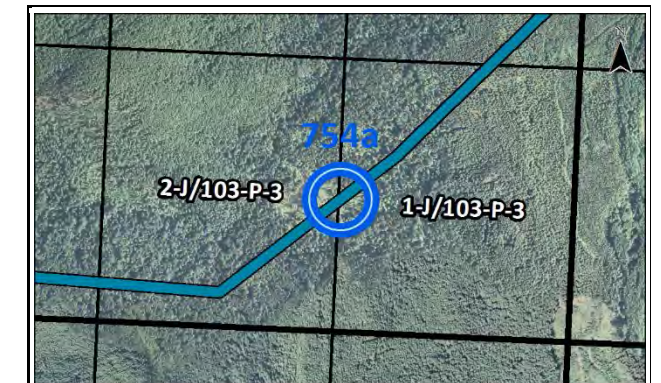


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Vetter Creek (WC 756a)**

**Survey Date:** June 20, 2014

**UTM (Zone 9 U):** 490112 E, 6113464 N

**Sensitivity:** High

**Field Crew:** C. Jerney, E. Lennert

**Habitat Survey Length (m):** 410

**Stream Classification:** S3\*

**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	2.0, 1.2-2.8
Wetted Width (m); Mean, Range	1.7, 1.0-2.5
Water Depth (m); Mean, Range	0.04, 0.00-0.09
Ordinary High Water Mark (m); Mean	0.11
Discharge (m³/s)	0.01
Stream Gradient (%)	14
Embeddedness	Moderately Embedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Organics/Fines	Organics/Fines
Mean Bank Height (m); Mean, Range	2.6, 1.5-3.0	2.9, 2.3-3.3
Grade Of Approach Slopes (%)	Moderate (4-14)	Moderate (4-14)
Riparian Area Width (m)	21	20
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	23
Fines (<2mm)	18
Small Gravel (2-16 mm)	47
Large Gravel (17-64 mm)	8
Cobble (65-256 mm)	3
Boulder (256-400 mm)	1
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	2	150	37	0.00, 0 - 0
Riffle	1	260	63	0.00

Cover Type	m²
Overhanging Vegetation	100
Woody Debris	30

Water Quality Parameters	
Water Temperature (°C)	8.6
pH	6.5
Dissolved Oxygen (mg/L)	11.1
Conductivity (uS/cm)	
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Marginal	Important	Unsuitable	Unsuitable	Marginal
Trout	Important	Important	Unsuitable	Unsuitable	Marginal
Char	Important	Important	Unsuitable	Unsuitable	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

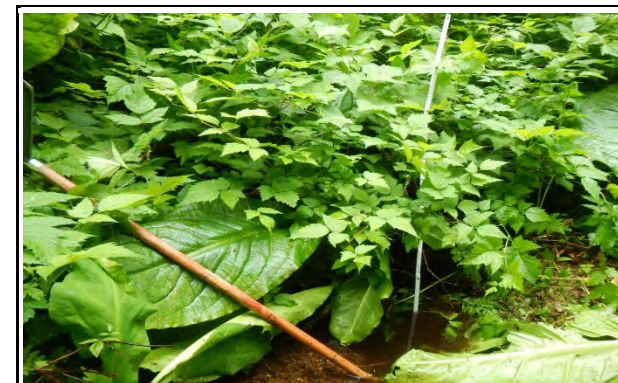


Plate 5 Photograph taken at 300m downstream looking upstream.

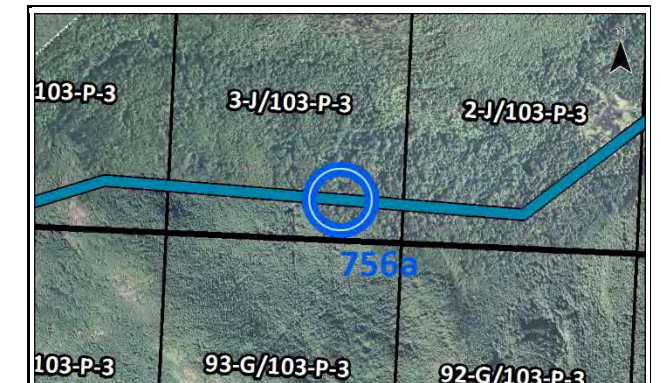


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



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Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Ts'ooih Ts'ap (WC 757a)**

**Survey Date:** June 20, 2014

**UTM (Zone 9 U):** 489955 E, 6113469 N

**Sensitivity:** High

**Field Crew:** C. Jerney, E. Lennert

**Habitat Survey Length (m):** 420

**Stream Classification:** S4\*

**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	0.9, 0.6-1.2
Wetted Width (m); Mean, Range	0.8, 0.4-1.3
Water Depth (m); Mean, Range	0.05, 0.00-0.11
Ordinary High Water Mark (m); Mean	0.16
Discharge (m³/s)	0.01
Stream Gradient (%)	20
Embeddedness	Moderately Embedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Organics/Fines	Organics/Fines
Mean Bank Height (m); Mean, Range	2.8, 2.0-3.5	2.9, 2.4-3.2
Grade Of Approach Slopes (%)	High (>14)	High (>14)
Riparian Area Width (m)	17	17
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	8
Fines (<2mm)	20
Small Gravel (2-16 mm)	59
Large Gravel (17-64 mm)	4
Cobble (65-256 mm)	7
Boulder (256-400 mm)	1
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	2	220	52	0.00, 0 - 0
Flat	1	15	4	0.00
Riffle	1	185	44	0.00

Cover Type	m²
Overhanging Vegetation	58
Under Cut Banks	10
Woody Debris	20

Water Quality Parameters	
Water Temperature (°C)	7.6
pH	6.5
Dissolved Oxygen (mg/L)	11.6
Conductivity (uS/cm)	
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Marginal	Important	Unsuitable	Unsuitable	Marginal
Trout	Important	Important	Unsuitable	Unsuitable	Marginal
Char	Important	Important	Unsuitable	Unsuitable	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
No fish captured				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	June 20, 2014	320	219 s	0	0.00

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 300m downstream looking downstream.



Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



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Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ksi Ts'ooihl Ts'ap (WC 2042.1) **Survey Date:** June 18, 2014  
**UTM (Zone 9 U):** 488863 E, 6113228 N **Sensitivity:** Low  
**Field Crew:** C. Jerney, J. Cote **Habitat Survey Length (m):** 380  
**Stream Classification:** S3\* **Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	2.3, 1.9-2.8
Wetted Width (m); Mean, Range	Dry Channel
Water Depth (m); Mean, Range	n/a
Ordinary High Water Mark (m); Mean	0.01
Discharge (m³/s)	n/a
Stream Gradient (%)	35
Embeddedness	Not Applicable

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Rock/Fines	Rock/Fines
Mean Bank Height (m); Mean, Range	1.6, 1.1-1.9	1.6, 1.3-2.0
Grade Of Approach Slopes (%)	High (>14)	High (>14)
Riparian Area Width (m)	15	15
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	3
Fines (<2mm)	0
Small Gravel (2-16 mm)	0
Large Gravel (17-64 mm)	15
Cobble (65-256 mm)	6
Boulder (256-400 mm)	2
Rock (>400 mm)	74

Habitat	No.	Length (m)	%	Velocity (m/s)
Not applicable				

Cover Type	m²
Overhanging Vegetation	5
Woody Debris	5

Water Quality Parameters	
Water Temperature (°C)	
pH	
Dissolved Oxygen (mg/L)	
Conductivity (uS/cm)	
Turbidity (visual)	

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

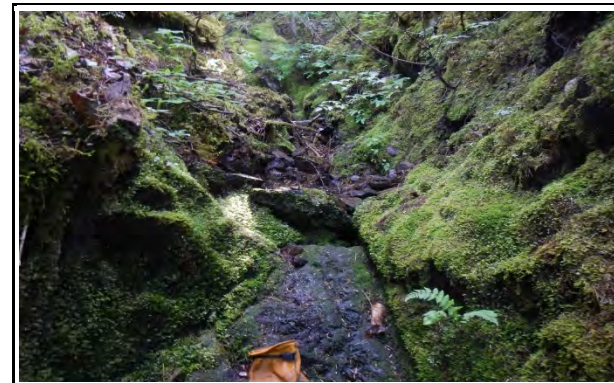


Plate 5 Photograph taken at 60m upstream looking upstream at typical habitat.

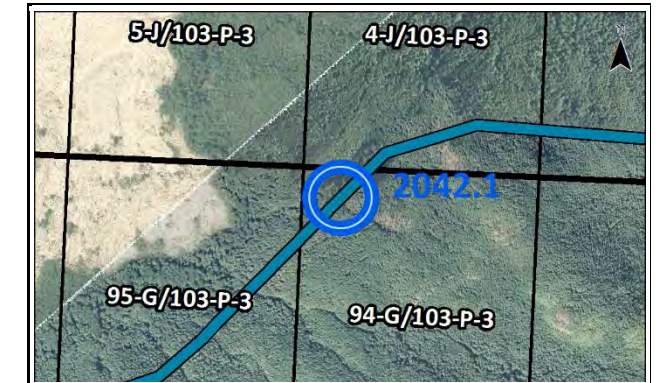


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ksi Ts'oohl Ts'ap (WC 2042)  
**UTM (Zone 9 U):** 488816 E, 6113283 N  
**Field Crew:** C. Jerney, J. Cote  
**Stream Classification:** S4\*

**Survey Date:** June 18, 2014  
**Sensitivity:** Low  
**Habitat Survey Length (m):** 417  
**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Frequently Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	1.0, 0.8-1.6
Wetted Width (m); Mean, Range	0.4, 0.2-0.8
Water Depth (m); Mean, Range	0.01, 0.00-0.04
Ordinary High Water Mark (m); Mean	0.16
Discharge (m³/s)	Negligible
Stream Gradient (%)	14
Embeddedness	Moderately Embedded

Channel and Flow Conditions Continued			
Beaver Dams	No		
Native Channel Width (m)	n/a		
Bank Conditions		Left Bank	Right Bank
Bank Shape	Vertical		Vertical
Bank Texture (Dominant/Subdominant)	Organics/Fines		Organics/Fines
Mean Bank Height (m); Mean, Range	0.4, 0.4-0.4		0.4, 0.4-0.5
Grade Of Approach Slopes (%)	High (>14)		High (>14)
Riparian Area Width (m)	15		15
Dominant Riparian Vegetation Type	Coniferous		Coniferous

Substrate	%
Organics	38
Fines (<2mm)	38
Small Gravel (2-16 mm)	3
Large Gravel (17-64 mm)	10
Cobble (65-256 mm)	9
Boulder (256-400 mm)	1
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	2	357	88	0.00, 0 - 0
Riffle	1	50	12	0.00

Cover Type	m²
Boulders	5
Depth	0
Instream Vegetation	5
Overhanging Vegetation	20
Under Cut Banks	5
Woody Debris	5

Water Quality Parameters	
Water Temperature (°C)	11.7
pH	NR
Dissolved Oxygen (mg/L)	10.2
Conductivity (uS/cm)	
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

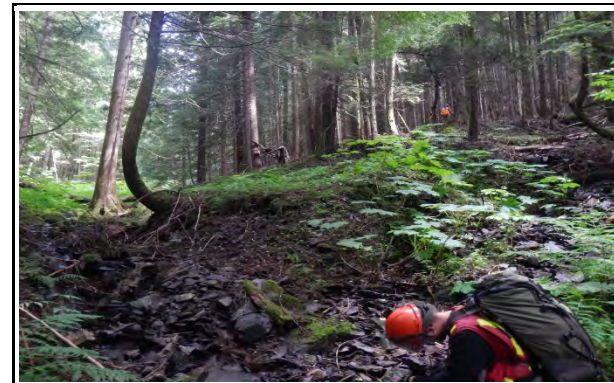


Plate 5 Photograph taken at 78m downstream looking upstream at the confluence with PWC 2042.1.

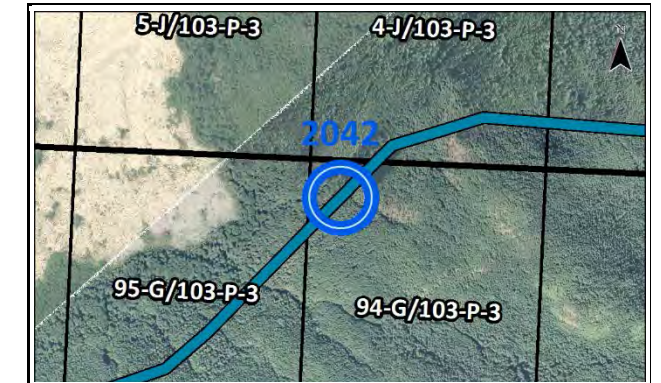


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Ksi Ts'ooihl Ts'ap (WC 2043)**  
**UTM (Zone 9 U): 488568 E, 6112901 N**  
**Field Crew: C. Jerney, J. Cote**  
**Stream Classification: S3\***

**Survey Date:** June 19, 2014  
**Sensitivity:** Low  
**Habitat Survey Length (m):** 328  
**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	3.1, 1.7-3.8
Wetted Width (m); Mean, Range	2.2, 1.4-2.9
Water Depth (m); Mean, Range	0.04, 0.00-0.15
Ordinary High Water Mark (m); Mean	0.31
Discharge (m³/s)	0.03
Stream Gradient (%)	14
Embeddedness	Not Applicable

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Vertical	Vertical
Bank Texture (Dominant/Subdominant)	Rock/Organics	Rock/Organics
Mean Bank Height (m); Mean, Range	2.6, 2.1-3.5	1.9, 0.6-2.8
Grade Of Approach Slopes (%)	High (>14)	High (>14)
Riparian Area Width (m)	30	30
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	0
Fines (<2mm)	0
Small Gravel (2-16 mm)	1
Large Gravel (17-64 mm)	1
Cobble (65-256 mm)	0
Boulder (256-400 mm)	0
Rock (>400 mm)	97

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	2	113	34	0.00, 0 - 0
Falls	2	120	37	0.00, 0 - 0
No defined channel	1	50	15	0.00
Riffle	1	45	14	0.00

Cover Type	m²
Overhanging Vegetation	6
Woody Debris	11

Water Quality Parameters	
Water Temperature (°C)	11.8
pH	6.5
Dissolved Oxygen (mg/L)	10.7
Conductivity (uS/cm)	
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
No fish captured				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	June 19, 2014	50	227 s	0	0.00
Minnow Trapping	June 18, 2014	4	72 hrs	0	0.00

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.

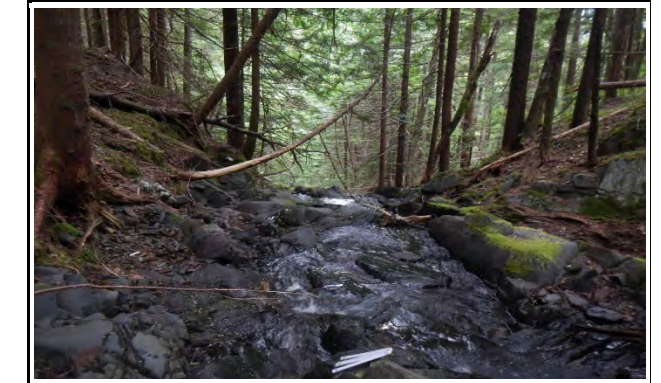


Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

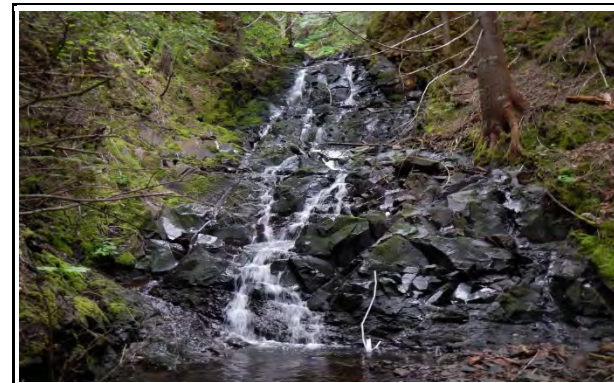


Plate 5 Photograph taken at 30m downstream at falls.

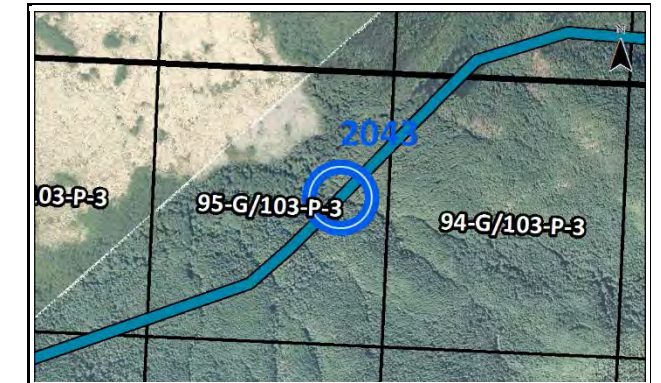


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



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Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ksi Ts'oohl Ts'ap (WC 2044)  
**UTM (Zone 9 U):** 488433 E, 6112750 N  
**Field Crew:** C. Jerney, J. Cote  
**Stream Classification:** S3\*

**Survey Date:** June 19, 2014  
**Sensitivity:** Low  
**Habitat Survey Length (m):** 400  
**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 1)	
Confinement	Entrenched
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	3.0, 3.0-3.0
Wetted Width (m); Mean, Range	0.3, 0.3-0.3
Water Depth (m); Mean, Range	0.07, 0.00-0.20
Ordinary High Water Mark (m); Mean	0.27
Discharge (m³/s)	Negligible
Stream Gradient (%)	22
Embeddedness	Not Applicable

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Vertical	Vertical
Bank Texture (Dominant/Subdominant)	Rock/Organics	Rock/Organics
Mean Bank Height (m); Mean, Range	20.0, 20.0-20.0	20.0, 20.0-20.0
Grade Of Approach Slopes (%)	High (>14)	High (>14)
Riparian Area Width (m)	30	30
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	0
Fines (<2mm)	0
Small Gravel (2-16 mm)	0
Large Gravel (17-64 mm)	0
Cobble (65-256 mm)	0
Boulder (256-400 mm)	0
Rock (>400 mm)	100

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	2	250	53	0.00, 0 - 0
Falls	2	50	11	0.00, 0 - 0
No defined channel	1	30	6	0.00
Riffle	1	140	30	0.00

Cover Type	m²
Not recorded	

Water Quality Parameters	
Water Temperature (°C)	18.2
pH	NR
Dissolved Oxygen (mg/L)	10.8
Conductivity (uS/cm)	
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 150m upstream looking downstream.

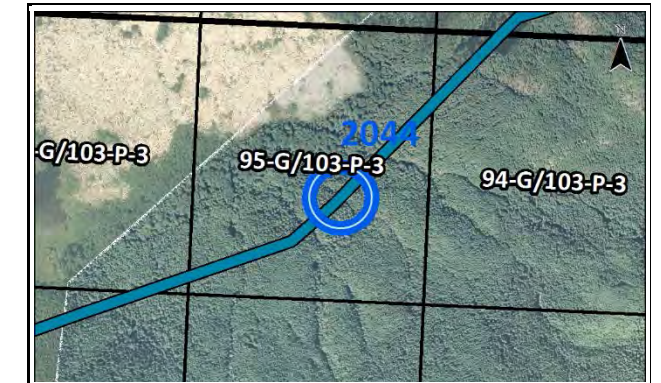


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



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Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Ksi Ts'ooihl Ts'ap (WC 2045)**  
**UTM (Zone 9 U):** 488330 E, 6112649 N  
**Field Crew:** C. Jerney, M. Henry, S. Whiteside  
**Stream Classification:** S2\*

**Survey Date:** June 17, 2014  
**Sensitivity:** Low  
**Habitat Survey Length (m):** 365  
**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Frequently Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	6.2, 3.3-8.0
Wetted Width (m); Mean, Range	1.8, 0.4-5.0
Water Depth (m); Mean, Range	0.05, 0.00-0.16
Ordinary High Water Mark (m); Mean	0.10
Discharge (m³/s)	0.02
Stream Gradient (%)	58
Embeddedness	Not Applicable

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Vertical	Vertical
Bank Texture (Dominant/Subdominant)	Rock/Organics	Rock/Organics
Mean Bank Height (m); Mean, Range	14.4, 3.5-30.0	9.8, 2.5-20.0
Grade Of Approach Slopes (%)	High (>14)	High (>14)
Riparian Area Width (m)	0	0
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	0
Fines (<2mm)	3
Small Gravel (2-16 mm)	21
Large Gravel (17-64 mm)	38
Cobble (65-256 mm)	9
Boulder (256-400 mm)	2
Rock (>400 mm)	25

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	2	201	55	0.00, 0 - 0
Dry	1	164	45	0.00

Cover Type	m²
Not recorded	

Water Quality Parameters	
Water Temperature (°C)	9.4
pH	7.5
Dissolved Oxygen (mg/L)	13.6
Conductivity (uS/cm)	36.4
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at 25m downstream looking upstream.



Plate 2 Photograph taken at 25m downstream looking downstream.



Plate 3 Photograph taken at 25m downstream looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 136m downstream looking downstream at the dry channel.

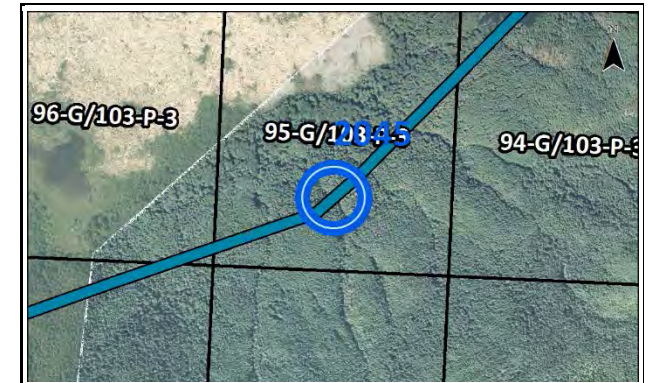


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company



Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ksi Ts'ooihl Ts'ap (WC 2046)  
**UTM (Zone 9 U):** 488115 E, 6112533 N  
**Field Crew:** C. Jerney, M. Henry, S. Whiteside  
**Stream Classification:** S3\*

**Survey Date:** June 17, 2014  
**Sensitivity:** Low  
**Habitat Survey Length (m):** 448  
**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	3.4, 2.8-4.8
Wetted Width (m); Mean, Range	0.2, 0.0-0.6
Water Depth (m); Mean, Range	0.01, 0.00-0.08
Ordinary High Water Mark (m); Mean	0.31
Discharge (m³/s)	Negligible
Stream Gradient (%)	53
Embeddedness	Not Applicable

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Vertical	Vertical
Bank Texture (Dominant/Subdominant)	Large Gravel/Fines	Large Gravel/Fines
Mean Bank Height (m); Mean, Range	1.1, 0.8-1.3	1.4, 0.7-2.5
Grade Of Approach Slopes (%)	Moderate (4-14)	Moderate (4-14)
Riparian Area Width (m)	3	3
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	0
Fines (<2mm)	0
Small Gravel (2-16 mm)	11
Large Gravel (17-64 mm)	20
Cobble (65-256 mm)	23
Boulder (256-400 mm)	46
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	2	320	72	0.00, 0 - 0
Dry	1	122	28	0.00

Cover Type	m²
Not recorded	

Water Quality Parameters	
Water Temperature (°C)	8.8
pH	7.5
Dissolved Oxygen (mg/L)	12.7
Conductivity (uS/cm)	47.9
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.

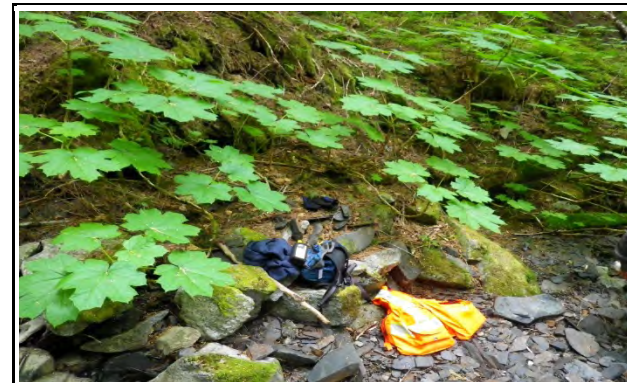


Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 320m downstream looking downstream.

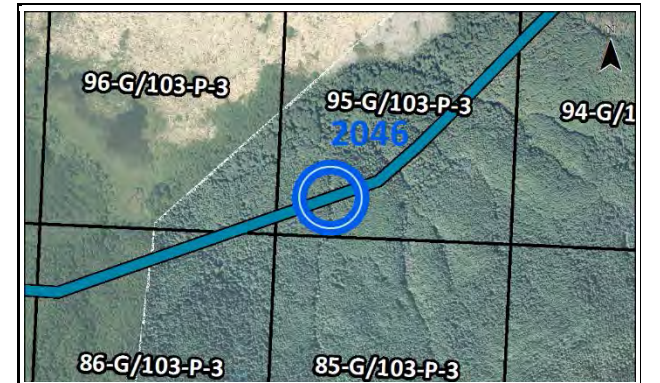


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ksi Ts'oohl Ts'ap (WC 2046.1) **Survey Date:** June 16, 2014  
**UTM (Zone 9 U):** 487806 E, 6112411 N **Sensitivity:** Low  
**Field Crew:** C. Jerney, M. Henry, S. Whiteside **Habitat Survey Length (m):** 410  
**Stream Classification:** S4\* **Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Occasionally Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	1.1, 1.0-1.3
Wetted Width (m); Mean, Range	0.7, 0.5-1.2
Water Depth (m); Mean, Range	0.03, 0.00-0.08
Ordinary High Water Mark (m); Mean	0.19
Discharge (m³/s)	Negligible
Stream Gradient (%)	36
Embeddedness	Not Applicable

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Undercut
Bank Texture (Dominant/Subdominant)	Rock/Organics	Rock/Organics
Mean Bank Height (m); Mean, Range	1.3, 1.1-1.5	1.2, 0.3-3.0
Grade Of Approach Slopes (%)	Moderate (4-14)	High (>14)
Riparian Area Width (m)	5	5
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	0
Fines (<2mm)	4
Small Gravel (2-16 mm)	23
Large Gravel (17-64 mm)	32
Cobble (65-256 mm)	12
Boulder (256-400 mm)	0
Rock (>400 mm)	30

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	2	410	98	0.00, 0 - 0
No defined channel	1	10	2	0.00

Cover Type	m²
Boulders	12
Depth	0
Instream Vegetation	0
Overhanging Vegetation	0
Under Cut Banks	0
Woody Debris	50

Water Quality Parameters	
Water Temperature (°C)	8.8
pH	7.6
Dissolved Oxygen (mg/L)	11.7
Conductivity (uS/cm)	70.5
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

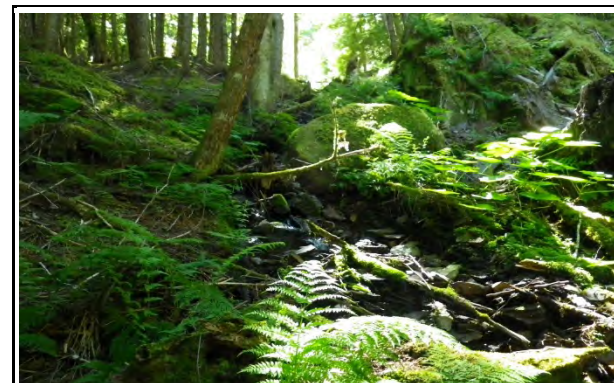


Plate 5 Photograph taken at 140m downstream looking upstream at a high gradient section.

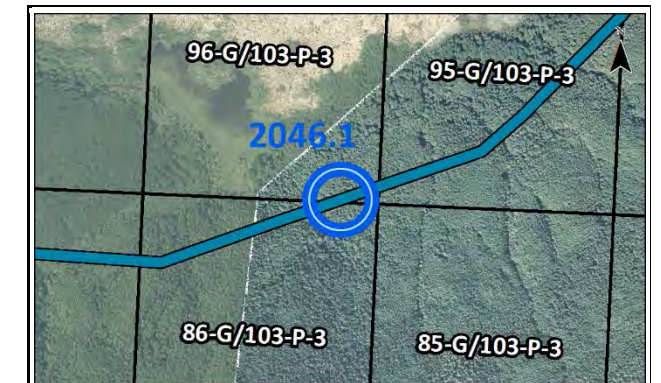


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Ksi Ts'ooihl Ts'ap (WC 2047)**  
**UTM (Zone 9 U): 487752 E, 6112397 N**  
**Field Crew: C. Jerney, M. Henry, S. Whiteside**  
**Stream Classification: S3\***

**Survey Date:** June 15, 2014  
**Sensitivity:** Low  
**Habitat Survey Length (m):** 417  
**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Confined
Channel Pattern	Irregular, Meandering
Channel Width (m); Mean, Range	2.7, 1.3-3.4
Wetted Width (m); Mean, Range	1.7, 0.5-2.6
Water Depth (m); Mean, Range	0.03, 0.00-0.08
Ordinary High Water Mark (m); Mean	0.40
Discharge (m³/s)	Negligible
Stream Gradient (%)	42
Embeddedness	Not Applicable

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Vertical	Vertical
Bank Texture (Dominant/Subdominant)	Rock/Organics	Large Gravel/Organics
Mean Bank Height (m); Mean, Range	2.1, 1.8-2.5	5.1, 4.5-5.5
Grade Of Approach Slopes (%)	Moderate (4-14)	High (>14)
Riparian Area Width (m)	2	12
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	6
Fines (<2mm)	1
Small Gravel (2-16 mm)	14
Large Gravel (17-64 mm)	63
Cobble (65-256 mm)	8
Boulder (256-400 mm)	2
Rock (>400 mm)	5

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	1	70	17	0.00
Dry	1	52	13	0.00
No defined channel	1	285	70	0.00

Cover Type	m²
Boulders	0
Depth	0
Instream Vegetation	0
Overhanging Vegetation	0
Under Cut Banks	0
Woody Debris	5

Water Quality Parameters	
Water Temperature (°C)	8.3
pH	7.3
Dissolved Oxygen (mg/L)	11.0
Conductivity (uS/cm)	72.7
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
No fish captured				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Minnow Trapping	June 16, 2014	6	108 hrs	0	0.00

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 248m downstream looking downstream.

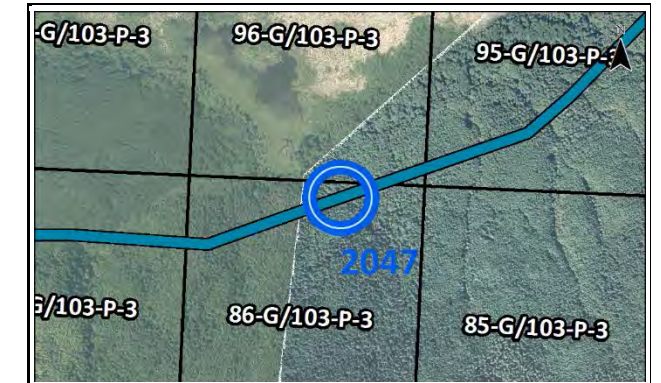


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ksi Ts'ooihl Ts'ap (WC 2048)  
**UTM (Zone 9 U):** 487304 E, 6112214 N  
**Field Crew:** C. Jerney, N. Postma  
**Stream Classification:** S3\*

**Survey Date:** June 15, 2014  
**Sensitivity:** Low  
**Habitat Survey Length (m):**  
**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Frequently Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	3.8, 2.8-4.6
Wetted Width (m); Mean, Range	Dry Channel
Water Depth (m); Mean, Range	n/a
Ordinary High Water Mark (m); Mean	0.30
Discharge (m³/s)	n/a
Stream Gradient (%)	42
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Cobble/Large Gravel	Cobble/Large Gravel
Mean Bank Height (m); Mean, Range	1.2, 0.5-2.1	1.0, 0.6-1.4
Grade Of Approach Slopes (%)	High (>14)	Moderate (4-14)
Riparian Area Width (m)	0	0
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	8
Fines (<2mm)	0
Small Gravel (2-16 mm)	0
Large Gravel (17-64 mm)	28
Cobble (65-256 mm)	33
Boulder (256-400 mm)	24
Rock (>400 mm)	6

Water Quality Parameters	
Water Temperature (°C)	
pH	
Dissolved Oxygen (mg/L)	
Conductivity (uS/cm)	
Turbidity (visual)	

Habitat	No.	Length (m)	%	Velocity (m/s)
Not applicable				

Cover Type	m²
Not recorded	

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.

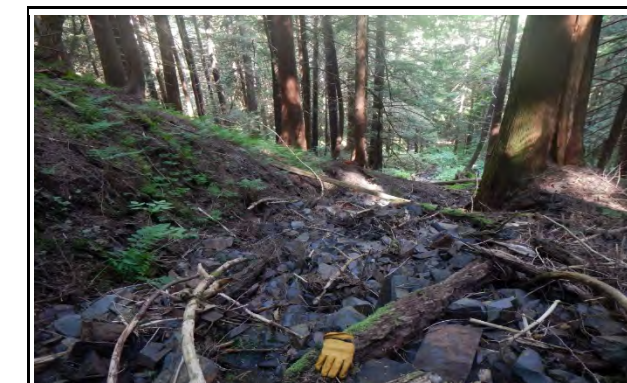


Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.

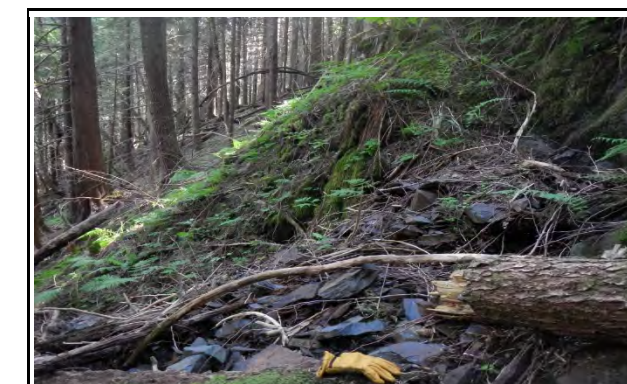


Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 146m downstream looking upstream.

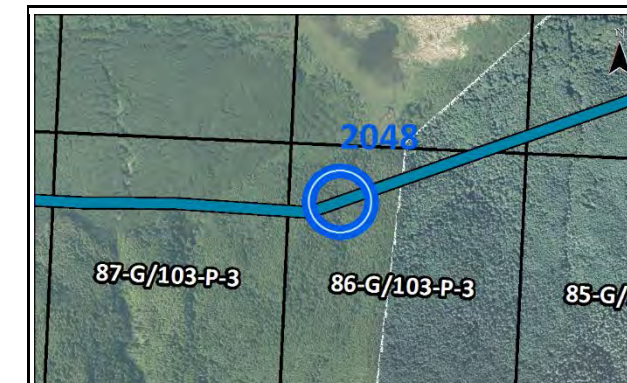


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ksi Ts'ooihl Ts'ap (WC 2049a) **Survey Date:** June 26, 2014  
**UTM (Zone 9 U):** 486850 E, 6112169 N **Sensitivity:** Low  
**Field Crew:** N. Postma, D. Cooper **Habitat Survey Length (m):** 400  
**Stream Classification:** S2\* **Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Frequently Confined
Channel Pattern	Straight
Channel Width (m); Mean, Range	6.3, 2.2-11.3
Wetted Width (m); Mean, Range	1.9, 1.1-4.4
Water Depth (m); Mean, Range	0.08, 0.00-0.24
Ordinary High Water Mark (m); Mean	0.15
Discharge (m³/s)	0.01
Stream Gradient (%)	14
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Vertical
Bank Texture (Dominant/Subdominant)	Fines/Small Gravel	Fines/Small Gravel
Mean Bank Height (m); Mean, Range	0.8, 0.5-1.4	0.8, 0.3-1.3
Grade Of Approach Slopes (%)	Moderate (4-14)	High (>14)
Riparian Area Width (m)	4	3
Dominant Riparian Vegetation Type	Deciduous	Deciduous

Substrate	%
Organics	0
Fines (<2mm)	3
Small Gravel (2-16 mm)	8
Large Gravel (17-64 mm)	7
Cobble (65-256 mm)	36
Boulder (256-400 mm)	45
Rock (>400 mm)	0

Water Quality Parameters	
Water Temperature (°C)	9.3
pH	7.7
Dissolved Oxygen (mg/L)	11.1
Conductivity (uS/cm)	26.0
Turbidity (visual)	Clear

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	2	150	100	0.00, 0 - 0

Cover Type	m²
Boulders	130
Overhanging Vegetation	230
Woody Debris	65

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Marginal	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Marginal	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
No fish captured				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	June 26, 2014	100	281 s	0	0.00
Minnow Trapping	June 26, 2014	5	110 hrs	0	0.00

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 50m upstream looking downstream.

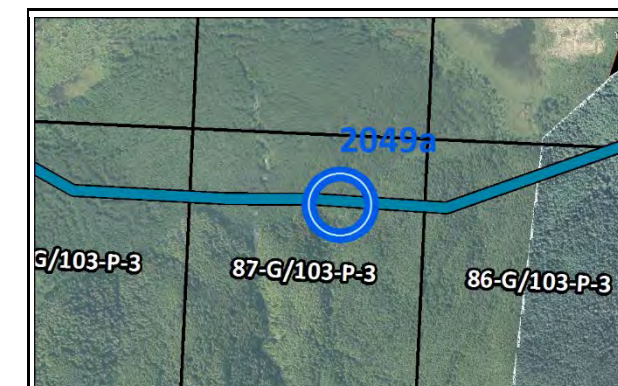


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Ksi Ts'ooihl Ts'ap (WC 2051)**

UTM (Zone 9 U): 486602 E, 6112179 N

Field Crew: J. Cote, D. Cooper

Stream Classification: S2

Survey Date: June 25, 2014

Sensitivity: High

Habitat Survey Length (m): 525

Timing Window of Least Risk: No window

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Occasionally Confined
Channel Pattern	Irregular, Wandering
Channel Width (m); Mean, Range	7.7, 5.0-11.0
Wetted Width (m); Mean, Range	6.4, 4.5-9.0
Water Depth (m); Mean, Range	0.40, 0.12-0.85
Ordinary High Water Mark (m); Mean	0.60
Discharge (m³/s)	1.46
Stream Gradient (%)	7
Embeddedness	Unembedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Organics/Boulders	Organics/Boulders
Mean Bank Height (m); Mean, Range	1.3, 0.4-2.0	2.0, 1.5-2.5
Grade Of Approach Slopes (%)	Moderate (4-14)	Moderate (4-14)
Riparian Area Width (m)	30	30
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	1
Fines (<2mm)	8
Small Gravel (2-16 mm)	10
Large Gravel (17-64 mm)	15
Cobble (65-256 mm)	23
Boulder (256-400 mm)	43
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	3	247	34	0.47, 0.4 - 0.5
Pool	2	50	7	0.25, 0.2 - 0.3
Rapid	4	419	59	0.35, 0.3 - 0.4

Cover Type	m²
Boulders	41
Depth	9
Instream Vegetation	0
Overhanging Vegetation	44
Under Cut Banks	0
Woody Debris	17

Water Quality Parameters	
Water Temperature (°C)	8.9
pH	7.7
Dissolved Oxygen (mg/L)	11.6
Conductivity (uS/cm)	15.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Marginal
Trout	Unsuitable	Marginal	Unsuitable	Unsuitable	Marginal
Char	Unsuitable	Marginal	Marginal	Unsuitable	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	8	0	107, 83-146	Chinook salmon, chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, lamprey, pink salmon, sculpin, sockeye salmon, steelhead, threespine stickleback
Coho salmon	0	15	n/a	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	June 25, 2014	75	701 s	3	0.43
Minnow Trapping	June 25, 2014	5	100 hrs	5	0.05
Observation	June 25, 2014	n/a	n/a	15	n/a

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments

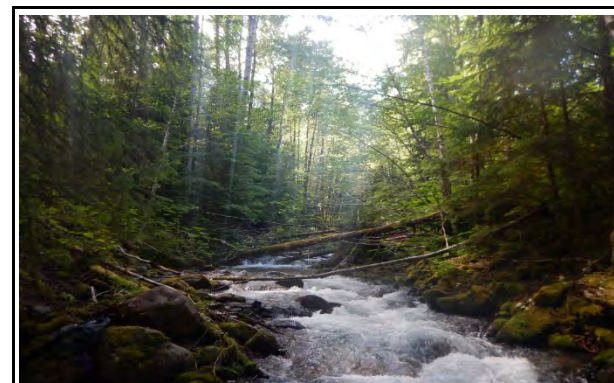


Plate 1 Photograph taken at right-of-way looking upstream.

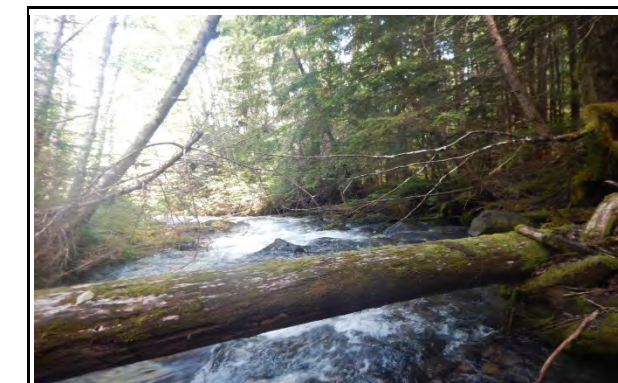


Plate 2 Photograph taken at right-of-way looking downstream.

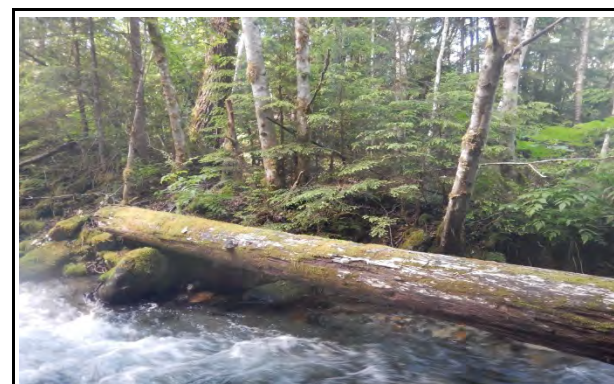


Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 575m downstream looking downstream at river right turning into a riffle-pool channel.

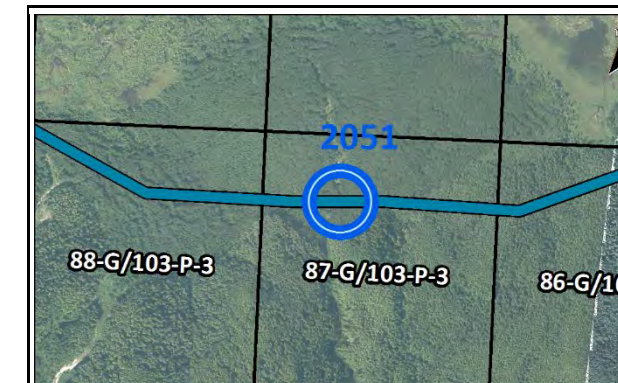


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ksi Ts'ooihl Ts'ap (WC 2053)  
**UTM (Zone 9 U):** 485856 E, 6112726 N  
**Field Crew:** C. Jerney, M. Bahr  
**Stream Classification:** S3

**Survey Date:** June 13, 2014  
**Sensitivity:** High  
**Habitat Survey Length (m):** 200  
**Timing Window of Least Risk:** August 1- August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Frequently Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	3.6, 2.1-5.1
Wetted Width (m); Mean, Range	Dry Channel
Water Depth (m); Mean, Range	n/a
Ordinary High Water Mark (m); Mean	0.00
Discharge (m³/s)	n/a
Stream Gradient (%)	11
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Vertical	Sloping
Bank Texture (Dominant/Subdominant)	Large Gravel/Fines	Large Gravel/Fines
Mean Bank Height (m); Mean, Range	1.5, 1.0-1.8	1.1, 1.0-1.3
Grade Of Approach Slopes (%)	Moderate (4-14)	Moderate (4-14)
Riparian Area Width (m)	5	5
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	0
Fines (<2mm)	13
Small Gravel (2-16 mm)	17
Large Gravel (17-64 mm)	38
Cobble (65-256 mm)	28
Boulder (256-400 mm)	5
Rock (>400 mm)	0

Water Quality Parameters	
Water Temperature (°C)	
pH	
Dissolved Oxygen (mg/L)	
Conductivity (uS/cm)	
Turbidity (visual)	

Habitat	No.	Length (m)	%	Velocity (m/s)
Not applicable				

Cover Type	m²
Not recorded	

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Marginal
Trout	Unsuitable	Marginal	Unsuitable	Unsuitable	Marginal
Char	Unsuitable	Marginal	Unsuitable	Unsuitable	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	5	0	88, 69-123	None
Coastal cutthroat trout	1	0	109	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Minnow Trapping	June 13, 2014	4	76 hrs	6	0.08

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 270m downstream looking upstream.

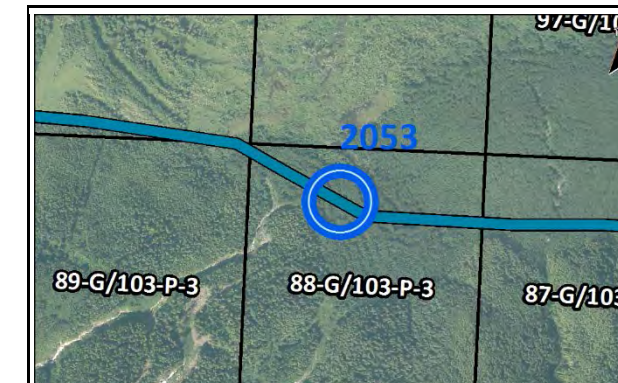


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ksi Ts'ooihl Ts'ap (WC 2054)  
**UTM (Zone 9 U):** 485810 E, 6112249 N  
**Field Crew:** C. Jerney, N. Postma  
**Stream Classification:** S2

**Survey Date:** June 14, 2014  
**Sensitivity:** High  
**Habitat Survey Length (m):** 200  
**Timing Window of Least Risk:** August 1- August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	6.3, 5.0-9.0
Wetted Width (m); Mean, Range	3.5, 2.8-5.1
Water Depth (m); Mean, Range	0.19, 0.05-0.33
Ordinary High Water Mark (m); Mean	0.71
Discharge (m³/s)	0.53
Stream Gradient (%)	33
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Overhanging	Overhanging
Bank Texture (Dominant/Subdominant)	Fines/Small Gravel	Fines/Small Gravel
Mean Bank Height (m); Mean, Range	1.7, 1.0-2.2	2.0, 1.6-3.0
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	5	4
Dominant Riparian Vegetation Type	Mixed C and D	Shrub

Substrate	%
Organics	0
Fines (<2mm)	11
Small Gravel (2-16 mm)	23
Large Gravel (17-64 mm)	32
Cobble (65-256 mm)	18
Boulder (256-400 mm)	15
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	1	100	51	0.80
Riffle	2	90	46	0.73, 0.7 - 0.75
Run	1	5	3	0.50

Cover Type	m²
Boulders	31
Depth	0
Instream Vegetation	0
Overhanging Vegetation	78
Under Cut Banks	21
Woody Debris	20

Water Quality Parameters	
Water Temperature (°C)	5.6
pH	7.8
Dissolved Oxygen (mg/L)	11.7
Conductivity (uS/cm)	9.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Important	Important	Unsuitable	Marginal	Marginal
Trout	Important	Important	Marginal	Marginal	Marginal
Char	Important	Important	Marginal	Marginal	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	5	0	88, 69-123	None
Coastal cutthroat trout	1	0	109	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	June 14, 2014	50	274 s	0	0.00
Minnow Trapping	June 13, 2014	9	181 hrs	6	0.03

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.

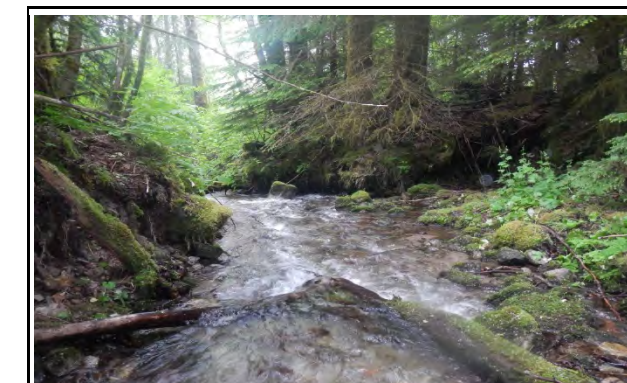


Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 400m downstream looking west at a wetland.

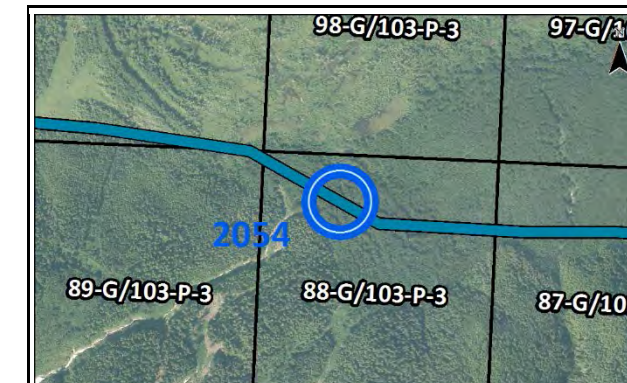


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company



Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ksi Ts'ooihl Ts'ap (NCD 2055) **Survey Date:** June 22, 2014  
**UTM (Zone 9 U):** 485060 E, 6112454 N **Sensitivity:** Low  
**Field Crew:** N. Postma, S. Whiteside **Habitat Survey Length (m):** 400  
**Stream Classification:** NCD **Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 1)	
Confinement	Unconfined
Channel Pattern	Irregular, Wandering
Channel Width (m); Mean, Range	n/a
Wetted Width (m); Mean, Range	16.0, 16.0-16.0
Water Depth (m); Mean, Range	0.63, 0.40-1.00
Ordinary High Water Mark (m); Mean	n/a
Discharge (m³/s)	Negligible
Stream Gradient (%)	1
Embeddedness	Not Applicable

Channel and Flow Conditions Continued			
Beaver Dams	Yes		
Native Channel Width (m)	n/a		
Bank Conditions		Left Bank	Right Bank
Bank Shape		n/a	n/a
Bank Texture (Dominant/Subdominant)		n/a	n/a
Mean Bank Height (m); Mean, Range		n/a	n/a
Grade Of Approach Slopes (%)		Low (<4)	Low (<4)
Riparian Area Width (m)		9	4
Dominant Riparian Vegetation Type		Shrub	Shrub

Substrate	%
Organics	100
Fines (<2mm)	0
Small Gravel (2-16 mm)	0
Large Gravel (17-64 mm)	0
Cobble (65-256 mm)	0
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Flat	2	280	93	0.00, 0 - 0
Impoundment	1	20	7	0.00

Cover Type	m²
Boulders	0
Depth	140
Instream Vegetation	1140
Overhanging Vegetation	700
Under Cut Banks	0
Woody Debris	170

Water Quality Parameters	
Water Temperature (°C)	12.8
pH	6.9
Dissolved Oxygen (mg/L)	4.7
Conductivity (uS/cm)	53.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Marginal	Unsuitable	Marginal	Marginal
Trout	Unsuitable	Marginal	Marginal	Marginal	Marginal
Char	Unsuitable	Marginal	Marginal	Marginal	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Threespine stickleback	117	25	42, 29-61	None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	June 22, 2014	100	368 s	0	0.00
Minnow Trapping	June 22, 2014	5	105 hrs	117	1.11

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments

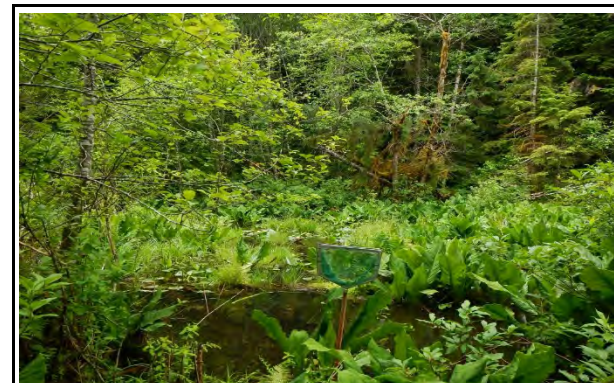


Plate 1 Photograph taken at right-of-way looking upslope.

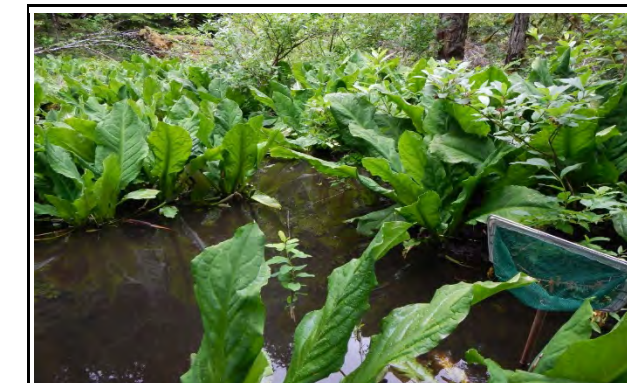


Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.

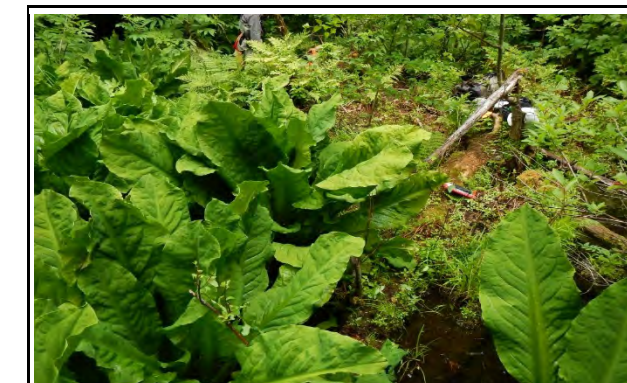


Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 300m downstream looking downslope.

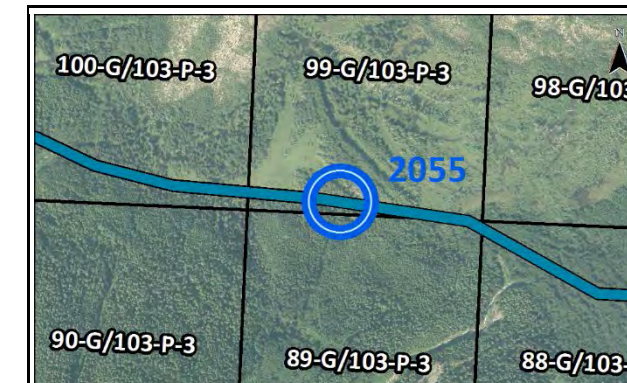


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ksi Ts'ooihl Ts'ap (NCD 2056)  
**UTM (Zone 9 U):** 484770 E, 6112472 N  
**Field Crew:** C. Jerney, M. Bahr  
**Stream Classification:** NCD

**Survey Date:** June 12, 2014  
**Sensitivity:** High  
**Habitat Survey Length (m):** 200  
**Timing Window of Least Risk:** June 15- September 1

Channel and Flow Conditions (No. of Transects: 1)	
Confinement	
Channel Pattern	
Channel Width (m); Mean, Range	n/a
Wetted Width (m); Mean, Range	35.0, 35.0-35.0
Water Depth (m); Mean, Range	0.15, 0.00-0.45
Ordinary High Water Mark (m); Mean	n/a
Discharge (m³/s)	Negligible
Stream Gradient (%)	1
Embeddedness	Not Applicable

Channel and Flow Conditions Continued			
Beaver Dams	No		
Native Channel Width (m)	n/a		
Bank Conditions		Left Bank	Right Bank
Bank Shape		n/a	n/a
Bank Texture (Dominant/Subdominant)		n/a	n/a
Mean Bank Height (m); Mean, Range		n/a	n/a
Grade Of Approach Slopes (%)		Low (<4)	Low (<4)
Riparian Area Width (m)		8	27
Dominant Riparian Vegetation Type		Grass	Grass

Substrate	%
Organics	NR
Fines (<2mm)	NR
Small Gravel (2-16 mm)	NR
Large Gravel (17-64 mm)	NR
Cobble (65-256 mm)	NR
Boulder (256-400 mm)	NR
Rock (>400 mm)	NR

Habitat	No.	Length (m)	%	Velocity (m/s)
No defined channel	2	200	100	0.00, 0 - 0

Cover Type	m²
Depth	5
Overhanging Vegetation	60
Under Cut Banks	30

Water Quality Parameters	
Water Temperature (°C)	12.2
pH	6.1
Dissolved Oxygen (mg/L)	3.5
Conductivity (uS/cm)	29.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Marginal	Unsuitable	Marginal	Marginal
Trout	Unsuitable	Marginal	Unsuitable	Unsuitable	Marginal
Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking north.



Plate 2 Photograph taken at right-of-way looking south.



Plate 3 Photograph taken at right-of-way looking east.



Plate 4 Photograph taken at right-of-way looking west.



Plate 5 Photograph taken at 50m downstream looking west at a wetland.

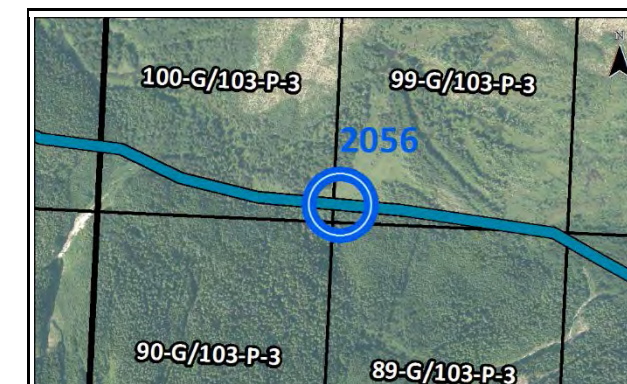


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ksi Ts'ooih Ts'ap (NCD 2057.1) **Survey Date:** June 12, 2014  
**UTM (Zone 9 U):** 484710 E, 6112482 N **Sensitivity:** High  
**Field Crew:** C. Jerney, M. Bahr **Habitat Survey Length (m):** 200  
**Stream Classification:** NCD **Timing Window of Least Risk:** June 15- September 1

Channel and Flow Conditions (No. of Transects: 1)		Channel and Flow Conditions Continued		
Confinement		Beaver Dams	Yes	
Channel Pattern		Native Channel Width (m)	n/a	
Channel Width (m); Mean, Range	n/a	<b>Bank Conditions</b>	<b>Left Bank</b>	<b>Right Bank</b>
Wetted Width (m); Mean, Range	35.0, 35.0-35.0	Bank Shape	n/a	n/a
Water Depth (m); Mean, Range	0.15, 0.00-0.45	Bank Texture (Dominant/Subdominant)	n/a	n/a
Ordinary High Water Mark (m); Mean	n/a	Mean Bank Height (m); Mean, Range	n/a	n/a
Discharge (m³/s)	Negligible	Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Stream Gradient (%)	0	Riparian Area Width (m)	12	31
Embeddedness	Not Applicable	Dominant Riparian Vegetation Type	Grass	Grass

Substrate	%
Organics	100
Fines (<2mm)	0
Small Gravel (2-16 mm)	0
Large Gravel (17-64 mm)	0
Cobble (65-256 mm)	0
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Water Quality Parameters	
Water Temperature (°C)	12.2
pH	6.1
Dissolved Oxygen (mg/L)	3.5
Conductivity (uS/cm)	29.0
Turbidity (visual)	Clear

Habitat	No.	Length (m)	%	Velocity (m/s)	Cover Type	m²
No defined channel	2	200	100	0.00, 0 - 0	Depth	5
					Overhanging Vegetation	60
					Under Cut Banks	30

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Marginal	Unsuitable	Marginal	Marginal
Trout	Unsuitable	Marginal	Unsuitable	Unsuitable	Marginal
Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Coho salmon	6	0	69, 52-86	None
Threespine stickleback	4	0	55, 44-64	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Dip Net	June 12, 2014	n/a	n/a	1	n/a
Minnow Trapping	June 13, 2014	2	8 hrs	9	1.13

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

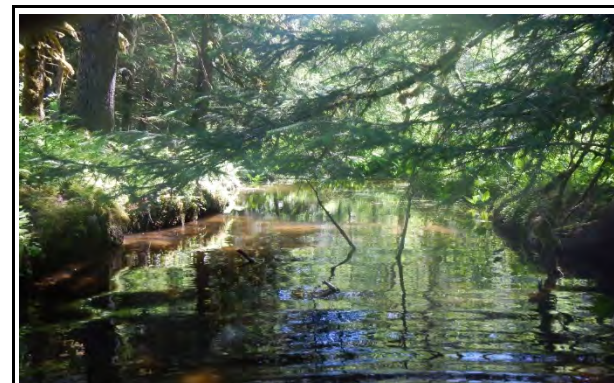


Plate 5 Photograph taken at 233m downstream looking upslope.

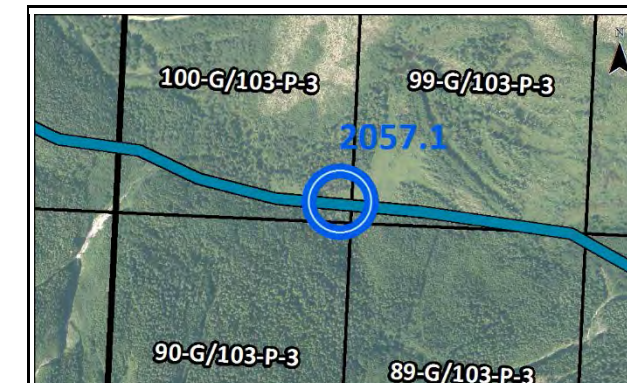


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ksi Ts'ooihl Ts'ap (NCD 2057)  
**UTM (Zone 9 U):** 484613 E, 6112479 N  
**Field Crew:** C. Jerney, M. Bahr  
**Stream Classification:** NCD

**Survey Date:** June 12, 2014  
**Sensitivity:** High  
**Habitat Survey Length (m):** 200  
**Timing Window of Least Risk:** June 15 - September 1

Channel and Flow Conditions (No. of Transects: 1)	
Confinement	
Channel Pattern	
Channel Width (m); Mean, Range	n/a
Wetted Width (m); Mean, Range	35.0, 35.0-35.0
Water Depth (m); Mean, Range	0.15, 0.00-0.45
Ordinary High Water Mark (m); Mean	n/a
Discharge (m³/s)	Negligible
Stream Gradient (%)	1
Embeddedness	Not Applicable

Channel and Flow Conditions Continued			
Beaver Dams	Yes		
Native Channel Width (m)	n/a		
Bank Conditions		Left Bank	Right Bank
Bank Shape		n/a	n/a
Bank Texture (Dominant/Subdominant)		n/a	n/a
Mean Bank Height (m); Mean, Range		n/a	n/a
Grade Of Approach Slopes (%)		Low (<4)	Low (<4)
Riparian Area Width (m)		10	31
Dominant Riparian Vegetation Type		Grass	Grass

Substrate	%
Organics	100
Fines (<2mm)	0
Small Gravel (2-16 mm)	0
Large Gravel (17-64 mm)	0
Cobble (65-256 mm)	0
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Water Quality Parameters	
Water Temperature (°C)	12.2
pH	6.1
Dissolved Oxygen (mg/L)	3.5
Conductivity (uS/cm)	29.0
Turbidity (visual)	Clear

Habitat	No.	Length (m)	%	Velocity (m/s)
No defined channel	2	200	100	0.00, 0 - 0

Cover Type	m²
Depth	5
Overhanging Vegetation	60
Under Cut Banks	30

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Marginal	Unsuitable	Marginal	Marginal
Trout	Unsuitable	Marginal	Unsuitable	Marginal	Marginal
Char	Unsuitable	Marginal	Unsuitable	Marginal	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Coho salmon	6	0	69, 52-86	None
Threespine stickleback	4	0	55, 44-64	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Dip Net	June 12, 2014	n/a	n/a	1	n/a
Minnow Trapping	June 13, 2014	2	8 hrs	9	1.13

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

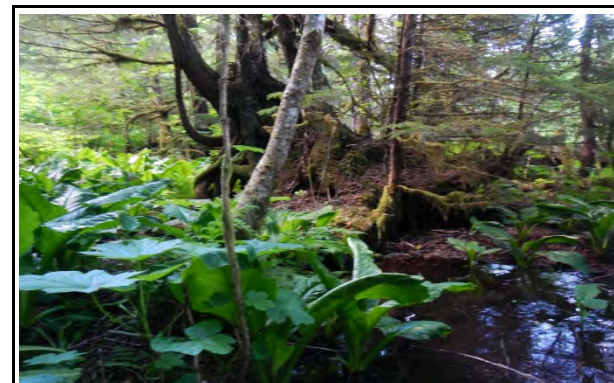


Plate 5 Photograph taken at 175m upstream looking downslope.

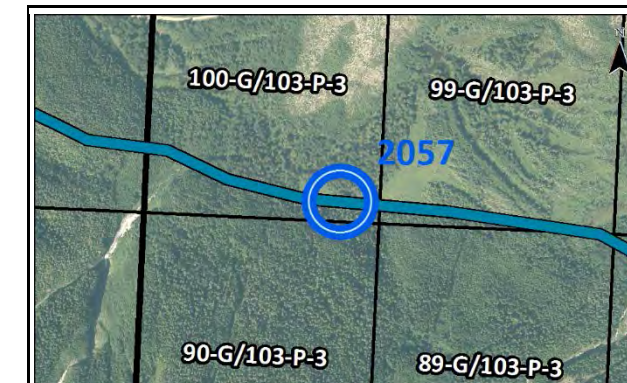


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ksi Ts'ooihl Ts'ap (WC 2059)  
**UTM (Zone 9 U):** 484111 E, 6112603 N  
**Field Crew:** N. Postma, S. Whiteside  
**Stream Classification:** S2

**Survey Date:** June 21, 2014  
**Sensitivity:** High  
**Habitat Survey Length (m):** 400  
**Timing Window of Least Risk:** June 15 - July 20

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Unconfined
Channel Pattern	Straight
Channel Width (m); Mean, Range	7.1, 4.8-9.7
Wetted Width (m); Mean, Range	3.9, 2.3-6.8
Water Depth (m); Mean, Range	0.10, 0.01-0.28
Ordinary High Water Mark (m); Mean	0.16
Discharge (m³/s)	NR
Stream Gradient (%)	20
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Boulders/Cobble	Boulders/Cobble
Mean Bank Height (m); Mean, Range	0.6, 0.3-1.0	0.8, 0.4-1.1
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	55	55
Dominant Riparian Vegetation Type	Shrub	Shrub

Substrate	%
Organics	0
Fines (<2mm)	0
Small Gravel (2-16 mm)	22
Large Gravel (17-64 mm)	20
Cobble (65-256 mm)	23
Boulder (256-400 mm)	27
Rock (>400 mm)	8

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	2	270	73	0.00, 0 - 0
Riffle	1	100	27	0.00

Cover Type	m²
Boulders	350
Depth	0
Instream Vegetation	0
Overhanging Vegetation	400
Under Cut Banks	0
Woody Debris	25

Water Quality Parameters	
Water Temperature (°C)	6.3
pH	8.4
Dissolved Oxygen (mg/L)	11.8
Conductivity (uS/cm)	25.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Marginal
Trout	Unsuitable	Marginal	Unsuitable	Unsuitable	Marginal
Char	Unsuitable	Marginal	Unsuitable	Unsuitable	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range
Char	3	0	120, 115-128
Coho salmon	24	30	55, 42-83
Sockeye salmon	1	0	60
Threespine stickleback	11	0	50, 38-62

Fish Species Previously Documented
Coho salmon, Dolly Varden, threespine stickleback

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	June 21, 2014	100	400 s	0	0.00
Minnow Trapping	June 21, 2014	5	105 hrs	39	0.37

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments

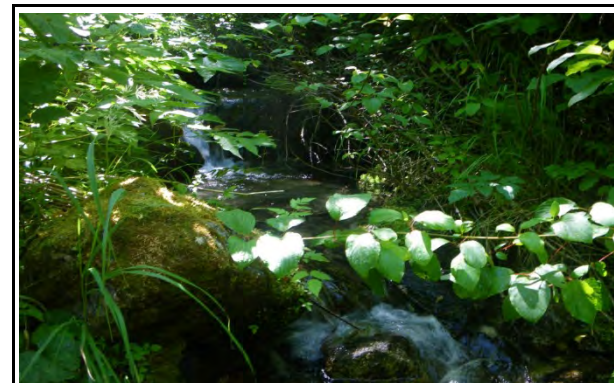


Plate 1 Photograph taken at right-of-way looking upstream.

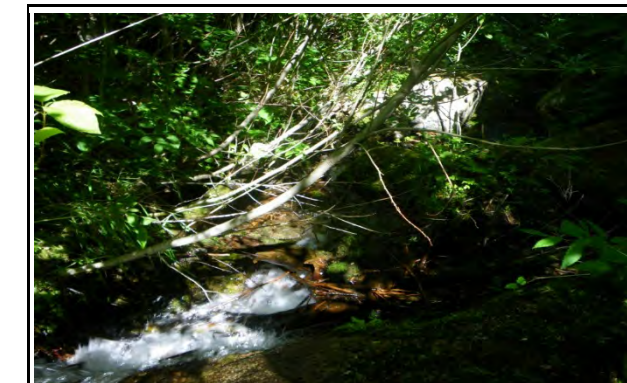


Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

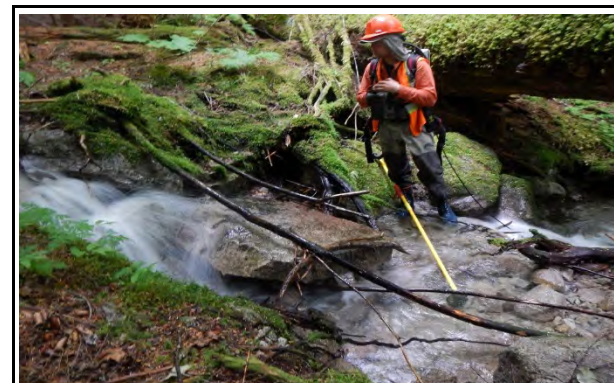


Plate 5 Photograph taken at 140m upstream looking left.



Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ksi Ts'ooihl Ts'ap (WC 760a)  
**UTM (Zone 9 U):** 483085 E, 6112940 N  
**Field Crew:** M. Henry, K. Gasser  
**Stream Classification:** S3

**Survey Date:** June 19, 2014  
**Sensitivity:** High  
**Habitat Survey Length (m):** 435  
**Timing Window of Least Risk:** June 15 - August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Occasionally Confined
Channel Pattern	Irregular, Wandering
Channel Width (m); Mean, Range	4.5, 2.9-6.0
Wetted Width (m); Mean, Range	3.4, 2.1-5.5
Water Depth (m); Mean, Range	0.10, 0.02-0.36
Ordinary High Water Mark (m); Mean	0.20
Discharge (m³/s)	0.02
Stream Gradient (%)	20
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued			
Beaver Dams	No		
Native Channel Width (m)	n/a		
Bank Conditions		Left Bank	Right Bank
Bank Shape		Vertical	Sloping
Bank Texture (Dominant/Subdominant)		Cobble/Organics	Rock/Organics
Mean Bank Height (m); Mean, Range		0.9, 0.3-1.5	9.2, 3.5-15.0
Grade Of Approach Slopes (%)		Low (<4)	Low (<4)
Riparian Area Width (m)		15	5
Dominant Riparian Vegetation Type		Coniferous	Coniferous

Substrate	%
Organics	0
Fines (<2mm)	8
Small Gravel (2-16 mm)	23
Large Gravel (17-64 mm)	26
Cobble (65-256 mm)	18
Boulder (256-400 mm)	25
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Flat	2	20	19	0.00, 0 - 0
Riffle	8	64	60	0.35, 0.25 - 0.6
Run	7	23	21	0.19, 0.1 - 0.3

Cover Type	m²
Overhanging Vegetation	9
Under Cut Banks	18
Woody Debris	5

Water Quality Parameters	
Water Temperature (°C)	9.2
pH	7.4
Dissolved Oxygen (mg/L)	14.0
Conductivity (uS/cm)	33.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Marginal	Marginal	Unsuitable	Marginal	Marginal
Trout	Marginal	Marginal	Marginal	Marginal	Marginal
Char	Marginal	Marginal	Marginal	Marginal	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range
Char	4	0	75, 29-112
Coho salmon	7	0	33, 28-40
Salmonid	0	25	n/a

Fish Species Previously Documented
None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	June 19, 2014	150	337 s	5	1.48
Dip Net	June 19, 2014	n/a	n/a	6	n/a
Observation	June 19, 2014	n/a	n/a	25	n/a

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 200m downstream looking downstream.

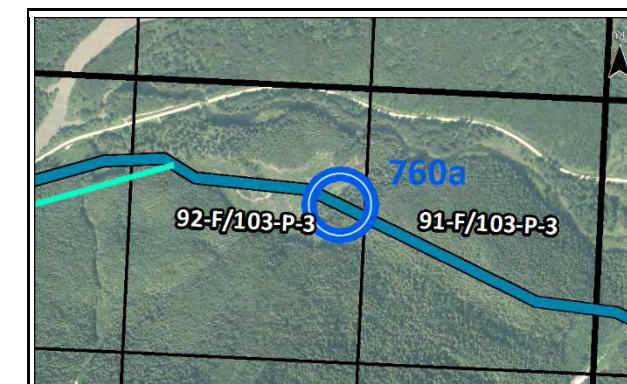


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



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Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ksi Ts'ooihl Ts'ap (WC 761a)  
**UTM (Zone 9 U):** 482754 E, 6113013 N  
**Field Crew:** M. Henry, K. Gasser  
**Stream Classification:** S3

**Survey Date:** June 20, 2014  
**Sensitivity:** High  
**Habitat Survey Length (m):** 743  
**Timing Window of Least Risk:** June 15- August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Frequently Confined
Channel Pattern	Irregular, Wandering
Channel Width (m); Mean, Range	2.1, 1.1-2.7
Wetted Width (m); Mean, Range	1.2, 0.5-2.0
Water Depth (m); Mean, Range	0.08, 0.00-0.18
Ordinary High Water Mark (m); Mean	0.19
Discharge (m³/s)	0.01
Stream Gradient (%)	18
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions		
	Left Bank	Right Bank
Bank Shape	Vertical	Sloping
Bank Texture (Dominant/Subdominant)	Rock/Boulders	Boulders/Organics
Mean Bank Height (m); Mean, Range	2.9, 1.0-4.0	0.7, 0.4-1.0
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	0	15
Dominant Riparian Vegetation Type	None	Mixed C and D

Substrate	%
Organics	0
Fines (<2mm)	27
Small Gravel (2-16 mm)	13
Large Gravel (17-64 mm)	21
Cobble (65-256 mm)	12
Boulder (256-400 mm)	28
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	1	275	37	0.15
Flat	1	5	1	0.01
Other	1	445	60	0.00
Run	2	18	2	0.08, 0.05 - 0.1

Cover Type	m²
Overhanging Vegetation	1
Under Cut Banks	1
Woody Debris	1

Water Quality Parameters	
Water Temperature (°C)	9.6
pH	7.3
Dissolved Oxygen (mg/L)	12.8
Conductivity (uS/cm)	30.2
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Marginal	Important	Unsuitable	Marginal	Marginal
Trout	Marginal	Important	Marginal	Marginal	Marginal
Char	Marginal	Important	Marginal	Marginal	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	2	0	86, 80-91	Coho salmon
Coho salmon	1	5	61	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Minnow Trapping	June 18, 2014	5	100 hrs	3	0.03
Observation	June 20, 2014	n/a	n/a	5	n/a

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments

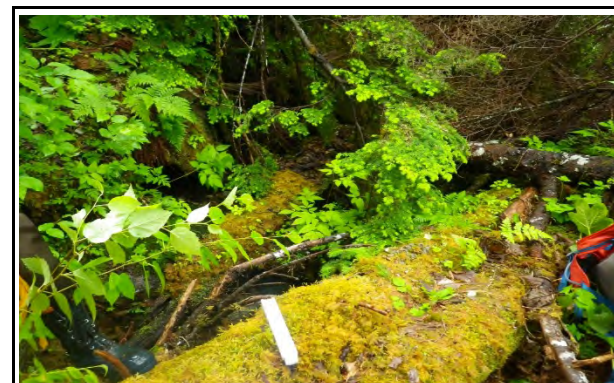


Plate 1 Photograph taken at right-of-way looking upstream.

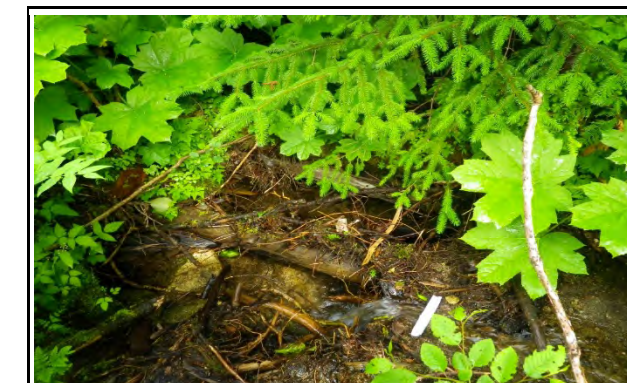


Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.

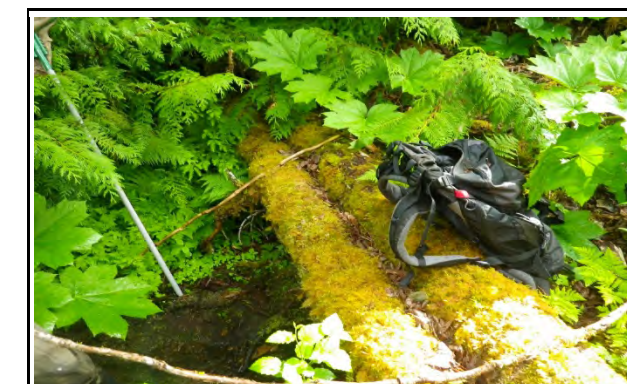


Plate 4 Photograph taken at right-of-way looking right.

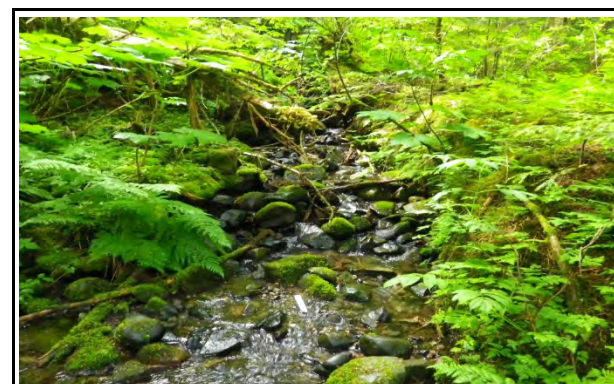


Plate 5 Photograph taken at 160m downstream looking upstream.

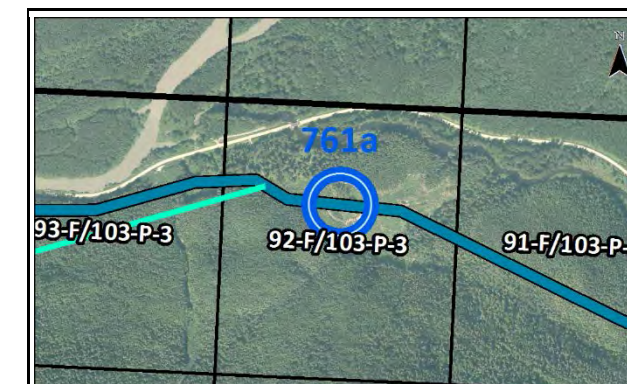


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ksi Ts'ooihl Ts'ap (WC 762a)  
**UTM (Zone 9 U):** 482240 E, 6113061 N  
**Field Crew:** M. Henry, K. Gasser  
**Stream Classification:** S3\*

**Survey Date:** June 18, 2014  
**Sensitivity:** Low  
**Habitat Survey Length (m):** 250  
**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Occasionally Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	3.5, 2.0-4.2
Wetted Width (m); Mean, Range	Dry Channel
Water Depth (m); Mean, Range	n/a
Ordinary High Water Mark (m); Mean	0.20
Discharge (m³/s)	n/a
Stream Gradient (%)	
Embeddedness	Not Applicable

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Vertical
Bank Texture (Dominant/Subdominant)	Boulders/Large Gravel	Boulders/Large Gravel
Mean Bank Height (m); Mean, Range	1.3, 1.0-2.0	2.0, 1.4-2.5
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	3	1
Dominant Riparian Vegetation Type	Mixed C and D	Coniferous

Substrate	%
Organics	0
Fines (<2mm)	5
Small Gravel (2-16 mm)	8
Large Gravel (17-64 mm)	14
Cobble (65-256 mm)	32
Boulder (256-400 mm)	40
Rock (>400 mm)	0

Water Quality Parameters	
Water Temperature (°C)	
pH	
Dissolved Oxygen (mg/L)	
Conductivity (uS/cm)	
Turbidity (visual)	

Habitat	No.	Length (m)	%	Velocity (m/s)
Not applicable				

Cover Type	m²
Not recorded	

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments

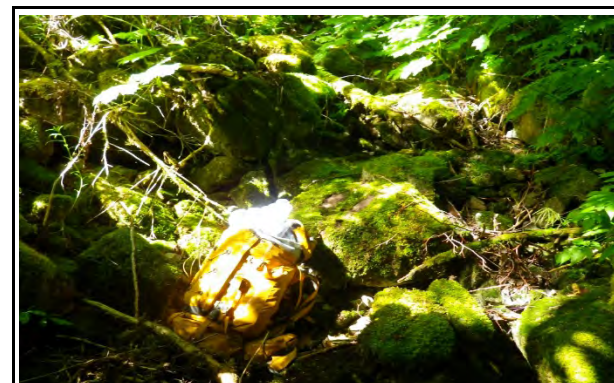


Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

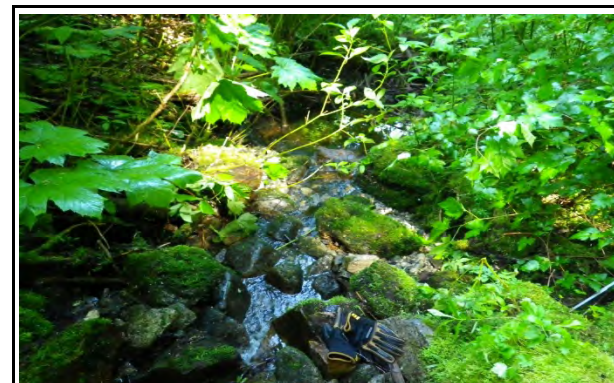


Plate 5 Photograph taken at 100m upstream looking downstream.

