Appendix A

Document Management

Document Management Protocol

Communication for the Emergency Erosion Repairs for Racing River Bridge (Km 641.1) and Liard River (Km 780.0) Project will occur using CentraCollab, email, telephone, and through the delivery of hardcopy documents (if requested by PSPC). CentraCollab will act as the primary communication and document management tool throughout the project. It will act as the central file storage location for all project documents, allows for retrieval of these documents at any time during the project by group members and is capable of storing and sharing large electronic files.

Email and telephone may be used for general communication, transitory information and other communications where a record is not considered necessary (e.g. day-to-day coordination, in-depth discussion of project elements, etc.). Email shall not be used for the submission of deliverables or other project documentations. Email contact information for project members is provided in the project contact list.

Hardcopy documents are to only be provided if specifically requested by PSPC. The Departmental Representative will provide the Contractor with the necessary address information at the time of the request. Material samples shall be provided directly to the testing lab specified by the Departmental Representative for Quality Assurance purposes or be delivered to the project site.

CentralCollab

CentralCollab is a web-based collaborative platform that is used to submit and store project documentation. It is the responsibility of the submitting party to upload documents to CentralCollab in the correct folder and with the correct file naming convention.

CentralCollab can be accessed at the following address: https://app.centralcollab.com/
The contractor is encouraged to have CentralCollab accounts for project team members who are involved with accessing or posting project documentation. Accounts can be created by PSPC throughout the project by contacting the PSPC project team.

Project documentation includes but is not limited to submittals, deliverables, drawings, reports, meeting minutes, project schedules, notifications, contemplated change notices, change orders, etc.

Appendix B

Project Specific Health and Safety Plan Template

<insert company logo/information>

PROJECT SPECIFIC HEALTH AND SAFETY PLAN

<Name of Project>
<PROJECT No.>

<Date>

<Rev. Number>

Prepared for:

Public Services and Procurement Canada
Services publics et Approvisionnement Canada

The Contractor shall ensure that this document is available on site for the project duration and available to all workers.

<This template is provided to aid the Contractor in preparing their project specific health and safety plan according to the contract requirements. It is the responsibility of the Contractor to ensure that all required information is presented in their project specific health and safety plan to meet the requirements of the project specifications and WorkSafeBC's health and safety obligations. The Contractor shall review all aspects of this template and make changes and additions as needed to suit the project requirements.>

Table of Contents

Appendix 7: Key Member Resumes and Safety Certifications

Appendix 8: Local Hospital Maps

Appendix 9: Safe Work Procedures

1. Contractor Safety Policy / Statement

<A statement about the Contracting company's policy regarding health and safety on the project site.>

2. Project Health and Safety Compliance Obligations

The submission of the Project Specific Health and Safety Plan indicates <*Contracting Company Name*> commitment to comply with all health and safety related obligations from the following:

- All procedures, rules and policies from this Project Specific Health and Safety Plan
- WorkSafeBC Requirements
- Project Specifications
- *<Other, add any other requirements that apply>*

3. Definition of Responsibilities

<A clear description of the health and safety related responsibilities for key members of the Contractor's project team. The table below is provided to assist with presenting this information.>

Position	Name(s)	Description of Health and Safety Responsibilities
Project Manager		
Project Superintendent		
Health and Safety Coordinator		
First Aid Attendant(s)		
Supervisors		
Workers		
Sub-Contractors		

4. General Project Safety Rules

<*A list of general construction safety rules and regulations that the company will adhere to. Additionally, a description of the disciplinary action procedure for disregard or negligence of the provide rules.****>***

5. Health and Safety Risks / Hazards and Engineering and Administrative Control Measures

5.1 Workplace Hazard Assessment – Health and Safety Risks Identified

<Summary of health risks and safety hazards resulting from hazard assessment analysis of the circumstances of each "workplace" including:

- *The number of workers who may require first aid at any time;*
- *The nature and extent of the risks and hazards in the workplace;*
- *The types of injuries likely to occur;*
- *Any barriers to first aid being provided to an injured worker or member of the public; and*
- *The time that may be required to obtain transportation and to transport an injured worker to medical treatment>*

<Statement from the Contractor indicating the hazard rating assignment (low, moderate, or high) for each "workplace" as defined by WorkSafeBC and applicable to the application of G3.16 of WorkSafeBC Occupational Health and Safety Regulations>

<The table below can be used as a template for the format of this section. Three workplaces are shown as an example, but the Contractor may extend or trim the table as applicable to the proposed work in the Contract.>

Workplace 1	
Number of Workers	
Risks / Hazards Descriptions	
Type of Injuries	
Barriers to First Aid	
Time to Obtain Transport	
WorkSafeBC Hazard Rating Assessment	*Low, Medium or High*
Workplace 2	
Number of Workers	
Risks / Hazards Descriptions	
Type of Injuries	
Barriers to First Aid	
Time to Obtain Transport	
WorkSafeBC Hazard Rating Assessment	*Low, Medium or High*
Workplace 3	
Number of Workers	
Risks / Hazards Descriptions	
Type of Injuries	
Barriers to First Aid	
Time to Obtain Transport	
WorkSafeBC Hazard Rating Assessment	*Low, Medium or High*

<WorkSafeBC Hazard Assessment Rating: The following links to the specific sections of the WorkSafeBC OHS regulations will assist in determining the Hazard Rating Assessment for each workplace.

https://www.worksafebc.com/en/law-policy/occupational-health-safety/searchable-ohs-regulation/ohs-guidelines/guidelines-part-03#SectionNumber:G3.16

https://www.worksafebc.com/en/law-policy/occupational-health-safety/searchable-ohs-regulation/ohs-regulation/part-03-rights-and-responsibilities#Schedule3A>

5.2 Hazards Materials

<List of hazardous materials to be brought onsite as required by the work>

5.3 Job Specific Safe Work Procedures

<Review your company safe work procedures to ensure that there are procedures for all tasks relevant to the project. In the case that your company does not have an existing safe work procedure for a specific task please provide this procedure in Appendix 8.>

All job specific safe work procedures are available in <*Contracting Company Name*> corporate Health and Safety Plan and are available to all employees on site and the PSPC team upon request. Procedures that are not available in <Contracting Company Name> corporate Health and Safety Plan can be found in Appendix 8. *<remove last sentence if not required>.*

5.4 Required PPE and Training

<Identification of the PPE and description of the training required for any members of the contractor's project team and PSPC's team visiting the site.>

5.5 First Aid Requirements

<Identification of the First Aid Requirements for each "workplace" in compliance with WorkSafeBC and project requirements as follows:

.1 Estimated travel time from the "workplace" to the nearest hospital.

.2 Maximum numbers of workers at any time per "workplace".

.3 The first aid supplies, equipment, and facilities which will be available at each "workplace".

.4 The first aid attendant certificate level onsite at each "workplace".

.5 The first aid transportation which will be used on the project (i.e. ETV), if required by Contractor or WorkSafeBC requirements. Details of where the ETV will be located / parked relative to the locations of the first aid attendant(s) during the work.>

6. Inspection Policy and Procedures

*<A description of the site inspection policy and procedure. The procedure should include identification of investigator, completion of a site inspection form and how the findings of the inspection will be presented to the remainder of the construction team.***>**

7. Incident Reporting and Investigation Policy

<*A description of the procedure completed following an incident occurring on site. The procedure should include the completion of an incident/accident report (template to be provided by the contractor in Appendix 5)***>**

8. Occupational Health and Safety

8.1 Representative/Committee Procedures

<*A description of the procedures that will be completed regularly throughout the project to keep the project site safe for all contractor's personnel, travelling public and PSPC's project team members.>*

8.2 Meetings

<*A description of the health and safety meetings that will be completed throughout the project. This section could include the frequency of meetings and the agenda that will be followed.***>**

8.3 Communications and Record Keeping Policies

<*A description of the policies related to health and safety communications and record keeping. This needs to include a description of the files that will be kept and how communication regarding health and safety will proceed with the entire project team, including the owner's team, the prime contractor's team and all sub-contractors.****>***

9. Emergency Contact Information

9.1 Key Project Contact Numbers

Contractor's Team			
Name and Position	**Office Number**	**Cell Phone Number**	**Sat Phone (If Used)**
Project Superintendent			
Health and Safety Coordinator			
First Aid Attendant(s)			
Key Sub-Contractor Representatives			
PSPC Team			
Name and Position	**Office Number**	**Cell Phone Number**	**Satellite Phone**
George Smith – Contract Asset Performance Manager, Alaska Highway	250.774.6956	250.321.0174	600.700.0131
XXX – Onsite Inspection and QA Representative			

9.2 Emergency Response Agencies/Assistance

<Note: The contractor is responsible for verifying that all the numbers listed below are correct and up to date and that all required numbers are presented. Please remove any emergency numbers that are not in the project vicinity. ***911*** *is not available in the Fort Nelson Northern Rockies Regional Municipality. Contractor shall confirm if* ***911*** *is available in the project location. If not available in project location, make note in table as not available at project site>*

Agency/Assistance	**Contact**
RCMP	911
Local Police – Fort Nelson (emergency)	250.774.2777
Local Police – Fort Nelson (non-emergency)	250.774.2700
Local Police – Fort St. John (emergency)	250.787.8100
Local Police – Fort St. John (non-emergency)	250.787.8140
Local Police – Watson Lake (emergency)	867.536.5555
Local Police – Watson Lake (non-emergency)	867.536.2677

BC Ambulance (BC Emergency Health Services)	911 / 1.800.461.9911 / 250.374.5937
Ambulance – Fort Nelson	250.774.2344
Ambulance – Fort St. John	250.785.5559
Ambulance – Watson Lake	867.536.4444
S.T.A.R.S Ambulance	1.888.888.4567
Hospitals	
Local Hospital – Fort Nelson	250.774.8100
Local Hospital – Fort St. John	250.262.5200
Local Hospital – Watson Lake	867.536.4444
Fire and Rescue	911
Fire and Rescue – Fort St. John	250.785.4333
Fire and Rescue – Fort Nelson (emergency)	250.774.2222
Fire and Rescue – Fort Nelson (non-emergency)	250.774.3955
Fire and Rescue – Watson Lake (emergency)	867.536.2222
Fire and Rescue – Watson Lake (non-emergency)	867.536.8008
BC Forest Fire Reporting	1.800.663.5555 / *5555 (Cell)
Yukon Forest Fire Reporting	1.888.798.3473
WorkSafeBC Work Site Emergency 24 hr.	1.888.621.7233
WorkSafeBC Regional Office	1.800.663.4630 / 250.785.1283
HazMat 24 hr.	1.800.663.3456
BC Environmental - PEP 24 hr.	1.800.663.3456
BC Environmental Regional Office	250.787.3411
BC Hydro – Power (emergency) 24 hr.	911
BC Hydro – Power (non-emergency)	1.800.224.9376
Fortis BC – Natural Gas Emergencies 24 hr.	1.800.663.9911
NorthwesTel – Corporate Office (Whitehorse)	867.668.5300
BC One Call	1.800.474.6886 / *6868 (Cell)
Poison Control	1.800.567.8911 / *311 (Cell)
Commercial Vehicle Inspection and Standards (CVSE)	
Reporting Safety Violations 24 hr.	1.888.775.8785
Peace River Regional Office	250.784.2363

10. Wildlife Management

<Identify any training and processes for project members regarding wildlife encounters and prevention.>

11. Fire Safety, Reporting and Evacuation

<Identify any fire safety policies, project specific reporting and evacuation procedures.>

12. Contractor's Team Review and Acceptance

This document has been prepared through discussions with the Contractor's entire project team *<including sub-contractors (if applicable)>* and will be enforced by the contractor for the duration of the project. By signing this document, the signee confirms that they have reviewed the document and agree with its contents.

Project Manager

Name	Signature	Date

Site Superintendent

Name	Signature	Date

Health and Safety Manager

Name	Signature	Date

Quality Control Manager

Name	Signature	Date

<Major Sub-Contractor Representatives>

Name	Signature	Date

<Major Sub-Contractor Representatives>

Name	Signature	Date

Appendix 1: Preliminary Hazard Assessment Form

PRELIMINARY HAZARD ASSESSMENT FORM

Project Number:	R.122128.001 (Racing River Bridge) R.117668.001 (Liard River)
Location:	Emergency Pier Scour Protection- Racing River Bridge km 641.1 Emergency Embankment Stabilization Liard River km 780
Date:	2021-07-20
Name of Departmental Representative:	Meisam Norouzi, PSPC

Site Specific Orientation Provided at Project Location **Yes** ☐ **No** ☐

Notice of Project Required **Yes** ☐ **No** ☐

NOTE:
PSPC requires "**A Notice of Project"** for all construction work related activities.

NOTE:
OHS law is made up of many municipal, provincial, and federal acts, regulations, bylaws and codes. There are also many other pieces of legislation in British Columbia that impose OHS obligations.

Important Notice: This hazard assessment has been prepared by PSPC for its own project planning process, and to inform the Contractor of actual and potential hazards that may be encountered in performance of the work. PSPC does not warrant the completeness or adequacy of this hazard assessment for the project and the paramount responsibility for project hazard assessment rests with the Contractor.

TYPES OF HAZARDS TO CONSIDER	Potential Risk for:				COMMENTS
Examples: Chemical, Biological, Natural, Physical, Psychosocial, and Ergonomic	PSPC, Other Government Departments, and Inmates		General Public or other provincial contractors		Note: When thinking about this pre-construction hazard assessment, remember a **hazard** is anything that may cause harm, such as chemicals, electricity, working from heights, etc; the **risk** is the chance, high or low, that somebody could be harmed by these and other hazards, together with an indication of how serious the harm could be.
Listed below are common construction related hazards. Your project may include pre-existing hazards that are not listed. Contact the Regional Construction Safety Coordinator for assistance should this issue arise.	**Yes**	**No**	**Yes**	**No**	

Typical Construction Hazards					Comments
Concealed/Buried Services (electrical, gas, water, sewer, etc)	Yes		Yes		
Slip Hazards or Unsound Footing	Yes		Yes		
Working at Heights **(2.4m)**	Yes		Yes		In a federal work environment the fall protection requirement is **2.4m NOT 3m** as per WBC OHSR

PRELIMINARY HAZARD ASSESSMENT FORM

Working Over or Around Water	Yes		Yes		Unpredictable water levels, swift water rescue must be considered within the Site Specific Safety Plan
Heavy overhead lifting operations, mobile cranes etc.		No		No	
Marine and/or Vehicular Traffic (site vehicles, public vehicles, etc.	Yes		Yes		
Fire and Explosion Hazards		No		No	
High Noise Levels	Yes		Yes		
Excavations	Yes		Yes		
Blasting		No		No	
Construction Equipment	Yes		Yes		
Pedestrian Traffic (site personnel, tenants, visitors, public)	Yes		Yes		
Multiple Employer Worksite	Yes		Yes		Federal and provincial employees may be on site.

Electrical Hazards					**Comments**
Contact With Overhead Wires		No		No	
Live Electrical Systems or Equipment		No		No	TBD by contractor
Other: Arc Flash		No		No	

Physical Hazards					**Comments**
Equipment Slippage Due To Slopes/Ground Conditions	Yes		Yes		
Earthquake	Yes		Yes		
Tsunami		No		No	
Avalanche		No		No	
Forest Fires	Yes		Yes		
Fire and Explosion Hazards	Yes		Yes		
Working in Isolation	Yes		Yes		
Working Alone	Yes		Yes		
Violence in the Workplace	Yes		Yes		
High Noise Levels	Yes		Yes		
Inclement weather	Yes		Yes		High winds, rain, and snow
High Pressure Systems		No		No	
Other:					

Hazardous Work Environments					**Comments**
Confined Spaces / Enclosed Spaces		No		No	Follow Worksafe B.C. Confined Space Regulations
Suspended / Mobile Work Platforms		No		No	
Other:					

PRELIMINARY HAZARD ASSESSMENT FORM

Biological Hazards					Comments
Mould Proliferations		No		No	
Accumulation of Bird or Bat Guano		No		No	
Bacteria / Legionella in Cooling Towers / Process Water		No		No	
Rodent / Insect Infestation		No		No	
Poisonous Plants		No		No	
Sharp or Potentially Infectious Objects in Wastes	Yes		Yes		
Wildlife	Yes		Yes		Bears, Bison, Sheep, Cougars
Other					
COVID 19	Yes		Yes		Reference: CSA National COVID 19 Standardized Protocol, Province of B.C. Construction - Business PHO, Worksafe, B.C.