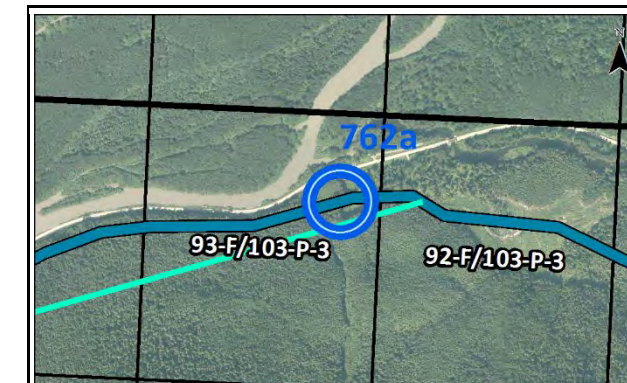


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**





Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Kwinyarh Creek (WC 767a)**

**Survey Date:** July 01, 2014

**UTM (Zone 9 U):** 479684 E, 6112310 N

**Sensitivity:** High

**Field Crew:** J. Beblow, S. Courtney

**Habitat Survey Length (m):** 150

**Stream Classification:** S3

**Timing Window of Least Risk:** August 1 - January 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	4.6, 4.0-5.1
Wetted Width (m); Mean, Range	3.0, 1.7-4.2
Water Depth (m); Mean, Range	0.15, 0.01-0.26
Ordinary High Water Mark (m); Mean	0.10
Discharge (m³/s)	0.04
Stream Gradient (%)	16
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Vertical	Vertical
Bank Texture (Dominant/Subdominant)	Cobble/Boulders	Cobble/Boulders
Mean Bank Height (m); Mean, Range	2.9, 1.5-4.0	2.0, 1.5-2.3
Grade Of Approach Slopes (%)	High (>14)	High (>14)
Riparian Area Width (m)	30	30
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	0
Fines (<2mm)	2
Small Gravel (2-16 mm)	8
Large Gravel (17-64 mm)	17
Cobble (65-256 mm)	28
Boulder (256-400 mm)	46
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Pool	2	7	7	0.06, 0.06 - 0.06
Riffle	3	93	93	0.19, 0.19 - 0.19

Cover Type	m²
Boulders	155
Overhanging Vegetation	21
Woody Debris	43

Water Quality Parameters	
Water Temperature (°C)	6.2
pH	7.5
Dissolved Oxygen (mg/L)	12.0
Conductivity (uS/cm)	17.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Marginal	Marginal	Unsuitable	Marginal	Marginal
Trout	Marginal	Marginal	Marginal	Marginal	Marginal
Char	Marginal	Marginal	Marginal	Marginal	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Coastal cutthroat trout	6	0	83, 69-115	Coastal cutthroat trout

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 01, 2014	120	700 s	12	1.71
Minnow Trapping	July 01, 2014	5	25 hrs	0	0.00

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments

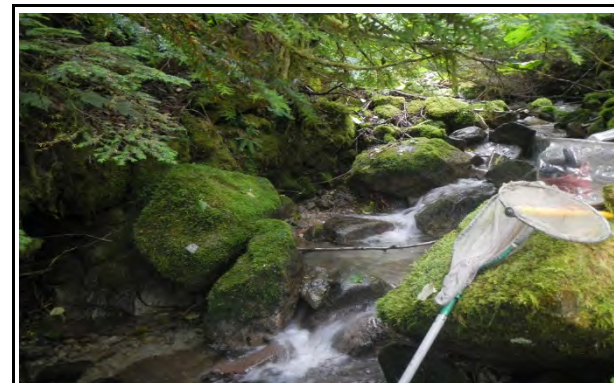


Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.

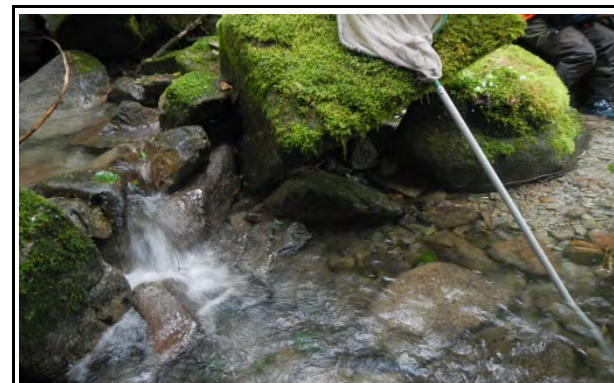


Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

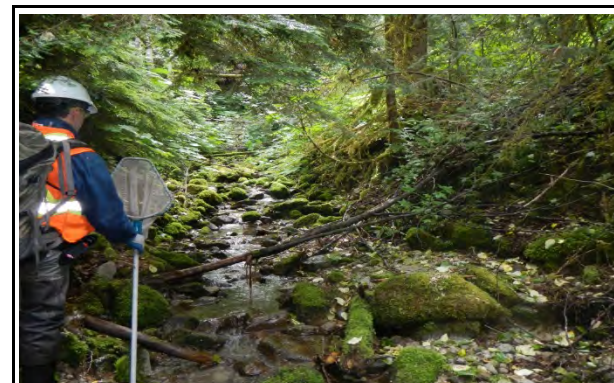


Plate 5 Photograph taken at 70m downstream looking upstream at a riffle.

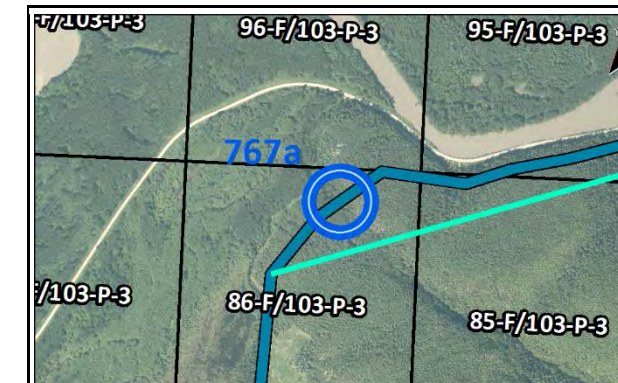


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Ksi Ts'ooihl Ts'ap (WC 2509)**  
**UTM (Zone 9 U): 482211 E, 6112966 N**  
**Field Crew: M. Henry, K. Gasser**  
**Stream Classification: S3\***

**Survey Date:** June 18, 2014  
**Sensitivity:** Low  
**Habitat Survey Length (m):** 350  
**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Occasionally Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	1.8, 1.5-2.3
Wetted Width (m); Mean, Range	0.9, 0.6-1.4
Water Depth (m); Mean, Range	0.10, 0.00-0.27
Ordinary High Water Mark (m); Mean	0.12
Discharge (m³/s)	Negligible
Stream Gradient (%)	33
Embeddedness	Not Applicable

Channel and Flow Conditions Continued			
Beaver Dams	No		
Native Channel Width (m)	n/a		
Bank Conditions		Left Bank	Right Bank
Bank Shape	Sloping		Vertical
Bank Texture (Dominant/Subdominant)	Boulders/Cobble		Rock/Boulders
Mean Bank Height (m); Mean, Range	1.1, 0.8-1.6		5.9, 0.3-18.0
Grade Of Approach Slopes (%)	High (>14)		Low (<4)
Riparian Area Width (m)	10		5
Dominant Riparian Vegetation Type	Shrub		Shrub

Substrate	%
Organics	0
Fines (<2mm)	5
Small Gravel (2-16 mm)	12
Large Gravel (17-64 mm)	28
Cobble (65-256 mm)	25
Boulder (256-400 mm)	30
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	2	240	69	0.00, 0 - 0
Culvert	1	30	9	0.00
Impoundment	1	10	3	0.00
No defined channel	1	70	20	0.00

Cover Type	m²
Boulders	0
Depth	0
Instream Vegetation	0
Overhanging Vegetation	0
Under Cut Banks	0
Woody Debris	0

Water Quality Parameters	
Water Temperature (°C)	9.4
pH	7.4
Dissolved Oxygen (mg/L)	13.4
Conductivity (uS/cm)	25.5
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments

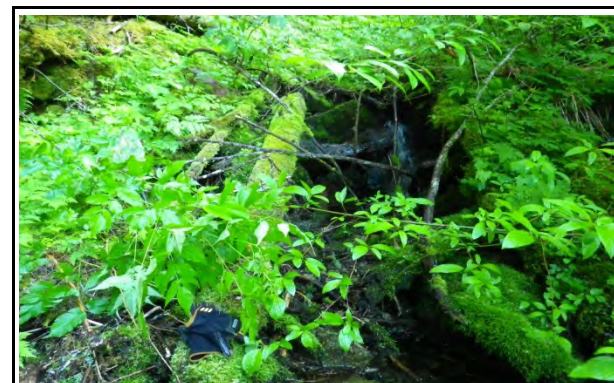


Plate 1 Photograph taken at right-of-way looking upstream.

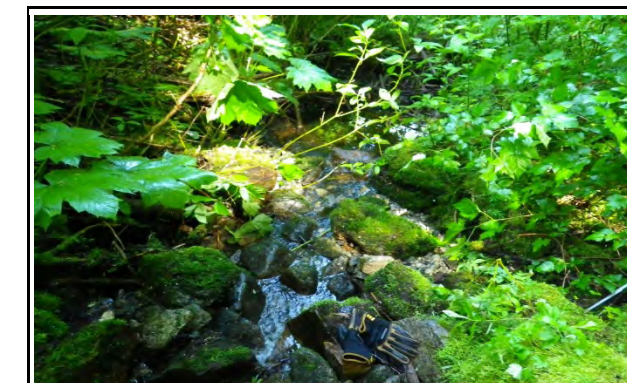


Plate 2 Photograph taken at right-of-way looking downstream.

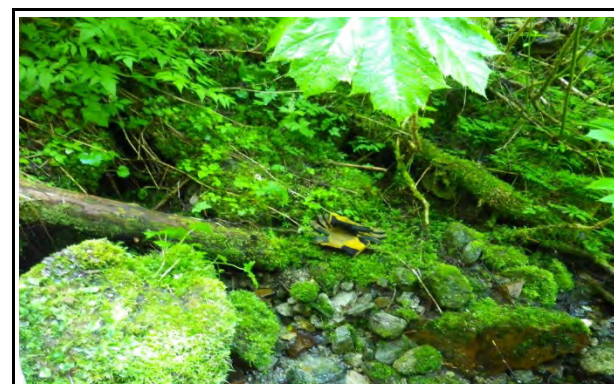


Plate 3 Photograph taken at right-of-way looking left.

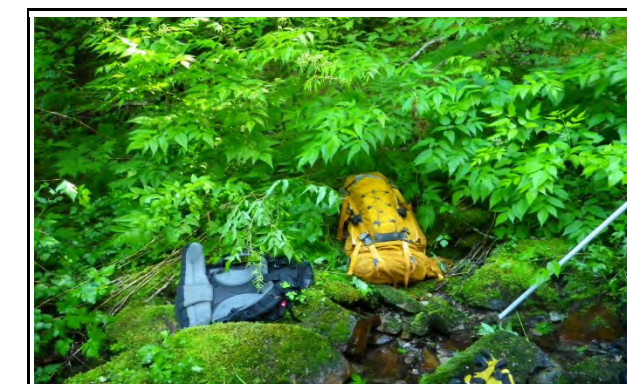


Plate 4 Photograph taken at right-of-way looking right.

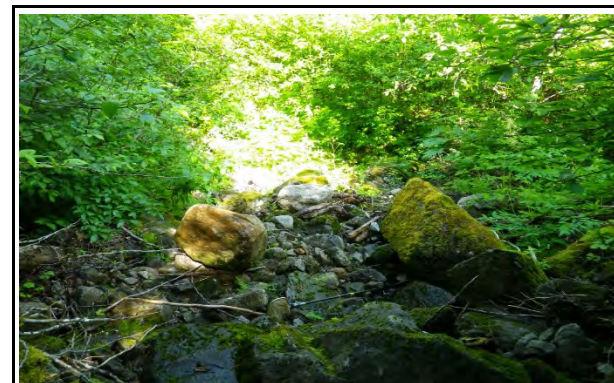


Plate 5 Photograph taken at 125m downstream looking downstream at a high gradient section.

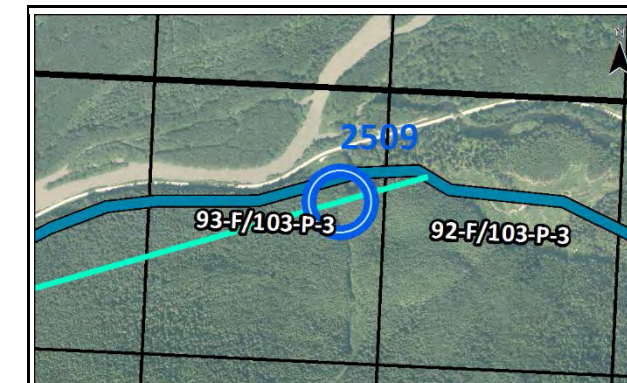


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Kwinyarh Creek (WC 2514)

**Survey Date:** July 01, 2014

**UTM (Zone 9 U):** 479757 E, 6112221 N

**Sensitivity:** High

**Field Crew:** J. Beblow, S. Courtney

**Habitat Survey Length (m):** 150

**Stream Classification:** S3

**Timing Window of Least Risk:** August 1 - January 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Frequently Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	4.2, 3.4-5.1
Wetted Width (m); Mean, Range	1.7, 1.6-2.0
Water Depth (m); Mean, Range	0.12, 0.04-0.19
Ordinary High Water Mark (m); Mean	0.18
Discharge (m³/s)	0.05
Stream Gradient (%)	10
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Vertical
Bank Texture (Dominant/Subdominant)	Boulders/Cobble	Boulders/Cobble
Mean Bank Height (m); Mean, Range	1.6, 0.4-2.3	1.4, 0.6-2.2
Grade Of Approach Slopes (%)	Low (<4)	High (>14)
Riparian Area Width (m)	30	30
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	0
Fines (<2mm)	3
Small Gravel (2-16 mm)	16
Large Gravel (17-64 mm)	20
Cobble (65-256 mm)	21
Boulder (256-400 mm)	40
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Pool	2	7	7	0.06, 0.06 - 0.06
Riffle	3	93	93	0.18, 0.16 - 0.19

Cover Type	m²
Boulders	155
Overhanging Vegetation	21
Woody Debris	43

Water Quality Parameters	
Water Temperature (°C)	6.1
pH	7.5
Dissolved Oxygen (mg/L)	12.2
Conductivity (uS/cm)	14.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Marginal	Marginal	Unsuitable	Marginal	Unsuitable
Trout	Important	Important	Important	Important	Marginal
Char	Important	Important	Important	Important	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Coastal cutthroat trout	6	0	83, 69-115	Coastal cutthroat trout

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 01, 2014	200	400 s	6	1.50
Minnow Trapping	July 01, 2014	5	25 hrs	0	0.00

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments

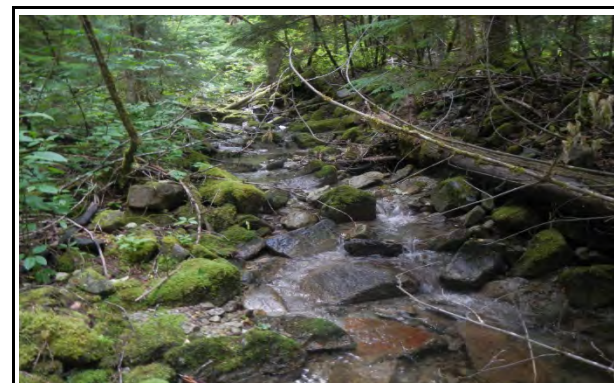


Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at right-of-way at potential spawning habitat.

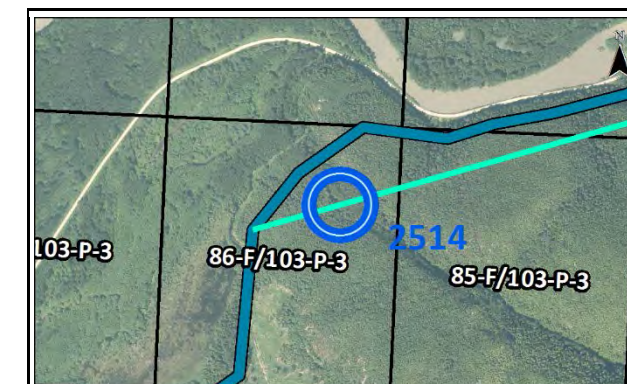


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Kwinyarh Creek (WC 768a)**

**UTM (Zone 9 U):** 478989 E, 6111215 N

**Field Crew:** B. Stitt, C. Jermey

**Stream Classification:** S2

**Survey Date:** July 13, 2014

**Sensitivity:** High

**Habitat Survey Length (m):** 400

**Timing Window of Least Risk:** No window

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Occasionally Confined
Channel Pattern	Irregular, Wandering
Channel Width (m); Mean, Range	10.3, 7.0-16.0
Wetted Width (m); Mean, Range	6.0, 4.5-8.0
Water Depth (m); Mean, Range	0.17, 0.00-0.60
Ordinary High Water Mark (m); Mean	0.42
Discharge (m³/s)	0.33
Stream Gradient (%)	2
Embeddedness	Unembedded

Channel and Flow Conditions Continued		
Beaver Dams	Yes	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Large Gravel/Small Gravel	Large Gravel/Small Gravel
Mean Bank Height (m); Mean, Range	1.6, 0.5-5.0	1.3, 0.9-1.8
Grade Of Approach Slopes (%)	Moderate (4-14)	Moderate (4-14)
Riparian Area Width (m)	9	8
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	0
Fines (<2mm)	6
Small Gravel (2-16 mm)	18
Large Gravel (17-64 mm)	48
Cobble (65-256 mm)	24
Boulder (256-400 mm)	4
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Pool	5	37	9	0.09, 0 - 0.15
Riffle	10	286	71	0.33, 0.2 - 0.5
Run	6	80	20	0.19, 0.15 - 0.2

Cover Type	m²
Boulders	5
Overhanging Vegetation	76
Under Cut Banks	8
Woody Debris	110

Water Quality Parameters	
Water Temperature (°C)	12.4
pH	8.7
Dissolved Oxygen (mg/L)	10.6
Conductivity (uS/cm)	43.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Important	Important	Unsuitable	Marginal	Essential
Trout	Important	Important	Marginal	Marginal	Essential
Char	Important	Important	Marginal	Marginal	Important

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Chinook salmon	2	0	71, 69-72	Chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, pink salmon, sculpin, steelhead, stickleback
Coastal cutthroat trout	3	0	367, 356-381	
Coastrange sculpin	5	0	82, 65-106	
Coho salmon	10	0	43, 30-54	
Prickly sculpin	2	0	66, 50-82	
Salmon	0	200	n/a	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Angling	July 13, 2014	2	2 Anglers	3	6.00
Backpack Electrofishing	July 13, 2014	300	385 s	10	2.60
Minnow Trapping	July 13, 2014	6	18 hrs	9	0.50
Observation	July 13, 2014	n/a	n/a	200	n/a

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 117m downstream.



Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Underground trenchless
Preliminary Pipeline Crossing Method Option B	Aerial
Preliminary Vehicle and Equipment Crossing Method Option A	None
Preliminary Vehicle and Equipment Crossing Method Option B	Not applicable

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Ansedagan Creek (NCD 771a)** **Survey Date:** June 22, 2014  
**UTM (Zone 9 U):** 477515 E, 6109403 N **Sensitivity:** High  
**Field Crew:** C. Jerney, J. Cote **Habitat Survey Length (m):** 485  
**Stream Classification:** NCD **Timing Window of Least Risk:** August 1 - August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Occasionally Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	n/a
Wetted Width (m); Mean, Range	34.7, 18.0-46.0
Water Depth (m); Mean, Range	1.10, 0.32-2.00
Ordinary High Water Mark (m); Mean	n/a
Discharge (m³/s)	Negligible
Stream Gradient (%)	2
Embeddedness	Not Applicable

Channel and Flow Conditions Continued		
Beaver Dams	Yes	
Native Channel Width (m)	n/a	
Bank Conditions		
	Left Bank	Right Bank
Bank Shape	n/a	n/a
Bank Texture (Dominant/Subdominant)	n/a	n/a
Mean Bank Height (m); Mean, Range	n/a	n/a
Grade Of Approach Slopes (%)	Moderate (4-14)	Moderate (4-14)
Riparian Area Width (m)	30	30
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	83
Fines (<2mm)	18
Small Gravel (2-16 mm)	0
Large Gravel (17-64 mm)	0
Cobble (65-256 mm)	0
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	2	32	7	0.18, 0.15 - 0.2
Flat	1	15	3	0.02
No defined channel	2	183	39	0.08, 0.05 - 0.1
Pool	2	5	1	0.08, 0.05 - 0.1
Riffle	7	187	39	0.14, 0.1 - 0.2
Run	4	52	11	0.05, 0.05 - 0.05

Cover Type	m²
Boulders	3
Depth	329
Instream Vegetation	20
Overhanging Vegetation	393
Under Cut Banks	3
Woody Debris	39

Water Quality Parameters	
Water Temperature (°C)	14.9
pH	7.5
Dissolved Oxygen (mg/L)	6.3
Conductivity (uS/cm)	135.0
Turbidity (visual)	Moderate

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Important	Unsuitable	Marginal	Marginal
Trout	Marginal	Important	Marginal	Marginal	Marginal
Char	Marginal	Important	Marginal	Marginal	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	1	0	106	None
Coastal cutthroat trout	8	1	37, 28-80	
Coho salmon	1	0	113	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	June 22, 2014	198	349 s	18	5.16
Minnow Trapping	June 21, 2014	5	100 hrs	1	0.01
Observation	June 22, 2014	n/a	n/a	1	n/a

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 18m upstream looking downslope at an active beaver dam.

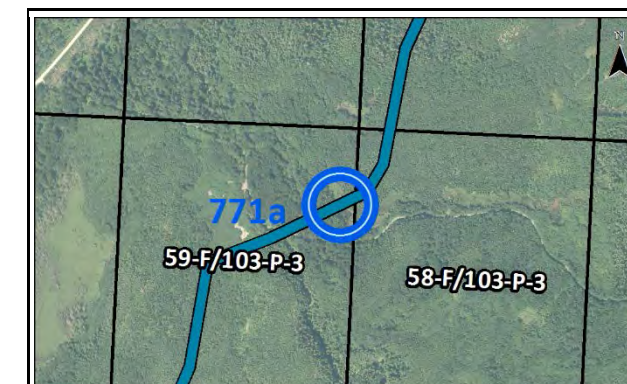


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Ansedagan Creek (WC 772a)**

UTM (Zone 9 U): 477408 E, 6109346 N

Field Crew: C. Sinclair, J. McNeice

Stream Classification: S2

Survey Date: July 14, 2014

Sensitivity: High

Habitat Survey Length (m):

Timing Window of Least Risk: No window

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Frequently Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	11.7, 7.8-15.3
Wetted Width (m); Mean, Range	8.1, 6.2-10.4
Water Depth (m); Mean, Range	0.27, 0.15-0.41
Ordinary High Water Mark (m); Mean	0.37
Discharge (m³/s)	1.04
Stream Gradient (%)	3
Embeddedness	Moderately Embedded

Channel and Flow Conditions Continued			
Beaver Dams	No		
Native Channel Width (m)	n/a		
Bank Conditions		Left Bank	Right Bank
Bank Shape	Sloping		Sloping
Bank Texture (Dominant/Subdominant)	Cobble/Large Gravel		Cobble/Large Gravel
Mean Bank Height (m); Mean, Range	2.4, 1.2-4.0		1.0, 0.4-1.6
Grade Of Approach Slopes (%)	Moderate (4-14)		Moderate (4-14)
Riparian Area Width (m)	50		50
Dominant Riparian Vegetation Type	Mixed C and D		Mixed C and D

Substrate	%
Organics	0
Fines (<2mm)	1
Small Gravel (2-16 mm)	9
Large Gravel (17-64 mm)	18
Cobble (65-256 mm)	72
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Water Quality Parameters	
Water Temperature (°C)	11.2
pH	7.8
Dissolved Oxygen (mg/L)	10.6
Conductivity (uS/cm)	83.0
Turbidity (visual)	Clear

Habitat	No.	Length (m)	%	Velocity (m/s)
Pool	1	10	5	0.80
Riffle	4	163	80	0.85, 0.8 - 0.89
Run	2	30	15	0.78, 0.75 - 0.8

Cover Type	m²
Depth	8
Overhanging Vegetation	103
Under Cut Banks	64
Woody Debris	22

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Important	Important	Unsuitable	Important	Important
Trout	Important	Important	Important	Important	Important
Char	Important	Important	Important	Important	Important

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range
Char	9	0	118, 85-150
Coastal cutthroat trout	1	0	170
Coho salmon	3	0	73, 41-105
Rainbow trout	7	0	118, 87-244

Fish Species Previously Documented
Chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, pink salmon, steelhead, stickleback

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 14, 2014	160	709 s	16	2.26
Minnow Trapping	July 14, 2014	5	115 hrs	12	0.10

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments

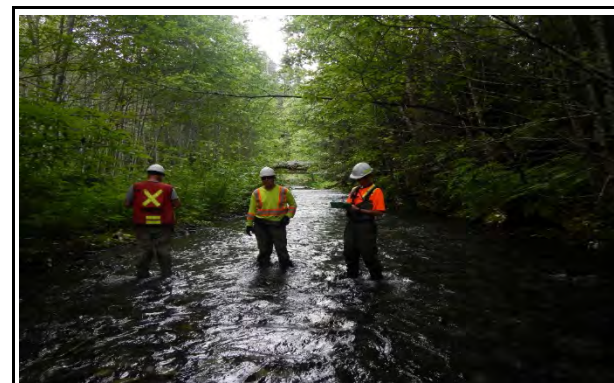


Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at right-of-way at a char captured by electrofishing.

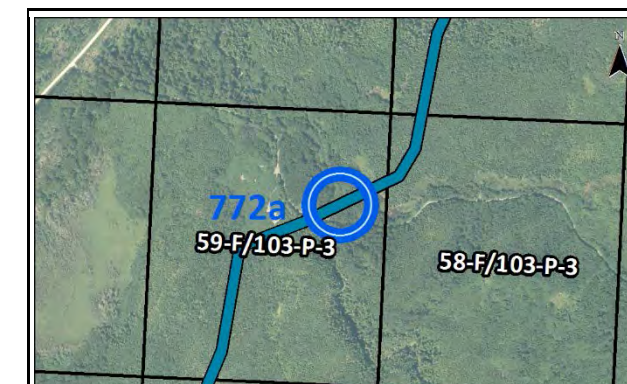


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Nass River (WC 773a)**

**Survey Date:** June 23, 2014

**UTM (Zone 9 U):** 476935 E, 6108579 N

**Sensitivity:** Low

**Field Crew:** C. Jerney, J. Cote

**Habitat Survey Length (m):**

**Stream Classification:** S3\*

**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Occasionally Confined
Channel Pattern	Irregular, Wandering
Channel Width (m); Mean, Range	2.7, 1.6-4.2
Wetted Width (m); Mean, Range	0.3, 0.0-1.6
Water Depth (m); Mean, Range	0.02, 0.00-0.17
Ordinary High Water Mark (m); Mean	0.20
Discharge (m³/s)	NR
Stream Gradient (%)	3
Embeddedness	Not Applicable

Channel and Flow Conditions Continued			
Beaver Dams	No		
Native Channel Width (m)	n/a		
Bank Conditions		Left Bank	Right Bank
Bank Shape	Sloping		Sloping
Bank Texture (Dominant/Subdominant)	Organics/Fines		Organics/Fines
Mean Bank Height (m); Mean, Range	0.6, 0.4-1.0		0.4, 0.3-0.4
Grade Of Approach Slopes (%)	Low (<4)		Moderate (4-14)
Riparian Area Width (m)	15		15
Dominant Riparian Vegetation Type	Mixed C and D		Mixed C and D

Substrate	%
Organics	62
Fines (<2mm)	26
Small Gravel (2-16 mm)	5
Large Gravel (17-64 mm)	8
Cobble (65-256 mm)	0
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Not recorded				

Cover Type	m²
Not recorded	

Water Quality Parameters	
Water Temperature (°C)	
pH	
Dissolved Oxygen (mg/L)	
Conductivity (uS/cm)	
Turbidity (visual)	

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 300m downstream looking downstream.

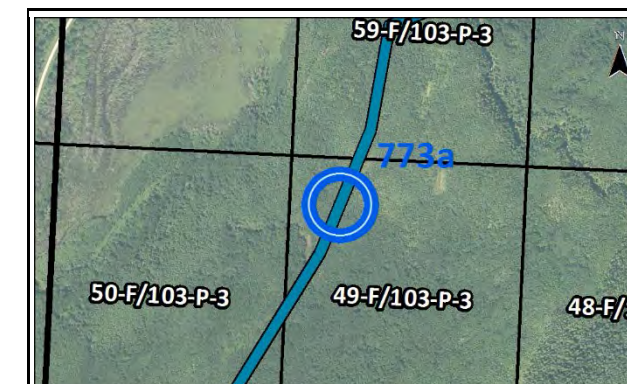


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



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Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ksemamaith Creek (WC 775a) **Survey Date:** July 03, 2014  
**UTM (Zone 9 U):** 475465 E, 6106057 N **Sensitivity:** Low  
**Field Crew:** J. Beblow, S. Courtney **Habitat Survey Length (m):** 105  
**Stream Classification:** S3\* **Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Entrenched
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	3.2, 1.5-6.0
Wetted Width (m); Mean, Range	2.8, 1.5-8.0
Water Depth (m); Mean, Range	0.34, 0.10-0.65
Ordinary High Water Mark (m); Mean	0.43
Discharge (m³/s)	0.01
Stream Gradient (%)	15
Embeddedness	Unembedded

Channel and Flow Conditions Continued		
Beaver Dams	Yes	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Vertical	Sloping
Bank Texture (Dominant/Subdominant)	Cobble/Fines	Fines/Cobble
Mean Bank Height (m); Mean, Range	1.4, 0.7-3.0	1.1, 0.7-1.5
Grade Of Approach Slopes (%)	High (>14)	High (>14)
Riparian Area Width (m)	20	20
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	39
Fines (<2mm)	43
Small Gravel (2-16 mm)	0
Large Gravel (17-64 mm)	0
Cobble (65-256 mm)	10
Boulder (256-400 mm)	0
Rock (>400 mm)	8

Habitat	No.	Length (m)	%	Velocity (m/s)
Chute	1	40	50	0.00
Flat	1	40	50	0.00

Cover Type	m²
Overhanging Vegetation	25
Woody Debris	15

Water Quality Parameters	
Water Temperature (°C)	18.7
pH	5.3
Dissolved Oxygen (mg/L)	9.6
Conductivity (uS/cm)	80.0
Turbidity (visual)	Stained

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Marginal	Unsuitable	Marginal	Marginal
Trout	Unsuitable	Marginal	Marginal	Marginal	Marginal
Char	Unsuitable	Marginal	Marginal	Marginal	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
No fish captured				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Minnow Trapping	July 03, 2014	5	105 hrs	0	0.00

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

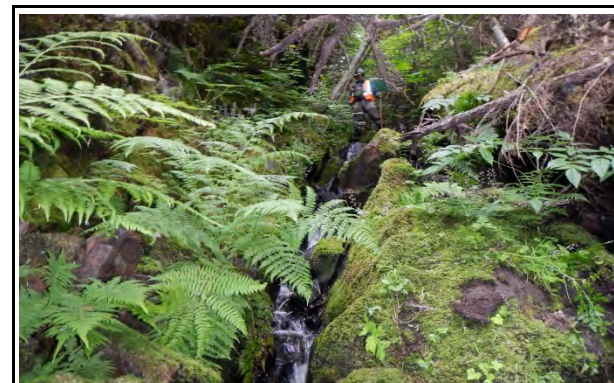


Plate 5 Photograph taken at 50m downstream looking upstream at a 45% bedrock chute.

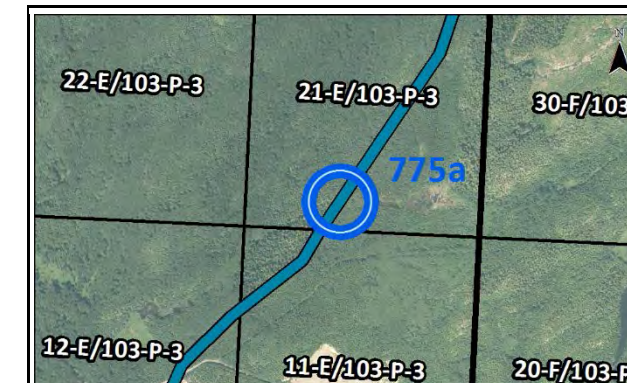


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company



Proposed Westcoast Connector Gas Transmission Project  
Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Ksemamaith Creek (WC 776a)**  
**UTM (Zone 9 U): 474847 E, 6105185 N**  
**Field Crew:** B. Rudmik, S. Whiteside  
**Stream Classification:** S2

**Survey Date:** July 12, 2014  
**Sensitivity:** High  
**Habitat Survey Length (m):** 400  
**Timing Window of Least Risk:** No window

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Occasionally Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	13.7, 11.0-15.8
Wetted Width (m); Mean, Range	10.5, 6.5-12.7
Water Depth (m); Mean, Range	0.38, 0.21-0.55
Ordinary High Water Mark (m); Mean	0.91
Discharge (m³/s)	3.72
Stream Gradient (%)	4
Embeddedness	Moderately Embedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Cobble/Boulders	Cobble/Boulders
Mean Bank Height (m); Mean, Range	1.5, 0.9-2.6	1.3, 0.8-1.7
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Deciduous	Deciduous

Substrate	%
Organics	0
Fines (<2mm)	7
Small Gravel (2-16 mm)	8
Large Gravel (17-64 mm)	18
Cobble (65-256 mm)	43
Boulder (256-400 mm)	25
Rock (>400 mm)	0

Water Quality Parameters	
Water Temperature (°C)	10.6
pH	7.5
Dissolved Oxygen (mg/L)	9.9
Conductivity (uS/cm)	60.0
Turbidity (visual)	Clear

Habitat	No.	Length (m)	%	Velocity (m/s)
Rapid	3	170	43	1.58, 1.5 - 1.65
Riffle	3	230	58	1.18, 1.15 - 1.2

Cover Type	m²
Boulders	12
Depth	4
Instream Vegetation	0
Overhanging Vegetation	9
Under Cut Banks	17
Woody Debris	12

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Important	Important	Unsuitable	Marginal	Important
Trout	Important	Important	Important	Marginal	Important
Char	Important	Important	Important	Marginal	Important

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range
Char	2	0	87, 85-89
Chinook salmon	1	0	53
Coastal cutthroat trout	7	0	79, 62-120
Coastrange sculpin	3	0	53, 48-58
Coho salmon	10	0	38, 34-46
Prickly sculpin	1	0	62

Fish Species Previously Documented
Chum salmon, coho salmon, Dolly Varden, pink salmon, rainbow trout, steelhead

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 12, 2014	300	438 s	18	4.11
Minnow Trapping	July 14, 2014	6	138 hrs	6	0.04

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments

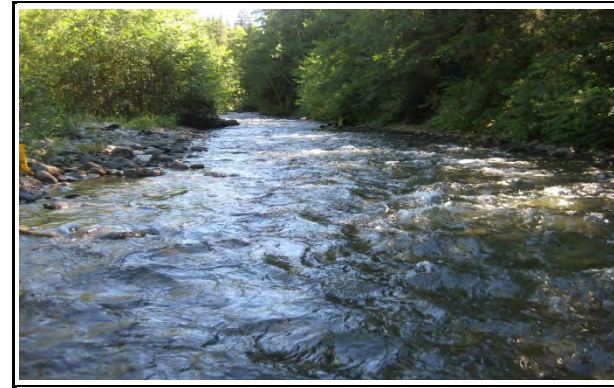


Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 1600m downstream looking east at the confluence with the Nass River.

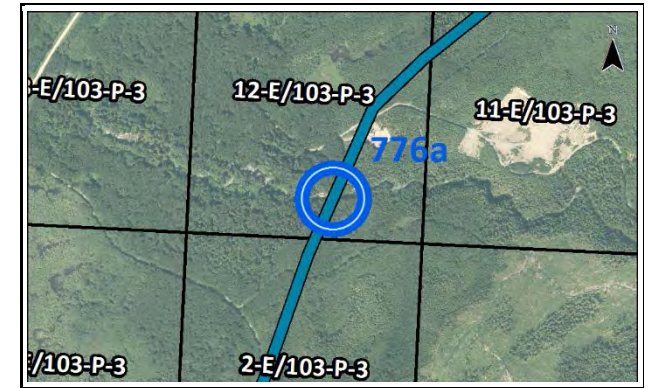


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ksi Mat'in (NCD 777a)

**Survey Date:** June 24, 2014

**UTM (Zone 9 U):** 474747 E, 6104157 N

**Sensitivity:** High

**Field Crew:** J. Beblow, S. Courtney

**Habitat Survey Length (m):** 170

**Stream Classification:** NCD

**Timing Window of Least Risk:** June 1- August 31

Channel and Flow Conditions (No. of Transects: 2)	
Confinement	Unconfined
Channel Pattern	
Channel Width (m); Mean, Range	n/a
Wetted Width (m); Mean, Range	
Water Depth (m); Mean, Range	0.35, 0.30-0.40
Ordinary High Water Mark (m); Mean	n/a
Discharge (m³/s)	
Stream Gradient (%)	1
Embeddedness	Unembedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions		
	Left Bank	Right Bank
Bank Shape	n/a	n/a
Bank Texture (Dominant/Subdominant)	n/a	n/a
Mean Bank Height (m); Mean, Range	n/a	n/a
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	30	30
Dominant Riparian Vegetation Type	Deciduous	Deciduous

Substrate	%
Organics	NR
Fines (<2mm)	NR
Small Gravel (2-16 mm)	NR
Large Gravel (17-64 mm)	NR
Cobble (65-256 mm)	NR
Boulder (256-400 mm)	NR
Rock (>400 mm)	NR

Habitat	No.	Length (m)	%	Velocity (m/s)
Flat	2	170	100	0.00, 0 - 0

Cover Type	m²
Depth	1200
Instream Vegetation	500
Overhanging Vegetation	2500

Water Quality Parameters	
Water Temperature (°C)	13.7
pH	6.9
Dissolved Oxygen (mg/L)	2.8
Conductivity (uS/cm)	80.0
Turbidity (visual)	Stained

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Marginal	Important	Unsuitable	Important	Marginal
Trout	Marginal	Important	Marginal	Important	Marginal
Char	Marginal	Important	Marginal	Important	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	2	0	90, 83-97	None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Minnow Trapping	June 23, 2014	3	57 hrs	2	0.04

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking north.



Plate 2 Photograph taken at right-of-way looking south.



Plate 3 Photograph taken at right-of-way looking east.



Plate 4 Photograph taken at right-of-way looking west.



Plate 5 Photograph taken at 20m downstream looking west at a road crossing.



Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ksi Mat'in (WC 779a)

**UTM (Zone 9 U):** 475049 E, 6103238 N

**Field Crew:** E. Lennert, J. McNeice

**Stream Classification:** S3

**Survey Date:** July 03, 2014

**Sensitivity:** High

**Habitat Survey Length (m):**

**Timing Window of Least Risk:** August 1- January 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Unconfined
Channel Pattern	Irregular, Wandering
Channel Width (m); Mean, Range	3.1, 2.1-5.1
Wetted Width (m); Mean, Range	1.2, 0.6-1.8
Water Depth (m); Mean, Range	0.15, 0.10-0.30
Ordinary High Water Mark (m); Mean	0.20
Discharge (m³/s)	Negligible
Stream Gradient (%)	4
Embeddedness	Highly Embedded

Channel and Flow Conditions Continued			
Beaver Dams	Yes		
Native Channel Width (m)	n/a		
Bank Conditions		Left Bank	Right Bank
Bank Shape	Sloping		Sloping
Bank Texture (Dominant/Subdominant)	Fines/Organics		Fines/Organics
Mean Bank Height (m); Mean, Range	0.4, 0.3-0.5		0.3, 0.2-0.4
Grade Of Approach Slopes (%)	Moderate (4-14)		Moderate (4-14)
Riparian Area Width (m)	30		30
Dominant Riparian Vegetation Type	Coniferous		Coniferous

Substrate	%
Organics	50
Fines (<2mm)	50
Small Gravel (2-16 mm)	0
Large Gravel (17-64 mm)	0
Cobble (65-256 mm)	0
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Flat	3	180	72	0.04, 0.04 - 0.04
Riffle	1	70	28	0.10

Cover Type	m²
Boulders	0
Depth	0
Instream Vegetation	6
Overhanging Vegetation	190
Under Cut Banks	46
Woody Debris	85

Water Quality Parameters	
Water Temperature (°C)	11.8
pH	9.6
Dissolved Oxygen (mg/L)	9.6
Conductivity (uS/cm)	110.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Marginal	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Marginal	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range
Coastal cutthroat trout	1	0	112
Lamprey	1	0	150
Salmonid	0	1	NR

Fish Species Previously Documented
None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 03, 2014	100	206 s	2	0.97
Observation	July 03, 2014	n/a	n/a	1	n/a

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 100m upstream looking downstream.

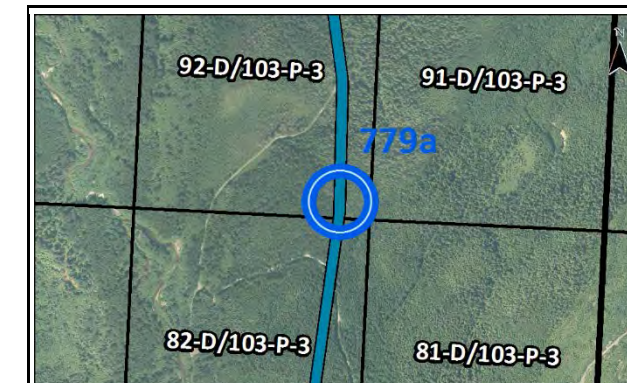


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Ksi Mat'in (NCD 780.1)**

**UTM (Zone 9 U): 474536 E, 6101964 N**

**Field Crew: K. Gasser, N. Pilgrim**

**Stream Classification: NCD**

**Survey Date: July 14, 2014**

**Sensitivity: High**

**Habitat Survey Length (m): 300**

**Timing Window of Least Risk: No window**

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	
Channel Pattern	
Channel Width (m); Mean, Range	n/a
Wetted Width (m); Mean, Range	45.0, 30.0-55.0
Water Depth (m); Mean, Range	0.90, 0.60-1.30
Ordinary High Water Mark (m); Mean	n/a
Discharge (m <sup>3</sup> /s)	Negligible
Stream Gradient (%)	2
Embeddedness	

Channel and Flow Conditions Continued			
Beaver Dams	Yes		
Native Channel Width (m)	n/a		
Bank Conditions		Left Bank	Right Bank
Bank Shape		n/a	n/a
Bank Texture (Dominant/Subdominant)		n/a	n/a
Mean Bank Height (m); Mean, Range		n/a	n/a
Grade Of Approach Slopes (%)		Low (<4)	Low (<4)
Riparian Area Width (m)		50	50
Dominant Riparian Vegetation Type		Deciduous	Deciduous

Substrate	%
Organics	0
Fines (<2mm)	50
Small Gravel (2-16 mm)	0
Large Gravel (17-64 mm)	0
Cobble (65-256 mm)	10
Boulder (256-400 mm)	40
Rock (>400 mm)	0

Water Quality Parameters	
Water Temperature (°C)	7.9
pH	6.7
Dissolved Oxygen (mg/L)	9.0
Conductivity (uS/cm)	17.2
Turbidity (visual)	Moderate

Habitat	No.	Length (m)	%	Velocity (m/s)
Impoundment	2	300	100	0.00, 0 - 0

Cover Type	m <sup>2</sup>
Overhanging Vegetation	15
Woody Debris	25

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Important	Important	Unsuitable	Unsuitable	Marginal
Trout	Important	Important	Marginal	Unsuitable	Marginal
Char	Important	Important	Marginal	Unsuitable	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range
Char	5	0	88, 42-113
Chinook salmon	2	0	54, 40-68
Coastal cutthroat trout	5	0	100, 72-130
Coastrange sculpin	42	0	75, 58-102
Coho salmon	18	0	44, 30-84
Salmon	1	0	26
Sculpin	1	0	50
Stickleback	1	0	55
Threespine stickleback	2	0	33, 31-35

Fish Species Previously Documented
None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 14, 2014	824	2535 s	284	11.20
Minnow Trapping	July 14, 2014	6	113 hrs	6	0.05

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

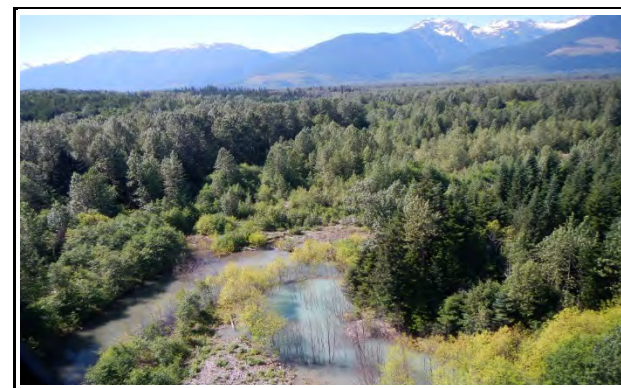


Plate 5 Photograph taken at right-of-way looking downslope at the NCD from a helicopter.

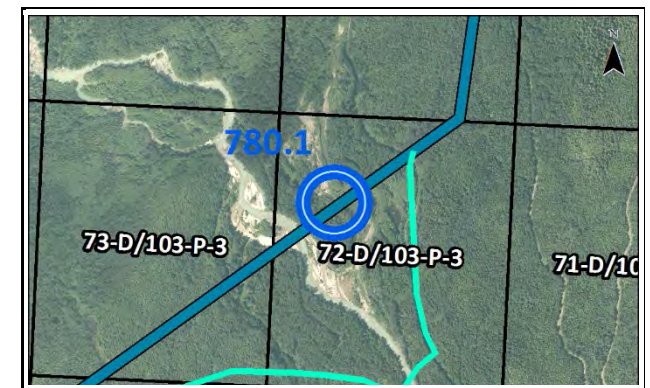


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Clear span bridge
Preliminary Vehicle and Equipment Crossing Method Option B	Multi span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Ksi Mat'in (WC 781a)**

**UTM (Zone 9 U):** 474430 E, 6101864 N

**Field Crew:** K. Gasser, N. Pilgrim

**Stream Classification:** S1-B

**Survey Date:** July 12, 2014

**Sensitivity:** High

**Habitat Survey Length (m):** 300

**Timing Window of Least Risk:** No window

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Frequently Confined
Channel Pattern	Irregular, Wandering
Channel Width (m); Mean, Range	50.8, 31.0-88.0
Wetted Width (m); Mean, Range	29.0, 22.0-37.0
Water Depth (m); Mean, Range	0.76, 0.30-1.20
Ordinary High Water Mark (m); Mean	1.74
Discharge (m³/s)	NR
Stream Gradient (%)	3
Embeddedness	Moderately Embedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Vertical
Bank Texture (Dominant/Subdominant)	Cobble/Cobble	Fines/Cobble
Mean Bank Height (m); Mean, Range	2.2, 1.8-3.5	2.5, 1.9-3.0
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Shrub	Mixed C and D

Substrate	%
Organics	0
Fines (<2mm)	4
Small Gravel (2-16 mm)	0
Large Gravel (17-64 mm)	1
Cobble (65-256 mm)	48
Boulder (256-400 mm)	46
Rock (>400 mm)	0

Water Quality Parameters	
Water Temperature (°C)	7.9
pH	6.7
Dissolved Oxygen (mg/L)	9.0
Conductivity (uS/cm)	17.2
Turbidity (visual)	Low

Habitat	No.	Length (m)	%	Velocity (m/s)
Pool	1	5	2	0.00
Riffle	1	20	7	0.00
Run	2	275	92	0.00, 0 - 0

Cover Type	m²
Boulders	96
Depth	15
Overhanging Vegetation	10
Under Cut Banks	37
Woody Debris	47

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Marginal	Important	Unsuitable	Marginal	Important
Trout	Marginal	Important	Important	Marginal	Important
Char	Marginal	Important	Important	Marginal	Important

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range
Char	2	0	74, 73-75
Chinook salmon	1	0	80
Coastrange sculpin	1	0	62
Coho salmon	15	0	37, 35-38
Sculpin	1	0	45

Fish Species Previously Documented
Chinook salmon, chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, pink salmon, rainbow trout, sculpin, steelhead

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 12, 2014	325	319 s	4	1.25
Dip Net	July 12, 2014	n/a	n/a	13	n/a
Minnow Trapping	July 14, 2014	6	134 hrs	3	0.02

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments

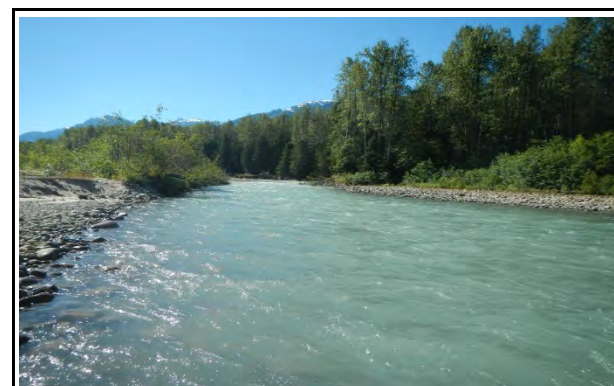


Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.

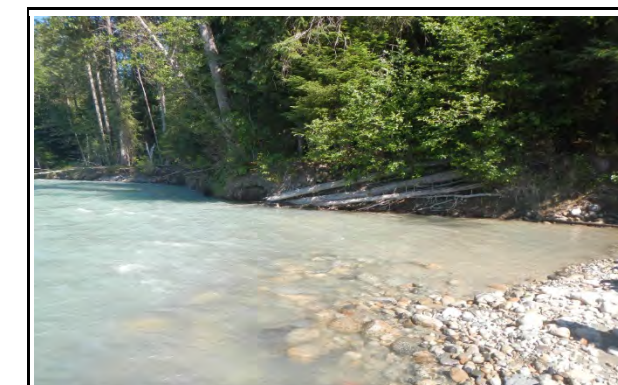


Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 3500m downstream looking upstream at the confluence with the Nass River.

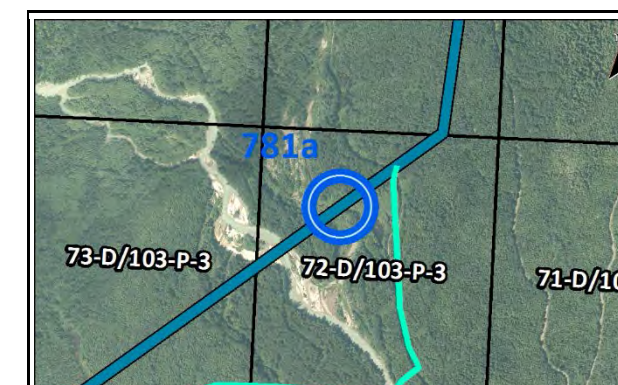


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Underground trenchless
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Ksi Mat'in (WC 2060)**

**UTM (Zone 9 U): 474797 E, 6102025 N**

**Field Crew: M. Henry, N. Glover**

**Stream Classification: S3**

**Survey Date:** June 22, 2014

**Sensitivity:** High

**Habitat Survey Length (m):** 245

**Timing Window of Least Risk:** August 1- August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Occasionally Confined
Channel Pattern	Irregular, Wandering
Channel Width (m); Mean, Range	4.9, 2.0-7.0
Wetted Width (m); Mean, Range	2.5, 1.8-4.2
Water Depth (m); Mean, Range	0.09, 0.05-0.17
Ordinary High Water Mark (m); Mean	0.24
Discharge (m³/s)	NR
Stream Gradient (%)	4
Embeddedness	Highly Embedded

Channel and Flow Conditions Continued		
Beaver Dams	Yes	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Fines/Organics	Fines/Organics
Mean Bank Height (m); Mean, Range	0.3, 0.2-0.5	0.4, 0.3-0.5
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	22	67
Dominant Riparian Vegetation Type	Shrub	Shrub

Substrate	%
Organics	0
Fines (<2mm)	100
Small Gravel (2-16 mm)	0
Large Gravel (17-64 mm)	0
Cobble (65-256 mm)	0
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Culvert	1	10	4	0.00
Flat	2	14	6	0.01, 0 - 0.01
Impoundment	1	145	59	0.01
Pool	1	1	0	0.01
Run	3	75	31	0.17, 0.1 - 0.2

Cover Type	m²
Boulders	0
Depth	802
Instream Vegetation	251
Overhanging Vegetation	209
Under Cut Banks	3
Woody Debris	541

Water Quality Parameters	
Water Temperature (°C)	9.6
pH	7.7
Dissolved Oxygen (mg/L)	10.0
Conductivity (uS/cm)	167.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Marginal	Important	Unsuitable	Important	Marginal
Trout	Marginal	Important	Marginal	Important	Marginal
Char	Marginal	Important	Marginal	Important	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range
Char	1	0	116
Coastal cutthroat trout	5	0	80, 58-95
Unidentified species	0	2	n/a

Fish Species Previously Documented
None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	June 22, 2014	100	420 s	5	1.19
Minnow Trapping	June 22, 2014	9	207 hrs	1	0.00

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments

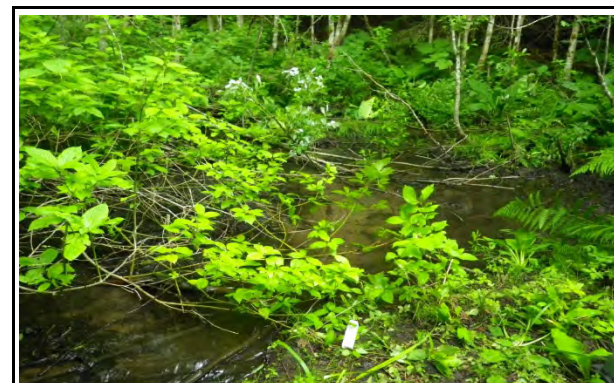


Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 120m downstream looking left at an impoundment with a beaver lodge present.

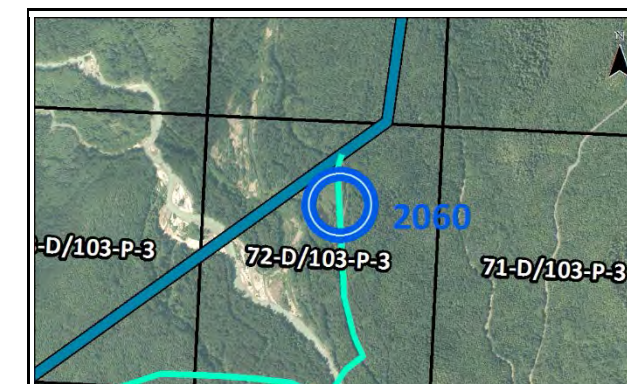


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ksi Mat'in (WC 2060.1)

**Survey Date:** July 13, 2014

**UTM (Zone 9 U):** 474840 E, 6101360 N

**Sensitivity:** High

**Field Crew:** K. Gasser, N. Pilgrim

**Habitat Survey Length (m):** 100

**Stream Classification:** S3

**Timing Window of Least Risk:** August 1 - August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Frequently Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	2.2, 1.7-2.7
Wetted Width (m); Mean, Range	2.4, 2.1-2.8
Water Depth (m); Mean, Range	0.22, 0.09-0.44
Ordinary High Water Mark (m); Mean	0.63
Discharge (m³/s)	0.20
Stream Gradient (%)	10
Embeddedness	Unembedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Undercut	Undercut
Bank Texture (Dominant/Subdominant)	Fines/Large Gravel	Fines/Large Gravel
Mean Bank Height (m); Mean, Range	1.2, 0.5-1.9	1.3, 0.9-2.1
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Coniferous	Mixed C and D

Substrate	%
Organics	0
Fines (<2mm)	4
Small Gravel (2-16 mm)	28
Large Gravel (17-64 mm)	38
Cobble (65-256 mm)	25
Boulder (256-400 mm)	5
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	5	14	14	0.00, 0 - 0
Pool	8	17	17	0.00, 0 - 0
Riffle	4	37	37	0.00, 0 - 0
Run	4	32	32	0.00, 0 - 0

Cover Type	m²
Boulders	3
Under Cut Banks	15
Woody Debris	17

Water Quality Parameters	
Water Temperature (°C)	10.0
pH	8.2
Dissolved Oxygen (mg/L)	12.0
Conductivity (uS/cm)	162.1
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Important	Important	Unsuitable	Unsuitable	Marginal
Trout	Important	Important	Marginal	Unsuitable	Marginal
Char	Important	Important	Marginal	Unsuitable	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	1	0	28	None
Coastal cutthroat trout	3	0	133, 85-200	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 13, 2014	100	493 s	4	0.81

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at 10m upstream looking upstream.

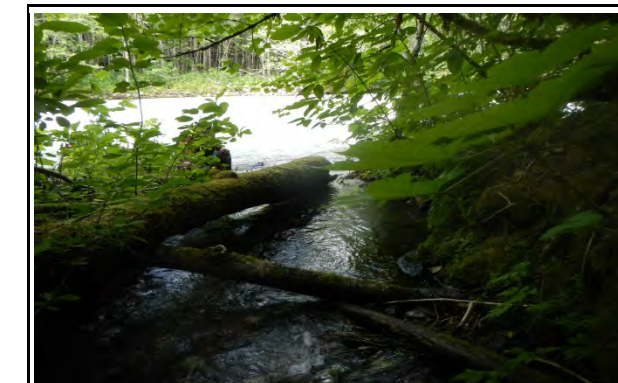


Plate 2 Photograph taken at 10m upstream looking downstream.



Plate 3 Photograph taken at 10m upstream looking left.

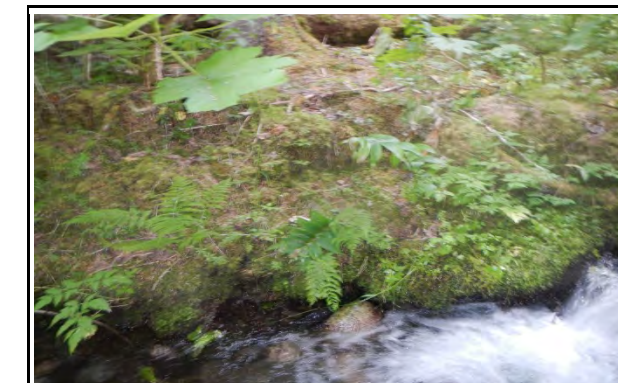


Plate 4 Photograph taken at 10m upstream looking right.



Plate 5 Photograph taken at 100m upstream looking upstream at a hanging culvert.

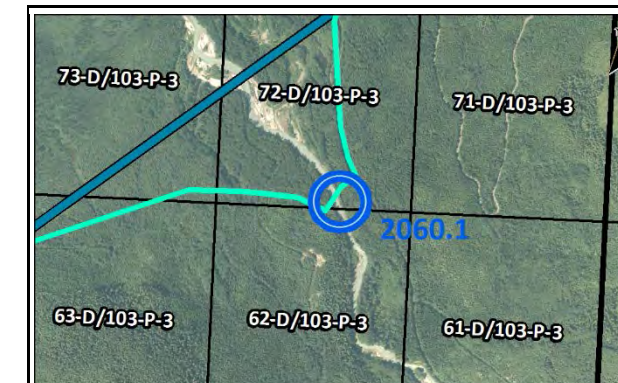


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Ksi Mat'in (WC 2061)**

**UTM (Zone 9 U):** 474830 E, 6101371 N

**Field Crew:** K. Gasser, N. Pilgrim

**Stream Classification:** S1-B

**Survey Date:** July 12, 2014

**Sensitivity:** High

**Habitat Survey Length (m):** 335

**Timing Window of Least Risk:** No window

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Frequently Confined
Channel Pattern	Irregular, Wandering
Channel Width (m); Mean, Range	37.5, 25.0-45.0
Wetted Width (m); Mean, Range	37.0, 25.0-45.0
Water Depth (m); Mean, Range	0.71, 0.40-1.00
Ordinary High Water Mark (m); Mean	1.14
Discharge (m³/s)	NR
Stream Gradient (%)	4
Embeddedness	Moderately Embedded

Channel and Flow Conditions Continued			
Beaver Dams	No		
Native Channel Width (m)	n/a		
Bank Conditions		Left Bank	Right Bank
Bank Shape	Sloping		Sloping
Bank Texture (Dominant/Subdominant)	Cobble/Boulders		Cobble/Fines
Mean Bank Height (m); Mean, Range	2.4, 1.7-3.0		3.2, 1.0-10.0
Grade Of Approach Slopes (%)	Low (<4)		Moderate (4-14)
Riparian Area Width (m)	50		50
Dominant Riparian Vegetation Type	Deciduous		Mixed C and D

Substrate	%
Organics	0
Fines (<2mm)	2
Small Gravel (2-16 mm)	2
Large Gravel (17-64 mm)	0
Cobble (65-256 mm)	48
Boulder (256-400 mm)	48
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Riffle	2	270	81	0.00, 0 - 0
Run	1	65	19	0.00

Cover Type	m²
Boulders	600
Depth	600

Water Quality Parameters	
Water Temperature (°C)	7.9
pH	6.7
Dissolved Oxygen (mg/L)	9.0
Conductivity (uS/cm)	17.2
Turbidity (visual)	Low

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Marginal	Important	Unsuitable	Marginal	Important
Trout	Marginal	Important	Important	Marginal	Important
Char	Marginal	Important	Important	Marginal	Important

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range
Char	2	0	74, 73-75
Chinook salmon	1	0	80
Coastrange sculpin	1	0	62
Coho salmon	15	0	37, 35-38
Sculpin	1	0	45

Fish Species Previously Documented
Chinook salmon, chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, pink salmon, rainbow trout, sculpin, steelhead

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 12, 2014	325	319 s	4	1.25
Dip Net	July 12, 2014	n/a	n/a	13	n/a
Minnow Trapping	July 14, 2014	6	134 hrs	3	0.02

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments

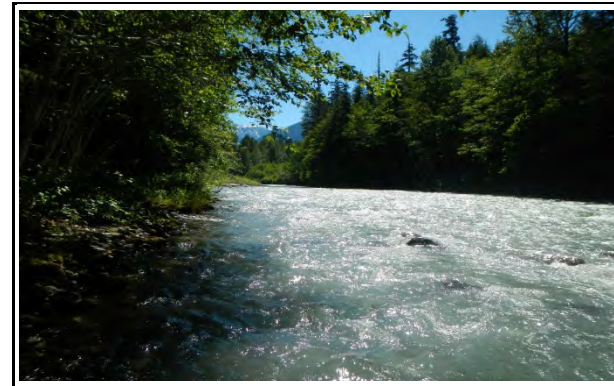


Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 120m downstream at the river and man-made side channel.

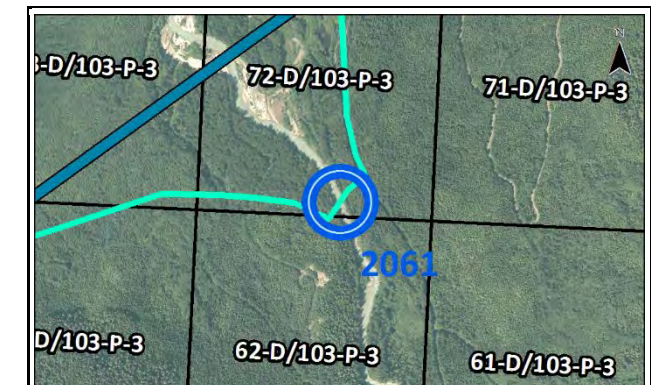


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Aerial
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	None
Preliminary Vehicle and Equipment Crossing Method Option B	Not applicable

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company



Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ginlulak Creek (WC 785a)

**Survey Date:** July 03, 2014

**UTM (Zone 9 U):** 472294 E, 6100075 N

**Sensitivity:** High

**Field Crew:** C. Sinclair, D. Cooper

**Habitat Survey Length (m):**

**Stream Classification:** S2

**Timing Window of Least Risk:** June 15 - July 10

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Unconfined
Channel Pattern	Irregular, Wandering
Channel Width (m); Mean, Range	11.1, 4.0-15.8
Wetted Width (m); Mean, Range	5.5, 2.4-8.4
Water Depth (m); Mean, Range	0.15, 0.04-0.35
Ordinary High Water Mark (m); Mean	0.34
Discharge (m³/s)	0.01
Stream Gradient (%)	1
Embeddedness	Unembedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Small Gravel/Fines	Small Gravel/Fines
Mean Bank Height (m); Mean, Range	0.4, 0.3-0.7	0.4, 0.2-0.6
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	100	100
Dominant Riparian Vegetation Type	Mixed C and D	Deciduous

Substrate	%
Organics	0
Fines (<2mm)	8
Small Gravel (2-16 mm)	17
Large Gravel (17-64 mm)	50
Cobble (65-256 mm)	25
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Pool	2	10	5	0.02, 0.02 - 0.02
Riffle	2	27	15	0.06, 0.06 - 0.06
Run	2	73	40	0.06, 0.06 - 0.06
Subterranean	1	73	40	0.00

Cover Type	m²
Boulders	0
Depth	1
Instream Vegetation	0
Overhanging Vegetation	117
Under Cut Banks	18
Woody Debris	33

Water Quality Parameters	
Water Temperature (°C)	9.2
pH	7.2
Dissolved Oxygen (mg/L)	7.3
Conductivity (uS/cm)	2.2
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Important	Important	Unsuitable	Unsuitable	Important
Trout	Important	Important	Marginal	Unsuitable	Important
Char	Important	Important	Marginal	Unsuitable	Important

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Coho salmon	9	0	37, 34-39	Chum salmon, coho salmon, Dolly Varden, pink salmon
Salmonid	0	10	n/a	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 03, 2014	100	705 s	18	2.55
Observation	July 03, 2014	n/a	n/a	10	n/a

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments

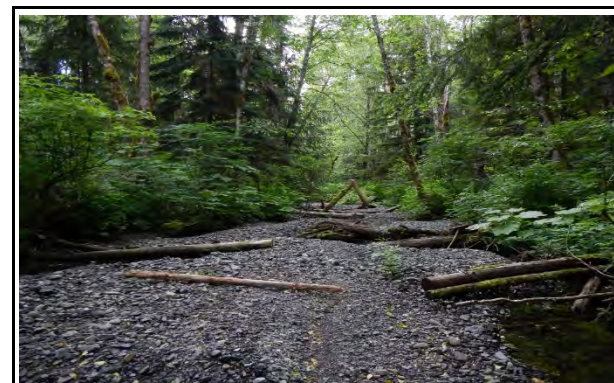


Plate 1 Photograph taken at right-of-way looking upstream.

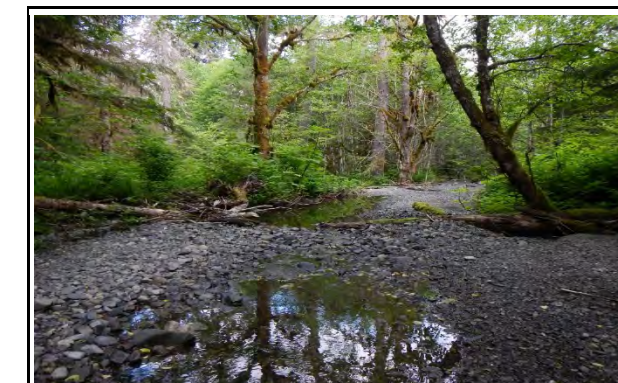


Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

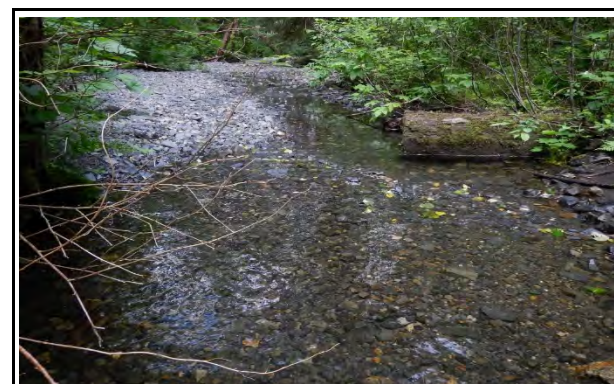


Plate 5 Photograph taken at 73m upstream looking downstream.

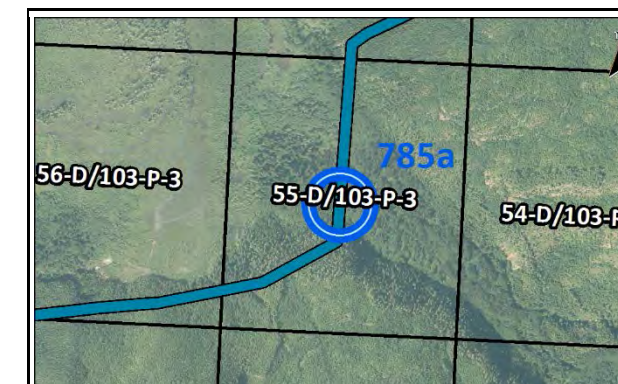


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ginlulak Creek (WC 786a)

**Survey Date:** July 03, 2014

**UTM (Zone 9 U):** 471999 E, 6099638 N

**Sensitivity:** Low

**Field Crew:** C. Sinclair, D. Cooper

**Habitat Survey Length (m):** 200

**Stream Classification:** S2\*

**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Entrenched
Channel Pattern	Straight
Channel Width (m); Mean, Range	5.8, 4.8-6.5
Wetted Width (m); Mean, Range	0.6, 0.2-1.2
Water Depth (m); Mean, Range	0.06, 0.00-0.19
Ordinary High Water Mark (m); Mean	0.23
Discharge (m³/s)	0.01
Stream Gradient (%)	36
Embeddedness	Highly Embedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Vertical	Vertical
Bank Texture (Dominant/Subdominant)	Fines/Rock	Fines/Rock
Mean Bank Height (m); Mean, Range	1.5, 0.6-3.0	3.8, 2.5-5.0
Grade Of Approach Slopes (%)	High (>14)	High (>14)
Riparian Area Width (m)	20	20
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	0
Fines (<2mm)	0
Small Gravel (2-16 mm)	10
Large Gravel (17-64 mm)	8
Cobble (65-256 mm)	12
Boulder (256-400 mm)	70
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	1	20	29	0.00
Falls	1	50	71	0.00

Cover Type	m²
Not recorded	

Water Quality Parameters	
Water Temperature (°C)	
pH	
Dissolved Oxygen (mg/L)	
Conductivity (uS/cm)	
Turbidity (visual)	

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments

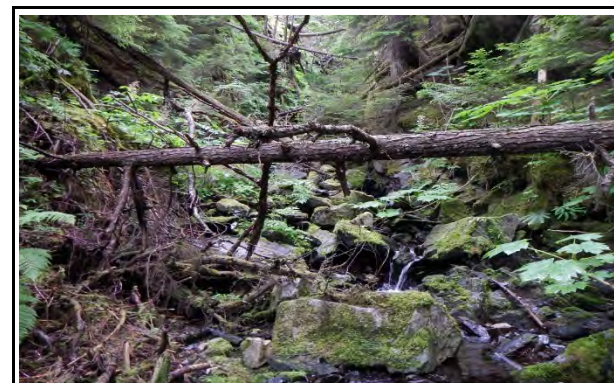


Plate 1 Photograph taken at right-of-way looking upstream.

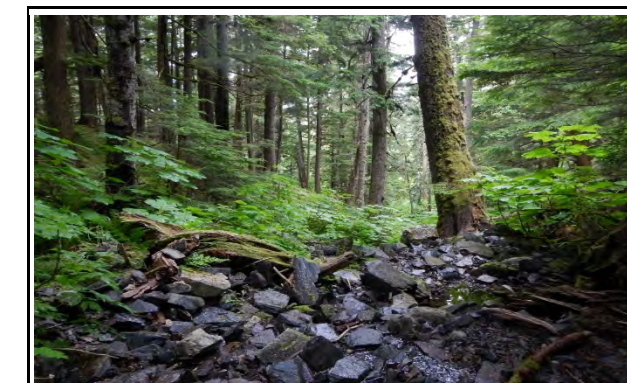


Plate 2 Photograph taken at right-of-way looking downstream.

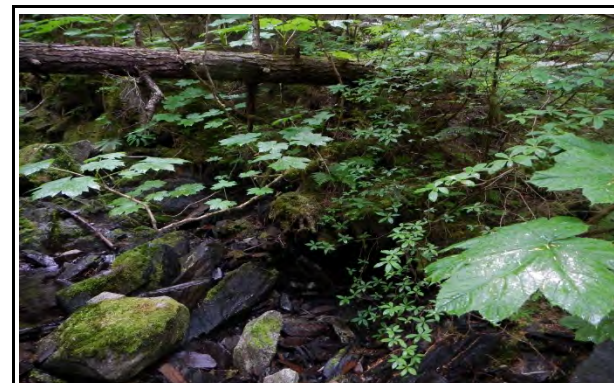


Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 75m downstream looking upstream.

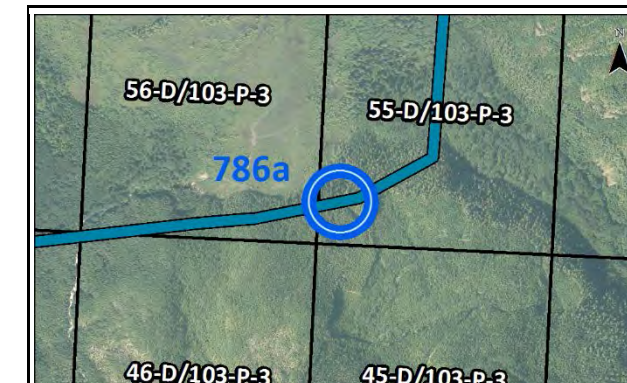


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Ginlulak Creek (WC 787a)**

UTM (Zone 9 U): 471119 E, 6099496 N

Field Crew: B. Rudmik, S. Whiteside

Stream Classification: S2

Survey Date: July 12, 2014

Sensitivity: High

Habitat Survey Length (m): 400

Timing Window of Least Risk: No window

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Occasionally Confined
Channel Pattern	Irregular, Wandering
Channel Width (m); Mean, Range	10.5, 9.0-12.0
Wetted Width (m); Mean, Range	7.7, 7.0-9.0
Water Depth (m); Mean, Range	0.44, 0.20-0.90
Ordinary High Water Mark (m); Mean	2.82
Discharge (m³/s)	NR
Stream Gradient (%)	30
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	Yes	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Vertical	Vertical
Bank Texture (Dominant/Subdominant)	Boulders/Rock	Boulders/Rock
Mean Bank Height (m); Mean, Range	4.1, 2.5-5.5	3.3, 2.2-5.0
Grade Of Approach Slopes (%)	High (>14)	High (>14)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	0
Fines (<2mm)	5
Small Gravel (2-16 mm)	5
Large Gravel (17-64 mm)	12
Cobble (65-256 mm)	25
Boulder (256-400 mm)	33
Rock (>400 mm)	20

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	1	117	29	1.40
Falls	1	38	10	0.00
Rapid	1	245	61	1.20

Cover Type	m²
Boulders	20
Depth	15
Instream Vegetation	0
Overhanging Vegetation	50
Under Cut Banks	36
Woody Debris	51

Water Quality Parameters	
Water Temperature (°C)	13.3
pH	7.1
Dissolved Oxygen (mg/L)	9.6
Conductivity (uS/cm)	15.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Marginal	Important	Unsuitable	Marginal	Marginal
Trout	Marginal	Important	Marginal	Marginal	Marginal
Char	Marginal	Important	Marginal	Marginal	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	12	0	89, 69-131	Chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, lamprey, pink salmon, sculpin, stickleback
Coho salmon	57	0	62, 32-85	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 12, 2014	400	527 s	13	2.47
Minnow Trapping	July 14, 2014	6	144 hrs	56	0.39

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments

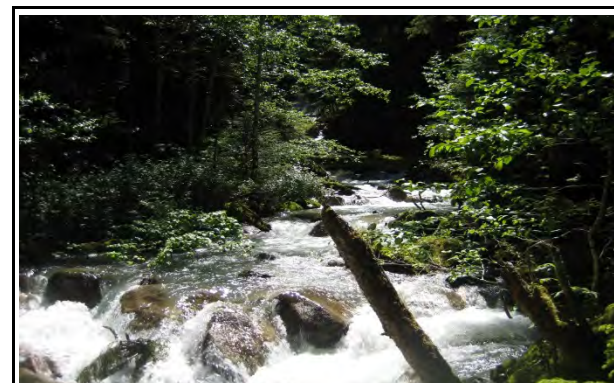


Plate 1 Photograph taken at right-of-way looking upstream.

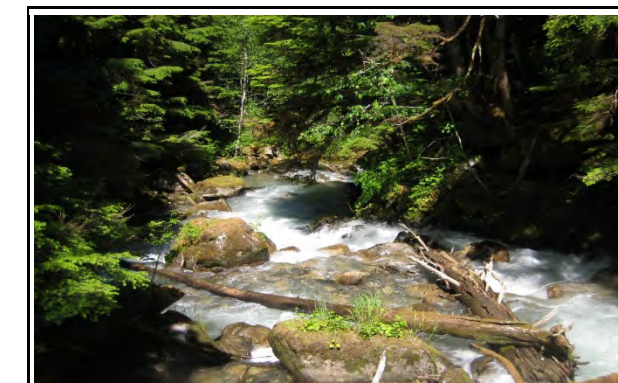


Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.

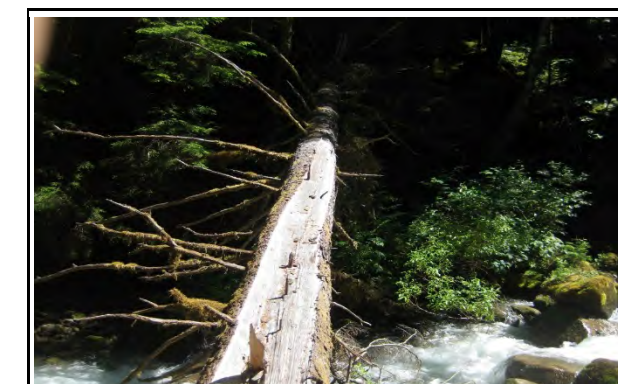


Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 45m downstream looking downstream at typical cascade.

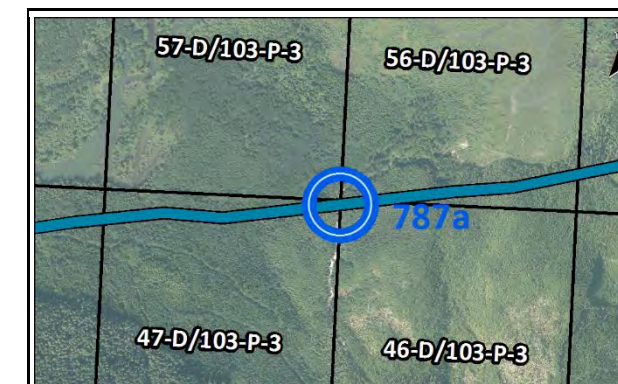


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ginlulak Creek (WC 788a)

**Survey Date:** July 06, 2014

**UTM (Zone 9 U):** 470833 E, 6099439 N

**Sensitivity:** High

**Field Crew:** E. Nyhof, S. Courtney

**Habitat Survey Length (m):** 50

**Stream Classification:** S3

**Timing Window of Least Risk:** June 1 - August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Occasionally Confined
Channel Pattern	Irregular, Wandering
Channel Width (m); Mean, Range	2.1, 1.4-2.4
Wetted Width (m); Mean, Range	1.5, 1.0-2.4
Water Depth (m); Mean, Range	0.08, 0.02-0.25
Ordinary High Water Mark (m); Mean	0.13
Discharge (m³/s)	0.01
Stream Gradient (%)	
Embeddedness	Moderately Embedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions		
Bank Shape	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Organics/Cobble	Organics/Cobble
Mean Bank Height (m); Mean, Range	2.4, 0.5-4.0	1.4, 0.3-2.0
Grade Of Approach Slopes (%)	Moderate (4-14)	Moderate (4-14)
Riparian Area Width (m)	2	2
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	0
Fines (<2mm)	0
Small Gravel (2-16 mm)	16
Large Gravel (17-64 mm)	33
Cobble (65-256 mm)	42
Boulder (256-400 mm)	10
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Pool	2	35	100	0.00, 0 - 0

Cover Type	m²
Depth	10
Woody Debris	9

Water Quality Parameters	
Water Temperature (°C)	10.8
pH	6.4
Dissolved Oxygen (mg/L)	10.8
Conductivity (uS/cm)	32.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Marginal	Marginal	Marginal	Marginal	Unsuitable
Char	Important	Important	Important	Marginal	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	7	0	86, 75-94	None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 06, 2014	104	125 s	7	5.60

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.

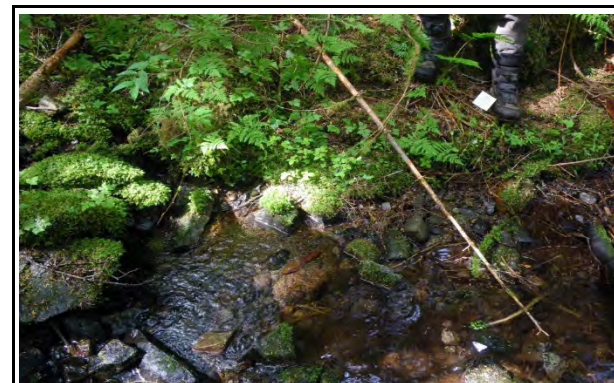


Plate 3 Photograph taken at right-of-way looking left.

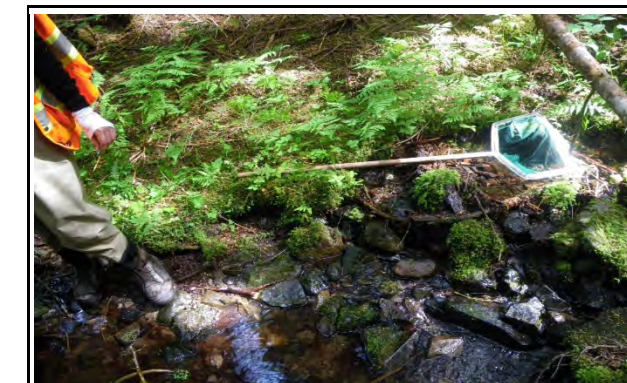


Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 100m downstream looking upstream.

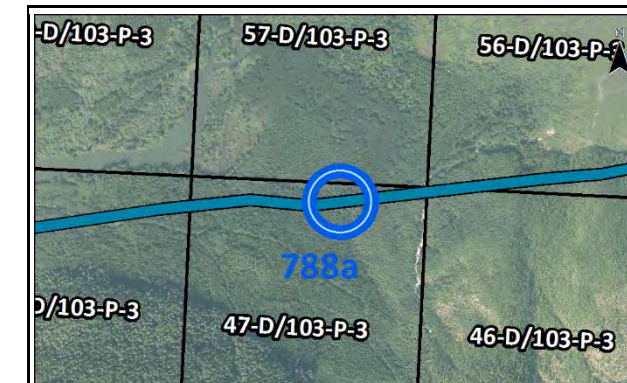


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ginlulak Creek (WC 788b)

**Survey Date:** July 02, 2014

**UTM (Zone 9 U):** 470303 E, 6099424 N

**Sensitivity:** Low

**Field Crew:** E. Lennert, D. Cooper

**Habitat Survey Length (m):** 200

**Stream Classification:** S3\*

**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 5)	
Confinement	Occasionally Confined
Channel Pattern	Straight
Channel Width (m); Mean, Range	2.1, 1.9-2.3
Wetted Width (m); Mean, Range	0.8, 0.0-1.8
Water Depth (m); Mean, Range	0.07, 0.00-0.20
Ordinary High Water Mark (m); Mean	0.07
Discharge (m³/s)	0.01
Stream Gradient (%)	15
Embeddedness	Unembedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Cobble/Boulders	Cobble/Boulders
Mean Bank Height (m); Mean, Range	1.0, 0.4-2.3	0.9, 0.3-1.7
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	0
Fines (<2mm)	6
Small Gravel (2-16 mm)	16
Large Gravel (17-64 mm)	28
Cobble (65-256 mm)	27
Boulder (256-400 mm)	23
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Pool	1	10	5	0.00
Riffle	2	190	95	0.00, 0 - 0

Cover Type	m²
Boulders	80
Depth	0
Instream Vegetation	0
Overhanging Vegetation	15
Under Cut Banks	25
Woody Debris	15

Water Quality Parameters	
Water Temperature (°C)	14.2
pH	8.6
Dissolved Oxygen (mg/L)	9.6
Conductivity (uS/cm)	6.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Unsuitable
Trout	Marginal	Marginal	Unsuitable	Unsuitable	Unsuitable
Char	Marginal	Marginal	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
No fish captured				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 02, 2014	100	114 s	0	0.00

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.

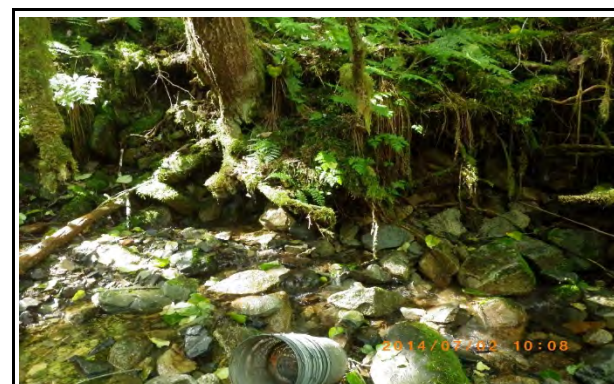


Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 8m downstream looking upstream at a tributary confluence with intermittent flow.



Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ginlulak Creek (WC 789a)

**Survey Date:** July 02, 2014

**UTM (Zone 9 U):** 470225 E, 6099387 N

**Sensitivity:** Low

**Field Crew:** E. Lennert, D. Cooper

**Habitat Survey Length (m):** 200

**Stream Classification:** S3\*

**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Occasionally Confined
Channel Pattern	Straight
Channel Width (m); Mean, Range	2.7, 2.2-3.2
Wetted Width (m); Mean, Range	Dry Channel
Water Depth (m); Mean, Range	n/a
Ordinary High Water Mark (m); Mean	0.00
Discharge (m³/s)	n/a
Stream Gradient (%)	25
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions		
Bank Shape	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Cobble/Large Gravel	Cobble/Large Gravel
Mean Bank Height (m); Mean, Range	1.0, 0.2-1.7	1.1, 0.2-1.7
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	18
Fines (<2mm)	3
Small Gravel (2-16 mm)	25
Large Gravel (17-64 mm)	20
Cobble (65-256 mm)	8
Boulder (256-400 mm)	25
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Not applicable				

Cover Type	m²
Boulders	7
Depth	0
Instream Vegetation	0
Overhanging Vegetation	8
Under Cut Banks	0
Woody Debris	18

Water Quality Parameters	
Water Temperature (°C)	
pH	
Dissolved Oxygen (mg/L)	
Conductivity (uS/cm)	
Turbidity (visual)	

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 132m downstream looking upstream at a falls.

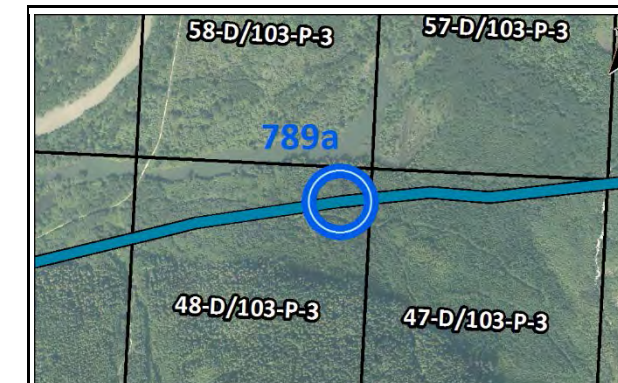


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Ginlulak Creek (WC 790a)**

**Survey Date:** June 30, 2014

**UTM (Zone 9 U):** 469473 E, 6099190 N

**Sensitivity:** High

**Field Crew:** J. Beblow, J. McNeice

**Habitat Survey Length (m):** 340

**Stream Classification:** S2

**Timing Window of Least Risk:** June 15- August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Confined
Channel Pattern	Irregular, Wandering
Channel Width (m); Mean, Range	6.6, 5.2-8.6
Wetted Width (m); Mean, Range	3.9, 1.2-6.5
Water Depth (m); Mean, Range	0.15, 0.06-0.23
Ordinary High Water Mark (m); Mean	0.21
Discharge (m³/s)	0.06
Stream Gradient (%)	24
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Cobble/Large Gravel	Cobble/Large Gravel
Mean Bank Height (m); Mean, Range	1.0, 0.1-2.3	0.8, 0.4-2.0
Grade Of Approach Slopes (%)	Low (<4)	Moderate (4-14)
Riparian Area Width (m)	20	20
Dominant Riparian Vegetation Type	Deciduous	Deciduous

Substrate	%
Organics	0
Fines (<2mm)	0
Small Gravel (2-16 mm)	2
Large Gravel (17-64 mm)	28
Cobble (65-256 mm)	23
Boulder (256-400 mm)	47
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	2	125	37	0.50, 0.5 - 0.5
Culvert	1	5	1	0.00
Flat	1	10	3	0.10
Riffle	2	200	59	0.18, 0.15 - 0.2

Cover Type	m²
Boulders	230
Depth	5
Overhanging Vegetation	175
Under Cut Banks	85
Woody Debris	90

Water Quality Parameters	
Water Temperature (°C)	12.4
pH	7.0
Dissolved Oxygen (mg/L)	7.5
Conductivity (uS/cm)	16.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Important	Unsuitable	Unsuitable	Unsuitable
Trout	Marginal	Marginal	Unsuitable	Unsuitable	Unsuitable
Char	Marginal	Marginal	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	2	0	132, 122-141	None
Coho salmon	0	50	n/a	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	June 30, 2014	100	164 s	2	1.22
Observation	June 30, 2014	n/a	n/a	50	n/a

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments

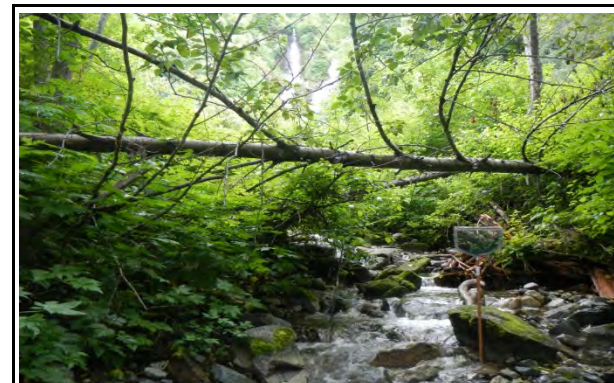


Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

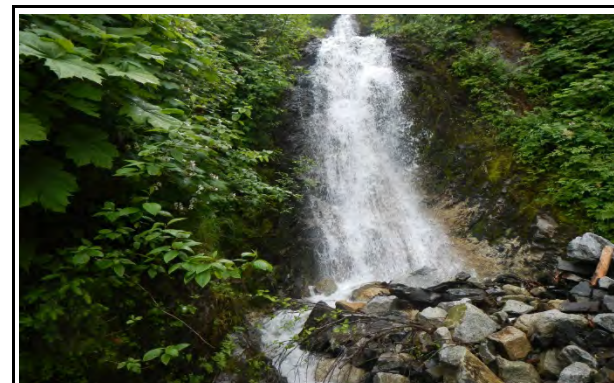


Plate 5 Photograph taken at 95m upstream looking upstream at a falls.

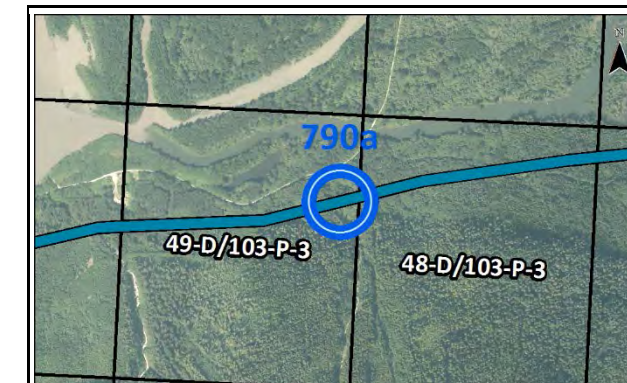


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Nass River (WC 791a)**

**UTM (Zone 9 U):** 468600 E, 6099084 N

**Field Crew:** E. Lennert, S. Courtney

**Stream Classification:** S2

**Survey Date:** June 30, 2014

**Sensitivity:** High

**Habitat Survey Length (m):** 300

**Timing Window of Least Risk:** June 1- August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Confined
Channel Pattern	Straight
Channel Width (m); Mean, Range	14.8, 12.0-25.0
Wetted Width (m); Mean, Range	13.6, 11.0-20.0
Water Depth (m); Mean, Range	0.32, 0.15-0.70
Ordinary High Water Mark (m); Mean	0.32
Discharge (m³/s)	1.47
Stream Gradient (%)	37
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Vertical	Sloping
Bank Texture (Dominant/Subdominant)	Boulders/Rock	Boulders/Rock
Mean Bank Height (m); Mean, Range	2.0, 1.5-2.6	2.4, 2.0-2.8
Grade Of Approach Slopes (%)	High (>14)	Low (<4)
Riparian Area Width (m)	30	30
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	0
Fines (<2mm)	12
Small Gravel (2-16 mm)	7
Large Gravel (17-64 mm)	18
Cobble (65-256 mm)	29
Boulder (256-400 mm)	35
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	2	231	77	0.60, 0.4 - 0.8
Chute	1	60	20	1.00
Pool	2	9	3	0.55, 0.4 - 0.7

Cover Type	m²
Boulders	1376
Depth	176
Overhanging Vegetation	226
Under Cut Banks	100
Woody Debris	135

Water Quality Parameters	
Water Temperature (°C)	9.3
pH	8.6
Dissolved Oxygen (mg/L)	11.4
Conductivity (uS/cm)	3.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Marginal	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Important	Unsuitable	Unsuitable	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	6	0	99, 67-124	Coarse or non-game fish
Sculpin	2	0	72, 64-79	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	June 30, 2014	150	205 s	8	3.90
Minnow Trapping	June 29, 2014	4	88 hrs	0	0.00

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

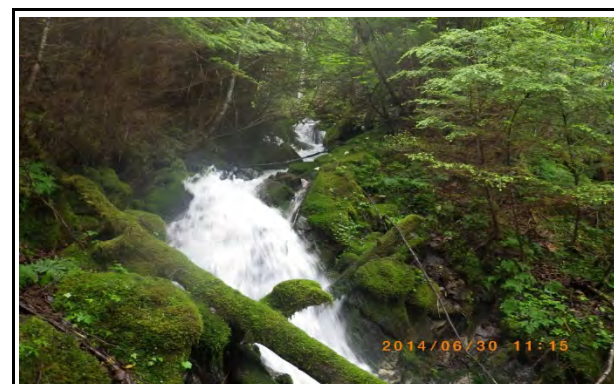


Plate 5 Photograph taken at 40m upstream looking upstream at a chute.

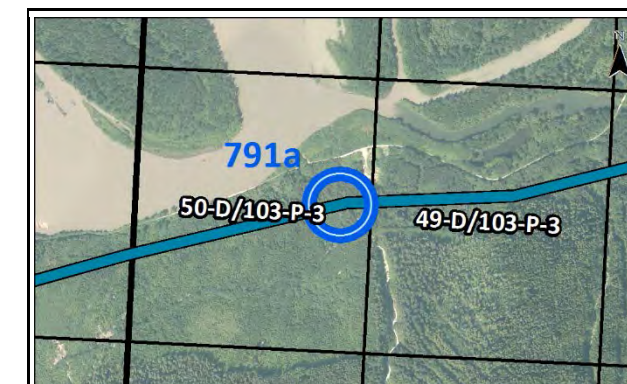


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company



Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Nass River (WC 792a)**

**UTM (Zone 9 U):** 468576 E, 6099076 N

**Field Crew:** E. Lennert, S. Courtney

**Stream Classification:** S3

**Survey Date:** June 30, 2014

**Sensitivity:** High

**Habitat Survey Length (m):** 370

**Timing Window of Least Risk:** August 1- August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	3.3, 2.6-4.0
Wetted Width (m); Mean, Range	3.3, 2.6-4.0
Water Depth (m); Mean, Range	0.24, 0.10-0.42
Ordinary High Water Mark (m); Mean	0.29
Discharge (m³/s)	0.12
Stream Gradient (%)	18
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Vertical	Vertical
Bank Texture (Dominant/Subdominant)	Boulders/Rock	Boulders/Rock
Mean Bank Height (m); Mean, Range	1.4, 0.5-3.0	1.6, 0.4-3.0
Grade Of Approach Slopes (%)	High (>14)	High (>14)
Riparian Area Width (m)	36	50
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	0
Fines (<2mm)	0
Small Gravel (2-16 mm)	4
Large Gravel (17-64 mm)	7
Cobble (65-256 mm)	43
Boulder (256-400 mm)	30
Rock (>400 mm)	16

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	2	185	48	0.40, 0.4 - 0.4
Chute	1	20	5	1.00
Riffle	1	180	47	0.10

Cover Type	m²
Boulders	180
Depth	150
Instream Vegetation	0
Overhanging Vegetation	190
Under Cut Banks	170
Woody Debris	130

Water Quality Parameters	
Water Temperature (°C)	10.8
pH	8.3
Dissolved Oxygen (mg/L)	10.6
Conductivity (uS/cm)	3.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Marginal	Important	Unsuitable	Unsuitable	Unsuitable
Trout	Important	Important	Important	Unsuitable	Unsuitable
Char	Important	Important	Important	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	1	0	100	None
Rainbow trout	0	1	NR	
Threespine stickleback	1	0	NR	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	June 30, 2014	150	200 s	2	1.00

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments

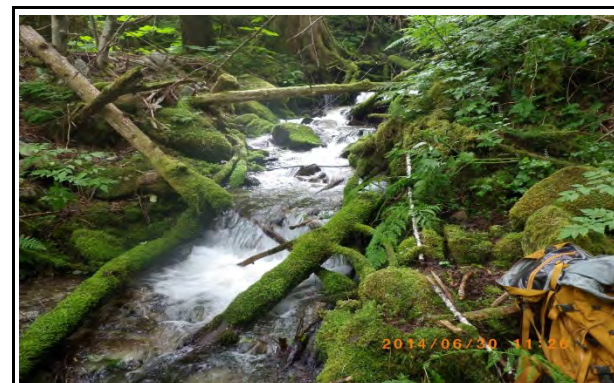


Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 275m downstream looking upstream.

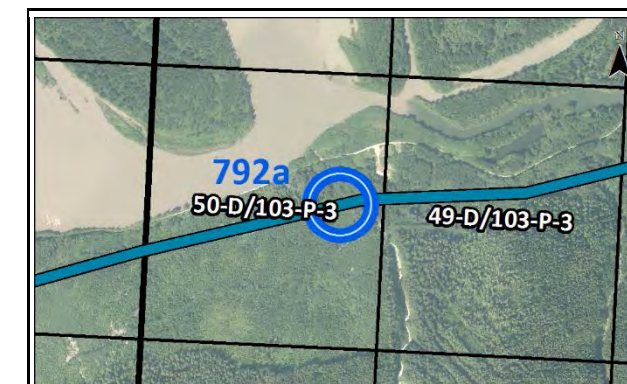


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Nass River (WC 793a)**

**UTM (Zone 9 U):** 466944 E, 6098638 N

**Field Crew:** E. Nyhof, J. Beblow

**Stream Classification:** S2

**Survey Date:** June 29, 2014

**Sensitivity:** High

**Habitat Survey Length (m):** 385

**Timing Window of Least Risk:** June 15 - August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Occasionally Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	5.8, 3.2-9.1
Wetted Width (m); Mean, Range	3.6, 2.1-4.3
Water Depth (m); Mean, Range	0.16, 0.08-0.26
Ordinary High Water Mark (m); Mean	0.27
Discharge (m³/s)	0.22
Stream Gradient (%)	17
Embeddedness	Unembedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Boulders/Cobble	Boulders/Cobble
Mean Bank Height (m); Mean, Range	1.1, 0.5-1.6	1.0, 0.5-1.8
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	30	30
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	0
Fines (<2mm)	9
Small Gravel (2-16 mm)	13
Large Gravel (17-64 mm)	3
Cobble (65-256 mm)	24
Boulder (256-400 mm)	50
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	4	150	38	0.57, 0.57 - 0.57
Flat	2	110	28	0.00, 0.001 - 0.001
Pool	1	5	1	0.25
Riffle	3	125	32	0.45, 0.3 - 0.57

Cover Type	m²
Boulders	334
Depth	536
Overhanging Vegetation	487
Under Cut Banks	10
Woody Debris	314

Water Quality Parameters	
Water Temperature (°C)	10.7
pH	8.1
Dissolved Oxygen (mg/L)	11.8
Conductivity (uS/cm)	2.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Marginal	Marginal	Unsuitable	Marginal	Marginal
Trout	Marginal	Marginal	Marginal	Marginal	Marginal
Char	Marginal	Marginal	Marginal	Marginal	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	2	0	68, 40-96	Coho salmon, Dolly Varden

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	June 29, 2014	125	580 s	2	0.34
Minnow Trapping	June 29, 2014	5	105 hrs	0	0.00

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

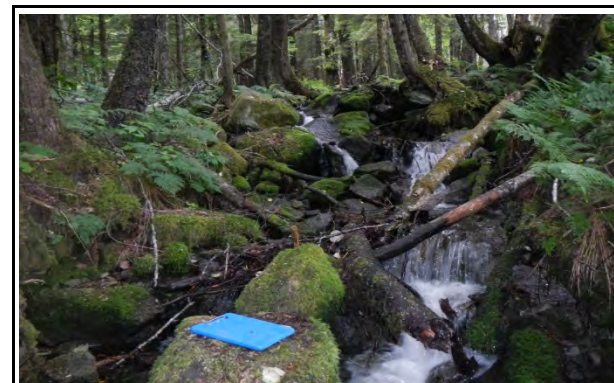


Plate 5 Photograph taken at 40m downstream looking upstream at a 25% gradient section.

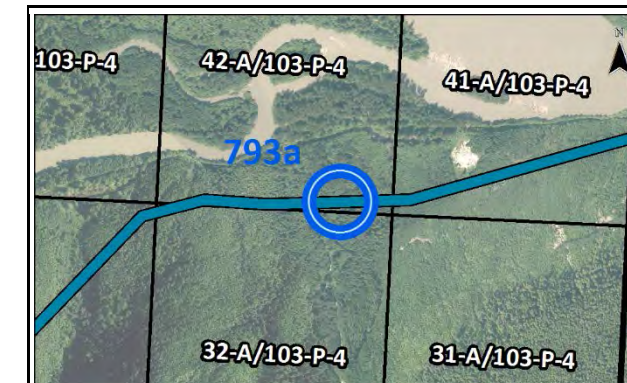


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Nass River (WC 794a)**

**Survey Date:** June 29, 2014

**UTM (Zone 9 U):** 466062 E, 6098328 N

**Sensitivity:** High

**Field Crew:** E. Lennert, S. Courtney

**Habitat Survey Length (m):** 475

**Stream Classification:** S3

**Timing Window of Least Risk:** August 15- August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	3.3, 2.5-4.4
Wetted Width (m); Mean, Range	2.5, 1.6-3.7
Water Depth (m); Mean, Range	0.15, 0.00-0.35
Ordinary High Water Mark (m); Mean	0.20
Discharge (m³/s)	0.03
Stream Gradient (%)	9
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	Yes	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Cobble/Small Gravel	Cobble/Small Gravel
Mean Bank Height (m); Mean, Range	0.6, 0.3-0.8	0.8, 0.3-1.5
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	30	30
Dominant Riparian Vegetation Type	Deciduous	Deciduous

Substrate	%
Organics	0
Fines (<2mm)	12
Small Gravel (2-16 mm)	38
Large Gravel (17-64 mm)	22
Cobble (65-256 mm)	20
Boulder (256-400 mm)	9
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	6	97	21	0.34, 0.3 - 0.35
Flat	2	160	34	0.01, 0.01 - 0.01
Pool	3	4	1	0.15, 0.15 - 0.15
Riffle	7	204	43	0.25, 0.2 - 0.3
Run	1	4	1	0.20

Cover Type	m²
Boulders	129
Depth	1165
Instream Vegetation	500
Overhanging Vegetation	262
Under Cut Banks	64
Woody Debris	627

Water Quality Parameters	
Water Temperature (°C)	7.4
pH	7.1
Dissolved Oxygen (mg/L)	10.2
Conductivity (uS/cm)	140.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Important	Unsuitable	Important	Unsuitable
Trout	Important	Important	Important	Important	Marginal
Char	Important	Important	Important	Important	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	2	0	90, 88-92	None
Coastal cutthroat trout	8	0	115, 89-135	
Coho salmon	5	0	63, 58-74	
Sculpin	1	0	75	
Threespine stickleback	3	0	48, 45-50	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	June 29, 2014	100	124 s	10	8.06
Minnow Trapping	June 29, 2014	5	15 hrs	9	0.60

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 110m downstream looking upstream at a potential spawning area.



Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Quilgaw Creek (WC 796a)**

UTM (Zone 9 U): 464461 E, 6096380 N

Field Crew: B. Stitt, C. Jerney, R. Ball

Stream Classification: S1-B

Survey Date: July 10, 2014

Sensitivity: High

Habitat Survey Length (m):

Timing Window of Least Risk: No window

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Unconfined
Channel Pattern	Irregular, Meandering
Channel Width (m); Mean, Range	28.8, 28.0-30.0
Wetted Width (m); Mean, Range	28.8, 28.0-30.0
Water Depth (m); Mean, Range	0.94, 0.33-1.70
Ordinary High Water Mark (m); Mean	0.94
Discharge (m³/s)	2.51
Stream Gradient (%)	1
Embeddedness	Not Applicable

Channel and Flow Conditions Continued		
Beaver Dams	Yes	
Native Channel Width (m)	n/a	
Bank Conditions		
Bank Shape	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Fines/Organics	Fines/Organics
Mean Bank Height (m); Mean, Range	2.8, 2.5-3.0	2.8, 2.5-3.0
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	100	40
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	38
Fines (<2mm)	62
Small Gravel (2-16 mm)	0
Large Gravel (17-64 mm)	0
Cobble (65-256 mm)	0
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Water Quality Parameters	
Water Temperature (°C)	14.4
pH	8.7
Dissolved Oxygen (mg/L)	9.5
Conductivity (uS/cm)	84.8
Turbidity (visual)	Clear

Habitat	No.	Length (m)	%	Velocity (m/s)	Cover Type	m²
Not recorded					Not recorded	

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Important	Unsuitable	Marginal	Essential
Trout	Unsuitable	Important	Marginal	Marginal	Essential
Char	Unsuitable	Important	Marginal	Marginal	Important

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range
Chinook salmon	4	0	54, 48-58
Coastal cutthroat trout	6	0	156, 51-205
Coho salmon	23	0	56, 42-83
Prickly sculpin	5	0	69, 39-118
Stickleback	15	0	67, 54-84
Threespine stickleback	15	0	68, 54-75
Western river lamprey	5	0	125, 110-132

Fish Species Previously Documented
Chum salmon, coarse or non-game fish, coastal cutthroat trout, coho salmon, pink salmon, stickleback

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 10, 2014	650	1409 s	18	1.28
Minnow Trapping	July 10, 2014	6	114 hrs	55	0.48

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments

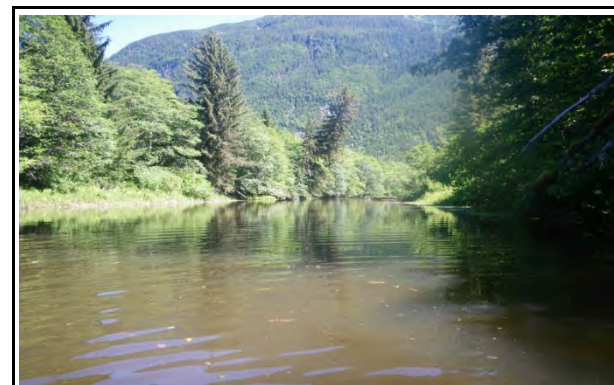


Plate 1 Photograph taken at right-of-way looking upstream.

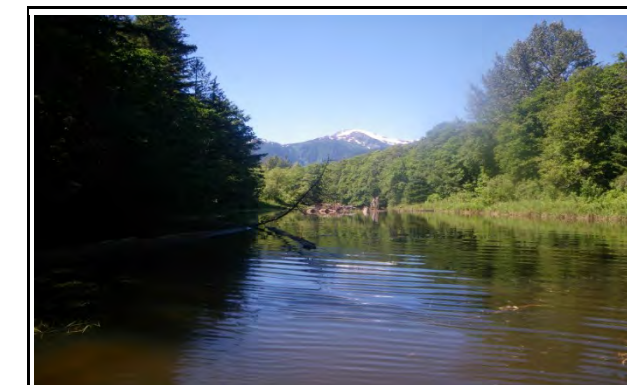


Plate 2 Photograph taken at right-of-way looking downstream.

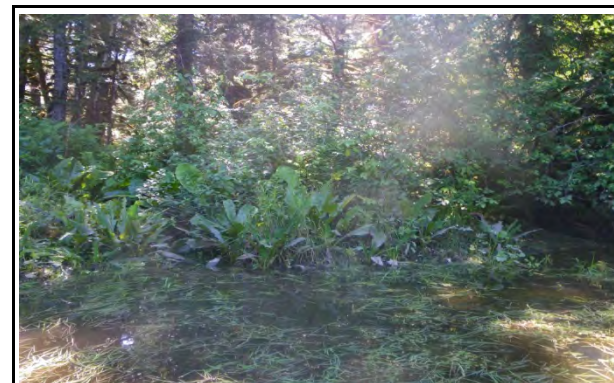


Plate 3 Photograph taken at right-of-way looking left.

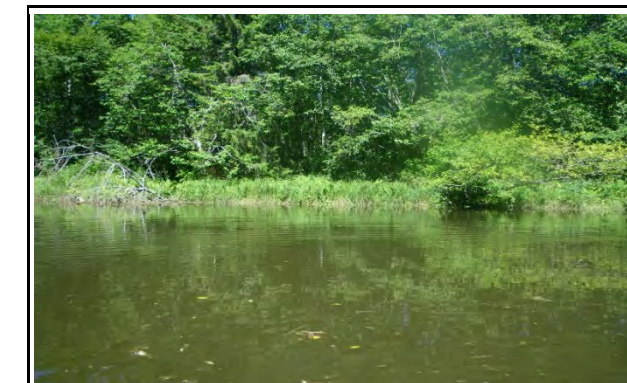


Plate 4 Photograph taken at right-of-way looking right.

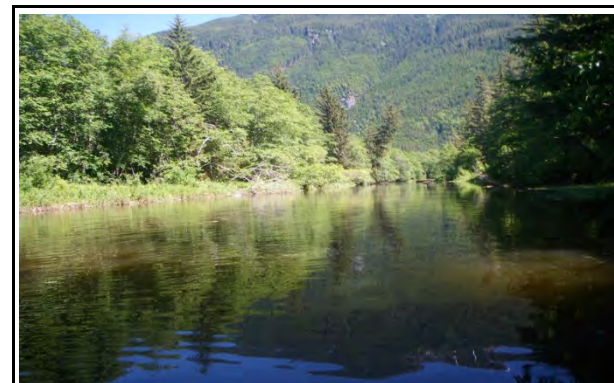


Plate 5 Photograph taken at 60m downstream looking upstream.



Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Underground trenchless
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Quilgauw Creek (NCD 798a)**  
**UTM (Zone 9 U):** 463836 E, 6095731 N  
**Field Crew:** E. Lennert, R. Ball  
**Stream Classification:** NCD

**Survey Date:** July 01, 2014  
**Sensitivity:** High  
**Habitat Survey Length (m):** 150  
**Timing Window of Least Risk:** June 15- July 15

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Occasionally Confined
Channel Pattern	Straight
Channel Width (m); Mean, Range	n/a
Wetted Width (m); Mean, Range	19.8, 17.0-23.0
Water Depth (m); Mean, Range	1.28, 0.40-3.00
Ordinary High Water Mark (m); Mean	n/a
Discharge (m³/s)	Negligible
Stream Gradient (%)	0
Embeddedness	Not Applicable

Channel and Flow Conditions Continued		
Beaver Dams	Yes	
Native Channel Width (m)	n/a	
Bank Conditions		
Bank Shape	Left Bank	Right Bank
Bank Shape	n/a	n/a
Bank Texture (Dominant/Subdominant)	n/a	n/a
Mean Bank Height (m); Mean, Range	n/a	n/a
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	100
Fines (<2mm)	0
Small Gravel (2-16 mm)	0
Large Gravel (17-64 mm)	0
Cobble (65-256 mm)	0
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Impoundment	3	180	100	0.00, 0 - 0

Cover Type	m²
Boulders	0
Depth	3000
Instream Vegetation	400
Overhanging Vegetation	275
Under Cut Banks	0
Woody Debris	235

Water Quality Parameters	
Water Temperature (°C)	17.3
pH	7.8
Dissolved Oxygen (mg/L)	5.0
Conductivity (uS/cm)	64.0
Turbidity (visual)	Stained

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Important	Unsuitable	Important	Marginal
Trout	Unsuitable	Important	Marginal	Important	Marginal
Char	Unsuitable	Important	Marginal	Important	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Chinook salmon	2	0	108, 98-118	None
Coho salmon	2	0	120, 119-121	
Threespine stickleback	70	0	NR	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Minnow Trapping	July 01, 2014	5	120 hrs	74	0.62

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 50m upstream looking upslope.

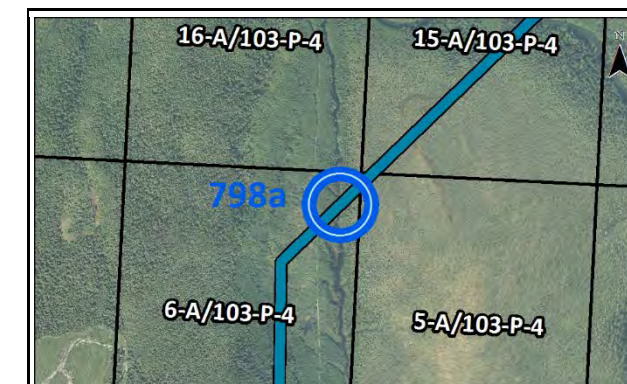


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Ksi Higinx (WC 799a)**

**UTM (Zone 9 U):** 468966 E, 6093759 N

**Field Crew:** C. Sinclair, J. McNeice

**Stream Classification:** S3

**Survey Date:** July 08, 2014

**Sensitivity:** High

**Habitat Survey Length (m):** 200

**Timing Window of Least Risk:** June 15-August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Frequently Confined
Channel Pattern	Straight
Channel Width (m); Mean, Range	1.9, 1.2-2.6
Wetted Width (m); Mean, Range	0.8, 0.5-1.4
Water Depth (m); Mean, Range	0.12, 0.02-0.60
Ordinary High Water Mark (m); Mean	0.53
Discharge (m³/s)	0.02
Stream Gradient (%)	1
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	Yes	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Fines/Organics	Fines/Organics
Mean Bank Height (m); Mean, Range	0.4, 0.2-0.6	0.4, 0.3-0.6
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	100	100
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	6
Fines (<2mm)	94
Small Gravel (2-16 mm)	0
Large Gravel (17-64 mm)	0
Cobble (65-256 mm)	0
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Pool	1	4	2	0.05
Run	3	196	98	0.10, 0.07 - 0.11

Cover Type	m²
Boulders	0
Depth	0
Instream Vegetation	0
Overhanging Vegetation	166
Under Cut Banks	13
Woody Debris	83

Water Quality Parameters	
Water Temperature (°C)	10.8
pH	7.6
Dissolved Oxygen (mg/L)	9.9
Conductivity (uS/cm)	10.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Important	Unsuitable	Unsuitable	Marginal
Trout	Unsuitable	Important	Unsuitable	Unsuitable	Marginal
Char	Unsuitable	Important	Unsuitable	Unsuitable	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	1	0	90	None
Coho salmon	6	0	69, 55-78	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 08, 2014	23	102 s	7	6.86

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 65m upstream looking downstream.

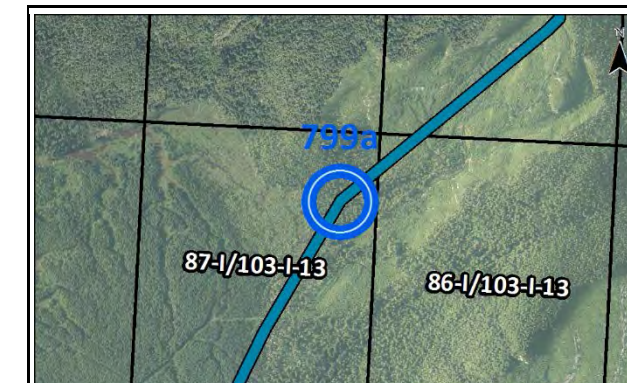


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ksi Higinx (NCD 800a.1)

**Survey Date:** July 02, 2014

**UTM (Zone 9 U):** 462792 E, 6093422 N

**Sensitivity:** High

**Field Crew:** E. Nyhof, S. Courtney

**Habitat Survey Length (m):** 200

**Stream Classification:** NCD

**Timing Window of Least Risk:** June 15- September 1

Channel and Flow Conditions (No. of Transects: 0)	
Confinement	
Channel Pattern	
Channel Width (m); Mean, Range	n/a
Wetted Width (m); Mean, Range	
Water Depth (m); Mean, Range	
Ordinary High Water Mark (m); Mean	n/a
Discharge (m³/s)	
Stream Gradient (%)	
Embeddedness	

Channel and Flow Conditions Continued			
Beaver Dams	No		
Native Channel Width (m)	n/a		
Bank Conditions		Left Bank	Right Bank
Bank Shape		n/a	n/a
Bank Texture (Dominant/Subdominant)		n/a	n/a
Mean Bank Height (m); Mean, Range		n/a	n/a
Grade Of Approach Slopes (%)			
Riparian Area Width (m)			
Dominant Riparian Vegetation Type	NR	NR	NR

Substrate	%
Organics	NR
Fines (<2mm)	NR
Small Gravel (2-16 mm)	NR
Large Gravel (17-64 mm)	NR
Cobble (65-256 mm)	NR
Boulder (256-400 mm)	NR
Rock (>400 mm)	NR

Habitat	No.	Length (m)	%	Velocity (m/s)
No defined channel	2	200	100	0.00, 0 - 0

Cover Type	m²
Instream Vegetation	10
Overhanging Vegetation	300
Woody Debris	150

Water Quality Parameters	
Water Temperature (°C)	15.2
pH	7.0
Dissolved Oxygen (mg/L)	6.3
Conductivity (uS/cm)	63.0
Turbidity (visual)	Stained

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Marginal
Trout	Unsuitable	Marginal	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Marginal	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Coho salmon	4	0	77, 71-80	None
Salmonid	0	2	n/a	
Stickleback	6	0	54, 45-62	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Minnow Trapping	July 02, 2014	2	0 hrs	10	0.00
Observation	July 02, 2014	n/a	n/a	2	n/a

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.

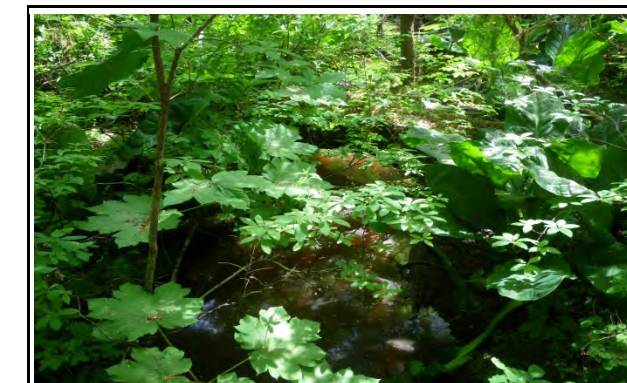


Plate 4 Photograph taken at right-of-way looking right.



Plate 5 No photograph available.

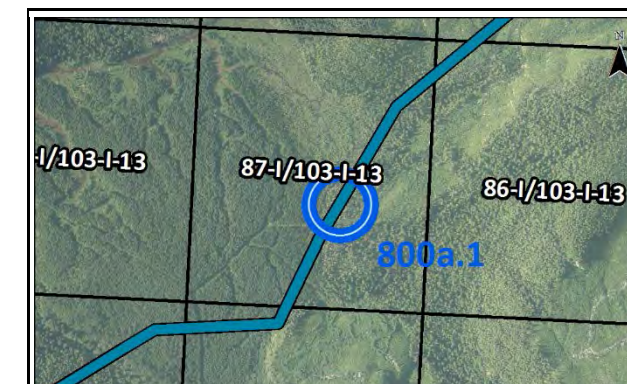


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Ksi Higinx Side Channel (WC 801a)**  
**UTM (Zone 9 U):** 462015 E, 6092863 N  
**Field Crew:** N. Postma, D. Cooper  
**Stream Classification:** S2

**Survey Date:** July 01, 2014  
**Sensitivity:** High  
**Habitat Survey Length (m):** 450  
**Timing Window of Least Risk:** No window

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Unconfined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	18.2, 13.2-20.8
Wetted Width (m); Mean, Range	14.7, 10.4-18.4
Water Depth (m); Mean, Range	0.53, 0.05-0.78
Ordinary High Water Mark (m); Mean	0.70
Discharge (m³/s)	2.05
Stream Gradient (%)	3
Embeddedness	Highly Embedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Fines/Fines	Fines/Fines
Mean Bank Height (m); Mean, Range	2.0, 1.6-2.7	1.8, 0.8-2.8
Grade Of Approach Slopes (%)	Low (<4)	High (>14)
Riparian Area Width (m)	100	62
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	0
Fines (<2mm)	36
Small Gravel (2-16 mm)	8
Large Gravel (17-64 mm)	11
Cobble (65-256 mm)	41
Boulder (256-400 mm)	0
Rock (>400 mm)	5

Water Quality Parameters	
Water Temperature (°C)	9.2
pH	7.5
Dissolved Oxygen (mg/L)	11.4
Conductivity (uS/cm)	7.0
Turbidity (visual)	Clear

Habitat	No.	Length (m)	%	Velocity (m/s)
Pool	1	35	7	0.20
Riffle	1	30	6	0.50
Run	3	420	87	0.23, 0.2 - 0.3

Cover Type	m²
Boulders	0
Depth	420
Instream Vegetation	2
Overhanging Vegetation	253
Under Cut Banks	54
Woody Debris	636

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Important	Important	Unsuitable	Important	Important
Trout	Important	Important	Important	Important	Important
Char	Important	Important	Important	Important	Important

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range
Char	1	0	62
Chinook salmon	5	0	63, 38-75
Coastal cutthroat trout	2	0	69, 57-80
Coho salmon	41	0	68, 49-80
Lamprey	1	0	145
Rainbow trout	11	0	68, 53-88
Sculpin	4	0	99, 80-140

Fish Species Previously Documented
Chinook salmon, chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, eulachon, lamprey, pink salmon, rainbow trout, sockeye salmon, steelhead, threespine stickleback

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 01, 2014	100	236 s	7	2.97
Minnow Trapping	July 01, 2014	5	105 hrs	58	0.55

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 25m downstream looking downstream at a small island.

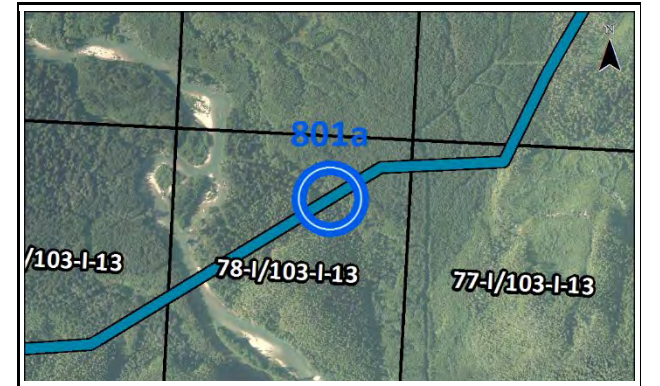


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	None
Preliminary Vehicle and Equipment Crossing Method Option B	Not applicable

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company



Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Ksi Higinx (WC 802a)**

**UTM (Zone 9 U):** 461567 E, 6092563 N

**Field Crew:** B. Stitt, C. Jermey, R. Ball

**Stream Classification:** S1-B

**Survey Date:** July 10, 2014

**Sensitivity:** High

**Habitat Survey Length (m):**

**Timing Window of Least Risk:** No window

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Occasionally Confined
Channel Pattern	Irregular, Meandering
Channel Width (m); Mean, Range	84.2, 63.0-125.0
Wetted Width (m); Mean, Range	76.2, 37.0-125.0
Water Depth (m); Mean, Range	0.78, 0.15-1.50
Ordinary High Water Mark (m); Mean	1.01
Discharge (m³/s)	NR
Stream Gradient (%)	1
Embeddedness	Unembedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Fines/Organics	Fines/Organics
Mean Bank Height (m); Mean, Range	2.5, 1.5-3.0	3.6, 1.5-10.0
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	15	15
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	0
Fines (<2mm)	10
Small Gravel (2-16 mm)	9
Large Gravel (17-64 mm)	39
Cobble (65-256 mm)	28
Boulder (256-400 mm)	13
Rock (>400 mm)	0

Water Quality Parameters	
Water Temperature (°C)	10.6
pH	NR
Dissolved Oxygen (mg/L)	10.8
Conductivity (uS/cm)	17.5
Turbidity (visual)	Clear

Habitat	No.	Length (m)	%	Velocity (m/s)
Not recorded				

Cover Type	m²
Not recorded	

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Important	Important	Unsuitable	Important	Essential
Trout	Marginal	Important	Important	Important	Essential
Char	Important	Important	Important	Important	Important

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range
Char	6	0	217, 78-340
Chinook salmon	5	13	399, 48-800
Coastrange sculpin	2	0	135
Coho salmon	3	0	57, 43-82
Mountain whitefish	2	0	213, 120-305

Fish Species Previously Documented
Chinook salmon, chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, eulachon, lamprey, pink salmon, rainbow trout, sockeye salmon, steelhead, threespine stickleback

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Angling	July 10, 2014	2	2 Anglers	2	4.00
Backpack Electrofishing	July 10, 2014	3000	1826 s	7	0.38
Minnow Trapping	July 10, 2014	6	120 hrs	9	0.08

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.

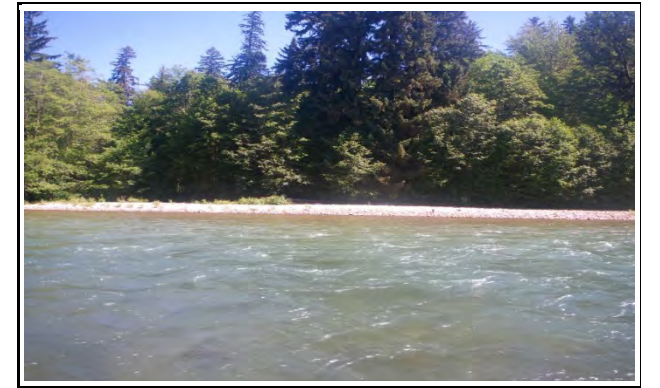


Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 80m downstream looking downstream.

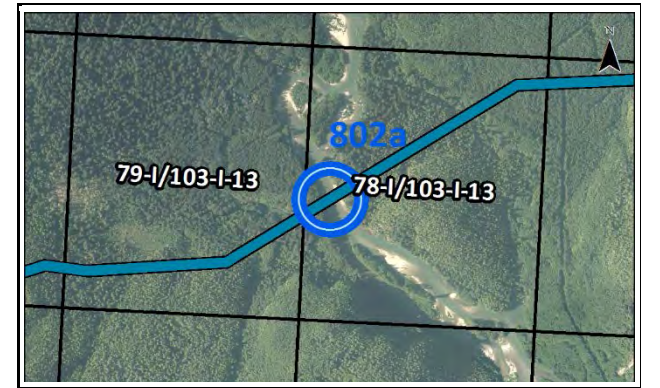


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Underground trenchless
Preliminary Pipeline Crossing Method Option B	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Ksi Higinx (WC 803a)**  
**UTM (Zone 9 U): 461457 E, 6092516 N**  
**Field Crew: M. Bahr, S. Whiteside**  
**Stream Classification: S2**

**Survey Date:** June 23, 2014  
**Sensitivity:** High  
**Habitat Survey Length (m):** 400  
**Timing Window of Least Risk:** June 15- September 1

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Unconfined
Channel Pattern	Regular Meanders
Channel Width (m); Mean, Range	13.9, 11.3-18.4
Wetted Width (m); Mean, Range	12.5, 10.9-17.3
Water Depth (m); Mean, Range	0.53, 0.25-0.80
Ordinary High Water Mark (m); Mean	0.65
Discharge (m³/s)	0.86
Stream Gradient (%)	1
Embeddedness	Moderately Embedded

Channel and Flow Conditions Continued		
Beaver Dams	Yes	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Undercut	Undercut
Bank Texture (Dominant/Subdominant)	Fines/Cobble	Fines/Cobble
Mean Bank Height (m); Mean, Range	1.3, 1.1-1.6	1.1, 0.7-1.5
Grade Of Approach Slopes (%)	High (>14)	High (>14)
Riparian Area Width (m)	200	128
Dominant Riparian Vegetation Type	Deciduous	Deciduous

Substrate	%
Organics	0
Fines (<2mm)	23
Small Gravel (2-16 mm)	0
Large Gravel (17-64 mm)	6
Cobble (65-256 mm)	70
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Impoundment	1	180	47	0.05
Pool	1	17	4	0.20
Riffle	3	88	23	0.38, 0.35 - 0.4
Run	2	97	25	0.23, 0.2 - 0.25

Cover Type	m²
Depth	554
Instream Vegetation	90
Overhanging Vegetation	262
Under Cut Banks	172
Woody Debris	138

Water Quality Parameters	
Water Temperature (°C)	10.4
pH	7.6
Dissolved Oxygen (mg/L)	10.7
Conductivity (uS/cm)	8.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Important	Important	Unsuitable	Important	Important
Trout	Marginal	Important	Important	Important	Important
Char	Marginal	Important	Important	Important	Important

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Coho salmon	18	20	45, 32-59	None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	June 23, 2014	75	1080 s	18	1.67
Observation	June 23, 2014	n/a	n/a	20	n/a

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 315m downstream looking upstream.

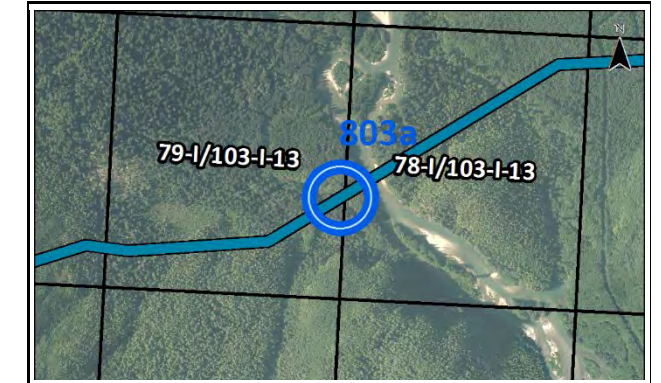


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Ksi Higinx (WC 804b)**

**UTM (Zone 9 U):** 461061 E, 6092318 N

**Field Crew:** N. Postma, D. Cooper

**Stream Classification:** S3

**Survey Date:** June 27, 2014

**Sensitivity:** High

**Habitat Survey Length (m):** 200

**Timing Window of Least Risk:** August 1 - August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Occasionally Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	3.3, 2.0-5.0
Wetted Width (m); Mean, Range	1.0, 0.3-2.7
Water Depth (m); Mean, Range	0.07, 0.01-0.21
Ordinary High Water Mark (m); Mean	0.16
Discharge (m³/s)	Negligible
Stream Gradient (%)	14
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Fines/Small Gravel	Fines/Small Gravel
Mean Bank Height (m); Mean, Range	0.3, 0.2-0.6	0.4, 0.3-0.8
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	9	12
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	0
Fines (<2mm)	53
Small Gravel (2-16 mm)	19
Large Gravel (17-64 mm)	13
Cobble (65-256 mm)	13
Boulder (256-400 mm)	3
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	2	40	27	0.38, 0.35 - 0.4
Flat	2	73	49	0.08, 0.05 - 0.1
Pool	1	2	1	0.10
Riffle	1	8	5	0.10
Run	1	25	17	0.20

Cover Type	m²
Boulders	11
Instream Vegetation	20
Overhanging Vegetation	119
Under Cut Banks	22
Woody Debris	25

Water Quality Parameters	
Water Temperature (°C)	11.3
pH	6.8
Dissolved Oxygen (mg/L)	8.6
Conductivity (uS/cm)	13.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Marginal	Important	Unsuitable	Unsuitable	Important
Trout	Important	Important	Marginal	Unsuitable	Important
Char	Important	Important	Marginal	Unsuitable	Important

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	4	0	88, 76-104	None
Coastal cutthroat trout	3	0	70, 57-83	
Coho salmon	6	0	76, 68-98	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Minnow Trapping	June 27, 2014	2	48 hrs	13	0.27

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 76m downstream looking upstream at the stream entering a wetland.



Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Ksi Higinx (WC 804c)**

**UTM (Zone 9 U):** 460755 E, 6092285 N

**Field Crew:** N. Postma, D. Cooper

**Stream Classification:** S3

**Survey Date:** June 27, 2014

**Sensitivity:** High

**Habitat Survey Length (m):** 190

**Timing Window of Least Risk:** August 1 - August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Unconfined
Channel Pattern	Irregular, Meandering
Channel Width (m); Mean, Range	3.8, 2.0-6.7
Wetted Width (m); Mean, Range	2.7, 1.4-5.3
Water Depth (m); Mean, Range	0.15, 0.00-0.40
Ordinary High Water Mark (m); Mean	0.25
Discharge (m³/s)	0.03
Stream Gradient (%)	7
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Overhanging	Undercut
Bank Texture (Dominant/Subdominant)	Fines/Large Gravel	Fines/Large Gravel
Mean Bank Height (m); Mean, Range	0.6, 0.5-0.8	0.7, 0.6-1.0
Grade Of Approach Slopes (%)	High (>14)	High (>14)
Riparian Area Width (m)	100	65
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	0
Fines (<2mm)	5
Small Gravel (2-16 mm)	14
Large Gravel (17-64 mm)	17
Cobble (65-256 mm)	64
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Water Quality Parameters	
Water Temperature (°C)	9.5
pH	7.8
Dissolved Oxygen (mg/L)	10.8
Conductivity (uS/cm)	35.0
Turbidity (visual)	Clear

Habitat	No.	Length (m)	%	Velocity (m/s)
Pool	2	10	5	0.15, 0.1 - 0.2
Riffle	4	83	43	0.29, 0.25 - 0.3
Run	3	98	51	0.17, 0.1 - 0.2

Cover Type	m²
Overhanging Vegetation	319
Under Cut Banks	102
Woody Debris	44

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Important	Important	Unsuitable	Marginal	Important
Trout	Important	Important	Marginal	Marginal	Important
Char	Important	Important	Marginal	Marginal	Important

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range
Char	9	0	79, 53-94
Coastal cutthroat trout	3	0	76, 64-98
Coho salmon	2	0	65, 55-75
Lamprey	0	1	200

Fish Species Previously Documented
None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Minnow Trapping	June 28, 2014	5	25 hrs	14	0.56
Observation	June 27, 2014	n/a	n/a	1	n/a

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.

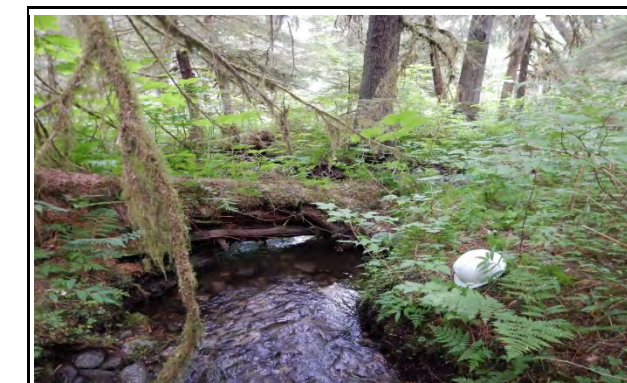


Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 100m upstream looking upstream at a 2 meter high falls.

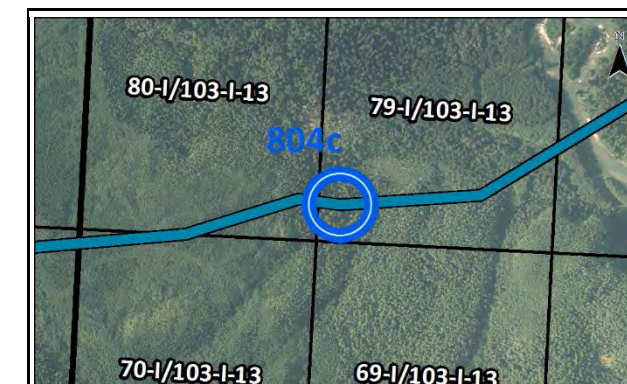


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Ksi Higinx (WC 805a)**

**Survey Date:** June 27, 2014

**UTM (Zone 9 U):** 460673 E, 6092287 N

**Sensitivity:** High

**Field Crew:** N. Postma, D. Cooper

**Habitat Survey Length (m):** 150

**Stream Classification:** S2

**Timing Window of Least Risk:** August 1- August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Unconfined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	8.0, 2.9-18.0
Wetted Width (m); Mean, Range	3.0, 2.0-3.7
Water Depth (m); Mean, Range	0.15, 0.00-0.80
Ordinary High Water Mark (m); Mean	0.31
Discharge (m³/s)	0.02
Stream Gradient (%)	3
Embeddedness	Moderately Embedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Fines/Small Gravel	Fines/Small Gravel
Mean Bank Height (m); Mean, Range	0.6, 0.5-0.7	0.6, 0.4-0.9
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	65	100
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	0
Fines (<2mm)	53
Small Gravel (2-16 mm)	15
Large Gravel (17-64 mm)	12
Cobble (65-256 mm)	20
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Pool	4	28	18	0.10, 0.1 - 0.1
Riffle	5	92	60	0.27, 0.2 - 0.3
Run	2	34	22	0.20, 0.2 - 0.2

Cover Type	m²
Boulders	2
Depth	0
Instream Vegetation	0
Overhanging Vegetation	145
Under Cut Banks	27
Woody Debris	56

Water Quality Parameters	
Water Temperature (°C)	9.1
pH	7.9
Dissolved Oxygen (mg/L)	10.3
Conductivity (uS/cm)	38.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Important	Important	Unsuitable	Marginal	Important
Trout	Important	Important	Marginal	Marginal	Important
Char	Important	Important	Marginal	Marginal	Important

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	4	0	83, 66-96	None
Coastal cutthroat trout	4	0	62, 36-89	
Coho salmon	41	0	53, 35-84	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	June 27, 2014	30	261 s	23	8.81
Dip Net	June 27, 2014	n/a	n/a	2	n/a
Minnow Trapping	June 27, 2014	3	60 hrs	24	0.40

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 50m downstream looking downstream at the stream braiding around a large (3 m) root pile.

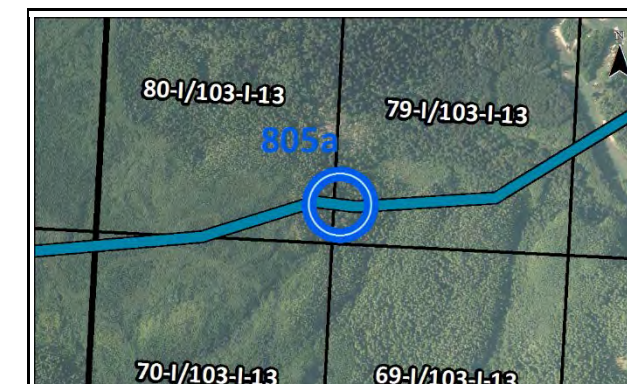


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Ksi Higinx (WC 805b)**

**Survey Date:** June 29, 2014

**UTM (Zone 9 U):** 460635 E, 6092292 N

**Sensitivity:** High

**Field Crew:** N. Postma, D. Cooper

**Habitat Survey Length (m):** 135

**Stream Classification:** S3\*

**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Occasionally Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	1.8, 1.6-2.3
Wetted Width (m); Mean, Range	1.1, 0.7-1.6
Water Depth (m); Mean, Range	0.08, 0.02-0.20
Ordinary High Water Mark (m); Mean	0.13
Discharge (m³/s)	0.01
Stream Gradient (%)	18
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued			
Beaver Dams	No		
Native Channel Width (m)	n/a		
Bank Conditions		Left Bank	Right Bank
Bank Shape	Sloping		Sloping
Bank Texture (Dominant/Subdominant)	Fines/Small Gravel		Fines/Small Gravel
Mean Bank Height (m); Mean, Range	0.5, 0.4-0.6		0.4, 0.3-0.6
Grade Of Approach Slopes (%)	Low (<4)		Moderate (4-14)
Riparian Area Width (m)	15		7
Dominant Riparian Vegetation Type	Shrub		Coniferous

Substrate	%
Organics	0
Fines (<2mm)	52
Small Gravel (2-16 mm)	45
Large Gravel (17-64 mm)	3
Cobble (65-256 mm)	0
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Falls	1	32	38	0.70
Riffle	2	53	62	0.23, 0.2 - 0.25

Cover Type	m²
Boulders	3
Overhanging Vegetation	69
Under Cut Banks	3
Woody Debris	8

Water Quality Parameters	
Water Temperature (°C)	8.3
pH	7.8
Dissolved Oxygen (mg/L)	11.2
Conductivity (uS/cm)	68.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Marginal	Important	Unsuitable	Unsuitable	Marginal
Trout	Important	Important	Unsuitable	Unsuitable	Marginal
Char	Important	Important	Unsuitable	Unsuitable	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 35m downstream looking downstream at the confluence with stream 805a.

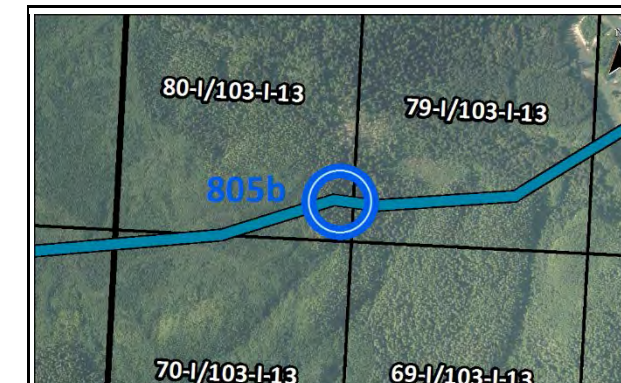


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Nass River (WC 806a)**

**Survey Date:** July 13, 2014

**UTM (Zone 9 U):** 458922 E, 6092121 N

**Sensitivity:** High

**Field Crew:** C. Sinclair, J. McNeice

**Habitat Survey Length (m):** 200

**Stream Classification:** S2

**Timing Window of Least Risk:** August 1 - August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Frequently Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	7.2, 3.5-10.4
Wetted Width (m); Mean, Range	3.5, 1.9-7.1
Water Depth (m); Mean, Range	0.14, 0.06-0.35
Ordinary High Water Mark (m); Mean	0.28
Discharge (m³/s)	0.04
Stream Gradient (%)	10
Embeddedness	Moderately Embedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Cobble/Small Gravel	Cobble/Small Gravel
Mean Bank Height (m); Mean, Range	1.5, 1.2-1.8	1.1, 0.6-1.5
Grade Of Approach Slopes (%)	Moderate (4-14)	Moderate (4-14)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	0
Fines (<2mm)	3
Small Gravel (2-16 mm)	2
Large Gravel (17-64 mm)	12
Cobble (65-256 mm)	43
Boulder (256-400 mm)	40
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	2	54	27	0.25, 0.2 - 0.3
Pool	4	16	8	0.20, 0.2 - 0.2
Rapid	1	38	19	0.30
Riffle	4	62	31	0.28, 0.2 - 0.37
Run	1	30	15	0.18

Cover Type	m²
Boulders	85
Overhanging Vegetation	30
Under Cut Banks	12
Woody Debris	62

Water Quality Parameters	
Water Temperature (°C)	12.0
pH	7.4
Dissolved Oxygen (mg/L)	10.5
Conductivity (uS/cm)	44.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Important	Important	Unsuitable	Marginal	Marginal
Trout	Important	Important	Important	Marginal	Marginal
Char	Important	Important	Unsuitable	Marginal	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	4	0	111, 95-145	Coho salmon, Dolly Varden
Coastal cutthroat trout	9	0	102, 70-150	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 13, 2014	50	149 s	13	8.72

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.

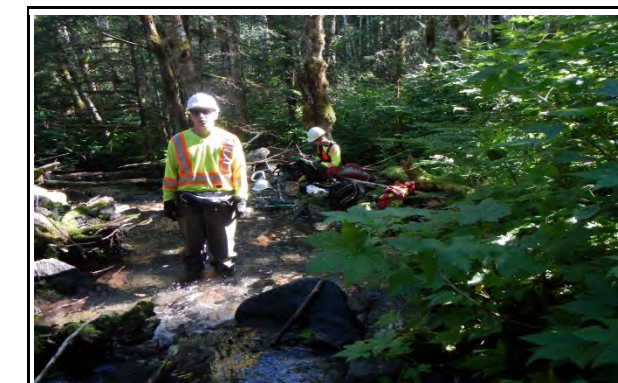


Plate 2 Photograph taken at right-of-way looking downstream.

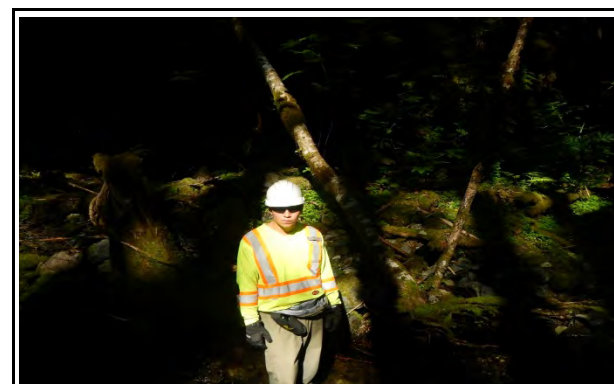


Plate 3 Photograph taken at right-of-way looking left.

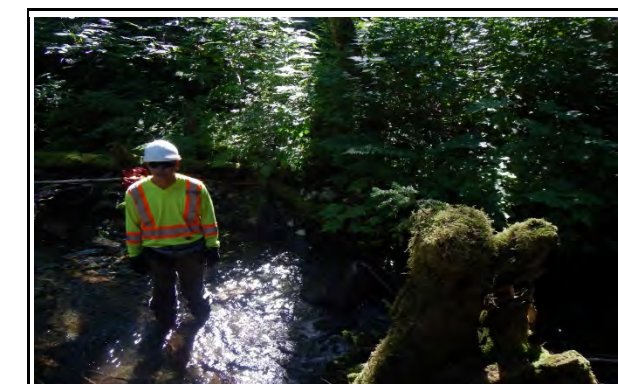


Plate 4 Photograph taken at right-of-way looking right.

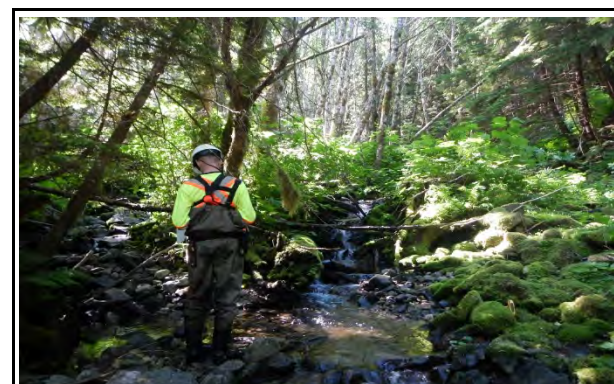


Plate 5 Photograph taken at 24m downstream at a falls.

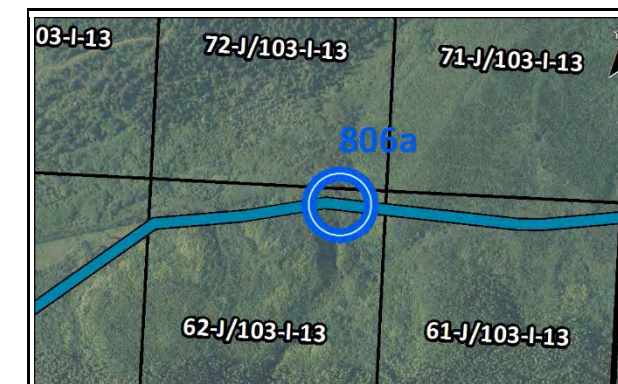


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Nass River (WC 806b)**

**UTM (Zone 9 U):** 457689 E, 6091563 N

**Field Crew:** C. Sinclair, J. McNeice

**Stream Classification:** S2

**Survey Date:** July 12, 2014

**Sensitivity:** High

**Habitat Survey Length (m):** 200

**Timing Window of Least Risk:** August 1 - August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	7.5, 5.5-10.6
Wetted Width (m); Mean, Range	4.9, 4.5-5.5
Water Depth (m); Mean, Range	0.20, 0.10-0.60
Ordinary High Water Mark (m); Mean	0.36
Discharge (m³/s)	0.13
Stream Gradient (%)	5
Embeddedness	Moderately Embedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Cobble/Large Gravel	Cobble/Large Gravel
Mean Bank Height (m); Mean, Range	0.7, 0.5-1.0	0.8, 0.6-1.0
Grade Of Approach Slopes (%)	Moderate (4-14)	Moderate (4-14)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	0
Fines (<2mm)	0
Small Gravel (2-16 mm)	13
Large Gravel (17-64 mm)	25
Cobble (65-256 mm)	33
Boulder (256-400 mm)	25
Rock (>400 mm)	0

Water Quality Parameters	
Water Temperature (°C)	12.1
pH	6.8
Dissolved Oxygen (mg/L)	10.5
Conductivity (uS/cm)	13.0
Turbidity (visual)	Clear

Habitat	No.	Length (m)	%	Velocity (m/s)
Falls	1	2	1	0.00
Pool	2	80	30	0.00, 0 - 0
Riffle	1	83	31	0.00
Run	2	105	39	0.00, 0 - 0

Cover Type	m²
Boulders	35
Depth	35
Instream Vegetation	0
Overhanging Vegetation	150
Under Cut Banks	10
Woody Debris	100

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Important	Important	Unsuitable	Unsuitable	Important
Trout	Important	Important	Important	Important	Important
Char	Important	Important	Important	Marginal	Important

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	4	0	476, 50-1700	None
Coastal cutthroat trout	2	0	88, 75-101	
Coho salmon	3	0	43, 40-48	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 12, 2014	65	399 s	9	2.26

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments

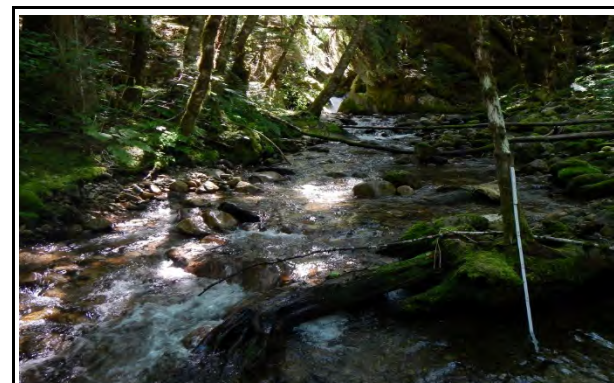


Plate 1 Photograph taken at right-of-way looking upstream.

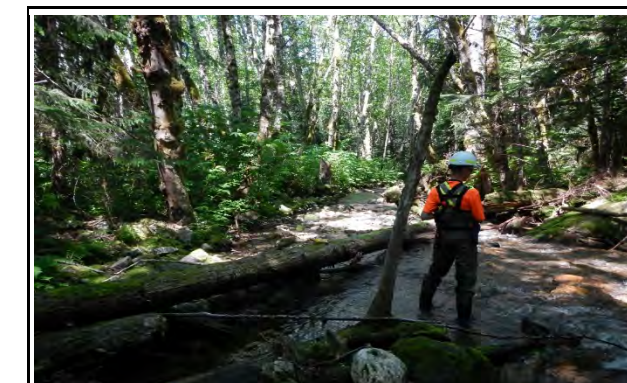


Plate 2 Photograph taken at right-of-way looking downstream.

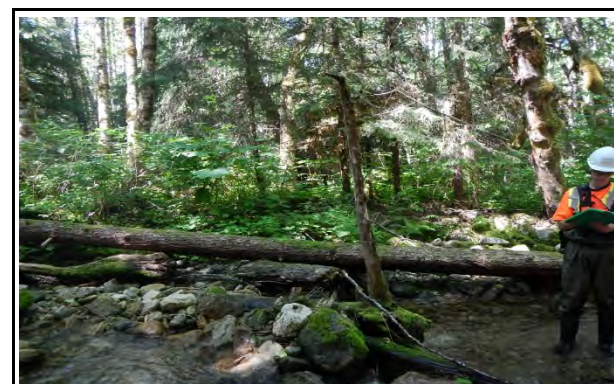


Plate 3 Photograph taken at right-of-way looking left.

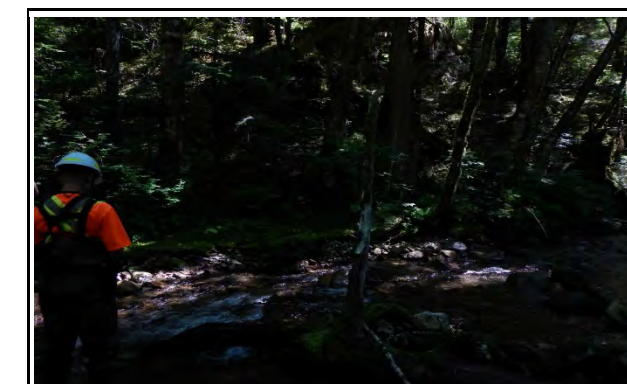


Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at right-of-way at a mature char.

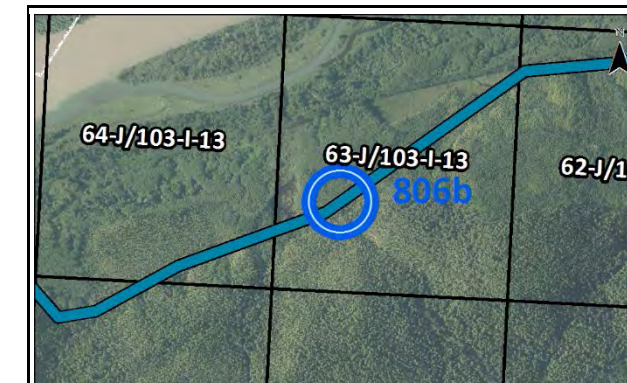


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company



Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Nass River (WC 808a)**

**Survey Date:** July 12, 2014

**UTM (Zone 9 U):** 457500 E, 6091468 N

**Sensitivity:** High

**Field Crew:** C. Sinclair, J. McNeice

**Habitat Survey Length (m):** 200

**Stream Classification:** S3

**Timing Window of Least Risk:** June 15- September 1

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Frequently Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	1.5, 0.8-2.4
Wetted Width (m); Mean, Range	0.9, 0.5-1.3
Water Depth (m); Mean, Range	0.08, 0.02-0.80
Ordinary High Water Mark (m); Mean	0.13
Discharge (m³/s)	Negligible
Stream Gradient (%)	1
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Fines/Organics	Fines/Organics
Mean Bank Height (m); Mean, Range	0.3, 0.2-0.5	0.3, 0.2-0.4
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	20
Fines (<2mm)	23
Small Gravel (2-16 mm)	50
Large Gravel (17-64 mm)	2
Cobble (65-256 mm)	6
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Flat	2	130	100	0.04, 0.04 - 0.04

Cover Type	m²
Boulders	0
Depth	0
Instream Vegetation	0
Overhanging Vegetation	40
Under Cut Banks	0
Woody Debris	31

Water Quality Parameters	
Water Temperature (°C)	14.4
pH	7.2
Dissolved Oxygen (mg/L)	5.0
Conductivity (uS/cm)	7.0
Turbidity (visual)	Low

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Important	Unsuitable	Marginal	Unsuitable
Trout	Unsuitable	Important	Unsuitable	Marginal	Unsuitable
Char	Unsuitable	Important	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Coho salmon	11	0	66, 48-82	None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 12, 2014	30	199 s	11	5.53

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 30m downstream looking downstream.

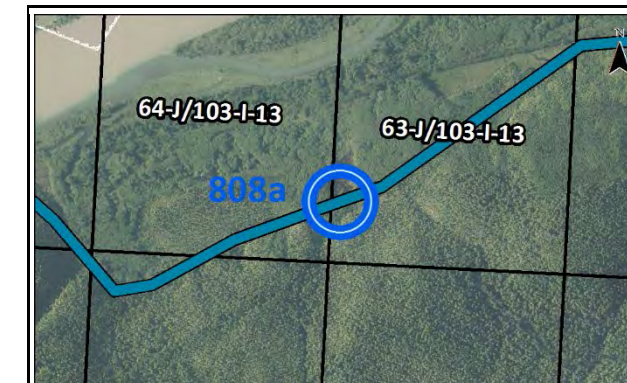


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Nass River (WC 808b)**

**Survey Date:** July 06, 2014

**UTM (Zone 9 U):** 456667 E, 6091222 N

**Sensitivity:** High

**Field Crew:** C. Sinclair, D. Cooper

**Habitat Survey Length (m):**

**Stream Classification:** S2

**Timing Window of Least Risk:** August 1 - August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Confined
Channel Pattern	Irregular, Meandering
Channel Width (m); Mean, Range	7.5, 2.8-10.6
Wetted Width (m); Mean, Range	4.4, 2.3-6.5
Water Depth (m); Mean, Range	0.21, 0.05-0.37
Ordinary High Water Mark (m); Mean	0.39
Discharge (m³/s)	0.13
Stream Gradient (%)	17
Embeddedness	Moderately Embedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Boulders	Boulders
Mean Bank Height (m); Mean, Range	0.9, 0.4-1.3	0.9, 0.4-1.2
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	0
Fines (<2mm)	0
Small Gravel (2-16 mm)	6
Large Gravel (17-64 mm)	13
Cobble (65-256 mm)	23
Boulder (256-400 mm)	59
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	2	130	45	0.35, 0.3 - 0.4
Pool	3	24	8	0.14, 0.09 - 0.25
Run	4	136	47	0.26, 0.25 - 0.3

Cover Type	m²
Boulders	160
Depth	6
Overhanging Vegetation	105
Under Cut Banks	91
Woody Debris	88

Water Quality Parameters	
Water Temperature (°C)	9.7
pH	7.4
Dissolved Oxygen (mg/L)	11.4
Conductivity (uS/cm)	9.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Marginal	Marginal	Unsuitable	Unsuitable	Marginal
Trout	Marginal	Marginal	Unsuitable	Marginal	Marginal
Char	Marginal	Marginal	Unsuitable	Unsuitable	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	2	0	115, 112-117	None
Coastal cutthroat trout	3	0	84, 35-116	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 06, 2014	55	360 s	3	0.83
Minnow Trapping	July 06, 2014	5	11 hrs	2	0.18

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments

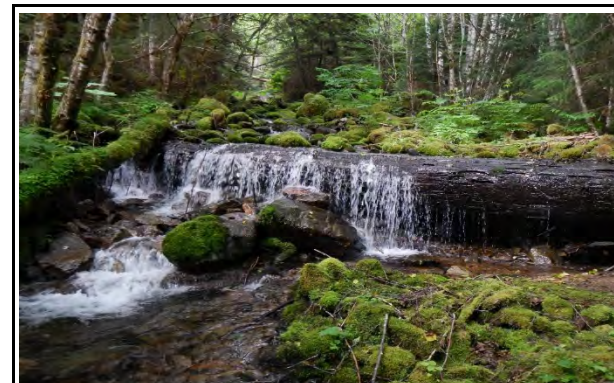


Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

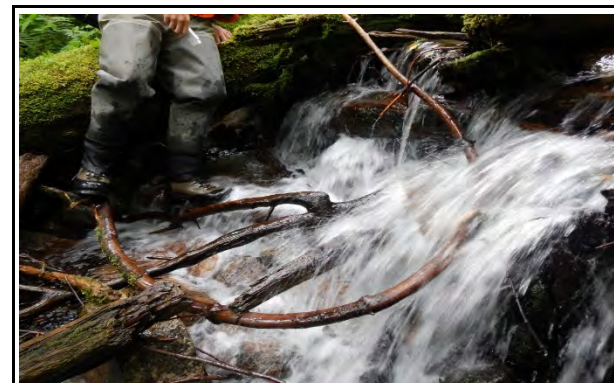


Plate 5 Photograph taken at 30m downstream looking right at a cascade.

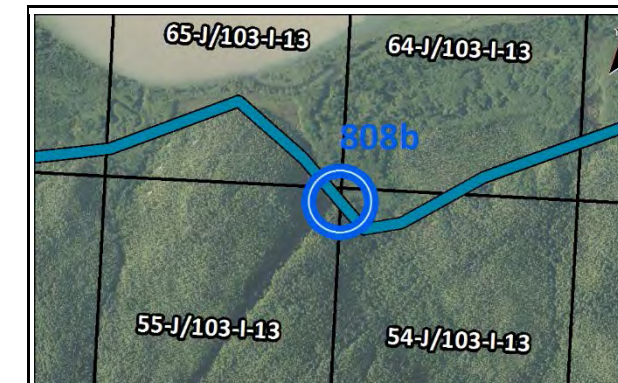


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Nass River (WC 809a)

**Survey Date:** July 05, 2014

**UTM (Zone 9 U):** 456620 E, 6091294 N

**Sensitivity:** High

**Field Crew:** C. Sinclair, D. Cooper

**Habitat Survey Length (m):**

**Stream Classification:** S2

**Timing Window of Least Risk:** June 1- August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Confined
Channel Pattern	Irregular, Meandering
Channel Width (m); Mean, Range	6.7, 5.2-8.5
Wetted Width (m); Mean, Range	5.4, 2.5-8.1
Water Depth (m); Mean, Range	0.22, 0.09-0.52
Ordinary High Water Mark (m); Mean	0.44
Discharge (m³/s)	0.43
Stream Gradient (%)	18
Embeddedness	Highly Embedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Vertical	Vertical
Bank Texture (Dominant/Subdominant)	Boulders/Organics	Boulders/Organics
Mean Bank Height (m); Mean, Range	1.1, 0.7-1.5	1.1, 0.8-1.4
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	0
Fines (<2mm)	0
Small Gravel (2-16 mm)	3
Large Gravel (17-64 mm)	8
Cobble (65-256 mm)	19
Boulder (256-400 mm)	69
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	2	100	19	1.30, 1.3 - 1.3
Pool	2	43	8	0.50, 0.1 - 0.9
Rapid	1	25	5	1.30
Riffle	2	89	17	1.10, 1.1 - 1.1
Run	2	260	50	0.45, 0.1 - 0.8

Cover Type	m²
Boulders	212
Depth	82
Overhanging Vegetation	186
Under Cut Banks	42
Woody Debris	56

Water Quality Parameters	
Water Temperature (°C)	10.7
pH	8.0
Dissolved Oxygen (mg/L)	11.2
Conductivity (uS/cm)	10.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Marginal
Trout	Unsuitable	Marginal	Marginal	Marginal	Marginal
Char	Unsuitable	Marginal	Unsuitable	Unsuitable	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	2	0	76, 60-91	None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 05, 2014	100	779 s	2	0.26
Minnow Trapping	July 05, 2014	3	57 hrs	1	0.02

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments

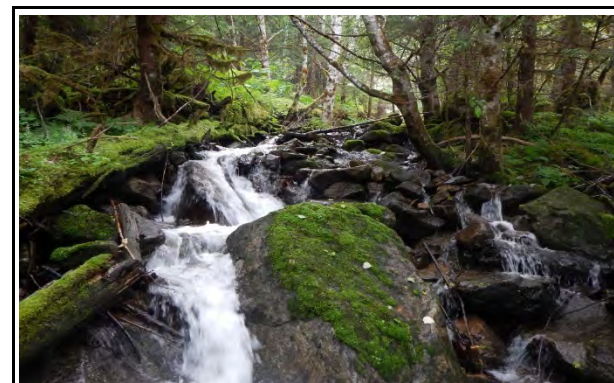


Plate 1 Photograph taken at 60m upstream looking upstream.