Chemical Hazards					Comments
Asbestos Materials on Site **(See comments)**		No		No	
Designated Substance Present		No		No	If “yes” a pre-project designated substance survey report is required.
Chemicals Used in work **(see comments)**	Yes		Yes		WHMIS 2015 SDS for all products being used
Lead in paint **(See comments)**		No		No	
Mercury in Thermostats or Switches **(See comments)**		No		No	
Application of Chemicals or Pesticides		No		No	
PCB Liquids in Electrical Equipment **(See comments)**		No		No	
Radioactive Materials in Equipment	Yes		Yes		Use of nuclear density testing equipment possible.
Other: Silica (See comments)	Yes		Yes		Reference Worksafe B.C. silica and rock dust regulations

Contaminated Sites Hazards					Comments
Hazardous Waste		No		No	
Hydrocarbons		No		No	
Metals		No		No	
Other:					
Security Hazards					**Comments**
Risk of Assault	Yes		Yes		
Other:					

Other Hazards					Comments

PRELIMINARY HAZARD ASSESSMENT FORM

Other Compliance and Permit Requirements[1]	YES	NO			Notes / Comments[2]
Is a Building Permit required?		No			
Is a Electrical permit required?		No			
Is a Plumbing Permit required?		No			
Is a Sewage Permit required?		No			
Is a Dumping Permit required?	TBD				Contractor shall follow federal/provincial regulations
Is a Hot Work Permit required?		No			Mandatory for any hot work process
Is a Permit to Work required?		No			
Is a Confined Space Entry Permit required?		No			Mandatory for all Confined Spaces
Is a Confined Space Entry Log required?		No			Mandatory for all Confined Spaces
Discharge Approval for treated water required?	Yes				

Notes:

(1) Does not relieve Contractor from complying with all applicable federal, provincial, and municipal laws and regulations.
(2) TBD means To Be Determined by Contractor.
(3) Contractor and employees (including sub-trades) must attend a CSC/PSPC Security and Safety Orientation prior to gaining any access to institutional property prior to work commencing.

Prime Contractor Acknowledgement: We confirm receipt and review of this Preliminary Project Hazard Assessment and acknowledge our responsibility for conducting our own assessment of project hazards, and taking all necessary protective measures (which may exceed those cited herein) for performance of the work.			
Contractor Name			
Signatory for Contractor		**Date Signed**	
RETURN EXECUTED DOCUMENT TO PSPC DEPARTMENTAL REPRESENTATIVE.			

Appendix 2: Confirmation of Prime Contractor's Main Responsibilities Under WorkSafeBC Occupational Health and Safety Regulations and Worker's Compensation Act Form

Public Services and Procurement Canada | Services publics et Approvisionnement Canada

Confirmation of Prime Contractor's Main Responsibilities Under the WorkSafeBC Occupational Health and Safety Regulations and *Worker's Compensation Act*

Name of Project: _____

Owner: Public Services and Procurement Canada

Contractor: _____

Consulting Engineer: _____

	YES	NO
1.The Contractor acknowledges appointment as Prime Contractor on the construction project noted below	☐	☐
2. The name of the Prime Contractor's Qualified Coordinator of occupational health and safety activities for this project has been submitted to the Owner and is as shown below.	☐	☐
3. The Prime Contractor understands that in any conflict of directions, WCB OH&S Regulations and/or the Worker's Compensation Act shall prevail.	☐	☐
4. The Prime Contractor understands and will direct that all supervisors/coordinators must immediately report any apparent conflict as described above.	☐	☐
5. The Prime Contractor agrees that their supervisor shall immediately notify the consulting Engineer's representative of any reported conflict.	☐	☐
6. The Prime Contractor has requested and received information from the Owner regarding any known hazards to the health and safety of persons pre-existing at the workplace.	☐	☐
7. The Prime Contractor has conducted an inspection of the workplace to verify the presence of any hazards.	☐	☐
8. The Prime Contractor will communicate hazards information to any persons who may be affected and ensure that appropriate measures are taken to effectively control or eliminate the hazards.	☐	☐
9. The Prime Contractor accepts that written documentation such as notes, records, inspections, meeting minutes, etc., on all health and safety issues must be available upon request to the PSPC departmental representatives and/or to a WCB officer at the workplace.	☐	☐
10. The Prime Contractor will confirm that all workers are suitably trained and competent to perform the duties for which they have been assigned.	☐	☐
11. The Prime Contractor confirms that safety orientation of all new workers will be conducted.	☐	☐
12. The Prime Contractor's written Safety Program has been provided to the Owner's representative.	☐	☐
13. The Prime Contractor confirms that meetings to exchange information on any safety issues, concerns, hazards or safety directives will be conducted weekly or more often if required.	☐	☐
14. The Prime Contractor confirms that before the commencement of work, crews will attend a daily crew safety meeting.	☐	☐
15. The Prime Contractor confirms that their supervisor has assessed and will coordinate the workplace first-aid requirements	☐	☐
16. The Prime Contractor confirms that the procedure to transport injured workers is established	☐	☐

Prime Contractor Representative's

Name:_____

Title:_____ Signature:_____

Date:_____

Prime Contractor's OH&S Coordinator

Name:_____

Title:_____ Signature:_____

Date:_____

Canada

Appendix 3: Contractor's COVID-19 Safe Work Plan

<provided by the Contractor>

Appendix 4: Contractor Daily Toolbox Meeting Form

<provided by the Contractor>

Appendix 5: Site Safety Orientation Form

<provided by the Contractor>

Appendix 6: Incident/Accident Report Template

<*provided by the Contractor*>

Appendix 7: Key Member Resumes and Safety Certifications

<*provided by the Contractor*>

Appendix 8: Local Hospital Maps
<provided by the Contractor>

Appendix 9: Safe Work Procedures <*if required*>

Appendix C

Category 2
Traffic Management Plan Template

<insert company logo / information>

Category 2
Traffic Management Plan

<Date>

Rev. *<Number>*

Prepared for:

Public Services and Procurement Canada | Services publics et Approvisionnement Canada

The Contractor shall ensure that this document is available on site to all workers for the project duration.

<This template is provided to aid the Contractor in preparing their traffic management plan according to the contract requirements. It is the responsibility of the Contractor to ensure that all required information is presented in their traffic management plan to meet the requirements of the project specifications and British Columbia Ministry of Transportation and Infrastructure's Traffic Management Manual for Work on Roadways – 2020 Office Edition. The Contractor shall review all aspects of this template and make changes and additions as needed to suit the project requirements.>

Table of Contents

1. Category Definition

Based on the steps outlined in Section 3.2: Project Category Determination in BC MoTI's Traffic Management Manual for Work on Roadways (2020 Office Edition)

A Category 2 Traffic Management Plan is characterized by:

-
-
-
-

<Add as many points as deemed required for the project>

A Category 2 Traffic Management Plan consists of:

-
-
-
-

<Add as many points as deemed required for the project>

The aim of the Category 2 Traffic Management Plan is to minimize the site-specific risks that were identified for the project.

2. Traffic Control Plan

See also Appendix A: Traffic Control Plan Drawings in this Traffic Management Plan for the proposed layouts of the traffic control devices for the project. A list of the drawings is provided in Section 2.4 Drawing List.

Plan Date	*<Date when plan was initiated.>*
Latest Revision	*<Date of latest revision.>*
Site Name	*<Name of project.>*
Plan Developed By	*<Name of person who developed the plan.>*
Exact location, direction, and distance to nearest landmarks	*<Highway number and name of location, etc.>*
Project Supervisor	*<Name of Project Supervisor.>*
Prime Contractor	*<Name of Prime Contractor.>*
Traffic Control Manager	*<Name of Traffic Control Manager (if applicable).>*
Traffic Engineer	*<Name of Traffic Engineer (if applicable).>*
Traffic Control Supervisor	*<Name of Traffic Control Supervisor and company.>*
Traffic Control Persons	*<Names of TCP and company.>*
Project Start Date	*<Date>*
Project Completion Date	*<Date>*

2.1 Traffic Control Provisions

Traffic Control Supervisor	<*Name of Traffic Control Supervisor and company.*>
Traffic Control Persons	<*Name of TCP and company.*> Automated Flagger Assistance Devices will not be used on the project.
Off-Hours Traffic Control	<*Types of traffic control devices.*>
Illumination	Traffic Control Persons (TCP) will be used during non-daylight hours (before sunrise after sunset). Details of the overhead lighting to be used at each TCP location are included in <*Report Section / Appendix*>. Details shown include the location, direction, height, brightness, and use of shields on the lights to suitably illuminate the TCP but not obstruct the visibility of drivers approaching the TCP.
Means of Communication	<*How will TCP communicate?*>
Signage	<*Are signs installed for short-duration or long-duration work?*> <*Are the signs spaced in accordance with posted speed?*> <*Are details provided for the procedures, processes, and sequencing used to determine the layout of the signs in the field and the order of installation and order of removal of the signs in the field? Refer to Section 6: Traffic Control Layouts – General Instructions of the BC Ministry of Transportation Traffic Management Manual for Work on Roadways – 2020 Office Edition for further details. At a minimum the text and figures included in Item 6.7.4 – Two-Lane, Two-Way Roadways shall be included within the Contractor's Traffic Management Plan for reference during the work (in main body of the plan or in Appendices of the plan with reference to applicable Appendix in main body of the plan). The Contractor shall customize the details of the steps for the project as required.*> <*Are graphical representation of the sign supports planned for use on the project shown; including Post Mounted Supports found in Figure 01 35 00 – 01 and or the Wind Resistant Sign Stand found in Figure 01 35 00 – 02 (both shown below)?*> All sign supports shall either be a post mounted support per the requirements of Figure 01 or Wind Resistance Sign Stand per the requirements of Figure 02.

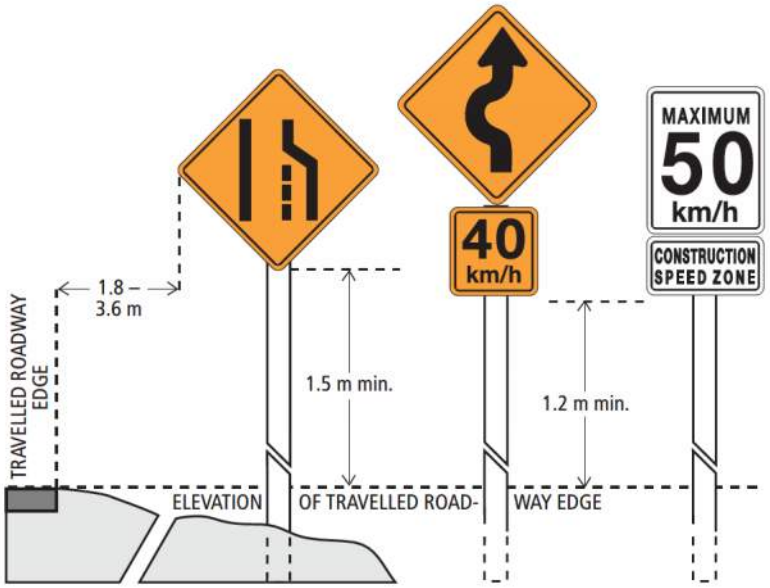

Figure 01: Post Mounted Supports

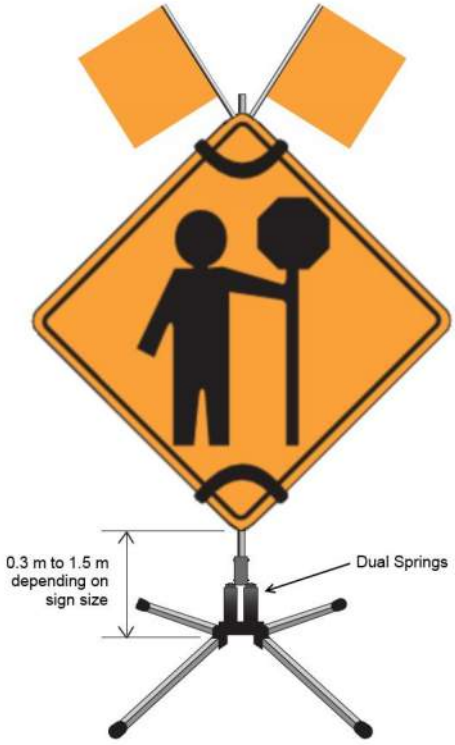

Figure 02: Wind Resistant Sign Stand

Flags will be used on the following signs:

.1 Traffic Control Person Ahead (C-001-1).
.2 Survey Crew Ahead (C-003).
.3 Crew Working Ahead (C-004).

	.4 Accident Scene (C-058). Unless pre-approved by the Departmental Representative, one or more sandbags or weights will be in used at all times to further stabilize all Wind Resistance Sign Stands. Where an option for a sign size is available, the sign size used will be the larger dimension sign as listed in Appendix B.2: Sizes and Applications of Individual Signs of the BC Ministry of Transportation Traffic Management Manual for Work on Roadways – 2020 Office Edition. Signs will be positioned so that they do not block the sight lines of drivers entering a roadway from side roads or other access points.
Portable Dynamic Message Signs (DMS)	<*Are DMS required? Where will they be located?*> Two (2) portable dynamic message signs (DMS) will be used for the duration of the work. The DMS will have a minimum of 3 lines with 8 characters per line (minimum 450 mm character size) A portable dynamic message sign (DMS) will be used in the location identified in 7.2 Typical Construction Speed Zone Signing – Two-Lane, Two-way Roadway (Item 3.2 – Traffic Management, subsection .1.5.3 of the contract specification). A list of DMS messages which will be displayed on the DMS throughout the project is shown in Appendix D. Messages that will be used on the DMS are per Section 4 – Temporary Traffic Control Devices (Table 4.5 and Table 4.2) of the BC Ministry of Transportation Traffic Management Manual for Work on Roadways – 2020 Office Edition plus other messages anticipated to be required on the project.
PSPC Permanent Variable Message Signs	PSPC will assist <*Name of Contractor*> with the Public Information Plan by notifying DriveBC of the work and posting notice of the project on PSPC's permanent variable message signs along the highway. <*Name of Contractor*> will inform PSPC a minimum seven (7) days in advance of any scheduled work to be posted. All other requirements of the Public Information Plan (Section 3.2.3 of the BC Ministry of Transportation Traffic Management Manual for Work on Roadways – 2020 Office Edition has been included in the Traffic Management Plan and will be undertaken / implemented <*Name of Contractor*> prior to commencing work.
Intersections affected by work zone or traffic control devices	<*Are intersections affected by the work zone or traffic control devices?*> <*If so, how will the intersections be controlled?*> <*Will additional traffic control devices be required?*>

Flexible Drums	*<Will flexible drums be used to delineate lane drops?>* *<Will they be used to identify construction accesses to the work activity area?>* Unless preapproved by the Departmental Representative, where 45 cm, 70 cm, or 90 cm cones are called for by the BC Ministry of Transportation Traffic Management Manual for Work on Roadways – 2020 Office Edition, 100 cm tubular markers will be used.
Traffic Stoppages	*<Are there any anticipated traffic stoppages?>* *<If so, for how long?>* *<Will there be single lane alternating traffic?>*
Layout of Devices	*<Identify spacing between traffic control devices.>*
Emergency Vehicles	*<Will emergency vehicles have clear, unobstructed access to the site.>* *<What procedures will be in place to ensure that emergency vehicles are able to access the site without delay?>*
Pilot Cars	Pilot cars will not be used when the length of the single lane alternating traffic does not exceed 300 m. The traffic control signage layout used in conjunction with pilot cars will include the Prepare to Stop (C-029) sign (sign spacing shall be adjusted to suit). During non-work hours temporary traffic signals, controlled by the Pilot Car Driver may be used to replace the traffic control persons. If this traffic control arrangement is used, the traffic control signage layout plan will be revised to include applicable signage from 7.10 Lane Closure with Temporary Signals – Single Lane Alternating Traffic – Short and Long Duration and submitted as part of the Traffic Management Plan. .4 The traffic control signage layout shall include the Men Working (C-004) sign in advance of the Construction Ahead (C-018-1A) sign. The spacing shall be per applicable Construction Sign Spacing (Dimension A as defined in Table B of Section 7 of the BC Ministry of Transportation Traffic Management Manual for Work on Roadways – 2020 Office Edition) for the applicable speed (adjust all other sign spacing as required).

Drop-offs	Drop-off's are defined as an abrupt change in elevation created by construction activity such as milling, paving, or excavation that is steeper than 3H:1V. Drop-off's will be treated in accordance with Section 6.5 of the BC Ministry of Transportation Traffic Management Manual for Work on Roadways – 2020 Office Edition whenever the drop-off is within 1.5 m of the edge of the travel lane. Additionally, drop-offs ≥ 150 mm between 1.5 m and 3.0 m of the travel lane will be signed with Low Shoulder (C-013) signs at least once every 1 kilometer for as long as the condition persists.