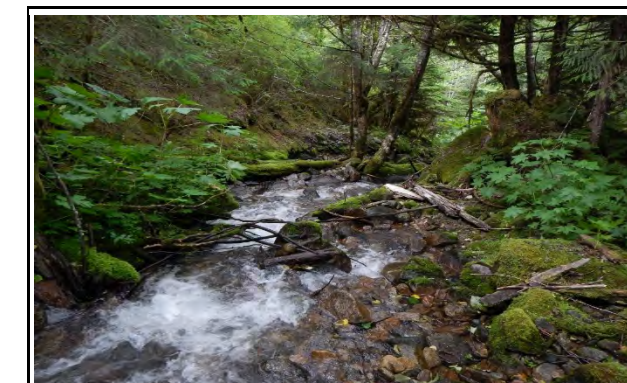


Plate 2 Photograph taken at 60m upstream looking downstream.



Plate 3 Photograph taken at 60m upstream looking left.

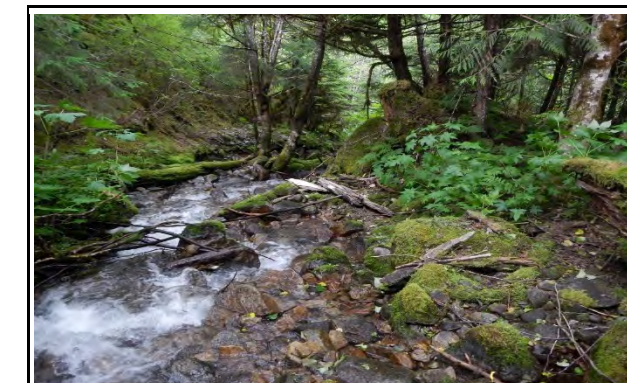


Plate 4 Photograph taken at 60m upstream looking right.



Plate 5 Photograph taken at 162m downstream at a portion of stream flowing into a pond/wetland.

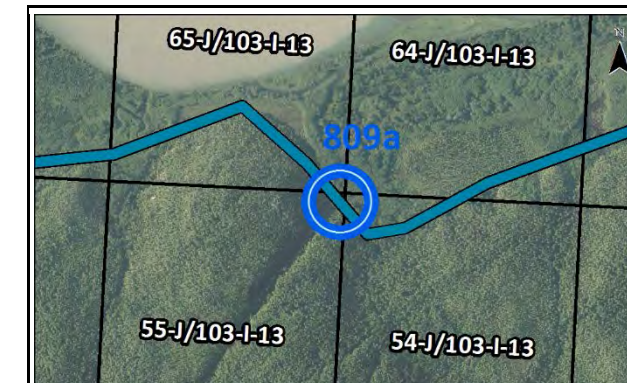


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Nass River (WC 810a)**

**UTM (Zone 9 U):** 455951 E, 6091398 N

**Field Crew:** C. Sinclair, D. Cooper

**Stream Classification:** S3

**Survey Date:** July 05, 2014

**Sensitivity:** High

**Habitat Survey Length (m):**

**Timing Window of Least Risk:** June 15- August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Frequently Confined
Channel Pattern	Irregular, Meandering
Channel Width (m); Mean, Range	4.7, 3.6-5.1
Wetted Width (m); Mean, Range	2.1, 1.4-2.8
Water Depth (m); Mean, Range	0.08, 0.04-0.18
Ordinary High Water Mark (m); Mean	0.30
Discharge (m³/s)	0.01
Stream Gradient (%)	1
Embeddedness	Highly Embedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Fines/Organics	Fines/Organics
Mean Bank Height (m); Mean, Range	0.6, 0.4-0.9	0.7, 0.5-1.1
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	100	100
Dominant Riparian Vegetation Type	Deciduous	Deciduous

Substrate	%
Organics	13
Fines (<2mm)	57
Small Gravel (2-16 mm)	15
Large Gravel (17-64 mm)	7
Cobble (65-256 mm)	8
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Water Quality Parameters	
Water Temperature (°C)	8.9
pH	7.5
Dissolved Oxygen (mg/L)	10.5
Conductivity (uS/cm)	18.0
Turbidity (visual)	Low

Habitat	No.	Length (m)	%	Velocity (m/s)
Pool	2	52	26	0.01, 0.01 - 0.01
Riffle	1	22	11	0.05
Run	4	126	63	0.04, 0.01 - 0.05

Cover Type	m²
Depth	200
Instream Vegetation	60
Overhanging Vegetation	7
Woody Debris	27

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Marginal	Important	Unsuitable	Marginal	Marginal
Trout	Marginal	Important	Unsuitable	Marginal	Marginal
Char	Marginal	Important	Unsuitable	Marginal	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	8	0	92, 58-166	None
Coho salmon	83	0	51, 41-119	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Minnow Trapping	July 04, 2014	5	95 hrs	91	0.96

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 150m downstream looking downstream at the confluence with the Nass River.

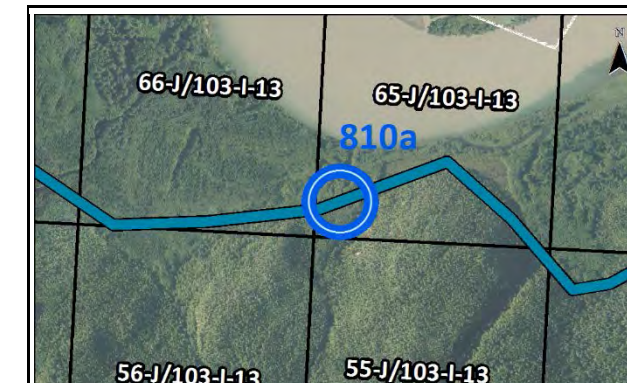


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Nass River (WC 811b)

**UTM (Zone 9 U):** 455444 E, 6091310 N

**Field Crew:** C. Sinclair, D. Cooper

**Stream Classification:** S3

**Survey Date:** July 04, 2014

**Sensitivity:** High

**Habitat Survey Length (m):** 200

**Timing Window of Least Risk:** August 1 - August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Frequently Confined
Channel Pattern	Irregular, Meandering
Channel Width (m); Mean, Range	2.6, 1.7-4.0
Wetted Width (m); Mean, Range	1.8, 0.7-3.2
Water Depth (m); Mean, Range	0.16, 0.04-0.37
Ordinary High Water Mark (m); Mean	0.29
Discharge (m³/s)	0.01
Stream Gradient (%)	3
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued			
Beaver Dams	No		
Native Channel Width (m)	n/a		
Bank Conditions		Left Bank	Right Bank
Bank Shape	Sloping		Sloping
Bank Texture (Dominant/Subdominant)	Fines/Small Gravel		Fines/Small Gravel
Mean Bank Height (m); Mean, Range	0.4, 0.3-0.8		0.5, 0.3-0.6
Grade Of Approach Slopes (%)	Low (<4)		Low (<4)
Riparian Area Width (m)	100		100
Dominant Riparian Vegetation Type	Mixed C and D		Mixed C and D

Substrate	%
Organics	27
Fines (<2mm)	70
Small Gravel (2-16 mm)	3
Large Gravel (17-64 mm)	0
Cobble (65-256 mm)	0
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Pool	7	42	21	0.11, 0.1 - 0.12
Run	9	158	79	0.16, 0.16 - 0.16

Cover Type	m²
Depth	2
Instream Vegetation	0
Overhanging Vegetation	148
Under Cut Banks	30
Woody Debris	54

Water Quality Parameters	
Water Temperature (°C)	10.7
pH	8.5
Dissolved Oxygen (mg/L)	10.6
Conductivity (uS/cm)	13.0
Turbidity (visual)	Low

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Marginal	Important	Unsuitable	Marginal	Marginal
Trout	Marginal	Important	Unsuitable	Marginal	Marginal
Char	Marginal	Important	Unsuitable	Marginal	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	7	0	60, 34-88	None
Coastal cutthroat trout	2	0	55, 53-56	
Coho salmon	8	0	66, 38-82	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 04, 2014	72	386 s	17	4.40

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.

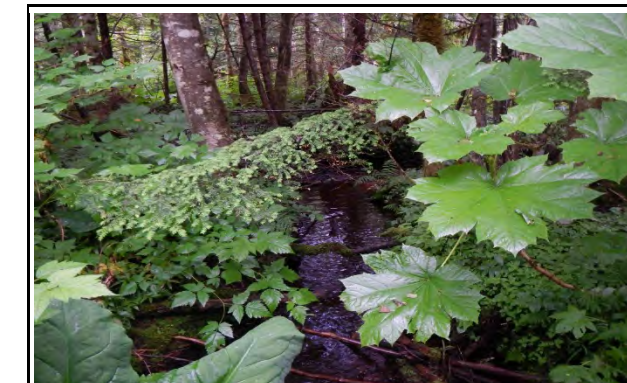


Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 15m downstream looking downstream at a wetland complex, also the confluence with 811A.

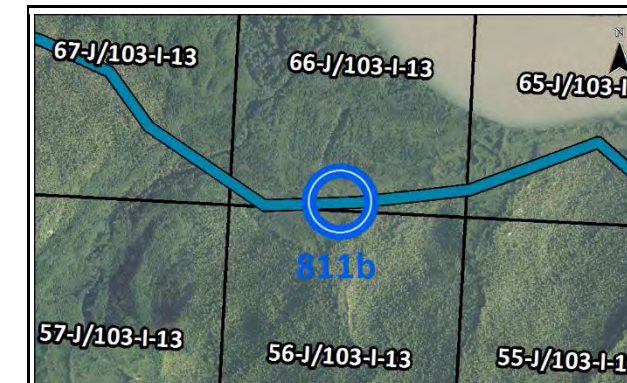


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Nass River (WC 812a)

**Survey Date:** July 13, 2014

**UTM (Zone 9 U):** 454975 E, 6091431 N

**Sensitivity:** High

**Field Crew:** E. Lennert, A. Kemprath

**Habitat Survey Length (m):** 1000

**Stream Classification:** S2

**Timing Window of Least Risk:** No window

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Occasionally Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	18.0, 14.0-21.0
Wetted Width (m); Mean, Range	16.0, 13.0-19.0
Water Depth (m); Mean, Range	0.52, 0.40-0.75
Ordinary High Water Mark (m); Mean	0.72
Discharge (m³/s)	NR
Stream Gradient (%)	4
Embeddedness	Unembedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions		
Bank Shape	Left Bank	Right Bank
Bank Shape	Vertical	Sloping
Bank Texture (Dominant/Subdominant)	Boulders/Cobble	Rock/Boulders
Mean Bank Height (m); Mean, Range	17.3, 16.0-18.0	13.3, 4.5-18.0
Grade Of Approach Slopes (%)	High (>14)	Moderate (4-14)
Riparian Area Width (m)	25	25
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	0
Fines (<2mm)	3
Small Gravel (2-16 mm)	3
Large Gravel (17-64 mm)	3
Cobble (65-256 mm)	37
Boulder (256-400 mm)	50
Rock (>400 mm)	5

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	5	612	67	1.30, 0.8 - 1.5
Pool	1	20	2	0.75
Riffle	1	147	16	0.80
Run	2	141	15	1.05, 1 - 1.1

Cover Type	m²
Boulders	4260
Depth	650
Overhanging Vegetation	290
Under Cut Banks	600
Woody Debris	310

Water Quality Parameters	
Water Temperature (°C)	10.8
pH	7.7
Dissolved Oxygen (mg/L)	12.8
Conductivity (uS/cm)	9.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Marginal	Marginal	Unsuitable	Marginal	Marginal
Trout	Marginal	Marginal	Marginal	Marginal	Marginal
Char	Marginal	Marginal	Marginal	Marginal	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range
Char	1	0	60
Rainbow trout	3	0	97, 86-105
Sculpin	3	0	85, 65-105
Sockeye salmon	2	0	60, 57-62

Fish Species Previously Documented
Chinook salmon, coho salmon, Dolly Varden, pink salmon, rainbow trout, sculpin

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 13, 2014	100	314 s	1	0.32
Minnow Trapping	July 13, 2014	5	120 hrs	8	0.07

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments

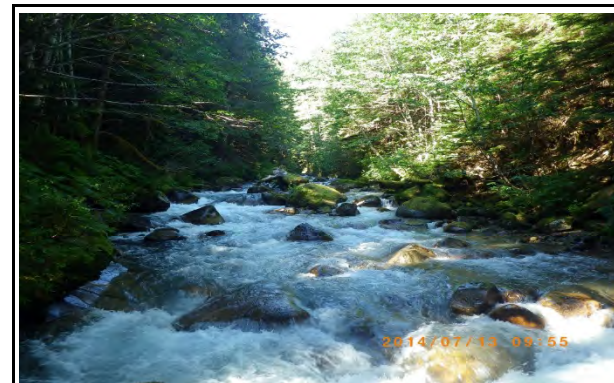


Plate 1 Photograph taken at right-of-way looking upstream.

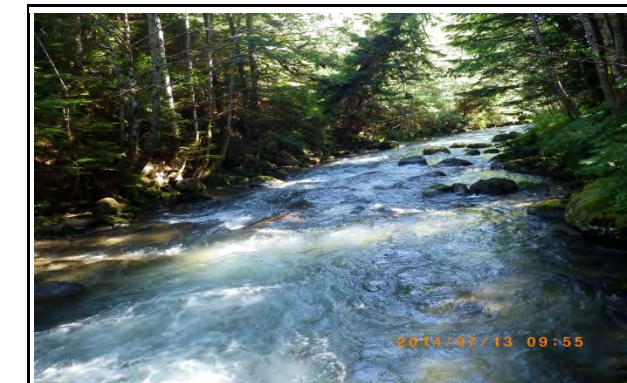


Plate 2 Photograph taken at right-of-way looking downstream.

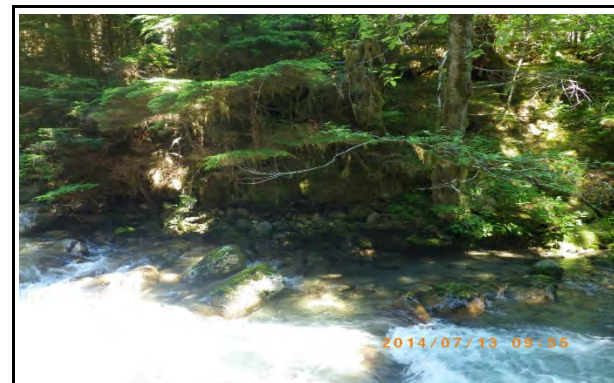


Plate 3 Photograph taken at right-of-way looking left.

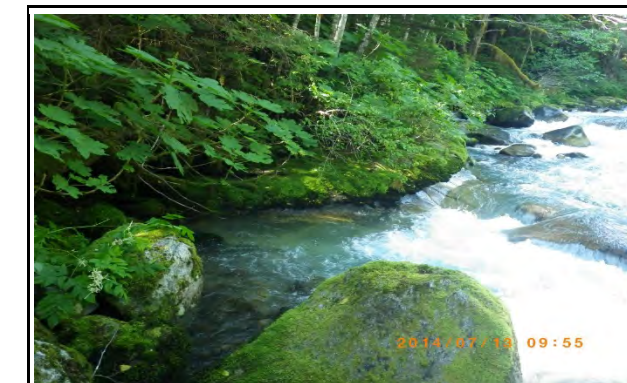


Plate 4 Photograph taken at right-of-way looking right.

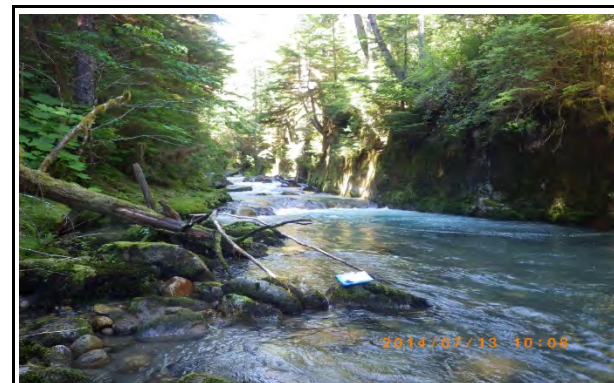


Plate 5 Photograph taken at 90m upstream looking upstream at the start of the canyon.

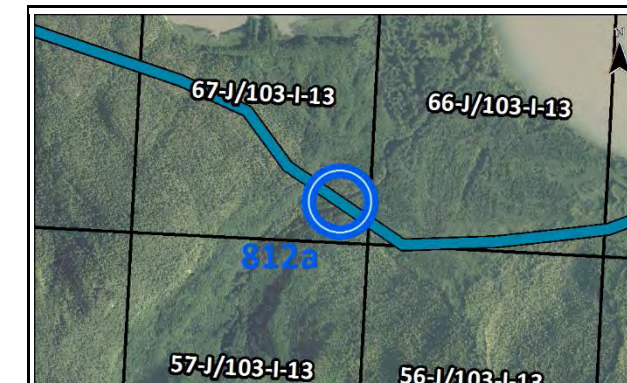


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Nass River (WC 813a)**

**Survey Date:** July 06, 2014

**UTM (Zone 9 U):** 453814 E, 6091989 N

**Sensitivity:** Low

**Field Crew:** N. Postma, R. Ball

**Habitat Survey Length (m):** 185

**Stream Classification:** S3\*

**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Frequently Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	4.3, 2.3-6.7
Wetted Width (m); Mean, Range	1.3, 0.3-3.6
Water Depth (m); Mean, Range	0.09, 0.01-0.26
Ordinary High Water Mark (m); Mean	0.16
Discharge (m³/s)	Negligible
Stream Gradient (%)	16
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Vertical
Bank Texture (Dominant/Subdominant)	Boulders/Rock	Rock/Rock
Mean Bank Height (m); Mean, Range	1.2, 0.4-2.4	1.0, 0.4-1.5
Grade Of Approach Slopes (%)	High (>14)	High (>14)
Riparian Area Width (m)	6	4
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	0
Fines (<2mm)	8
Small Gravel (2-16 mm)	9
Large Gravel (17-64 mm)	3
Cobble (65-256 mm)	3
Boulder (256-400 mm)	22
Rock (>400 mm)	54

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	2	140	58	0.00, 0 - 0
Falls	1	55	23	0.00
Pool	2	30	13	0.00, 0 - 0
Rapid	1	15	6	0.00

Cover Type	m²
Boulders	12
Overhanging Vegetation	50
Under Cut Banks	6
Woody Debris	13

Water Quality Parameters	
Water Temperature (°C)	11.9
pH	6.4
Dissolved Oxygen (mg/L)	10.0
Conductivity (uS/cm)	12.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Marginal	Marginal	Unsuitable	Unsuitable	Unsuitable
Trout	Marginal	Marginal	Unsuitable	Unsuitable	Unsuitable
Char	Marginal	Marginal	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
No fish captured				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 06, 2014	100	398 s	0	0.00
Minnow Trapping	July 06, 2014	6	120 hrs	0	0.00

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

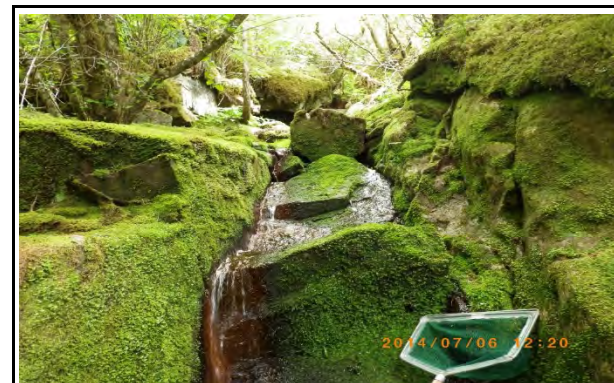


Plate 5 Photograph taken at 85m downstream looking upstream at an approximately 30 m high bedrock falls.

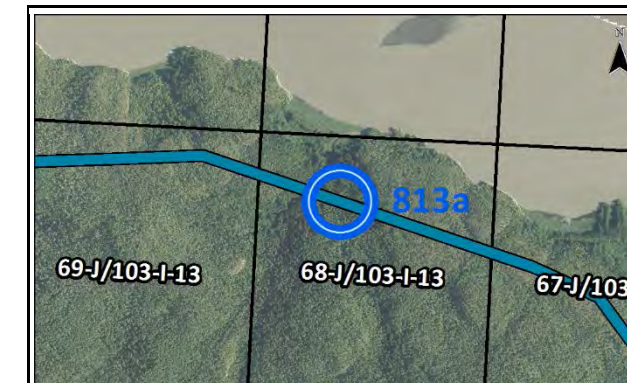


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Nass River (WC 814a)**  
**UTM (Zone 9 U):** 453643 E, 6092034 N  
**Field Crew:** N. Postma, R. Ball  
**Stream Classification:** S2

**Survey Date:** July 05, 2014  
**Sensitivity:** High  
**Habitat Survey Length (m):** 300  
**Timing Window of Least Risk:** August 1- August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Occasionally Confined
Channel Pattern	Irregular, Wandering
Channel Width (m); Mean, Range	5.5, 3.9-6.8
Wetted Width (m); Mean, Range	2.8, 1.9-3.5
Water Depth (m); Mean, Range	0.10, 0.04-0.24
Ordinary High Water Mark (m); Mean	0.20
Discharge (m³/s)	0.02
Stream Gradient (%)	9
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Vertical	Sloping
Bank Texture (Dominant/Subdominant)	Fines/Large Gravel	Fines/Large Gravel
Mean Bank Height (m); Mean, Range	1.0, 0.6-1.7	0.9, 0.4-1.9
Grade Of Approach Slopes (%)	Moderate (4-14)	Low (<4)
Riparian Area Width (m)	5	7
Dominant Riparian Vegetation Type	Shrub	Shrub

Substrate	%
Organics	0
Fines (<2mm)	8
Small Gravel (2-16 mm)	16
Large Gravel (17-64 mm)	13
Cobble (65-256 mm)	36
Boulder (256-400 mm)	26
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	1	15	10	0.15
Flat	1	10	6	0.05
Pool	3	11	7	0.07, 0.05 - 0.1
Rapid	5	61	40	0.24, 0.2 - 0.3
Riffle	1	40	26	0.25
Run	2	17	11	0.10, 0.1 - 0.1

Cover Type	m²
Boulders	42
Overhanging Vegetation	57
Under Cut Banks	8
Woody Debris	20

Water Quality Parameters	
Water Temperature (°C)	11.8
pH	7.9
Dissolved Oxygen (mg/L)	10.0
Conductivity (uS/cm)	18.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Marginal	Important	Unsuitable	Unsuitable	Marginal
Trout	Marginal	Important	Unsuitable	Unsuitable	Marginal
Char	Marginal	Important	Unsuitable	Unsuitable	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	8	0	79, 57-116	None
Coastal cutthroat trout	2	0	58, 31-84	
Coho salmon	20	0	48, 30-79	
Sculpin	0	1	40	
Unidentified species	1	500	75	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Dip Net	July 05, 2014	n/a	n/a	16	n/a
Minnow Trapping	July 05, 2014	5	95 hrs	15	0.16
Observation	July 05, 2014	n/a	n/a	501	n/a

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 100m downstream looking downstream at the start of the tidal influenced area.

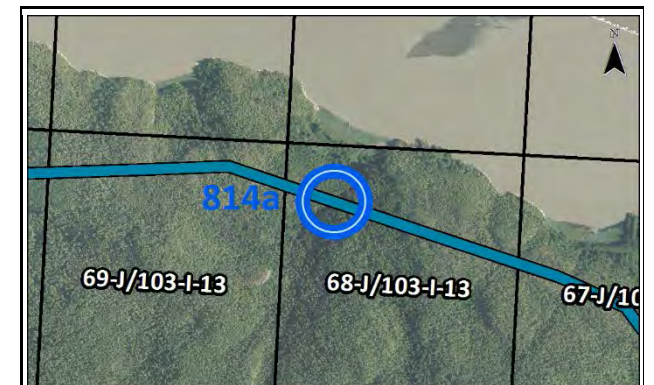


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**





Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Nass River (WC 815a)**

**Survey Date:** July 11, 2014

**UTM (Zone 9 U):** 452404 E, 6092012 N

**Sensitivity:** High

**Field Crew:** K. Gasser, N. Pilgrim

**Habitat Survey Length (m):** 200

**Stream Classification:** S3

**Timing Window of Least Risk:** June 15- July 15

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Occasionally Confined
Channel Pattern	Irregular, Meandering
Channel Width (m); Mean, Range	2.2, 1.3-4.0
Wetted Width (m); Mean, Range	1.3, 0.6-2.8
Water Depth (m); Mean, Range	0.09, 0.03-0.50
Ordinary High Water Mark (m); Mean	0.39
Discharge (m³/s)	Negligible
Stream Gradient (%)	4
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Undercut	Sloping
Bank Texture (Dominant/Subdominant)	Cobble/Large Gravel	Small Gravel/Large Gravel
Mean Bank Height (m); Mean, Range	0.7, 0.5-1.0	0.8, 0.1-1.1
Grade Of Approach Slopes (%)	Moderate (4-14)	Low (<4)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	0
Fines (<2mm)	0
Small Gravel (2-16 mm)	25
Large Gravel (17-64 mm)	56
Cobble (65-256 mm)	19
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Flat	3	111	56	0.00, 0 - 0
Pool	10	27	14	0.00, 0 - 0
Riffle	6	31	16	0.00, 0 - 0
Run	4	28	14	0.00, 0 - 0

Cover Type	m²
Boulders	24
Instream Vegetation	52
Overhanging Vegetation	1
Under Cut Banks	16
Woody Debris	7

Water Quality Parameters	
Water Temperature (°C)	11.8
pH	6.0
Dissolved Oxygen (mg/L)	7.0
Conductivity (uS/cm)	24.9
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Important	Important	Unsuitable	Marginal	Marginal
Trout	Important	Important	Marginal	Marginal	Marginal
Char	Important	Important	Marginal	Marginal	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	0	11	n/a	None
Chinook salmon	0	2	n/a	
Coho salmon	0	47	n/a	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Dip Net	July 11, 2014	n/a	n/a	0	n/a

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.

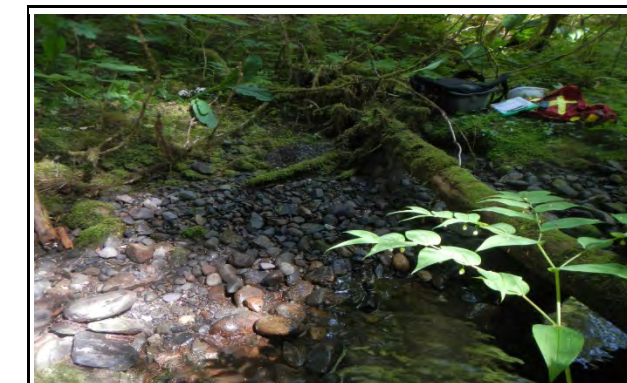


Plate 4 Photograph taken at right-of-way looking right.

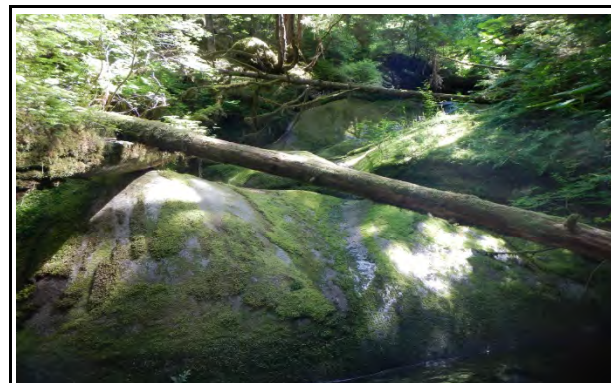


Plate 5 Photograph taken at 45m upstream at falls .

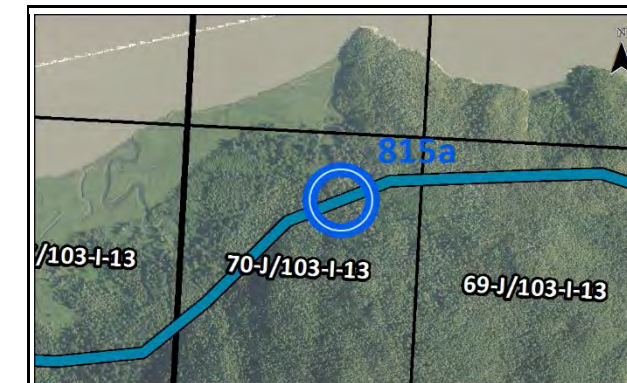


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Nass River (WC 816a)**

**Survey Date:** July 09, 2014

**UTM (Zone 9 U):** 452049 E, 6091746 N

**Sensitivity:** High

**Field Crew:** K. Gasser, N. Pilgrim

**Habitat Survey Length (m):** 200

**Stream Classification:** S2

**Timing Window of Least Risk:** June 15- July 15

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Frequently Confined
Channel Pattern	Tortuous Meanders
Channel Width (m); Mean, Range	9.3, 8.0-10.0
Wetted Width (m); Mean, Range	1.5, 0.7-2.0
Water Depth (m); Mean, Range	0.13, 0.03-0.30
Ordinary High Water Mark (m); Mean	1.18
Discharge (m³/s)	NR
Stream Gradient (%)	2
Embeddedness	Not Applicable

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Vertical	Vertical
Bank Texture (Dominant/Subdominant)	Fines/Organics	Fines/Organics
Mean Bank Height (m); Mean, Range	1.7, 1.3-2.1	1.5, 1.1-1.8
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Shrub	Shrub

Substrate	%
Organics	50
Fines (<2mm)	50
Small Gravel (2-16 mm)	0
Large Gravel (17-64 mm)	0
Cobble (65-256 mm)	0
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Run	2	200	100	0.00, 0 - 0

Cover Type	m²
Overhanging Vegetation	15
Woody Debris	17

Water Quality Parameters	
Water Temperature (°C)	12.4
pH	5.8
Dissolved Oxygen (mg/L)	NR
Conductivity (uS/cm)	45.2
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Important	Unsuitable	Unsuitable	Marginal
Trout	Unsuitable	Marginal	Unsuitable	Unsuitable	Marginal
Char	Unsuitable	Marginal	Unsuitable	Unsuitable	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range
Char	1	0	70
Chinook salmon	2	0	70
Coho salmon	4	0	33, 30-40
Sculpin	2	0	60, 50-70

Fish Species Previously Documented
None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Dip Net	July 09, 2014	n/a	n/a	4	n/a
Minnow Trapping	July 09, 2014	6	132 hrs	5	0.04

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at right-of-way at a juvenile chinook salmon.

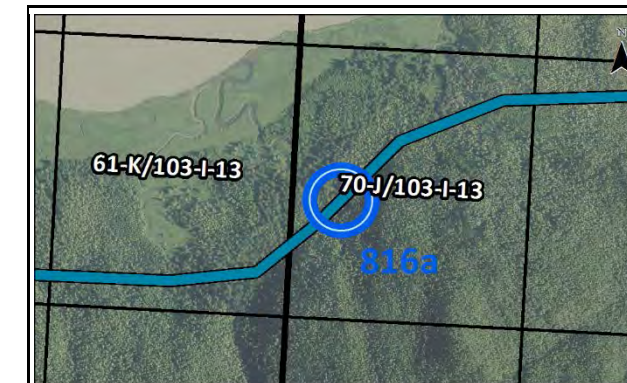


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Nass River (WC 817a)

**UTM (Zone 9 U):** 451728 E, 6091468 N

**Field Crew:** N. Postma, R. Ball

**Stream Classification:** S2

**Survey Date:** July 07, 2014

**Sensitivity:** High

**Habitat Survey Length (m):** 300

**Timing Window of Least Risk:** August 1- August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Unconfined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	8.8, 4.8-13.0
Wetted Width (m); Mean, Range	7.3, 3.5-11.6
Water Depth (m); Mean, Range	0.22, 0.09-0.49
Ordinary High Water Mark (m); Mean	0.44
Discharge (m³/s)	0.80
Stream Gradient (%)	10
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Vertical	Undercut
Bank Texture (Dominant/Subdominant)	Large Gravel/Cobble	Large Gravel/Fines
Mean Bank Height (m); Mean, Range	0.9, 0.8-1.0	1.0, 0.5-1.4
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	0
Fines (<2mm)	3
Small Gravel (2-16 mm)	8
Large Gravel (17-64 mm)	20
Cobble (65-256 mm)	49
Boulder (256-400 mm)	20
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	2	90	25	0.35, 0 - 0.7
Pool	9	34	9	0.00, 0 - 0
Riffle	6	161	44	0.00, 0 - 0
Run	7	79	22	0.00, 0 - 0

Cover Type	m²
Boulders	151
Depth	1
Instream Vegetation	0
Overhanging Vegetation	75
Under Cut Banks	26
Woody Debris	81

Water Quality Parameters	
Water Temperature (°C)	10.1
pH	6.9
Dissolved Oxygen (mg/L)	10.5
Conductivity (uS/cm)	9.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Important	Important	Unsuitable	Marginal	Marginal
Trout	Important	Important	Marginal	Important	Marginal
Char	Important	Important	Important	Important	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	10	0	55, 28-85	None
Coastal cutthroat trout	1	0	33	
Coho salmon	12	0	59, 37-82	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 07, 2014	100	646 s	23	3.56

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.

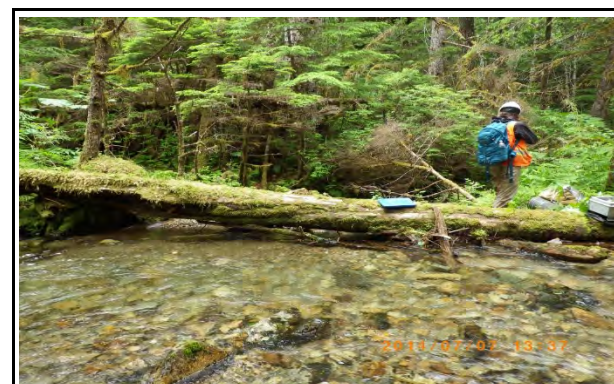


Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

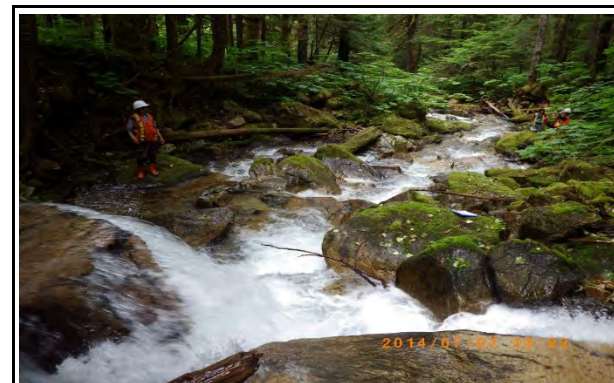


Plate 5 Photograph taken at 100m upstream looking downstream.

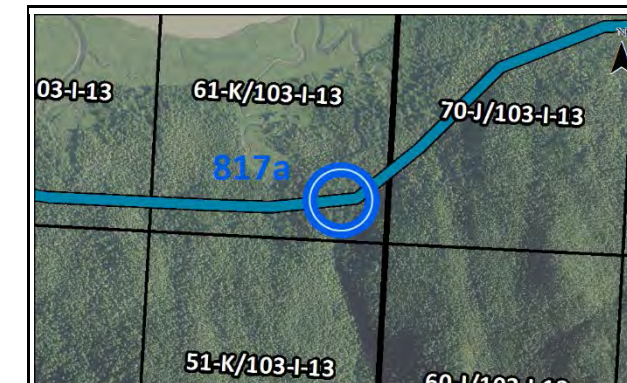


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Nass River (WC 818a)**

**Survey Date:** July 04, 2014

**UTM (Zone 9 U):** 450562 E, 6091444 N

**Sensitivity:** High

**Field Crew:** N. Postma, J. McNeice

**Habitat Survey Length (m):** 419

**Stream Classification:** S2

**Timing Window of Least Risk:** June 15- August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	8.8, 7.1-12.4
Wetted Width (m); Mean, Range	6.0, 3.9-8.6
Water Depth (m); Mean, Range	0.25, 0.03-0.52
Ordinary High Water Mark (m); Mean	0.47
Discharge (m³/s)	0.47
Stream Gradient (%)	9
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Vertical
Bank Texture (Dominant/Subdominant)	Boulders/Rock	Boulders/Cobble
Mean Bank Height (m); Mean, Range	10.7, 0.6-30.0	1.7, 1.1-2.1
Grade Of Approach Slopes (%)	Moderate (4-14)	High (>14)
Riparian Area Width (m)	5	6
Dominant Riparian Vegetation Type	Deciduous	Deciduous

Substrate	%
Organics	0
Fines (<2mm)	4
Small Gravel (2-16 mm)	7
Large Gravel (17-64 mm)	8
Cobble (65-256 mm)	21
Boulder (256-400 mm)	60
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	5	197	46	0.62, 0.5 - 0.7
Falls	1	10	2	0.00
Pool	5	32	7	0.26, 0.1 - 0.4
Rapid	2	62	14	0.45, 0.4 - 0.5
Riffle	1	105	24	0.30
Run	2	23	5	0.25, 0.2 - 0.3

Cover Type	m²
Boulders	638
Depth	9
Overhanging Vegetation	195
Under Cut Banks	30
Woody Debris	117

Water Quality Parameters	
Water Temperature (°C)	11.5
pH	7.9
Dissolved Oxygen (mg/L)	9.9
Conductivity (uS/cm)	17.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Important	Important	Unsuitable	Marginal	Marginal
Trout	Important	Important	Marginal	Marginal	Marginal
Char	Important	Important	Marginal	Marginal	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	24	0	88, 63-128	None
Coho salmon	68	0	55, 45-83	

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Minnow Trapping	July 04, 2014	8	160 hrs	92	0.58

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments

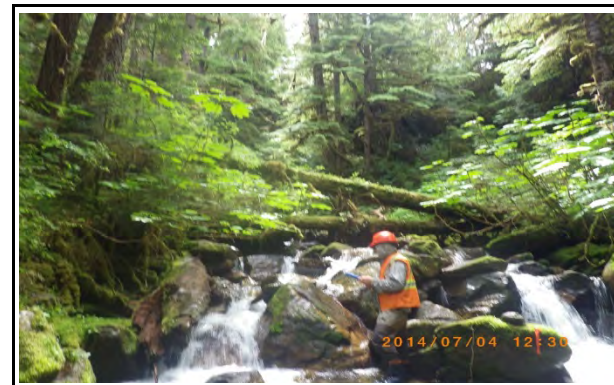


Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.

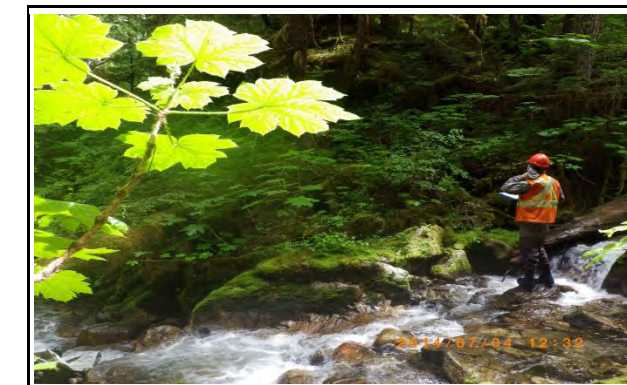


Plate 4 Photograph taken at right-of-way looking right.

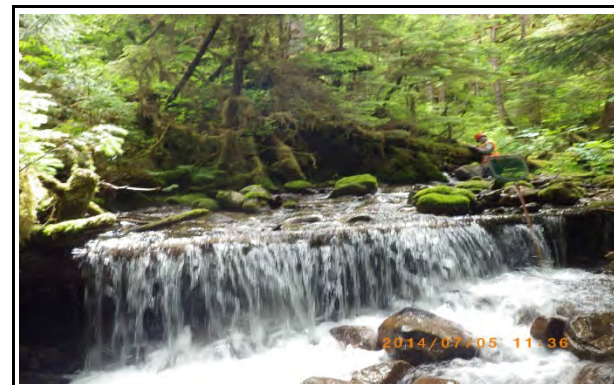


Plate 5 Photograph taken at 104m downstream looking upstream at a falls.

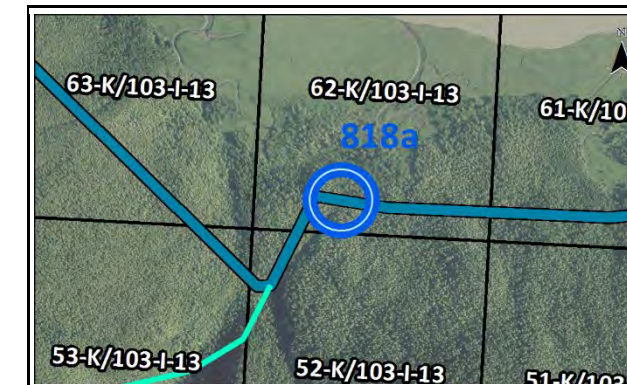


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Nass River (WC 2515)

**Survey Date:** July 14, 2014

**UTM (Zone 9 U):** 450246 E, 6091184 N

**Sensitivity:** High

**Field Crew:** E. Lennert, A. Kemprath

**Habitat Survey Length (m):** 900

**Stream Classification:** S3

**Timing Window of Least Risk:** June 1- August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	3.0, 1.8-6.1
Wetted Width (m); Mean, Range	2.6, 1.8-4.0
Water Depth (m); Mean, Range	0.12, 0.05-0.20
Ordinary High Water Mark (m); Mean	0.32
Discharge (m³/s)	0.17
Stream Gradient (%)	18
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Vertical	Vertical
Bank Texture (Dominant/Subdominant)	Cobble/Large Gravel	Boulders/Cobble
Mean Bank Height (m); Mean, Range	3.9, 0.3-10.0	0.8, 0.5-1.3
Grade Of Approach Slopes (%)	High (>14)	High (>14)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	0
Fines (<2mm)	6
Small Gravel (2-16 mm)	8
Large Gravel (17-64 mm)	26
Cobble (65-256 mm)	31
Boulder (256-400 mm)	29
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	1	380	40	0.70
Falls	1	470	49	0.10
Riffle	1	100	11	0.25

Cover Type	m²
Boulders	230
Depth	200
Instream Vegetation	0
Overhanging Vegetation	190
Under Cut Banks	100
Woody Debris	230

Water Quality Parameters	
Water Temperature (°C)	9.0
pH	7.4
Dissolved Oxygen (mg/L)	12.4
Conductivity (uS/cm)	67.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Unsuitable
Trout	Marginal	Marginal	Unsuitable	Marginal	Unsuitable
Char	Marginal	Marginal	Marginal	Marginal	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	3	0	96, 90-101	None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 14, 2014	100	225 s	1	0.44
Minnow Trapping	July 14, 2014	5	110 hrs	2	0.02

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.

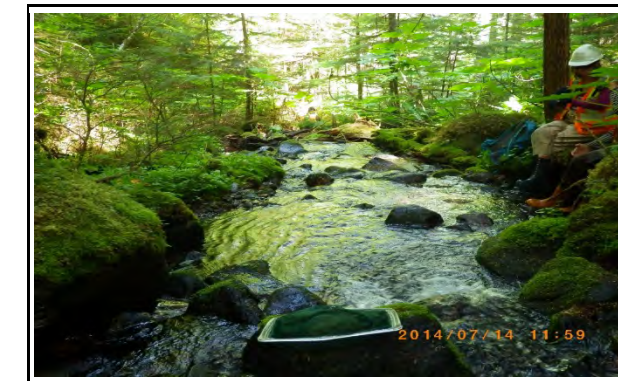


Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 850m downstream looking downstream at the confluence with the Nass River.

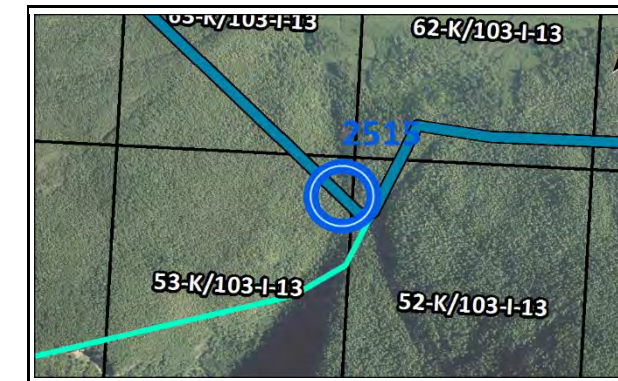


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Nass River (WC 2516)

**Survey Date:** July 15, 2014

**UTM (Zone 9 U):** 450231 E, 6091198 N

**Sensitivity:** Low

**Field Crew:** E. Lennert, A. Kemprath

**Habitat Survey Length (m):**

**Stream Classification:** S5

**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 0)	
Confinement	
Channel Pattern	
Channel Width (m); Mean, Range	
Wetted Width (m); Mean, Range	
Water Depth (m); Mean, Range	
Ordinary High Water Mark (m); Mean	
Discharge (m³/s)	
Stream Gradient (%)	
Embeddedness	

Channel and Flow Conditions Continued		
Beaver Dams		No
Native Channel Width (m)		n/a
Bank Conditions	Left Bank	Right Bank
Bank Shape		
Bank Texture (Dominant/Subdominant)		
Mean Bank Height (m); Mean, Range		
Grade Of Approach Slopes (%)		
Riparian Area Width (m)		
Dominant Riparian Vegetation Type		

Substrate	%
Organics	NR
Fines (<2mm)	NR
Small Gravel (2-16 mm)	NR
Large Gravel (17-64 mm)	NR
Cobble (65-256 mm)	NR
Boulder (256-400 mm)	NR
Rock (>400 mm)	NR

Habitat	No.	Length (m)	%	Velocity (m/s)
Not applicable				

Cover Type	m²
Not recorded	

Water Quality Parameters	
Water Temperature (°C)	
pH	
Dissolved Oxygen (mg/L)	
Conductivity (uS/cm)	
Turbidity (visual)	

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at 7m downstream looking right.



Plate 5 Photograph taken at 66m downstream looking downstream at a gradient barrier of 55%.

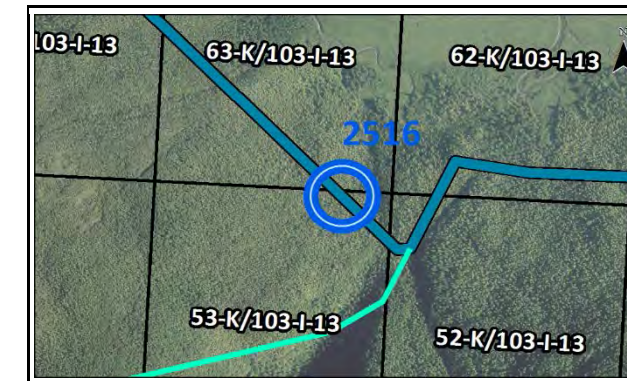


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Nass River (WC 2517)  
**UTM (Zone 9 U):** 449667 E, 6091754 N  
**Field Crew:** M. Bahr, S. Courtney  
**Stream Classification:** S6

**Survey Date:** July 04, 2014  
**Sensitivity:** Low  
**Habitat Survey Length (m):**  
**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 0)	
Confinement	
Channel Pattern	
Channel Width (m); Mean, Range	
Wetted Width (m); Mean, Range	
Water Depth (m); Mean, Range	
Ordinary High Water Mark (m); Mean	
Discharge (m³/s)	
Stream Gradient (%)	
Embeddedness	

Channel and Flow Conditions Continued		
Beaver Dams		No
Native Channel Width (m)		n/a
Bank Conditions	Left Bank	Right Bank
Bank Shape		
Bank Texture (Dominant/Subdominant)		
Mean Bank Height (m); Mean, Range		
Grade Of Approach Slopes (%)		
Riparian Area Width (m)		
Dominant Riparian Vegetation Type		

Substrate	%
Organics	NR
Fines (<2mm)	NR
Small Gravel (2-16 mm)	NR
Large Gravel (17-64 mm)	NR
Cobble (65-256 mm)	NR
Boulder (256-400 mm)	NR
Rock (>400 mm)	NR

Habitat	No.	Length (m)	%	Velocity (m/s)
Not applicable				

Cover Type	m²
Not recorded	

Water Quality Parameters	
Water Temperature (°C)	
pH	
Dissolved Oxygen (mg/L)	
Conductivity (uS/cm)	
Turbidity (visual)	

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.

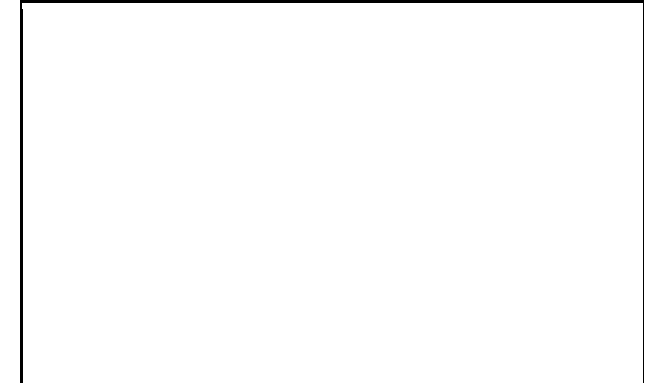


Plate 2 No photograph available.



Plate 3 No photograph available.



Plate 4 No photograph available.



Plate 5 No photograph available.

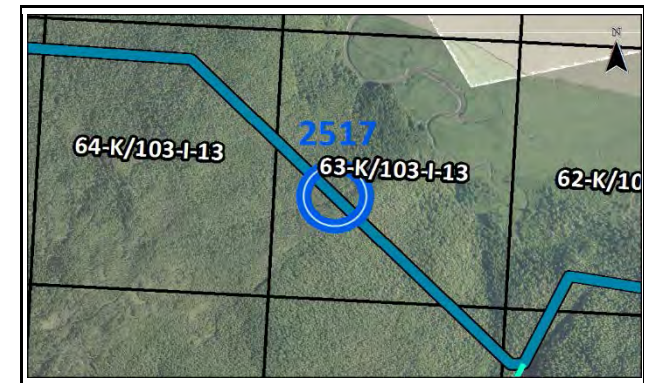


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Nass River (WC 2518)

**Survey Date:** July 04, 2014

**UTM (Zone 9 U):** 448230 E, 6092255 N

**Sensitivity:** Low

**Field Crew:** M. Bahr, S. Courtney

**Habitat Survey Length (m):**

**Stream Classification:** S6

**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 0)	
Confinement	
Channel Pattern	
Channel Width (m); Mean, Range	
Wetted Width (m); Mean, Range	
Water Depth (m); Mean, Range	
Ordinary High Water Mark (m); Mean	
Discharge (m³/s)	
Stream Gradient (%)	
Embeddedness	

Channel and Flow Conditions Continued		
Beaver Dams		No
Native Channel Width (m)		n/a
Bank Conditions	Left Bank	Right Bank
Bank Shape		
Bank Texture (Dominant/Subdominant)		
Mean Bank Height (m); Mean, Range		
Grade Of Approach Slopes (%)		
Riparian Area Width (m)		
Dominant Riparian Vegetation Type		

Substrate	%
Organics	NR
Fines (<2mm)	NR
Small Gravel (2-16 mm)	NR
Large Gravel (17-64 mm)	NR
Cobble (65-256 mm)	NR
Boulder (256-400 mm)	NR
Rock (>400 mm)	NR

Habitat	No.	Length (m)	%	Velocity (m/s)
Not applicable				

Cover Type	m²
Not recorded	

Water Quality Parameters	
Water Temperature (°C)	
pH	
Dissolved Oxygen (mg/L)	
Conductivity (uS/cm)	
Turbidity (visual)	

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
No fish captured				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Minnow Trapping	July 07, 2014	5	335 hrs	0	0.00

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking southeast.



Plate 5 No photograph available.

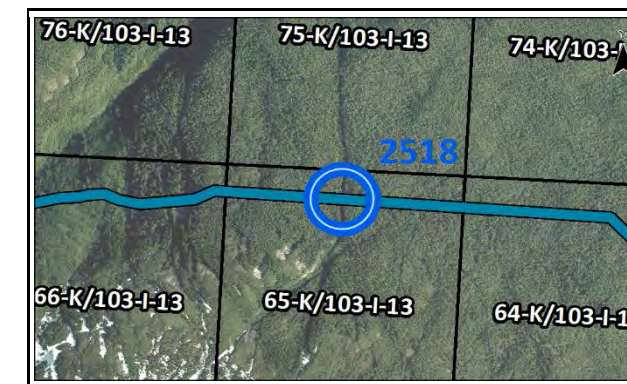


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



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Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Nass River (WC 2519)**

**Survey Date:** July 04, 2014

**UTM (Zone 9 U):** 447747 E, 6092286 N

**Sensitivity:** Low

**Field Crew:** M. Bahr, S. Courtney

**Habitat Survey Length (m):**

**Stream Classification:** S6

**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 0)	
Confinement	
Channel Pattern	
Channel Width (m); Mean, Range	
Wetted Width (m); Mean, Range	
Water Depth (m); Mean, Range	
Ordinary High Water Mark (m); Mean	
Discharge (m³/s)	
Stream Gradient (%)	
Embeddedness	

Channel and Flow Conditions Continued		
Beaver Dams		No
Native Channel Width (m)		n/a
Bank Conditions	Left Bank	Right Bank
Bank Shape		
Bank Texture (Dominant/Subdominant)		
Mean Bank Height (m); Mean, Range		
Grade Of Approach Slopes (%)		
Riparian Area Width (m)		
Dominant Riparian Vegetation Type		

Substrate	%
Organics	NR
Fines (<2mm)	NR
Small Gravel (2-16 mm)	NR
Large Gravel (17-64 mm)	NR
Cobble (65-256 mm)	NR
Boulder (256-400 mm)	NR
Rock (>400 mm)	NR

Habitat	No.	Length (m)	%	Velocity (m/s)
Not applicable				

Cover Type	m²
Not recorded	

Water Quality Parameters	
Water Temperature (°C)	
pH	
Dissolved Oxygen (mg/L)	
Conductivity (uS/cm)	
Turbidity (visual)	

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 No photograph available.

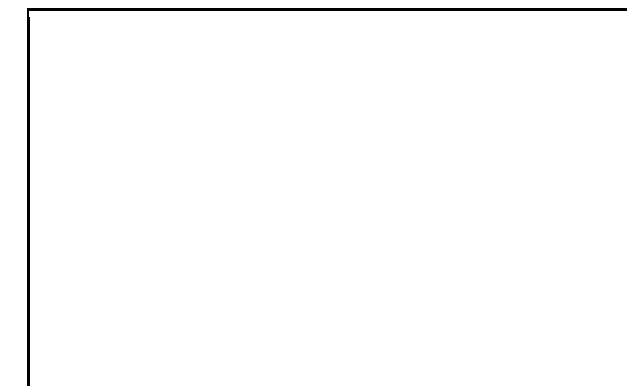


Plate 4 No photograph available.



Plate 5 Photograph taken at right-of-way looking upstream at watercourse.

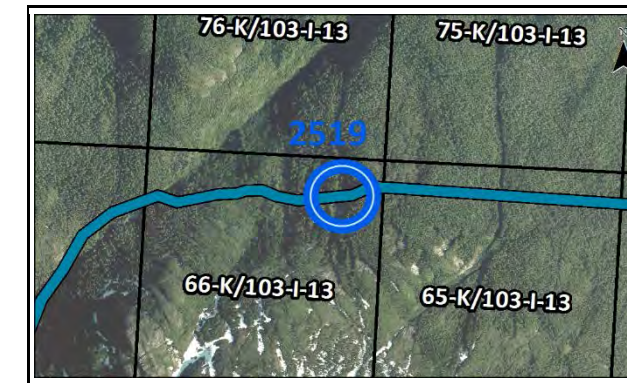


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Nass River (WC 2520)

**Survey Date:** July 04, 2014

**UTM (Zone 9 U):** 447109 E, 6092185 N

**Sensitivity:** Low

**Field Crew:** M. Bahr, S. Courtney

**Habitat Survey Length (m):**

**Stream Classification:** S5

**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 0)	
Confinement	
Channel Pattern	
Channel Width (m); Mean, Range	
Wetted Width (m); Mean, Range	
Water Depth (m); Mean, Range	
Ordinary High Water Mark (m); Mean	
Discharge (m³/s)	
Stream Gradient (%)	
Embeddedness	

Channel and Flow Conditions Continued		
Beaver Dams		No
Native Channel Width (m)		n/a
Bank Conditions	Left Bank	Right Bank
Bank Shape		
Bank Texture (Dominant/Subdominant)		
Mean Bank Height (m); Mean, Range		
Grade Of Approach Slopes (%)		
Riparian Area Width (m)		
Dominant Riparian Vegetation Type		

Substrate	%
Organics	NR
Fines (<2mm)	NR
Small Gravel (2-16 mm)	NR
Large Gravel (17-64 mm)	NR
Cobble (65-256 mm)	NR
Boulder (256-400 mm)	NR
Rock (>400 mm)	NR

Habitat	No.	Length (m)	%	Velocity (m/s)
Not applicable				

Cover Type	m²
Not recorded	

Water Quality Parameters	
Water Temperature (°C)	
pH	
Dissolved Oxygen (mg/L)	
Conductivity (uS/cm)	
Turbidity (visual)	

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.

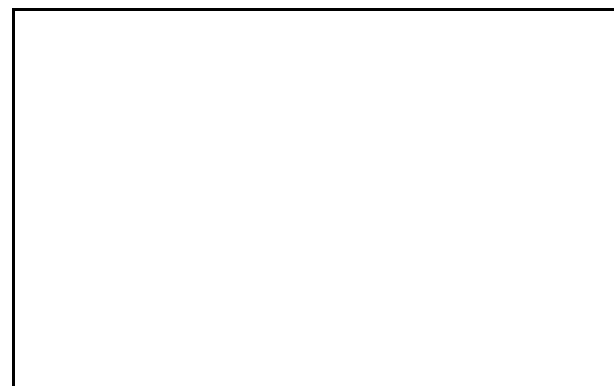


Plate 3 No photograph available.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 No photograph available.

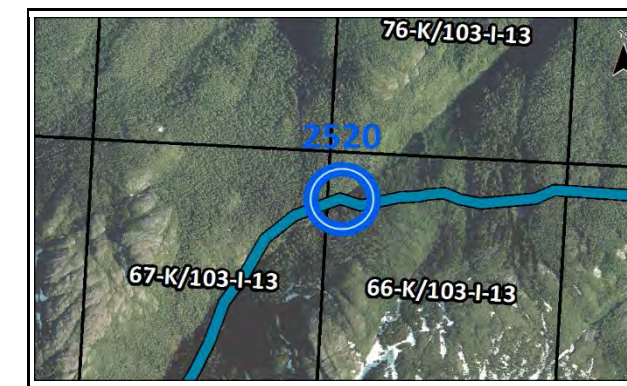


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Nass River (WC 2521)**

**Survey Date:** July 04, 2014

**UTM (Zone 9 U):** 446702 E, 6091835 N

**Sensitivity:** Low

**Field Crew:** M. Bahr, S. Courtney

**Habitat Survey Length (m):**

**Stream Classification:** S5

**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 0)		Channel and Flow Conditions Continued		
Confinement		Beaver Dams	No	
Channel Pattern		Native Channel Width (m)	n/a	
Channel Width (m); Mean, Range		<b>Bank Conditions</b>	<b>Left Bank</b>	<b>Right Bank</b>
Wetted Width (m); Mean, Range		Bank Shape		
Water Depth (m); Mean, Range		Bank Texture (Dominant/Subdominant)		
Ordinary High Water Mark (m); Mean		Mean Bank Height (m); Mean, Range		
Discharge (m³/s)		Grade Of Approach Slopes (%)		
Stream Gradient (%)		Riparian Area Width (m)		
Embeddedness		Dominant Riparian Vegetation Type		

Substrate	%
Organics	NR
Fines (<2mm)	NR
Small Gravel (2-16 mm)	NR
Large Gravel (17-64 mm)	NR
Cobble (65-256 mm)	NR
Boulder (256-400 mm)	NR
Rock (>400 mm)	NR

Habitat	No.	Length (m)	%	Velocity (m/s)
Not applicable				

Cover Type	m²
Not recorded	

Water Quality Parameters	
Water Temperature (°C)	
pH	
Dissolved Oxygen (mg/L)	
Conductivity (uS/cm)	
Turbidity (visual)	

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.

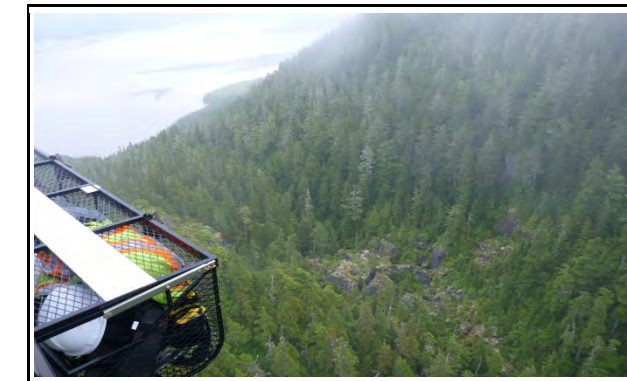


Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 No photograph available.

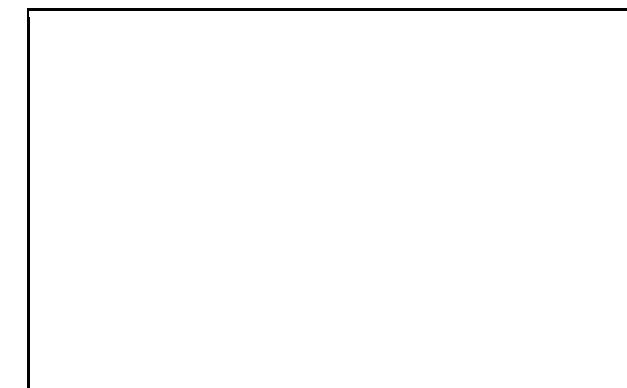


Plate 4 No photograph available.



Plate 5 Photograph taken at right-of-way looking upstream.

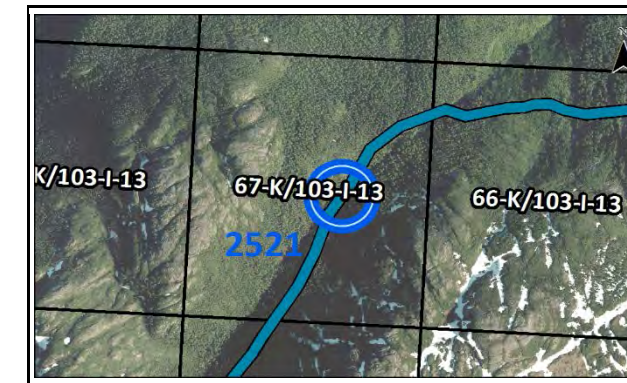


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ksgyukwsa'a (WC 2522)

**Survey Date:** July 04, 2014

**UTM (Zone 9 U):** 446540 E, 6091498 N

**Sensitivity:** Low

**Field Crew:** M. Bahr, S. Courtney

**Habitat Survey Length (m):**

**Stream Classification:** S5

**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 0)	
Confinement	
Channel Pattern	
Channel Width (m); Mean, Range	
Wetted Width (m); Mean, Range	
Water Depth (m); Mean, Range	
Ordinary High Water Mark (m); Mean	
Discharge (m³/s)	
Stream Gradient (%)	
Embeddedness	

Channel and Flow Conditions Continued		
Beaver Dams		No
Native Channel Width (m)		n/a
Bank Conditions	Left Bank	Right Bank
Bank Shape		
Bank Texture (Dominant/Subdominant)		
Mean Bank Height (m); Mean, Range		
Grade Of Approach Slopes (%)		
Riparian Area Width (m)		
Dominant Riparian Vegetation Type		

Substrate	%
Organics	NR
Fines (<2mm)	NR
Small Gravel (2-16 mm)	NR
Large Gravel (17-64 mm)	NR
Cobble (65-256 mm)	NR
Boulder (256-400 mm)	NR
Rock (>400 mm)	NR

Habitat	No.	Length (m)	%	Velocity (m/s)
Not applicable				

Cover Type	m²
Not recorded	

Water Quality Parameters	
Water Temperature (°C)	
pH	
Dissolved Oxygen (mg/L)	
Conductivity (uS/cm)	
Turbidity (visual)	

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 No photograph available.

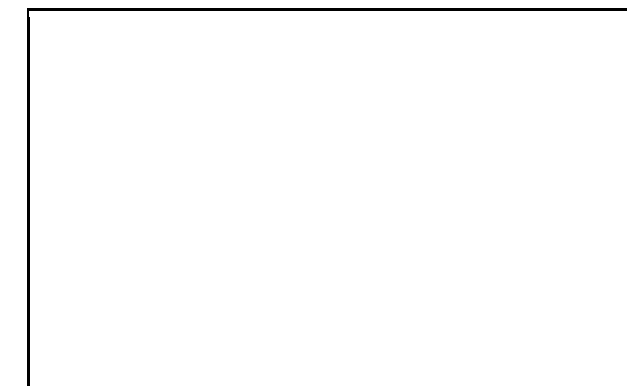


Plate 4 No photograph available.

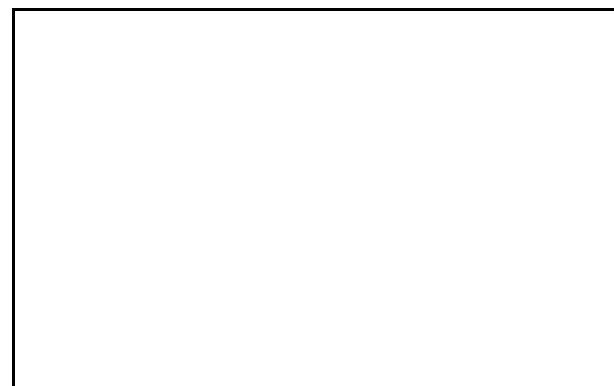


Plate 5 No photograph available.

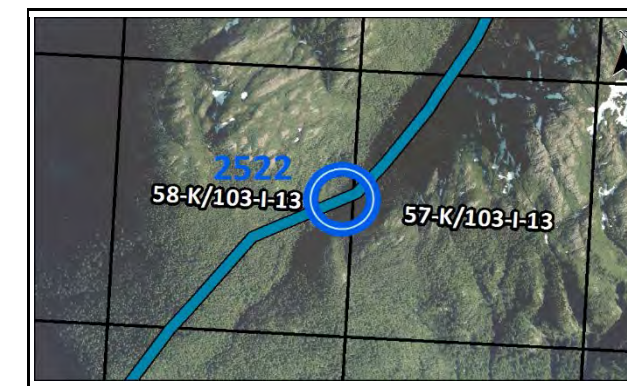


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Ksgyukwsa'a (WC 2523)**

UTM (Zone 9 U): 445180 E, 6089609 N

Field Crew: B. Rudmik, S. Whiteside

Stream Classification: S1-B

Survey Date: July 13, 2014

Sensitivity: High

Habitat Survey Length (m): 430

Timing Window of Least Risk: No window

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Occasionally Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	22.4, 20.0-25.0
Wetted Width (m); Mean, Range	19.3, 17.0-23.0
Water Depth (m); Mean, Range	0.33, 0.19-0.45
Ordinary High Water Mark (m); Mean	0.73
Discharge (m³/s)	NR
Stream Gradient (%)	1
Embeddedness	Moderately Embedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Undercut	Sloping
Bank Texture (Dominant/Subdominant)	Cobble/Large Gravel	Cobble/Large Gravel
Mean Bank Height (m); Mean, Range	0.8, 0.7-0.9	0.6, 0.4-0.8
Grade Of Approach Slopes (%)	Moderate (4-14)	Low (<4)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	0
Fines (<2mm)	9
Small Gravel (2-16 mm)	9
Large Gravel (17-64 mm)	13
Cobble (65-256 mm)	55
Boulder (256-400 mm)	15
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	1	40	9	1.50
Pool	1	25	6	0.40
Riffle	2	365	85	0.95, 0.9 - 1

Cover Type	m²
Boulders	330
Depth	248
Instream Vegetation	0
Overhanging Vegetation	44
Under Cut Banks	58
Woody Debris	19

Water Quality Parameters	
Water Temperature (°C)	12.6
pH	7.5
Dissolved Oxygen (mg/L)	9.7
Conductivity (uS/cm)	14.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Important	Marginal	Unsuitable	Marginal	Unsuitable
Trout	Marginal	Marginal	Marginal	Marginal	Unsuitable
Char	Important	Important	Important	Important	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range
Char	20	0	106, 74-170
Coho salmon	8	0	56, 36-80
Sculpin	10	0	65, 48-82

Fish Species Previously Documented
Chum salmon, coho salmon, Dolly Varden, pink salmon, rainbow trout

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 13, 2014	300	683 s	54	7.91
Minnow Trapping	July 13, 2014	8	24 hrs	11	0.46

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments

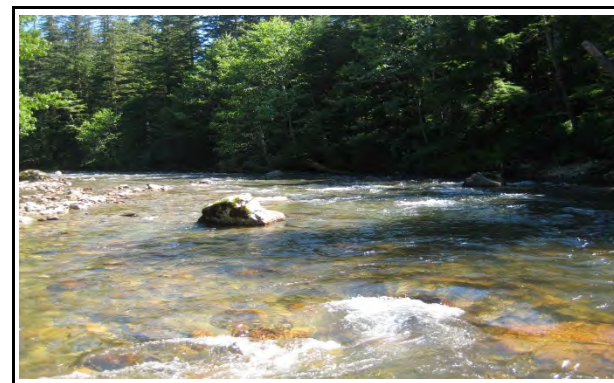


Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.

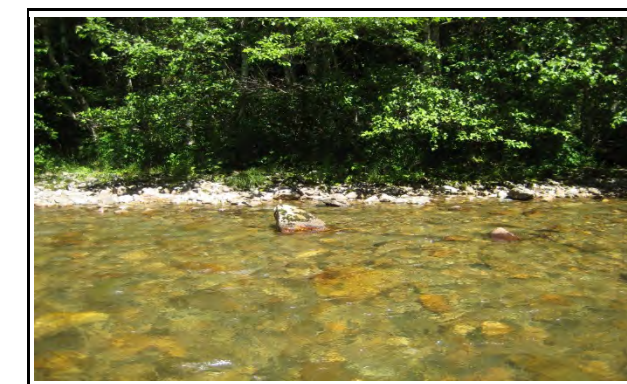


Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 65m downstream at a potential overwintering area.

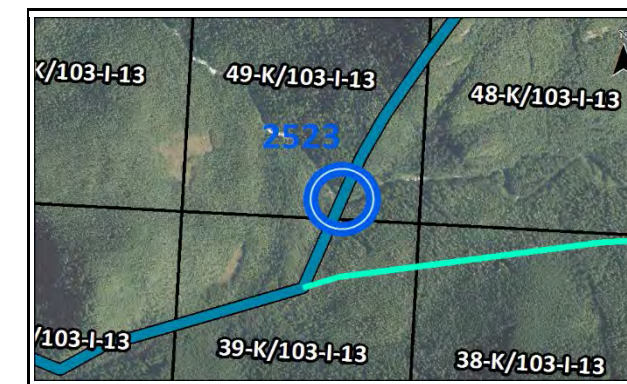


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Nass River (WC 819a)**

**UTM (Zone 9 U): 450123 E, 6090895 N**

**Field Crew: E. Lennert, A. Kemprath**

**Stream Classification: S3**

**Survey Date:** July 14, 2014

**Sensitivity:** High

**Habitat Survey Length (m):** 375

**Timing Window of Least Risk:** June 1- August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Unconfined
Channel Pattern	Irregular, Wandering
Channel Width (m); Mean, Range	2.8, 0.7-6.0
Wetted Width (m); Mean, Range	2.6, 1.0-5.5
Water Depth (m); Mean, Range	0.21, 0.07-0.80
Ordinary High Water Mark (m); Mean	0.39
Discharge (m³/s)	0.04
Stream Gradient (%)	3
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Vertical	Vertical
Bank Texture (Dominant/Subdominant)	Small Gravel/Large Gravel	Small Gravel/Large Gravel
Mean Bank Height (m); Mean, Range	0.7, 0.3-0.9	0.7, 0.4-1.2
Grade Of Approach Slopes (%)	High (>14)	High (>14)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	2
Fines (<2mm)	28
Small Gravel (2-16 mm)	56
Large Gravel (17-64 mm)	14
Cobble (65-256 mm)	0
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Pool	1	25	7	0.10
Riffle	3	350	93	0.22, 0.2 - 0.25

Cover Type	m²
Boulders	10
Depth	52
Instream Vegetation	20
Overhanging Vegetation	195
Under Cut Banks	146
Woody Debris	215

Water Quality Parameters	
Water Temperature (°C)	6.0
pH	7.7
Dissolved Oxygen (mg/L)	13.7
Conductivity (uS/cm)	67.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Marginal	Marginal	Marginal	Marginal	Marginal
Char	Important	Important	Important	Important	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	2	0	87, 67-107	None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 14, 2014	60	204 s	2	0.98
Minnow Trapping	July 14, 2014	5	115 hrs	0	0.00

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 275m downstream looking upstream.

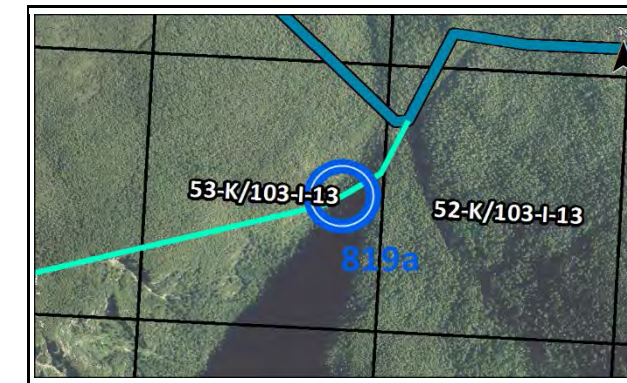


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Nass River (WC 820a)

**Survey Date:** July 04, 2014

**UTM (Zone 9 U):** 449512 E, 6090630 N

**Sensitivity:** Low

**Field Crew:** M. Bahr, S. Courtney

**Habitat Survey Length (m):**

**Stream Classification:** S5

**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 1)	
Confinement	
Channel Pattern	
Channel Width (m); Mean, Range	
Wetted Width (m); Mean, Range	
Water Depth (m); Mean, Range	
Ordinary High Water Mark (m); Mean	
Discharge (m³/s)	
Stream Gradient (%)	71
Embeddedness	

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape		
Bank Texture (Dominant/Subdominant)		
Mean Bank Height (m); Mean, Range		
Grade Of Approach Slopes (%)		
Riparian Area Width (m)	0	0
Dominant Riparian Vegetation Type		

Substrate	%
Organics	NR
Fines (<2mm)	NR
Small Gravel (2-16 mm)	NR
Large Gravel (17-64 mm)	NR
Cobble (65-256 mm)	NR
Boulder (256-400 mm)	NR
Rock (>400 mm)	NR

Habitat	No.	Length (m)	%	Velocity (m/s)
Not applicable				

Cover Type	m²
Not recorded	

Water Quality Parameters	
Water Temperature (°C)	
pH	
Dissolved Oxygen (mg/L)	
Conductivity (uS/cm)	
Turbidity (visual)	

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking downstream.

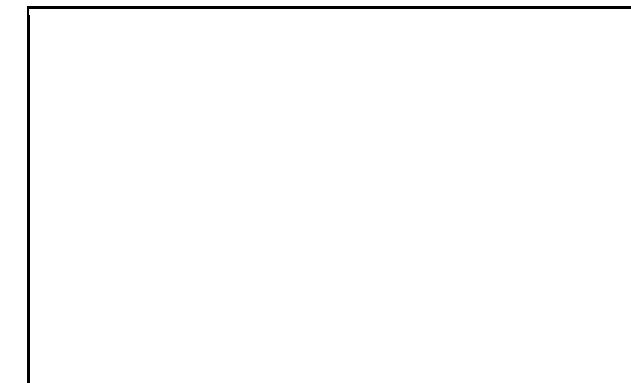


Plate 2 No photograph available.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 No photograph available.

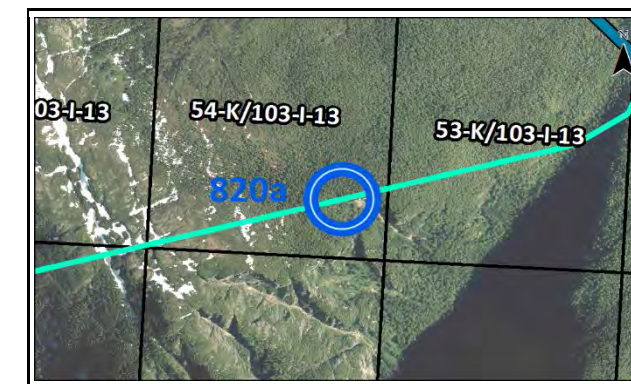


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ksgyukwsa'a (WC 2524)

**Survey Date:** July 04, 2014

**UTM (Zone 9 U):** 447233 E, 6090001 N

**Sensitivity:** Low

**Field Crew:** M. Bahr, S. Courtney

**Habitat Survey Length (m):**

**Stream Classification:** S5

**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 0)	
Confinement	
Channel Pattern	
Channel Width (m); Mean, Range	
Wetted Width (m); Mean, Range	
Water Depth (m); Mean, Range	
Ordinary High Water Mark (m); Mean	
Discharge (m³/s)	
Stream Gradient (%)	
Embeddedness	

Channel and Flow Conditions Continued		
Beaver Dams		No
Native Channel Width (m)		n/a
Bank Conditions	Left Bank	Right Bank
Bank Shape		
Bank Texture (Dominant/Subdominant)		
Mean Bank Height (m); Mean, Range		
Grade Of Approach Slopes (%)		
Riparian Area Width (m)		
Dominant Riparian Vegetation Type		

Substrate	%
Organics	NR
Fines (<2mm)	NR
Small Gravel (2-16 mm)	NR
Large Gravel (17-64 mm)	NR
Cobble (65-256 mm)	NR
Boulder (256-400 mm)	NR
Rock (>400 mm)	NR

Habitat	No.	Length (m)	%	Velocity (m/s)
Not applicable				

Cover Type	m²
Not recorded	

Water Quality Parameters	
Water Temperature (°C)	
pH	
Dissolved Oxygen (mg/L)	
Conductivity (uS/cm)	
Turbidity (visual)	

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 No photograph available.



Plate 5 No photograph available.

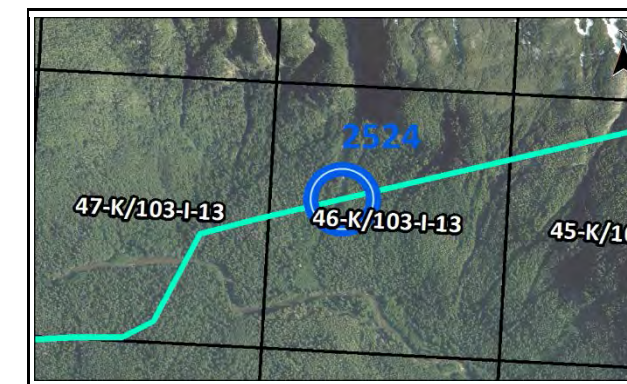


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company



Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Ksgyukwsa'a (WC 826a)**

**UTM (Zone 9 U):** 446786 E, 6089806 N

**Field Crew:** M. Bahr, S. Courtney

**Stream Classification:** S1-B

**Survey Date:** July 05, 2014

**Sensitivity:** High

**Habitat Survey Length (m):** 769

**Timing Window of Least Risk:** No window

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	31.0, 28.5-36.7
Wetted Width (m); Mean, Range	27.3, 22.9-31.2
Water Depth (m); Mean, Range	0.51, 0.15-0.90
Ordinary High Water Mark (m); Mean	1.32
Discharge (m³/s)	11.46
Stream Gradient (%)	1
Embeddedness	Moderately Embedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Cobble/Large Gravel	Cobble/Large Gravel
Mean Bank Height (m); Mean, Range	1.2, 0.7-1.6	2.1, 1.3-3.0
Grade Of Approach Slopes (%)	Low (<4)	Moderate (4-14)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	0
Fines (<2mm)	7
Small Gravel (2-16 mm)	11
Large Gravel (17-64 mm)	27
Cobble (65-256 mm)	36
Boulder (256-400 mm)	16
Rock (>400 mm)	3

Habitat	No.	Length (m)	%	Velocity (m/s)
Pool	1	89	13	0.85
Rapid	1	20	3	2.50
Riffle	3	228	34	1.18, 0.37 - 1.96
Run	2	332	50	0.63, 0.45 - 0.8

Cover Type	m²
Boulders	106
Depth	318
Instream Vegetation	0
Overhanging Vegetation	3
Under Cut Banks	5
Woody Debris	8

Water Quality Parameters	
Water Temperature (°C)	8.7
pH	7.1
Dissolved Oxygen (mg/L)	12.2
Conductivity (uS/cm)	13.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Marginal	Marginal	Unsuitable	Marginal	Unsuitable
Trout	Marginal	Marginal	Marginal	Marginal	Unsuitable
Char	Important	Important	Important	Important	Important

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	20	0	94, 69-125	Chum salmon, coho salmon, Dolly Varden, pink salmon, rainbow trout

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 05, 2014	100	298 s	3	1.01
Minnow Trapping	July 13, 2014	8	40 hrs	17	0.43

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 100m downstream looking downstream.

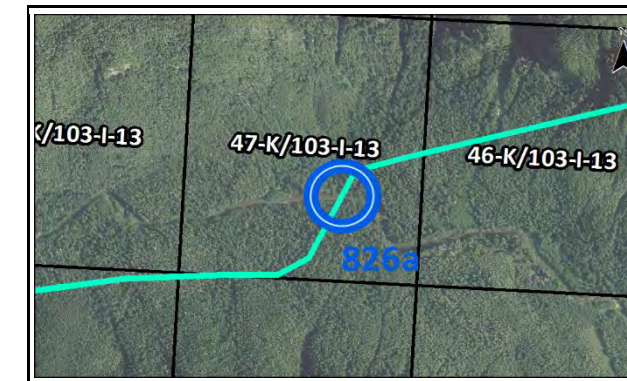


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Ksgyukwsa'a (WC 828a)**

**Survey Date:** July 19, 2014

**UTM (Zone 9 U):** 445952 E, 6089476 N

**Sensitivity:** Low

**Field Crew:** J. Cote, N. Glover

**Habitat Survey Length (m):** 280

**Stream Classification:** S3\*

**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Occasionally Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	2.0, 1.4-3.1
Wetted Width (m); Mean, Range	1.2, 0.4-1.9
Water Depth (m); Mean, Range	0.10, 0.01-0.22
Ordinary High Water Mark (m); Mean	0.08
Discharge (m³/s)	0.01
Stream Gradient (%)	14
Embeddedness	Low Embeddedness

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Boulders/Cobble	Boulders/Cobble
Mean Bank Height (m); Mean, Range	0.9, 0.5-1.7	0.8, 0.3-1.6
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	0
Fines (<2mm)	7
Small Gravel (2-16 mm)	8
Large Gravel (17-64 mm)	15
Cobble (65-256 mm)	19
Boulder (256-400 mm)	27
Rock (>400 mm)	23

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	2	190	68	0.00, 0 - 0
Pool	2	10	4	0.00, 0 - 0
Riffle	1	80	29	0.00

Cover Type	m²
Boulders	50
Overhanging Vegetation	220
Under Cut Banks	19

Water Quality Parameters	
Water Temperature (°C)	8.0
pH	7.5
Dissolved Oxygen (mg/L)	9.3
Conductivity (uS/cm)	10.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments

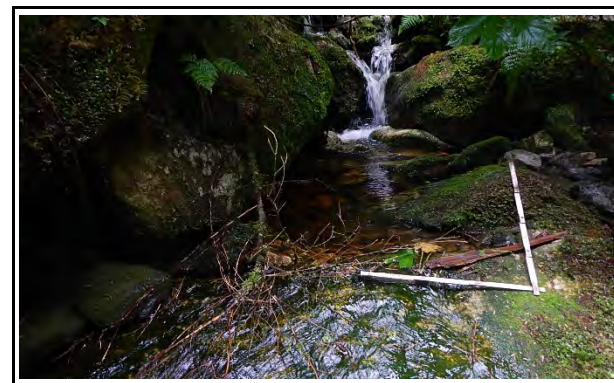


Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

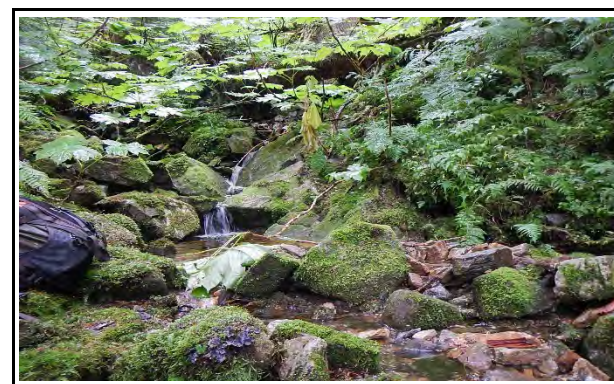


Plate 5 Photograph taken at 70m upstream looking upstream.

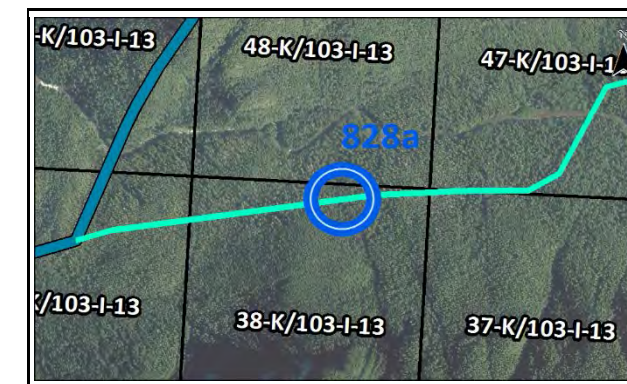


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Ksgyukwsa'a (WC 829a)**

**Survey Date:** July 10, 2014

**UTM (Zone 9 U):** 445483 E, 6089391 N

**Sensitivity:** High

**Field Crew:** C. Sinclair, J. McNeice

**Habitat Survey Length (m):** 200

**Stream Classification:** S2

**Timing Window of Least Risk:** June 15 - August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Confined
Channel Pattern	Straight
Channel Width (m); Mean, Range	8.0, 5.8-10.4
Wetted Width (m); Mean, Range	4.2, 3.2-5.6
Water Depth (m); Mean, Range	0.22, 0.04-0.68
Ordinary High Water Mark (m); Mean	0.54
Discharge (m³/s)	0.71
Stream Gradient (%)	15
Embeddedness	Moderately Embedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Boulders/Cobble	Boulders/Cobble
Mean Bank Height (m); Mean, Range	1.3, 1.2-1.5	1.4, 1.2-1.5
Grade Of Approach Slopes (%)	Moderate (4-14)	Moderate (4-14)
Riparian Area Width (m)	60	50
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	0
Fines (<2mm)	0
Small Gravel (2-16 mm)	0
Large Gravel (17-64 mm)	10
Cobble (65-256 mm)	47
Boulder (256-400 mm)	43
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Cascade	2	200	100	0.29, 0.27 - 0.3

Cover Type	m²
Boulders	650
Overhanging Vegetation	12
Under Cut Banks	60
Woody Debris	275

Water Quality Parameters	
Water Temperature (°C)	10.8
pH	7.3
Dissolved Oxygen (mg/L)	11.0
Conductivity (uS/cm)	6.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Char	Marginal	Marginal	Marginal	Marginal	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	5	0	129, 85-158	Dolly Varden

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 10, 2014	117	457 s	10	2.19

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments

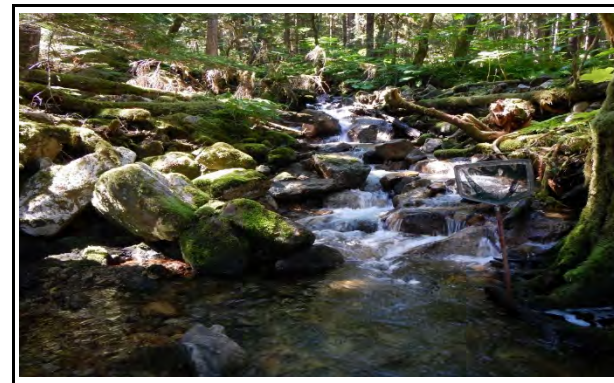


Plate 1 Photograph taken at right-of-way looking upstream.

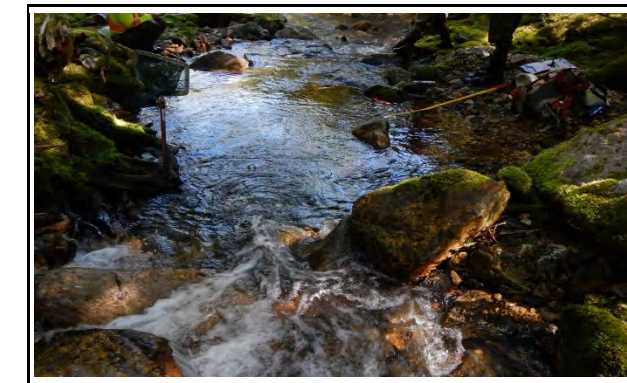


Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 150m downstream looking downstream.

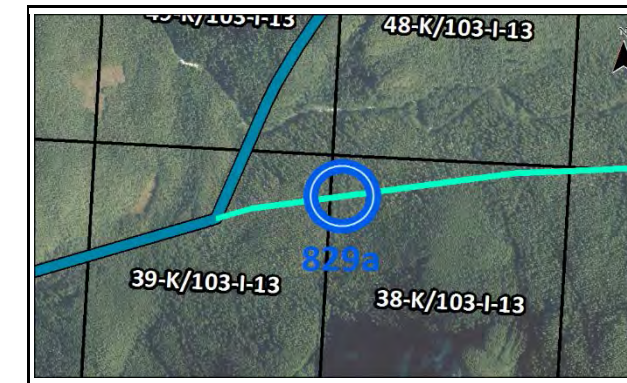


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ksgyukwsa'a (WC 830a.1)

**Survey Date:** July 07, 2014

**UTM (Zone 9 U):** 444916 E, 6089246 N

**Sensitivity:** High

**Field Crew:** M. Bahr, S. Courtney

**Habitat Survey Length (m):** 300

**Stream Classification:** S2

**Timing Window of Least Risk:** June 15- August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Frequently Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	5.3, 3.4-8.3
Wetted Width (m); Mean, Range	1.9, 0.7-3.2
Water Depth (m); Mean, Range	0.10, 0.01-0.27
Ordinary High Water Mark (m); Mean	0.28
Discharge (m³/s)	0.02
Stream Gradient (%)	17
Embeddedness	Moderately Embedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Vertical	Vertical
Bank Texture (Dominant/Subdominant)	Cobble/Large Gravel	Cobble/Large Gravel
Mean Bank Height (m); Mean, Range	3.1, 2.5-4.0	3.5, 1.5-6.0
Grade Of Approach Slopes (%)	High (>14)	High (>14)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	0
Fines (<2mm)	2
Small Gravel (2-16 mm)	33
Large Gravel (17-64 mm)	28
Cobble (65-256 mm)	32
Boulder (256-400 mm)	5
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Riffle	2	220	100	0.00, 0 - 0

Cover Type	m²
Boulders	3
Depth	6
Overhanging Vegetation	5
Woody Debris	25

Water Quality Parameters	
Water Temperature (°C)	9.3
pH	6.9
Dissolved Oxygen (mg/L)	12.5
Conductivity (uS/cm)	26.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Marginal	Marginal	Unsuitable	Unsuitable	Marginal
Char	Marginal	Marginal	Unsuitable	Marginal	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	3	2	77, 65-95	None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 07, 2014	90	297 s	3	1.01
Observation	July 07, 2014	n/a	n/a	2	n/a

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 200m downstream looking right.

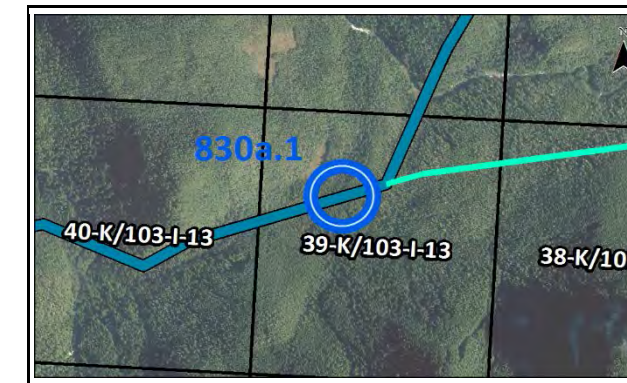


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Ksgyukwsa'a (WC 830a)

**Survey Date:** July 07, 2014

**UTM (Zone 9 U):** 444889 E, 6089244 N

**Sensitivity:** High

**Field Crew:** M. Bahr, S. Courtney

**Habitat Survey Length (m):** 300

**Stream Classification:** S2

**Timing Window of Least Risk:** June 15- August 31

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Frequently Confined
Channel Pattern	Straight
Channel Width (m); Mean, Range	8.5, 2.0-30.0
Wetted Width (m); Mean, Range	1.9, 1.0-3.2
Water Depth (m); Mean, Range	0.05, 0.02-0.10
Ordinary High Water Mark (m); Mean	0.14
Discharge (m³/s)	0.04
Stream Gradient (%)	18
Embeddedness	Moderately Embedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Vertical	Vertical
Bank Texture (Dominant/Subdominant)	Organics/Cobble	Organics/Cobble
Mean Bank Height (m); Mean, Range	14.2, 10.0-20.0	5.7, 4.0-8.0
Grade Of Approach Slopes (%)	High (>14)	High (>14)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	28
Fines (<2mm)	25
Small Gravel (2-16 mm)	12
Large Gravel (17-64 mm)	15
Cobble (65-256 mm)	21
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Riffle	2	235	100	0.00, 0 - 0

Cover Type	m²
Depth	16
Overhanging Vegetation	40
Under Cut Banks	2
Woody Debris	28

Water Quality Parameters	
Water Temperature (°C)	7.5
pH	6.4
Dissolved Oxygen (mg/L)	11.4
Conductivity (uS/cm)	24.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Unsuitable
Trout	Marginal	Marginal	Unsuitable	Unsuitable	Marginal
Char	Marginal	Marginal	Unsuitable	Marginal	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Char	3	0	77, 65-95	None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 07, 2014	90	297 s	3	1.01

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 100m upstream looking left at poorly defined channel.

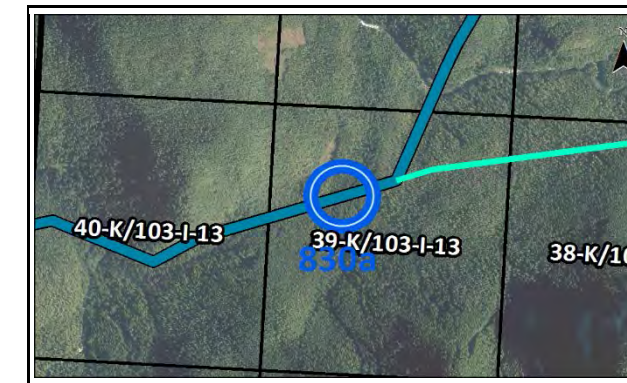


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Welda Creek (WC 831a)**

**Survey Date:** July 07, 2014

**UTM (Zone 9 U):** 444112 E, 6089032 N

**Sensitivity:** High

**Field Crew:** C. Sinclair, D. Cooper

**Habitat Survey Length (m):** 500

**Stream Classification:** S2

**Timing Window of Least Risk:** No window

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Frequently Confined
Channel Pattern	Irregular, Wandering
Channel Width (m); Mean, Range	16.2, 12.3-24.1
Wetted Width (m); Mean, Range	14.1, 11.0-20.1
Water Depth (m); Mean, Range	0.35, 0.18-0.65
Ordinary High Water Mark (m); Mean	0.54
Discharge (m³/s)	1.01
Stream Gradient (%)	8
Embeddedness	Moderately Embedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Boulders/Cobble	Boulders/Cobble
Mean Bank Height (m); Mean, Range	1.2, 0.9-1.5	1.1, 0.7-1.8
Grade Of Approach Slopes (%)	Moderate (4-14)	Moderate (4-14)
Riparian Area Width (m)	100	100
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	0
Fines (<2mm)	0
Small Gravel (2-16 mm)	0
Large Gravel (17-64 mm)	5
Cobble (65-256 mm)	40
Boulder (256-400 mm)	55
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Rapid	2	130	100	0.80, 0.8 - 0.8

Cover Type	m²
Boulders	260
Overhanging Vegetation	50
Under Cut Banks	90
Woody Debris	45

Water Quality Parameters	
Water Temperature (°C)	11.5
pH	7.6
Dissolved Oxygen (mg/L)	10.7
Conductivity (uS/cm)	10.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Important	Marginal	Unsuitable	Important	Important
Trout	Important	Marginal	Important	Important	Important
Char	Important	Marginal	Important	Important	Important

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range
Char	1	0	54
Coastal cutthroat trout	7	0	77, 63-93
Sculpin	2	0	75, 60-90

Fish Species Previously Documented
Coho salmon, Dolly Varden, pink salmon, sculpin, stickleback

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 07, 2014	139	713 s	10	1.40

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 200m downstream looking upstream.



Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Welda Creek (WC 832a)**

UTM (Zone 9 U): 444043 E, 6089059 N

Field Crew: C. Sinclair, D. Cooper

Stream Classification: S1-B

Survey Date: July 07, 2014

Sensitivity: High

Habitat Survey Length (m): 500

Timing Window of Least Risk: No window

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Frequently Confined
Channel Pattern	Irregular, Wandering
Channel Width (m); Mean, Range	26.7, 12.9-40.0
Wetted Width (m); Mean, Range	17.4, 6.5-24.0
Water Depth (m); Mean, Range	0.29, 0.11-0.61
Ordinary High Water Mark (m); Mean	0.54
Discharge (m³/s)	0.69
Stream Gradient (%)	8
Embeddedness	Moderately Embedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Cobble/Large Gravel	Cobble/Large Gravel
Mean Bank Height (m); Mean, Range	1.0, 0.7-1.3	1.2, 0.5-1.7
Grade Of Approach Slopes (%)	Moderate (4-14)	Moderate (4-14)
Riparian Area Width (m)	100	100
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	0
Fines (<2mm)	0
Small Gravel (2-16 mm)	2
Large Gravel (17-64 mm)	10
Cobble (65-256 mm)	35
Boulder (256-400 mm)	51
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Pool	5	42	7	0.24, 0.13 - 0.6
Rapid	5	254	43	0.17, 0.15 - 0.2
Riffle	3	133	23	0.17, 0.15 - 0.2
Run	4	157	27	0.17, 0.15 - 0.18

Cover Type	m²
Boulders	260
Depth	14
Overhanging Vegetation	47
Under Cut Banks	200
Woody Debris	84

Water Quality Parameters	
Water Temperature (°C)	11.5
pH	8.1
Dissolved Oxygen (mg/L)	10.7
Conductivity (uS/cm)	10.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Important	Marginal	Unsuitable	Important	Marginal
Trout	Important	Marginal	Important	Important	Marginal
Char	Important	Marginal	Important	Important	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range
Coastal cutthroat trout	5	0	70, 62-78
Coho salmon	1	0	77
Sculpin	10	0	70, 47-115

Fish Species Previously Documented
Coho salmon, Dolly Varden, pink salmon, sculpin, stickleback

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 07, 2014	100	1009 s	32	3.17

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 45m downstream looking upstream at the stream splitting off a side channel.

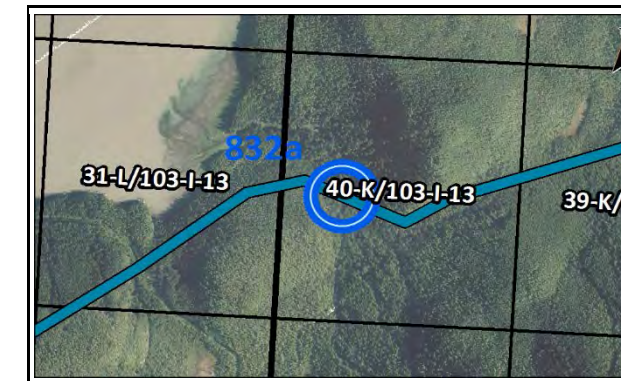


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.):** Unnamed tributary to Nass River (WC 1033a)

**Survey Date:** July 09, 2014

**UTM (Zone 9 U):** 504620 E, 6145640 N

**Sensitivity:** Low

**Field Crew:** J. Beblow, A. Kemprath

**Habitat Survey Length (m):** 200

**Stream Classification:** S3\*

**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Entrenched
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	3.8, 3.2-4.2
Wetted Width (m); Mean, Range	1.0, 0.3-2.8
Water Depth (m); Mean, Range	0.13, 0.02-0.60
Ordinary High Water Mark (m); Mean	0.23
Discharge (m³/s)	0.01
Stream Gradient (%)	14
Embeddedness	Unembedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Vertical	Vertical
Bank Texture (Dominant/Subdominant)	Cobble/Large Gravel	Fines/Organics
Mean Bank Height (m); Mean, Range	0.6, 0.4-0.9	0.8, 0.4-1.3
Grade Of Approach Slopes (%)	High (>14)	High (>14)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Mixed C and D	Mixed C and D

Substrate	%
Organics	0
Fines (<2mm)	0
Small Gravel (2-16 mm)	10
Large Gravel (17-64 mm)	29
Cobble (65-256 mm)	26
Boulder (256-400 mm)	15
Rock (>400 mm)	20

Habitat	No.	Length (m)	%	Velocity (m/s)
Flat	2	670	99	0.00, 0 - 0
Pool	1	4	1	0.00

Cover Type	m²
Boulders	5
Overhanging Vegetation	210
Under Cut Banks	25
Woody Debris	170

Water Quality Parameters	
Water Temperature (°C)	12.3
pH	6.8
Dissolved Oxygen (mg/L)	7.8
Conductivity (uS/cm)	94.0
Turbidity (visual)	Clear

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Marginal	Unsuitable	Marginal	Marginal
Trout	Unsuitable	Marginal	Marginal	Marginal	Marginal
Char	Unsuitable	Marginal	Marginal	Marginal	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
No fish captured				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 09, 2014	60	146 s	0	0.00

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 55m upstream looking downstream.

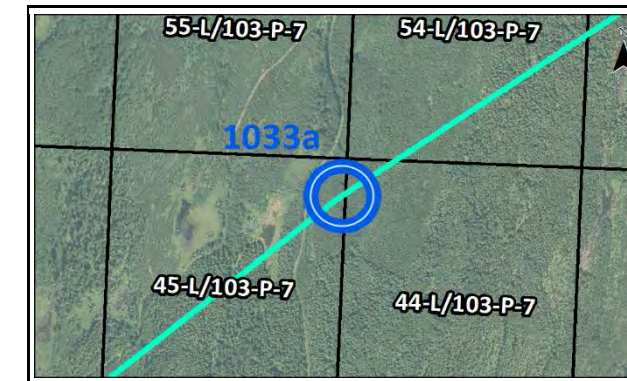


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company



Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Nass River (WC 1034)**

**Survey Date:** July 10, 2014

**UTM (Zone 9 U):** 504263 E, 6145342 N

**Sensitivity:** Low

**Field Crew:** J. Beblow, A. Kemprath, M. Wright

**Habitat Survey Length (m):** 200

**Stream Classification:** S4\*

**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Occasionally Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	1.2, 0.9-1.9
Wetted Width (m); Mean, Range	1.4, 1.1-1.9
Water Depth (m); Mean, Range	0.40, 0.05-0.90
Ordinary High Water Mark (m); Mean	0.62
Discharge (m³/s)	NR
Stream Gradient (%)	3
Embeddedness	Highly Embedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Sloping
Bank Texture (Dominant/Subdominant)	Fines/Organics	Fines/Organics
Mean Bank Height (m); Mean, Range	0.6, 0.3-0.8	0.5, 0.3-0.6
Grade Of Approach Slopes (%)	Low (<4)	Low (<4)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Coniferous	Coniferous

Substrate	%
Organics	47
Fines (<2mm)	52
Small Gravel (2-16 mm)	2
Large Gravel (17-64 mm)	0
Cobble (65-256 mm)	0
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Flat	2	220	100	0.00, 0 - 0

Cover Type	m²
Boulders	0
Depth	10
Instream Vegetation	7
Overhanging Vegetation	175
Under Cut Banks	50
Woody Debris	50

Water Quality Parameters	
Water Temperature (°C)	10.5
pH	6.9
Dissolved Oxygen (mg/L)	8.7
Conductivity (uS/cm)	93.0
Turbidity (visual)	Stained

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Marginal	Unsuitable	Marginal	Marginal
Trout	Unsuitable	Marginal	Marginal	Marginal	Marginal
Char	Unsuitable	Marginal	Marginal	Marginal	Marginal

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
No fish captured				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Backpack Electrofishing	July 10, 2014	75	242 s	0	0.00

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 150m downstream looking downstream at a wetland.

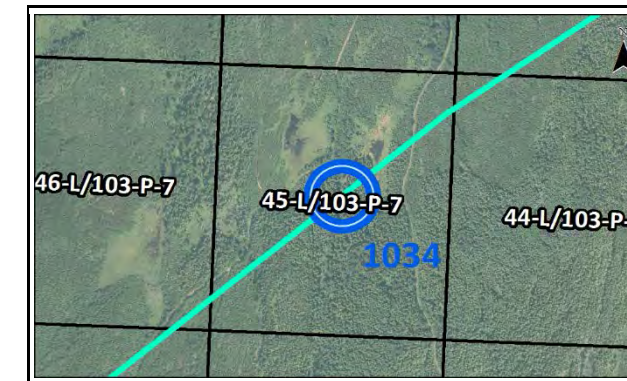


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Unnamed tributary to Nass River (WC 1034a)**

**Survey Date:** July 10, 2014

**UTM (Zone 9 U):** 503964 E, 6145079 N

**Sensitivity:** Low

**Field Crew:** J. Beblow, A. Kemprath

**Habitat Survey Length (m):** 150

**Stream Classification:** S3\*

**Timing Window of Least Risk:** Open

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Frequently Confined
Channel Pattern	Sinuuous
Channel Width (m); Mean, Range	1.7, 1.0-2.5
Wetted Width (m); Mean, Range	Dry Channel
Water Depth (m); Mean, Range	n/a
Ordinary High Water Mark (m); Mean	0.08
Discharge (m³/s)	n/a
Stream Gradient (%)	4
Embeddedness	Moderately Embedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Sloping	Vertical
Bank Texture (Dominant/Subdominant)	Small Gravel/Fines	Small Gravel/Large Gravel
Mean Bank Height (m); Mean, Range	0.7, 0.3-0.9	1.2, 1.0-1.4
Grade Of Approach Slopes (%)	Moderate (4-14)	High (>14)
Riparian Area Width (m)	50	50
Dominant Riparian Vegetation Type	Deciduous	Deciduous

Substrate	%
Organics	0
Fines (<2mm)	8
Small Gravel (2-16 mm)	14
Large Gravel (17-64 mm)	69
Cobble (65-256 mm)	8
Boulder (256-400 mm)	0
Rock (>400 mm)	0

Habitat	No.	Length (m)	%	Velocity (m/s)
Not applicable				

Cover Type	m²
Not recorded	

Water Quality Parameters	
Water Temperature (°C)	
pH	
Dissolved Oxygen (mg/L)	
Conductivity (uS/cm)	
Turbidity (visual)	

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
Trout	Unsuitable	Marginal	Unsuitable	Unsuitable	Unsuitable
Char	Unsuitable	Marginal	Unsuitable	Unsuitable	Unsuitable

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				None

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at 100m downstream looking upstream at a dry channel.

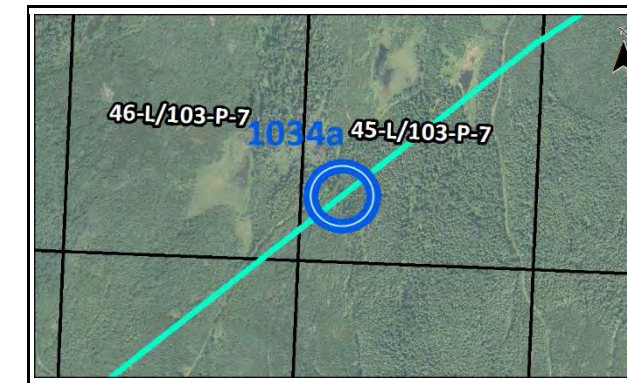


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Isolate if water present/open cut if dry or frozen to bottom
Preliminary Pipeline Crossing Method Option B	Not applicable
Preliminary Vehicle and Equipment Crossing Method Option A	Culvert
Preliminary Vehicle and Equipment Crossing Method Option B	Clear span bridge

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

Nisga'a Lands Freshwater Fish and Fish Habitat Technical Data Report

**Watercourse (Site No.): Nass River (WC 1038)**

UTM (Zone 9 U): 501117 E, 6143681 N

Field Crew: B. Stitt, C. Jerney, R. Ball

Stream Classification: S1-B

Survey Date: July 09, 2014

Sensitivity: High

Habitat Survey Length (m):

Timing Window of Least Risk: No window

Channel and Flow Conditions (No. of Transects: 6)	
Confinement	Entrenched
Channel Pattern	Irregular, Wandering
Channel Width (m); Mean, Range	82.5, 75.0-100.0
Wetted Width (m); Mean, Range	82.5, 75.0-100.0
Water Depth (m); Mean, Range	1.67, 1.50-2.00
Ordinary High Water Mark (m); Mean	1.67
Discharge (m³/s)	NR
Stream Gradient (%)	2
Embeddedness	Unembedded

Channel and Flow Conditions Continued		
Beaver Dams	No	
Native Channel Width (m)	n/a	
Bank Conditions	Left Bank	Right Bank
Bank Shape	Vertical	Vertical
Bank Texture (Dominant/Subdominant)	Rock/Large Gravel	Rock/Large Gravel
Mean Bank Height (m); Mean, Range	10.0, 10.0-10.0	10.0, 10.0-10.0
Grade Of Approach Slopes (%)	High (>14)	High (>14)
Riparian Area Width (m)	1	1
Dominant Riparian Vegetation Type	None	None

Substrate	%
Organics	0
Fines (<2mm)	0
Small Gravel (2-16 mm)	0
Large Gravel (17-64 mm)	10
Cobble (65-256 mm)	5
Boulder (256-400 mm)	5
Rock (>400 mm)	80

Water Quality Parameters	
Water Temperature (°C)	
pH	
Dissolved Oxygen (mg/L)	
Conductivity (uS/cm)	
Turbidity (visual)	

Habitat	No.	Length (m)	%	Velocity (m/s)
Run	1	840	100	0.00

Cover Type	m²
Not recorded	

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Feeding/Foraging	Wintering	Migration
Coho salmon	Marginal	Marginal	Unsuitable	Important	Essential
Trout	Marginal	Marginal	Important	Important	Essential
Char	Marginal	Marginal	Important	Important	Essential

Fish Species Present	No. Captured	No. Observed	Fork Length (mm); Mean, Range	Fish Species Previously Documented
Not sampled				Chinook salmon, chum salmon, coho salmon, cutthroat trout, Dolly Varden, eulachon, lamprey, mountain whitefish, pink salmon, rainbow trout, sculpin, sockeye salmon, steelhead, threespine stickleback

Sampling Method	Sample Date	Distance (m)/No. of Traps	Effort	No. Captured	CPUE
Not sampled					

Notes: CPUE: Catch per unit of effort is the number of fish captured per one hour of minnow trapping and 100 seconds of electrofishing.

Additional Habitat Comments



Plate 1 Photograph taken at right-of-way looking upstream.



Plate 2 Photograph taken at right-of-way looking downstream.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.



Plate 5 Photograph taken at right-of-way.

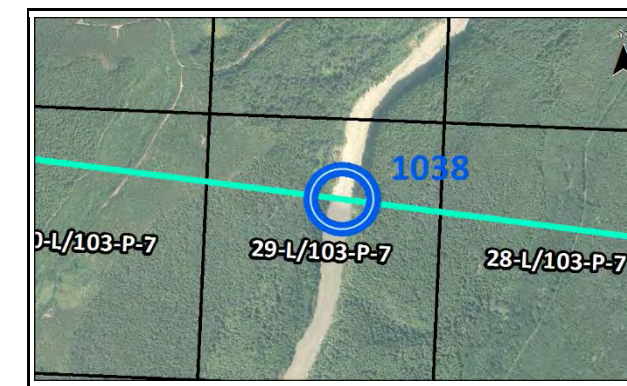


Plate 6 Map illustrating crossing location.

	Crossing Method
Preliminary Pipeline Crossing Method Option A	Aerial
Preliminary Pipeline Crossing Method Option B	Underground trenchless
Preliminary Vehicle and Equipment Crossing Method Option A	None
Preliminary Vehicle and Equipment Crossing Method Option B	Not applicable

**Proposed Westcoast Connector Gas Transmission Project**



A CH2M HILL Company

**APPENDIX D**  
**NCD PHOTOPLATES**

**Site:** Unnamed tributary to North Seaskinnish Creek (NCD 2499)  
**Survey Date:** June 26, 2014

**UTM (Zone 9 U):** 505542, 6141156  
**Field Crew:** E. Lennert, J. McNeice



Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

**ADDITIONAL HABITAT COMMENTS:**

--

**WESTCOAST CONNECTOR GAS  
TRANSMISSION SYSTEM**



A CH2M HILL Company

**Site:** Unnamed tributary to North Seaskinnish Creek (NCD 725a)  
**Survey Date:** June 27, 2014

**UTM (Zone 9 U):** 505637, 6140904  
**Field Crew:** E. Lennert, J. McNeice



Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

**ADDITIONAL HABITAT COMMENTS:**

--

**WESTCOAST CONNECTOR GAS  
TRANSMISSION SYSTEM**



A CH2M HILL Company

**Site:** Unnamed tributary to North Seaskinnish Creek (NCD 726a)  
**Survey Date:** June 27, 2014

**UTM (Zone 9 U):** 505698, 6140766  
**Field Crew:** E. Lennert, J. McNeice



Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

**ADDITIONAL HABITAT COMMENTS:**

--

**WESTCOAST CONNECTOR GAS  
TRANSMISSION SYSTEM**



A CH2M HILL Company

**Site:** Unnamed tributary to North Seaskinnish Creek (NCD 727a)  
**Survey Date:** June 28, 2014

**UTM (Zone 9 U):** 505682, 6140018  
**Field Crew:** E. Lennert, C. Hansen



Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

**ADDITIONAL HABITAT COMMENTS:**

--

**WESTCOAST CONNECTOR GAS  
TRANSMISSION SYSTEM**



A CH2M HILL Company



**Site:** Unnamed tributary to North Seaskinnish Creek (NCD 728a)  
**Survey Date:** June 27, 2014

**UTM (Zone 9 U):** 505660, 6139730  
**Field Crew:** J. Beblow, S. Courtney



Plate 1 Photograph taken at right-of-way looking north.



Plate 2 Photograph taken at right-of-way looking south.



Plate 3 Photograph taken at right-of-way looking east.



Plate 4 Photograph taken at right-of-way looking west.

**ADDITIONAL HABITAT COMMENTS:**

--

**WESTCOAST CONNECTOR GAS  
TRANSMISSION SYSTEM**



A CH2M HILL Company

**Site:** Unnamed tributary to North Seaskinnish Creek (NCD 729a)  
**Survey Date:** June 27, 2014

**UTM (Zone 9 U):** 505684, 6139056  
**Field Crew:** J. Beblow, S. Courtney



Plate 1 Photograph taken at right-of-way looking north.



Plate 2 Photograph taken at right-of-way looking south.



Plate 3 Photograph taken at right-of-way looking east.



Plate 4 Photograph taken at right-of-way looking west.

**ADDITIONAL HABITAT COMMENTS:**

--

**WESTCOAST CONNECTOR GAS  
TRANSMISSION SYSTEM**



A CH2M HILL Company

**Site:** Unnamed tributary to North Seaskinnish Creek (NCD 730a)  
**Survey Date:** June 26, 2014

**UTM (Zone 9 U):** 505519, 6138306  
**Field Crew:** J. Beblow, S. Courtney



Plate 1 Photograph taken at right-of-way looking north.

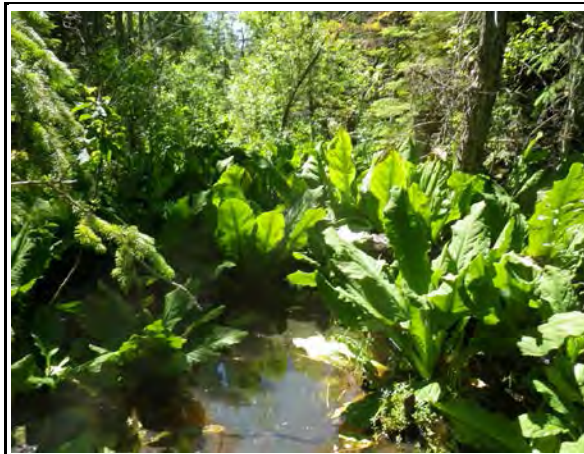


Plate 2 Photograph taken at right-of-way looking south.



Plate 3 Photograph taken at right-of-way looking east.

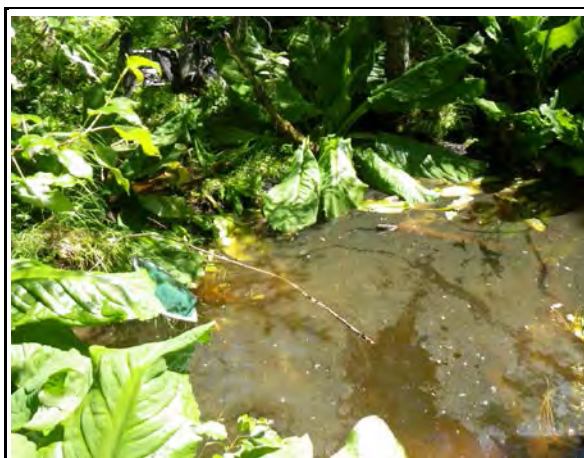




Plate 4 Photograph taken at right-of-way looking west.

<b>ADDITIONAL HABITAT COMMENTS:</b>		
<b>WESTCOAST CONNECTOR GAS TRANSMISSION SYSTEM</b>		 <small>A CH2M HILL Company</small>

**Site:** Unnamed tributary to North Seaskinnish Creek (NCD 731a)  
**Survey Date:** June 26, 2014

**UTM (Zone 9 U):** 504499, 6135360  
**Field Crew:** J. Beblow, S. Courtney



Plate 1 Photograph taken at right-of-way looking north.





Plate 2 Photograph taken at right-of-way looking south.



Plate 3 Photograph taken at right-of-way looking east.



Plate 4 Photograph taken at right-of-way looking west.

<b>ADDITIONAL HABITAT COMMENTS:</b>		
<b>WESTCOAST CONNECTOR GAS TRANSMISSION SYSTEM</b>		 <small>A CH2M HILL Company</small>

**Site:** Unnamed tributary to North Seaskinnish Creek (NCD 734a)  
**Survey Date:** June 25, 2014

**UTM (Zone 9 U):** 503536, 6132854  
**Field Crew:** J. Beblow, S. Courtney



Plate 1 Photograph taken at 30m upstream looking north.



Plate 2 Photograph taken at 30m upstream looking south.



Plate 3 Photograph taken at 30m upstream looking west.

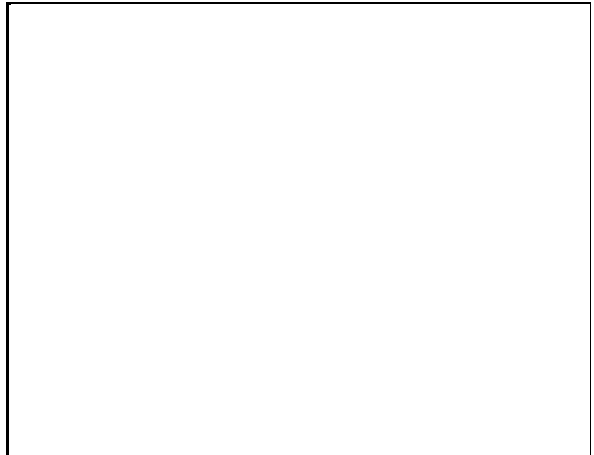




Plate 4 No photograph available.

<b>ADDITIONAL HABITAT COMMENTS:</b>		
<b>WESTCOAST CONNECTOR GAS TRANSMISSION SYSTEM</b>		 <small>A CH2M HILL Company</small>

**Site:** Unnamed tributary to Ksi Sgasginist (NCD 735a)  
**Survey Date:** June 25, 2014

**UTM (Zone 9 U):** 501824, 6127349  
**Field Crew:** J. Beblow, S. Courtney



Plate 1 Photograph taken at right-of-way looking north.





Plate 2 Photograph taken at right-of-way looking south.



Plate 3 Photograph taken at right-of-way looking east.



Plate 4 Photograph taken at right-of-way looking west.

<b>ADDITIONAL HABITAT COMMENTS:</b>		
<b>WESTCOAST CONNECTOR GAS TRANSMISSION SYSTEM</b>		 <small>A CH2M HILL Company</small>

**Site:** Unnamed tributary to Gitzyon Creek (NCD 2502)  
**Survey Date:** July 25, 2014

**UTM (Zone 9 U):** 497316, 6118558  
**Field Crew:** E. Lennert, J. McNeice



Plate 1 Photograph taken at right-of-way looking upslope.





Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

<b>ADDITIONAL HABITAT COMMENTS:</b>		
<b>WESTCOAST CONNECTOR GAS TRANSMISSION SYSTEM</b>		 <small>A CH2M HILL Company</small>

**Site:** Unnamed tributary to Gingit Creek (NCD 2504)  
**Survey Date:** June 22, 2014

**UTM (Zone 9 U):** 496870, 6118533  
**Field Crew:** C. Jerney, J. Cote



Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

**ADDITIONAL HABITAT COMMENTS:**

--

**WESTCOAST CONNECTOR GAS  
TRANSMISSION SYSTEM**



A CH2M HILL Company



**Site:** Unnamed tributary to Gitzyon Creek (NCD 2506)  
**Survey Date:** June 12, 2014

**UTM (Zone 9 U):** 496400, 6117909  
**Field Crew:** M. Henry, K. Gasser



Plate 1 Photograph taken at right-of-way looking upslope.

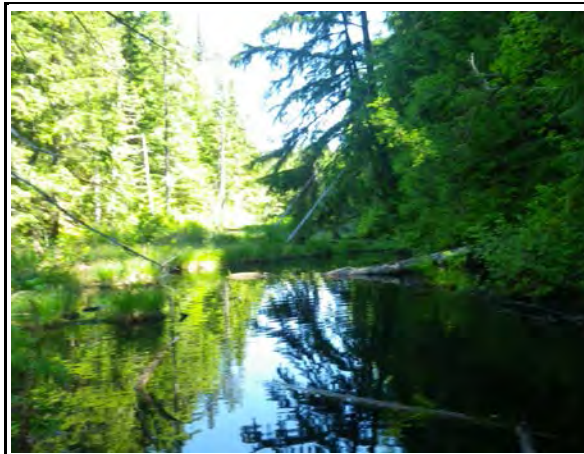




Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

<b>ADDITIONAL HABITAT COMMENTS:</b>		
<b>WESTCOAST CONNECTOR GAS TRANSMISSION SYSTEM</b>		 <small>A CH2M HILL Company</small>

**Site:** Unnamed tributary to Gitzyon Creek (NCD 742a)  
**Survey Date:** June 13, 2014

**UTM (Zone 9 U):** 496643, 6117615  
**Field Crew:** M. Henry, K. Gasser



Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

**ADDITIONAL HABITAT COMMENTS:**

--

**WESTCOAST CONNECTOR GAS  
TRANSMISSION SYSTEM**



A CH2M HILL Company

**Site:** Unnamed tributary to Vetter Creek (NCD 751a)  
**Survey Date:** June 30, 2014

**UTM (Zone 9 U):** 493349, 6114889  
**Field Crew:** N. Postma, D. Cooper



Plate 1 Photograph taken at right-of-way looking upslope.





Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

<b>ADDITIONAL HABITAT COMMENTS:</b>		
<b>WESTCOAST CONNECTOR GAS TRANSMISSION SYSTEM</b>		 <small>A CH2M HILL Company</small>

**Site:** Unnamed tributary to Vetter Creek (NCD 755a)  
**Survey Date:** June 19, 2014

**UTM (Zone 9 U):** 490804, 6113489  
**Field Crew:** C. Jerney, E. Lennert



Plate 1 Photograph taken at right-of-way looking upslope.





Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

<b>ADDITIONAL HABITAT COMMENTS:</b>		
<b>WESTCOAST CONNECTOR GAS TRANSMISSION SYSTEM</b>		 <small>A CH2M HILL Company</small>

**Site:** Unnamed tributary to Ksi Ts'oohl Ts'ap (NCD 2049)  
**Survey Date:** June 15, 2014

**UTM (Zone 9 U):** 487207, 6112173  
**Field Crew:** C. Jermey, N. Postma



Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

**ADDITIONAL HABITAT COMMENTS:**

--

**WESTCOAST CONNECTOR GAS  
TRANSMISSION SYSTEM**



A CH2M HILL Company

**Site:** Unnamed tributary to Nass River (NCD 763a)  
**Survey Date:** June 20, 2014

**UTM (Zone 9 U):** 481914, 6112957  
**Field Crew:** M. Henry, K. Gasser

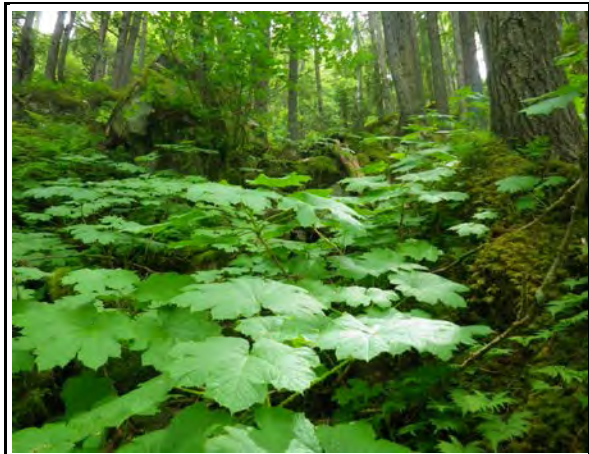


Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.

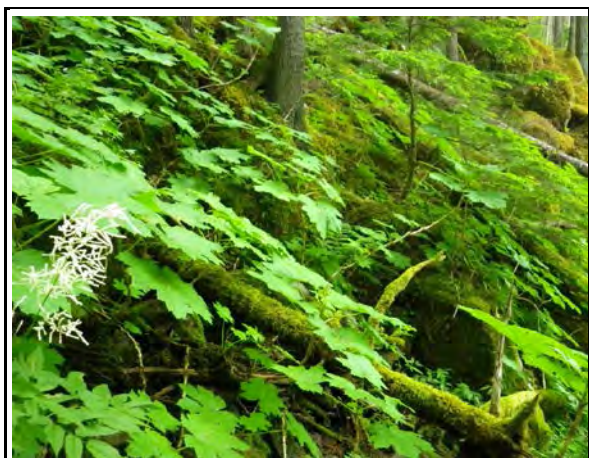




Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

<b>ADDITIONAL HABITAT COMMENTS:</b>		
<b>WESTCOAST CONNECTOR GAS TRANSMISSION SYSTEM</b>		 <small>A CH2M HILL Company</small>

**Site:** Unnamed tributary to Nass River (NCD 764a)  
**Survey Date:** June 20, 2014

**UTM (Zone 9 U):** 481548, 6112936  
**Field Crew:** M. Henry, K. Gasser



Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

**ADDITIONAL HABITAT COMMENTS:**

--

**WESTCOAST CONNECTOR GAS  
TRANSMISSION SYSTEM**



A CH2M HILL Company

**Site:** Unnamed tributary to Nass River (NCD 765a)  
**Survey Date:** June 21, 2014

**UTM (Zone 9 U):** 480896, 6112650  
**Field Crew:** M. Henry, K. Gasser



Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.

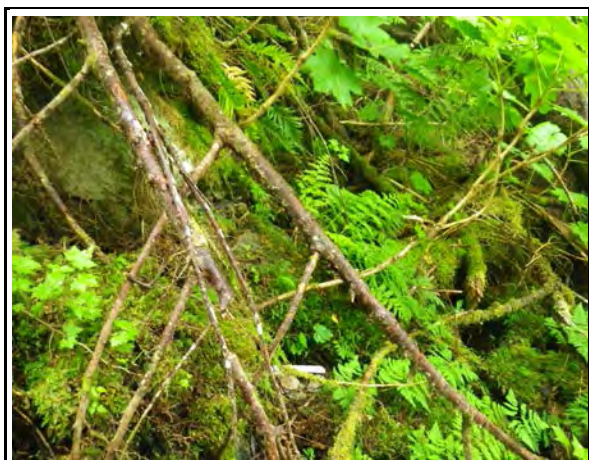




Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

<b>ADDITIONAL HABITAT COMMENTS:</b>		
<b>WESTCOAST CONNECTOR GAS TRANSMISSION SYSTEM</b>		 <small>A CH2M HILL Company</small>



**Site:** Unnamed tributary to Nass River (NCD 766a)  
**Survey Date:** June 21, 2014

**UTM (Zone 9 U):** 480616, 6112537  
**Field Crew:** M. Henry, K. Gasser



Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.

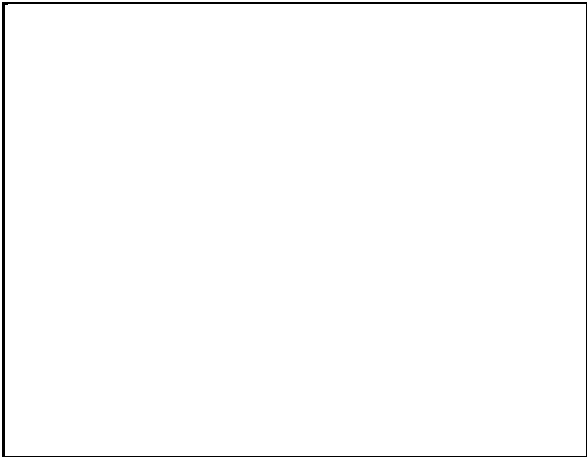




Plate 3 No photograph available.



Plate 4 Photograph taken at right-of-way looking right.

<b>ADDITIONAL HABITAT COMMENTS:</b>		
<b>WESTCOAST CONNECTOR GAS TRANSMISSION SYSTEM</b>		 <small>A CH2M HILL Company</small>

**Site:** Unnamed tributary to Nass River (NCD 2510)  
**Survey Date:** June 20, 2014

**UTM (Zone 9 U):** 481922, 6112870  
**Field Crew:** M. Henry, K. Gasser



Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.

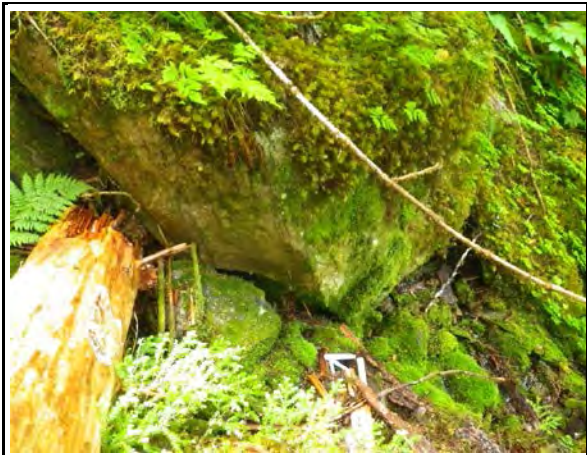




Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

<b>ADDITIONAL HABITAT COMMENTS:</b>		
<b>WESTCOAST CONNECTOR GAS TRANSMISSION SYSTEM</b>		 <small>A CH2M HILL Company</small>

**Site:** Unnamed tributary to Nass River (NCD 2511)  
**Survey Date:** June 20, 2014

**UTM (Zone 9 U):** 481568, 6112762  
**Field Crew:** M. Henry, K. Gasser



Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

**ADDITIONAL HABITAT COMMENTS:**

--

**WESTCOAST CONNECTOR GAS  
TRANSMISSION SYSTEM**



A CH2M HILL Company

**Site:** Unnamed tributary to Nass River (NCD 2512)  
**Survey Date:** June 21, 2014

**UTM (Zone 9 U):** 480997, 6112566  
**Field Crew:** M. Henry, K. Gasser



Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.

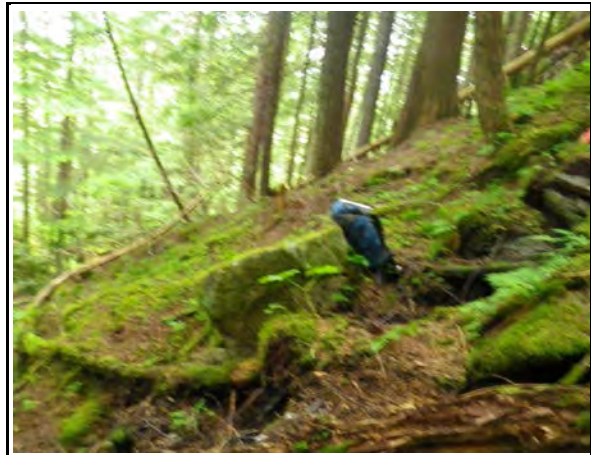


Plate 4 Photograph taken at right-of-way looking right.

**ADDITIONAL HABITAT COMMENTS:**

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**WESTCOAST CONNECTOR GAS  
TRANSMISSION SYSTEM**



A CH2M HILL Company

**Site:** Unnamed tributary to Nass River (NCD 2513)  
**Survey Date:** June 21, 2014

**UTM (Zone 9 U):** 480644, 6112453  
**Field Crew:** M. Henry, K. Gasser



Plate 1 Photograph taken at right-of-way looking upslope.





Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

<b>ADDITIONAL HABITAT COMMENTS:</b>		
<b>WESTCOAST CONNECTOR GAS TRANSMISSION SYSTEM</b>		 <small>A CH2M HILL Company</small>

**Site:** Unnamed tributary to Ansedagan Creek (NCD 769a)  
**Survey Date:** June 21, 2014

**UTM (Zone 9 U):** 477700, 6109838  
**Field Crew:** C. Jerney, J. Cote



Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

**ADDITIONAL HABITAT COMMENTS:**

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**WESTCOAST CONNECTOR GAS  
TRANSMISSION SYSTEM**



A CH2M HILL Company

**Site:** Unnamed tributary to Ansedagan Creek (NCD 770a)  
**Survey Date:** June 21, 2014

**UTM (Zone 9 U):** 477666, 6109612  
**Field Crew:** C. Jerney, J. Cote



Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

**ADDITIONAL HABITAT COMMENTS:**

--

**WESTCOAST CONNECTOR GAS  
TRANSMISSION SYSTEM**



A CH2M HILL Company

**Site:** Unnamed tributary to Nass River (NCD 774a)  
**Survey Date:** June 24, 2014

**UTM (Zone 9 U):** 476848, 6108366  
**Field Crew:** J. Cote, D. Cooper



Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

**ADDITIONAL HABITAT COMMENTS:**

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**WESTCOAST CONNECTOR GAS  
TRANSMISSION SYSTEM**



A CH2M HILL Company



**Site:** Unnamed tributary to Ksi Mat'in (NCD 780a)  
**Survey Date:** June 22, 2014

**UTM (Zone 9 U):** 474981, 6102614  
**Field Crew:** M. Henry, N. Glover



Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

**ADDITIONAL HABITAT COMMENTS:**

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**WESTCOAST CONNECTOR GAS  
TRANSMISSION SYSTEM**



A CH2M HILL Company

**Site:** Unnamed tributary to Ksi Mat'in (NCD 782a)  
**Survey Date:** July 02, 2014

**UTM (Zone 9 U):** 474219, 6101708  
**Field Crew:** J. Beblow, C. Sinclair



Plate 1 Photograph taken at right-of-way looking upslope.





Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

<b>ADDITIONAL HABITAT COMMENTS:</b>		
<b>WESTCOAST CONNECTOR GAS TRANSMISSION SYSTEM</b>		 <small>A CH2M HILL Company</small>

**Site:** Unnamed tributary to Ksi Mat'in (NCD 783a)  
**Survey Date:** July 02, 2014

**UTM (Zone 9 U):** 473796, 6101355  
**Field Crew:** J. Beblow, C. Sinclair, C. Hansen



Plate 1 Photograph taken at right-of-way looking upslope.





Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

<b>ADDITIONAL HABITAT COMMENTS:</b>		
<b>WESTCOAST CONNECTOR GAS TRANSMISSION SYSTEM</b>		 <small>A CH2M HILL Company</small>

**Site:** Unnamed tributary to Ksi Mat'in (NCD 784a)  
**Survey Date:** July 02, 2014

**UTM (Zone 9 U):** 473569, 6101169  
**Field Crew:** J. Beblow, C. Sinclair



Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

**ADDITIONAL HABITAT COMMENTS:**

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**WESTCOAST CONNECTOR GAS  
TRANSMISSION SYSTEM**



A CH2M HILL Company

**Site:** Unnamed tributary to Ksi Mat'in (NCD 2062)  
**Survey Date:** July 03, 2014

**UTM (Zone 9 U):** 474455, 6101380  
**Field Crew:** J. Beblow, S. Courtney



Plate 1 Photograph taken at right-of-way looking north.



Plate 2 Photograph taken at right-of-way looking south.



Plate 3 Photograph taken at right-of-way looking east.



Plate 4 Photograph taken at right-of-way looking west.

**ADDITIONAL HABITAT COMMENTS:**

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**WESTCOAST CONNECTOR GAS  
TRANSMISSION SYSTEM**



A CH2M HILL Company

**Site:** Unnamed tributary to Nass River (NCD 811a)  
**Survey Date:** July 04, 2014

**UTM (Zone 9 U):** 455545, 6091317  
**Field Crew:** C. Sinclair, D. Cooper



Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

**ADDITIONAL HABITAT COMMENTS:**

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**WESTCOAST CONNECTOR GAS  
TRANSMISSION SYSTEM**



A CH2M HILL Company

**Site:** Unnamed tributary to Nass River (NCD 1036)  
**Survey Date:** July 10, 2014

**UTM (Zone 9 U):** 503627, 6144771  
**Field Crew:** B. Rudmik, S. Whiteside



Plate 1 Photograph taken at right-of-way looking north.



Plate 2 Photograph taken at right-of-way looking south.



Plate 3 Photograph taken at right-of-way looking east.



Plate 4 Photograph taken at right-of-way looking west.

**ADDITIONAL HABITAT COMMENTS:**

--

**WESTCOAST CONNECTOR GAS  
TRANSMISSION SYSTEM**



A CH2M HILL Company

**Site:** Unnamed tributary to Nass River (NCD 1037)  
**Survey Date:** July 09, 2014

**UTM (Zone 9 U):** 502752, 6144007  
**Field Crew:** B. Rudmik, S. Whiteside



Plate 1 Photograph taken at right-of-way looking north.





Plate 2 Photograph taken at right-of-way looking south.



Plate 3 Photograph taken at right-of-way looking east.



Plate 4 Photograph taken at right-of-way looking west.

<b>ADDITIONAL HABITAT COMMENTS:</b>		
<b>WESTCOAST CONNECTOR GAS TRANSMISSION SYSTEM</b>		 <small>A CH2M HILL Company</small>



**Site:** Unnamed tributary to Nass River (NCD 1037a)  
**Survey Date:** July 09, 2014

**UTM (Zone 9 U):** 502522, 6143793  
**Field Crew:** B. Rudmik, S. Whiteside



Plate 1 Photograph taken at right-of-way looking north.

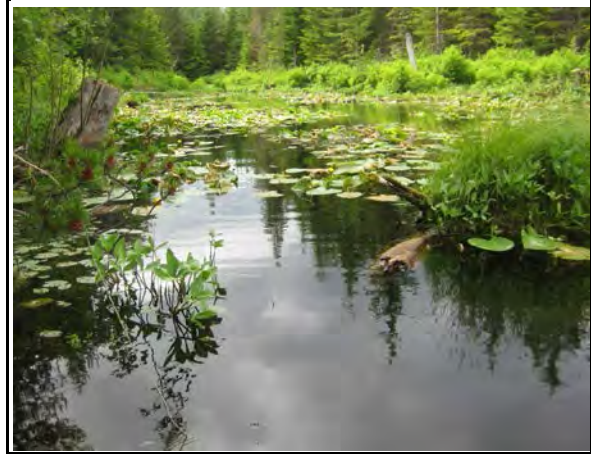


Plate 2 Photograph taken at right-of-way looking south.



Plate 3 Photograph taken at right-of-way looking east.

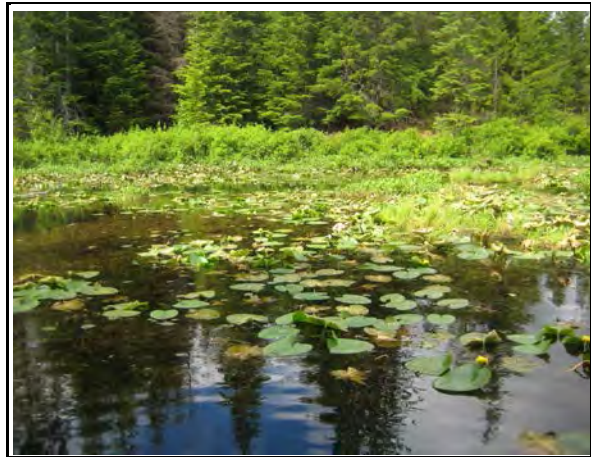


Plate 4 Photograph taken at right-of-way looking west.

**ADDITIONAL HABITAT COMMENTS:**

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**WESTCOAST CONNECTOR GAS  
TRANSMISSION SYSTEM**



A CH2M HILL Company

**Site:** Unnamed tributary to Nass River (NCD 1038b)  
**Survey Date:** July 11, 2014

**UTM (Zone 9 U):** 500384, 6143709  
**Field Crew:** C. Sinclair, J. McNeice



Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

**ADDITIONAL HABITAT COMMENTS:**

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**WESTCOAST CONNECTOR GAS  
TRANSMISSION SYSTEM**



A CH2M HILL Company

**Site:** Unnamed tributary to Kshadin Creek (NCD 1038c)  
**Survey Date:** July 11, 2014

**UTM (Zone 9 U):** 499425, 6143949  
**Field Crew:** C. Sinclair, J. McNeice



Plate 1 Photograph taken at right-of-way looking upslope.



Plate 2 Photograph taken at right-of-way looking downslope.



Plate 3 Photograph taken at right-of-way looking left.



Plate 4 Photograph taken at right-of-way looking right.

**ADDITIONAL HABITAT COMMENTS:**

--

**WESTCOAST CONNECTOR GAS  
TRANSMISSION SYSTEM**



A CH2M HILL Company

## **APPENDIX E**

### **WATER QUALITY PARAMETERS AND MEAN CHANNEL CHARACTERISTICS SUMMARY TABLE**

**WATER QUALITY PARAMETERS AND MEAN CHANNEL CHARACTERISTICS SUMMARY TABLE**

PWC Site	Stream Name (Alias) (Watershed Code)	Sample Date	Water Temp. (°C)	pH	Dissolved Oxygen (mg/L)	Turbidity (Visual)	Flow (m³/s)	Mean Channel Width (m)	Mean Wetted Width (m)	Mean Water Depth (m)	Dominant Substrate	Mean Bank Height (m)	Bank Shape	Bank Texture	Riparian Vegetation
724a	North Seaskinnish Creek (500-201900-24100)	June 27, 2014	12.50	7.11	6.35	Stained	0.02	4.0	3.7	0.52	Organics	Left: 2.5 Right: 3.2	Left: Sloping Right: Sloping	Left: Fines/small gravel Right: Fines/small gravel	Left: Coniferous Right: Coniferous
732a	North Seaskinnish Creek (500-201900-24100)	Jul 12, 2014	18.00	7.84	12.00	Clear	0.05	2.9	2.3	0.11	Rock	Left: 3.1 Right: 3.1	Left: Sloping Right: Sloping	Left: Rock/boulders Right: Rock/boulders	Left: Deciduous Right: Deciduous
733a	North Seaskinnish Creek (500-201900-24100)	Jul 11, 2014	21.50	8.32	10.50	Clear	1.04	11.2	10.9	0.54	Small gravel	Left: 1.5 Right: 1.6	Left: Sloping Right: Sloping	Left: Fines/small gravel Right: Fines/small gravel	Left: Shrub Right: Shrub
737a	Ksi Sgaginist (Seaskinnish River) (500-201900)	Jul 14, 2014	9.00	7.51	11.20	High	1.23	10.5	7.4	0.36	Cobble	Left: 0.9 Right: 0.8	Left: Sloping Right: Undercut	Left: Cobble/fines Right: Cobble/fines	Left: Mixed C and D Right: Mixed C and D
738a	Unnamed tributary to Gingit Creek (no watershed code)	June 12, 2014	12.20	7.80	10.20	Clear	0.12	3.7	3.3	0.15	Fines	Left: 0.8 Right: 0.7	Left: Undercut Right: Sloping	Left: Fines/small gravel Right: Fines/small gravel	Left: Coniferous Right: Deciduous
740a	Gingit Creek (500-185700-00300)	June 18, 2014	9.90	7.88	10.60	Clear	0.50	8.1	4.7	0.17	Large gravel	Left: 1.3 Right: 1.1	Left: Sloping Right: Sloping	Left: Large gravel/fines Right: Large gravel/small gravel	Left: Coniferous Right: Coniferous
741a	Unnamed tributary to Gingit Creek (no watershed code)	June 14, 2014	9.60	7.31	5.90	Clear	NR	1.2	0.6	0.07	Fines	Left: 0.5 Right: 0.4	Left: Vertical Right: Vertical	Left: Cobble/boulders Right: Cobble/boulders	Left: Coniferous Right: Coniferous
2500	Unnamed tributary to Gingit Creek (no watershed code)	June 14, 2014	7.50	7.93	10.00	Clear	0.06	3.0	2.3	0.19	Fines	Left: 0.4 Right: 0.4	Left: Sloping Right: Sloping	Left: Fines/organics Right: Fines/organics	Left: Deciduous Right: Deciduous
2501	Unnamed tributary to Gingit Creek (no watershed code)	June 20, 2014	7.80	8.66	10.80	Clear	0.04	2.0	1.8	0.12	Fines	Left: 0.5 Right: 0.5	Left: Undercut Right: Sloping	Left: Fines/small gravel Right: Fines/small gravel	Left: Shrub Right: Shrub
2503	Gitzyon Creek (500-185700-05200)	July 15, 2014	11.80	7.35	10.30	Clear	NR	6.6	7.0	0.43	Rock	Left: 1.2 Right: 2.7	Left: Sloping Right: Vertical	Left: Boulders/rock Right: Rock/boulders	Left: Coniferous Right: Coniferous
2508	Unnamed tributary to Mcleod Creek (no watershed code)	June 15, 2014	8.70	7.57	12.02	Clear	Negligible	2.0	1.2	0.08	Fines	Left: 0.4 Right: 0.4	Left: Sloping Right: Sloping	Left: Fines/fines Right: Fines/fines	Left: Coniferous Right: Coniferous
743a	Gitzyon Creek (500-185700-05200)	July 11, 2014	12.80	7.60	10.00	Clear	0.75	4.4	3.7	0.50	Rock	Left: 1.7 Right: 1.1	Left: Sloping Right: Sloping	Left: Rock/boulders Right: Rock/boulders	Left: Coniferous Right: Coniferous
744a	Unnamed tributary to Mcleod Creek (no watershed code)	June 14, 2014	7.80	7.14	11.76	Clear	0.01	1.2	1.2	0.14	Fines	Left: 0.6 Right: 0.7	Left: Vertical Right: Vertical	Left: Fines/organics Right: Fines/organics	Left: Mixed C and D Right: Mixed C and D
2146	Mcleod Creek (no watershed code)	June 14, 2014	14.70	6.99	4.29	Stained	Negligible	n/a	58.0	0.67	Organics	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: Wetland Right: Wetland
746a	Ksi Sii Aks (Ganor Creek, Tseax River) (500-185700)	July 15, 2014	13.50	7.45	12.80	Clear	NR	62.5	62.2	0.76	Small gravel	Left: 1.8 Right: 9.0	Left: Sloping Right: Sloping	Left: Rock/boulders Right: Boulders/cobble	Left: Mixed C and D Right: Shrub
747a	Vetter Creek (unnamed tributary to Lower Vetter) (500-185700-16700)	July 15, 2014	12.00	7.24	11.00	Clear	NR	28.5	21.0	1.23	Large gravel	Left: 19.4 Right: 2.7	Left: Vertical Right: Sloping	Left: Large gravel/fines Right: Large gravel/cobble	Left: Coniferous Right: Deciduous
748a	Unnamed tributary to Vetter Creek (no watershed code)	June 30, 2014	12.30	6.77	6.20	Stained	Negligible	n/a	100.0	1.17	Organics	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: Deciduous Right: Deciduous
753a	Vetter Creek (unnamed tributary to Lower Vetter) (500-185700-16700)	July 09, 2014	8.20	NR	NR	Moderate	4.12	36.3	15.2	0.48	Cobble	Left: 1.0 Right: 1.3	Left: Sloping Right: Sloping	Left: Cobble/large gravel Right: Cobble/large gravel	Left: Deciduous Right: Deciduous
754a	Unnamed tributary to Vetter Creek (no watershed code)	June 21, 2014	13.30	6.40	0.40	Stained	NR	1.1	0.8	0.21	Organics	Left: 0.4 Right: 0.4	Left: Sloping Right: Sloping	Left: Organics/organics Right: Organics/organics	Left: Grass Right: Grass
756a	Unnamed tributary to Vetter Creek (no watershed code)	June 20, 2014	8.60	6.50	11.10	Clear	0.01	2.0	1.7	0.04	Small gravel	Left: 2.6 Right: 2.9	Left: Sloping Right: Sloping	Left: Organics/fines Right: Organics/fines	Left: Coniferous Right: Coniferous
757a	Unnamed tributary to Ts'ooihl Ts'ap (no watershed code)	June 20, 2014	7.60	6.50	11.60	Clear	0.01	0.9	0.8	0.05	Small gravel	Left: 2.8 Right: 2.9	Left: Sloping Right: Sloping	Left: Organics/fines Right: Organics/fines	Left: Coniferous Right: Coniferous
2042	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	June 18, 2014	11.70	NR	10.20	Clear	Negligible	1.0	0.4	0.01	Organics/Fines	Left: 0.4 Right: 0.4	Left: Vertical Right: Vertical	Left: Organics/fines Right: Organics/fines	Left: Coniferous Right: Coniferous
2043	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	June 19, 2014	11.80	6.50	10.70	Clear	0.03	3.1	2.2	0.04	Rock	Left: 2.6 Right: 1.9	Left: Vertical Right: Vertical	Left: Rock/organics Right: Rock/organics	Left: Mixed C and D Right: Mixed C and D
2044	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	June 19, 2014	18.20	NR	10.80	Clear	Negligible	3.0	0.3	0.07	Rock	Left: 20.0 Right: 20.0	Left: Vertical Right: Vertical	Left: Rock/organics Right: Rock/organics	Left: Mixed C and D Right: Mixed C and D
2045	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	June 17, 2014	9.40	7.47	13.63	Clear	0.02	6.2	1.8	0.05	Large gravel	Left: 14.4 Right: 9.8	Left: Vertical Right: Vertical	Left: Rock/organics Right: Rock/organics	Left: Mixed C and D Right: Mixed C and D
2046	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	June 17, 2014	8.80	7.53	12.72	Clear	Negligible	3.4	0.2	0.01	Boulder	Left: 1.1 Right: 1.4	Left: Vertical Right: Vertical	Left: Large gravel/fines Right: Large gravel/fines	Left: Coniferous Right: Coniferous
2046.1	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	June 16, 2014	8.80	7.60	11.73	Clear	Negligible	1.1	0.7	0.03	Large gravel	Left: 1.3 Right: 1.2	Left: Sloping Right: Undercut	Left: Rock/organics Right: Rock/organics	Left: Coniferous Right: Coniferous
2047	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	June 15, 2014	8.30	7.29	11.03	Clear	Negligible	2.7	1.7	0.03	Large gravel	Left: 2.1 Right: 5.1	Left: Vertical Right: Vertical	Left: Rock/organics Right: Large gravel/organics	Left: Coniferous Right: Coniferous

PWC Site	Stream Name (Alias) (Watershed Code)	Sample Date	Water Temp. (°C)	pH	Dissolved Oxygen (mg/L)	Turbidity (Visual)	Flow (m³/s)	Mean Channel Width (m)	Mean Wetted Width (m)	Mean Water Depth (m)	Dominant Substrate	Mean Bank Height (m)	Bank Shape	Bank Texture	Riparian Vegetation
2049a	Unnamed tributary to Ksi Ts'oohl Ts'ap (no watershed code)	June 26, 2014	9.30	7.72	11.10	Clear	0.01	6.3	1.9	0.08	Boulder	Left: 0.8 Right: 0.8	Left: Sloping Right: Vertical	Left: Fines/small gravel Right: Fines/small gravel	Left: Deciduous Right: Deciduous
2051	Ksi Ts'oohl Ts'ap (Zolzap Creek) (500-155400)	June 25, 2014	8.90	7.65	11.60	Clear	1.46	7.7	6.4	0.40	Boulder	Left: 1.3 Right: 2.0	Left: Sloping Right: Sloping	Left: Organics/boulders Right: Organics/boulders	Left: Mixed C and D Right: Mixed C and D
2054	Unnamed tributary to Ksi Ts'oohl Ts'ap (no watershed code)	June 14, 2014	5.60	7.77	11.70	Clear	0.53	6.3	3.5	0.19	Large gravel	Left: 1.7 Right: 2.0	Left: Overhanging Right: Overhanging	Left: Fines/small gravel Right: Fines/small gravel	Left: Mixed C and D Right: Shrub
2055	Unnamed tributary to Ksi Ts'oohl Ts'ap (no watershed code)	June 22, 2014	12.80	6.87	4.70	Clear	Negligible	n/a	16.0	0.63	Organics	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: Shrub Right: Shrub
2056	Unnamed tributary to Ksi Ts'oohl Ts'ap (no watershed code)	June 12, 2014	12.20	6.10	3.50	Clear	Negligible	n/a	35.0	0.15	NR	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: Grass Right: Grass
2057.1	Unnamed tributary to Ksi Ts'oohl Ts'ap (no watershed code)	June 12, 2014	12.20	6.10	3.50	Clear	Negligible	n/a	35.0	0.15	Organics	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: Grass Right: Grass
2057	Unnamed tributary to Ksi Ts'oohl Ts'ap (no watershed code)	June 12, 2014	12.20	6.10	3.50	Clear	Negligible	n/a	35.0	0.15	Organics	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: Grass Right: Grass
2059	Unnamed tributary to Ksi Ts'oohl Ts'ap (no watershed code)	June 21, 2014	6.30	8.36	11.80	Clear	NR	7.1	3.9	0.10	Boulder	Left: 0.6 Right: 0.8	Left: Sloping Right: Sloping	Left: Boulders/cobble Right: Boulders/cobble	Left: Shrub Right: Shrub
760a	Unnamed tributary to Ksi Ts'oohl Ts'ap (no watershed code)	June 19, 2014	9.20	7.38	14.02	Clear	0.02	4.5	3.4	0.10	Large gravel	Left: 0.9 Right: 9.2	Left: Vertical Right: Sloping	Left: Cobble/organics Right: Rock/organics	Left: Coniferous Right: Coniferous
761a	Unnamed tributary to Ksi Ts'oohl Ts'ap (no watershed code)	June 20, 2014	9.60	7.33	12.81	Clear	0.01	2.1	1.2	0.08	Boulder	Left: 2.9 Right: 0.7	Left: Vertical Right: Sloping	Left: Rock/boulders Right: Boulders/organics	Left: None Right: Mixed C and D
767a	Unnamed tributary to Kwinyarh Creek (North Kwinyarh Creek) (no watershed code)	July 01, 2014	6.20	7.49	12.00	Clear	0.04	4.6	3.0	0.15	Boulder	Left: 2.9 Right: 2.0	Left: Vertical Right: Vertical	Left: Cobble/boulders Right: Cobble/boulders	Left: Mixed C and D Right: Mixed C and D
2509	Unnamed tributary to Ksi Ts'oohl Ts'ap (500-155000)	June 18, 2014	9.40	7.36	13.40	Clear	Negligible	1.8	0.9	0.10	Boulder	Left: 1.1 Right: 5.9	Left: Sloping Right: Vertical	Left: Boulders/cobble Right: Rock/boulders	Left: Shrub Right: Shrub
2514	Unnamed tributary to Kwinyarh Creek (North Kwinyarh Creek) (no watershed code)	July 01, 2014	6.10	7.52	12.20	Clear	0.05	4.2	1.7	0.12	Boulder	Left: 1.6 Right: 1.4	Left: Sloping Right: Vertical	Left: Boulders/cobble Right: Boulders/cobble	Left: Mixed C and D Right: Mixed C and D
768a	Kwinyarh Creek (500-136800)	July 13, 2014	12.40	8.71	10.56	Clear	0.33	10.3	6.0	0.17	Large gravel	Left: 1.6 Right: 1.3	Left: Sloping Right: Sloping	Left: Large gravel/small gravel Right: Large gravel/small gravel	Left: Mixed C and D Right: Mixed C and D
771a	Unnamed tributary to Ansedagan Creek (500-134700-06000)	June 22, 2014	14.90	7.52	6.30	Moderate	Negligible	n/a	34.7	1.10	Organics	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: Coniferous Right: Coniferous
772a	Ansedagan Creek (500-134700)	July 14, 2014	11.20	7.75	10.60	Clear	1.04	11.7	8.1	0.27	Cobble	Left: 2.4 Right: 1.0	Left: Sloping Right: Sloping	Left: Cobble/large gravel Right: Cobble/large gravel	Left: Mixed C and D Right: Mixed C and D
775a	Unnamed tributary to Ksemamaith Creek (no watershed code)	July 03, 2014	18.70	5.28	9.60	Stained	0.01	3.2	2.8	0.34	Fines	Left: 1.4 Right: 1.1	Left: Vertical Right: Sloping	Left: Cobble/fines Right: Fines/cobble	Left: Mixed C and D Right: Mixed C and D
776a	Ksemamaith Creek (Kseaden Creek) (500-114800)	July 12, 2014	10.60	7.50	9.90	Clear	3.72	13.7	10.5	0.38	Cobble	Left: 1.5 Right: 1.3	Left: Sloping Right: Sloping	Left: Cobble/boulders Right: Cobble/boulders	Left: Deciduous Right: Deciduous
777a	Unnamed tributary to Ksi Mat'in (no watershed code)	June 24, 2014	13.70	6.88	2.80	Stained	NR	n/a	NR	0.35	NR	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: Deciduous Right: Deciduous
779a	Unnamed tributary to Ksi Mat'in (no watershed code)	July 03, 2014	11.80	9.60	9.60	Clear	Negligible	3.1	1.2	0.15	Organics/Fines	Left: 0.4 Right: 0.3	Left: Sloping Right: Sloping	Left: Fines/organics Right: Fines/organics	Left: Coniferous Right: Coniferous
780.1	Ksi Mat'in (no watershed code)	July 14, 2014	7.90	6.66	9.00	Moderate	Negligible	n/a	45.0	0.90	Fines	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: Deciduous Right: Deciduous
781a	Ksi Mat'in (Ksedin Creek, Kwiniak Creek) (500-112000)	July 12, 2014	7.90	6.66	9.00	Low	NR	50.8	29.0	0.76	Cobble	Left: 2.2 Right: 2.5	Left: Sloping Right: Vertical	Left: Cobble/cobble Right: Fines/cobble	Left: Shrub Right: Mixed C and D
2060	Unnamed tributary to Ksi Mat'in (no watershed code)	June 22, 2014	9.60	7.73	10.00	Clear	NR	4.9	2.5	0.09	Fines	Left: 0.3 Right: 0.4	Left: Sloping Right: Sloping	Left: Fines/organics Right: Fines/organics	Left: Shrub Right: Shrub
2060.1	Unnamed tributary to Ksi Mat'in (no watershed code)	July 13, 2014	10.00	8.22	12.00	Clear	0.20	2.2	2.4	0.22	Large gravel	Left: 1.2 Right: 1.3	Left: Undercut Right: Undercut	Left: Fines/large gravel Right: Fines/large gravel	Left: Coniferous Right: Mixed C and D
2061	Ksi Mat'in (Ksedin Creek, Kwiniak Creek) (500-112000)	July 12, 2014	7.90	6.66	9.00	Low	NR	37.5	37.0	0.71	Cobble	Left: 2.4 Right: 3.2	Left: Sloping Right: Sloping	Left: Cobble/boulders Right: Cobble/fines	Left: Deciduous Right: Mixed C and D
785a	Unnamed tributary to Ginlulak Creek (East Ginlulak Creek) (no watershed code)	July 03, 2014	9.20	7.20	7.30	Clear	0.01	11.1	5.5	0.15	Large gravel	Left: 0.4 Right: 0.4	Left: Sloping Right: Sloping	Left: Small gravel/fines Right: Small gravel/fines	Left: Mixed C and D Right: Deciduous
787a	Ginlulak Creek (500-090500)	July 12, 2014	13.30	7.09	9.60	Clear	NR	10.5	7.7	0.44	Boulder	Left: 4.1 Right: 3.3	Left: Vertical Right: Vertical	Left: Boulders/rock Right: Boulders/rock	Left: Coniferous Right: Coniferous
788a	Unnamed tributary to Ginlulak Creek (no watershed code)	July 06, 2014	10.80	6.40	10.80	Clear	0.01	2.1	1.5	0.08	Cobble	Left: 2.4 Right: 1.4	Left: Sloping Right: Sloping	Left: Organics/cobble Right: Organics/cobble	Left: Coniferous Right: Coniferous
788b	Unnamed tributary to Ginlulak Creek (no watershed code)	July 02, 2014	14.20	8.60	9.60	Clear	0.01	2.1	0.8	0.07	Large gravel	Left: 1.0 Right: 0.9	Left: Sloping Right: Sloping	Left: Cobble/boulders Right: Cobble/boulders	Left: Coniferous Right: Coniferous