2.2 Work Activity Specific Risk Assessment and Traffic Plan

<A separate table and traffic control plan drawing (Table in Section 2.4 and drawings in Appendix A) is required for each unique element of work. Example elements of work are to include but are not limited to unloading of equipment, paving, line painting, rumble strip installation, excavation on highway, excavation off highway, culvert installation, etc. The Contractor is to add additional tables as necessary.>

Work Activity	*<Type of work: stationary, slow-moving, emergency, brief, short-duration, or long-duration work?>*
Station / Location	
Traffic Control Drawing	Appendix A – Drawing *<Drawing number of associated traffic control set-up>*
Identified Risks	*<What potential risks associated with the work have been identified?>*
Work On / Off Roadway	*<Is the work on or off the roadway?>*
Site Access / Egress	*<How will equipment access and exit from the site?>*
Intersections affected by work zone or traffic control devices	
Delays, Closures, Diversions, and Detours	*<Will delays, closures, diversions, and/or detours be in place?>* *<If so, illustrate in Appendix B: Detour Traffic Control Plan Drawing.>* *<What is the design speed for the detour?>* *<Can it withstand the traffic that will be using the road?>* *<For what duration will these be in place?>*
Hours of Work	*<The hours during which the work will occur.>* *<The time period during which the work will affect traffic.>*
Dump Site	*<Location of dump site and access/exit requirements.>*
Construction Equipment	*<How will construction equipment be protected during working hours? During off-hours?>*

2.3 Drawing List

Below is a table summarizing the of drawing(s) showing the applicable traffic accommodation strategies which will be used during specific elements of the work.

<Include a table or list of each element of work on the project and the applicable traffic accommodation strategies and layout drawing(s) which will be used during that element of work throughout all project locations. The table or list of each element of work on the project shall also include the applicable traffic accommodation strategies and layout drawing(s) to be used during non-work hours.>

Traffic Control Drawing(s)	**Corresponding Tender Drawing(s)**	**Project Location(s)**	**Construction Element(s)**
<Drawing No.>	*<Drawing No.>*	*<Station Range, e.g.283+360 to 308+905>*	*<e.g. ACP Placement, Rest Stop, Culvert Installation, etc.>*

3. Incident Management Plan

The Incident Management Plan defines processes for responding to unplanned events or traffic incidents in the work zone so that incident response operations within the work site are managed effectively.

The Incident Management Plan requirements are partially determined by the project category (see Section 3.2: Traffic Management Plan Sub-Plans and Section 3.4: Traffic Management Plan Requirements by Category in the **Traffic Management Manual for Work on Roadways).**

Traffic Control Supervisor and Qualifications	*<Name and qualifications.>*
Traffic Control Manager and Qualifications	*<Name and qualifications.>*
Emergency Response Agencies and Contact Information	*<Name and contact information (may be listed in Section 6: Contact List).>*
Types of traffic incident that could occur within work zone	*<Motor vehicle incident, motor vehicle incident with injuries, vehicle stalls, emergency vehicle transit of work zone, dangerous goods incident, wide load passing, etc.>*
Procedures for responding to traffic incident that occurs within work zone	*<Will there be a radio announcement?>* *<Who will evaluate the incident?>* *<Who will call 911?>* *<Will traffic be stopped, or will there be single lane alternating traffic?>* *<Who will assist the emergency responders through the site, and how?>* *<Who will assist if it is necessary to clear vehicles, and how?>*
Procedures to restore traffic flow around incident site as quickly as possible	*<How will traffic movement be restored?>* *<Will traffic control devices be used?>* *<If so, how?>*
Procedures to clear incident and restore normal project traffic	*<How will the incident be cleared to restore traffic movement?>* *<How many TCP are required?>*

operations as soon as possible	
Procedure to inform and update PSPC regarding incident in work zone	*<What is the procedure for advising the PSPC that an incident occurred, what response measures are being taken, what clearance measures are required, and what the estimated clearance time will be?>*
Procedure to inform travelling public of estimated duration of delay and alternative routes (if applicable)	*<Will DMS be used to display information?>*
Incident Reporting	*<Who will provide details to the PSPC?>* *<What is the process for incident follow-up?>*
Investigation Process	*<Who will lead the incident investigation?>* *<What investigation process will be used to assess the incident and those involved?>*
Review and Continuous Improvement Process	*<How incidents will be reviewed and followed up to reduce the severity and frequency of future incidents?>*

4. Public Information Plan

The Public Information Plan identifies actions and procedures for informing the travelling public, project stakeholders, and the PSPC of current traffic operations and planned changes to traffic operations.

PSPC will assist the Contractor with the Public Information Plan by notifying DriveBC of the work and posting notice of the project on PSPC's permanent variable message signs along the highway. All other requirements of the Public Information Plan (Section 3.2: Traffic Management Plan Sub-Plans and Section 3.4: Traffic Management Plan Requirements by Category in the BC Ministry of Transportation Traffic Management Manual for Work on Roadways – 2020 Office Edition) shall be included in the Traffic Management Plan and by undertaken / implemented by the Contractor prior to commencing work.

Process for routinely notifying PSPC of changes to scheduled work plans	<*Who will be responsible for the changes?*> <*What is the person's title?*>
Process for notifying travelling public of scheduled traffic delays and project duration	<*Identify the forms of communication to be used [radio, project signs, Permanent Dynamic Message Signs), Portable Dynamic Message Signs, public meetings, etc.].*>
Process for notifying travelling public of unscheduled traffic delays	<*Identify the forms of communication to be used [project signs, Permanent Dynamic Message Signs, Portable Dynamic Message Signs, public meetings, etc.].*>
Major user groups for alternating lane closures or road closures	<*Identify the major user groups (BC Trucking Association, BC Transit, emergency response agencies, school districts, etc.).*

5. Implementation Plan

The Implementation Plan identifies responsibilities and procedures for ensuring that traffic management sub-plans are developed and implemented in a coordinated manner.

It identifies the qualifications, responsibilities, and duties of supervisory and management personnel responsible for implementing the Traffic Management Plan and includes the designation of a Traffic Control Manager and a Traffic Control Supervisor.

See also Section 3.2: Traffic Management Plan Sub-Plans and Section 3.4: Traffic Management Plan Requirements by Category in the Traffic Management Manual for Work on Roadways.

Traffic Control Manager and Responsibilities	*<Name, qualifications, responsibilities, and duties.>*
Traffic Control Supervisor and Responsibilities	*<Name, qualifications, responsibilities, and duties.>*
Person who will manage emergency traffic control operations	*<Name and title.>*
Person who will maintain daily traffic control logs	*<Name and title.>*
Person who will manage Incident Management Plan	*<Name and title.>*
Person who will manage Public Information Plan	*<Name and title.>*
Person who will monitor inactive work site	*<Name, title, and responsibilities.>*

6. Contact List

6.1 Emergency Response Agencies/Assistance

Agency/Assistance		Contact 1	Contact 2
RCMP		**911**	
Local Police – Fort Nelson (emergency)		250.774.2777	
Local Police – Fort Nelson (non-emergency)		250.774.2700	
Local Police – Fort St. John (emergency)		250.787.8100	
Local Police – Fort St. John (non-emergency)		250.787.8140	
Local Police – Watson Lake (emergency)		867.536.5555	
Local Police – Watson Lake (non-emergency)		867.536.2677	
BC Ambulance			
Ambulance – Fort Nelson		250.774.2344	
Ambulance – Fort St. John		250.785.5559	
Ambulance – Watson Lake		867.536.4444	
S.T.A.R.S Ambulance		1.888.888.4567	
Fire and Rescue			
Fire and Rescue – Fort St. John		250.785.4333	
Fire and Rescue – Fort Nelson (emergency)		250.774.2222	
Fire and Rescue – Fort Nelson (non-emergency)		250.774.3955	
Fire and Rescue – Watson Lake (emergency)		867.536.2222	
Fire and Rescue – Watson Lake (non-emergency)		867.536.8008	
BC Forest Fire Reporting		1.800.663.5555	*5555 (Cell)
Yukon Forest Fire Reporting		1.888.798.3473	
WorkSafeBC Work Site Emergency	**24 hr.**	1.888.621.7233	1.800.663.4630 250.785.1283 (Non-emergency)
HazMat	**24 hr.**	1.800.663.3456	
BC Environmental Provincial Emergency Program	**24 hr.**	1.800.663.3456	
BC Environmental Regional Office		250.787.3411	
BC Hydro – Power (Emergency)	**24 hr.**	911	1.800.224.9376 (Non-emergency)
Fortis BC – Natural Gas Emergencies	**24 hr.**	1.800.663.9911	
BC One Call		1.800.474.6886	*6868 (Cell)
NorthwesTel (Corporate Office Whitehorse)		1.867.668.5300	
Poison Control		1.800.567.8911	*311 (Cell)
Reporting Safety Violations	**24 hr.**	1.888.775.8785	
Peace River Regional Office		250.784.2363	
Provincial Emergency Program	**24 hr.**	**1.800.663.3456**	

(Ground Search & Rescue)		
Commercial Vehicle Inspection and Standards (CVSE)	1.888.775.8785	
Towing Company	<Contact #>	
Road Maintenance Contractor – White Bear Industries	250.635.3169	
Other		
Northern Rockies Regional Municipality	250.774.2541	
School District 60	250.262.6000	
School District 81	250.774.2591	
Media		
Peace Sun / 101.5 The Bear	250.787.0669 (Studio)	250.785.6334 (Reception)
1001. Moose FM	250.787.2222 (Control Room)	250.787.100 (Office)
Alaska Highway News	250.785.5631	

6.2 Prime Contactor's Contact Numbers

Name and Position	Office Number	Cell Phone Number
<*Name*>, Project Superintendent	<Contact #>	<Contact #>
<*Name*>, Health and Safety Coordinator	<Contact #>	<Contact #>
<*Name*>, First Aid Attendant(s)	<Contact #>	<Contact #>
<*Name*>, Traffic Control Supervisor	<Contact #>	<Contact #>
<*Name*>, Traffic Control Company	<Contact #>	<Contact #>
<*Name*>, Key Subcontractor Representatives	<Contact #>	<Contact #>

6.3 PSPC Contact Numbers

Name and Position	Office Number	Cell Phone Number
George Smith – Operations Manager, Alaska Highway	250.774.6956	250.321.0174 600.700.0131 (Satellite Phone)
<*Name*> – Onsite Inspection and QA Representative	<Contact #>	<Contact #>

Appendix A: Traffic Control Plan Drawings

Appendix A: Traffic Control Plan Drawings

Site Diagram
<Use additional pages as necessary>

<Show all site factors affecting traffic control, traffic control devices, spacing, signs (including sizes), explanatory notes, North arrow, etc.>

<Per section 6.3 of the BC Ministry of Transportation Traffic Management Manual for Work on Roadways – 2020 Office Edition, traffic management shall be managed as one continuous work zone where the work is one kilometer apart or less.>

Appendix B: Detour Traffic Control Plan Drawings

Appendix B: Detour Traffic Control Plan Drawings

Site Diagram
<Use additional pages as necessary>

<Show all site factors affecting traffic control, traffic control devices, spacing, signs (including sizes), explanatory notes, North arrow, etc.>

<Per section 6.3 of the BC Ministry of Transportation Traffic Management Manual for Work on Roadways – 2020 Office Edition, traffic management shall be managed as one continuous work zone where the work is one kilometer apart or less.>

Appendix C: Daily Sign Check Form

Daily Sign Check Form

Project Name and Number Erosion Repairs for Racing River Bridge (Km 641.1 and Liard River (Km 780.0), Project No. R.122128.001	**Project Location** Km 641.1 and Km 780.0 of the Alaska Highway, BC
Type of Work	**Highway Location**

Date yyyy/mm/dd	**Time of Inspection**	**Location and Deficiency Type**	**Comments**	**Initials**

Date yyyy/mm/dd	Time of Inspection	Location and Deficiency Type	Comments	Initials

Appendix D: DMS Message Library

Appendix D: DMS Message Library

<Provide a list of DMS messages which will be displayed on the DMS throughout the project. Messages that will be used on the DMS shall be per Section 4 – Temporary Traffic Control Devices (Table 4.5 and Table 4.2) of the BC Ministry of Transportation Traffic Management Manual for Work on Roadways – 2020 Office Edition plus other messages anticipated to be required on the project.>

Appendix D

On-site Construction Start-up Form

Public Services and Procurement Canada | Services publics et Approvisionnement Canada

On-site Construction Start-up Form

Project Name:	
Project Number:	
Departmental Representative	Ph:
Contractor:	
Contractor Representative:	Ph:

The Contractor or its subcontractors shall not perform any on-site work until they receive a completed version of this form which has been signed by PSPC's Departmental Representative.
PSPC reserves the right to refuse payment for any on-site work performed prior to the receipt of the completed and signed form.
The list below is meant to be a guide and is not intended to be a comprehensive list of required submittal items for the project. Refer to Contract Documents and Contract Specifications for a Complete List.

Submission Item	**Reviewed & Accepted by PSPC**	**Date** (yyyy-mm-dd)	**Comments / Exclusions**
Contract, Bonding and Insurance	☐		
Health & Safety Plan	☐		
Traffic Management Plan	☐		
Environmental Protection Plan	☐		
Project Construction Schedule	☐		
Quality Management Plan	☐		
Construction Staging Plan	☐		
Construction Equipment List	☐		
Other:	☐		

Below to be completed by the Departmental Representative and returned to the Contractor

Has the Contractor submitted all required documents for construction work to commence? ☐ Yes ☐ No

Have all listed documents required prior to construction commencement been accepted by PSPC? ☐ Yes ☐ No

Comments: _____

_____

_____

_____

Name of Departmental Representative: _____

Signature: _____ Date: _____

Appendix E

Progress Payment Submittal Form

Progress Payment Submittal Form

Project Name:	
Progress Payment Number:	
Departmental Representative:	Ph:
Contractor:	
Contractor Representative:	Ph:

This form, completed and signed by the Contractor's Representative, shall be submitted with all documentation listed below for each progress payment request.
Upon receipt of this form and all documents, PSPC will commence review of the progress payment request in accordance with General Conditions 5 – Terms of Payment.
The list below is meant to be a guide and is not intended to be a comprehensive list of required submittal items for each progress payment. PSPC may request additional documentation not listed below.

Submission Item	Submitted	Comments
Progress Payment	☐	
Statutory Declaration	☐	
WorkSafeBC Clearance Letter	☐	
Project Schedule (with baseline tasks and updates showing completion dates and % complete)	☐	
Survey Details for each quantity claimed (see Appendix F – Measurement for Payment Survey Details Form)	☐	
Other:	☐	

Prime Contractor Representative:

Name:_____

Title:_____ Signature:_____

Date:_____

Appendix F

Measurement for Payment Survey Details Form

Public Services and Procurement Canada | Services publics et Approvisionnement Canada

Measurement for Payment Survey Details Form

Project Name:	
Progress Payment Number:	

This form shall be submitted with the progress payment request form to identify how the surveyed quantities for specific line items were obtained.

<Note: remove the examples below and add lines as needed to provide details for every item included in the progress payment measured by survey. Provide individual entries for each task (e.g.: a line for gravel placed at rest stop A and a separate line for gravel placed at rest stop B). A progress payment line item may have more than one entry – the total entries for a particular line item shall equal the quantity shown on the progress payment)>

Progress Payment Line Item	Specification Defining Payment Requirements	Work Description	Claimed Quantity for Payment	File Name(s) (include point files and break line files names to be compared to compute quantity)	Additional Details
13	*31 24 14*	*Excavation at Km 356 Rest Stop Sta. 282+020 to Sta. 282+070*	*1400 m^3*	• *Km 282 Rest Stop – OG.csv* • *Km 282 Rest Stop – OG Breaklines.dxf* • *Km 282 Rest Stop – Bottom Excavation.csv* • *Km 282 Rest Stop – Bottom Excavation Breaklines.dxf*	*In the provided csv files the difference between the 2 surfaces "OG" and "As-built" is equal to 1400 m^3*
14	*32 11 19*	*Crushed Base Gravel at Km 282 Rest Stop Sta. 282+020 to Sta. 282+070*	*800 m^3*	• *Km 282 Rest Stop – Bottom Excavation.csv"* • *Km 282 Rest Stop – Bottom Excavation Breaklines.dxf* • *Km 282 Rest Stop – As-Built Survey Data.csv* • *Km 282 Rest Stop – As-Built Survey Breaklines.dxf*	*In the provided csv files the difference between the 2 surfaces "OG" and "As-built" is equal to 800 m^3*

Canada

Appendix G

General Contractor & Sub-Contractor Construction Equipment List

Public Services and Procurement Canada | Services publics et Approvisionnement Canada

General Contractor & Sub-Contractor Construction Equipment List

Project Name: _____

Project Number: _____

General Contractor: _____ Sub-Contractors: _____

Owner of Equipment (General Contractor / Sub-Contractor)	Equipment Model and Size	Quantity	Brand	Equipment Manufacture Year	Additional Comments

Appendix H

Environmental Protection Plan (EPP) – Checklist

Environmental Protection Plan (EPP) — Checklist

Note: This checklist was developed to assist the Contractor in determining and mitigating environmental issues at site. It is considered a generic checklist and it is in the Contractor's best interest to review the PSPC Environmental Management Plan (EMP) or the Environmental Assessment (EA) as supporting documents in the completion of the site Environmental Protection Plan (EPP). This EPP Checklist does not need to be submitted for review by the Departmental Representative.

EPP Framework	Content Requirements	No	Yes	N/A
Project Setting and Site Activities				
Project Description	A brief description of the project and its location is provided.			
Environmental Sensitivities	Sensitive or protected features that could be impacted as a result of the Contractor's activities are described.			
Site Activities	A scope of work and a list of all construction or related activities to be undertaken during the project are provided.			
Project Schedule and Site Drawings				
Project Schedule	A project schedule is provided, including scheduled shut-downs and restricted work periods due to environmental requirements.			
Site Drawing	One or more site drawings(s) are provided, indicating the site location; site set-up and layout; erosion and sediment controls; in-stream work areas; and environmental sensitivities.			
Potential Environmental Impacts and Controls				
Potential Environmental Issues and Impacts	The potential environmental issues and impacts that may result from the construction activities are described. Environmental Reports (Environmental Assessments; Fish Habitat and Compensation, etc.) will be provided to the contractor especially with respect to any in-stream work procedures that will be required. For example, in-stream works will impact fish and fish habitat in the surrounding ecosystem. It is the Contractor's responsibility to ensure the work is completed in a manner that causes the least impact on the ecosystem (see section on Mitigation).			
Permits, Approvals, and Authorizations	List required permits, approvals and authorizations. As applicable, environmental mitigation measures prescribed by regulatory agencies and included in project permits, approvals and authorizations are described. NOTE: DFO, MoE and NWPA approvals and authorizations for in-stream works are PSPC's responsibility however, the Contractor must be aware of the requirements of these approvals/authorizations. Permitting for water withdrawal from the waterbody as part of construction activities is part of the Contractor's responsibility.			
Mitigation Strategies	Procedures, controls or best management practices (BMPs) to prevent or reduce adverse impacts on the environment are provided. All work in BC must adhere to the BC MoE "Standards and Best Practices for Instream Works".			
Erosion and Sediment	Erosion and sediment controls are provided, as appropriate for the jurisdiction.			

Waste Management and Hazardous Materials				
Waste Management and Hazardous Materials	Hazardous materials that will be used and/or stored on site are listed. Expected hazardous and non-hazardous waste materials along with proper handling, containment, storage, transportation and disposal methods are listed. As appropriate for the jurisdiction, estimated waste quantities and specific handling procedures are also provided. For example, refueling of equipment will be conducted at least 100m away from any active drainage courses.			
EPP Implementation				
Site Representative	Name(s) and contact details for the person(s) who will be the Contractor's Site Representative(s) are provided.			
Training and Communication	Training and communication details are provided.			
Monitoring and Reporting	Monitoring and inspection procedures, including a schedule of monitoring activities and reporting procedures are provided. For example, this would include downstream monitoring activities for increased siltation during in-stream works.			
Documentation	Information and/or records that will be maintained relating to the EPP and end environmental matters on the project site are described.			
EPP Update	EPP review and update procedures are provided.			
Environmental Emergency Response Procedures				
Environmental Emergency Response Procedures	Potential incidents that may impact the environment are identified, and emergency response procedures to prevent and respond to incidents are provided. An environmental emergency response contact list is also provided.			

Appendix I

Relevant Environmental Publications

Relevant Environmental Publications

The below documents are those commonly used when determining how to design and advance a project with the potential to impact a waterbody.

Agency	Publications	Summary
DFO	***Land Development Guidelines for the Protection of Aquatic Habitat - 1993***	This document is a good reference guide for any works that are occurring in or around the water.
	Canada's Fish Habitat Law	Document explaining the fish and fish habitat laws under the Fisheries Act.
	Riparian Revegetation	Information on minimizing, stabilizing and revegetating construction areas.
	Freshwater Intake End-of Pipe Fish Screen Guideline - 1995	Provides guidelines for the contractor to follow to ensure fish screens are used during freshwater intake operations at construction sites.
	Operational Statements Stream Crossings by Roads: • Clear Span Bridges • Temporary Ford Stream Crossing • Ice Bridges and Snow Fills • Bridge Maintenance • Maintenance of Riparian Vegetation in Existing Rights-of Way	Fisheries and Oceans Canada has developed a series of Operational Statements to streamline the undertaking of low risk activities. The Operational Statements outline conditions and measures for avoiding harmful alteration, disruption and destruction (HADD) of fish habitat, and applying them will ensure the project complies with subsection 35(1) of the *Fisheries Act*. You are NOT required to submit a proposal for review by Fisheries and Oceans Canada when you incorporate the measures and conditions outlined in an appropriate Operational Statement into your plans. http://www.pac.dfo-mpo.gc.ca/habitat/os-eo/index-eng.htm
MoE	***Fish-stream Crossing Guidebook - 2002***	Guidelines in protection of fish and fish habitat and the safe passage of fish during construction at/on stream crossings.
	Standards and Best Practices for Instream Works - 2004	Guide to planning and carrying out the proposed construction activities to comply with relevant legislation, regulations and policies.
	A User's Guide to Working In and Around Water - 2005	Understanding the regulation under British Columbia's Water Act.
	Fish-Stream Identification Guidebook - 1998	Assists in providing information on determining fish streams.
	The Streamkeepers Handbook	A practical guide to stream and wetland care in regards to rehabilitation planting.

Appendix J

Environmental Overview Assessment
Racing River Bridge Pier Erosion Repair KM 641.1
Alaska Highway, British Columbia

Public Services and Procurement Canada

ENVIRONMENTAL OVERVIEW ASSESSMENT

Racing River Bridge Pier Erosion Repair KM 641.1
Alaska Highway, British Columbia

August 6, 2021 CONFIDENTIAL

WSP CANADA INC.
840 Howe Street, Suite 1000
Vancouver, BC Canada
V6Z 2M1

WSP.COM

August 6, 2021

Confidential

Public Services and Procurement Canada.
219-800 Burrard St
Vancouver, BC
V6Z 0B9

Attention: Laurie Crawford, Environmental Coordinator, Environmental Services/Alaska Highway Program

Subject: Environmental Overview Assessment
Racing River Bridge Pier Erosion Repair Km 641.1, Alaska Highway, British Columbia

Dear Madam;

WSP Canada Inc. is pleased to submit a PDF copy of the Environmental Overview Assessment report for the above-referenced project.

We trust that the enclosed report meets your current requirements. If you have any questions regarding this project, the enclosed reports, or our services, please do not hesitate to call the undersigned at (250) 360-3578.

Thank you for utilizing our professional services. We look forward to serving your future environmental and engineering needs.

Sincerely,

Susan Blundell, M.Sc. R.P. Bio.
Senior Biologist

Encl. Environmental Overview Assessment

WSP ref.: 19M-01601-0C
PSPC Project no: 19M-01601-0CG

SIGNATURES

PREPARED BY

Susan Blundell, M.Sc. R.P.Bio
Senior Biologist

Reviewed by

Christie Lucas, B.Sc., EP
Group Lead – Environment
Vancouver Island

No environmental assessment can wholly eliminate uncertainty regarding the potential for recognized environmental conditions in connection with a site. Performance of a standardized environmental overview assessment is intended to reduce, but not eliminate, uncertainty regarding the potential for recognized environmental conditions in connection with the Site, given reasonable limits of time and cost.

The disclosure of any information contained in this report is the sole responsibility of the intended recipient. The material in it reflects WSP's best judgement in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. WSP accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This limitations statement is considered part of this report.

The original of the technology-based document sent herewith has been authenticated and will be retained by WSP for a minimum of ten years. Since the file transmitted is now out of WSP's control and its integrity can no longer be ensured, no guarantee may be given with regards to any modifications made to this document.

TABLE OF CONTENTS

TABLES

APPENDICES

1. INTRODUCTION

1.1. PROJECT DESCRIPTION

The Racing River Bridge is located on the Alaska Highway (km 641.1) between Fort Nelson and Liard River, near Toad River (Figure 1). The bridge structure is a two-lane, steel through truss bridge built in 1943. The bridge is comprised of 61 m and 69 m main truss spans and a 13 m approach span supported by steel I-girders.

The most recent inspection report for the bridge highlighted an issue with the center pier, located in the middle of the channel, where the riprap had washed away, and the pier foundation was exposed.

Analysis of the repair options for the pier included a review of existing relevant information, hydrology and hydraulic design analysis, risk analysis, and a summary of the options considered with discussion of each.

Pier #3 was originally founded on a spread footing and in the 1970's the pier failed from undermining due to erosion. The pier was subsequently repaired by driving additional piles just beyond each end of the pier and casting a new collar/cap around the undermined concrete pier and the new piles to support the bridge spans. The old tilted pier still forms part of the existing pier structure.

It is evident that at some point erosion protection was added to the base of Pier 3, consisting of riprap in the range of Class 500 kg to 1000 kg. The riprap was placed around the perimeter of the pier and protected the bottom of the extended concrete cap. Erosion risk was already identified as being a risk. In the spring of 2020, an event partly washed away the rock, exposing the piles that were driven for the pier reinforcement work. The piles are currently exposed at the nose of the pier and near the downstream east side (facing the skewed flow). See figures below showing photos depicting the damage from the spring 2020 event.

Currently the piled foundation of Pier 3 is exposed. The concrete collar added in the 1970's did not extend down into the channel bed. The channel bed appears to have lowered since that time. As a result, the piles are exposed below the collar by roughly 2.5 m.

Based on the review of the site history together with observations from the site visit, and the hydraulic analysis, there are multiple risks associated with the erosion at the existing bridge. This includes pier erosion from high flows and velocities, increased erosion from pier skew, and channel degradation. The existing center pier (Pier 3) of the Racing River bridge could be scoured to a significant depth at high flood events which could present significant risk to the bridge.

In order to protect the center pier from further erosion WSP is proposing to place riprap at a 1.5H:1V grade around its base.

1.2. OBJECTIVES

The objectives of the environmental overview report are to conduct a desktop review of fish and fish habitat, wildlife and vegetation resources in the vicinity of the project site. The following tasks were completed in preparation of this report:

- Summarize findings of the desktop information review;
- Assess potential project effects on identified environmental resources;
- Confirm potential permits and approvals required; and,
- Describe best management practices and provide examples of the mitigation measures.

2. METHODOLOGY

2.1. STUDY AREA

The Project study area for fish and fish habitat, wildlife and vegetation desktop information review, shown in Figures 1 and 2, was defined as the area directly affected by the Project (Project footprint) plus a buffer (5 km diameter). The fish and fish habitat review included only Racing River, which is the extent of where Project affects are likely to occur. The wildlife and vegetation review included a summary of rare and sensitive species and habitat within 5 km of the Project to ensure that all potential effects from the Project on these environmental resources were addressed.

2.2. DESKTOP REVIEW

The desktop information review focused on identifying and describing fish, vegetation and wildlife species that have the potential to occur in the Project area. A variety of literature sources were reviewed including the following websites:

- iMapBC (DataBC, 2021) https://www2.gov.bc.ca/gov/content/data/geographic-data-services/web-based-mapping/imapbc;
- TRIM mapping at 1:20,000 scale (Geo BC 2021) Map Tile 094M050 http://apps.gov.bc.ca/pub/dmf-viewer/?siteid=5628311639164388216;
- Biogeoclimatic Ecosystem Classification (BEC) Web (BC Ministry of Forests and Range, 2021) https://www.for.gov.bc.ca/hre/becweb/resources/maps/FieldMaps.html;
- Conservation Data Centre (Government of BC 2021) https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/conservation-data-centre
- Habitat Wizard (Government of BC 2021) https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/ecosystems/habitatwizard
- Aquatic Species at Risk Map (Fisheries and Oceans Canada [DFO] 2019) https://www.dfo-mpo.gc.ca/species-especes/sara-lep/map-carte/index-eng.html

- E-Flora (Klinkenberg, 2021) https://ibis.geog.ubc.ca/biodiversity/eflora/;
- E-Fauna (2021) E-Fauna BC: Electronic Atlas of the Fauna of British Columbia (ubc.ca)
- Important Bird Areas Canada (Bird Canada, 2021) https://www.ibacanada.org/explore_how.jsp?lang=en
- List of Migratory Birds protected in Canada (Government of Canada 2021) Birds protected in Canada - Canada.ca
- Provincial Priority Invasive Plant List (Province of British Columbia 2021) https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/invasive-species/priority-species/priority-plants/plants-table;
- BC Ministry of Environment and Climate Change (ENV) Ecological Reports Catalogue (EcoCat, 2021);
- Fish Inventories Data Queries (ENV, 2021).
- Species-specific COSEWIC and *SARA* documents:
    - Committee on the Status of Endangered Wildlife in Canada Status Reports (COSEWIC, 2021) http://www.cosewic.ca/index.php/en-ca/;
    - *Species at Risk Act* reports (*SARA*, 2021) https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html;

2.3. DEFINITIONS USED TO DESCRIBE SPECIES OF CONSERVATION CONCERN

The potential occurrence of fish, vegetation and wildlife species and their habitat within each of the Project study areas identified as being of conservation interest (i.e. rare and sensitive) are identified using the *SARA*, COSEWIC and British Columbia's Red, Blue and Yellow rating status defined below.

COSEWIC and *SARA* ratings for species have been defined in the following ways:

- Extinct - A species that no longer exists.
- Extirpated - A species that no longer exists in the wild in Canada, but occurring elsewhere (for example, in captivity or in the wild in the United States).
- Endangered - A species facing imminent extirpation or extinction.
- Threatened - A species likely to become endangered if limiting factors are not reversed.
- Special Concern - A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events.

Red, Blue and Yellow status as defined by the B.C. Conservation Data Centre's are as follows (BC Ministry of Sustainable Resource Management, 2002):

- Red list – Includes any indigenous species or subspecies (taxa) considered to be Extirpated, Endangered, or Threatened in British Columbia. Extirpated taxa no longer exist

in the wild in British Columbia but do occur elsewhere. Endangered taxa are facing imminent extirpation or extinction. Threatened taxa are likely to become endangered if limiting factors are not reversed. Red-listed taxa include those that have been, or are being, evaluated for these designations.

- Blue List – Includes any indigenous species or subspecies (taxa) considered to be Vulnerable in British Columbia. Vulnerable taxa are of special concern because of characteristics that make them particularly sensitive to human activities or natural events. Blue-listed taxa are at risk, but are not Extirpated, Endangered or Threatened.
- Yellow list – This comprises any indigenous species or subspecies (taxa) which is not at risk in British Columbia. The CDC tracks some Yellow listed taxa which are vulnerable during times of seasonal concentration.

The Conservation Data Centre (CDC) maintains tracking lists of rare vertebrates, for each Forest District in British Columbia. Species, subspecies, populations, or communities at high risk of extinction or extirpation are placed on the red list, while those considered vulnerable are placed on the blue list.

3. ENVIRONMENTAL SETTING

3.1. FISH AND FISH HABITAT

The bridge spans the Racing River, which drains northeast and confluences with Toad River, approximately 13.3 km downstream of the Racing River bridge crossing. Toad River is a tributary to the Liard River system. Racing River (Watershed Code 214-362900) is 6th order stream and is approximately 104 km long (ENV Habitat Wizard 2021). There was no previous stream survey data summarized in Habitat Wizard.

3.1.1 FISH PRESENCE

A summary of historical fish presence in Racing River is provided in Table 1. There are four species of salmonids historically found within Racing River including the Arctic Grayling (*Thymallus arcticus*), Bull Trout (*Salvelinus confluentus*), Dolly Varden (*Salvelinus malma*) and the Mountain Whitefish (*Prosopium williamsoni*). Slimy Sculpin (*Cottus cognatus*) have also been captured in Racing River.

Table 1: Summary of historical fish presence in Racing River

Common Name	Scientific Name	BC Listing	COSEWIC/ SARA	Date Observed
Arctic Grayling	*Thymallus arcticus*	Blue – Nahanni Population	N/A	1998
Bull Trout	*Salvelinus confluentus*	Blue – Western Arctic Population	Special Concern	1987
Dolly Varden	*Salvelinus malma*	Yellow	N/A	1998
Mountain Whitefish	*Prosopium williamsoni*	Yellow	N/A	1998
Slimy Sculpin	*Cottus cognatus*	Yellow	N/A	1998

Notes: Red = Extirpated, Endangered or Threatened Status, Blue = Special Concern, Yellow = Apparently Secure, N/A = Not classified, DD = Data deficient

Sources: BC ENV 2021, BC CDC 2021

3.1.2 FISH OF CONSERVATION CONCERN

There are two species of conservation concern found within Racing River; Arctic Grayling and Bull Trout.

Arctic Grayling within the watershed are provincially blue-listed as they are part of the Nahanni population. This lineage of Arctic Grayling is found in the Lower Liard drainage. This population of Arctic Grayling has been negatively impacted by historic forestry, oil and gas exploration and placer mining (BC CDC 2011).