PWC Site	Stream Name (Alias) (Watershed Code)	Sample Date	Water Temp. (°C)	pH	Dissolved Oxygen (mg/L)	Turbidity (Visual)	Flow (m³/s)	Mean Channel Width (m)	Mean Wetted Width (m)	Mean Water Depth (m)	Dominant Substrate	Mean Bank Height (m)	Bank Shape	Bank Texture	Riparian Vegetation
790a	Unnamed tributary to Ginlulak Creek (no watershed code)	June 30, 2014	12.40	7.00	7.50	Clear	0.06	6.6	3.9	0.15	Boulder	Left: 1.0 Right: 0.8	Left: Sloping Right: Sloping	Left: Cobble/large gravel Right: Cobble/large gravel	Left: Deciduous Right: Deciduous
791a	Unnamed tributary to Nass River (500-090000)	June 30, 2014	9.30	8.62	11.40	Clear	1.47	14.8	13.6	0.32	Boulder	Left: 2.0 Right: 2.4	Left: Vertical Right: Sloping	Left: Boulders/rock Right: Boulders/rock	Left: Coniferous Right: Coniferous
792a	Unnamed tributary to Nass River (no watershed code)	June 30, 2014	10.80	8.31	10.60	Clear	0.12	3.3	3.3	0.24	Cobble	Left: 1.4 Right: 1.6	Left: Vertical Right: Vertical	Left: Boulders/rock Right: Boulders/rock	Left: Coniferous Right: Coniferous
793a	Unnamed tributary to Nass River (500-084900)	June 29, 2014	10.70	8.13	11.80	Clear	0.22	5.8	3.6	0.16	Boulder	Left: 1.1 Right: 1.0	Left: Sloping Right: Sloping	Left: Boulders/cobble Right: Boulders/cobble	Left: Coniferous Right: Coniferous
794a	Unnamed tributary to Nass River (no watershed code)	June 29, 2014	7.40	7.14	10.20	Clear	0.03	3.3	2.5	0.15	Small gravel	Left: 0.6 Right: 0.8	Left: Sloping Right: Sloping	Left: Cobble/small gravel Right: Cobble/small gravel	Left: Deciduous Right: Deciduous
796a	Quilgaw Creek (500-075000)	July 10, 2014	14.40	8.67	9.45	Clear	2.51	28.8	28.8	0.94	Fines	Left: 2.8 Right: 2.8	Left: Sloping Right: Sloping	Left: Fines/organics Right: Fines/organics	Left: Mixed C and D Right: Mixed C and D
798a	Unnamed tributary to Quilgaw Creek (no watershed code)	July 01, 2014	17.30	7.83	5.00	Stained	Negligible	n/a	19.8	1.28	Organics	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: Coniferous Right: Coniferous
799a	Unnamed tributary to Ksi Hlginx (no watershed code)	July 08, 2014	10.80	7.60	9.90	Clear	0.02	1.9	0.8	0.12	Fines	Left: 0.4 Right: 0.4	Left: Sloping Right: Sloping	Left: Fines/organics Right: Fines/organics	Left: Mixed C and D Right: Mixed C and D
800a.1	Unnamed tributary to Ksi Hlginx (no watershed code)	July 02, 2014	15.20	6.95	6.30	Stained	NR	n/a	NR	NR	NR	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: NR Right: NR
801a	Ksi Hlginx Side Channel (Ishkeenickh River) (510)	July 01, 2014	9.20	7.50	11.40	Clear	2.05	18.2	14.7	0.53	Cobble	Left: 2.0 Right: 1.8	Left: Sloping Right: Sloping	Left: Fines/fines Right: Fines/fines	Left: Mixed C and D Right: Mixed C and D
802a	Ksi Hlginx (Ishkeenickh River) (510)	July 10, 2014	10.60	NR	10.83	Clear	NR	84.2	76.2	0.78	Large gravel	Left: 2.5 Right: 3.6	Left: Sloping Right: Sloping	Left: Fines/organics Right: Fines/organics	Left: Mixed C and D Right: Mixed C and D
803a	Unnamed tributary to Ksi Hlginx (no watershed code)	June 23, 2014	10.40	7.61	10.70	Clear	0.86	13.9	12.5	0.53	Cobble	Left: 1.3 Right: 1.1	Left: Undercut Right: Undercut	Left: Fines/cobble Right: Fines/cobble	Left: Deciduous Right: Deciduous
804b	Unnamed tributary to Ksi Hlginx (no watershed code)	June 27, 2014	11.30	6.80	8.60	Clear	Negligible	3.3	1.0	0.07	Fines	Left: 0.3 Right: 0.4	Left: Sloping Right: Sloping	Left: Fines/small gravel Right: Fines/small gravel	Left: Coniferous Right: Coniferous
804c	Unnamed tributary to Ksi Hlginx (no watershed code)	June 27, 2014	9.50	7.83	10.80	Clear	0.03	3.8	2.7	0.15	Cobble	Left: 0.6 Right: 0.7	Left: Overhanging Right: Undercut	Left: Fines/large gravel Right: Fines/large gravel	Left: Coniferous Right: Coniferous
805a	Unnamed tributary to Ksi Hlginx (no watershed code)	June 27, 2014	9.10	7.86	10.30	Clear	0.02	8.0	3.0	0.15	Fines	Left: 0.6 Right: 0.6	Left: Sloping Right: Sloping	Left: Fines/small gravel Right: Fines/small gravel	Left: Coniferous Right: Coniferous
805b	Unnamed tributary to Ksi Hlginx (no watershed code)	June 29, 2014	8.30	7.77	11.20	Clear	0.01	1.8	1.1	0.08	Fines	Left: 0.5 Right: 0.4	Left: Sloping Right: Sloping	Left: Fines/small gravel Right: Fines/small gravel	Left: Shrub Right: Coniferous
806a	Unnamed tributary to Nass River (500-058200)	July 13, 2014	12.00	7.40	10.50	Clear	0.04	7.2	3.5	0.14	Cobble	Left: 1.5 Right: 1.1	Left: Sloping Right: Sloping	Left: Cobble/small gravel Right: Cobble/small gravel	Left: Mixed C and D Right: Mixed C and D
806b	Unnamed tributary to Nass River (no watershed code)	July 12, 2014	12.10	6.81	10.50	Clear	0.13	7.5	4.9	0.20	Cobble	Left: 0.7 Right: 0.8	Left: Sloping Right: Sloping	Left: Cobble/large gravel Right: Cobble/large gravel	Left: Mixed C and D Right: Mixed C and D
808a	Unnamed tributary to Nass River (no watershed code)	July 12, 2014	14.40	7.24	5.00	Low	Negligible	1.5	0.9	0.08	Small gravel	Left: 0.3 Right: 0.3	Left: Sloping Right: Sloping	Left: Fines/organics Right: Fines/organics	Left: Mixed C and D Right: Mixed C and D
808b	Unnamed tributary to Nass River (no watershed code)	July 06, 2014	9.70	7.44	11.40	Clear	0.13	7.5	4.4	0.21	Boulder	Left: 0.9 Right: 0.9	Left: Sloping Right: Sloping	Left: Boulders Right: Boulders	Left: Mixed C and D Right: Mixed C and D
809a	Unnamed tributary to Nass River (500-053700)	July 05, 2014	10.70	7.97	11.20	Clear	0.43	6.7	5.4	0.22	Boulder	Left: 1.1 Right: 1.1	Left: Vertical Right: Vertical	Left: Boulders/organics Right: Boulders/organics	Left: Mixed C and D Right: Mixed C and D
810a	Unnamed tributary to Nass River (500-051800)	July 05, 2014	8.90	7.45	10.50	Low	0.01	4.7	2.1	0.08	Fines	Left: 0.6 Right: 0.7	Left: Sloping Right: Sloping	Left: Fines/organics Right: Fines/organics	Left: Deciduous Right: Deciduous
811b	Unnamed tributary to Nass River (no watershed code)	July 04, 2014	10.70	8.48	10.60	Low	0.01	2.6	1.8	0.16	Fines	Left: 0.4 Right: 0.5	Left: Sloping Right: Sloping	Left: Fines/small gravel Right: Fines/small gravel	Left: Mixed C and D Right: Mixed C and D
812a	Unnamed tributary to Nass River (Monkley Creek, unnamed tributary to Monkley Creek) (500-050900)	July 13, 2014	10.80	7.73	12.80	Clear	NR	18.0	16.0	0.52	Boulder	Left: 17.3 Right: 13.3	Left: Vertical Right: Sloping	Left: Boulders/cobble Right: Rock/boulders	Left: Coniferous Right: Coniferous
813a	Unnamed tributary to Nass River (no watershed code)	July 06, 2014	11.90	6.40	10.00	Clear	Negligible	4.3	1.3	0.09	Rock	Left: 1.2 Right: 1.0	Left: Sloping Right: Vertical	Left: Boulders/rock Right: Rock/rock	Left: Coniferous Right: Coniferous
814a	Unnamed tributary to Nass River (500-047000)	July 05, 2014	11.80	7.89	10.00	Clear	0.02	5.5	2.8	0.10	Cobble	Left: 1.0 Right: 0.9	Left: Vertical Right: Sloping	Left: Fines/large gravel Right: Fines/large gravel	Left: Shrub Right: Shrub
815a	Unnamed tributary to Nass River (no watershed code)	July 11, 2014	11.80	5.99	7.00	Clear	Negligible	2.2	1.3	0.09	Large gravel	Left: 0.7 Right: 0.8	Left: Undercut Right: Sloping	Left: Cobble/large gravel Right: Small gravel/large gravel	Left: Mixed C and D Right: Mixed C and D
816a	Unnamed tributary to Nass River (500-038600)	July 09, 2014	12.40	5.80	NR	Clear	NR	9.3	1.5	0.13	Organics/Fines	Left: 1.7 Right: 1.5	Left: Vertical Right: Vertical	Left: Fines/organics Right: Fines/organics	Left: Shrub Right: Shrub
817a	Unnamed tributary to Nass River (500-038000)	July 07, 2014	10.10	6.90	10.50	Clear	0.80	8.8	7.3	0.22	Cobble	Left: 0.9 Right: 1.0	Left: Vertical Right: Undercut	Left: Large gravel/cobble Right: Large gravel/fines	Left: Mixed C and D Right: Mixed C and D

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818a	Unnamed tributary to Nass River (500-036300)	July 04, 2014	11.50	7.88	9.90	Clear	0.47	8.8	6.0	0.25	Boulder	Left: 10.7 Right: 1.7	Left: Sloping Right: Vertical	Left: Boulders/rock Right: Boulders/cobble	Left: Deciduous Right: Deciduous
2515	Unnamed tributary to Nass River (500-034500)	July 14, 2014	9.00	7.35	12.40	Clear	0.17	3.0	2.6	0.12	Cobble	Left: 3.9 Right: 0.8	Left: Vertical Right: Vertical	Left: Cobble/large gravel Right: Boulders/cobble	Left: Coniferous Right: Coniferous
2523	Ksgyukwsa'a (Burton/Barton Creek) (500-018500)	July 13, 2014	12.60	7.47	9.70	Clear	NR	22.4	19.3	0.33	Cobble	Left: 0.8 Right: 0.6	Left: Undercut Right: Sloping	Left: Cobble/large gravel Right: Cobble/large gravel	Left: Mixed C and D Right: Mixed C and D
819a	Unnamed tributary to Nass River (500-034500)	July 14, 2014	6.00	7.65	13.70	Clear	0.04	2.8	2.6	0.21	Small gravel	Left: 0.7 Right: 0.7	Left: Vertical Right: Vertical	Left: Small gravel/large gravel Right: Small gravel/large gravel	Left: Coniferous Right: Coniferous
826a	Ksgyukwsa'a (Burton/Barton Creek) (500-018500)	July 05, 2014	8.70	7.05	12.20	Clear	11.46	31.0	27.3	0.51	Cobble	Left: 1.2 Right: 2.1	Left: Sloping Right: Sloping	Left: Cobble/large gravel Right: Cobble/large gravel	Left: Mixed C and D Right: Mixed C and D
828a	Unnamed tributary to Ksgyukwsa'a (no watershed code)	July 19, 2014	8.00	7.46	9.30	Clear	0.01	2.0	1.2	0.10	Boulder	Left: 0.9 Right: 0.8	Left: Sloping Right: Sloping	Left: Boulders/cobble Right: Boulders/cobble	Left: Coniferous Right: Coniferous
829a	Unnamed tributary to Ksgyukwsa'a (no watershed code)	July 10, 2014	10.80	7.26	11.00	Clear	0.71	8.0	4.2	0.22	Cobble	Left: 1.3 Right: 1.4	Left: Sloping Right: Sloping	Left: Boulders/cobble Right: Boulders/cobble	Left: Coniferous Right: Coniferous
830a.1	Unnamed tributary to Ksgyukwsa'a (no watershed code)	July 07, 2014	9.30	6.90	12.50	Clear	0.02	5.3	1.9	0.10	Small gravel	Left: 3.1 Right: 3.5	Left: Vertical Right: Vertical	Left: Cobble/large gravel Right: Cobble/large gravel	Left: Mixed C and D Right: Mixed C and D
830a	Unnamed tributary to Ksgyukwsa'a (no watershed code)	July 07, 2014	7.50	6.40	11.40	Clear	0.04	8.5	1.9	0.05	Organics	Left: 14.2 Right: 5.7	Left: Vertical Right: Vertical	Left: Organics/cobble Right: Organics/cobble	Left: Mixed C and D Right: Mixed C and D
831a	Unnamed tributary to Welda Creek (no watershed code)	July 07, 2014	11.50	7.64	10.70	Clear	1.01	16.2	14.1	0.35	Boulder	Left: 1.2 Right: 1.1	Left: Sloping Right: Sloping	Left: Boulders/cobble Right: Boulders/cobble	Left: Mixed C and D Right: Mixed C and D
832a	Welda Creek (500-016300)	July 07, 2014	11.50	8.10	10.70	Clear	0.69	26.7	17.4	0.29	Boulder	Left: 1.0 Right: 1.2	Left: Sloping Right: Sloping	Left: Cobble/large gravel Right: Cobble/large gravel	Left: Mixed C and D Right: Mixed C and D
1033a	Unnamed tributary to Nass River (no watershed code)	July 09, 2014	12.30	6.78	7.80	Clear	0.01	3.8	1.0	0.13	Large gravel	Left: 0.6 Right: 0.8	Left: Vertical Right: Vertical	Left: Cobble/large gravel Right: Fines/organics	Left: Mixed C and D Right: Mixed C and D
1034	Unnamed tributary to Nass River (no watershed code)	July 10, 2014	10.50	6.94	8.70	Stained	NR	1.2	1.4	0.40	Fines	Left: 0.6 Right: 0.5	Left: Sloping Right: Sloping	Left: Fines/organics Right: Fines/organics	Left: Coniferous Right: Coniferous
724a	North Seaskinnish Creek (500-201900-24100)	June 27, 2014	12.50	7.11	6.35	Stained	0.02	4.0	3.7	0.52	Organics	Left: 2.5 Right: 3.2	Left: Sloping Right: Sloping	Left: Fines/small gravel Right: Fines/small gravel	Left: Coniferous Right: Coniferous
732a	North Seaskinnish Creek (500-201900-24100)	July 12, 2014	18.00	7.84	12.00	Clear	0.05	2.9	2.3	0.11	Rock	Left: 3.1 Right: 3.1	Left: Sloping Right: Sloping	Left: Rock/boulders Right: Rock/boulders	Left: Deciduous Right: Deciduous
733a	North Seaskinnish Creek (500-201900-24100)	July 11, 2014	21.50	8.32	10.50	Clear	1.04	11.2	10.9	0.54	Small gravel	Left: 1.5 Right: 1.6	Left: Sloping Right: Sloping	Left: Fines/small gravel Right: Fines/small gravel	Left: Shrub Right: Shrub
737a	Ksi Sgaginist (Seaskinnish River) (500-201900)	July 14, 2014	9.00	7.51	11.20	High	1.23	10.5	7.4	0.36	Cobble	Left: 0.9 Right: 0.8	Left: Sloping Right: Undercut	Left: Cobble/fines Right: Cobble/fines	Left: Mixed C and D Right: Mixed C and D
738a	Unnamed tributary to Gingit Creek (no watershed code)	June 12, 2014	12.20	7.80	10.20	Clear	0.12	3.7	3.3	0.15	Fines	Left: 0.8 Right: 0.7	Left: Undercut Right: Sloping	Left: Fines/small gravel Right: Fines/small gravel	Left: Coniferous Right: Deciduous
740a	Gingit Creek (500-185700-00300)	June 18, 2014	9.90	7.88	10.60	Clear	0.50	8.1	4.7	0.17	Large gravel	Left: 1.3 Right: 1.1	Left: Sloping Right: Sloping	Left: Large gravel/fines Right: Large gravel/small gravel	Left: Coniferous Right: Coniferous
741a	Unnamed tributary to Gingit Creek (no watershed code)	June 14, 2014	9.60	7.31	5.90	Clear	NR	1.2	0.6	0.07	Fines	Left: 0.5 Right: 0.4	Left: Vertical Right: Vertical	Left: Cobble/boulders Right: Cobble/boulders	Left: Coniferous Right: Coniferous
2500	Unnamed tributary to Gingit Creek (no watershed code)	June 14, 2014	7.50	7.93	10.00	Clear	0.06	3.0	2.3	0.19	Fines	Left: 0.4 Right: 0.4	Left: Sloping Right: Sloping	Left: Fines/organics Right: Fines/organics	Left: Deciduous Right: Deciduous
2501	Unnamed tributary to Gingit Creek (no watershed code)	June 20, 2014	7.80	8.66	10.80	Clear	0.04	2.0	1.8	0.12	Fines	Left: 0.5 Right: 0.5	Left: Undercut Right: Sloping	Left: Fines/small gravel Right: Fines/small gravel	Left: Shrub Right: Shrub
2503	Gitzyon Creek (500-185700-05200)	July 15, 2014	11.80	7.35	10.30	Clear	NR	6.6	7.0	0.43	Rock	Left: 1.2 Right: 2.7	Left: Sloping Right: Vertical	Left: Boulders/rock Right: Rock/boulders	Left: Coniferous Right: Coniferous
2508	Unnamed tributary to Mcleod Creek (no watershed code)	June 15, 2014	8.70	7.57	12.02	Clear	Negligible	2.0	1.2	0.08	Fines	Left: 0.4 Right: 0.4	Left: Sloping Right: Sloping	Left: Fines/fines Right: Fines/fines	Left: Coniferous Right: Coniferous
743a	Gitzyon Creek (500-185700-05200)	July 11, 2014	12.80	7.60	10.00	Clear	0.75	4.4	3.7	0.50	Rock	Left: 1.7 Right: 1.1	Left: Sloping Right: Sloping	Left: Rock/boulders Right: Rock/boulders	Left: Coniferous Right: Coniferous
744a	Unnamed tributary to Mcleod Creek (no watershed code)	June 14, 2014	7.80	7.14	11.76	Clear	0.01	1.2	1.2	0.14	Fines	Left: 0.6 Right: 0.7	Left: Vertical Right: Vertical	Left: Fines/organics Right: Fines/organics	Left: Mixed C and D Right: Mixed C and D
2146	Mcleod Creek (no watershed code)	June 14, 2014	14.70	6.99	4.29	Stained	Negligible	n/a	58.0	0.67	Organics	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: Wetland Right: Wetland
746a	Ksi Sii Aks (Ganor Creek, Tseax River) (500-185700)	July 15, 2014	13.50	7.45	12.80	Clear	NR	62.5	62.2	0.76	Small gravel	Left: 1.8 Right: 9.0	Left: Sloping Right: Sloping	Left: Rock/boulders Right: Boulders/cobble	Left: Mixed C and D Right: Shrub
747a	Vetter Creek (unnamed tributary to Lower Vetter) (500-185700-16700)	July 15, 2014	12.00	7.24	11.00	Clear	NR	28.5	21.0	1.23	Large gravel	Left: 19.4 Right: 2.7	Left: Vertical Right: Sloping	Left: Large gravel/fines Right: Large gravel/cobble	Left: Coniferous Right: Deciduous



PWC Site	Stream Name (Alias) (Watershed Code)	Sample Date	Water Temp. (°C)	pH	Dissolved Oxygen (mg/L)	Turbidity (Visual)	Flow (m³/s)	Mean Channel Width (m)	Mean Wetted Width (m)	Mean Water Depth (m)	Dominant Substrate	Mean Bank Height (m)	Bank Shape	Bank Texture	Riparian Vegetation
748a	Unnamed tributary to Vetter Creek (no watershed code)	June 30, 2014	12.30	6.77	6.20	Stained	Negligible	n/a	100.0	1.17	Organics	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: Deciduous Right: Deciduous
753a	Vetter Creek (unnamed tributary to Lower Vetter) (500-185700-16700)	July 09, 2014	8.20	NR	NR	Moderate	4.12	36.3	15.2	0.48	Cobble	Left: 1.0 Right: 1.3	Left: Sloping Right: Sloping	Left: Cobble/large gravel Right: Cobble/large gravel	Left: Deciduous Right: Deciduous
754a	Unnamed tributary to Vetter Creek (no watershed code)	June 21, 2014	13.30	6.40	0.40	Stained	NR	1.1	0.8	0.21	Organics	Left: 0.4 Right: 0.4	Left: Sloping Right: Sloping	Left: Organics/organics Right: Organics/organics	Left: Grass Right: Grass
756a	Unnamed tributary to Vetter Creek (no watershed code)	June 20, 2014	8.60	6.50	11.10	Clear	0.01	2.0	1.7	0.04	Small gravel	Left: 2.6 Right: 2.9	Left: Sloping Right: Sloping	Left: Organics/fines Right: Organics/fines	Left: Coniferous Right: Coniferous
757a	Unnamed tributary to Ts'ooihl Ts'ap (no watershed code)	June 20, 2014	7.60	6.50	11.60	Clear	0.01	0.9	0.8	0.05	Small gravel	Left: 2.8 Right: 2.9	Left: Sloping Right: Sloping	Left: Organics/fines Right: Organics/fines	Left: Coniferous Right: Coniferous
2042	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	June 18, 2014	11.70	NR	10.20	Clear	Negligible	1.0	0.4	0.01	Organics/Fines	Left: 0.4 Right: 0.4	Left: Vertical Right: Vertical	Left: Organics/fines Right: Organics/fines	Left: Coniferous Right: Coniferous
2043	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	June 19, 2014	11.80	6.50	10.70	Clear	0.03	3.1	2.2	0.04	Rock	Left: 2.6 Right: 1.9	Left: Vertical Right: Vertical	Left: Rock/organics Right: Rock/organics	Left: Mixed C and D Right: Mixed C and D
2044	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	June 19, 2014	18.20	NR	10.80	Clear	Negligible	3.0	0.3	0.07	Rock	Left: 20.0 Right: 20.0	Left: Vertical Right: Vertical	Left: Rock/organics Right: Rock/organics	Left: Mixed C and D Right: Mixed C and D
2045	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	June 17, 2014	9.40	7.47	13.63	Clear	0.02	6.2	1.8	0.05	Large gravel	Left: 14.4 Right: 9.8	Left: Vertical Right: Vertical	Left: Rock/organics Right: Rock/organics	Left: Mixed C and D Right: Mixed C and D
2046	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	June 17, 2014	8.80	7.53	12.72	Clear	Negligible	3.4	0.2	0.01	Boulder	Left: 1.1 Right: 1.4	Left: Vertical Right: Vertical	Left: Large gravel/fines Right: Large gravel/fines	Left: Coniferous Right: Coniferous
2046.1	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	June 16, 2014	8.80	7.60	11.73	Clear	Negligible	1.1	0.7	0.03	Large gravel	Left: 1.3 Right: 1.2	Left: Sloping Right: Undercut	Left: Rock/organics Right: Rock/organics	Left: Coniferous Right: Coniferous
2047	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	June 15, 2014	8.30	7.29	11.03	Clear	Negligible	2.7	1.7	0.03	Large gravel	Left: 2.1 Right: 5.1	Left: Vertical Right: Vertical	Left: Rock/organics Right: Large gravel/organics	Left: Coniferous Right: Coniferous
2049a	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	June 26, 2014	9.30	7.72	11.10	Clear	0.01	6.3	1.9	0.08	Boulder	Left: 0.8 Right: 0.8	Left: Sloping Right: Vertical	Left: Fines/small gravel Right: Fines/small gravel	Left: Deciduous Right: Deciduous
2051	Ksi Ts'ooihl Ts'ap (Zolzap Creek) (500-155400)	June 25, 2014	8.90	7.65	11.60	Clear	1.46	7.7	6.4	0.40	Boulder	Left: 1.3 Right: 2.0	Left: Sloping Right: Sloping	Left: Organics/boulders Right: Organics/boulders	Left: Mixed C and D Right: Mixed C and D
2054	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	June 14, 2014	5.60	7.77	11.70	Clear	0.53	6.3	3.5	0.19	Large gravel	Left: 1.7 Right: 2.0	Left: Overhanging Right: Overhanging	Left: Fines/small gravel Right: Fines/small gravel	Left: Mixed C and D Right: Shrub
2055	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	June 22, 2014	12.80	6.87	4.70	Clear	Negligible	n/a	16.0	0.63	Organics	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: Shrub Right: Shrub
2056	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	June 12, 2014	12.20	6.10	3.50	Clear	Negligible	n/a	35.0	0.15	NR	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: Grass Right: Grass
2057.1	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	June 12, 2014	12.20	6.10	3.50	Clear	Negligible	n/a	35.0	0.15	Organics	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: Grass Right: Grass
2057	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	June 12, 2014	12.20	6.10	3.50	Clear	Negligible	n/a	35.0	0.15	Organics	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: Grass Right: Grass
2059	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	June 21, 2014	6.30	8.36	11.80	Clear	NR	7.1	3.9	0.10	Boulder	Left: 0.6 Right: 0.8	Left: Sloping Right: Sloping	Left: Boulders/cobble Right: Boulders/cobble	Left: Shrub Right: Shrub
760a	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	June 19, 2014	9.20	7.38	14.02	Clear	0.02	4.5	3.4	0.10	Large gravel	Left: 0.9 Right: 9.2	Left: Vertical Right: Sloping	Left: Cobble/organics Right: Rock/organics	Left: Coniferous Right: Coniferous
761a	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	June 20, 2014	9.60	7.33	12.81	Clear	0.01	2.1	1.2	0.08	Boulder	Left: 2.9 Right: 0.7	Left: Vertical Right: Sloping	Left: Rock/boulders Right: Boulders/organics	Left: None Right: Mixed C and D
767a	Unnamed tributary to Kwinyarh Creek (North Kwinyarh Creek) (no watershed code)	July 01, 2014	6.20	7.49	12.00	Clear	0.04	4.6	3.0	0.15	Boulder	Left: 2.9 Right: 2.0	Left: Vertical Right: Vertical	Left: Cobble/boulders Right: Cobble/boulders	Left: Mixed C and D Right: Mixed C and D
2509	Unnamed tributary to Ksi Ts'ooihl Ts'ap (500-155000)	June 18, 2014	9.40	7.36	13.40	Clear	Negligible	1.8	0.9	0.10	Boulder	Left: 1.1 Right: 5.9	Left: Sloping Right: Vertical	Left: Boulders/cobble Right: Rock/boulders	Left: Shrub Right: Shrub
2514	Unnamed tributary to Kwinyarh Creek (North Kwinyarh Creek) (no watershed code)	July 01, 2014	6.10	7.52	12.20	Clear	0.05	4.2	1.7	0.12	Boulder	Left: 1.6 Right: 1.4	Left: Sloping Right: Vertical	Left: Boulders/cobble Right: Boulders/cobble	Left: Mixed C and D Right: Mixed C and D
768a	Kwinyarh Creek (500-136800)	July 13, 2014	12.40	8.71	10.56	Clear	0.33	10.3	6.0	0.17	Large gravel	Left: 1.6 Right: 1.3	Left: Sloping Right: Sloping	Left: Large gravel/small gravel Right: Large gravel/small gravel	Left: Mixed C and D Right: Mixed C and D
771a	Unnamed tributary to Ansedagan Creek (500-134700-06000)	June 22, 2014	14.90	7.52	6.30	Moderate	Negligible	n/a	34.7	1.10	Organics	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: Coniferous Right: Coniferous
772a	Ansedagan Creek (500-134700)	July 14, 2014	11.20	7.75	10.60	Clear	1.04	11.7	8.1	0.27	Cobble	Left: 2.4 Right: 1.0	Left: Sloping Right: Sloping	Left: Cobble/large gravel Right: Cobble/large gravel	Left: Mixed C and D Right: Mixed C and D
775a	Unnamed tributary to Ksemamaith Creek (no watershed code)	July 03, 2014	18.70	5.28	9.60	Stained	0.01	3.2	2.8	0.34	Fines	Left: 1.4 Right: 1.1	Left: Vertical Right: Sloping	Left: Cobble/fines Right: Fines/cobble	Left: Mixed C and D Right: Mixed C and D

PWC Site	Stream Name (Alias) (Watershed Code)	Sample Date	Water Temp. (°C)	pH	Dissolved Oxygen (mg/L)	Turbidity (Visual)	Flow (m³/s)	Mean Channel Width (m)	Mean Wetted Width (m)	Mean Water Depth (m)	Dominant Substrate	Mean Bank Height (m)	Bank Shape	Bank Texture	Riparian Vegetation
776a	Ksemamaith Creek (Kseaden Creek) (500-114800)	July 12, 2014	10.60	7.50	9.90	Clear	3.72	13.7	10.5	0.38	Cobble	Left: 1.5 Right: 1.3	Left: Sloping Right: Sloping	Left: Cobble/boulders Right: Cobble/boulders	Left: Deciduous Right: Deciduous
777a	Unnamed tributary to Ksi Mat'in (no watershed code)	June 24, 2014	13.70	6.88	2.80	Stained	NR	n/a	NR	0.35	NR	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: Deciduous Right: Deciduous
779a	Unnamed tributary to Ksi Mat'in (no watershed code)	July 03, 2014	11.80	9.60	9.60	Clear	Negligible	3.1	1.2	0.15	Organics/Fines	Left: 0.4 Right: 0.3	Left: Sloping Right: Sloping	Left: Fines/organics Right: Fines/organics	Left: Coniferous Right: Coniferous
780.1	Ksi Mat'in (no watershed code)	July 14, 2014	7.90	6.66	9.00	Moderate	Negligible	n/a	45.0	0.90	Fines	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: Deciduous Right: Deciduous
781a	Ksi Mat'in (Ksedin Creek, Kwiniak Creek) (500-112000)	July 12, 2014	7.90	6.66	9.00	Low	NR	50.8	29.0	0.76	Cobble	Left: 2.2 Right: 2.5	Left: Sloping Right: Vertical	Left: Cobble/cobble Right: Fines/cobble	Left: Shrub Right: Mixed C and D
2060	Unnamed tributary to Ksi Mat'in (no watershed code)	June 22, 2014	9.60	7.73	10.00	Clear	NR	4.9	2.5	0.09	Fines	Left: 0.3 Right: 0.4	Left: Sloping Right: Sloping	Left: Fines/organics Right: Fines/organics	Left: Shrub Right: Shrub
2060.1	Unnamed tributary to Ksi Mat'in (no watershed code)	July 13, 2014	10.00	8.22	12.00	Clear	0.20	2.2	2.4	0.22	Large gravel	Left: 1.2 Right: 1.3	Left: Undercut Right: Undercut	Left: Fines/large gravel Right: Fines/large gravel	Left: Coniferous Right: Mixed C and D
2061	Ksi Mat'in (Ksedin Creek, Kwiniak Creek) (500-112000)	July 12, 2014	7.90	6.66	9.00	Low	NR	37.5	37.0	0.71	Cobble	Left: 2.4 Right: 3.2	Left: Sloping Right: Sloping	Left: Cobble/boulders Right: Cobble/fines	Left: Deciduous Right: Mixed C and D
785a	Unnamed tributary to Ginlulak Creek (East Ginlulak Creek) (no watershed code)	July 03, 2014	9.20	7.20	7.30	Clear	0.01	11.1	5.5	0.15	Large gravel	Left: 0.4 Right: 0.4	Left: Sloping Right: Sloping	Left: Small gravel/fines Right: Small gravel/fines	Left: Mixed C and D Right: Deciduous
787a	Ginlulak Creek (500-090500)	July 12, 2014	13.30	7.09	9.60	Clear	NR	10.5	7.7	0.44	Boulder	Left: 4.1 Right: 3.3	Left: Vertical Right: Vertical	Left: Boulders/rock Right: Boulders/rock	Left: Coniferous Right: Coniferous
788a	Unnamed tributary to Ginlulak Creek (no watershed code)	July 06, 2014	10.80	6.40	10.80	Clear	0.01	2.1	1.5	0.08	Cobble	Left: 2.4 Right: 1.4	Left: Sloping Right: Sloping	Left: Organics/cobble Right: Organics/cobble	Left: Coniferous Right: Coniferous
788b	Unnamed tributary to Ginlulak Creek (no watershed code)	July 02, 2014	14.20	8.60	9.60	Clear	0.01	2.1	0.8	0.07	Large gravel	Left: 1.0 Right: 0.9	Left: Sloping Right: Sloping	Left: Cobble/boulders Right: Cobble/boulders	Left: Coniferous Right: Coniferous
790a	Unnamed tributary to Ginlulak Creek (no watershed code)	June 30, 2014	12.40	7.00	7.50	Clear	0.06	6.6	3.9	0.15	Boulder	Left: 1.0 Right: 0.8	Left: Sloping Right: Sloping	Left: Cobble/large gravel Right: Cobble/large gravel	Left: Deciduous Right: Deciduous
791a	Unnamed tributary to Nass River (500-090000)	June 30, 2014	9.30	8.62	11.40	Clear	1.47	14.8	13.6	0.32	Boulder	Left: 2.0 Right: 2.4	Left: Vertical Right: Sloping	Left: Boulders/rock Right: Boulders/rock	Left: Coniferous Right: Coniferous
792a	Unnamed tributary to Nass River (no watershed code)	June 30, 2014	10.80	8.31	10.60	Clear	0.12	3.3	3.3	0.24	Cobble	Left: 1.4 Right: 1.6	Left: Vertical Right: Vertical	Left: Boulders/rock Right: Boulders/rock	Left: Coniferous Right: Coniferous
793a	Unnamed tributary to Nass River (500-084900)	June 29, 2014	10.70	8.13	11.80	Clear	0.22	5.8	3.6	0.16	Boulder	Left: 1.1 Right: 1.0	Left: Sloping Right: Sloping	Left: Boulders/cobble Right: Boulders/cobble	Left: Coniferous Right: Coniferous
794a	Unnamed tributary to Nass River (no watershed code)	June 29, 2014	7.40	7.14	10.20	Clear	0.03	3.3	2.5	0.15	Small gravel	Left: 0.6 Right: 0.8	Left: Sloping Right: Sloping	Left: Cobble/small gravel Right: Cobble/small gravel	Left: Deciduous Right: Deciduous
796a	Quilgaw Creek (500-075000)	July 10, 2014	14.40	8.67	9.45	Clear	2.51	28.8	28.8	0.94	Fines	Left: 2.8 Right: 2.8	Left: Sloping Right: Sloping	Left: Fines/organics Right: Fines/organics	Left: Mixed C and D Right: Mixed C and D
798a	Unnamed tributary to Quilgaw Creek (no watershed code)	July 01, 2014	17.30	7.83	5.00	Stained	Negligible	n/a	19.8	1.28	Organics	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: Coniferous Right: Coniferous
799a	Unnamed tributary to Ksi Hlginx (no watershed code)	July 08, 2014	10.80	7.60	9.90	Clear	0.02	1.9	0.8	0.12	Fines	Left: 0.4 Right: 0.4	Left: Sloping Right: Sloping	Left: Fines/organics Right: Fines/organics	Left: Mixed C and D Right: Mixed C and D
800a.1	Unnamed tributary to Ksi Hlginx (no watershed code)	July 02, 2014	15.20	6.95	6.30	Stained	NR	n/a	NR	NR	NR	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: n/a Right: n/a	Left: NR Right: NR
801a	Ksi Hlginx Side Channel (Ishkeenickh River) (510)	July 01, 2014	9.20	7.50	11.40	Clear	2.05	18.2	14.7	0.53	Cobble	Left: 2.0 Right: 1.8	Left: Sloping Right: Sloping	Left: Fines/fines Right: Fines/fines	Left: Mixed C and D Right: Mixed C and D
802a	Ksi Hlginx (Ishkeenickh River) (510)	July 10, 2014	10.60	NR	10.83	Clear	NR	84.2	76.2	0.78	Large gravel	Left: 2.5 Right: 3.6	Left: Sloping Right: Sloping	Left: Fines/organics Right: Fines/organics	Left: Mixed C and D Right: Mixed C and D
803a	Unnamed tributary to Ksi Hlginx (no watershed code)	June 23, 2014	10.40	7.61	10.70	Clear	0.86	13.9	12.5	0.53	Cobble	Left: 1.3 Right: 1.1	Left: Undercut Right: Undercut	Left: Fines/cobble Right: Fines/cobble	Left: Deciduous Right: Deciduous
804b	Unnamed tributary to Ksi Hlginx (no watershed code)	June 27, 2014	11.30	6.80	8.60	Clear	Negligible	3.3	1.0	0.07	Fines	Left: 0.3 Right: 0.4	Left: Sloping Right: Sloping	Left: Fines/small gravel Right: Fines/small gravel	Left: Coniferous Right: Coniferous
804c	Unnamed tributary to Ksi Hlginx (no watershed code)	June 27, 2014	9.50	7.83	10.80	Clear	0.03	3.8	2.7	0.15	Cobble	Left: 0.6 Right: 0.7	Left: Overhanging Right: Undercut	Left: Fines/large gravel Right: Fines/large gravel	Left: Coniferous Right: Coniferous
805a	Unnamed tributary to Ksi Hlginx (no watershed code)	June 27, 2014	9.10	7.86	10.30	Clear	0.02	8.0	3.0	0.15	Fines	Left: 0.6 Right: 0.6	Left: Sloping Right: Sloping	Left: Fines/small gravel Right: Fines/small gravel	Left: Coniferous Right: Coniferous
805b	Unnamed tributary to Ksi Hlginx (no watershed code)	June 29, 2014	8.30	7.77	11.20	Clear	0.01	1.8	1.1	0.08	Fines	Left: 0.5 Right: 0.4	Left: Sloping Right: Sloping	Left: Fines/small gravel Right: Fines/small gravel	Left: Shrub Right: Coniferous
806a	Unnamed tributary to Nass River (500-058200)	July 13, 2014	12.00	7.40	10.50	Clear	0.04	7.2	3.5	0.14	Cobble	Left: 1.5 Right: 1.1	Left: Sloping Right: Sloping	Left: Cobble/small gravel Right: Cobble/small gravel	Left: Mixed C and D Right: Mixed C and D

PWC Site	Stream Name (Alias) (Watershed Code)	Sample Date	Water Temp. (°C)	pH	Dissolved Oxygen (mg/L)	Turbidity (Visual)	Flow (m³/s)	Mean Channel Width (m)	Mean Wetted Width (m)	Mean Water Depth (m)	Dominant Substrate	Mean Bank Height (m)	Bank Shape	Bank Texture	Riparian Vegetation
806b	Unnamed tributary to Nass River (no watershed code)	July 12, 2014	12.10	6.81	10.50	Clear	0.13	7.5	4.9	0.20	Cobble	Left: 0.7 Right: 0.8	Left: Sloping Right: Sloping	Left: Cobble/large gravel Right: Cobble/large gravel	Left: Mixed C and D Right: Mixed C and D
808a	Unnamed tributary to Nass River (no watershed code)	July 12, 2014	14.40	7.24	5.00	Low	Negligible	1.5	0.9	0.08	Small gravel	Left: 0.3 Right: 0.3	Left: Sloping Right: Sloping	Left: Fines/organics Right: Fines/organics	Left: Mixed C and D Right: Mixed C and D
808b	Unnamed tributary to Nass River (no watershed code)	July 06, 2014	9.70	7.44	11.40	Clear	0.13	7.5	4.4	0.21	Boulder	Left: 0.9 Right: 0.9	Left: Sloping Right: Sloping	Left: Boulders Right: Boulders	Left: Mixed C and D Right: Mixed C and D
809a	Unnamed tributary to Nass River (500-053700)	July 05, 2014	10.70	7.97	11.20	Clear	0.43	6.7	5.4	0.22	Boulder	Left: 1.1 Right: 1.1	Left: Vertical Right: Vertical	Left: Boulders/organics Right: Boulders/organics	Left: Mixed C and D Right: Mixed C and D
810a	Unnamed tributary to Nass River (500-051800)	July 05, 2014	8.90	7.45	10.50	Low	0.01	4.7	2.1	0.08	Fines	Left: 0.6 Right: 0.7	Left: Sloping Right: Sloping	Left: Fines/organics Right: Fines/organics	Left: Deciduous Right: Deciduous
811b	Unnamed tributary to Nass River (no watershed code)	July 04, 2014	10.70	8.48	10.60	Low	0.01	2.6	1.8	0.16	Fines	Left: 0.4 Right: 0.5	Left: Sloping Right: Sloping	Left: Fines/small gravel Right: Fines/small gravel	Left: Mixed C and D Right: Mixed C and D
812a	Unnamed tributary to Nass River (Monkley Creek, unnamed tributary to Monkley Creek) (500-050900)	July 13, 2014	10.80	7.73	12.80	Clear	NR	18.0	16.0	0.52	Boulder	Left: 17.3 Right: 13.3	Left: Vertical Right: Sloping	Left: Boulders/cobble Right: Rock/boulders	Left: Coniferous Right: Coniferous
813a	Unnamed tributary to Nass River (no watershed code)	July 06, 2014	11.90	6.40	10.00	Clear	Negligible	4.3	1.3	0.09	Rock	Left: 1.2 Right: 1.0	Left: Sloping Right: Vertical	Left: Boulders/rock Right: Rock/rock	Left: Coniferous Right: Coniferous
814a	Unnamed tributary to Nass River (500-047000)	July 05, 2014	11.80	7.89	10.00	Clear	0.02	5.5	2.8	0.10	Cobble	Left: 1.0 Right: 0.9	Left: Vertical Right: Sloping	Left: Fines/large gravel Right: Fines/large gravel	Left: Shrub Right: Shrub
815a	Unnamed tributary to Nass River (no watershed code)	July 11, 2014	11.80	5.99	7.00	Clear	Negligible	2.2	1.3	0.09	Large gravel	Left: 0.7 Right: 0.8	Left: Undercut Right: Sloping	Left: Cobble/large gravel Right: Small gravel/large gravel	Left: Mixed C and D Right: Mixed C and D
816a	Unnamed tributary to Nass River (500-038600)	July 09, 2014	12.40	5.80	NR	Clear	NR	9.3	1.5	0.13	Organics/Fines	Left: 1.7 Right: 1.5	Left: Vertical Right: Vertical	Left: Fines/organics Right: Fines/organics	Left: Shrub Right: Shrub
817a	Unnamed tributary to Nass River (500-038000)	July 07, 2014	10.10	6.90	10.50	Clear	0.80	8.8	7.3	0.22	Cobble	Left: 0.9 Right: 1.0	Left: Vertical Right: Undercut	Left: Large gravel/cobble Right: Large gravel/fines	Left: Mixed C and D Right: Mixed C and D
818a	Unnamed tributary to Nass River (500-036300)	July 04, 2014	11.50	7.88	9.90	Clear	0.47	8.8	6.0	0.25	Boulder	Left: 10.7 Right: 1.7	Left: Sloping Right: Vertical	Left: Boulders/rock Right: Boulders/cobble	Left: Deciduous Right: Deciduous
2515	Unnamed tributary to Nass River (500-034500)	July 14, 2014	9.00	7.35	12.40	Clear	0.17	3.0	2.6	0.12	Cobble	Left: 3.9 Right: 0.8	Left: Vertical Right: Vertical	Left: Cobble/large gravel Right: Boulders/cobble	Left: Coniferous Right: Coniferous
2523	Ksgyukwsa'a (Burton/Barton Creek) (500-018500)	July 13, 2014	12.60	7.47	9.70	Clear	NR	22.4	19.3	0.33	Cobble	Left: 0.8 Right: 0.6	Left: Undercut Right: Sloping	Left: Cobble/large gravel Right: Cobble/large gravel	Left: Mixed C and D Right: Mixed C and D
819a	Unnamed tributary to Nass River (500-034500)	July 14, 2014	6.00	7.65	13.70	Clear	0.04	2.8	2.6	0.21	Small gravel	Left: 0.7 Right: 0.7	Left: Vertical Right: Vertical	Left: Small gravel/large gravel Right: Small gravel/large gravel	Left: Coniferous Right: Coniferous
826a	Ksgyukwsa'a (Burton/Barton Creek) (500-018500)	July 05, 2014	8.70	7.05	12.20	Clear	11.46	31.0	27.3	0.51	Cobble	Left: 1.2 Right: 2.1	Left: Sloping Right: Sloping	Left: Cobble/large gravel Right: Cobble/large gravel	Left: Mixed C and D Right: Mixed C and D
828a	Unnamed tributary to Ksgyukwsa'a (no watershed code)	July 19, 2014	8.00	7.46	9.30	Clear	0.01	2.0	1.2	0.10	Boulder	Left: 0.9 Right: 0.8	Left: Sloping Right: Sloping	Left: Boulders/cobble Right: Boulders/cobble	Left: Coniferous Right: Coniferous
829a	Unnamed tributary to Ksgyukwsa'a (no watershed code)	July 10, 2014	10.80	7.26	11.00	Clear	0.71	8.0	4.2	0.22	Cobble	Left: 1.3 Right: 1.4	Left: Sloping Right: Sloping	Left: Boulders/cobble Right: Boulders/cobble	Left: Coniferous Right: Coniferous
830a.1	Unnamed tributary to Ksgyukwsa'a (no watershed code)	July 07, 2014	9.30	6.90	12.50	Clear	0.02	5.3	1.9	0.10	Small gravel	Left: 3.1 Right: 3.5	Left: Vertical Right: Vertical	Left: Cobble/large gravel Right: Cobble/large gravel	Left: Mixed C and D Right: Mixed C and D
830a	Unnamed tributary to Ksgyukwsa'a (no watershed code)	July 07, 2014	7.50	6.40	11.40	Clear	0.04	8.5	1.9	0.05	Organics	Left: 14.2 Right: 5.7	Left: Vertical Right: Vertical	Left: Organics/cobble Right: Organics/cobble	Left: Mixed C and D Right: Mixed C and D
831a	Unnamed tributary to Welda Creek (no watershed code)	July 07, 2014	11.50	7.64	10.70	Clear	1.01	16.2	14.1	0.35	Boulder	Left: 1.2 Right: 1.1	Left: Sloping Right: Sloping	Left: Boulders/cobble Right: Boulders/cobble	Left: Mixed C and D Right: Mixed C and D
832a	Welda Creek (500-016300)	July 07, 2014	11.50	8.10	10.70	Clear	0.69	26.7	17.4	0.29	Boulder	Left: 1.0 Right: 1.2	Left: Sloping Right: Sloping	Left: Cobble/large gravel Right: Cobble/large gravel	Left: Mixed C and D Right: Mixed C and D
1033a	Unnamed tributary to Nass River (no watershed code)	July 09, 2014	12.30	6.78	7.80	Clear	0.01	3.8	1.0	0.13	Large gravel	Left: 0.6 Right: 0.8	Left: Vertical Right: Vertical	Left: Cobble/large gravel Right: Fines/organics	Left: Mixed C and D Right: Mixed C and D
1034	Unnamed tributary to Nass River (no watershed code)	July 10, 2014	10.50	6.94	8.70	Stained	NR	1.2	1.4	0.40	Fines	Left: 0.6 Right: 0.5	Left: Sloping Right: Sloping	Left: Fines/organics Right: Fines/organics	Left: Coniferous Right: Coniferous

**APPENDIX F**  
**LARGE RIVER HABITAT MAPPING**



















July 2014

**FIGURE 4  
NASS RIVER  
PWC1038  
FISH HABITAT MAPPING INDEX**

**PROPOSED WESTCOAST  
CONNECTOR GAS**

8018

Proposed Project Components

-  Cypress to Cranberry Route
-  Kitsault Route
-  Kitsault Marine Route
-  Nasoga Route
-  Nasoga Marine Route
-  Alternate Route
-  400 m Route Corridor
-  Compressor Station
-  Permanent Access Road
-  Map Sheetframe
-  Road
-  Access/Resource Road
-  Rough Trail/Overgrown Road
-  Watercourse
-  Waterbody
-  First Nation
-  Treaty Settlement Land
-  Park/Protected Area

SCALE: 1:32,400

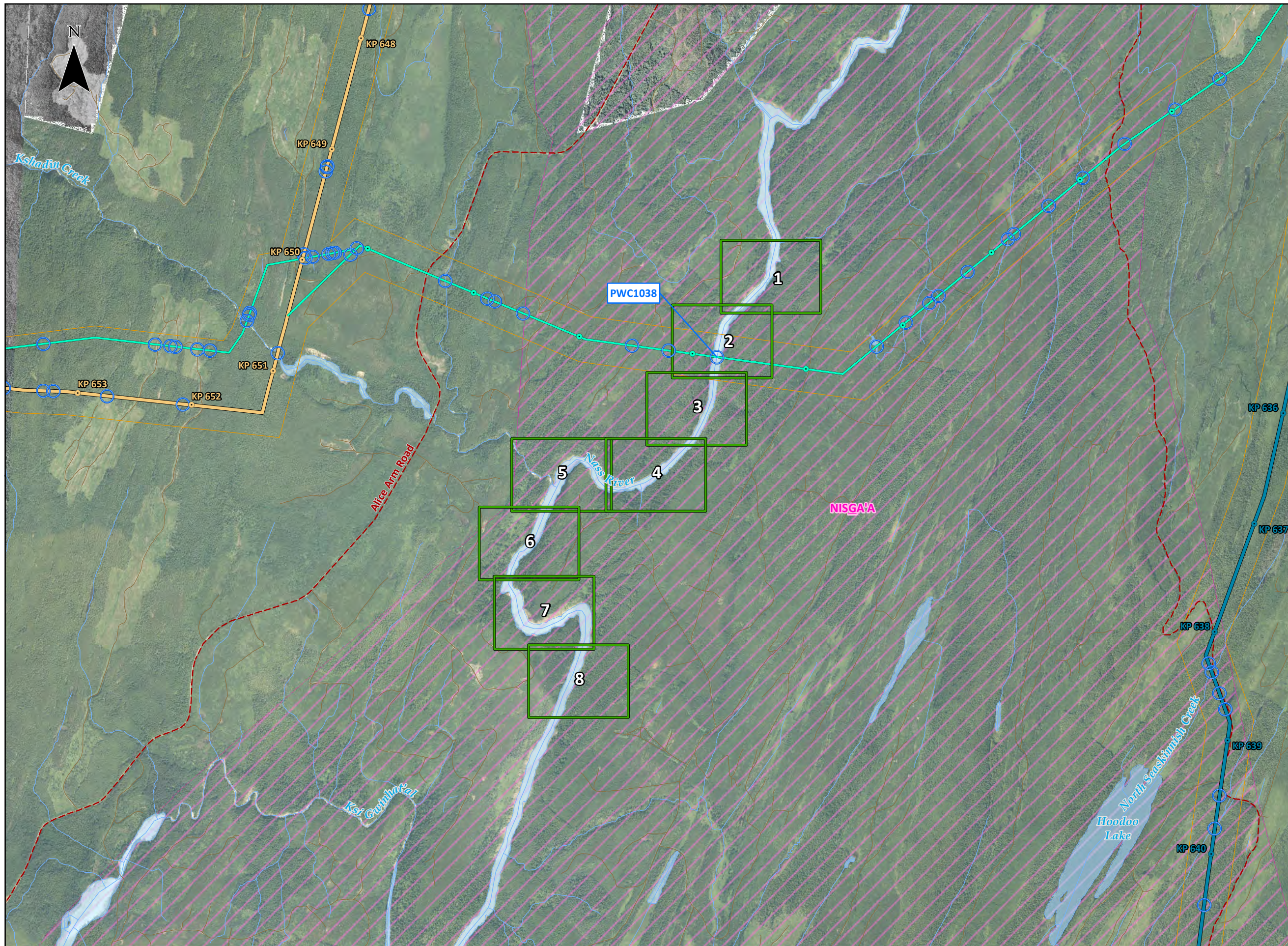
(All Locations Approximate)



NAD83 UTM Zone N. Route current to February 5, 2014  
Imagery: 2012 Province of BC 30 cm Orthoimagery acquired from Spectra Energy via Focus Surveys; Highways/Roads: IHS Inc. 2014; Rough Trails/Overgrown Roads: BC Forests, Lands and Natural Resource Operations 2012; Treaty Settlement Land: IHS Inc. 2013; Aboriginal Lands: Government of Canada 2014; Parks/Protected Areas, Hydrography: BC Forests, Lands and Natural Resource Operations 2008.

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Mapped By: CW      Checked By: JW



**FIGURE 4**  
**RIVER/ CREEK HABITAT FEATURES**  
**FOR THE NASS RIVER: PWC1038**  
**SHEET 1 OF 8**

**PROPOSED WESTCOAST CONNECTOR**  
**GAS TRANSMISSION PROJECT**

**LARGE RIVER HABITAT CLASSIFICATION**

*\*See index map for additional legend and data source information*

**Bank Habitat Types**

**Armoured/Stable:**

- A1** Stable at repose, CB/BL/GR dominant, uniform shoreline, low-moderate velocity, low cover
- A2** CB/BL dominant, irregular shoreline, BW habitat, low velocity, moderate cover
- A3** see A2 with more BL and BR, irregular shoreline, moderate-high velocity and BW, high cover

**Canyon:**

- C1** Stable banks formed by valley walls, CB/BL/BR, deep, high velocity and good cover
- C2** Steep stable BR banks, regular shoreline, moderate to deep and moderate to high velocity
- C3** Moderate eroded banks formed by valley walls, FN/GR/CB, moderate-high velocity, no cover

**Depositional:**

- D1** Low relief, gently sloping bank, fines, shallow/ low velocity, low cover, associated with bars
- D2** See D1 but with GR/CB, higher velocities (riffles), associated with bars and shoals

**Erosional:**

- E1** High, steep eroded unstable banks, fines, moderate-high velocity, vegetation/depth for cover
- E2** See E1 but with no vegetative debris, offshore depth is shallower
- E3** High steep eroding banks, GR/CB/Sand deposits, limited cover (turbidity)
- E4** Steep, slumping/eroding banks, CB/GR/SI, moderate depth, some BW, cover (depth/turbidity)
- E5** Low steep terraced banks, fines, low velocity, shallow to moderate, limited cover (turbidity)
- E6** Low slumping/eroding banks, CB/GR/SI, moderate depth, moderate-high velocity, high cover

**Flow Characteristics**

- R1** Moderate to high velocity, surface largely unbroken, usually deeper than Rf, substrate size dependent on hydraulics. Maximum depth > 1.0m
- R2** See R1 but with Maximum depth 0.5 - 1.0m
- R3** See R1 but with Maximum depth <0.5m
- F1** Flat - An area characterized by low velocity and near uniform flow that often lacks a definite thalweg; differentiated from pool habitat by high channel uniformity; more depositional than run habitat.

**Special Habitat Features**

- P1** Pool - Discrete unit with increased depth and decreased velocity, channel scour, Maximum depth > 1.0m
- P2** Pool - See P1 but with maximum depth 0.5 - 1.0m
- DP** Debris Pile - An accumulation of material including floating woody material or suspended sediment that is moved by flowing water.
- BW** Backwater - localized area with reverse flow direction, low velocity
- RF** Riffle - Moderate velocity and turbulence, substrate is large gravel / cobble typically only partially submerged, shallow relative to other channel units (~0.25m), channel profile straight to convex
- RA** Rapid - Turbulent flow, broken surface (standing waves), high velocity, armoured substrate (BL/BR)
- SN** Snye - Non-flowing water connected to flowing channel at the downstream end
- SL** Slough - Non-flowing waterbody isolated from flowing water except in flood events (oxbows)
- LJ** Log Jam - Accumulation of woody debris
- BG** Boulder Garden - Significant occurrence of large boulders providing significant instream cover
- MI** Multiple Island - More than two channels and permanent islands
- SI** Singular Island - Two channels around a single, permanent island
- NO** Navigable Obstruction - A natural physical obstacle that prevents the passage of a vessel on navigable waters and requires portaging in order to continue along the navigable water.

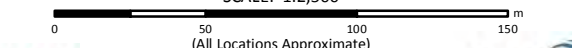
**Tributary Confluence:**

- TC1** Intermittent Flow, ephemeral stream
- TC2** Permanent watercourse, any width
- TCL** Tributary Confluence Left - Tributary Confluence to the left of the flow direction
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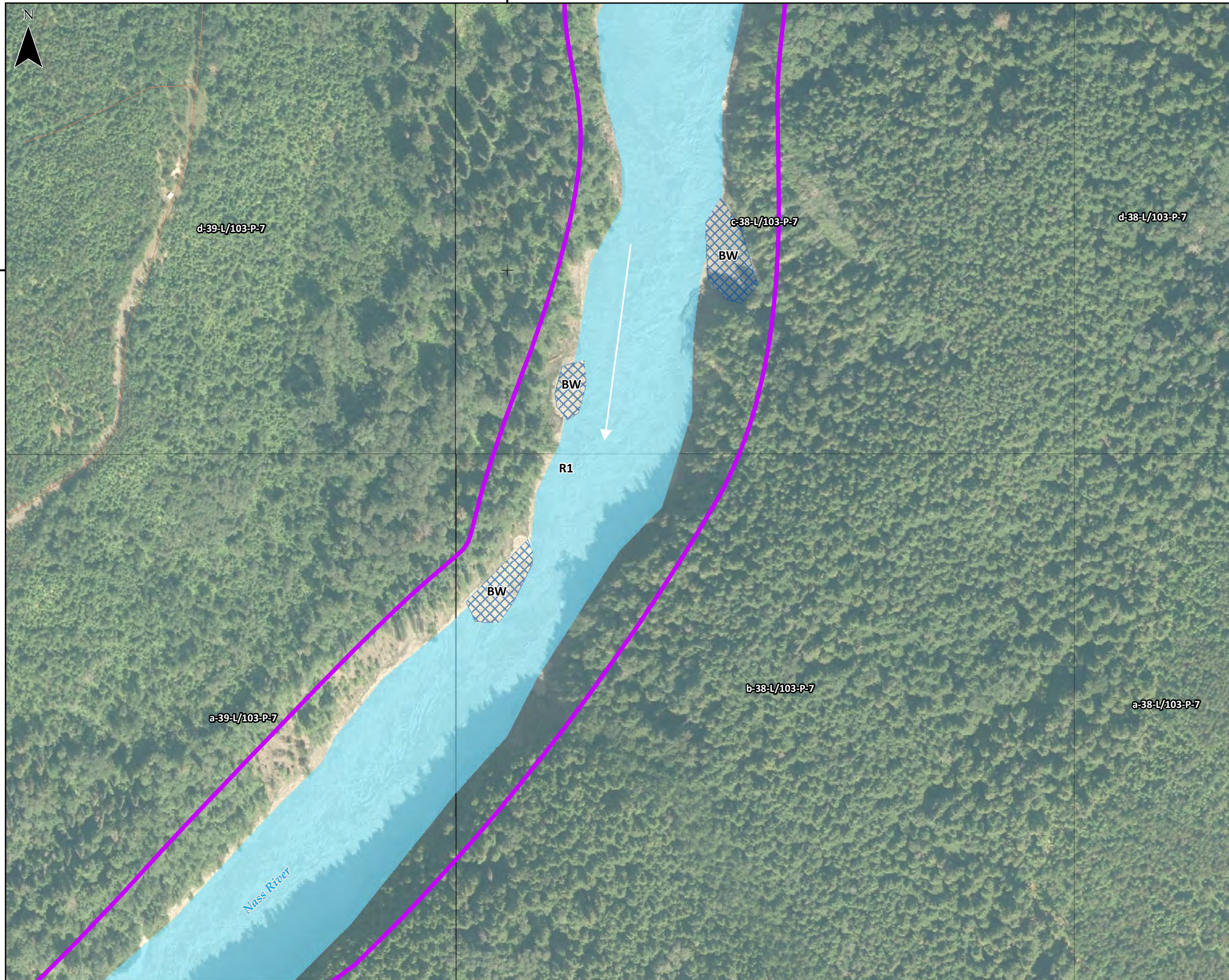
**Shoal**

- SHC** Shoal with coarse substrate (GR/CB/BL)
- SHF** Shoal with fine substrate (SA/SI)

SCALE: 1:2,500

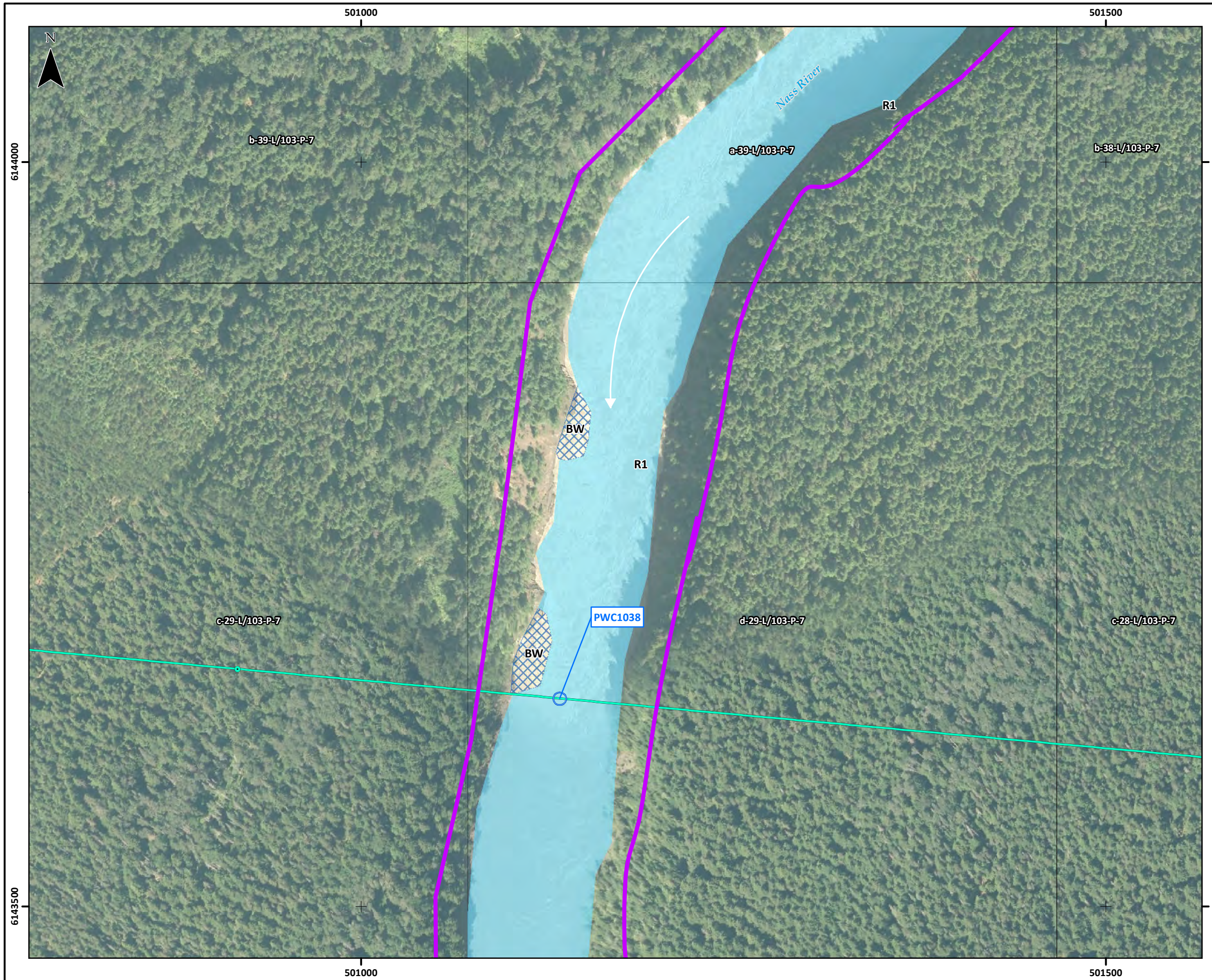


(All Locations Approximate)  
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**FIGURE 4**  
**RIVER/ CREEK HABITAT FEATURES**  
**FOR THE NASS RIVER: PWC1038**  
**SHEET 2 OF 8**

**PROPOSED WESTCOAST CONNECTOR**  
**GAS TRANSMISSION PROJECT**



**LARGE RIVER HABITAT CLASSIFICATION**

*\*See index map for additional legend and data source information*

**Bank Habitat Types**

**Armoured/Stable:**

- A1** Stable at repose, CB/BL/GR dominant, uniform shoreline, low-moderate velocity, low cover
- A2** CB/BL dominant, irregular shoreline, BW habitat, low velocity, moderate cover
- A3** see A2 with more BL and BR, irregular shoreline, moderate-high velocity and BW, high cover

**Canyon:**

- C1** Stable banks formed by valley walls, CB/BL/BR, deep, high velocity and good cover
- C2** Steep stable BR banks, regular shoreline, moderate to deep and moderate to high velocity
- C3** Moderate eroded banks formed by valley walls, FN/GR/CB, moderate-high velocity, no cover

**Depositional:**

- D1** Low relief, gently sloping bank, fines, shallow/ low velocity, low cover, associated with bars
- D2** See D1 but with GR/CB, higher velocities (riffles), associated with bars and shoals

**Erosional:**

- E1** High, steep eroded unstable banks, fines, moderate-high velocity, vegetation/depth for cover
- E2** See E1 but with no vegetative debris, offshore depth is shallower
- E3** High steep eroding banks, GR/CB/Sand deposits, limited cover (turbidity)
- E4** Steep, slumping/eroding banks, CB/GR/SI, moderate depth, some BW, cover (depth/turbidity)
- E5** Low steep terraced banks, fines, low velocity, shallow to moderate, limited cover (turbidity)
- E6** Low slumping/eroding banks, CB/GR/SI, moderate depth, moderate-high velocity, high cover

**Flow Characteristics**

- R1** Moderate to high velocity, surface largely unbroken, usually deeper than Rf, substrate size dependent on hydraulics. Maximum depth > 1.0m
- R2** See R1 but with Maximum depth 0.5 - 1.0m
- R3** See R1 but with Maximum depth <0.5m
- F1** Flat - An area characterized by low velocity and near uniform flow that often lacks a definite thalweg; differentiated from pool habitat by high channel uniformity; more depositional than run habitat.

**Special Habitat Features**

- P1** Pool - Discrete unit with increased depth and decreased velocity, channel scour, Maximum depth > 1.0m
- P2** Pool - See P1 but with maximum depth 0.5 - 1.0m
- DP** Debris Pile - An accumulation of material including floating woody material or suspended sediment that is moved by flowing water.
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- RF** Riffle - Moderate velocity and turbulence, substrate is large gravel / cobble typically only partially submerged, shallow relative to other channel units (~0.25m), channel profile straight to convex
- RA** Rapid - Turbulent flow, broken surface (standing waves), high velocity, armoured substrate (BL/BR)
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- BG** Boulder Garden - Significant occurrence of large boulders providing significant instream cover
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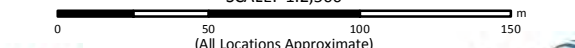
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**Shoal**

- SHC** Shoal with coarse substrate (GR/CB/BL)
- SHF** Shoal with fine substrate (SA/SI)

SCALE: 1:2,500



**FIGURE 4**  
**RIVER/ CREEK HABITAT FEATURES**  
**FOR THE NASS RIVER: PWC1038**  
**SHEET 3 OF 8**

**PROPOSED WESTCOAST CONNECTOR**  
**GAS TRANSMISSION PROJECT**

**LARGE RIVER HABITAT CLASSIFICATION**

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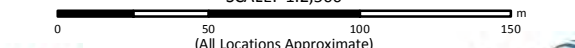
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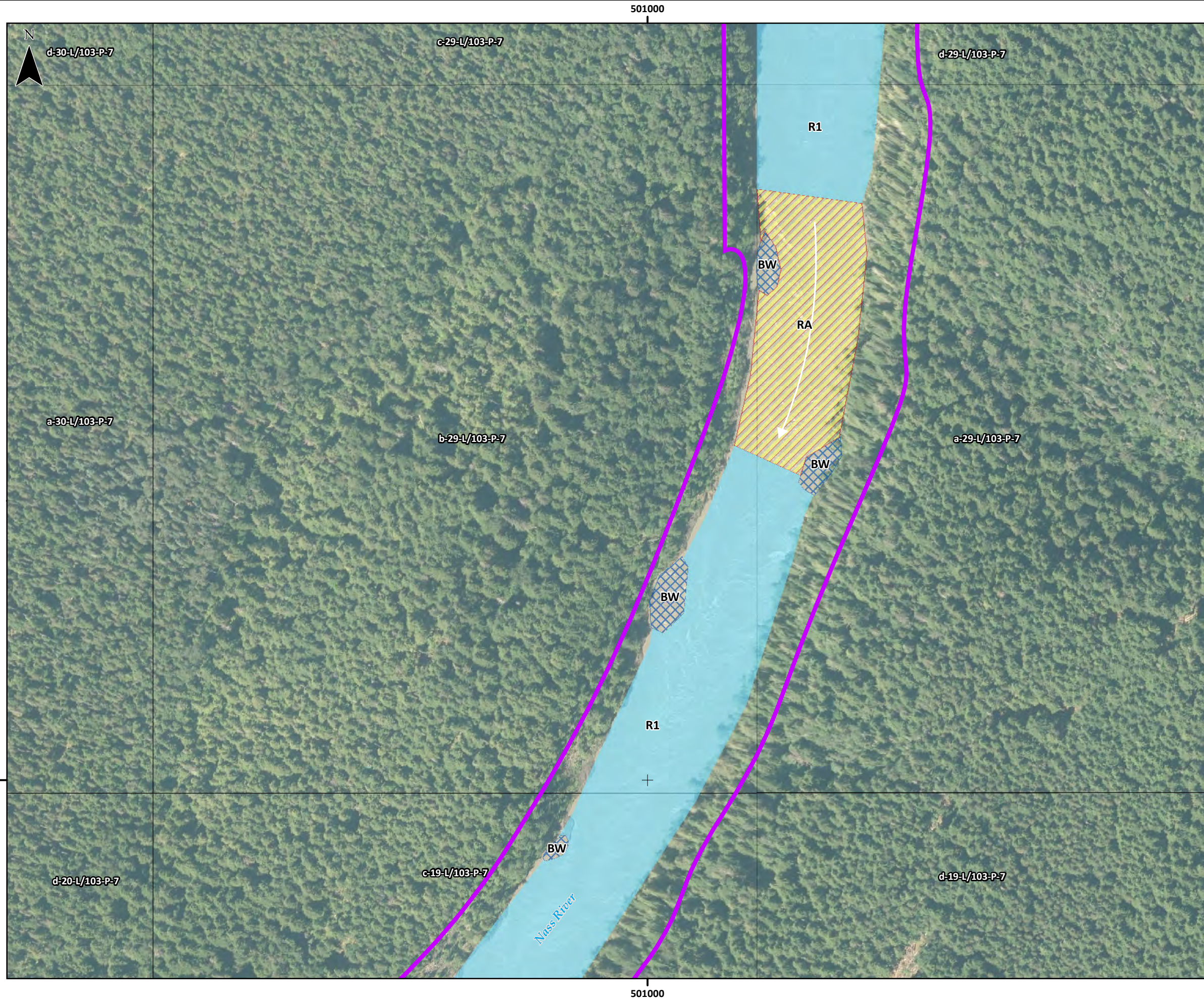
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SCALE: 1:2,500



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**FIGURE 4**  
**RIVER/ CREEK HABITAT FEATURES**  
**FOR THE NASS RIVER: PWC1038**  
**SHEET 4 OF 8**

**PROPOSED WESTCOAST CONNECTOR**  
**GAS TRANSMISSION PROJECT**

**LARGE RIVER HABITAT CLASSIFICATION**

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**Special Habitat Features**

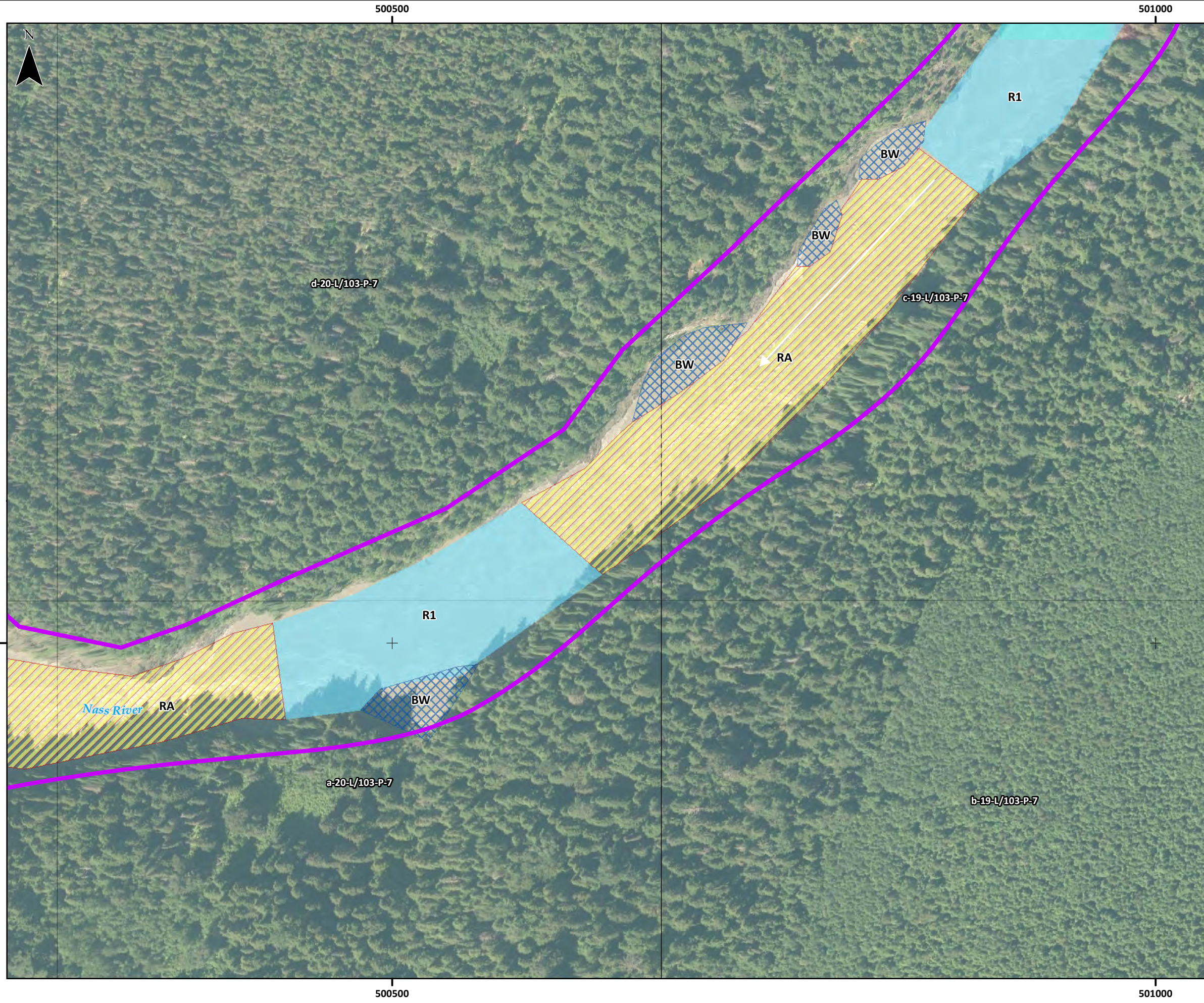
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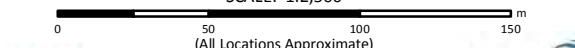
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**RIVER/ CREEK HABITAT FEATURES**  
**FOR THE NASS RIVER: PWC1038**  
**SHEET 5 OF 8**

**PROPOSED WESTCOAST CONNECTOR**  
**GAS TRANSMISSION PROJECT**

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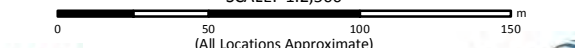
**Tributary Confluence:**

- TC1** Intermittent Flow, ephemeral stream
- TC2** Permanent watercourse, any width
- TCL** Tributary Confluence Left - Tributary Confluence to the left of the flow direction
- TCR** Tributary Confluence Right - Tributary Confluence to the right of the flow direction

**Shoal**

- SHC** Shoal with coarse substrate (GR/CB/BL)
- SHF** Shoal with fine substrate (SA/SI)

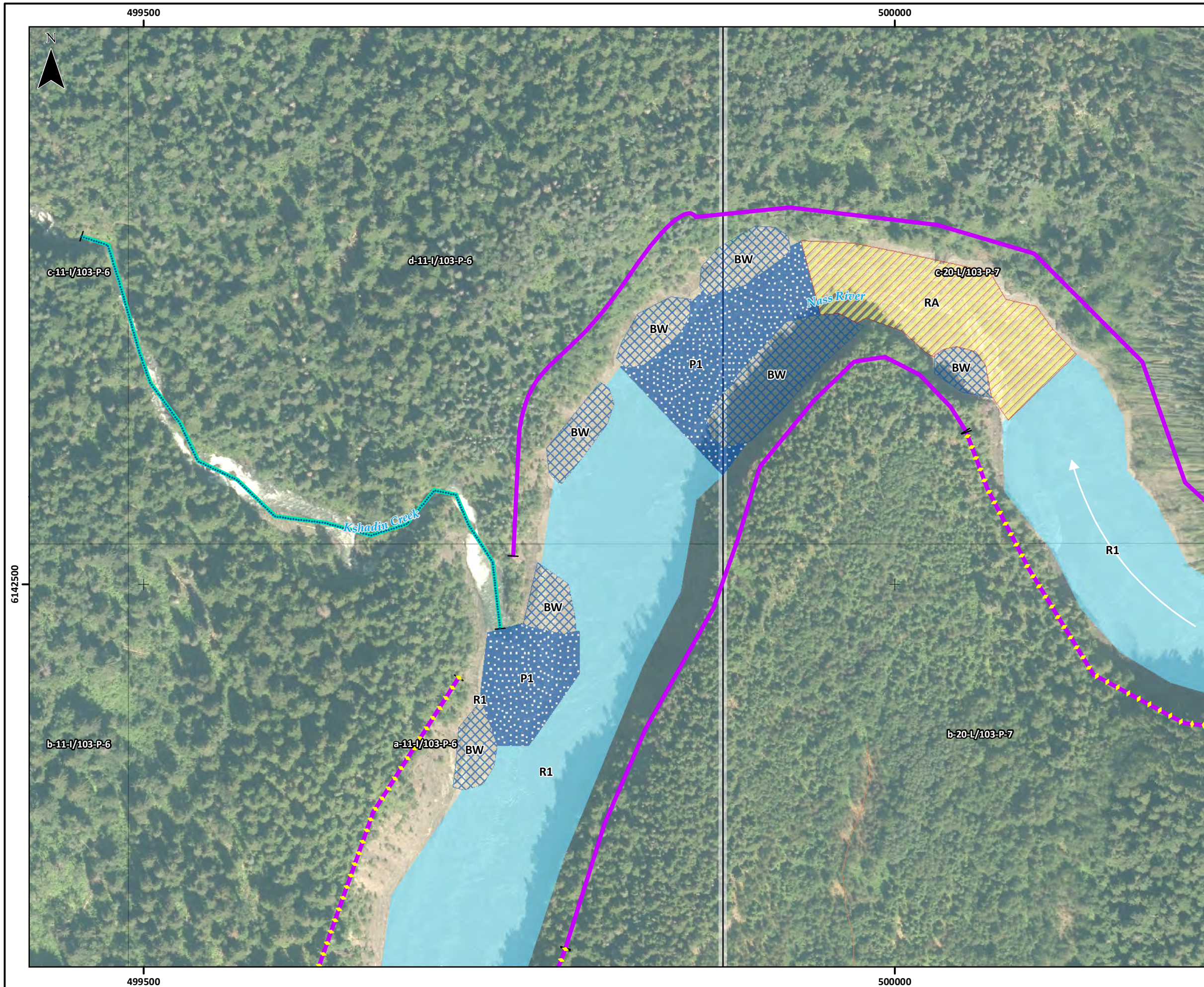
SCALE: 1:2,500



(All Locations Approximate)



*Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.*



**FIGURE 4**  
**RIVER/ CREEK HABITAT FEATURES**  
**FOR THE NASS RIVER: PWC1038**  
**SHEET 6 OF 8**

**PROPOSED WESTCOAST CONNECTOR**  
**GAS TRANSMISSION PROJECT**

**LARGE RIVER HABITAT CLASSIFICATION**

*\*See index map for additional legend and data source information*

**Bank Habitat Types**

*Armoured/Stable:*

- A1** Stable at repose, CB/BL/GR dominant, uniform shoreline, low-moderate velocity, low cover
- A2** CB/BL dominant, irregular shoreline, BW habitat, low velocity, moderate cover
- A3** see A2 with more BL and BR, irregular shoreline, moderate-high velocity and BW, high cover

*Canyon:*

- C1** Stable banks formed by valley walls, CB/BL/BR, deep, high velocity and good cover
- C2** Steep stable BR banks, regular shoreline, moderate to deep and moderate to high velocity
- C3** Moderate eroded banks formed by valley walls, FN/GR/CB, moderate-high velocity, no cover

*Depositional:*

- D1** Low relief, gently sloping bank, fines, shallow/ low velocity, low cover, associated with bars
- D2** See D1 but with GR/CB, higher velocities (riffles), associated with bars and shoals

*Erosional:*

- E1** High, steep eroded unstable banks, fines, moderate-high velocity, vegetation/depth for cover
- E2** See E1 but with no vegetative debris, offshore depth is shallower
- E3** High steep eroding banks, GR/CB/Sand deposits, limited cover (turbidity)
- E4** Steep, slumping/eroding banks, CB/GR/SI, moderate depth, some BW, cover (depth/turbidity)
- E5** Low steep terraced banks, fines, low velocity, shallow to moderate, limited cover (turbidity)
- E6** Low slumping/eroding banks, CB/GR/SI, moderate depth, moderate-high velocity, high cover

**Flow Characteristics**

- R1** Moderate to high velocity, surface largely unbroken, usually deeper than Rf, substrate size dependent on hydraulics. Maximum depth > 1.0m
- R2** See R1 but with Maximum depth 0.5 - 1.0m
- R3** See R1 but with Maximum depth <0.5m
- F1** Flat - An area characterized by low velocity and near uniform flow that often lacks a definite thalweg; differentiated from pool habitat by high channel uniformity; more depositional than run habitat.