Bull Trout are provincially blue-listed, and designated as Special Concern under COSEWIC, and *SARA* Schedule 1 as of August 2019. This population of Bull Trout are part of the Western Arctic population which includes the Mackenzie River System and major tributaries of that system (COSEWIC 2012). Bull Trout are particularly vulnerable to habitat degradation and fragmentation as they are slow-growing and late maturing species that prefer cold, pristine waters and unimpeded migratory routes (Government of Canada 2021).

3.1.3 FISH HABITAT

At the time of the site reconnaissance conducted in September 2020 by WSP Canada Inc. at the bridge location, water levels were at their lowest and Racing River existed as a braided, unconfined channel. The bankfull width is approximately 100 m. The stream has a riffle-pool morphology with a stream gradient of approximately 1.5%. At the time of the survey the stream consisted of 40% riffle, 40% run and 20% pool. Upstream of the bridge the channel has a wetted width of approximately 40 m but approximately 45 m upstream of the crossing it splits; the east channel conveys the majority (75%) of the water and has a channel width of 30 m and a maximum depth of 1 m. The west channel has a channel width of 20 m and water levels had a maximum depth of 30 cm. Channel substrate consists mostly of boulder and cobble; sand bars between the channels consisted of sand, gravels and cobbles. The banks along the east side of Racing River have been stabilized with gabion baskets near the bridge structure. Stream velocities and limited suitable substrate likely indicates that there is no spawning habitat in the immediate vicinity of the bridge, but rearing habitat is present for all species of fish known to occur in the system. Due to the unconfined and flashy nature of the stream there was very little cover habitat available (5%) and it consisted primarily of deep pool and boulder. Riparian vegetation consisted of young second

growth deciduous dominant woodland comprised of white spruce, trembling aspen, black cottonwood, subalpine fir with an understorey of soopalallie, prickly rose, wolf willow, shrubby cinquefoil, mountain avens, kinnikinnick, yarrow and grasses. There is no mapped distribution or presence of critical habitat for aquatic species at risk within the vicinity of the project (DFO 2019).

3.2. VEGETATION

3.2.1 GENERAL

The Project Area is located in the Northern Canadian Rockies Ecoregion within the Muskwa Foothills Ecosection. The Northern Canadian Rockies Ecoregion is mountains and plateaus separated by wide valleys and lowlands. This Project Area lies within the Moist Cool Boreal White and Black Spruce (BWBSmk) Biogeoclimatic Subzone. The mean annual temperature within the zone is -2.9 to 2°C; monthly averages remain below 0°C for 5-7 months of the year, and above 10°C for only 2-4 months. Annual precipitation averages between 330 and 570 mm, with 35-55% of this falling as snow. The ground freezes deeply for a large part of the year, and discontinuous permafrost is common in the northeastern parts of the zone.

White spruce, trembling aspen, lodgepole pine, black spruce, balsam poplar, tamarack, subalpine fir and paper birch are the major tree species in the forested sections of the BWBS. Forest fires are frequent throughout the zone, maintaining most of the forests in various successional stages. Forests predominate in the better-drained plateau, foothill, and cordilleran sections of the zone, where mixed trembling aspen — white spruce forests on Gray Luvisols dominate the landscape. Relatively open pine — lichen forests occur on the driest sites, which are usually on rapidly drained outwash deposits. Mixed pine and black spruce stands are common on level or gently sloping, north-facing sites on compacted morainal or lacustrine soils. Dense black spruce — moss communities develop on imperfectly drained sites.

Although the vegetation community occurring at the Racing River bridge has not been identified in the field it is likely the White spruce – Mountain alder – Horsetail (BWBSmk/111). This plant community is limited to sites that are subject to long cycle flooding (>100 years) along major waterways. These forests occur on level sites on upper fluvial benches. The tree layer consists primarily of white spruce. The understorey is well developed and consists of mountain alder, red-osier dogwood, prickly rose, highbush cranberry and gooseberries. The herb layer consists of horsetails, bunchberry, twinflower, common miterwort and trailing raspberry. The moss layer is well developed and consists of step moss and knight's plume. Much of the vegetation in the immediate vicinity of the bridge consists mostly of regenerating deciduous shrubs and juvenile white spruce and subalpine fir.

Table 2: Vegetation Typically Occurring within the Boreal White and Black Spruce Zone (BWBSmk)

Type	Common Name	Scientific Name
Trees	Lodgepole pine	*Pinus contorta*
	White spruce	*Picea glauca*
	Black spruce	*Picea mariana*
Shrubs	Soopolallie	*Shepherdia canadensis*
	Labrador tea	*Ledum groenlandicum*
	White spruce	*Picea glauca*
	Prickly rose	*Rosa acicularis*
	Highbush-cranberry	*Viburnum edule*
	Mountain alder	*Alnus incana*
Herbs and Dwarf Shrubs	Northern anemone	*Anenome parviflora*
	Kinnikinnick	*Arctostaphylos uva-urs*
	Fuzzy-spiked wildrye	*Leymus innovatus*
	Bunchberry	*Cornus canadensis*
	False toad-flax	*Geocaulon lividum*
	Twinflower	*Linnaea borealis*
	Common mitrewort	*Mitella nuda*
	Lingonberry	*Vaccinium vitis-idaea*
	Pink wintergreen	*Pyrola asarifolia*
	Tall bluebells	*Mertensia paniculata*
	Horsetail	*Equisetum spp.*
	Trailing raspberry	*Rubus pubescens*
Mosses and Lichens	Reindeer lichens	*Cladina spp.*
	Clad lichens	*Cladonia* spp.
	Freckle pelt	*Peltigera aphthosa*
	Step moss	*Hylocomium splendens*
	Red-stemmed feathermoss	*Pleurozium schreberi*
	Knight's plume	*Ptilium crista-castrensis*

Source: DeLong, et al., 2011.

3.2.1. VEGETATION AND ECOLOGICAL COMMUNITIES OF CONSERVATION CONCERN

Based on BC CDC search for the Boreal White and Black Spruce (BWBSmk) Biogeoclimatic Subzone and the Muskwa Hills Ecosection, suitable habitat for four plant species at risk may occur within the Project Area (Table 3).

Table 3: Rare Plant Species Known to Occur in Close Vicinity of the Project Area

Plant Species		BC Status[1]	COSEWIC[2]	SARA[3]	Habitat
Common Name	Scientific Name				
Davis' locoweed	*Oxytropis campestris var. davisii*	Blue	-	-	Dry to mesic sandy, gravelly or rocky sites, including river bars, roadsides
Gorman's penstemon	*Penstemon gormanii*	Blue	-	-	Riparian, occurring in shrub and herbaceous communities
Raup's willow	*Salix raupii*	Red	-	-	Riparian, occurring in shrub communities
Marsh fleabane	*Tephroseris palustris*	Blue	-	-	Wet to moist streambanks in the montane zone

Notes: "-" no information/not listed
1. British Columbia List Status: Red = Extirpated, Endangered or Threatened Status, Blue = Special Concern, Yellow = Apparently Secure

2. Committee on the Status of Endangered Wildlife in Canada; E = recommended to be placed on Schedule 1 of *SARA* as endangered; SC = recommended to be placed on Schedule 1 of *SARA* as special concern; T = recommended to be placed on Schedule 1 of *SARA* as threatened. N/A = not applicable, DD = Data deficient, NAR = not at risk.3. *Species at Risk Act*; listed on Schedule 1 of *SARA* as: E = endangered; SC = listed as special concern; T = threatened.

The closest documented occurrences of rare plants to the Site are Raup's willow, which overlaps the bridge crossing location, and Davis' locoweed located 7.5 km to the west northwest and 2.6 km to the northeast.

Rare plant communities that have some potential of occurring in the vicinity of Racing River are as follows:

- Balsam poplar – White spruce / Mountain alder – Red-osier dogwood (blue-listed); occurs on middle bench floodplains
- Narrow-leaf willow shrubland (red-listed); occurs on low bench floodplains
- Pacific willow / Red-osier dogwood / Horsetails (red-listed); occurs on low bench floodplains
- White spruce / Red swamp currant / Horsetails (blue-listed); occurs in fringe flood areas

None of the rare plant community occurrences were noted during the September 2020 assessment.

3.2.2. INVASIVE PLANT SPECIES

Data from the Invasive Alien Plant Program (IAPP), indicates that between 2003 and 2016 there are ten invasive plant species that potentially occur in the Project area (Table 4).

Table 4: Invasive Plant Species Potentially Occuring in the Project Area.

Common Name	Scientific Name	IAPP Map Symbol	Priority Invasive Plant List[1]	Weed Control Act[2]	FRPA[3]
Canada Thistle	*Cirsium arvense*	CT	No	Yes	Yes
Caraway	*Carum carvi*	CA	No	No	No
Common tansy	*Tanacetum vulgare*	TC	Yes	No	Yes
Oxeye daisy	*Leucanthemum vulgare*	OD	No	No	Yes
Perennial sow thistle	*Sonchus arvensis*	PS	No	Yes	No
Scentless chamomile	*Matricaria perforata*	SH	Yes	Yes	Yes
Sowthistle species	*Sonchus species*	SO	No	No	No
Yellow hawkweed	*Hieracium caespitosum*	YH	Yes	No	No
Yellow toadflax	*Linaria vulgaris*	YT	No	Yes	Yes

Notes: IAPP = Invasive Alien Plant Program

1. Listed in Government of BC Provincial Priority Invasive Plants List Table
2. Listed in Part 1 or 2 of Schedule A of BC Weed Control Act
3. Listed in BC Forest and Ranges Practices Act (FRPA)

3.3. WILDLIFE

3.3.1. GENERAL

In the Taiga Plains Ecoprovince, Moose is abundant and there are scattered herds of Caribou. American Black Bear and Lynx are common carnivores while small mammals include the Muskrat, Meadow Vole, Northern Red-Backed Vole, and Meadow Jumping Mouse. Some common birds species include Lesser Yellowlegs, Solitary Sandpipers, Spruce Grouse, Bay-breasted Warbler, Swamp Sparrow, Le Conte's Sparrow, Cape May Warbler, Canada Warbler, Black and White Warbler and Rose-breasted Grosbeak. Amphibians include western toad, northern chorus frog and wood frog. (Demarchi 2011, DeLong et al. 2011). A regional query of the Conservation Data Center for species of conservation concern based on the geographical location and potential habitat present is summarized in Table 5. One amphibian, 14 birds, 10 insects, and nine mammals were identified (BC CDC 2021).

Table 5: Summary of BC Ecosystems Explorer Regional Query Results

Species Group	Common Name	Scientific Name	BC List	COSEWIC	MBCA	SARA
Amphibians	Western Toad	*Anaxyrus boreas*	Yellow	SC (Nov 2012)	-	1-SC (Jun 2018)
Birds	Nelson's Sparrow	*Ammospiza nelsoni*	Red	NAR (May 1998)	Y	-
Birds	Short-eared Owl	*Asio flammeus*	Blue	SC (Mar 2008)	-	1-SC (Jul 2012)
Birds	Upland Sandpiper	*Bartramia longicauda*	Red	-	Y	-
Birds	American Bittern	*Botaurus lentiginosus*	Blue	-	Y	-
Birds	Swainson's Hawk	*Buteo swainsoni*	Red	-	-	-
Birds	Canada Warbler	*Cardellina canadensis*	Blue	SC (Nov 2020)	Y	1-T (Feb 2010)
Birds	Common Nighthawk	*Chordeiles minor*	Yellow	SC (May 2018)	Y	1-T (Feb 2010)
Birds	Evening Grosbeak	*Coccothraustes vespertinus*	Yellow	SC (Nov 2016)	Y	1-SC (May 2019)
Birds	Olive-sided Flycatcher	*Contopus cooperi*	Blue	SC (May 2018)	Y	1-T (Feb 2010)
Birds	Rusty Blackbird	*Euphagus carolinus*	Blue	SC (Apr 2017)	-	1-SC (Mar 2009)
Birds	Peregrine Falcon, *anatum* subspecies	*Falco peregrinus anatum*	Red	NAR (Dec 2017)	-	1-SC (Jun 2012)
Birds	Bay-breasted Warbler	*Setophaga castanea*	Red	-	Y	-
Birds	Cape May Warbler	*Setophaga tigrina*	Blue	-	Y	-
Birds	Black-throated Green Warbler	*Setophaga virens*	Blue	-	Y	-
Insects	Eastern Pine Elfin	*Callophrys niphon*	Red	-	-	-
Insects	Arctic Skipper, *mandan* subspecies	*Carterocephalus palaemon mandan*	Red	-	-	-
Insects	Prairie Bluet	*Coenagrion angulatum*	Blue	-	-	-
Insects	Cranberry Blue	*Agriades optilete*	Blue	-	-	-
Insects	Yellow-dotted Alpine	*Erebia pawloskii*	Red	-	-	-
Insects	Assiniboine Skipper	*Hesperia assiniboia*	Red	-	-	-
Insects	Bronze Copper	*Lycaena hyllus*	Blue	-	-	-
Insects	Philip's Arctic	*Oeneis philipi*	Red	-	-	-
Insects	Tawny Crescent	*Phyciodes batesii*	Blue	-	-	-
Insects	Kennedy's Emerald	*Somatochlora kennedyi*	Blue	-		-

Species Group	Common Name	Scientific Name	BC List	COSEWIC	MBCA	SARA
Mammals	Wood Bison	*Bos bison athabascae*	Red	SC (Nov 2013)	-	1-T (Jun 2003)
Mammals	Wolverine, *luscus* subspecies	*Gulo gulo luscus*	Blue	SC (May 2014)	-	1-SC (Jun 2018)
Mammals	Little Brown Myotis	*Myotis lucifugus*	Yellow	E (Nov 2013)	-	1-E (Dec 2014)
Mammals	Northern Myotis	*Myotis septentrionalis*	Blue	E (Nov 2013)	-	1-E (Dec 2014)
Mammals	Mountain Goat	*Oreamnos americanus*	Blue	-	-	-
Mammals	Stone's Sheep	*Ovis dalli stonei*	Blue	-	-	-
Mammals	Caribou (Boreal Population)	*Rangifer tarandus pop. 14*	Red	T (Nov 2014)	-	1-T (Jun 2003)
Mammals	Caribou (Northern Mountain Population)	*Rangifer tarandus pop. 15*	Blue	SC (May 2014)	-	1-SC (Jan 2005)
Mammals	Grizzly Bear	*Ursus arctos*	Blue	SC (May 2012)	-	1-SC (Jun 2018)

Notes: British Columbia List Status: Red = Extirpated, Endangered or Threatened Status, Blue = Special Concern, Yellow = Apparently Secure
COSEWIC = Committee on the Status of Endangered Wildlife in Canada, MBCA = Migratory Bird Convention Act, *SARA* = *Species at Risk Act*, Y = Yes, T = Threatened, SC =Special Concern, E = Endangered

3.3.2. WILDLIFE SPECIES OF CONSERVATION CONCERN AND ASSOCIATED WILDLIFE HABITAT

There are two wildlife species of conservation concern that have known publicly available occurrences identified within the Project study area (Table 6, Figure 2). This includes the Muskwa herd of Northern Mountain Population of Caribou (*Rangifer tarandus),* and the Northern myotis (*Myotis septentrionalis*). Northern myotis were outside the study area but were included because they are noted to use bridges.

Table 6: Wildlife Species of Conservation Concern under Provincial and / or Federal Legislation that may Inhabit the Project Area

Common Name	Scientific Name	BC Listing	COSEWIC	*SARA*	Last Date Observed
Caribou (Northern Mountain Population)	*Rangifer tarandus* pop. 15	Blue	SC (2014)	1-SC	2004
Northern Myotis	*Myotis septentrionalis*	Blue	E (2013)	1-E	1995

Notes: British Columbia List Status: Red = Extirpated, Endangered or Threatened Status, Blue = Special Concern, Yellow = Apparently Secure
COSEWIC = Committee on the Status of Endangered Wildlife in Canada, *SARA* = *Species at Risk Act*, T = Threatened, SC =Special Concern, E = Endangered, N/A = Not applicable.

The Project location does intersect the Muskwa Caribou Population. The closest Critical habitat identified is for the Parker Caribou Population Unit which is located approximately 100 km east of the project location (Figure 2). The Muskwa Caribou Population Unit is provincially blue-listed and listed as Special Concern on Schedule 1 of SARA. Caribou have complex movement patterns. In the summer, herds spend time on the alpine and upper subalpine ranges, in the winter some herds move down to coniferous forests and lower subalpine and other herds winter in the alpine. Movement is dependent on forage ability and security. Roads may adversely affect their access to important habitat (Environment Canada 2012). Calving occurs in late May to early June and pregnant females may disperse into high mountain terrain. Important food sources in summer include the leaves of willow and sedges. They are sensitive to noise and infrastructure development (Environment Canada 2012).