**Special Habitat Features**

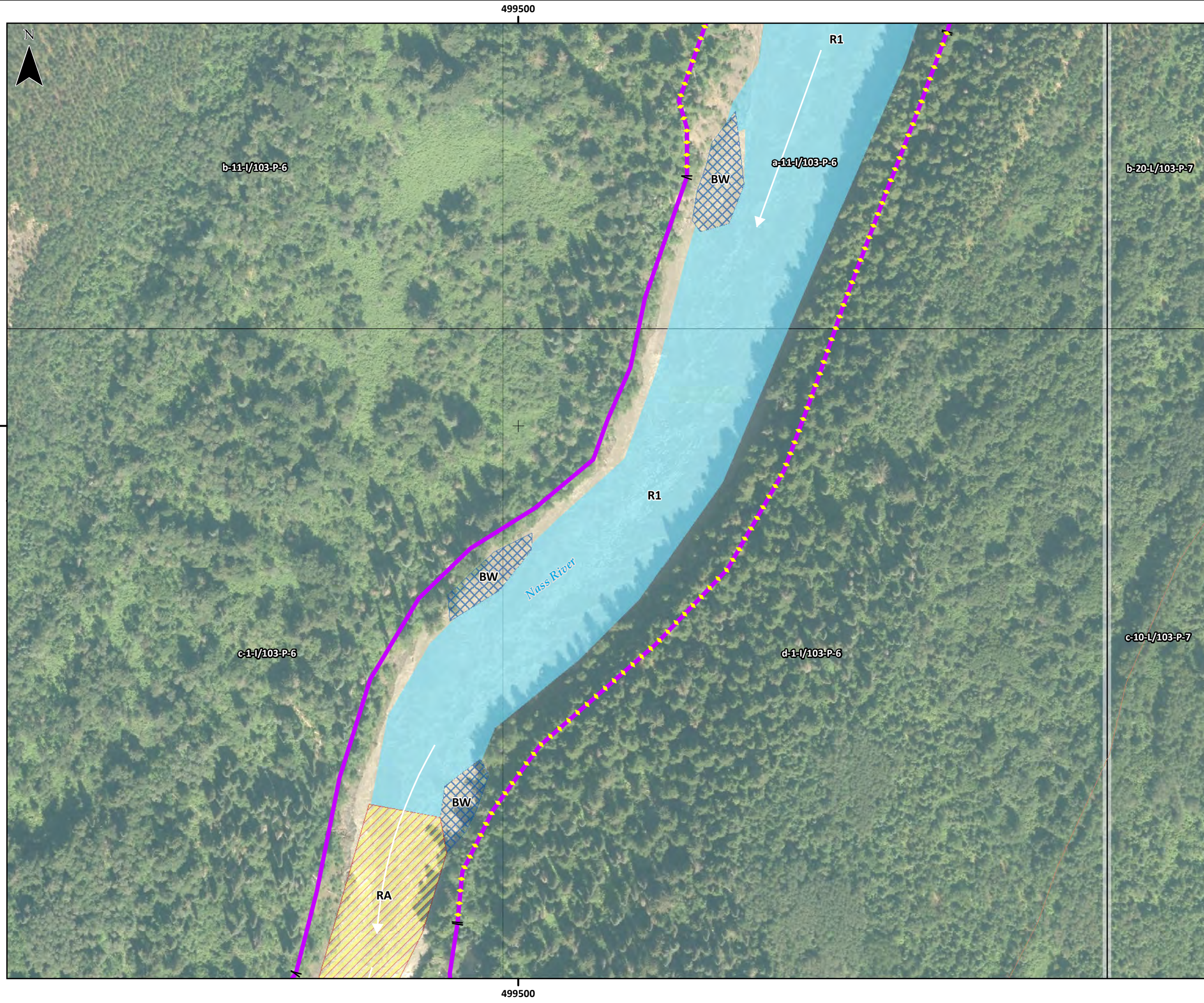
- P1** Pool - Discrete unit with increased depth and decreased velocity, channel scour, Maximum depth > 1.0m
- P2** Pool - See P1 but with maximum depth 0.5 - 1.0m
- DP** Debris Pile - An accumulation of material including floating woody material or suspended sediment that is moved by flowing water.
- BW** Backwater - localized area with reverse flow direction, low velocity
- RF** Riffle - Moderate velocity and turbulence, substrate is large gravel / cobble typically only partially submerged, shallow relative to other channel units (~0.25m), channel profile straight to convex
- RA** Rapid - Turbulent flow, broken surface (standing waves), high velocity, armoured substrate (BL/BR)
- SN** Snye - Non-flowing water connected to flowing channel at the downstream end
- SL** Slough - Non-flowing waterbody isolated from flowing water except in flood events (oxbows)
- LJ** Log Jam - Accumulation of woody debris
- BG** Boulder Garden - Significant occurrence of large boulders providing significant instream cover
- MI** Multiple Island - More than two channels and permanent islands
- SI** Singular Island - Two channels around a single, permanent island
- NO** Navigable Obstruction - A natural physical obstacle that prevents the passage of a vessel on navigable waters and requires portaging in order to continue along the navigable water.

*Tributary Confluence:*

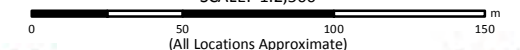
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- TCL** Tributary Confluence Left - Tributary Confluence to the left of the flow direction
- TCR** Tributary Confluence Right - Tributary Confluence to the right of the flow direction

*Shoal*

- SHC** Shoal with coarse substrate (GR/CB/BL)
- SHF** Shoal with fine substrate (SA/SI)



SCALE: 1:2,500



**FIGURE 4**  
**RIVER/ CREEK HABITAT FEATURES**  
**FOR THE NASS RIVER: PWC1038**  
**SHEET 7 OF 8**

**PROPOSED WESTCOAST CONNECTOR**  
**GAS TRANSMISSION PROJECT**

**LARGE RIVER HABITAT CLASSIFICATION**

*\*See index map for additional legend and data source information*

**Bank Habitat Types**

**Armoured/Stable:**

- A1** Stable at repose, CB/BL/GR dominant, uniform shoreline, low-moderate velocity, low cover
- A2** CB/BL dominant, irregular shoreline, BW habitat, low velocity, moderate cover
- A3** see A2 with more BL and BR, irregular shoreline, moderate-high velocity and BW, high cover

**Canyon:**

- C1** Stable banks formed by valley walls, CB/BL/BR, deep, high velocity and good cover
- C2** Steep stable BR banks, regular shoreline, moderate to deep and moderate to high velocity
- C3** Moderate eroded banks formed by valley walls, FN/GR/CB, moderate-high velocity, no cover

**Depositional:**

- D1** Low relief, gently sloping bank, fines, shallow/ low velocity, low cover, associated with bars
- D2** See D1 but with GR/CB, higher velocities (riffles), associated with bars and shoals

**Erosional:**

- E1** High, steep eroded unstable banks, fines, moderate-high velocity, vegetation/depth for cover
- E2** See E1 but with no vegetative debris, offshore depth is shallower
- E3** High steep eroding banks, GR/CB/Sand deposits, limited cover (turbidity)
- E4** Steep, slumping/eroding banks, CB/GR/SI, moderate depth, some BW, cover (depth/turbidity)
- E5** Low steep terraced banks, fines, low velocity, shallow to moderate, limited cover (turbidity)
- E6** Low slumping/eroding banks, CB/GR/SI, moderate depth, moderate-high velocity, high cover

**Flow Characteristics**

- R1** Moderate to high velocity, surface largely unbroken, usually deeper than Rf, substrate size dependent on hydraulics. Maximum depth > 1.0m
- R2** See R1 but with Maximum depth 0.5 - 1.0m
- R3** See R1 but with Maximum depth <0.5m
- F1** Flat - An area characterized by low velocity and near uniform flow that often lacks a definite thalweg; differentiated from pool habitat by high channel uniformity; more depositional than run habitat.

**Special Habitat Features**

- P1** Pool - Discrete unit with increased depth and decreased velocity, channel scour, Maximum depth > 1.0m
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- DP** Debris Pile - An accumulation of material including floating woody material or suspended sediment that is moved by flowing water.
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- SL** Slough - Non-flowing waterbody isolated from flowing water except in flood events (oxbows)
- LJ** Log Jam - Accumulation of woody debris
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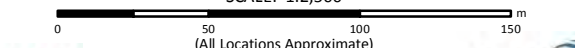
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**Shoal**

- SHC** Shoal with coarse substrate (GR/CB/BL)
- SHF** Shoal with fine substrate (SA/SI)

SCALE: 1:2,500



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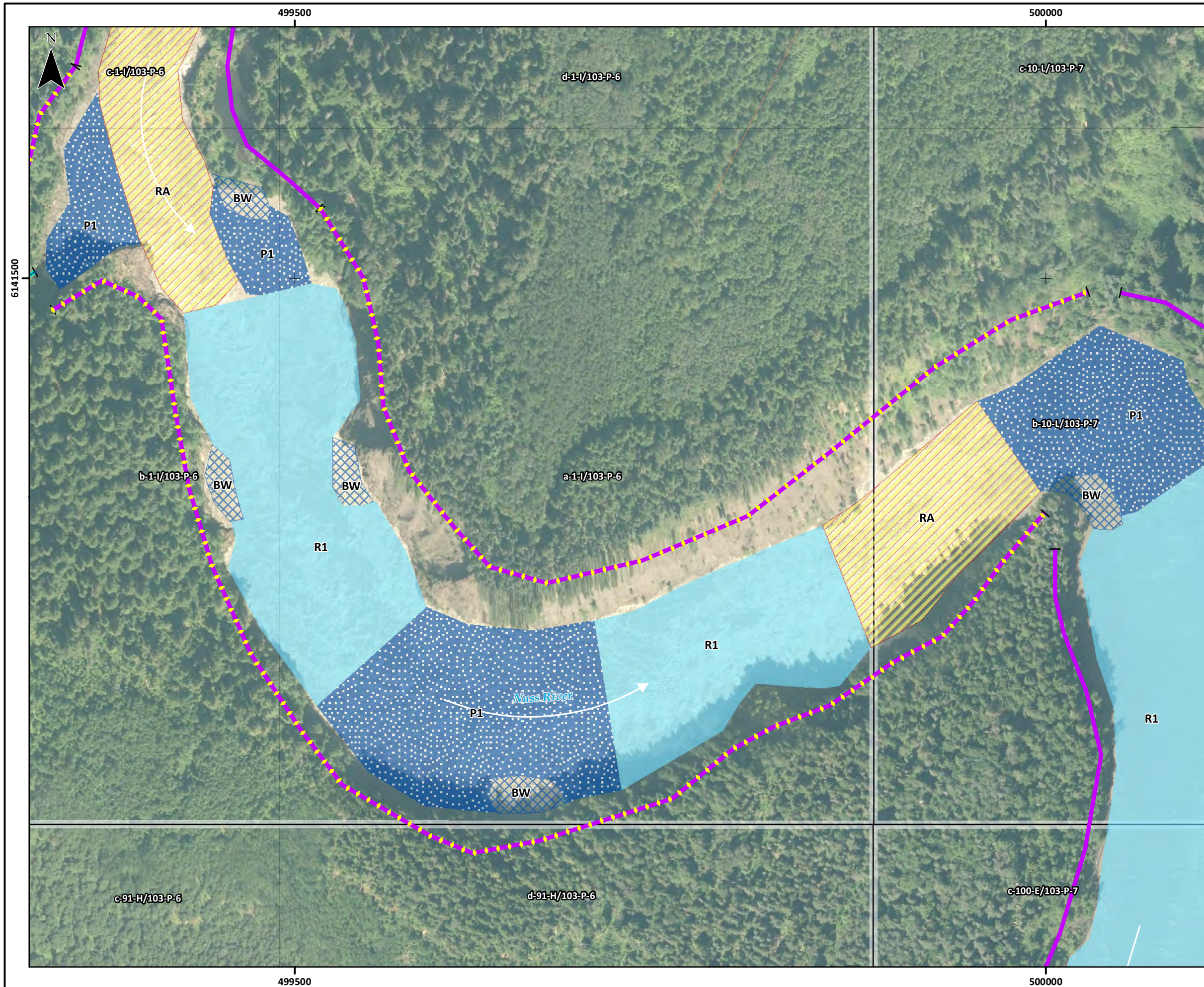


FIGURE 4  
RIVER/ CREEK HABITAT FEATURES  
FOR THE NASS RIVER: PWC1038  
SHEET 8 OF 8




PROPOSED WESTCOAST CONNECTOR  
GAS TRANSMISSION PROJECT

**LARGE RIVER HABITAT CLASSIFICATION**




*\*See index map for additional legend and data source information*

**Bank Habitat Types**



*Armoured/Stable:*

-  **A1** Stable at repose, CB/BL/GR dominant, uniform shoreline, low-moderate velocity, low cover
-  **A2** CB/BL dominant, irregular shoreline, BW habitat, low velocity, moderate cover
-  **A3** see A2 with more BL and BR, irregular shoreline, moderate-high velocity and BW, high cover







*Canyon:*

-  **C1** Stable banks formed by valley walls, CB/BL/BR, deep, high velocity and good cover
-  **C2** Steep stable BR banks, regular shoreline, moderate to deep and moderate to high velocity
-  **C3** Moderate eroded banks formed by valley walls, FN/GR/CB, moderate-high velocity, no cover





*Depositional:*

-  **D1** Low relief, gently sloping bank, fines, shallow/ low velocity, low cover, associated with bars
-  **D2** See D1 but with GR/CB, higher velocities (riffles), associated with bars and shoals














*Erosional:*

-  **E1** High, steep eroded unstable banks, fines, moderate-high velocity, vegetation/depth for cover
-  **E2** See E1 but with no vegetative debris, offshore depth is shallower
-  **E3** High steep eroding banks, GR/CB/Sand deposits, limited cover (turbidity)
-  **E4** Steep, slumping/eroding banks, CB/GR/SI, moderate depth, some BW, cover (depth/turbidity)
-  **E5** Low steep terraced banks, fines, low velocity, shallow to moderate, limited cover (turbidity)
-  **E6** Low slumping/eroding banks, CB/GR/SI, moderate depth, moderate-high velocity, high cover





**Flow Characteristics**

-  **R1** Moderate to high velocity, surface largely unbroken, usually deeper than Rf, substrate size dependent on hydraulics. Maximum depth > 1.0m
-  **R2** See R1 but with Maximum depth 0.5 - 1.0m
-  **R3** See R1 but with Maximum depth <0.5m
-  **F1** Flat - An area characterized by low velocity and near uniform flow that often lacks a definite thalweg; differentiated from pool habitat by high channel uniformity; more depositional than run habitat.



**Special Habitat Features**

-  **P1** Pool - Discrete unit with increased depth and decreased velocity, channel scour, Maximum depth > 1.0m
-  **P2** Pool - See P1 but with maximum depth 0.5 - 1.0m
-  **DP** Debris Pile - An accumulation of material including floating woody material or suspended sediment that is moved by flowing water.
-  **BW** Backwater - localized area with reverse flow direction, low velocity
-  **RF** Riffle - Moderate velocity and turbulence, substrate is large gravel / cobble typically only partially submerged, shallow relative to other channel units (~0.25m), channel profile straight to convex
-  **RA** Rapid - Turbulent flow, broken surface (standing waves), high velocity, armoured substrate (BL/BR)
-  **SN** Snye - Non-flowing water connected to flowing channel at the downstream end
-  **SL** Slough - Non-flowing waterbody isolated from flowing water except in flood events (oxbows)
-  **LJ** Log Jam - Accumulation of woody debris
-  **BG** Boulder Garden - Significant occurrence of large boulders providing significant instream cover
-  **MI** Multiple Island - More than two channels and permanent islands
-  **SI** Singular Island - Two channels around a single, permanent island
-  **NO** Navigable Obstruction - A natural physical obstacle that prevents the passage of a vessel on navigable waters and requires portaging in order to continue along the navigable water.

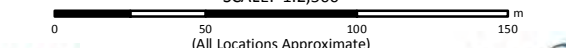
*Tributary Confluence:*

-  **TC1** Intermittent Flow, ephemeral stream
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-  **TCL** Tributary Confluence Left - Tributary Confluence to the left of the flow direction
-  **TCR** Tributary Confluence Right - Tributary Confluence to the right of the flow direction

*Shoal*

-  **SHC** Shoal with coarse substrate (GR/CB/BL)
-  **SHF** Shoal with fine substrate (SA/SI)

SCALE: 1:2,500



(All Locations Approximate)  
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**FIGURE 4  
QUILGAUW CREEK  
PWC796A  
FISH HABITAT MAPPING INDEX**

**PROPOSED WESTCOAST  
CONNECTOR GAS**

8018

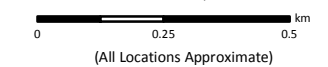
Proposed Project Components

-  Cypress to Cranberry Route
-  Kitsault Route
-  Kitsault Marine Route
-  Nasoga Route
-  Nasoga Marine Route
-  Alternate Route
-  400 m Route Corridor
-  Compressor Station
-  Permanent Access Road

-  Potential Pipeline Watercourse Crossing

-  Map Sheetframe
-  Road
-  Access/Resource Road
-  Rough Trail/Overgrown Road
-  Watercourse
-  Waterbody
-  First Nation
-  Treaty Settlement Land
-  Park/Protected Area

SCALE: 1:15,000



(All Locations Approximate)



NAD83 UTM Zone N. Route current to February 5, 2014  
Imagery: 2012 Province of BC 30 cm Orthoimagery acquired from Spectra Energy via Focus Surveys; Highways/Roads: IHS Inc. 2014; Rough Trails/Overgrown Roads: BC Forests, Lands and Natural Resource Operations 2012; Treaty Settlement Land: IHS Inc. 2013; Aboriginal Lands: Government of Canada 2014; Parks/Protected Areas, Hydrography: BC Forests, Lands and Natural Resource Operations 2008.

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Mapped By: KS

Checked By: JW

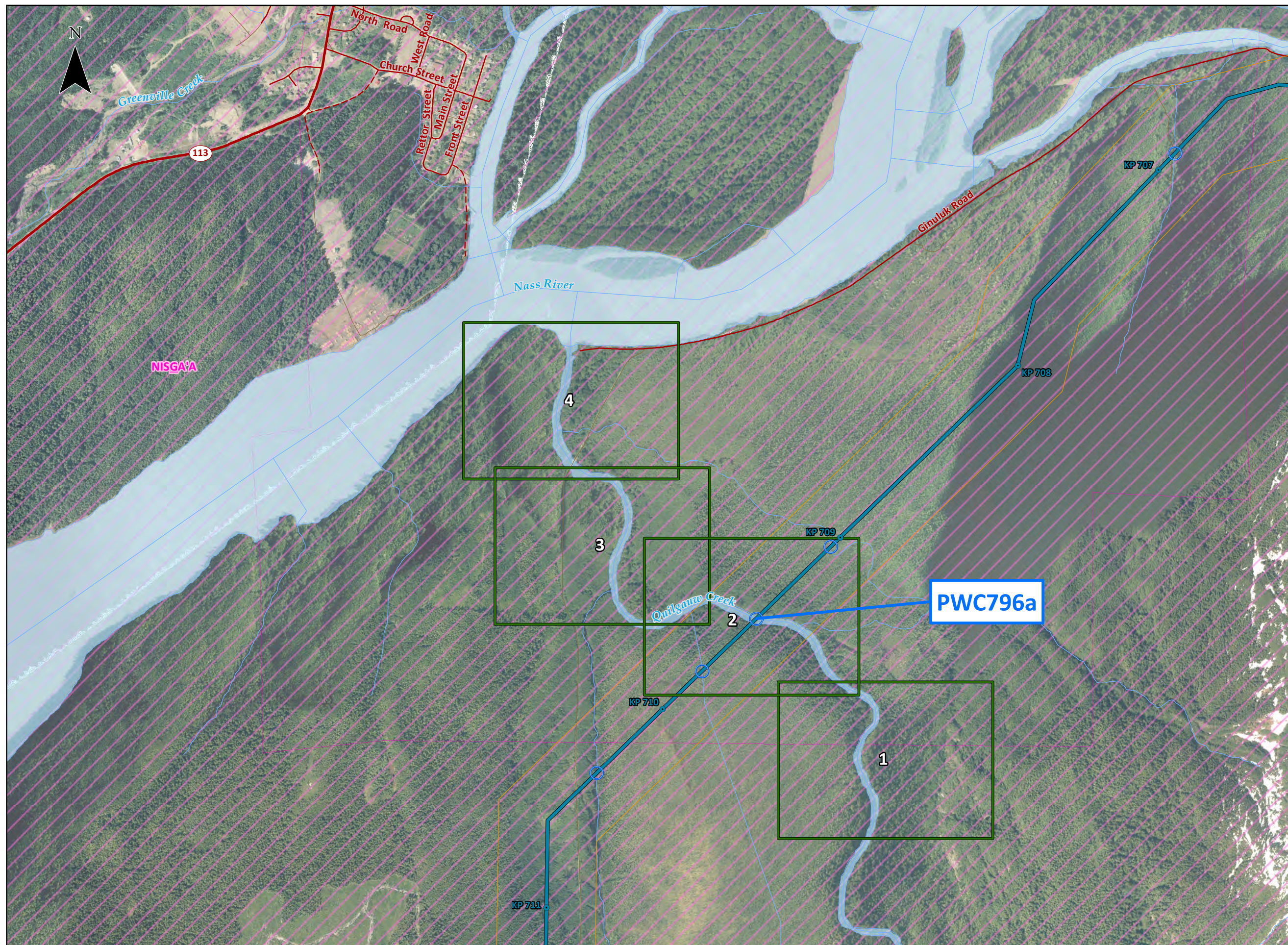
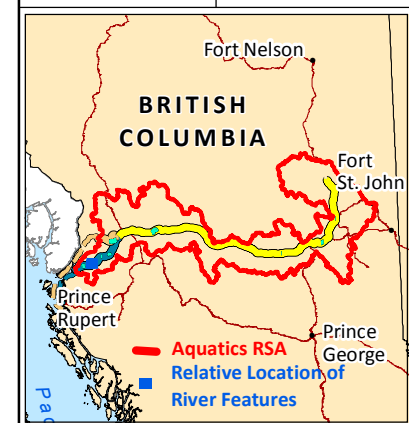


FIGURE 4  
RIVER/ CREEK HABITAT FEATURES  
FOR QUILGAUW CREEK: PWC796a  
SHEET 1 OF 4

PROPOSED WESTCOAST CONNECTOR  
GAS TRANSMISSION PROJECT

**LARGE RIVER HABITAT CLASSIFICATION**

\*See index map for additional legend and data source information

**Bank Habitat Types**

*Armoured/Stable:*

- A1** Stable at repose, CB/BL/GR dominant, uniform shoreline, low-moderate velocity, low cover
- A2** CB/BL dominant, irregular shoreline, BW habitat, low velocity, moderate cover
- A3** see A2 with more BL and BR, irregular shoreline, moderate-high velocity and BW, high cover

*Canyon:*

- C1** Stable banks formed by valley walls, CB/BL/BR, deep, high velocity and good cover
- C2** Steep stable BR banks, regular shoreline, moderate to deep and moderate to high velocity
- C3** Moderate eroded banks formed by valley walls, FN/GR/CB, moderate-high velocity, no cover

*Depositional:*

- D1** Low relief, gently sloping bank, fines, shallow/ low velocity, low cover, associated with bars
- D2** See D1 but with GR/CB, higher velocities (riffles), associated with bars and shoals

*Erosional:*

- E1** High, steep eroded unstable banks, fines, moderate-high velocity, vegetation/depth for cover
- E2** See E1 but with no vegetative debris, offshore depth is shallower
- E3** High steep eroding banks, GR/CB/Sand deposits, limited cover (turbidity)
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- E6** Low slumping/eroding banks, CB/GR/SI, moderate depth, moderate-high velocity, high cover

**Flow Characteristics**

- R1** Moderate to high velocity, surface largely unbroken, usually deeper than Rf, substrate size dependent on hydraulics. Maximum depth > 1.0m
- R2** See R1 but with Maximum depth 0.5 - 1.0m
- R3** See R1 but with Maximum depth <0.5m
- F1** Flat - An area characterized by low velocity and near uniform flow that often lacks a definite thalweg; differentiated from pool habitat by high channel uniformity; more depositional than run habitat.

**Special Habitat Features**

- P1** Pool - Discrete unit with increased depth and decreased velocity, channel scour, Maximum depth > 1.0m
- P2** Pool - See P1 but with maximum depth 0.5 - 1.0m
- DP** Debris Pile - An accumulation of material including floating woody material or suspended sediment that is moved by flowing water.
- BW** Backwater - localized area with reverse flow direction, low velocity
- RF** Riffle - Moderate velocity and turbulence, substrate is large gravel / cobble typically only partially submerged, shallow relative to other channel units (~0.25m), channel profile straight to convex
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- SN** Snye - Non-flowing water connected to flowing channel at the downstream end
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- BG** Boulder Garden - Significant occurrence of large boulders providing significant instream cover
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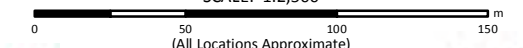
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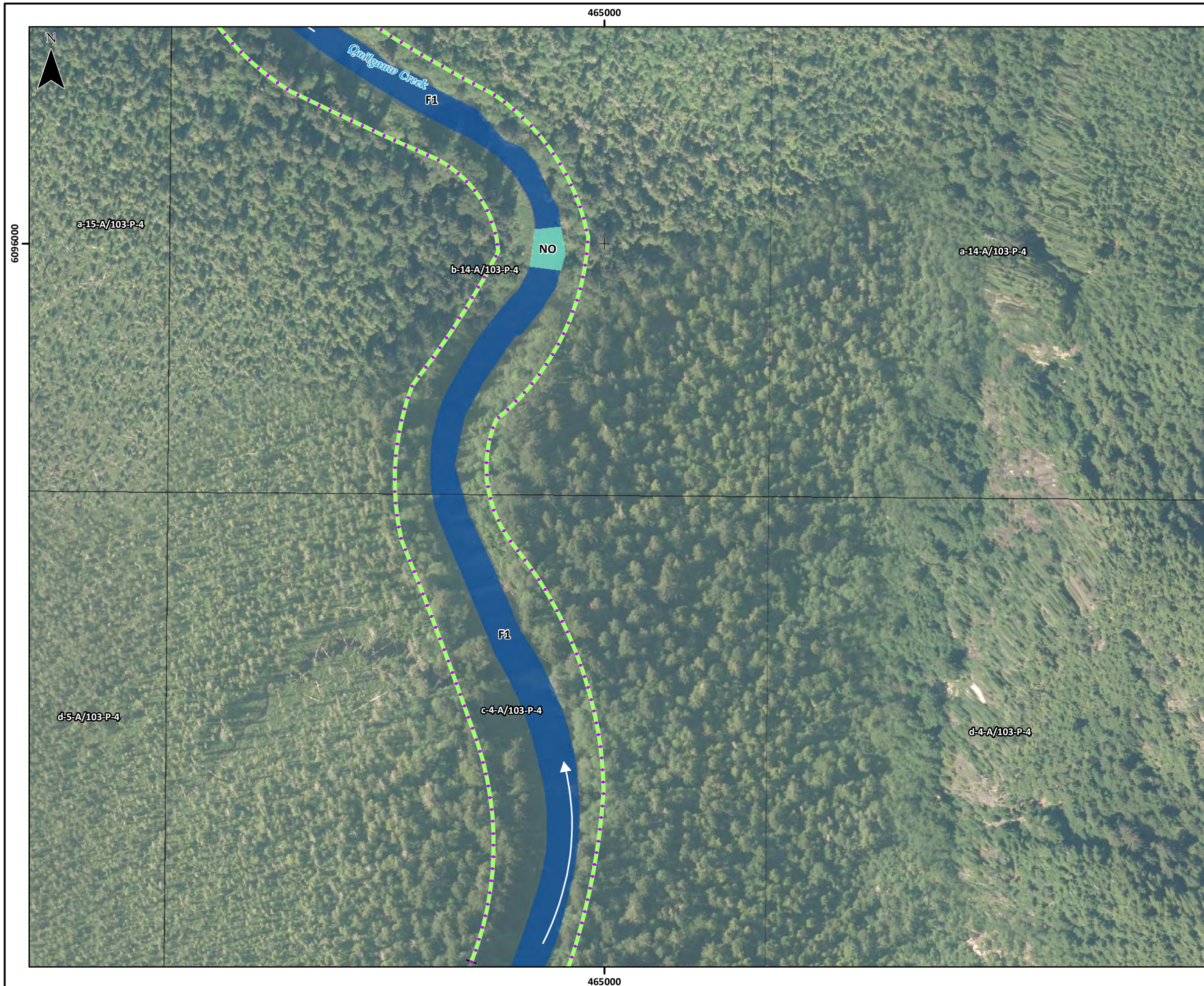
*Shoal*

- SHC** Shoal with coarse substrate (GR/CB/BL)
- SHF** Shoal with fine substrate (SA/SI)

SCALE: 1:2,500



(All Locations Approximate)  
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**FIGURE 4**  
**RIVER/ CREEK HABITAT FEATURES**  
**FOR QUILGAUW CREEK: PWC796a**  
**SHEET 2 OF 4**

**PROPOSED WESTCOAST CONNECTOR**  
**GAS TRANSMISSION PROJECT**

**LARGE RIVER HABITAT CLASSIFICATION**

*\*See index map for additional legend and data source information*

**Bank Habitat Types**

**Armoured/Stable:**

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- A3** see A2 with more BL and BR, irregular shoreline, moderate-high velocity and BW, high cover

**Canyon:**

- C1** Stable banks formed by valley walls, CB/BL/BR, deep, high velocity and good cover
- C2** Steep stable BR banks, regular shoreline, moderate to deep and moderate to high velocity
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**Depositional:**

- D1** Low relief, gently sloping bank, fines, shallow/ low velocity, low cover, associated with bars
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**Erosional:**

- E1** High, steep eroded unstable banks, fines, moderate-high velocity, vegetation/depth for cover
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**Flow Characteristics**

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**Special Habitat Features**

- P1** Pool - Discrete unit with increased depth and decreased velocity, channel scour, Maximum depth > 1.0m
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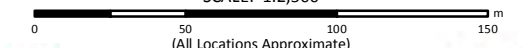
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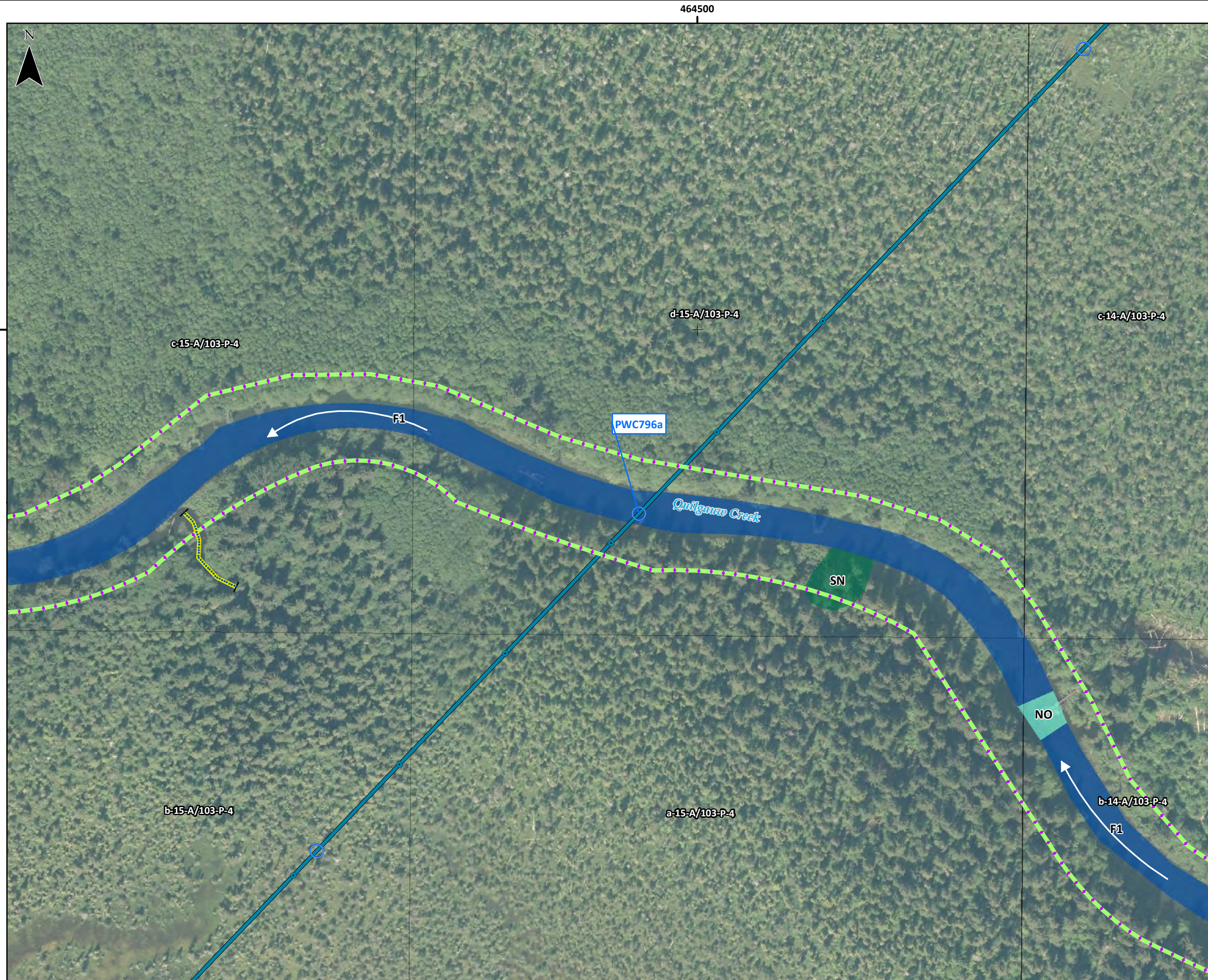
**Shoal**

- SHC** Shoal with coarse substrate (GR/CB/BL)
- SHF** Shoal with fine substrate (SA/SI)

SCALE: 1:2,500



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6096500

6096500

464500

464500



**FIGURE 4**  
**RIVER/ CREEK HABITAT FEATURES**  
**FOR QUILGAUW CREEK: PWC796a**  
**SHEET 3 OF 4**

**PROPOSED WESTCOAST CONNECTOR**  
**GAS TRANSMISSION PROJECT**

**LARGE RIVER HABITAT CLASSIFICATION**

*\*See index map for additional legend and data source information*

**Bank Habitat Types**

**Armoured/Stable:**

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**Canyon:**

- C1** Stable banks formed by valley walls, CB/BL/BR, deep, high velocity and good cover
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**Depositional:**

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- E2** See E1 but with no vegetative debris, offshore depth is shallower
- E3** High steep eroding banks, GR/CB/Sand deposits, limited cover (turbidity)
- E4** Steep, slumping/eroding banks, CB/GR/SI, moderate depth, some BW, cover (depth/turbidity)
- E5** Low steep terraced banks, fines, low velocity, shallow to moderate, limited cover (turbidity)
- E6** Low slumping/eroding banks, CB/GR/SI, moderate depth, moderate-high velocity, high cover

**Flow Characteristics**

- R1** Moderate to high velocity, surface largely unbroken, usually deeper than Rf, substrate size dependent on hydraulics. Maximum depth > 1.0m
- R2** See R1 but with Maximum depth 0.5 - 1.0m
- R3** See R1 but with Maximum depth <0.5m
- F1** Flat - An area characterized by low velocity and near uniform flow that often lacks a definite thalweg; differentiated from pool habitat by high channel uniformity; more depositional than run habitat.

**Special Habitat Features**

- P1** Pool - Discrete unit with increased depth and decreased velocity, channel scour, Maximum depth > 1.0m
- P2** Pool - See P1 but with maximum depth 0.5 - 1.0m
- DP** Debris Pile - An accumulation of material including floating woody material or suspended sediment that is moved by flowing water.
- BW** Backwater - localized area with reverse flow direction, low velocity
- RF** Riffle - Moderate velocity and turbulence, substrate is large gravel / cobble typically only partially submerged, shallow relative to other channel units (~0.25m), channel profile straight to convex
- RA** Rapid - Turbulent flow, broken surface (standing waves), high velocity, armoured substrate (BL/BR)
- SN** Snye - Non-flowing water connected to flowing channel at the downstream end
- SL** Slough - Non-flowing waterbody isolated from flowing water except in flood events (oxbows)
- LJ** Log Jam - Accumulation of woody debris
- BG** Boulder Garden - Significant occurrence of large boulders providing significant instream cover
- MI** Multiple Island - More than two channels and permanent islands
- SI** Singular Island - Two channels around a single, permanent island
- NO** Navigable Obstruction - A natural physical obstacle that prevents the passage of a vessel on navigable waters and requires portaging in order to continue along the navigable water.

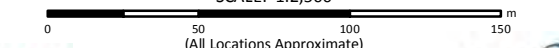
**Tributary Confluence:**

- TC1** Intermittent Flow, ephemeral stream
- TC2** Permanent watercourse, any width
- TC2L** Tributary Confluence Left - Tributary Confluence to the left of the flow direction
- TCR** Tributary Confluence Right - Tributary Confluence to the right of the flow direction

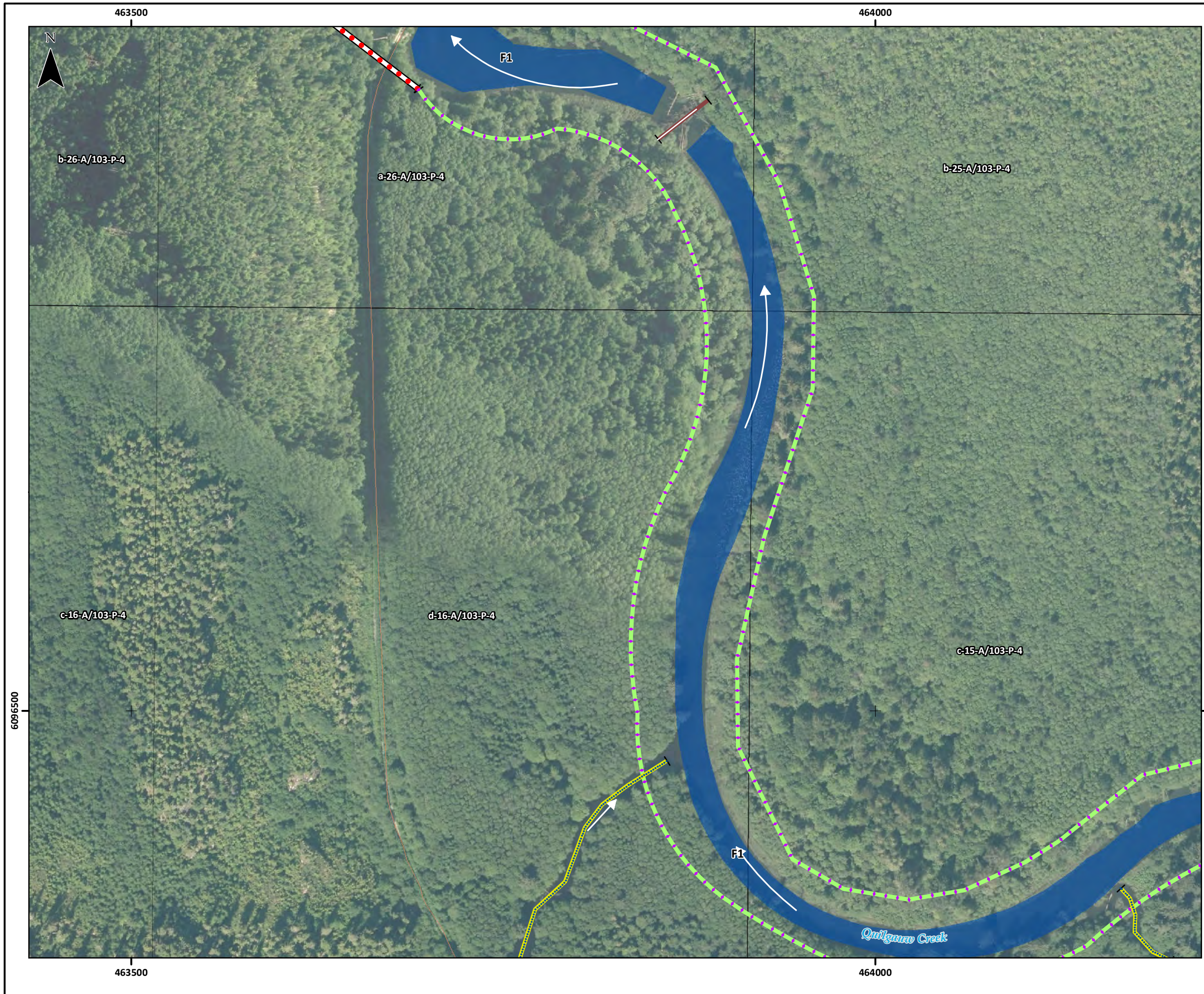
**Shoal**

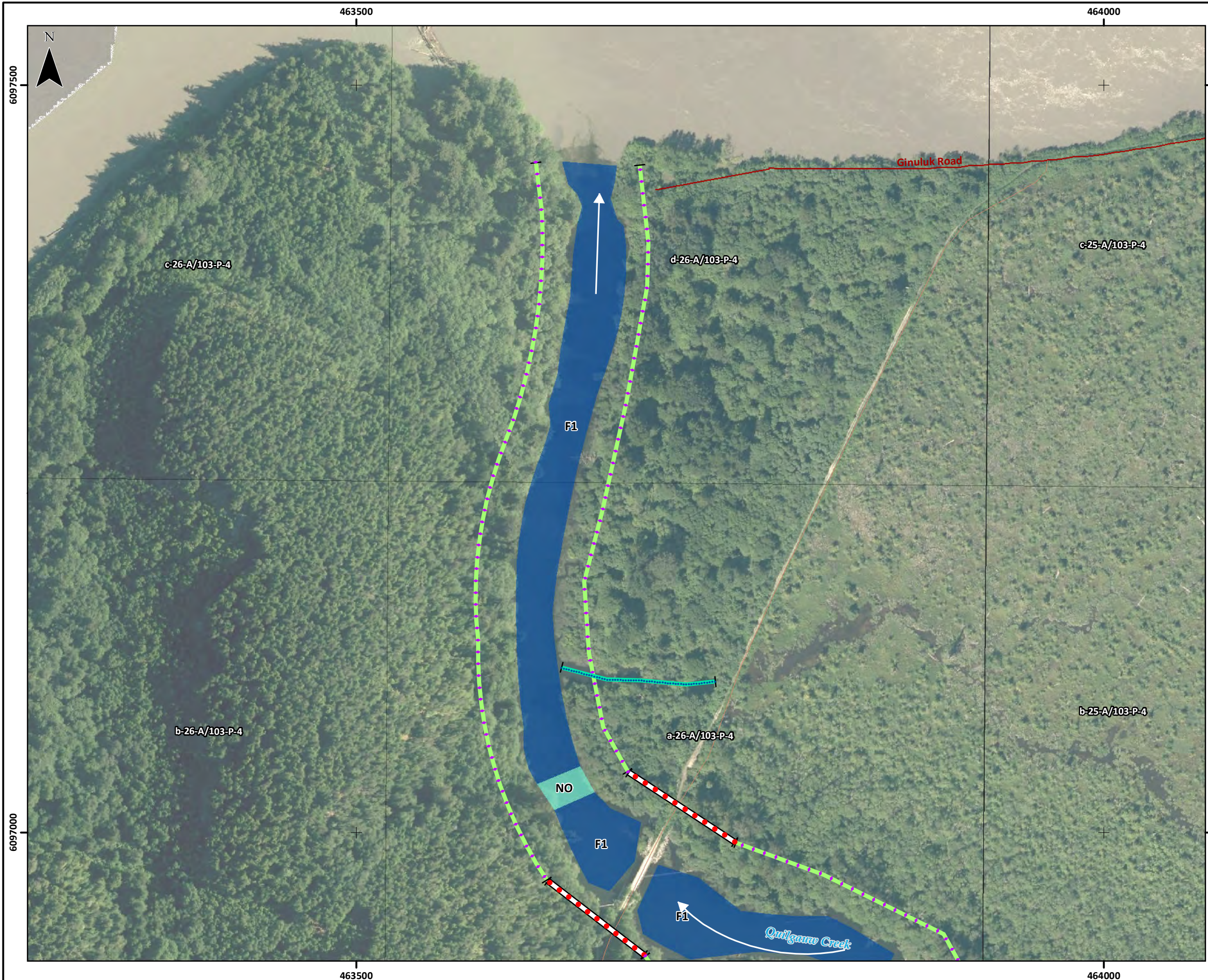
- SHC** Shoal with coarse substrate (GR/CB/BL)
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SCALE: 1:2,500



(All Locations Approximate)  
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**FIGURE 4**  
**RIVER/ CREEK HABITAT FEATURES**  
**FOR QUILGAUNW CREEK: PWC796a**  
**SHEET 4 OF 4**

**PROPOSED WESTCOAST CONNECTOR**  
**GAS TRANSMISSION PROJECT**

**LARGE RIVER HABITAT CLASSIFICATION**

*\*See index map for additional legend and data source information*

**Bank Habitat Types**

- Armoured/Stable:**
- A1** Stable at repose, CB/BL/GR dominant, uniform shoreline, low-moderate velocity, low cover
  - A2** CB/BL dominant, irregular shoreline, BW habitat, low velocity, moderate cover
  - A3** see A2 with more BL and BR, irregular shoreline, moderate-high velocity and BW, high cover

- Canyon:**
- C1** Stable banks formed by valley walls, CB/BL/BR, deep, high velocity and good cover
  - C2** Steep stable BR banks, regular shoreline, moderate to deep and moderate to high velocity
  - C3** Moderate eroded banks formed by valley walls, FN/GR/CB, moderate-high velocity, no cover

- Depositional:**
- D1** Low relief, gently sloping bank, fines, shallow/ low velocity, low cover, associated with bars
  - D2** See D1 but with GR/CB, higher velocities (riffles), associated with bars and shoals

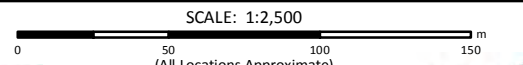
- Erosional:**
- E1** High, steep eroded unstable banks, fines, moderate-high velocity, vegetation/depth for cover
  - E2** See E1 but with no vegetative debris, offshore depth is shallower
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  - TC2** Permanent watercourse, any width
  - TCL** Tributary Confluence Left - Tributary Confluence to the left of the flow direction
  - TCR** Tributary Confluence Right - Tributary Confluence to the right of the flow direction

- Shoal**
- SHC** Shoal with coarse substrate (GR/CB/BL)
  - SHF** Shoal with fine substrate (SA/SI)





















July 2014

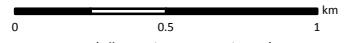
**FIGURE 4  
KSI HLGINX  
PWC802A  
FISH HABITAT MAPPING INDEX**

**PROPOSED WESTCOAST  
CONNECTOR GAS**

8018

- Proposed Project Components**
-  Cypress to Cranberry Route
  -  Kitsault Route
  -  Kitsault Marine Route
  -  Nasoga Route
  -  Nasoga Marine Route
  -  Alternate Route
  -  400 m Route Corridor
  -  Compressor Station
  -  Permanent Access Road
  -  Map Sheetframe
  -  Road
  -  Access/Resource Road
  -  Rough Trail/Overgrown Road
  -  Watercourse
  -  Waterbody
  -  First Nation
  -  Treaty Settlement Land
  -  Park/Protected Area

SCALE: 1:25,000



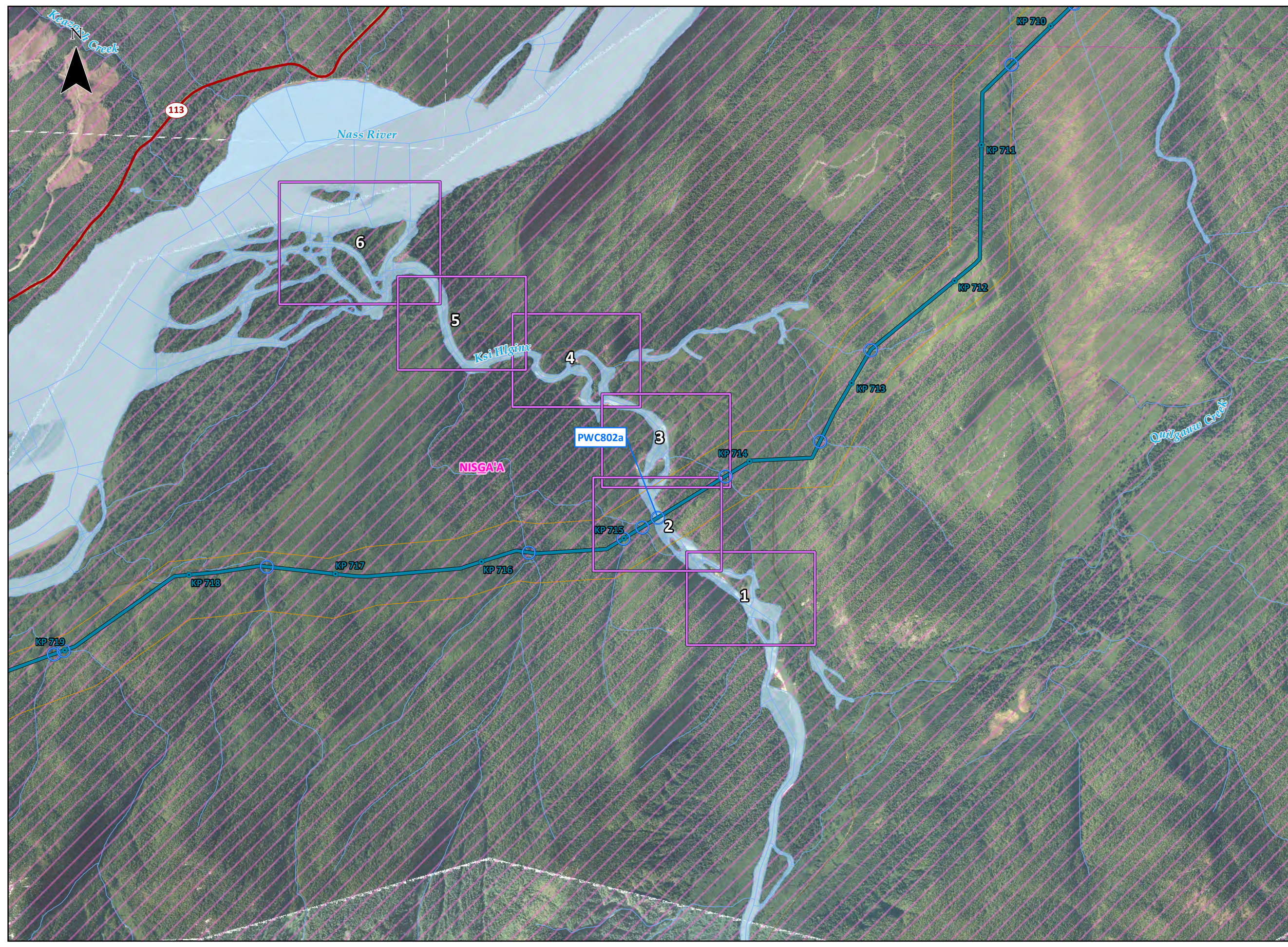
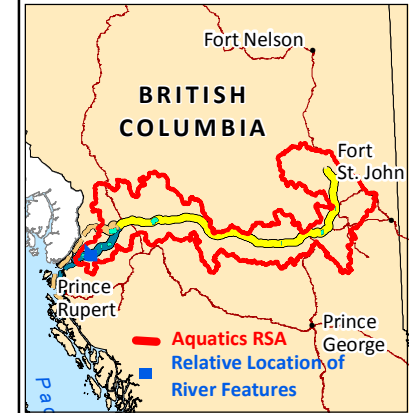
(All Locations Approximate)



NAD83 UTM Zone N. Route current to February 5, 2014  
 Imagery: 2012 Province of BC 30 cm Orthoimagery acquired from Spectra Energy via Focus Surveys; Highways/Roads: IHS Inc. 2014; Rough Trails/Overgrown Roads: BC Forests, Lands and Natural Resource Operations 2012; Treaty Settlement Land: IHS Inc. 2013; Aboriginal Lands: Government of Canada 2014; Parks/Protected Areas, Hydrography: BC Forests, Lands and Natural Resource Operations 2008.

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Mapped By: CW      Checked By: JW



**FIGURE 4**  
**RIVER/ CREEK HABITAT FEATURES**  
**FOR KSI HLGINX: PWC802a**  
**SHEET 1 OF 6**




**PROPOSED WESTCOAST CONNECTOR**  
**GAS TRANSMISSION PROJECT**

**LARGE RIVER HABITAT CLASSIFICATION**




*\*See index map for additional legend and data source information*

**Bank Habitat Types**



*Armoured/Stable:*

-  **A1** Stable at repose, CB/BL/GR dominant, uniform shoreline, low-moderate velocity, low cover
-  **A2** CB/BL dominant, irregular shoreline, BW habitat, low velocity, moderate cover
-  **A3** see A2 with more BL and BR, irregular shoreline, moderate-high velocity and BW, high cover







*Canyon:*

-  **C1** Stable banks formed by valley walls, CB/BL/BR, deep, high velocity and good cover
-  **C2** Steep stable BR banks, regular shoreline, moderate to deep and moderate to high velocity
-  **C3** Moderate eroded banks formed by valley walls, FN/GR/CB, moderate-high velocity, no cover





*Depositional:*

-  **D1** Low relief, gently sloping bank, fines, shallow/ low velocity, low cover, associated with bars
-  **D2** See D1 but with GR/CB, higher velocities (riffles), associated with bars and shoals














*Erosional:*

-  **E1** High, steep eroded unstable banks, fines, moderate-high velocity, vegetation/depth for cover
-  **E2** See E1 but with no vegetative debris, offshore depth is shallower
-  **E3** High steep eroding banks, GR/CB/Sand deposits, limited cover (turbidity)
-  **E4** Steep, slumping/eroding banks, CB/GR/SI, moderate depth, some BW, cover (depth/turbidity)
-  **E5** Low steep terraced banks, fines, low velocity, shallow to moderate, limited cover (turbidity)
-  **E6** Low slumping/eroding banks, CB/GR/SI, moderate depth, moderate-high velocity, high cover





**Flow Characteristics**

-  **R1** Moderate to high velocity, surface largely unbroken, usually deeper than Rf, substrate size dependent on hydraulics. Maximum depth > 1.0m
-  **R2** See R1 but with Maximum depth 0.5 - 1.0m
-  **R3** See R1 but with Maximum depth <0.5m
-  **F1** Flat - An area characterized by low velocity and near uniform flow that often lacks a definite thalweg; differentiated from pool habitat by high channel uniformity; more depositional than run habitat.



**Special Habitat Features**

-  **P1** Pool - Discrete unit with increased depth and decreased velocity, channel scour, Maximum depth > 1.0m
-  **P2** Pool - See P1 but with maximum depth 0.5 - 1.0m
-  **DP** Debris Pile - An accumulation of material including floating woody material or suspended sediment that is moved by flowing water.
-  **BW** Backwater - localized area with reverse flow direction, low velocity
-  **RF** Riffle - Moderate velocity and turbulence, substrate is large gravel / cobble typically only partially submerged, shallow relative to other channel units (~0.25m), channel profile straight to convex
-  **RA** Rapid - Turbulent flow, broken surface (standing waves), high velocity, armoured substrate (BL/BR)
-  **SN** Snye - Non-flowing water connected to flowing channel at the downstream end
-  **SL** Slough - Non-flowing waterbody isolated from flowing water except in flood events (oxbows)
-  **LJ** Log Jam - Accumulation of woody debris
-  **BG** Boulder Garden - Significant occurrence of large boulders providing significant instream cover
-  **MI** Multiple Island - More than two channels and permanent islands
-  **SI** Singular Island - Two channels around a single, permanent island
-  **NO** Navigable Obstruction - A natural physical obstacle that prevents the passage of a vessel on navigable waters and requires portaging in order to continue along the navigable water.

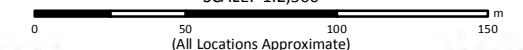
*Tributary Confluence:*

-  **TC1** Intermittent Flow, ephemeral stream
-  **TC2** Permanent watercourse, any width
-  **TCL** Tributary Confluence Left - Tributary Confluence to the left of the flow direction
-  **TCR** Tributary Confluence Right - Tributary Confluence to the right of the flow direction

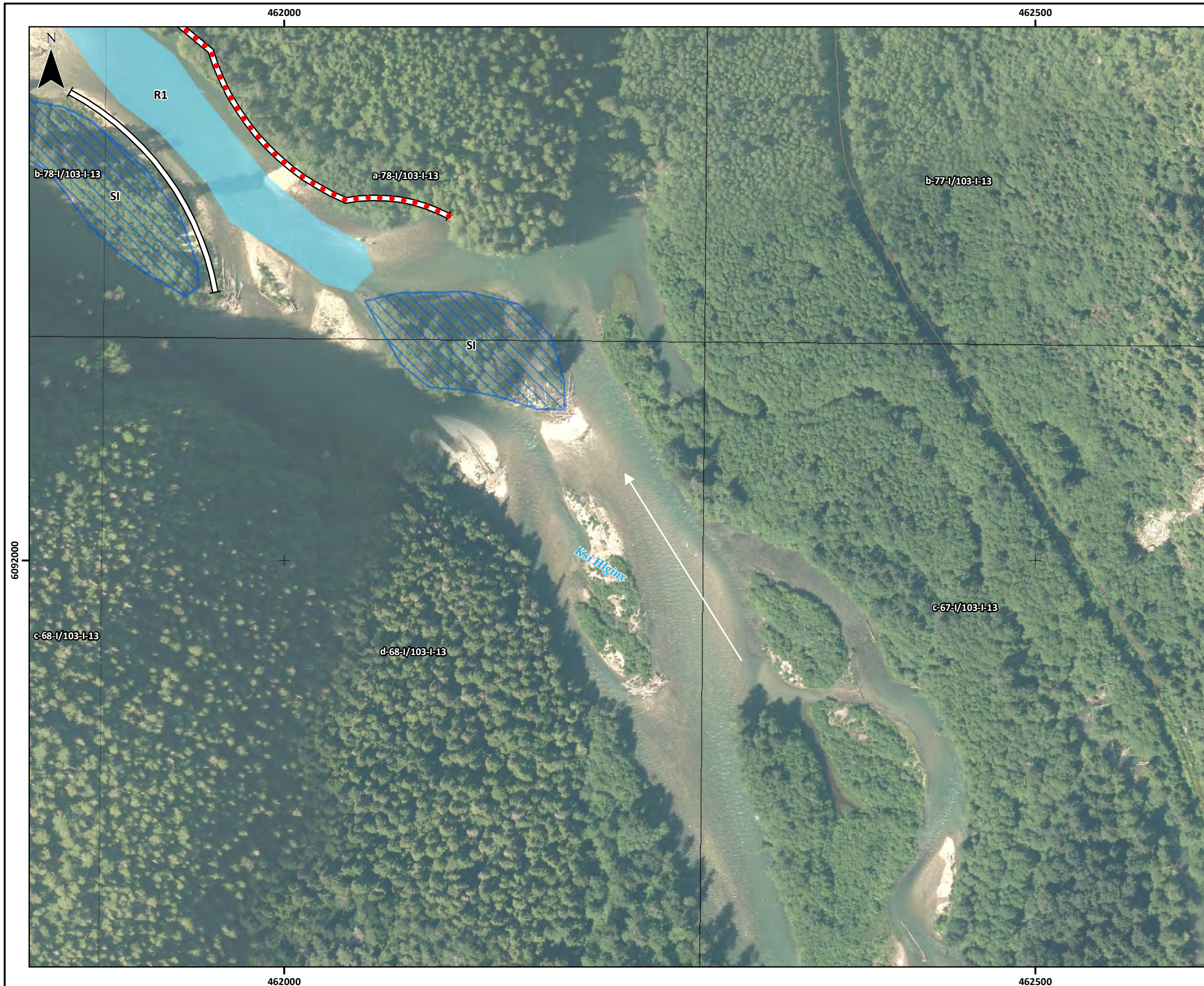
*Shoal*

-  **SHC** Shoal with coarse substrate (GR/CB/BL)
-  **SHF** Shoal with fine substrate (SA/SI)

SCALE: 1:2,500



(All Locations Approximate)  
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**FIGURE 4**  
**RIVER/ CREEK HABITAT FEATURES**  
**FOR KSI HLGINX: PWC802a**  
**SHEET 2 OF 6**

**PROPOSED WESTCOAST CONNECTOR**  
**GAS TRANSMISSION PROJECT**

**LARGE RIVER HABITAT CLASSIFICATION**

*\*See index map for additional legend and data source information*

**Bank Habitat Types**

**Armoured/Stable:**

- A1** Stable at repose, CB/BL/GR dominant, uniform shoreline, low-moderate velocity, low cover
- A2** CB/BL dominant, irregular shoreline, BW habitat, low velocity, moderate cover
- A3** see A2 with more BL and BR, irregular shoreline, moderate-high velocity and BW, high cover

**Canyon:**

- C1** Stable banks formed by valley walls, CB/BL/BR, deep, high velocity and good cover
- C2** Steep stable BR banks, regular shoreline, moderate to deep and moderate to high velocity
- C3** Moderate eroded banks formed by valley walls, FN/GR/CB, moderate-high velocity, no cover

**Depositional:**

- D1** Low relief, gently sloping bank, fines, shallow/ low velocity, low cover, associated with bars
- D2** See D1 but with GR/CB, higher velocities (riffles), associated with bars and shoals

**Erosional:**

- E1** High, steep eroded unstable banks, fines, moderate-high velocity, vegetation/depth for cover
- E2** See E1 but with no vegetative debris, offshore depth is shallower
- E3** High steep eroding banks, GR/CB/Sand deposits, limited cover (turbidity)
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**Flow Characteristics**

- R1** Moderate to high velocity, surface largely unbroken, usually deeper than RF, substrate size dependent on hydraulics. Maximum depth > 1.0m
- R2** See R1 but with Maximum depth 0.5 - 1.0m
- R3** See R1 but with Maximum depth <0.5m
- F1** Flat - An area characterized by low velocity and near uniform flow that often lacks a definite thalweg; differentiated from pool habitat by high channel uniformity; more depositional than run habitat.

**Special Habitat Features**

- P1** Pool - Discrete unit with increased depth and decreased velocity, channel scour, Maximum depth > 1.0m
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- DP** Debris Pile - An accumulation of material including floating woody material or suspended sediment that is moved by flowing water.
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- SN** Snye - Non-flowing water connected to flowing channel at the downstream end
- SL** Slough - Non-flowing waterbody isolated from flowing water except in flood events (oxbows)
- LJ** Log Jam - Accumulation of woody debris
- BG** Boulder Garden - Significant occurrence of large boulders providing significant instream cover
- MI** Multiple Island - More than two channels and permanent islands
- SI** Singular Island - Two channels around a single, permanent island
- NO** Navigable Obstruction - A natural physical obstacle that prevents the passage of a vessel on navigable waters and requires portaging in order to continue along the navigable water.

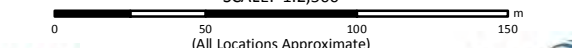
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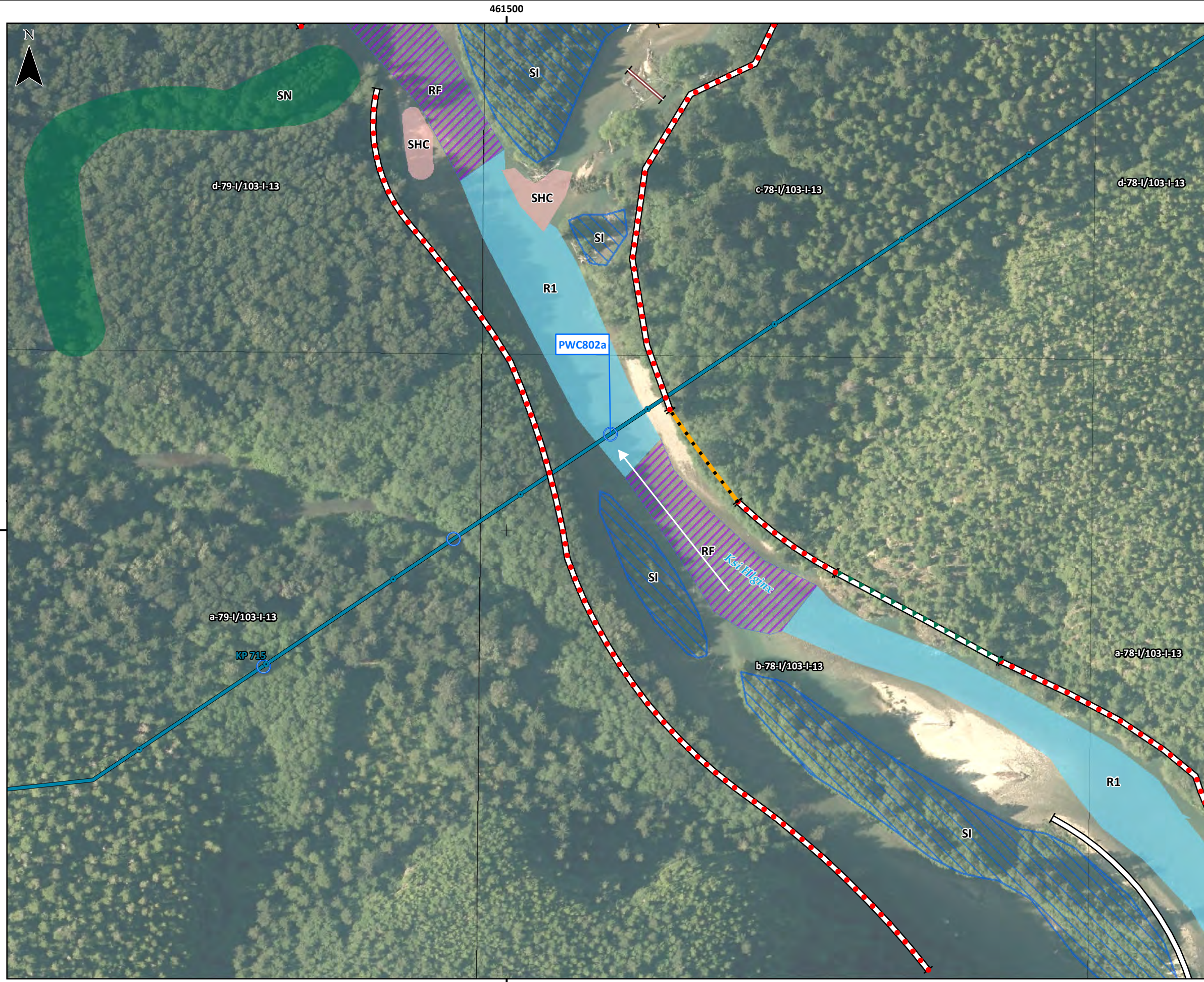
**Shoal**

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**FIGURE 4**  
**RIVER/ CREEK HABITAT FEATURES**  
**FOR KSI HLGINX: PWC802a**  
**SHEET 3 OF 6**

**PROPOSED WESTCOAST CONNECTOR**  
**GAS TRANSMISSION PROJECT**

**LARGE RIVER HABITAT CLASSIFICATION**

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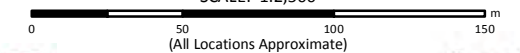
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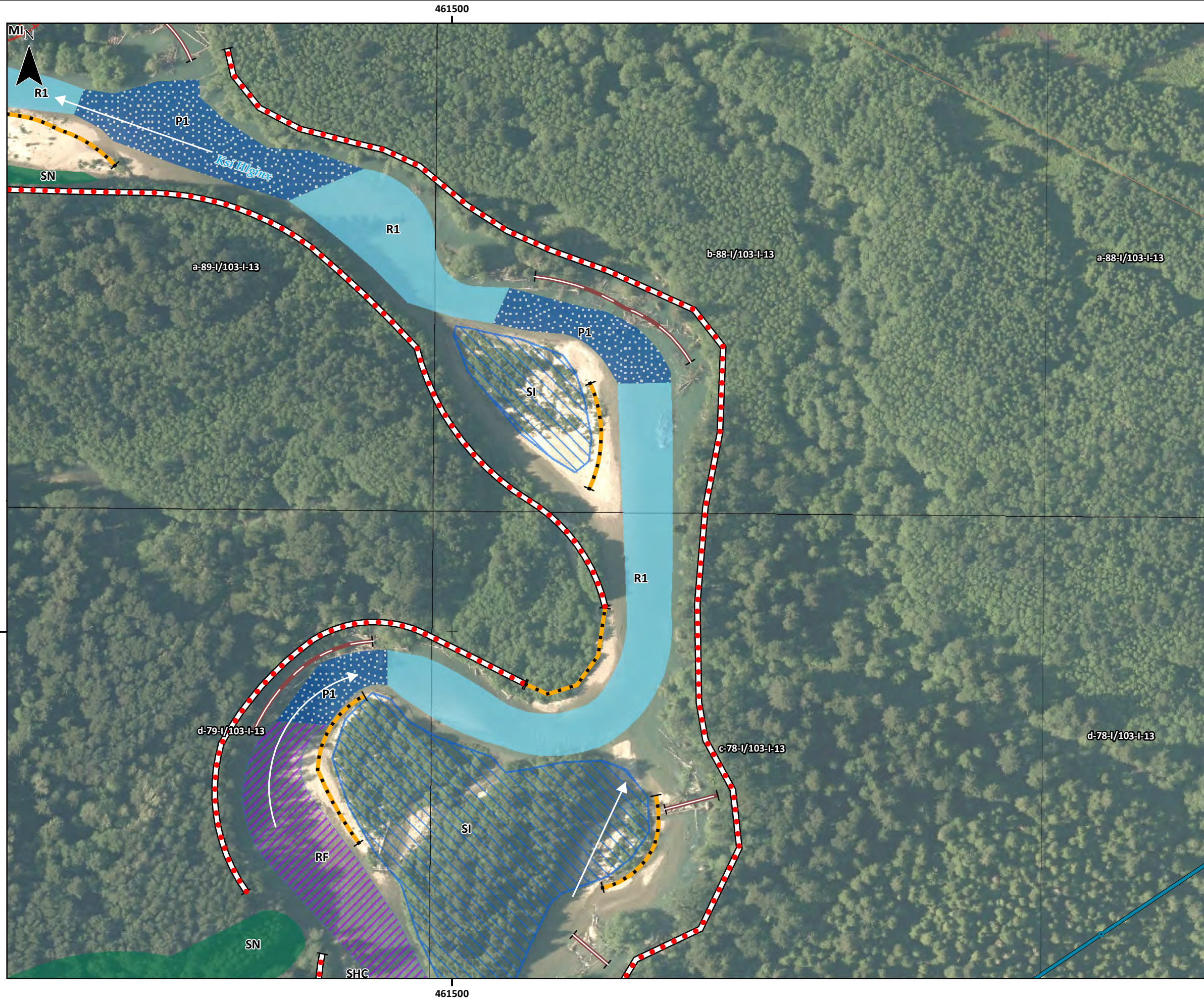


FIGURE 4  
RIVER/ CREEK HABITAT FEATURES  
FOR KSI HLGINX: PWC802a  
SHEET 4 OF 6

PROPOSED WESTCOAST CONNECTOR  
GAS TRANSMISSION PROJECT

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- SI** Singular Island - Two channels around a single, permanent island
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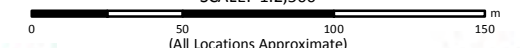
*Tributary Confluence:*

- TC1** Intermittent Flow, ephemeral stream
- TC2** Permanent watercourse, any width
- TCL** Tributary Confluence Left - Tributary Confluence to the left of the flow direction
- TCR** Tributary Confluence Right - Tributary Confluence to the right of the flow direction

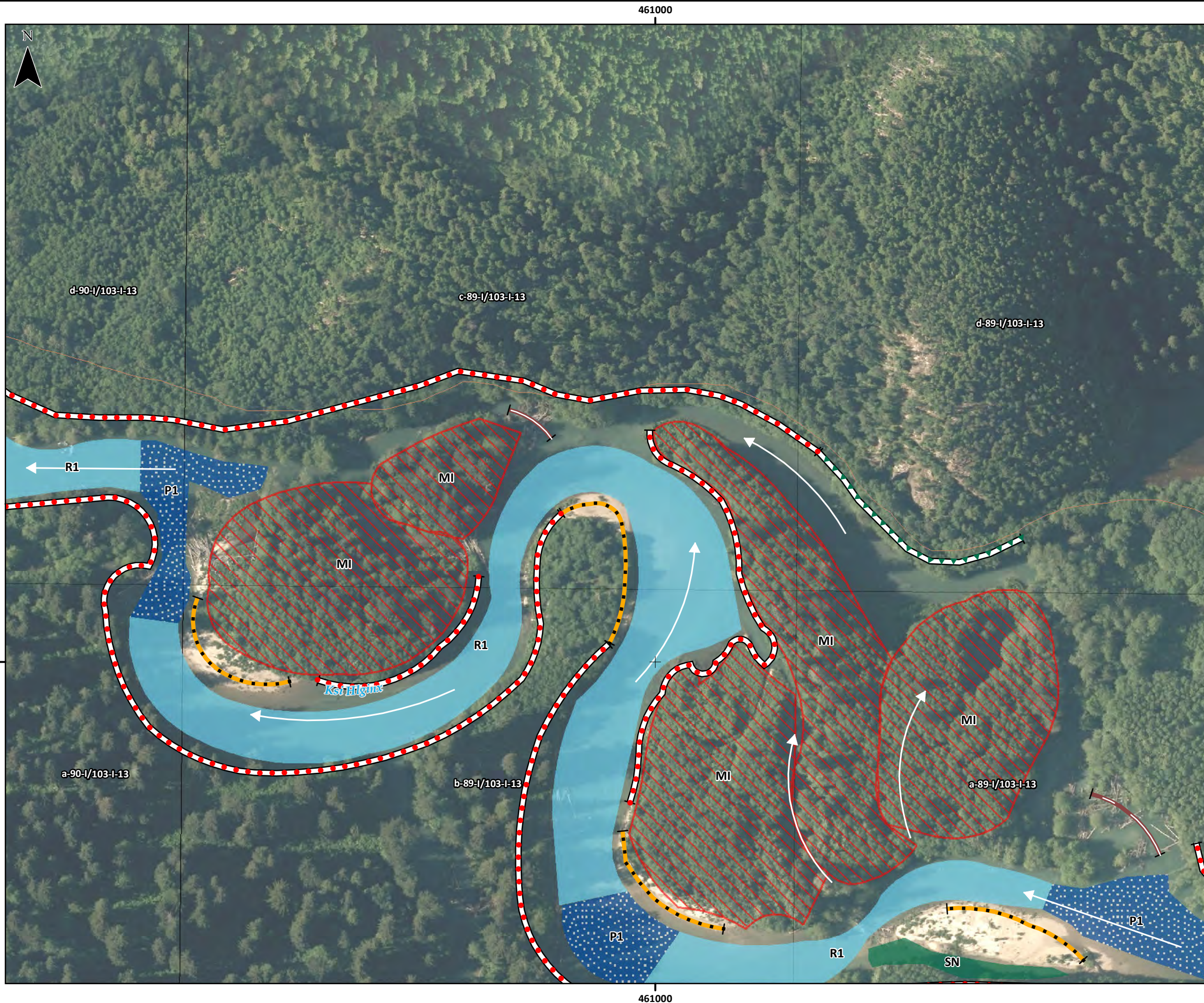
*Shoal*

- SHC** Shoal with coarse substrate (GR/CB/BL)
- SHF** Shoal with fine substrate (SA/SI)

SCALE: 1:2,500



(All Locations Approximate)  
Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.



461000

461000

6093500

6093500



**FIGURE 4**  
**RIVER/ CREEK HABITAT FEATURES**  
**FOR KSI HGINX: PWC802a**  
**SHEET 5 OF 6**

**PROPOSED WESTCOAST CONNECTOR**  
**GAS TRANSMISSION PROJECT**

**LARGE RIVER HABITAT CLASSIFICATION**

*\*See index map for additional legend and data source information*

**Bank Habitat Types**

**Armoured/Stable:**

- A1** Stable at repose, CB/BL/GR dominant, uniform shoreline, low-moderate velocity, low cover
- A2** CB/BL dominant, irregular shoreline, BW habitat, low velocity, moderate cover
- A3** see A2 with more BL and BR, irregular shoreline, moderate-high velocity and BW, high cover

**Canyon:**

- C1** Stable banks formed by valley walls, CB/BL/BR, deep, high velocity and good cover
- C2** Steep stable BR banks, regular shoreline, moderate to deep and moderate to high velocity
- C3** Moderate eroded banks formed by valley walls, FN/GR/CB, moderate-high velocity, no cover

**Depositional:**

- D1** Low relief, gently sloping bank, fines, shallow/ low velocity, low cover, associated with bars
- D2** See D1 but with GR/CB, higher velocities (riffles), associated with bars and shoals

**Erosional:**

- E1** High, steep eroded unstable banks, fines, moderate-high velocity, vegetation/depth for cover
- E2** See E1 but with no vegetative debris, offshore depth is shallower
- E3** High steep eroding banks, GR/CB/Sand deposits, limited cover (turbidity)
- E4** Steep, slumping/eroding banks, CB/GR/SI, moderate depth, some BW, cover (depth/turbidity)
- E5** Low steep terraced banks, fines, low velocity, shallow to moderate, limited cover (turbidity)
- E6** Low slumping/eroding banks, CB/GR/SI, moderate depth, moderate-high velocity, high cover

**Flow Characteristics**

- R1** Moderate to high velocity, surface largely unbroken, usually deeper than RF, substrate size dependent on hydraulics. Maximum depth > 1.0m
- R2** See R1 but with Maximum depth 0.5 - 1.0m
- R3** See R1 but with Maximum depth <0.5m
- F1** Flat - An area characterized by low velocity and near uniform flow that often lacks a definite thalweg; differentiated from pool habitat by high channel uniformity; more depositional than run habitat.

**Special Habitat Features**

- P1** Pool - Discrete unit with increased depth and decreased velocity, channel scour, Maximum depth > 1.0m
- P2** Pool - See P1 but with maximum depth 0.5 - 1.0m
- DP** Debris Pile - An accumulation of material including floating woody material or suspended sediment that is moved by flowing water.
- BW** Backwater - localized area with reverse flow direction, low velocity
- RF** Riffle - Moderate velocity and turbulence, substrate is large gravel / cobble typically only partially submerged, shallow relative to other channel units (~0.25m), channel profile straight to convex
- RA** Rapid - Turbulent flow, broken surface (standing waves), high velocity, armoured substrate (BL/BR)
- SN** Snye - Non-flowing water connected to flowing channel at the downstream end
- SL** Slough - Non-flowing waterbody isolated from flowing water except in flood events (oxbows)
- LJ** Log Jam - Accumulation of woody debris
- BG** Boulder Garden - Significant occurrence of large boulders providing significant instream cover
- MI** Multiple Island - More than two channels and permanent islands
- SI** Singular Island - Two channels around a single, permanent island
- NO** Navigable Obstruction - A natural physical obstacle that prevents the passage of a vessel on navigable waters and requires portaging in order to continue along the navigable water.