Northern myotis were located outside of the 5 km buffer but are included as they are reported to have used bridges in the area as roost sites. Northern myotis are provincially listed as Blue (Special Concern) and Endangered under COSEWIC and *SARA* Schedule 1. This bat is generally associated with old-growth intact forests habitat with low edge-to-interior ratios. Day and night roost differ in the summer with caves, mines, and quarry tunnels used as night roosts. During the day they can be observed in crevices, hollows or under loose bark on trees, some summer roost may occur under bridges (BC CDC 2014). The literature notes that bridges are used as daytime roost sites by bats, no maternal bats colonies have been found under or in bridges in northern BC (Holroyd et al., 2016).

4. POTENTIAL PROJECT INTERACTIONS

4.1 PROPOSED WORKS

To provide temporary erosion protection to the existing riprap at Pier 3 will be applied to the exposed pier. Riprap will be added at a nominal thickness of 2.8 m at 1.5H:1V slope which will allow for a minimum thickness of 2.0 m after scour and the top of the riprap to be located 0.3 m above the bottom of the existing concrete collar. The bottom elevation will be near the streambed elevation. The estimated riprap footprint is 430 m2 and the estimated riprap volume is 1030 m^3.

In order to complete the erosion protection measures the following steps are proposed:

- Complete fish salvage
- Divert water in the west channel into the east channel in order to dewater the mobilization route as much as possible
- Lay down rig matting
- Remove and salvage existing riprap. Stockpile riprap out of water.
- Excavate and salvage any existing material down to the bottom of riprap elevation with a 1.5H:1V backslope. Stockpile the excavated material out of water
- Lay down non-woven geotextile on the prepared surface
- Build up riprap armour layer (salvaged and mobilized) 2.8 m thick at 1.5:1V slope, while filling the void underneath the concrete collar with the salvaged channel material.
- Remove rig matting and restore channel substrate in the west channel as necessary
- Seed all exposed soils along the shoreline with a native grass seed mix.

Although there will be temporary changes to instream substrate conditions along the access route and at the riprap installation site there will be no permanent losses to fish habitat upon the completion of the erosion control works. The existing exposed pier area consists of an area that is rarely underwater and was prior to the scouring episodes covered in large riprap, providing very limited habitat for fish. The proposed works will result in the reinstatement of the riprap. Access to the Site will be made possible via an existing unpaved pathway located to the west of the bridge. It is unlikely that any trees will need to be removed in order to access the stream edge. Following the completion of the erosion control works all exposed soils in the riparian area will be seeded with native grass seed.

4.2 POTENTIAL EFFECTS

High-level potential project interactions with fish and fish habitat are summarized in Table 7. In addition to the potential aquatic effects the project may also include effects to terrestrial resources

including direct/indirect effects to birds and bats directly affiliated with the bridge structure as well as indirect effects to wildlife in the general area.

Table 7: Project Activities and Potential Pathways of Effects (DFO 2018) associated with the Project.

Pathway of Effect		Potential Effects
Land-based activities	Riparian vegetation clearing / disturbance	– Change in habitat structure and cover – Change in sediment concentrations – Change in water temperature – Change in food supply – Change in nutrient concentrations – Change in contaminant concentrations
	Use of industrial equipment	– Potential mortality of fish/eggs from equipment – Change in sediment concentrations – Change in contaminant concentrations
	Fish passage issues	– Incidental entrainment, impingement or mortality of resident species – Change in access to habitats
Both	Placement of materials below high-water mark	– Change in sediment concentrations – Change in habitat structure and cover – Change in food supply – Change in nutrient concentrations
In-water	Streambed Materials / Riprap Removal	– Change in food supply – Change in habitat structure and cover – Change in sediment concentration

4.3 PERMITS AND APPROVALS

Due to the instream works required as part of the erosion repair both a B.C. Water Sustainability Act Section 11 Authorization and a Fisheries and Oceans Canada Request for Review will be required. In order to complete a fish salvage within the work area it will be necessary to acquire a fish collection permit. Details are presented below in Table 8.

Table 8: Potential Permits and Approvals

Potential Project Activity	Potential Permits and Approvals	Timing Constraints and Considerations
– Instream works – Works on banks of stream or within riparian areas – Works on the foundation of the bridge	– DFO Request for Review, potentially a Letter of Authorization under paragraph 35(2) of the *Fisheries Act.* – B.C. *Water Sustainability Act* Section 11 Notification. – B.C. Scientific Fish Collection Permit	– DFO - 60-day time limit to review an application to determine whether the required information has been submitted, and a 90-day time limit form the date of notification that the application is complete to issue the authorization (additional time would be required if Habitat Offsetting is required).

Potential Project Activity	Potential Permits and Approvals	Timing Constraints and Considerations
		– BC *Water Sustainability Act* notification estimated to be 140 days. – The reduced risk work window for the Project area for both spring and fall spawners, ranges between July 15 and August 15 for the Northeast Region (BC MFLNRO 2016).

4.4 MITIGATION MEASURES

Mitigation will be required to protect the environment and if required, satisfy permit and approval requirements. Mitigation measures will need to address the potential effects of all stages of the construction, as well as on-going operations. A Construction Environmental Management Plan (CEMP) and various other mitigation plans will need to be developed, the level of detail for which will be determined by the contractor based on specific Project activities. Table 9 provides a summary of example Mitigation Plans that may be required.

Table 9: Mitigation Plans that may be Required

Project Activity	Environmental Protection Plans that may be Required
– Vehicle and equipment movement and maintenance – Bridge erosion protection activities	– CEMP which includes best management practices for construction / rehabilitation activities and specifically outlines protection measures for avoiding effects to the Racing River and adjacent riparian / forest environments. – Spill Response Plan (specifically outlining protection measures that limit the use and discharge of deleterious substances used for erosion control / construction activities) – Contractor Environmental Protection Plan (EPP) – Specific bird or bat management plans – Caribou Protection Plan (CPP)

4.4.1 MITIGATION STRATEGIES

Protection of Migratory Birds and Bats

The most effective mitigation strategy is to conduct the work before or after the breeding season for birds and bats that could potentially occur in the region. Bats become more active in April in most regions of BC (Holroyd et al., 2016). The general breeding bird window for the Project study area located in Zone B6 (Nesting Periods – Canada.ca) is from late April to mid-August (Birds Canada 2021). There is some potential for sensitive bird species to nest in the Racing River Bridge structure and the adjacent habitat. The Provincial *Wildlife Act* provides protection for the eggs and

active nests of all birds during breeding season. Section 34 of the *Act* states "A person commits an offence if the person, except as provided by regulation, possesses, takes, injures, molests or destroys:

(a) a bird or its egg;
(b) the nest of eagle, peregrine falcon, gyrfalcon, osprey, heron or burrowing owl; or
(c) the nest of a bird not referred to in paragraph(b) when the nest is occupied by a bird or its egg."

Subsections 34(a) and (c) have generally been interpreted to protect the active nests of all birds during breeding season. The nests of the birds listed in subsection (b) of the Provincial *Wildlife Act* are protected regardless of the time of year, or whether or not they are active. At the Federal level the *Migratory Birds Convention Act* (1994) provides similar protection for all migratory birds. These nesting windows, which are provided for information purposes, must be confirmed with the local regulators and taken into consideration when scheduling Project activities.

All bat species are protected from being killed or harassed under the BC *Wildlife Act*. Although there are no documented occurrences of bats utilizing the bridge as roosting habitat there is some potential for them to occur on the Racing River Bridge.

Prior to any project activities occurring at the Racing River a Qualified Environmental Professional (QEP) should determine that the bridge is not occupied by either bats or birds. Observed bird nests that are in good condition must be considered active until an assessment can determine otherwise. A no work buffer zone should be placed around any active nests and the QEP will determine the set back and develop a management plan. The buffer zone will depend on a number of factors including surrounding vegetative cover, species sensitivity, existing disturbance and the type of construction activity. If an active nest is present, a management plan can be completed to ensure that this nest is not disturbed by the construction. The erosion repair works are proposed for late August to early September at which time all bird nesting should be completed, and therefore there is a very low probability that active nests will be encountered.

Protection of Caribou

A Caribou Protection Plan (CPP) should be available during construction to avoid or mitigate any adverse effects on caribou for the duration of the Project. The risk periods for Woodland Caribou in northern BC are as follows (MFLNRO 2014):

- Low risk: July 16 – September 14
- Caution: September 15 – January 14
- Critical: January 15 – July 15
- Critical: Migration period for caribou in north-central BC is April 1 to May 20 and December 1 to January 1

A CPP should identify strategies and best management practices and include the following information:

- Background information on caribou:
    - Description of caribou and protected areas near the project;
    - Conservation status and population status of the particular herd(s);
    - Habitat use and distribution including timing of movements;

- Signs of caribou presence – include images of animal and scat for those people not familiar with caribou; and,
- Sensitive times for caribou based on habitat and movements.

- Project activities and schedule:
  - Identify if project footprint/interactions are occurring within or near protected habitat and where the caribou may be during project duration.
- Identify any potential project effects if applicable.
- Identify specific mitigation and timing including:
  - General measures including presentation of the CPP to all relevant staff;
  - Project specific measures to protect caribou and their habitat including important environmental features such as mineral licks;
  - Do not block any noted game trails with equipment of laydown material;
  - Fence any temporary trenches/excavations;
  - Identify ways to abate excessive noise;
  - What to do if animal or recent sign is noted, create a record of event;
  - Describe harassment and how to avoid it; and,
  - Identify roles and implementation of CPP.
- Identify events that would require the consultation with a wildlife biologist. This would include any detection of mineral licks or presence of caribou at the site.

Instream Works Practices

In order to provide an access route for the large equipment across the west channel, stream isolation by diversion around the construction area will be required. This will be done by a combination of localized isolation and natural stream diversion, temporarily directing all flows to the east channel. Isolation will start by working at the lowest flow possible to carefully move streambed material to create a flatter surface to install the isolation system. Placement of sandbags, an aqua dam, or other non-erodible removable cofferdam materials will be done to provide the primary isolation barrier. Additional small sandbags will be hand placed to plug larger gaps in the primary barrier, then a bell hole with pumps will be used downstream of the barrier to complete the site dewatering.

Prior to the dewatering of the west channel a fish salvage will be necessary. Fish exclusion netting will be installed upstream and downstream of the proposed access route in the west channel. A combination of electrofishing and trapping will be used to remove all fish from this area before the diversion is installed and the route is dewatered. Fish passage will be maintained through the east channel throughout the construction. An environmental monitor will be on site at all time during works within 30 m of a watercourse and will be a qualified environmental professional (QEP). If turbid waters are created as a result of the isolation process, these waters will need to be treated prior to being rereleased into the watercourse (i.e. overland flow, silt sock etc.)

Before the installation of fish exclusion fencing and salvage of fish from within the active construction zone it will be necessary to obtain a Fish Collection Licence from Fisheries and Oceans Canada (DFO) and FLNRORD.

All construction works are to be scheduled for the dry season (late August – early September) when potential for water related erosion is at a minimum. In order to take advantage of the lowest

possible water levels it will be necessary to work outside of the instream fisheries window as recommended for the region. The associated potential risks to fish associated with work being undertaken during the proposed work schedule are considered very low. The instream window restrictions are associated with the movement of fall spawners in the system. The work area has been assessed for the potential as spawning habitat and it has been determined that there is no suitable substrate present. Consequently, the main concern would be to maintain fish movement through the work area as well as ensure that water quality continues to be within the B.C. Approved Water Quality Guidelines for the Protection of Aquatic Life. The partial diversion of flows into the main channel (east) and the compliance with a sediment and erosion control best management practices will minimize impacts to spawning fish migrating up Racing River during construction.

Equipment to be used in the vicinity of the River should be inspected before commencing work and cleaned to remove oil, grease and other substances deleterious to aquatic life. Equipment should use only biodegradable hydraulic fluid. Equipment with fuel or fluid leaks should not be permitted to work within or above any watercourse. Any equipment that develops a leak should immediately be removed from the watercourse and repaired.

The monitor will take water quality throughout the entire construction process for turbidity and pH. This will allow the monitor to determine if construction activities are negatively impacting water quality using the B.C. Approved Water Quality Guidelines.

Sediment and Erosion Control Plan

A sediment control plan should be followed throughout and following the construction phase. The sediment control plan will consist of the following elements:

- If any soil or other erodible material is to be stockpiled for more than seven days, it will be covered with polyethylene sheeting that is anchored securely to prevent displacement by wind.
- Where necessary, silt fencing will be used to retain sediments on the construction site;
- The sediment control structures will be installed as the first construction activity. All sediment control structures will be inspected regularly, and repaired/maintained as necessary;
- Sediment and erosion control materials will be stockpiled on site for use in any emergency situation that may arise. Stockpiled materials will include filter cloth, hay bales, rip-rap, grass seed, drain rock, culverts, matting polyethylene, etc.; and,

As soon as practical after construction, any remaining disturbed soils in the riparian area will be revegetated using an appropriate grass seed mixture. Seeding will be conducted before the end of the growing season to allow establishment of germination/roots. It will be important to create a site-specific Sediment and Erosion Control Plan for the site prior to the commencement of construction to ensure that no construction related material can enter the watercourse.

Invasive Plant Species Management

The Project area contains several invasive plant species, the spread of which should be mitigated to the extent possible. An invasive plant management plan will be required that includes:

- Limiting the introduction of invasive plant via seed or runners;
- Early detection and eradication of small patches of invasive plants;
- Maintaining desired plant communities through good management;
- Revegetating disturbed sites with desired plants; and,
- Evaluating the effectiveness of prevention efforts and adapting plans for the following year.

Spill Prevention

A Project specific Spill Prevention Plan will be required that consists of the following elements:

- All fueling of vehicles and/or equipment must be done at least 30 m away from Racing River and should not be done where the ground slopes towards the watercourse.
- If fuel is stored on site it must be at least 30 m from the River in a bermed compound that is sized to contain 110% fuel if a spill should occur.
- Industry approved spill kits should be stored no further than 30 m away from each piece of equipment and should be sized to handle the largest piece of equipment used. Additional spill pads should be kept in all pieces of equipment to further aid in immediate spill response including those for oil and gas and antifreeze.
- If a spill does occur, it should immediately be reported to the environmental monitor and to the Environmental Emergency Program (1-800-663-3456). Written notification should follow within two weeks of the verbal report.
- If a spill does occur, site personnel should immediately take steps to stop the discharge (if possible). As quickly as possible, they should contain the spill, clean up the affected area and dispose of waste materials at an approved disposal site.

Storage and maintenance facilities should have spill clean-up and disposal equipment. They also should have Medical Safety Data Sheets (MSDS) for any hazardous substances, a list of emergency contact names and telephone numbers, and a written list of emergency response and spill-reporting procedures:

- All hydraulic systems, fuel systems and lubricating systems should be in good repair;
- Equipment should be inspected before commencing work. Equipment with fuel or fluid leaks should not be permitted to work within or above any watercourse. Any equipment that develops a leak should immediately be removed from the watercourse and repaired;
- Before commencing work, all equipment should be steam-cleaned to remove oil, grease and other substances deleterious to aquatic life; and,
- Equipment should use only biodegradable hydraulic fluid.

4.5 RECOMMENDATIONS

It is recommended A CEMP should be prepared and submitted to PSPC to ensure all mitigation measures can be met and should include those mitigation strategies identified above. A qualified Environmental Monitor should be onsite during works to ensure compliance with the CEMP and other environmental protection plans. The CEMP can also be used to support any permit application or discussions with regulatory agencies, if required. A CPP should also be included as part of the environmental protection plans required for the duration of the project.

It is also recommended, that prior to construction, a pre-screen for presence of bats and swallows that may be using the bridge should be conducted if construction will occur in the spring or summer.

5. CLOSURE

This memo was prepared by WSP Canada Inc. The assessment represents the conditions at the subject property only at the time of the assessment and is based on the information referenced and contained herein. The conclusions presented respecting current conditions represent the best judgment of the assessors based on current environmental standards. WSP Canada Inc. attests that to the best of our knowledge, the information presented in this report is accurate. The information in this report should be evaluated, interpreted, and implemented only in the context of the assignment. The use of this memo or any of its parts for other projects without written permission of the Client and WSP Canada Inc. is solely at the user's own risk. This report must be reviewed and approved by the relevant regulating agencies prior to being relied on for planning and/or construction purposes.

6. REFERENCES

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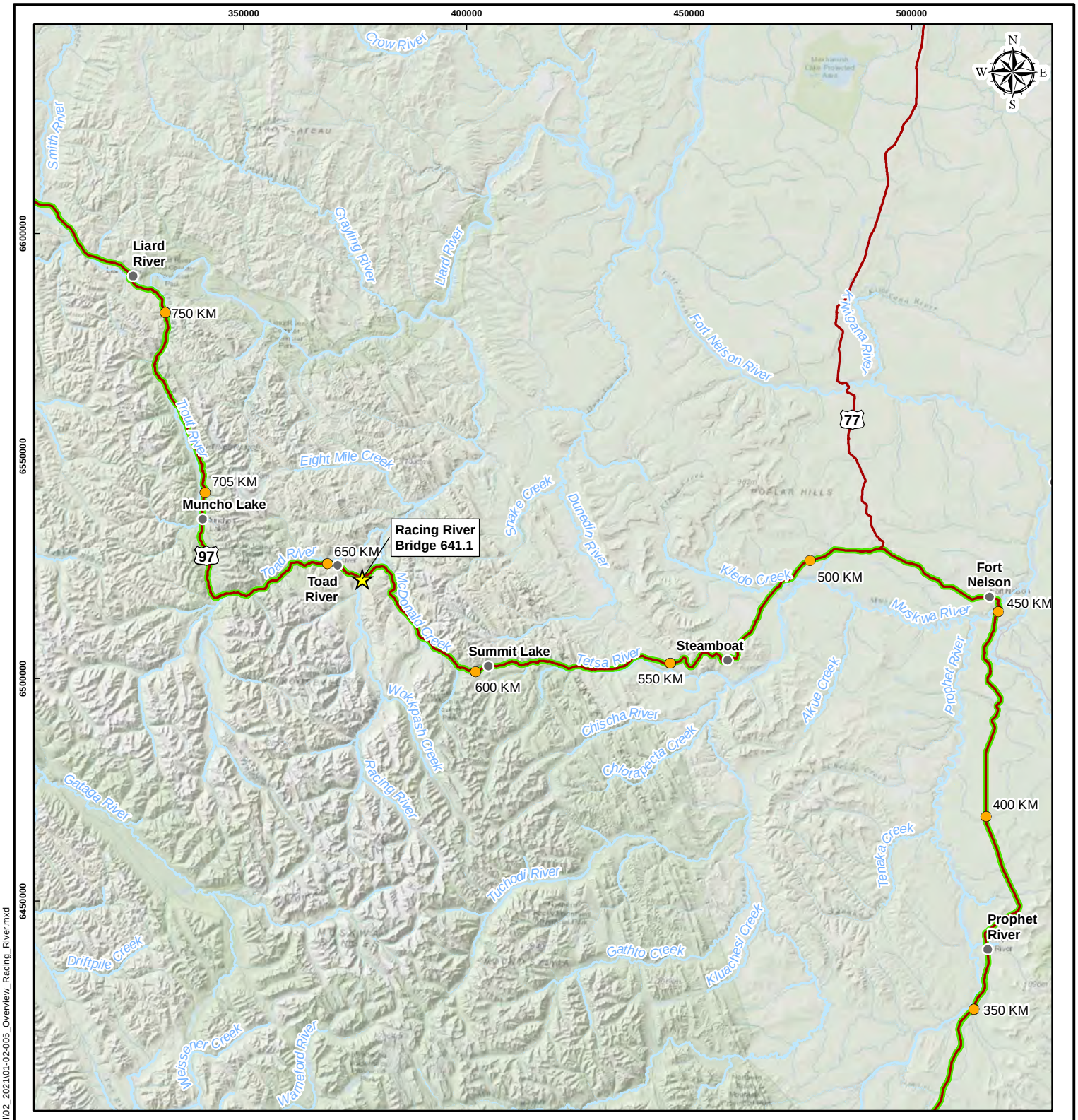
APPENDIX

A FIGURES



Legend

- Populated Place
- KM Post
- Project Site Location
- Highway
- Highway 97
- Watercourse

0 10 20 Kilometers

Scale: 1:1,200,000

References:
Data BC - BC Catalogue
Open Government License
(http://www.data.gov.bc.ca/)
NRCAN Geogratis
Open Government License
(http://geogratis.cgdi.gc.ca/)
MFLNRO - Archaeology Branch
Archaeological Sites RAAD

CLIENT: Public Services and Procurement Canada

PROJECT: Racing River Bridge
KM 641.1

TITLE: Map Overview

DATE:	PROJECT NO:	
July 05, 2021	19M-01601-01	**Figure 1**

GIS FILE: 01-02-005_Overview_Racing_River.mxd

COORDINATE SYSTEM:	ANALYST:	REVIEWED:
NAD 1983 UTM Zone 10N	MY	SB

wsp

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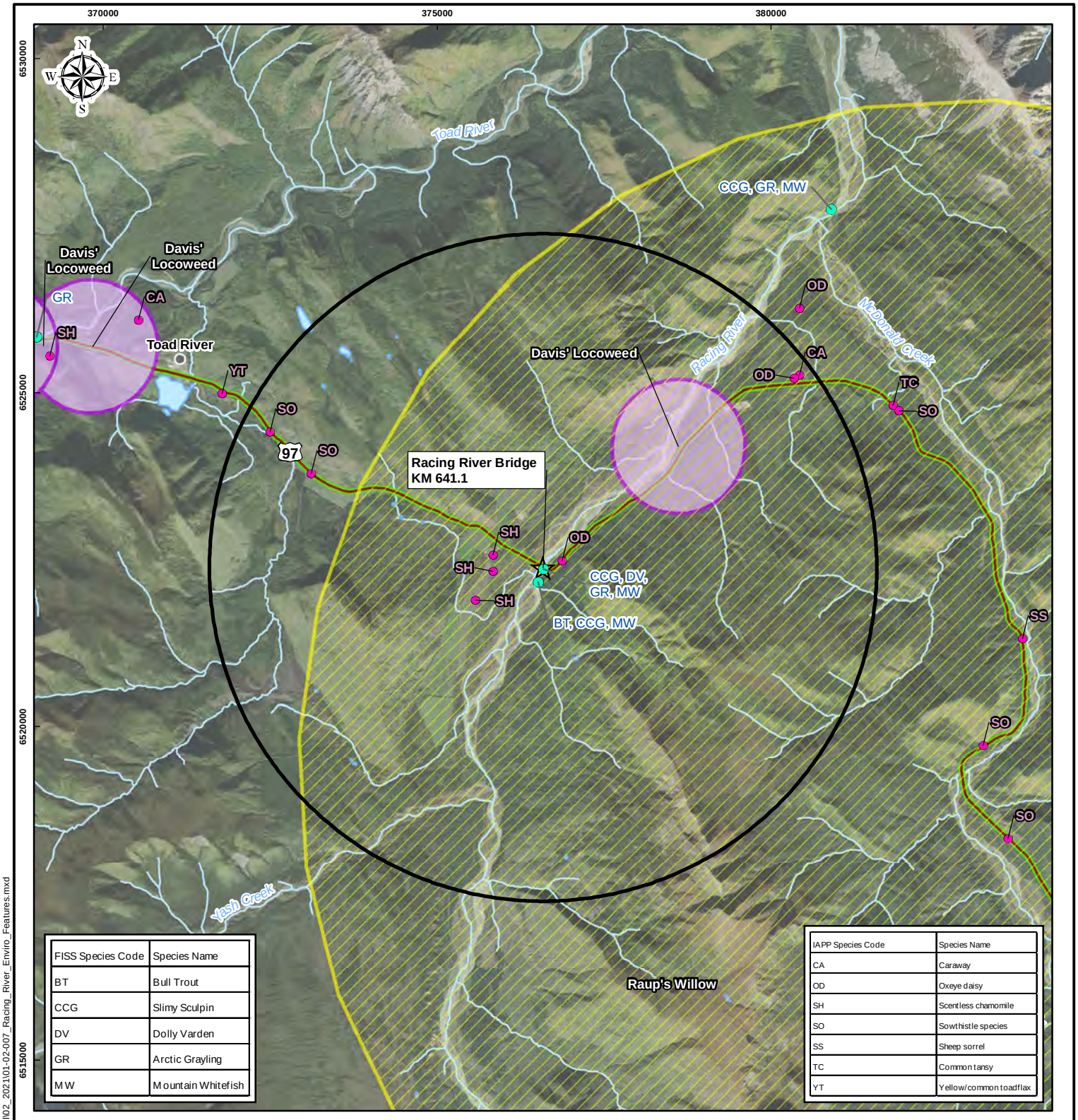

FISS Species Code	Species Name
BT	Bull Trout
CCG	Slimy Sculpin
DV	Dolly Varden
GR	Arctic Grayling
MW	Mountain Whitefish

IAPP Species Code	Species Name
CA	Caraway
OD	Oxeye daisy
SH	Scentless chamomile
SO	Sowthistle species
SS	Sheep sorrel
TC	Common tansy
YT	Yellow/common toadflax

Legend

- Populated Place
- KM Post
- Watercourse
- Highway
- Highway 97
- Project Site Location
- FISS Point
- Invasive Alien Plant Program (IAPP) Point
- Project 5km Buffer

CDC Plant Species of Conservation Concern
- Davis' Locoweed
- Raup's Willow

Note:
- Muskwa Caribou Herd Population covers whole map.
- CBC Animal species of conservation Caribou (Northern Mountain Population) covers whole map

0 1 2 Kilometers

Scale: 1:80,000

References:
Data BC - BC Catalogue
Open Government License
(http://www.data.gov.bc.ca/)
NRCAN Geogratis
Open Government License
(http://geogratis.cgdi.gc.ca/)
MFLNRO - Archaeology Branch
Archaeological Sites RAAD

CLIENT: Public Services and Procurement Canada

PROJECT: Racing River Bridge
KM 641.1

TITLE: Environmental Features

DATE:	PROJECT NO:	
July 06, 2021	19M-01601-01	**Figure 2**

GIS FILE: 01-02-007_Racing_River_Enviro_Features.mxd

COORDINATE SYSTEM:	ANALYST:	REVIEWED:
NAD 1983 UTM Zone 10N	MY	SB

wsp

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APPENDIX

B PHOTOPLATES

Photograph 1: Exposed pier on Racing River bridge.

Photograph 2: Racing River, looking downstream from east bank.

Photograph 3: Racing River, looking downstream from west bank.

Photograph 4: Central pier that will require erosion repairs.

Photograph 5: Looking upstream from west bank, above the bridge.

Photograph 6: Looking downstream from west bank, below the bridge.

Photograph 7: Looking upstream along west channel at proposed access route.

Photograph 8: Looking upstream along east channel.

Photograph 9: Looking downstream along east channel, downstream of bridge.

Photograph 10: View of bridge, downstream from east bank.

Photograph 11: View below bridge structure along east bank.

Photograph 12: Dry channel along east bank.

Appendix K

Environmental Overview Assessment
Liard River Erosion Control Work KM 780
Alaska Highway, British Columbia

Public Services and Procurement Canada

ENVIRONMENTAL OVERVIEW ASSESSMENT

Liard River Erosion Control Work KM 780
Alaska Highway, British Columbia

August 6, 2021 CONFIDENTIAL

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WSP.COM

August 6, 2021

Confidential

Public Services and Procurement Canada
219-800 Burrard St
Vancouver, BC
V6Z 0B9

Attention: **Laurie Crawford, Environmental Coordinator, Environmental Services/Alaska Highway Program**

Subject: **Environmental Overview Assessment**
Liard River Bank Erosion Repair Km 780, Alaska Highway, British Columbia

Dear Madam;

WSP Canada Inc. is pleased to submit a PDF copy of the Environmental Overview Assessment report for the above-referenced project.

We trust that the enclosed report meets your current requirements. If you have any questions regarding this project, the enclosed reports, or our services, please do not hesitate to call the undersigned at (604) 839-0263.

Thank you for utilizing our professional services. We look forward to serving your future environmental and engineering needs.

Sincerely,

Susan Blundell, M.Sc. R.P. Bio.
Senior Biologist

Encl. Environmental Overview Assessment

WSP ref.: 19M-01601-01
PSPC Project no: R.122128.001

SIGNATURES

PREPARED BY

Susan Blundell, M.Sc. R.P.Bio
Senior Biologist

Reviewed by

Christie Lucas, B.Sc., EP
Group Lead – Environment
Vancouver Island

No environmental assessment can wholly eliminate uncertainty regarding the potential for recognized environmental conditions in connection with a site. Performance of a standardized environmental overview assessment is intended to reduce, but not eliminate, uncertainty regarding the potential for recognized environmental conditions in connection with the Site, given reasonable limits of time and cost.

The disclosure of any information contained in this report is the sole responsibility of the intended recipient. The material in it reflects WSP's best judgement in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. WSP accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This limitations statement is considered part of this report.

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APPENDICES

1. INTRODUCTION

1.1. PROJECT DESCRIPTION

The Liard River erosion site is located on the Alaska Highway (km 780) between the communities of Liard River and Coal River, near Fort Halkett Provincial Park.

The erosion site is located at the outer bend of a meander and extends about 500 m along the Liard River. The erosion site starts downstream of a natural rock outcrop where the flow is actively attacking the highway embankment slope. The lower portion of the slope is eroded with steepened slope, with sloughing observed at a critical region where the erosive flow is directly attacking the bank. The space between the River and the highway edge of pavement appears to be decreasing with progressive erosion of the embankment slope.

It is evident that at some point riprap was trenched into the dry bank to mitigate further erosion. Observation on site indicate that some of the riprap previously placed has been washed away or displaced downstream leaving patches of what appears to be bare embankment fill material.

Based on a review of the site history together with observations from the site visit, and the hydraulic analysis, there are multiple risks associated with the erosion at the erosion site. These includes further erosion laterally and vertically from the seasonal peak flows and velocities, and embankment slope stability with continued erosion.

In order to protect the highway WSP is proposing to place riprap revetment along the most critical 200 m section of the highway embankment.

1.2. OBJECTIVES

The objectives of the environmental overview report are to conduct a desktop review of fish and fish habitat, wildlife and vegetation resources in the vicinity of the project site. The following tasks were completed in preparation of this report:

- Summarize findings of the desktop information review;
- Assess potential project effects on identified environmental resources;
- Confirm potential permits and approvals required; and,
- Describe best management practices and provide examples of the mitigation measures.

2. METHODOLOGY

2.1. STUDY AREA

The Project study area for fish and fish habitat, wildlife and vegetation desktop information review, shown in Figures 1 and 2, was defined as the area directly affected by the Project (Project footprint) plus a buffer (5 km diameter). The fish and fish habitat review included only the Liard River, which is the extent of where Project affects are likely to occur. The wildlife and vegetation review included a summary of rare and sensitive species and habitat within 5 km of the Project to ensure that all potential effects from the Project on these environmental resources were addressed.

2.2. DESKTOP REVIEW

The desktop information review focused on identifying and describing fish, vegetation and wildlife species that have the potential to occur in the Project area. A variety of literature sources were reviewed including the following websites:

- iMapBC (DataBC, 2021) https://www2.gov.bc.ca/gov/content/data/geographic-data-services/web-based-mapping/imapbc;
- TRIM mapping at 1:20,000 scale (Geo BC 2021) Map Tile 094M050 http://apps.gov.bc.ca/pub/dmf-viewer/?siteid=5628311639164388216;
- Biogeoclimatic Ecosystem Classification (BEC) Web (BC Ministry of Forests and Range, 2021) https://www.for.gov.bc.ca/hre/becweb/resources/maps/FieldMaps.html;
- Conservation Data Centre (Government of BC 2021) https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/conservation-data-centre
- Habitat Wizard (Government of BC 2021) https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/ecosystems/habitatwizard
- Aquatic Species at Risk Map (Fisheries and Oceans Canada [DFO] 2019) https://www.dfo-mpo.gc.ca/species-especes/sara-lep/map-carte/index-eng.html
- E-Flora (Klinkenberg, 2021) https://ibis.geog.ubc.ca/biodiversity/eflora/;
- E-Fauna (2021) E-Fauna BC: Electronic Atlas of the Fauna of British Columbia (ubc.ca)
- Important Bird Areas Canada (Bird Canada, 2021) https://www.ibacanada.org/explore_how.jsp?lang=en
- List of Migratory Birds protected in Canada (Government of Canada 2021) Birds protected in Canada - Canada.ca
- Provincial Priority Invasive Plant List (Province of British Columbia 2021) https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/invasive-species/priority-species/priority-plants/plants-table;

- BC Ministry of Environment and Climate Change (ENV) Ecological Reports Catalogue (EcoCat, 2021);
- Fish Inventories Data Queries (ENV, 2021).
- Species-specific COSEWIC and *SARA* documents:
    - Committee on the Status of Endangered Wildlife in Canada Status Reports (COSEWIC, 2021) http://www.cosewic.ca/index.php/en-ca/;
    - *Species at Risk Act* reports (*SARA*, 2021) https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html

2.3. DEFINITIONS USED TO DESCRIBE SPECIES OF CONSERVATION CONCERN

The potential occurrence of fish, vegetation and wildlife species and their habitat within each of the Project study areas identified as being of conservation interest (i.e. rare and sensitive) are identified using the *SARA*, COSEWIC and British Columbia's Red, Blue and Yellow rating status defined below.

COSEWIC and *SARA* ratings for species have been defined in the following ways:

- Extinct - A species that no longer exists.
- Extirpated - A species that no longer exists in the wild in Canada, but occurring elsewhere (for example, in captivity or in the wild in the United States).
- Endangered - A species facing imminent extirpation or extinction.
- Threatened - A species likely to become endangered if limiting factors are not reversed.
- Special Concern - A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events.