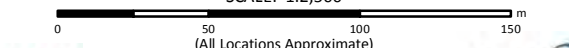
**Tributary Confluence:**

- TC1** Intermittent Flow, ephemeral stream
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- TCR** Tributary Confluence Right - Tributary Confluence to the right of the flow direction

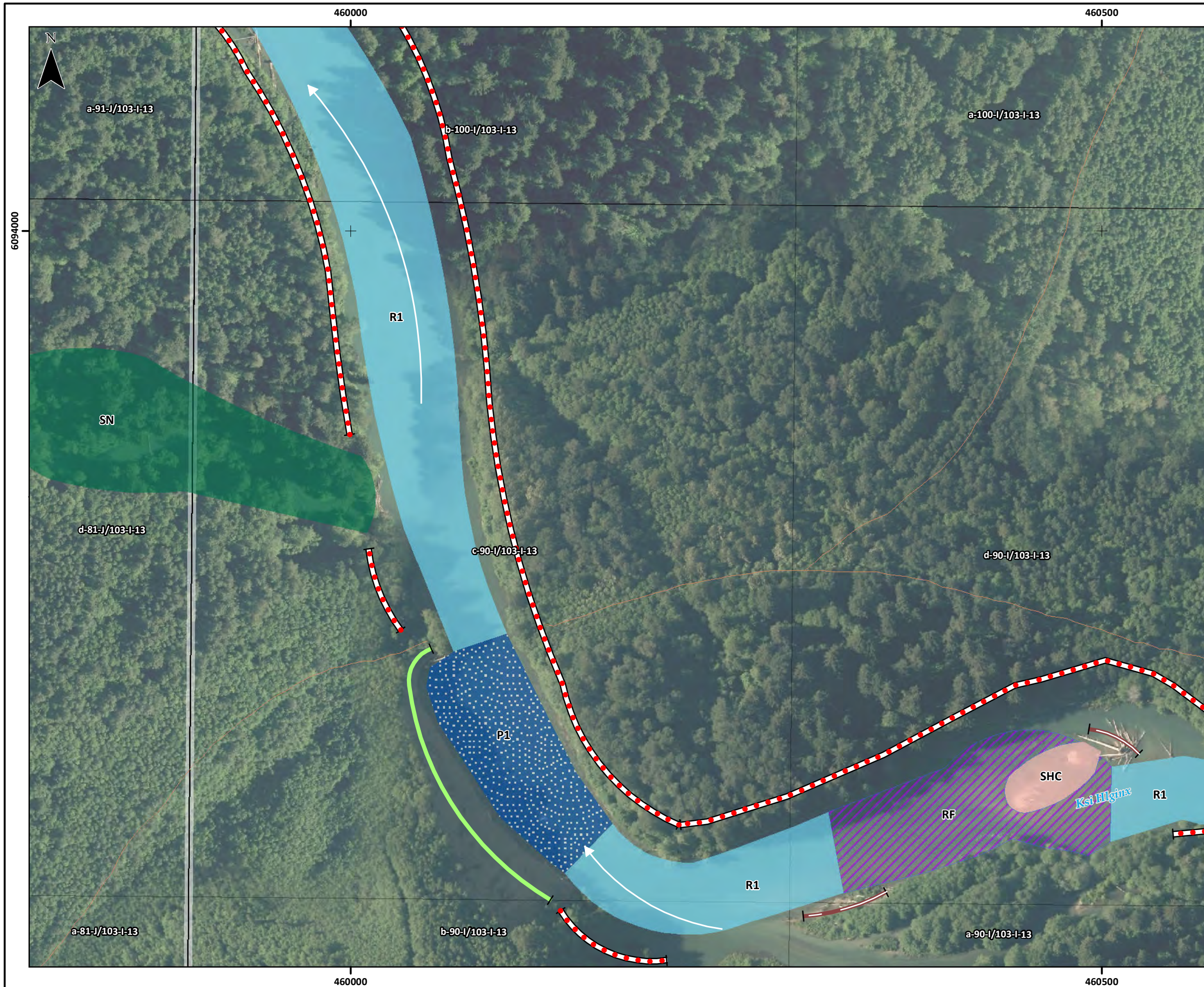
**Shoal**

- SHC** Shoal with coarse substrate (GR/CB/BL)
- SHF** Shoal with fine substrate (SA/SI)

SCALE: 1:2,500



(All Locations Approximate)  
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**FIGURE 4**  
**RIVER/ CREEK HABITAT FEATURES**  
**FOR KSI HGINX: PWC802a**  
**SHEET 6 OF 6**

**PROPOSED WESTCOAST CONNECTOR**  
**GAS TRANSMISSION PROJECT**

- LARGE RIVER HABITAT CLASSIFICATION**  
*\*See index map for additional legend and data source information*
- Bank Habitat Types**
- Armoured/Stable:*
- A1** Stable at repose, CB/BL/GR dominant, uniform shoreline, low-moderate velocity, low cover
  - A2** CB/BL dominant, irregular shoreline, BW habitat, low velocity, moderate cover
  - A3** see A2 with more BL and BR, irregular shoreline, moderate-high velocity and BW, high cover
- Canyon:*
- C1** Stable banks formed by valley walls, CB/BL/BR, deep, high velocity and good cover
  - C2** Steep stable BR banks, regular shoreline, moderate to deep and moderate to high velocity
  - C3** Moderate eroded banks formed by valley walls, FN/GR/CB, moderate-high velocity, no cover
- Depositional:*
- D1** Low relief, gently sloping bank, fines, shallow/ low velocity, low cover, associated with bars
  - D2** See D1 but with GR/CB, higher velocities (riffles), associated with bars and shoals
- Erosional:*
- E1** High, steep eroded unstable banks, fines, moderate-high velocity, vegetation/depth for cover
  - E2** See E1 but with no vegetative debris, offshore depth is shallower
  - E3** High steep eroding banks, GR/CB/Sand deposits, limited cover (turbidity)
  - E4** Steep, slumping/eroding banks, CB/GR/SI, moderate depth, some BW, cover (depth/turbidity)
  - E5** Low steep terraced banks, fines, low velocity, shallow to moderate, limited cover (turbidity)
  - E6** Low slumping/eroding banks, CB/GR/SI, moderate depth, moderate-high velocity, high cover
- Flow Characteristics**
- R1** Moderate to high velocity, surface largely unbroken, usually deeper than Rf, substrate size dependent on hydraulics. Maximum depth > 1.0m
  - R2** See R1 but with Maximum depth 0.5 - 1.0m
  - R3** See R1 but with Maximum depth <0.5m
  - F1** Flat - An area characterized by low velocity and near uniform flow that often lacks a definite thalweg; differentiated from pool habitat by high channel uniformity; more depositional than run habitat.
- Special Habitat Features**
- P1** Pool - Discrete unit with increased depth and decreased velocity, channel scour, Maximum depth > 1.0m
  - P2** Pool - See P1 but with maximum depth 0.5 - 1.0m
  - DP** Debris Pile - An accumulation of material including floating woody material or suspended sediment that is moved by flowing water.
  - BW** Backwater - localized area with reverse flow direction, low velocity
  - RF** Riffle - Moderate velocity and turbulence, substrate is large gravel / cobble typically only partially submerged, shallow relative to other channel units (~0.25m), channel profile straight to convex
  - RA** Rapid - Turbulent flow, broken surface (standing waves), high velocity, armoured substrate (BL/BR)
  - SN** Snye - Non-flowing water connected to flowing channel at the downstream end
  - SL** Slough - Non-flowing waterbody isolated from flowing water except in flood events (oxbows)
  - LJ** Log Jam - Accumulation of woody debris
  - BG** Boulder Garden - Significant occurrence of large boulders providing significant instream cover
  - MI** Multiple Island - More than two channels and permanent islands
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  - TC2** Permanent watercourse, any width
  - TCL** Tributary Confluence Left - Tributary Confluence to the left of the flow direction
  - TCR** Tributary Confluence Right - Tributary Confluence to the right of the flow direction
- Shoal**
- SHC** Shoal with coarse substrate (GR/CB/BL)
  - SHF** Shoal with fine substrate (SA/SI)

SCALE: 1:3,000

(All Locations Approximate)

tera ENVIRONMENTAL CONSULTANTS

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Spectra Energy

18018\_Fish\_Habitat\_Creek\_Mapping.mxd

**APPENDIX G**  
**FISH HABITAT POTENTIAL RATINGS SUMMARY TABLE**

**SUMMARY OF FISH HABITAT POTENTIAL RATINGS**

PWC Site	Stream Name (Alias) (Watershed Code)	Fish Species	Fish Habitat Potential Ratings				
			Spawning	Rearing	Wintering	Adult Suitability	Migration
724a	North Seaskinnish Creek (500-201900-24100)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
		Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
732a	North Seaskinnish Creek (500-201900-24100)	Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Marginal/ Unsuitable
		Trout	Unsuitable	Marginal	Unsuitable	Unsuitable	
		Char	Unsuitable	Marginal	Unsuitable	Unsuitable	
733a	North Seaskinnish Creek (500-201900-24100)	Coho salmon	Important	Important	Important	Unsuitable	Important
		Trout	Important	Important	Important	Important	
		Char	Important	Important	Important	Important	
737a	Ksi Sgasginist (Seaskinnish River) (500-201900)	Coho salmon	Marginal	Marginal	Unsuitable	Unsuitable	Marginal
		Trout	Marginal	Marginal	Unsuitable	Marginal	
		Char	Marginal	Marginal	Unsuitable	Marginal	
738a	Unnamed tributary to Gingit Creek (no watershed code)	Coho salmon	Marginal	Important	Marginal	Unsuitable	Marginal
		Trout	Important	Important	Marginal	Marginal	
		Char	Important	Important	Marginal	Marginal	
740a	Gingit Creek (500-185700-00300)	Coho salmon	Important	Important	Marginal	Unsuitable	Important
		Trout	Important	Important	Marginal	Marginal	
		Char	Important	Important	Marginal	Marginal	
741a	Unnamed tributary to Gingit Creek (no watershed code)	Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Marginal	Unsuitable	Unsuitable	
		Char	Unsuitable	Marginal	Unsuitable	Unsuitable	
2500	Unnamed tributary to Gingit Creek (no watershed code)	Coho salmon	Unsuitable	Important	Marginal	Unsuitable	Marginal
		Trout	Marginal	Important	Marginal	Marginal	
		Char	Marginal	Important	Marginal	Marginal	
2501	Unnamed tributary to Gingit Creek (no watershed code)	Coho salmon	Marginal	Important	Marginal	Unsuitable	Important/ Marginal
		Trout	Important	Important	Marginal	Marginal	
		Char	Important	Important	Marginal	Marginal	
2503	Gitzyon Creek (500-185700-05200)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
		Char	Marginal	Marginal	Unsuitable	Marginal	
2508	Unnamed tributary to Mcleod Creek (no watershed code)	Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Marginal	Unsuitable	Unsuitable	
		Char	Unsuitable	Marginal	Unsuitable	Unsuitable	
743a	Gitzyon Creek (500-185700-05200)	Coho salmon	Marginal	Marginal	Unsuitable	Unsuitable	Marginal/ Unsuitable
		Trout	Marginal	Marginal	Unsuitable	Unsuitable	
		Char	Important	Important	Marginal	Marginal	

PWC Site	Stream Name (Alias) (Watershed Code)	Fish Species	Fish Habitat Potential Ratings				
			Spawning	Rearing	Wintering	Adult Suitability	Migration
744a	Unnamed tributary to Mcleod Creek (no watershed code)	Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Marginal
		Trout	Unsuitable	Marginal	Unsuitable	Marginal	
		Char	Unsuitable	Marginal	Unsuitable	Marginal	
2146	Mcleod Creek (no watershed code)	Coho salmon	Unsuitable	Marginal	Marginal	Unsuitable	Marginal
		Trout	Unsuitable	Marginal	Marginal	Marginal	
		Char	Unsuitable	Marginal	Marginal	Marginal	
746a	Ksi Sii Aks (Ganor Creek, Tseax River) (500-185700)	Coho salmon	Essential	Essential	Essential	Unsuitable	Essential
		Trout	Essential	Essential	Essential	Essential	
		Char	Essential	Essential	Essential	Essential	
747a	Vetter Creek (unnamed tributary to Lower Vetter) (500-185700-16700)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Marginal/ Unsuitable
		Trout	Important	Important	Important	Important	
		Char	Important	Important	Important	Important	
748a	Unnamed tributary to Vetter Creek (no watershed code)	Coho salmon	Unsuitable	Marginal	Marginal	Unsuitable	Unsuitable
		Trout	Unsuitable	Marginal	Marginal	Marginal	
		Char	Unsuitable	Marginal	Marginal	Marginal	
749b	Unnamed tributary to Vetter Creek (no watershed code)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
		Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
753a	Vetter Creek (unnamed tributary to Lower Vetter) (500-185700-16700)	Coho salmon	Marginal	Marginal	Marginal	Unsuitable	Unsuitable
		Trout	Marginal	Important	Important	Important	
		Char	Important	Important	Important	Important	
754a	Unnamed tributary to Vetter Creek (no watershed code)	Coho salmon	Unsuitable	Marginal	Marginal	Unsuitable	Marginal
		Trout	Unsuitable	Marginal	Marginal	Marginal	
		Char	Unsuitable	Marginal	Marginal	Marginal	
756a	Unnamed tributary to Vetter Creek (no watershed code)	Coho salmon	Marginal	Important	Unsuitable	Unsuitable	Marginal
		Trout	Important	Important	Unsuitable	Unsuitable	
		Char	Important	Important	Unsuitable	Unsuitable	
757a	Unnamed tributary to Ts'oohl Ts'ap (no watershed code)	Coho salmon	Marginal	Important	Unsuitable	Unsuitable	Marginal
		Trout	Important	Important	Unsuitable	Unsuitable	
		Char	Important	Important	Unsuitable	Unsuitable	
2042.1	Unnamed tributary to Ksi Ts'oohl Ts'ap (no watershed code)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
		Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
2042	Unnamed tributary to Ksi Ts'oohl Ts'ap (no watershed code)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
		Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
2043	Unnamed tributary to Ksi Ts'oohl Ts'ap (no watershed code)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
		Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	

PWC Site	Stream Name (Alias) (Watershed Code)	Fish Species	Fish Habitat Potential Ratings				
			Spawning	Rearing	Wintering	Adult Suitability	Migration
2044	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
		Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
2045	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
		Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
2046	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
		Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
2046.1	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
		Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
2047	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
		Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
2048	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
		Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
2049a	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Marginal	Unsuitable	Unsuitable	
		Char	Unsuitable	Marginal	Unsuitable	Unsuitable	
2051	Ksi Ts'ooihl Ts'ap (Zolzap Creek) (500-155400)	Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Marginal
		Trout	Unsuitable	Marginal	Unsuitable	Unsuitable	
		Char	Unsuitable	Marginal	Unsuitable	Marginal	
2053	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Marginal
		Trout	Unsuitable	Marginal	Unsuitable	Unsuitable	
		Char	Unsuitable	Marginal	Unsuitable	Unsuitable	
2054	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	Coho salmon	Important	Important	Marginal	Unsuitable	Marginal
		Trout	Important	Important	Marginal	Marginal	
		Char	Important	Important	Marginal	Marginal	
2055	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	Coho salmon	Unsuitable	Marginal	Marginal	Unsuitable	Marginal
		Trout	Unsuitable	Marginal	Marginal	Marginal	
		Char	Unsuitable	Marginal	Marginal	Marginal	
2056	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	Coho salmon	Unsuitable	Marginal	Marginal	Unsuitable	Marginal
		Trout	Unsuitable	Marginal	Unsuitable	Unsuitable	
		Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
2057.1	Unnamed tributary to Ksi Ts'ooihl Ts'ap (no watershed code)	Coho salmon	Unsuitable	Marginal	Marginal	Unsuitable	Marginal
		Trout	Unsuitable	Marginal	Unsuitable	Unsuitable	
		Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	

PWC Site	Stream Name (Alias) (Watershed Code)	Fish Species	Fish Habitat Potential Ratings				
			Spawning	Rearing	Wintering	Adult Suitability	Migration
2057	Unnamed tributary to Ksi Ts'oohl Ts'ap (no watershed code)	Coho salmon	Unsuitable	Marginal	Marginal	Unsuitable	Marginal
		Trout	Unsuitable	Marginal	Marginal	Unsuitable	
		Char	Unsuitable	Marginal	Marginal	Unsuitable	
2059	Unnamed tributary to Ksi Ts'oohl Ts'ap (no watershed code)	Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Marginal
		Trout	Unsuitable	Marginal	Unsuitable	Unsuitable	
		Char	Unsuitable	Marginal	Unsuitable	Unsuitable	
760a	Unnamed tributary to Ksi Ts'oohl Ts'ap (no watershed code)	Coho salmon	Marginal	Marginal	Marginal	Unsuitable	Marginal
		Trout	Marginal	Marginal	Marginal	Marginal	
		Char	Marginal	Marginal	Marginal	Marginal	
761a	Unnamed tributary to Ksi Ts'oohl Ts'ap (no watershed code)	Coho salmon	Marginal	Important	Marginal	Unsuitable	Marginal
		Trout	Marginal	Important	Marginal	Marginal	
		Char	Marginal	Important	Marginal	Marginal	
762a	Unnamed tributary to Ksi Ts'oohl Ts'ap (no watershed code)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
		Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
767a	Unnamed tributary to Kwinyarh Creek (North Kwinyarh Creek) (no watershed code)	Coho salmon	Marginal	Marginal	Marginal	Unsuitable	Marginal
		Trout	Marginal	Marginal	Marginal	Marginal	
		Char	Marginal	Marginal	Marginal	Marginal	
2509	Unnamed tributary to Ksi Ts'oohl Ts'ap (500-155000)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
		Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
2514	Unnamed tributary to Kwinyarh Creek (North Kwinyarh Creek) (no watershed code)	Coho salmon	Marginal	Marginal	Marginal	Unsuitable	Marginal/ Unsuitable
		Trout	Important	Important	Important	Important	
		Char	Important	Important	Important	Important	
768a	Kwinyarh Creek (500-136800)	Coho salmon	Important	Important	Marginal	Unsuitable	Essential/ Important
		Trout	Important	Important	Marginal	Marginal	
		Char	Important	Important	Marginal	Marginal	
771a	Unnamed tributary to Ansedagan Creek (500-134700-06000)	Coho salmon	Unsuitable	Important	Marginal	Unsuitable	Marginal
		Trout	Marginal	Important	Marginal	Marginal	
		Char	Marginal	Important	Marginal	Marginal	
772a	Ansedagan Creek (500-134700)	Coho salmon	Important	Important	Important	Unsuitable	Important
		Trout	Important	Important	Important	Important	
		Char	Important	Important	Important	Important	
773a	Unnamed tributary to Nass River (no watershed code)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
		Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
775a	Unnamed tributary to Ksemamaith Creek (no watershed code)	Coho salmon	Unsuitable	Marginal	Marginal	Unsuitable	Marginal
		Trout	Unsuitable	Marginal	Marginal	Marginal	
		Char	Unsuitable	Marginal	Marginal	Marginal	

PWC Site	Stream Name (Alias) (Watershed Code)	Fish Species	Fish Habitat Potential Ratings				
			Spawning	Rearing	Wintering	Adult Suitability	Migration
776a	Ksemamaith Creek (Kseaden Creek) (500-114800)	Coho salmon	Important	Important	Marginal	Unsuitable	Important
		Trout	Important	Important	Marginal	Important	
		Char	Important	Important	Marginal	Important	
777a	Unnamed tributary to Ksi Mat'in (no watershed code)	Coho salmon	Marginal	Important	Important	Unsuitable	Marginal
		Trout	Marginal	Important	Important	Marginal	
		Char	Marginal	Important	Important	Marginal	
779a	Unnamed tributary to Ksi Mat'in (no watershed code)	Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Marginal	Unsuitable	Unsuitable	
		Char	Unsuitable	Marginal	Unsuitable	Unsuitable	
780.1	Ksi Mat'in (no watershed code)	Coho salmon	Important	Important	Unsuitable	Unsuitable	Marginal
		Trout	Important	Important	Unsuitable	Marginal	
		Char	Important	Important	Unsuitable	Marginal	
781a	Ksi Mat'in (Ksedin Creek, Kwiniak Creek) (500-112000)	Coho salmon	Marginal	Important	Marginal	Unsuitable	Important
		Trout	Marginal	Important	Marginal	Important	
		Char	Marginal	Important	Marginal	Important	
2060	Unnamed tributary to Ksi Mat'in (no watershed code)	Coho salmon	Marginal	Important	Important	Unsuitable	Marginal
		Trout	Marginal	Important	Important	Marginal	
		Char	Marginal	Important	Important	Marginal	
2060.1	Unnamed tributary to Ksi Mat'in (no watershed code)	Coho salmon	Important	Important	Unsuitable	Unsuitable	Marginal
		Trout	Important	Important	Unsuitable	Marginal	
		Char	Important	Important	Unsuitable	Marginal	
2061	Ksi Mat'in (Ksedin Creek, Kwiniak Creek) (500-112000)	Coho salmon	Marginal	Important	Marginal	Unsuitable	Important
		Trout	Marginal	Important	Marginal	Important	
		Char	Marginal	Important	Marginal	Important	
785a	Unnamed tributary to Ginlulak Creek (East Ginlulak Creek) (no watershed code)	Coho salmon	Important	Important	Unsuitable	Unsuitable	Important
		Trout	Important	Important	Unsuitable	Marginal	
		Char	Important	Important	Unsuitable	Marginal	
786a	Unnamed tributary to Ginlulak Creek (no watershed code)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
		Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
787a	Ginlulak Creek (500-090500)	Coho salmon	Marginal	Important	Marginal	Unsuitable	Marginal
		Trout	Marginal	Important	Marginal	Marginal	
		Char	Marginal	Important	Marginal	Marginal	
788a	Unnamed tributary to Ginlulak Creek (no watershed code)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Marginal/ Unsuitable
		Trout	Marginal	Marginal	Marginal	Marginal	
		Char	Important	Important	Marginal	Important	
788b	Unnamed tributary to Ginlulak Creek (no watershed code)	Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Unsuitable
		Trout	Marginal	Marginal	Unsuitable	Unsuitable	
		Char	Marginal	Marginal	Unsuitable	Unsuitable	

PWC Site	Stream Name (Alias) (Watershed Code)	Fish Species	Fish Habitat Potential Ratings				
			Spawning	Rearing	Wintering	Adult Suitability	Migration
789a	Unnamed tributary to Ginlulak Creek (no watershed code)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
		Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
790a	Unnamed tributary to Ginlulak Creek (no watershed code)	Coho salmon	Unsuitable	Important	Unsuitable	Unsuitable	Unsuitable
		Trout	Marginal	Marginal	Unsuitable	Unsuitable	
		Char	Marginal	Marginal	Unsuitable	Unsuitable	
791a	Unnamed tributary to Nass River (500-090000)	Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Marginal/ Unsuitable
		Trout	Unsuitable	Marginal	Unsuitable	Unsuitable	
		Char	Unsuitable	Important	Unsuitable	Unsuitable	
792a	Unnamed tributary to Nass River (no watershed code)	Coho salmon	Marginal	Important	Unsuitable	Unsuitable	Unsuitable
		Trout	Important	Important	Unsuitable	Important	
		Char	Important	Important	Unsuitable	Important	
793a	Unnamed tributary to Nass River (500-084900)	Coho salmon	Marginal	Marginal	Marginal	Unsuitable	Marginal
		Trout	Marginal	Marginal	Marginal	Marginal	
		Char	Marginal	Marginal	Marginal	Marginal	
794a	Unnamed tributary to Nass River (no watershed code)	Coho salmon	Unsuitable	Important	Important	Unsuitable	Marginal/ Unsuitable
		Trout	Important	Important	Important	Important	
		Char	Important	Important	Important	Important	
796a	Quilgauw Creek (500-075000)	Coho salmon	Unsuitable	Important	Marginal	Unsuitable	Essential/ Important
		Trout	Unsuitable	Important	Marginal	Marginal	
		Char	Unsuitable	Important	Marginal	Marginal	
798a	Unnamed tributary to Quilgauw Creek (no watershed code)	Coho salmon	Unsuitable	Important	Important	Unsuitable	Marginal
		Trout	Unsuitable	Important	Important	Marginal	
		Char	Unsuitable	Important	Important	Marginal	
799a	Unnamed tributary to Ksi Hlginx (no watershed code)	Coho salmon	Unsuitable	Important	Unsuitable	Unsuitable	Marginal
		Trout	Unsuitable	Important	Unsuitable	Unsuitable	
		Char	Unsuitable	Important	Unsuitable	Unsuitable	
800a.1	Unnamed tributary to Ksi Hlginx (no watershed code)	Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Marginal/ Unsuitable
		Trout	Unsuitable	Marginal	Unsuitable	Unsuitable	
		Char	Unsuitable	Marginal	Unsuitable	Unsuitable	
801a	Ksi Hlginx Side Channel (Ishkeenickh River) -510	Coho salmon	Important	Important	Important	Unsuitable	Important
		Trout	Important	Important	Important	Important	
		Char	Important	Important	Important	Important	
802a	Ksi Hlginx (Ishkeenickh River) -510	Coho salmon	Important	Important	Important	Unsuitable	Essential/ Important
		Trout	Marginal	Important	Important	Important	
		Char	Important	Important	Important	Important	
803a	Unnamed tributary to Ksi Hlginx (no watershed code)	Coho salmon	Important	Important	Important	Unsuitable	Important
		Trout	Marginal	Important	Important	Important	
		Char	Marginal	Important	Important	Important	



PWC Site	Stream Name (Alias) (Watershed Code)	Fish Species	Fish Habitat Potential Ratings				
			Spawning	Rearing	Wintering	Adult Suitability	Migration
804b	Unnamed tributary to Ksi Hlginx (no watershed code)	Coho salmon	Marginal	Important	Unsuitable	Unsuitable	Important
		Trout	Important	Important	Unsuitable	Marginal	
		Char	Important	Important	Unsuitable	Marginal	
804c	Unnamed tributary to Ksi Hlginx (no watershed code)	Coho salmon	Important	Important	Marginal	Unsuitable	Important
		Trout	Important	Important	Marginal	Marginal	
		Char	Important	Important	Marginal	Marginal	
805a	Unnamed tributary to Ksi Hlginx (no watershed code)	Coho salmon	Important	Important	Marginal	Unsuitable	Important
		Trout	Important	Important	Marginal	Marginal	
		Char	Important	Important	Marginal	Marginal	
805b	Unnamed tributary to Ksi Hlginx (no watershed code)	Coho salmon	Marginal	Important	Unsuitable	Unsuitable	Marginal
		Trout	Important	Important	Unsuitable	Unsuitable	
		Char	Important	Important	Unsuitable	Unsuitable	
806a	Unnamed tributary to Nass River (500-058200)	Coho salmon	Important	Important	Marginal	Unsuitable	Marginal
		Trout	Important	Important	Marginal	Important	
		Char	Important	Important	Marginal	Unsuitable	
806b	Unnamed tributary to Nass River (no watershed code)	Coho salmon	Important	Important	Unsuitable	Unsuitable	Important
		Trout	Important	Important	Important	Important	
		Char	Important	Important	Marginal	Important	
808a	Unnamed tributary to Nass River (no watershed code)	Coho salmon	Unsuitable	Important	Marginal	Unsuitable	Unsuitable
		Trout	Unsuitable	Important	Marginal	Unsuitable	
		Char	Unsuitable	Important	Unsuitable	Unsuitable	
808b	Unnamed tributary to Nass River (no watershed code)	Coho salmon	Marginal	Marginal	Unsuitable	Unsuitable	Marginal
		Trout	Marginal	Marginal	Marginal	Unsuitable	
		Char	Marginal	Marginal	Unsuitable	Unsuitable	
809a	Unnamed tributary to Nass River (500-053700)	Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Marginal
		Trout	Unsuitable	Marginal	Marginal	Marginal	
		Char	Unsuitable	Marginal	Unsuitable	Unsuitable	
810a	Unnamed tributary to Nass River (500-051800)	Coho salmon	Marginal	Important	Marginal	Unsuitable	Marginal
		Trout	Marginal	Important	Marginal	Unsuitable	
		Char	Marginal	Important	Marginal	Unsuitable	
811b	Unnamed tributary to Nass River (no watershed code)	Coho salmon	Marginal	Important	Marginal	Unsuitable	Marginal
		Trout	Marginal	Important	Marginal	Unsuitable	
		Char	Marginal	Important	Marginal	Unsuitable	
812a	Unnamed tributary to Nass River (Monkley Creek, unnamed tributary to Monkley Creek) (500-050900)	Coho salmon	Marginal	Marginal	Marginal	Unsuitable	Marginal
		Trout	Marginal	Marginal	Marginal	Marginal	
		Char	Marginal	Marginal	Marginal	Marginal	

PWC Site	Stream Name (Alias) (Watershed Code)	Fish Species	Fish Habitat Potential Ratings				
			Spawning	Rearing	Wintering	Adult Suitability	Migration
813a	Unnamed tributary to Nass River (no watershed code)	Coho salmon	Marginal	Marginal	Unsuitable	Unsuitable	Unsuitable
		Trout	Marginal	Marginal	Unsuitable	Unsuitable	
		Char	Marginal	Marginal	Unsuitable	Unsuitable	
814a	Unnamed tributary to Nass River (500-047000)	Coho salmon	Marginal	Important	Unsuitable	Unsuitable	Marginal
		Trout	Marginal	Important	Unsuitable	Unsuitable	
		Char	Marginal	Important	Unsuitable	Unsuitable	
815a	Unnamed tributary to Nass River (no watershed code)	Coho salmon	Important	Important	Marginal	Unsuitable	Marginal
		Trout	Important	Important	Marginal	Marginal	
		Char	Important	Important	Marginal	Marginal	
816a	Unnamed tributary to Nass River (500-038600)	Coho salmon	Unsuitable	Important	Unsuitable	Unsuitable	Marginal
		Trout	Unsuitable	Marginal	Unsuitable	Unsuitable	
		Char	Unsuitable	Marginal	Unsuitable	Unsuitable	
817a	Unnamed tributary to Nass River (500-038000)	Coho salmon	Important	Important	Marginal	Unsuitable	Marginal
		Trout	Important	Important	Important	Marginal	
		Char	Important	Important	Important	Important	
818a	Unnamed tributary to Nass River (500-036300)	Coho salmon	Important	Important	Marginal	Unsuitable	Marginal
		Trout	Important	Important	Marginal	Marginal	
		Char	Important	Important	Marginal	Marginal	
2515	Unnamed tributary to Nass River (500-034500)	Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Marginal/ Unsuitable
		Trout	Marginal	Marginal	Marginal	Unsuitable	
		Char	Marginal	Marginal	Marginal	Marginal	
2516	Unnamed tributary to Nass River (no watershed code)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
		Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
2517	Unnamed tributary to Nass River (no watershed code)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
		Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
2518	Unnamed tributary to Nass River (500-030700)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
		Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
2519	Unnamed tributary to Nass River (no watershed code)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
		Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
2520	Unnamed tributary to Nass River (500-029400)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
		Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
2521	Unnamed tributary to Nass River (500-018500-08500)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
		Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	

PWC Site	Stream Name (Alias) (Watershed Code)	Fish Species	Fish Habitat Potential Ratings				
			Spawning	Rearing	Wintering	Adult Suitability	Migration
2522	Unnamed tributary to Ksgyukwsa'a (no watershed code)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
		Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
2523	Ksgyukwsa'a (Burton/Barton Creek) (500-018500)	Coho salmon	Important	Marginal	Marginal	Unsuitable	Marginal/ Unsuitable
		Trout	Marginal	Marginal	Marginal	Marginal	
		Char	Important	Important	Important	Important	
819a	Unnamed tributary to Nass River (500-034500)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Marginal/ Unsuitable
		Trout	Marginal	Marginal	Marginal	Marginal	
		Char	Important	Important	Important	Important	
820a	Unnamed tributary to Nass River (no watershed code)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
		Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
2524	Unnamed tributary to Ksgyukwsa'a (no watershed code)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
		Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
826a	Ksgyukwsa'a (Burton/Barton Creek) (500-018500)	Coho salmon	Marginal	Marginal	Marginal	Unsuitable	Important/ Unsuitable
		Trout	Marginal	Marginal	Marginal	Marginal	
		Char	Important	Important	Important	Important	
828a	Unnamed tributary to Ksgyukwsa'a (no watershed code)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
		Char	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
829a	Unnamed tributary to Ksgyukwsa'a (no watershed code)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Marginal/ Unsuitable
		Trout	Unsuitable	Unsuitable	Unsuitable	Unsuitable	
		Char	Marginal	Marginal	Marginal	Marginal	
830a.1	Unnamed tributary to Ksgyukwsa'a (no watershed code)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Marginal/ Unsuitable
		Trout	Marginal	Marginal	Unsuitable	Unsuitable	
		Char	Marginal	Marginal	Marginal	Unsuitable	
830a	Unnamed tributary to Ksgyukwsa'a (no watershed code)	Coho salmon	Unsuitable	Marginal	Unsuitable	Unsuitable	Marginal/ Unsuitable
		Trout	Marginal	Marginal	Unsuitable	Unsuitable	
		Char	Marginal	Marginal	Marginal	Unsuitable	
831a	Unnamed tributary to Welda Creek (no watershed code)	Coho salmon	Important	Marginal	Important	Unsuitable	Important
		Trout	Important	Marginal	Important	Important	
		Char	Important	Marginal	Important	Important	
832a	Welda Creek (500-016300)	Coho salmon	Important	Marginal	Important	Unsuitable	Marginal
		Trout	Important	Marginal	Important	Important	
		Char	Important	Marginal	Important	Important	
1033a	Unnamed tributary to Nass River (no watershed code)	Coho salmon	Unsuitable	Marginal	Marginal	Unsuitable	Marginal
		Trout	Unsuitable	Marginal	Marginal	Marginal	
		Char	Unsuitable	Marginal	Marginal	Marginal	

PWC Site	Stream Name (Alias) (Watershed Code)	Fish Species	Fish Habitat Potential Ratings				
			Spawning	Rearing	Wintering	Adult Suitability	Migration
1034	Unnamed tributary to Nass River (no watershed code)	Coho salmon	Unsuitable	Marginal	Marginal	Unsuitable	Marginal
		Trout	Unsuitable	Marginal	Marginal	Marginal	
		Char	Unsuitable	Marginal	Marginal	Marginal	
1034a	Unnamed tributary to Nass River (500-262200)	Coho salmon	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
		Trout	Unsuitable	Marginal	Unsuitable	Unsuitable	
		Char	Unsuitable	Marginal	Unsuitable	Unsuitable	
1038	Nass River -500	Coho salmon	Marginal	Marginal	Important	Unsuitable	Essential
		Trout	Marginal	Marginal	Important	Important	
		Char	Marginal	Marginal	Important	Important	

**APPENDIX H**  
**FISH SAMPLING EFFORTS SUMMARY TABLE**

**FISH SAMPLING EFFORTS SUMMARY TABLE**

PWC Site	Stream Name (Alias) (Watershed Code)	Sample Date	Sampling Effort	CPUE	Fish Species Captured or Observed	Number Captured	Approx. Number Observed	Fork Length Range (mm)	Previously Documented Fish Species
724a	North Seaskinnish Creek (500-201900-24100)	June 27, 2014	BPEF: 100 m, 204 s MT: 5 traps, 105 hrs	BPEF: 0 MT: 0	None	0	0	n/a	Chinook salmon, coarse or non-game fish, coho salmon, rainbow trout, steelhead, threespine stickleback
732a	North Seaskinnish Creek (500-201900-24100)	July 12, 2014	MT: 5 traps, 20 hrs	MT: 0.55	Rainbow trout	9	0	70-135	Chinook salmon, coarse or non-game fish, coho salmon, rainbow trout, steelhead, threespine stickleback
					Sculpin	2	0	40-55	
733a	North Seaskinnish Creek (500-201900-24100)	July 11, 2014	BPEF: 200 m, 349 s MT: 6 traps, 114 hrs OB: n/a	BPEF: 8.88 MT: 0.96 OB: n/a	Prickly sculpin	60	0	57-133	Chinook salmon, coarse or non-game fish, coho salmon, rainbow trout, steelhead, threespine stickleback
					Redside shiner	78	200	35-122	
					Threespine stickleback	2	0	65-71	
737a	Ksi Sgasginist (Seaskinnish River) (500-201900)	July 14, 2014	BPEF: 150 m, 210 s	BPEF: 0.48	Char	1	0	95	Chinook salmon, chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, lamprey, pink salmon, rainbow trout, sculpin, sockeye salmon, steelhead, stickleback
738a	Unnamed tributary to Gingit Creek (no watershed code)	June 12, 2014	BPEF: 100 m, 229 s MT: 5 traps, 93 hrs	BPEF: 0 MT: 0.31	Char	29	0	74-135	None
740a	Gingit Creek (500-185700-00300)	June 18, 2014	BPEF: 100 m, 250 s MT: 3 traps, 54 hrs	BPEF: 0.80 MT: 0.17	Char	11	0	64-110	Bull trout, Chinook salmon, chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, pink salmon, sockeye salmon
2500	Unnamed tributary to Gingit Creek (no watershed code)	June 14, 2014	BPEF: 100 m, 266 s	BPEF: 1.13	Char	3	0	68-74	None
2501	Unnamed tributary to Gingit Creek (no watershed code)	June 20, 2014	BPEF: 100 m, 619 s	BPEF: 1.94	Char	12	0	51-87	None
2503	Gitzyon Creek (500-185700-05200)	July 15, 2014	BPEF: 120 m, 192 s	BPEF: 0	None	0	0	n/a	Chinook salmon, chum salmon, coho salmon, Dolly Varden, pink salmon, rainbow trout, sockeye salmon
743a	Gitzyon Creek (500-185700-05200)	July 11, 2014	BPEF: 145 m, 283 s	BPEF: 3.53	Char	10	3	59-113	Chinook salmon, chum salmon, coho salmon, Dolly Varden, pink salmon, rainbow trout, sockeye salmon
744a	Unnamed tributary to Mcleod Creek (no watershed code)	June 14, 2014	BPEF: 107 m, 295 s	BPEF: 0	None	0	0	n/a	None
2146	Mcleod Creek (no watershed code)	June 14, 2014	MT: 7 traps, 164 hrs	MT: 0	None	0	0	n/a	None
748a	Unnamed tributary to Vetter Creek (no watershed code)	June 30, 2014	BPEF: 60 m, 215 s MT: 7 traps, 138 hrs	BPEF: 0 MT: 0	None	0	0	n/a	None
753a	Vetter Creek (unnamed tributary to Lower Vetter) (500-185700-16700)	July 09, 2014	BPEF: 150 m, 526 s MT: 6 traps, 108 hrs	BPEF: 3.99 MT: 0.08	Char	25	1	34-155	Bull trout, Dolly Varden, rainbow trout, steelhead
					Coastal cutthroat trout	5	0	76-130	

PWC Site	Stream Name (Alias) (Watershed Code)	Sample Date	Sampling Effort	CPUE	Fish Species Captured or Observed	Number Captured	Approx. Number Observed	Fork Length Range (mm)	Previously Documented Fish Species
754a	Unnamed tributary to Vetter Creek (no watershed code)	June 21, 2014	MT: 5 traps, 100 hrs	MT: 0	None	0	0	n/a	None
757a	Unnamed tributary to Ts'oohl Ts'ap (no watershed code)	June 20, 2014	BPEF: 320 m, 219 s	BPEF: 0	None	0	0	n/a	None
2043	Unnamed tributary to Ksi Ts'oohl Ts'ap (no watershed code)	June 19, 2014	BPEF: 50 m, 227 s MT: 4 traps, 72 hrs	BPEF: 0 MT: 0	None	0	0	n/a	None
2047	Unnamed tributary to Ksi Ts'oohl Ts'ap (no watershed code)	June 15, 2014	MT: 6 traps, 108 hrs	MT: 0	None	0	0	n/a	None
2049a	Unnamed tributary to Ksi Ts'oohl Ts'ap (no watershed code)	June 26, 2014	BPEF: 100 m, 281 s MT: 5 traps, 110 hrs	BPEF: 0 MT: 0	None	0	0	n/a	None
2051	Ksi Ts'oohl Ts'ap (Zolzap Creek) (500-155400)	June 25, 2014	BPEF: 75 m, 701 s MT: 5 traps, 100 hrs OB: n/a	BPEF: 0.43 MT: 0.05 OB: n/a	Char Coho salmon	8 0	0 15	83-146 n/a	Chinook salmon, chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, lamprey, pink salmon, sculpin, sockeye salmon, steelhead, threespine stickleback
2053	Unnamed tributary to Ksi Ts'oohl Ts'ap (no watershed code)	June 13, 2014	MT: 4 traps, 76 hrs	MT: 0.08	Char Coastal cutthroat trout	5 1	0 0	69-123 109	None
2054	Unnamed tributary to Ksi Ts'oohl Ts'ap (no watershed code)	June 14, 2014	BPEF: 50 m, 274 s MT: 9 traps, 181 hrs	BPEF: 0 MT: 0.03	Char Coastal cutthroat trout	5 1	0 0	69-123 109	None
2055	Unnamed tributary to Ksi Ts'oohl Ts'ap (no watershed code)	June 22, 2014	BPEF: 100 m, 368 s MT: 5 traps, 105 hrs	BPEF: 0 MT: 1.11	Threespine stickleback	117	25	29-61	None
2057.1	Unnamed tributary to Ksi Ts'oohl Ts'ap (no watershed code)	June 12, 2014	MT: 2 traps, 8 hrs DN: n/a OB: n/a	MT: 1.13 DN: n/a OB: n/a	Coho salmon Threespine stickleback	6 4	0 0	52-86 44-64	None
2057	Unnamed tributary to Ksi Ts'oohl Ts'ap (no watershed code)	June 12, 2014	MT: 2 traps, 8 hrs DN: n/a OB: n/a	MT: 1.13 DN: n/a OB: n/a	Coho salmon Threespine stickleback	6 4	0 0	52-86 44-64	None
2059	Unnamed tributary to Ksi Ts'oohl Ts'ap (no watershed code)	June 21, 2014	BPEF: 100 m, 400 s MT: 5 traps, 105 hrs	BPEF: 0 MT: 0.37	Char Coho salmon Sockeye salmon Threespine stickleback	3 24 1 11	0 30 0 0	115-128 42-83 60 38-62	Coho salmon, Dolly Varden, threespine stickleback
760a	Unnamed tributary to Ksi Ts'oohl Ts'ap (no watershed code)	June 19, 2014	BPEF: 150 m, 337 s DN: n/a OB: n/a	BPEF: 1.48 DN: n/a OB: n/a	Char Coho salmon Salmonid	4 7 0	0 0 25	29-112 28-40 n/a	None
761a	Unnamed tributary to Ksi Ts'oohl Ts'ap (no watershed code)	June 20, 2014	MT: 5 traps, 100 hrs OB: n/a	MT: 0.03 OB: n/a	Char Coho salmon	2 1	0 5	80-91 61	Coho salmon
767a	Unnamed tributary to Kwinyarh Creek (North Kwinyarh Creek) (no watershed code)	July 01, 2014	BPEF: 120 m, 700 s MT: 5 traps, 25 hrs	BPEF: 1.71 MT: 0	Coastal cutthroat trout	6	0	69-115	Coastal cutthroat trout

PWC Site	Stream Name (Alias) (Watershed Code)	Sample Date	Sampling Effort	CPUE	Fish Species Captured or Observed	Number Captured	Approx. Number Observed	Fork Length Range (mm)	Previously Documented Fish Species
2514	Unnamed tributary to Kwinyarh Creek (North Kwinyarh Creek) (no watershed code)	July 01, 2014	BPEF: 200 m, 400 s MT: 5 traps, 25 hrs	BPEF: 1.50 MT: 0	Coastal cutthroat trout	6	0	69-115	Coastal cutthroat trout
768a	Kwinyarh Creek (500-136800)	July 13, 2014	BPEF: 300 m, 385 s MT: 6 traps, 18 hrs AN: 2 Anglers 30 minutes OB: n/a	BPEF: 2.60 MT: 0.50 AN: 6.00 OB: n/a	Chinook salmon	2	0	69-72	Chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, pink salmon, sculpin, steelhead, stickleback
					Coastal cutthroat trout	3	0	356-381	
					Coastrange sculpin	5	0	65-106	
					Coho salmon	10	0	30-54	
					Prickly sculpin	2	0	50-82	
Salmon	0	200	n/a						
771a	Unnamed tributary to Ansedagan Creek (500-134700-06000)	June 22, 2014	BPEF: 198 m, 349 s MT: 5 traps, 100 hrs OB: n/a	BPEF: 5.16 MT: 0.01 OB: n/a	Char	1	0	106	None
					Coastal cutthroat trout	8	1	28-80	
					Coho salmon	1	0	113	
772a	Ansedagan Creek (500-134700)	July 14, 2014	BPEF: 160 m, 709 s MT: 5 traps, 115 hrs	BPEF: 2.26 MT: 0.10	Char	9	0	85-150	Chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, pink salmon, steelhead, stickleback
					Coastal cutthroat trout	1	0	170	
					Coho salmon	3	0	41-105	
					Rainbow trout	7	0	87-244	
775a	Unnamed tributary to Ksemamaith Creek (no watershed code)	July 03, 2014	MT: 5 traps, 105 hrs	MT: 0	None	0	0	n/a	None
776a	Ksemamaith Creek (Kseaden Creek) (500-114800)	July 12, 2014	BPEF: 300 m, 438 s MT: 6 traps, 138 hrs	BPEF: 4.11 MT: 0.04	Char	2	0	85-89	Chum salmon, coho salmon, Dolly Varden, pink salmon, rainbow trout, steelhead
					Chinook salmon	1	0	53	
					Coastal cutthroat trout	7	0	62-120	
					Coastrange sculpin	3	0	48-58	
					Coho salmon	10	0	34-46	
Prickly sculpin	1	0	62						
777a	Unnamed tributary to Ksi Mat'in (no watershed code)	June 24, 2014	MT: 3 traps, 57 hrs	MT: 0.04	Char	2	0	83-97	None
779a	Unnamed tributary to Ksi Mat'in (no watershed code)	July 03, 2014	BPEF: 100 m, 206 s OB: n/a	BPEF: 0.97 OB: n/a	Coastal cutthroat trout	1	0	112	None
					Lamprey	1	0	150	
					Salmonid	0	1	n/r	
780.1	Ksi Mat'in (no watershed code)	July 14, 2014	BPEF: 824 m, 2535 s MT: 6 traps, 113 hrs	BPEF: 11.20 MT: 0.05	Char	5	0	42-113	None
					Chinook salmon	2	0	40-68	
					Coastal cutthroat trout	5	0	72-130	
					Coastrange sculpin	42	0	58-102	
					Coho salmon	18	0	30-84	
					Salmon	1	0	26	
					Sculpin	1	0	50	
					Stickleback	1	0	55	
Threespine stickleback	2	0	31-35						



PWC Site	Stream Name (Alias) (Watershed Code)	Sample Date	Sampling Effort	CPUE	Fish Species Captured or Observed	Number Captured	Approx. Number Observed	Fork Length Range (mm)	Previously Documented Fish Species
781a	Ksi Mat'in (Ksedin Creek, Kwiniak Creek) (500-112000)	July 12, 2014	BPEF: 325 m, 319 s MT: 6 traps, 134 hrs DN: n/a OB: n/a	BPEF: 1.25 MT: 0.02 DN: n/a OB: n/a	Char	2	0	73-75	Chinook salmon, chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, pink salmon, rainbow trout, sculpin, steelhead
					Chinook salmon	1	0	80	
					Coastrange sculpin	1	0	62	
					Coho salmon	15	0	35-38	
					Sculpin	1	0	45	
2060	Unnamed tributary to Ksi Mat'in (no watershed code)	June 22, 2014	BPEF: 100 m, 420 s MT: 9 traps, 207 hrs	BPEF: 1.19 MT: 0	Char	1	0	116	None
					Coastal cutthroat trout	5	0	58-95	
					Unidentified species	0	2	n/a	
2060.1	Unnamed tributary to Ksi Mat'in (no watershed code)	July 13, 2014	BPEF: 100 m, 493 s	BPEF: 0.81	Char	1	0	28	None
					Coastal cutthroat trout	3	0	85-200	
2061	Ksi Mat'in (Ksedin Creek, Kwiniak Creek) (500-112000)	July 12, 2014	BPEF: 325 m, 319 s MT: 6 traps, 134 hrs DN: n/a OB: n/a	BPEF: 1.25 MT: 0.02 DN: n/a OB: n/a	Char	2	0	73-75	Chinook salmon, chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, pink salmon, rainbow trout, sculpin, steelhead
					Chinook salmon	1	0	80	
					Coastrange sculpin	1	0	62	
					Coho salmon	15	0	35-38	
					Sculpin	1	0	45	
785a	Unnamed tributary to Ginlulak Creek (East Ginlulak Creek) (no watershed code)	July 03, 2014	BPEF: 100 m, 705 s OB: n/a	BPEF: 2.55 OB: n/a	Coho salmon	9	0	34-39	Chum salmon, coho salmon, Dolly Varden, pink salmon
					Salmonid	0	10	n/a	
787a	Ginlulak Creek (500-090500)	July 12, 2014	BPEF: 400 m, 527 s MT: 6 traps, 144 hrs	BPEF: 2.47 MT: 0.39	Char	12	0	69-131	Chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, lamprey, pink salmon, stickleback
					Coho salmon	57	0	32-85	
788a	Unnamed tributary to Ginlulak Creek (no watershed code)	July 06, 2014	BPEF: 104 m, 125 s	BPEF: 5.60	Char	7	0	75-94	None
788b	Unnamed tributary to Ginlulak Creek (no watershed code)	July 02, 2014	BPEF: 100 m, 114 s	BPEF: 0	None	0	0	n/a	None
790a	Unnamed tributary to Ginlulak Creek (no watershed code)	June 30, 2014	BPEF: 100 m, 164 s OB: n/a	BPEF: 1.22 OB: n/a	Char	2	0	122-141	None
					Coho salmon	0	50	n/a	
791a	Unnamed tributary to Nass River (500-090000)	June 30, 2014	BPEF: 150 m, 205 s MT: 4 traps, 88 hrs	BPEF: 3.90 MT: 0	Char	6	0	67-124	Coarse or non-game fish
					Sculpin	2	0	64-79	
792a	Unnamed tributary to Nass River (no watershed code)	June 30, 2014	BPEF: 150 m, 200 s	BPEF: 1.00	Char	1	0	100	None
					Rainbow trout	0	1	n/r	
					Threespine stickleback	1	0	n/r	
793a	Unnamed tributary to Nass River (500-084900)	June 29, 2014	BPEF: 125 m, 580 s MT: 5 traps, 105 hrs	BPEF: 0.34 MT: 0	Char	2	0	40-96	Coho salmon, Dolly Varden
794a	Unnamed tributary to Nass River (no watershed code)	June 29, 2014	BPEF: 100 m, 124 s MT: 5 traps, 15 hrs	BPEF: 8.06 MT: 0.60	Char	2	0	88-92	None
					Coastal cutthroat trout	8	0	89-135	
					Coho salmon	5	0	58-74	
					Sculpin	1	0	75	
					Threespine stickleback	3	0	45-50	

PWC Site	Stream Name (Alias) (Watershed Code)	Sample Date	Sampling Effort	CPUE	Fish Species Captured or Observed	Number Captured	Approx. Number Observed	Fork Length Range (mm)	Previously Documented Fish Species
796a	Quilgauw Creek (500-075000)	July 10, 2014	BPEF: 650 m, 1409 s MT: 6 traps, 114 hrs	BPEF: 1.28 MT: 0.48	Chinook salmon	4	0	48-58	Chum salmon, coarse or non-game fish, coastal cutthroat trout, coho salmon, pink salmon, stickleback
					Coastal cutthroat trout	6	0	51-205	
					Coho salmon	23	0	42-83	
					Prickly sculpin	5	0	39-118	
					Stickleback	15	0	54-84	
					Threespine stickleback	15	0	54-75	
					Western river lamprey	5	0	110-132	
798a	Unnamed tributary to Quilgauw Creek (no watershed code)	July 01, 2014	MT: 5 traps, 120 hrs	MT: 0.62	Chinook salmon	2	0	98-118	None
					Coho salmon	2	0	119-121	
					Threespine stickleback	70	0	n/r	
799a	Unnamed tributary to Ksi Hlginx (no watershed code)	July 08, 2014	BPEF: 23 m, 102 s	BPEF: 6.86	Char	1	0	90	None
					Coho salmon	6	0	55-78	
800a.1	Unnamed tributary to Ksi Hlginx (no watershed code)	July 02, 2014	MT: 2 traps, 0 hrs OB: n/a	MT: 0 OB: n/a	Coho salmon	4	0	71-80	None
					Salmonid	0	2	n/a	
					Stickleback	6	0	45-62	
801a	Ksi Hlginx Side Channel (Ishkeenickh River) (510)	July 01, 2014	BPEF: 100 m, 236 s MT: 5 traps, 105 hrs	BPEF: 2.97 MT: 0.55	Char	1	0	62	Chinook salmon, chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, eulachon, lamprey, pink salmon, rainbow trout, sockeye salmon, steelhead, threespine stickleback
					Chinook salmon	5	0	38-75	
					Coastal cutthroat trout	2	0	57-80	
					Coho salmon	41	0	49-80	
					Lamprey	1	0	145	
					Rainbow trout	11	0	53-88	
802a	Ksi Hlginx (Ishkeenickh River) (510)	July 10, 2014	BPEF: 3000 m, 1826 s MT: 6 traps, 120 hrs AN: 2 Anglers 30 minutes	BPEF: 0.38 MT: 0.08 AN: 4.00	Char	6	0	78-340	Chinook salmon, chum salmon, coastal cutthroat trout, coho salmon, Dolly Varden, eulachon, lamprey, pink salmon, rainbow trout, sockeye salmon, steelhead, threespine stickleback
					Chinook salmon	5	13	48-800	
					Coastrange sculpin	2	0	135	
					Coho salmon	3	0	43-82	
					Mountain whitefish	2	0	120-305	
803a	Unnamed tributary to Ksi Hlginx (no watershed code)	June 23, 2014	BPEF: 75 m, 1080 s OB: n/a	BPEF: 1.67 OB: n/a	Coho salmon	18	20	32-59	None
804b	Unnamed tributary to Ksi Hlginx (no watershed code)	June 27, 2014	MT: 2 traps, 48 hrs	MT: 0.27	Char	4	0	76-104	None
					Coastal cutthroat trout	3	0	57-83	
					Coho salmon	6	0	68-98	
804c	Unnamed tributary to Ksi Hlginx (no watershed code)	June 27, 2014	MT: 5 traps, 25 hrs OB: n/a	MT: 0.56 OB: n/a	Char	9	0	53-94	None
					Coastal cutthroat trout	3	0	64-98	
					Coho salmon	2	0	55-75	
					Lamprey	0	1	200	
805a	Unnamed tributary to Ksi Hlginx (no watershed code)	June 27, 2014	BPEF: 30 m, 261 s MT: 3 traps, 60 hrs DN: n/a OB: n/a	BPEF: 8.81 MT: 0.40 DN: n/a OB: n/a	Char	4	0	66-96	None
					Coastal cutthroat trout	4	0	36-89	
					Coho salmon	41	0	35-84	
806a	Unnamed tributary to Nass River (500-058200)	July 13, 2014	BPEF: 50 m, 149 s	BPEF: 8.72	Char	4	0	95-145	Coho salmon, Dolly Varden
					Coastal cutthroat trout	9	0	70-150	

PWC Site	Stream Name (Alias) (Watershed Code)	Sample Date	Sampling Effort	CPUE	Fish Species Captured or Observed	Number Captured	Approx. Number Observed	Fork Length Range (mm)	Previously Documented Fish Species
806b	Unnamed tributary to Nass River (no watershed code)	July 12, 2014	BPEF: 65 m, 399 s	BPEF: 2.26	Char	4	0	50-1700	None
					Coastal cutthroat trout	2	0	75-101	
					Coho salmon	3	0	40-48	
808a	Unnamed tributary to Nass River (no watershed code)	July 12, 2014	BPEF: 30 m, 199 s	BPEF: 5.53	Coho salmon	11	0	48-82	None
808b	Unnamed tributary to Nass River (no watershed code)	July 06, 2014	BPEF: 55 m, 360 s MT: 5 traps, 11 hrs	BPEF: 0.83 MT: 0.18	Char	2	0	112-117	None
					Coastal cutthroat trout	3	0	35-116	
809a	Unnamed tributary to Nass River (500-053700)	July 05, 2014	BPEF: 100 m, 779 s MT: 3 traps, 57 hrs	BPEF: 0.26 MT: 0.02	Char	2	0	60-91	None
810a	Unnamed tributary to Nass River (500-051800)	July 05, 2014	MT: 5 traps, 95 hrs	MT: 0.96	Char	8	0	58-166	None
					Coho salmon	83	0	41-119	
811b	Unnamed tributary to Nass River (no watershed code)	July 04, 2014	BPEF: 72 m, 386 s	BPEF: 4.40	Char	7	0	34-88	None
					Coastal cutthroat trout	2	0	53-56	
					Coho salmon	8	0	38-82	
812a	Unnamed tributary to Nass River (Monkley Creek, unnamed tributary to Monkley Creek) (500-050900)	July 13, 2014	BPEF: 100 m, 314 s MT: 5 traps, 120 hrs	BPEF: 0.32 MT: 0.07	Char	1	0	60	Chinook salmon, coho salmon, Dolly Varden, pink salmon, rainbow trout, sculpin
					Rainbow trout	3	0	86-105	
					Sculpin	3	0	65-105	
					Sockeye salmon	2	0	57-62	
813a	Unnamed tributary to Nass River (no watershed code)	July 06, 2014	BPEF: 100 m, 398 s MT: 6 traps, 120 hrs	BPEF: 0 MT: 0	None	0	0	n/a	None
814a	Unnamed tributary to Nass River (500-047000)	July 05, 2014	MT: 5 traps, 95 hrs DN: n/a OB: n/a	MT: 0.16 DN: n/a OB: n/a	Char	8	0	57-116	None
					Coastal cutthroat trout	2	0	31-84	
					Coho salmon	20	0	30-79	
					Sculpin	0	1	40	
					Unidentified species	1	500	75	
815a	Unnamed tributary to Nass River (no watershed code)	July 11, 2014	DN: n/a OB: n/a	DN: n/a OB: n/a	Char	0	11	n/a	None
					Chinook salmon	0	2	n/a	
					Coho salmon	0	47	n/a	
816a	Unnamed tributary to Nass River (500-038600)	July 09, 2014	MT: 6 traps, 132 hrs DN: n/a OB: n/a	MT: 0.04 DN: n/a OB: n/a	Char	1	0	70	None
					Chinook salmon	2	0	70	
					Coho salmon	4	0	30-40	
					Sculpin	2	0	50-70	
817a	Unnamed tributary to Nass River (500-038000)	July 07, 2014	BPEF: 100 m, 646 s	BPEF: 3.56	Char	10	0	28-85	None
					Coastal cutthroat trout	1	0	33	
					Coho salmon	12	0	37-82	
818a	Unnamed tributary to Nass River (500-036300)	July 04, 2014	MT: 8 traps, 160 hrs	MT: 0.58	Char	24	0	63-1147	None
					Coho salmon	68	0	45-660	
2515	Unnamed tributary to Nass River (500-034500)	July 14, 2014	BPEF: 100 m, 225 s MT: 5 traps, 110 hrs	BPEF: 0.44 MT: 0.02	Char	3	0	90-101	None
2518	Unnamed tributary to Nass River (500-030700)	July 04, 2014	MT: 5 traps, 335 hrs	MT: 0	None	0	0	n/a	None
2523	Ksgyukwsa'a (Burton/Barton Creek) (500-018500)	July 13, 2014	BPEF: 300 m, 683 s MT: 8 traps, 24 hrs	BPEF: 7.91 MT: 0.46	Char	20	0	74-170	Chum salmon, coho salmon, Dolly Varden, pink salmon, rainbow trout
					Coho salmon	8	0	36-80	
					Sculpin	10	0	48-82	

PWC Site	Stream Name (Alias) (Watershed Code)	Sample Date	Sampling Effort	CPUE	Fish Species Captured or Observed	Number Captured	Approx. Number Observed	Fork Length Range (mm)	Previously Documented Fish Species
819a	Unnamed tributary to Nass River (500-034500)	July 14, 2014	BPEF: 60 m, 204 s MT: 5 traps, 115 hrs	BPEF: 0.98 MT: 0	Char	2	0	67-107	None
826a	Ksgyukwsa'a (Burton/Barton Creek) (500-018500)	July 05, 2014	BPEF: 100 m, 298 s MT: 8 traps, 40 hrs	BPEF: 1.01 MT: 0.43	Char	20	0	69-125	Chum salmon, coho salmon, Dolly Varden, pink salmon, rainbow trout
829a	Unnamed tributary to Ksgyukwsa'a (no watershed code)	July 10, 2014	BPEF: 117 m, 457 s	BPEF: 2.19	Char	5	0	85-158	Dolly Varden
830a.1	Unnamed tributary to Ksgyukwsa'a (no watershed code)	July 07, 2014	BPEF: 90 m, 297 s OB: n/a	BPEF: 1.01 OB: n/a	Char	3	2	65-95	None
830a	Unnamed tributary to Ksgyukwsa'a (no watershed code)	July 07, 2014	BPEF: 90 m, 297 s	BPEF: 1.01	Char	3	0	65-95	None
831a	Unnamed tributary to Welda Creek (no watershed code)	July 07, 2014	BPEF: 139 m, 713 s	BPEF: 1.40	Char	1	0	54	Coho salmon, Dolly Varden, pink salmon, sculpin, stickleback
					Coastal cutthroat trout	7	0	63-93	
					Sculpin	2	0	60-90	
832a	Welda Creek (500-016300)	July 07, 2014	BPEF: 100 m, 1009 s	BPEF: 3.17	Coastal cutthroat trout	5	0	62-78	Coho salmon, Dolly Varden, pink salmon, sculpin, stickleback
					Coho salmon	1	0	77	
					Sculpin	10	0	47-115	
1033a	Unnamed tributary to Nass River (no watershed code)	July 09, 2014	BPEF: 60 m, 146 s	BPEF: 0	None	0	0	n/a	None
1034	Unnamed tributary to Nass River (no watershed code)	July 10, 2014	BPEF: 75 m, 242 s	BPEF: 0	None	0	0	n/a	None

**APPENDIX I**  
**FISH-BEARING STATUS ASSESSMENT OF SELECT STREAMS**

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To:	Andrea Battistel, B.Sc., P.Biol, R.P.Bio Senior Aquatics Specialist TERA, a CH2M HILL Company	From:	Melinda Bahr, M.Sc., B.Sc., R.P.Bio, PMP Team Lead, Aquatics Biologist Stantec Terrace
File:	Spectra Energy Transmission Westcoast Connector Gas Transmission Project Non Fish Bearing Streams	Date:	July 21, 2014

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**Reference: Westcoast Connector Gas Transmission Project**

Fisheries field crews have been collecting fish and fish habitat data in the Nisga'a Lands along the Westcoast Connector Gas Transmission Project in June and July 2014 as a component of the environmental baseline data collection. The work has been completed in collaboration with Tera, a CH2M HILL company. During the assessments, 10 sites were encountered that were not assessed on the ground due to access constraints and safety considerations.

This memo provides the biological and biophysical rationale for the recommended fish bearing status of these proposed watercourse crossings (PWCs). The sites encountered were as follows:

- PWC 2516 to PWC 2522 along the Nasoga Route (Figure 1)
- PWC 820a and PWC 2524 along the Nass Bay Alternate Route (Figure 2)

**METHODS**

The above noted PWCs were investigated using the following approach:

- Desktop assessments were completed on each stream to determine stream gradients.
- Aerial reconnaissance was conducted to confirm the desktop analysis.
- A resident fish population assessment was conducted by setting minnow traps to determine if a self-sustaining fish population exists upstream of the PWCs (Figure 3).
- Ground reconnaissance was completed at PWC 2516 to determine fish habitat potential.

**DESKTOP ASSESSMENT**

Mapped stream gradients were determined at all sites as an indicator of potential barriers, fish presence and overall habitat values.

Fish Barriers: A calculated TRIM gradient  $\geq 20\%$  over a slope distance of 100m or more has been a benchmark in determining obstruction of fish passage (Forest practices Code of British Columbia 1998). A more conservative approach was taken for this assessment as Dolly Varden have been found in streams nearby with gradients up to 30% (see site cards for PWC 829a and 830a).

Habitat Value: Steep stream gradients result in high velocity water and diminished habitat values. As stream gradients increase, the ability for fish to fulfill critical life-stages (e.g. spawning, rearing, and overwintering) decreases. Potential habitat values were based on the following criteria:

**Reference: Westcoast Connector Gas Transmission Project**

- Streams with gradients between 1 and 8% have a very high potential to support fish and were classified as having a HIGH potential habitat value.
- Streams with gradients between 8 and 16% have a high to moderate potential to support fish (Forest Practices Code of British Columbia 1998) and were classified as having a MODERATE potential habitat value.
- Streams with gradients between 16 and 19% have a low potential to support fish (Forest Practices Code of British Columbia 1998) and were classified as having a LOW potential habitat value.
- Streams with gradients between 19-30% rarely support fish. As a precautionary approach in this assessment, these streams were classified as having UNLIKELY potential habitat value.
- Streams with gradients >30% are too steep to support fish and were classified as having a habitat value of NONE.

Table 1 presents the results of the desktop assessment for the PWCs along the Nasoga and Nass Bay Alternate route.

**Table 1 Location, Gradient and Fish Bearing Status of PWCs 2516-2522 on the Nasoga Route and PWC 820a and 2524 on the Nass Bay Alternate Route.**

Stream Name	PWC	UTM Location	Gradient	Gradient is a Fish Barrier	Fish Habitat Potential	Fish Bearing Status
<b>NASOGA ROUTE</b>						
<b>Unnamed Tributary to the Nass River</b>	2516	450101, 6091316, 9 U	46%	Yes	NONE	Non Fish Bearing at PWC
<b>Unnamed Tributary to the Nass River</b>	2517	449678, 6091699, 9 U	45%	Yes	NONE	Non Fish Bearing at PWC
<b>Unnamed Tributary to the Nass River</b>	2518	448269, 6092181, 9 U	49%	Yes	NONE	Non Fish Bearing at PWC
<b>Unnamed Tributary to the Nass River</b>	2519	447739, 6092156, 9 U	66%	Yes	NONE	Non Fish Bearing at PWC
<b>Unnamed Tributary to the Nass River</b>	2520	447126, 6092131, 9 U	42%	Yes	NONE	Non Fish Bearing at PWC
<b>Unnamed Tributary to the Nass River</b>	2521	446784, 6091816, 9 U	42%	Yes	NONE	Non Fish Bearing at PWC
<b>Unnamed Tributary to Ksgyukwsa'a</b>	2522	446226, 6090928, 9 U	45%	Yes	NONE	Non Fish Bearing at PWC

**Reference: Westcoast Connector Gas Transmission Project**

Stream Name	PWC	UTM Location	Gradient	Gradient is a Fish Barrier	Fish Habitat Potential	Fish Bearing Status
<b>NASS BAY ALTERNATE ROUTE</b>						
<b>Unnamed Tributary to Ksgyukwsa'a</b>	2524	447295, 6090043, 9 U	34%	Yes	NONE	Non Fish Bearing at PWC
<b>Unnamed Tributary to the Nass River</b>	820a	449307, 6090621, 9 U	71%	Yes	NONE	Non Fish Bearing at PWC

## AERIAL RECONNAISSANCE

Fish habitat potential was also assessed through aerial assessments from a helicopter. The helicopter hovered at each PWC and the stream was examined for substrate composition, riparian vegetation and stream morphology. Each stream was photographed and waypoints were taken. Qualitative observations were captured for each site and are provided on individual site cards.

The channels that were not covered by crown closure and were visible from the helicopter typically had low flow with a trickle of water cascading over bedrock or large rock slabs and boulders. Habitat complexity was negligible; stream morphology features (pools, riffles) conducive to fish were absent.

## RESIDENT POPULATION ASSESSMENT

Resident fish populations of trout and/or char can exist in streams above known fish barriers. In order for a resident fish population to exist, a low gradient section above the fish barrier must be present and must provide sufficient habitat for spawning, rearing and overwintering life stages of the population. In addition, the watercourse requires continual year round flow (i.e. not ephemeral).

The resident fish population assessment involved a helicopter overflight on July 7, 2014 of the mountain above the PWC locations to evaluate if there were any low gradient sections that had sufficient habitat to support fish. The low gradient sections on the top of the mountain were dry (see Figure 3) except for a small pond approximately 160m long and 1.5m deep located at the headwaters of the stream on which PWC 2518 is located. This pond was minnow trapped with five traps for 67 hours and produced no fish. Trapping locations and times are provided in Table 2 and a visual overview of the trap locations can be found on Figure 3.

**Table 2 Minnow Trap Locations, Set and Pull times and Fish Capture in Pond at Headwaters of Stream on which PWC 2518 is Located.**

Trap #	Date In	Time In	Date Out	Time Out	Fish Caught	UTM
1	07-Jul-14	15:12	10-Jul-14	10:18	None	447467, 6091258 9U
2	07-Jul-14	15:00	10-Jul-14	10:13	None	447487, 6091250 9U
3	07-Jul-14	15:20	10-Jul-14	10:23	None	447496, 6091277 9U
4	07-Jul-14	15:17	10-Jul-14	10:19	None	447574, 6091316 9U
5	07-Jul-14	15:18	10-Jul-14	10:22	None	447567, 6091313 9U



July 21, 2014

Andrea Battistel, B.Sc., P.Biol, R.P.Bio Senior Aquatics Specialist

Page 4 of 5

**Reference: Westcoast Connector Gas Transmission Project**

## **GROUND BASED RECONNAISSANCE AT PWC 2516**

A ground based reconnaissance was completed at PWC 2516 on July 15, 2014. This stream, although steep, was accessible due to its proximity to PWC 2515 and was likely representative of others on the same mountainside with similar gradients. A crew was able to hike to the PWC and noted it as an ephemeral draw through a bedrock canyon.

The stream had vertical bedrock walls approximately 15m high and gradients were 80-90% at the PWC and 40-50% downstream of the PWC. The stream had very little water and poor connectivity throughout. A veneer of water was flowing over sections of sheer bedrock making it impassable for fish. Connectivity to the fish bearing watercourse downstream was subsurface at the time of assessment and would be limited to times of seasonal high flows. During high flow seasons, the stream would be a high velocity cascade based on the gradient. No fish habitat was present.

The ground based reconnaissance at PWC 2516 was used as validation of the potential habitat at other streams in this area as it is located in similar terrain. The assessment affirmed the lack of fish habitat potential for the other streams located at higher elevations and steep gradients along this section of the line.

## **CONCLUSION**

PWCs 2516-2522 on the Nasoga Route and PWCs 820a and 2524 on the Nass Bay Alternate Route were determined to have downstream fish barriers caused by high gradients and no potential for resident fish migration from known fish bearing waters in Nass Bay. Aerial assessments, a ground reconnaissance of PWC 2516, representative of streams in the area and our professional experience suggest that fish presence in these streams is highly unlikely. In addition, sampling confirmed that those streams do not have sufficient habitat to support resident populations.

As such, these watercourses are considered as non-fish bearing.

Kind regards,

### **STANTEC CONSULTING LTD.**



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Attachment: Figures 1-3

MB/JC/nlb

July 21, 2014

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Page 5 of 5

**Reference: Westcoast Connector Gas Transmission Project**

## **REFERENCES**

Forest Practices Code of British Columbia. 1998. Fish-Stream Identification Guidebook. Second Edition, Version 2.1 Canadian Cataloguing in Publication Data.



Southwest view, showing route along the mountain and steep gradient slope.



South view, showing gradient barrier from Nass Bay upstream to PWCs 2517-2519.



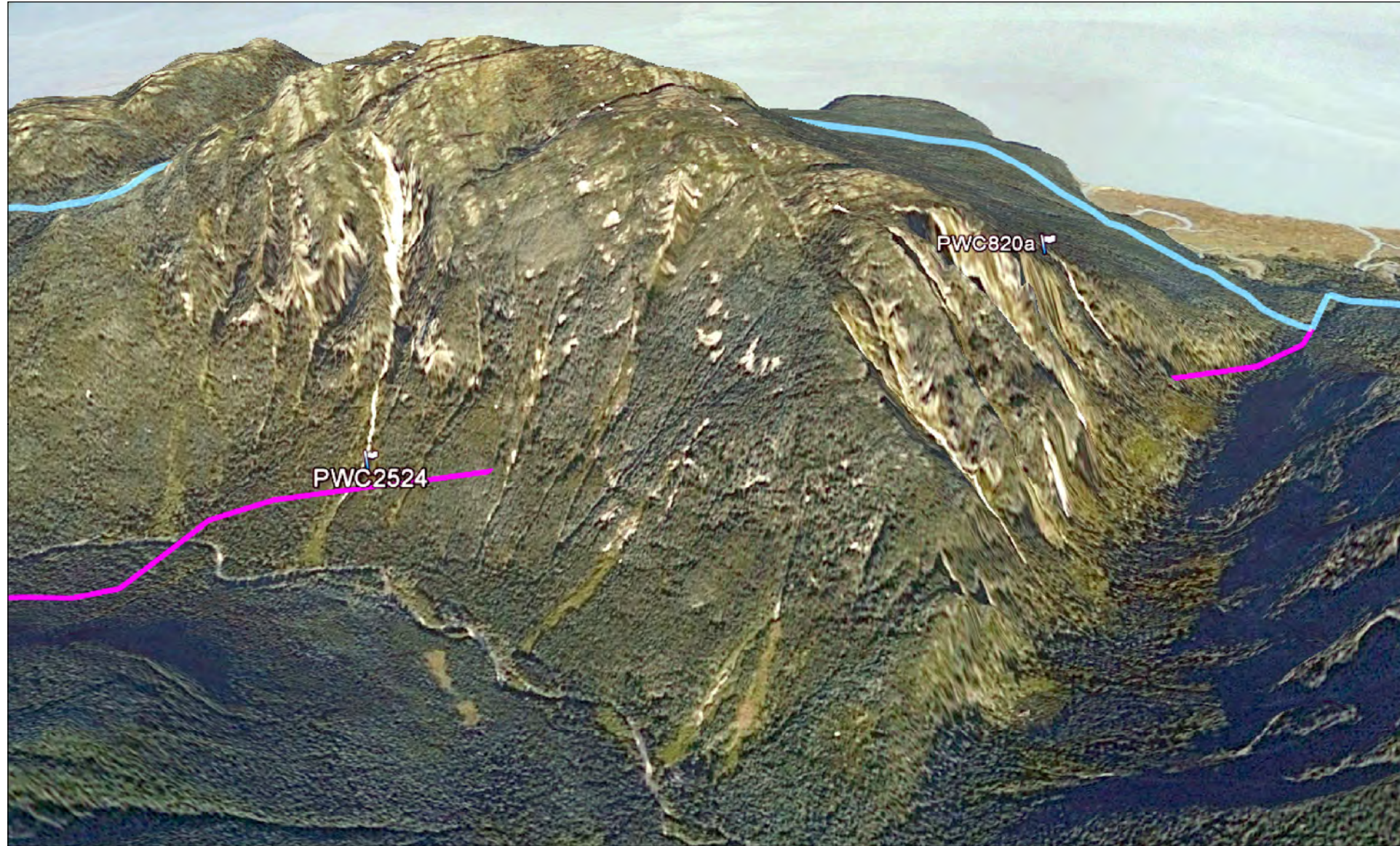
West view, showing gradient barrier from Nass Bay upstream to PWCs 2520-2522.



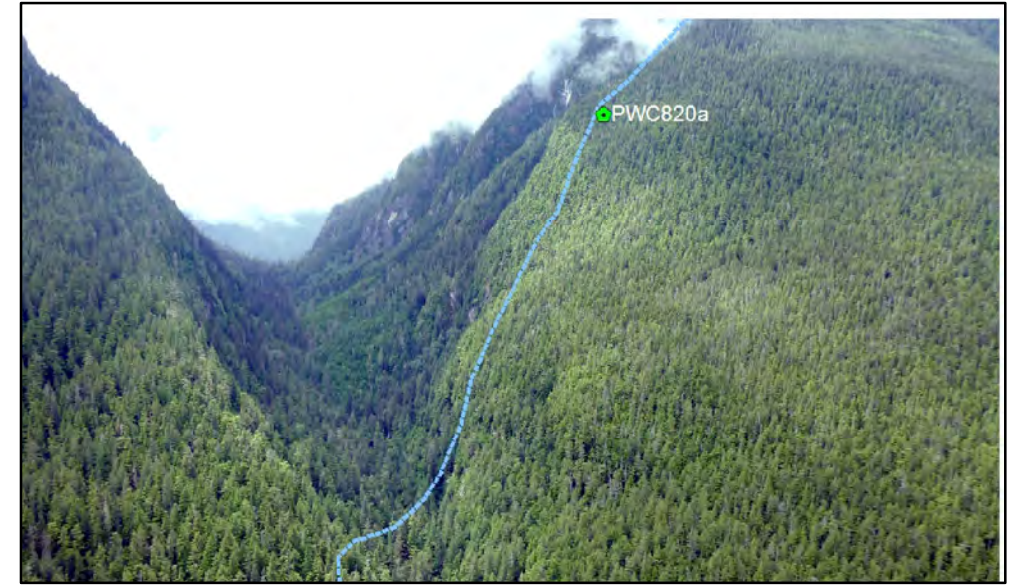
**General Comments**  
 As Figure 1 indicates, the pipeline route runs along the northern slope of the mountains, crossing PWCs 2516 through 2522. These watercourses have identified gradient barriers downstream from the PWC which impede fish migration. Inset photos show varying aspects of the mountain where the pipeline route is proposed.

**Nasoga Route PWCs 2516 - 2522**

PREPARED BY: Stantec  
 FIGURE NO: **Figure 1**  
 PREPARED FOR: Tera a CH2M Hill Company  
 Date Prepared: 21 July, 2014



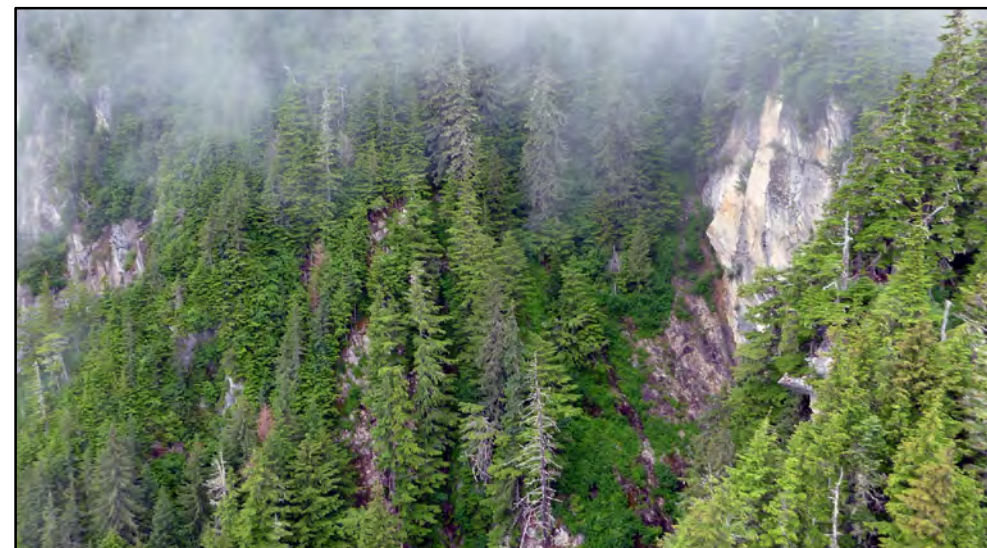
Alternate pipeline route outlined in pink showing steep gradients at PWCs 820a and 2524.



Looking southwest showing alternate pipeline route crossing PWC 820a.




PWC2524. Note steep gradient and lack of fish habitat potential.



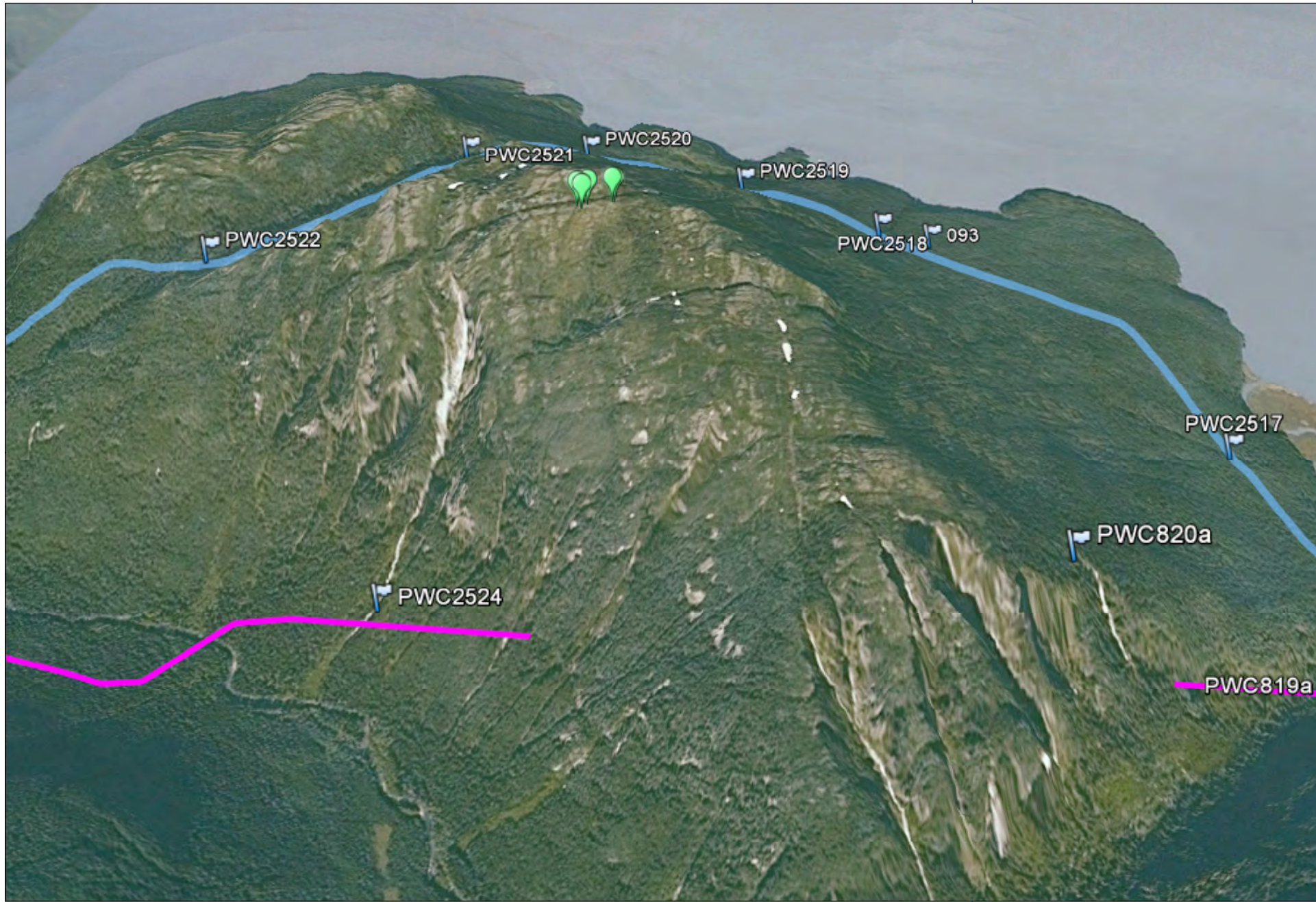
PWC820a. Note steep gradient and rock face near proposed centreline.

**General Comments**

As Figure 2 indicates, the Alternate Route runs west from PWC820a through the mountain towards PWC2524. These watercourses have identified gradient barriers downstream from the PWC and have no fish habitat potential. Inset photos show the locations of both PWC820a and PWC2524.

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 FIGURE NO:  
**Figure 2**  
 PREPARED FOR:  
 Tera  
 a CH2M Hill Company  
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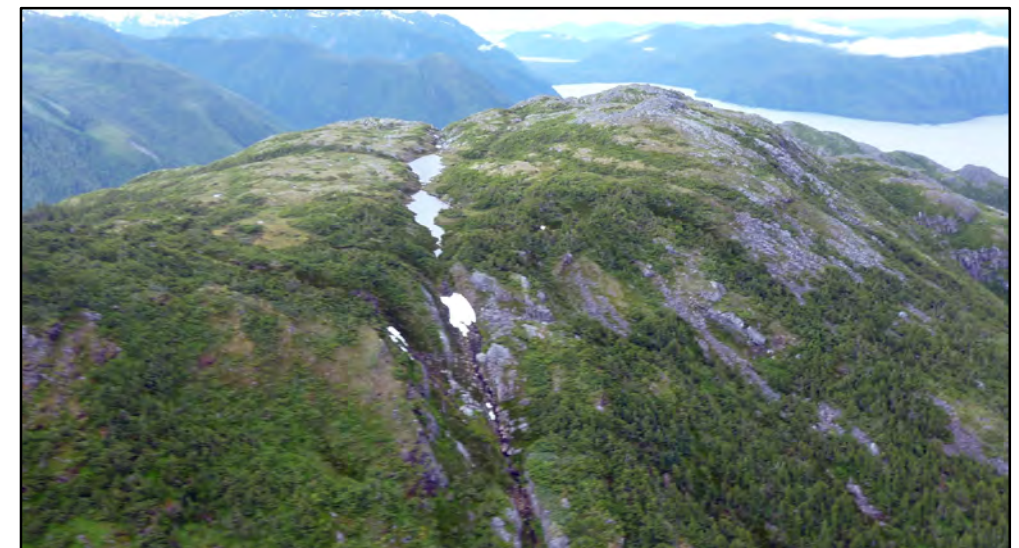
**Nass Bay Alt Route PWCs  
 820a & 2524**



Northview of trapping location.



Topography of the mountain top.



View of the pond outlet connecting to stream on which PWC2518 is located.



### General Comments

Minnow traps were set on the top of the mountain, as indicated by the green symbols. These traps were fishing in a pond at the headwaters of the stream on which PWC2518 is located. Traps were left for 67 hours and produced no fish. Inset photos show the topography of the mountain top and the outlet of the pond to the stream.

### Minnow Trapping Locations

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FIGURE NO.:

**Figure 3**

Date Prepared

21 July, 2014