Red, Blue and Yellow status as defined by the B.C. Conservation Data Centre's are as follows (BC Ministry of Sustainable Resource Management, 2002):

- Red list – Includes any indigenous species or subspecies (taxa) considered to be Extirpated, Endangered, or Threatened in British Columbia. Extirpated taxa no longer exist in the wild in British Columbia but do occur elsewhere. Endangered taxa are facing imminent extirpation or extinction. Threatened taxa are likely to become endangered if limiting factors are not reversed. Red-listed taxa include those that have been, or are being, evaluated for these designations.
- Blue List – Includes any indigenous species or subspecies (taxa) considered to be Vulnerable in British Columbia. Vulnerable taxa are of special concern because of characteristics that make them particularly sensitive to human activities or natural events. Blue-listed taxa are at risk, but are not Extirpated, Endangered or Threatened.
- Yellow list – This comprises any indigenous species or subspecies (taxa) which is not at risk in British Columbia. The CDC tracks some Yellow listed taxa which are vulnerable during times of seasonal concentration.

The Conservation Data Centre (CDC) maintains tracking lists of rare vertebrates, for each Forest District in British Columbia. Species, subspecies, populations, or communities at high risk of extinction or extirpation are placed on the red list, while those considered vulnerable are placed on the blue list.

3. ENVIRONMENTAL SETTING

3.1. FISH AND FISH HABITAT

The project is located on the north bank of the Liard River, which is a major tributary to the Mackenzie River. Liard River (Watershed Code 210) is 9th order tributary to the Mackenzie River and is approximately 506.35 km long (ENV Habitat Wizard 2021). Three previous stream surveys completed by Triton Environmental Consultants were summarized in Habitat Wizard for Liard River. All three watercourse assessments were completed in 2011 at three separate locations. The average channel width ranged from 257.83 to 347 m and the gradient was 1% at all three locations. Water temperature ranged from 11 to 17°C and the conductivity ranged from 153 to 210µS.

3.1.1 FISH PRESENCE

A summary of historical fish presence in Liard River is provided in Table 1. There are 12 species of salmonids historically found within Liard River including the Arctic Grayling, three char (Bull Trout, Dolly Varden, lake trout), four whitefish (lake whitefish, pygmy whitefish, round whitefish, mountain whitefish), two Pacific salmonids (chinook salmon, chum salmon), inconnu, and rainbow trout.

Table 1: Summary of historical fish presence in Liard River

Common Name	Scientific Name	BC Listing	COSEWIC/ SARA	Date Observed
Arctic Cisco	*Coregonus autumnalis*	Red	N/A	1998
Arctic Grayling	*Thymallus arcticus*	Blue – Nahanni Population	N/A	2013
Arctic Lamprey	*Lethenteron camtschaticum*	N/A	N/A	1998
Bull Trout	*Salvelinus confluentus*	Blue – Western Arctic Population	Special Concern	1981
Burbot	*Lota lota*	Yellow	N/A	20013
Carp	*Cyprinus carpio*	Exotic	N/A	1982
Chinook Salmon	*Oncorhynchus tshawytscha*	No status	N/A	1983
Dolly Varden	*Salvelinus malma*	Yellow	N/A	1998
Finescale Dace	*Chrosomus neogaeus*	Yellow	N/A	1998
Fish unidentified species	N/A	N/A	N/A	2013
Flathead Chub	*Platygobio gracilis*	Yellow	N/A	2014
Goldeye	*Hiodon alosoides*	Blue	N/A	2002
Inconnu	*Stenodus leucichthys*	Blue	N/A	2002
Lake Chub	*Couesius plumbeus pop. 2*	Red – Liard Hot Springs Population	DD	2002
Lake Trout	*Salvelinus namaycush*	Yellow	N/A	2013
Lake Whitefish	*Coregonus clupeaformis*	Yellow	N/A	1998

Common Name	Scientific Name	BC Listing	COSEWIC/ SARA	Date Observed
Largescale Sucker	*Catostomus macrocheilus*	Yellow	N/A	2002
Longnose Dace	*Rhinichthys cataractae*	Yellow	N/A	2002
Longnose Sucker	*Catostomus catostomus*	Yellow	N/A	1998
Mountain Whitefish	*Prosopium williamsoni*	Yellow	N/A	2013
Pearl Dace	*Margariscus nachtriebi*	Yellow	N/A	2013
Northern Pike	*Esox lucius*	Yellow	N/A	2013
Pygmy Whitefish	*Prosopium coulterii*	Yellow	N/A	2013
Rainbow Trout	*Oncorhynchus mykiss*	Yellow	N/A	1998
Round Whitefish	*Prosopium cylindraceum*	Yellow	N/A	1998
Slimy Sculpin	*Cottus cognatus*	Yellow	N/A	2013
Spoonhead Sculpin	*Cottus ricei*	Yellow	N/A	2002
Trout-perch	*Percopsis omiscomaycus*	Yellow	N/A	2002
Walleye	*Sander vitreus*	Yellow	N/A	2002
White Sucker	*Catostomus commersonii*	Yellow	N/A	1982

Notes: Red = Extirpated, Endangered or Threatened Status, Blue = Special Concern, Yellow = Apparently Secure, N/A = Not classified, DD = Data deficient

Sources: BC ENV 2021, BC CDC 2021

3.1.2 FISH OF CONSERVATION CONCERN

There are six species of conservation concern found within the Liard River; Arctic Cisco, Arctic Grayling, Bull Trout, Goldeye, Inconnu, and Lake Chub.

Arctic Cisco are a provincially red-listed species. There is only one occurrence of Arctic Cisco in BC (lower Liard River). Threats to this population are limited, and the population is assumed to be stable (BC CDC 2019).

Arctic Grayling within the watershed are provincially blue-listed as they are part of the Nahanni population. This lineage of Arctic Grayling is found in the Muskwa rivers in the Lower Liard drainage. This population of Arctic Grayling has been negatively impacted by historic forestry, oil and gas exploration and placer mining (BC CDC 2011).

Bull Trout are provincially blue-listed, and designated as Special Concern under COSEWIC, and *SARA* Schedule 1 as of August 2019. This population of Bull Trout are part of the Western Arctic population which includes the Mackenzie River System and major tributaries of that system (COSEWIC 2012). Bull Trout are particularly vulnerable to habitat degradation and fragmentation as they are slow-growing and late maturing species that prefer cold, pristine waters and unimpeded migratory routes (Government of Canada 2021).

Goldeye is a provincially blue-listed species found in low numbers and occurrences within the Liard River systems in northeastern BC (BC CDC 2019).

Inconnu within the Liard River watershed are provincially blue-listed and are considered a migratory population in the Liard River system. There is some evidence that some of the Liard population breeds in BC, however, no fry have been collected in the province (BC CDC 2019).

The Liard Hot Springs population of Lake Chub are provincially red-listed and designated as Threatened under COSEWIC. This population of small fish occupies unique thermal spring environments in BC. The small area of habitat in this hot spring complex, and risks posed by

human activities including the introduction of exotic species, could result in extinction in a short period of time (Government of Canada 2021). This population is located approximately 17 km to the southeast of the Site.

3.1.3 FISH HABITAT

Based on the fish habitat reconnaissance conducted on September 30, 2020. In the vicinity of the slope erosion site the channel width is approximately 375 m wide. The channel has a very gently gradient (<1%) and has a riffle-pool morphology. A large cobble and gravel bar and a side channel is located along the west bank of the Liard River, across from the Site. The channel consists mostly of run with lesser amounts of pools. It was difficult to determine habitat features or channel substrate during the site assessment due to turbid water. Cover habitat appears to be mostly deep pools; there did not appear to be any large woody debris or undercut banks present and instream and overstream vegetation were absent. Fish distribution data available through Habitat Wizard in the vicinity of the Site does not provide details regarding habitat utilization or life stage.

There is no mapped distribution or presence of critical habitat for aquatic species at risk within the vicinity of the project (DFO 2019). The closest occurrence of critical habitat for an aquatic species at risk is for the Hotsprings Physa (*Physella wrighti*) which is located at Liard Hotsprings, approximately 17 km to the southeast of the erosion repair Site.

3.2. VEGETATION

3.2.1 GENERAL

The Project Area is located in the Liard Plain Ecosection within the Liard Basin Ecoregion. This ecosection is drained chiefly by the Liard River, which flows through the middle of the ecosection, but the Liard is joined by the Dease, Kechika, Rabbit and Trout rivers in the south and the Smith, Coal and Hyland rivers in the north, while the Blue and Rancheria rivers flow from the west. The Project Area lies within the Moist Cool Boreal White and Black Spruce (BWBSmk) Biogeoclimatic Subzone. The mean annual temperature within the zone is -2.9 to 2°C; monthly averages remain below 0°C for 5-7 months of the year, and above 10°C for only 2-4 months. Annual precipitation averages between 330 and 570 mm, with 35-55% of this falling as snow. The ground freezes deeply for a large part of the year, and discontinuous permafrost is common in the northeastern parts of the zone.

White spruce, trembling aspen, lodgepole pine, black spruce, balsam poplar, tamarack, subalpine fir and paper birch are the major tree species in the forested sections of the BWBS. Forest fires are frequent throughout the zone, maintaining most of the forests in various successional stages. Forests predominate in the better-drained plateau, foothill, and cordilleran sections of the zone, where mixed trembling aspen — white spruce forests on Gray Luvisols dominate the landscape. Relatively open pine — lichen forests occur on the driest sites, which are usually on rapidly drained outwash deposits. Mixed pine and black spruce stands are common on level or gently sloping, north-facing sites on compacted morainal or lacustrine soils. Dense black spruce — moss communities develop on imperfectly drained sites.

Although the vegetation community occurring at the Liard River erosion site has not been identified in the field it is likely the White spruce – Currant – Horsetail (BWBSmk/110). This plant community typically occurs on lower and toes of slopes where soils are general medium to fine

textured and are derived from fluvial, morainal or lacustrine parent materials. The tree layer is predominantly white spruce and trembling aspen. The understorey is sparse and consists of prickly rose and tall bluebells and ground cover of bunchberry, horsetails, common miterwort and twinflower. Due to the degree disturbance present along the slope failure area there was also yarrow, fireweed, Canada goldenrod and northern wormwood. Many trees along the top of bank are showing signs of slope instability as they are leaning over the bank.

Table 2: Vegetation Typically Occurring within the Boreal White and Black Spruce Zone (BWBSmk)

Type	Common Name	Scientific Name
Trees	Lodgepole pine	*Pinus contorta*
	White spruce	*Picea glauca*
	Black spruce	*Picea mariana*
Shrubs	Soopolallie	*Shepherdia canadensis*
	Labrador tea	*Ledum groenlandicum*
	White spruce	*Picea glauca*
	Prickly rose	*Rosa acicularis*
	Highbush-cranberry	*Viburnum edule*
	Mountain alder	*Alnus incana*
Herbs and Dwarf Shrubs	Northern anemone	*Anenome parviflora*
	Kinnikinnick	*Arctostaphylos uva-urs*
	Fuzzy-spiked wildrye	*Leymus innovatus*
	Bunchberry	*Cornus canadensis*
	False toad-flax	*Geocaulon lividum*
	Twinflower	*Linnaea borealis*
	Common mitrewort	*Mitella nuda*
	Lingonberry	*Vaccinium vitis-idaea*
	Pink wintergreen	*Pyrola asarifolia*
	Tall bluebells	*Mertensia paniculata*
	Horsetail	*Equisetum spp.*
	Trailing raspberry	*Rubus pubescens*
Mosses and Lichens	Reindeer lichens	*Cladina spp.*
	Clad lichens	*Cladonia* spp.
	Freckle pelt	*Peltigera aphthosa*
	Step moss	*Hylocomium splendens*
	Red-stemmed feathermoss	*Pleurozium schreberi*
	Knight's plume	*Ptilium crista-castrensis*

Source: DeLong, et al., 2011.

3.2.1. VEGETATION AND ECOLOGICAL COMMUNITIES OF CONSERVATION CONCERN

Based on BC CDC search for the Boreal White and Black Spruce (BWBSmk) Biogeoclimatic Subzone and the Northern Rockies Regional Municipality (NRRM), suitable habitat for five plant species at risk may occur within the Project Area (Table 3).

Table 3: Rare Plant Species Known to Occur in Close Vicinity of the Project Area

Plant Species		BC Status[1]	COSEWIC[2]	SARA[3]	Habitat
Common Name	**Scientific Name**				
Davis' locoweed	*Oxytropis campestris var. davisii*	Blue	-	-	Dry to mesic sandy, gravelly or rocky sites, including river bars, roadsides
Common pitcher-plant	*Serracenia purpurea ssp. purpurea*	Red	-	-	Bogs and fens in the montane zone, known only from the Fort Nelson area
Gorman's penstemon	*Penstemon gormanii*	Blue	-	-	Riparian, occurring in shrub and herbaceous communities
Raup's willow	*Salix raupii*	Red	-	-	Riparian, occurring in shrub communities
Marsh fleabane	*Tephroseris palustris*	Blue	-	-	Wet to moist streambanks in the montane zone

Notes: "-" no information/not listed
1. British Columbia List Status: Red = Extirpated, Endangered or Threatened Status, Blue = Special Concern, Yellow = Apparently Secure

2. Committee on the Status of Endangered Wildlife in Canada; E = recommended to be placed on Schedule 1 of *SARA* as endangered; SC = recommended to be placed on Schedule 1 of *SARA* as special concern; T = recommended to be placed on Schedule 1 of *SARA* as threatened. N/A = not applicable, DD = Data deficient, NAR = not at risk.3. *Species at Risk Act*; listed on Schedule 1 of *SARA* as: E = endangered; SC = listed as special concern; T = threatened.

The only confirmed occurrence of a rare plant in the vicinity of the Site is Davis locoweed, located approximately 15 km to the southeast. Rare plant communities that have some potential of occurring in the vicinity of the Liard River Site are as follows:

- Balsam poplar – White spruce / Mountain alder – Red-osier dogwood (blue-listed); occurs on middle bench floodplains
- Narrow-leaf willow shrubland (red-listed); occurs on low bench floodplains
- Pacific willow / Red-osier dogwood / Horsetails (red-listed); occurs on low bench floodplains
- Swamp horsetail – Beaked sedge (blue-listed); occurs in back-levee depressions along sediment laden, low-gradient streams

There are five occurrences of the Balsam poplar – White spruce / Mountain alder – Red-osier dogwood documented along the Liard River within the study area, but none are present at the Site; the closest occurrence is 400 m to the west on the other side of the River.

3.2.2. INVASIVE PLANT SPECIES

Data from the Invasive Alien Plant Program (IAPP), indicates that between 2011 and 2014 there are three invasive plant species that potentially occur in the Project area (Table 4).

Table 4: Invasive Plant Species Potentially Occuring in the Project Area.

Common Name	Scientific Name	IAPP Map Symbol	Priority Invasive Plant List[1]	Weed Control Regulation[2]	FRPA[3]
Smooth hawkweed	*Hieracium laevigatum*	SM	No	No	No
Caraway	*Carum carvi*	CA	No	No	No
Sowthistle species	*Sonchus species*	SO	No	No	No
Yellow hawkweed	*Hieracium caespitosum*	YH	Yes	No	No

Notes: IAPP = Invasive Alien Plant Program

1. Listed in Government of BC Provincial Priority Invasive Plants List Table
2. Listed in Part 1 or 2 of Schedule A of BC Weed Control Regulation
3. Listed in BC *Forest and Range Practices Act* (FRPA)

Yellow hawkweed is listed on the BC Provincial Priority Invasive Plant List as a management item which are species that are more widespread but may be of concern in specific situations with certain high values - e.g., conservation lands, specific agriculture crops. Management objectives are to reduce the invasive species impacts locally or regionally, where resources are available (BC ENV 2021).

3.3. WILDLIFE

3.3.1. GENERAL

In the North Boreal Mountains Ecoprovince, moose are the most numerous and widely distributed ungulate but the Thinhorn Sheep (both the pure white Dall's and Stone's) and Caribou best characterize the fauna. Mountain Goats are an abundant species in rugged alpine areas. Wood Bison are also present where the natural vegetation includes open trembling aspen or conifer forests, and shrub lands with extensive wet and dry open meadows.

Grizzly Bears, American Black Bears, and Grey Wolf are common throughout the valleys; Wolverine and Lynx are also common Small mammals include Collared Pika, Arctic Ground Squirrel, Tundra Vole, and Brown Lemming.

This ecoprovince supports only 50% of all bird species known to occur in the province and 40% of all species known to breed. However, many species breed nowhere else in British Columbia including the Pacific Loon, Gyrfalcon, Lesser Golden-Plover, Wandering Tattler, Hudsonian Godwit, Red-necked Phalarope, Arctic Tern, Northern Shrike, Smith's Longspur, Snow Bunting, Common Redpoll, and "Timberline" Sparrow. This area is the centre of abundance for Willow and Rock ptarmigan, Bohemian Waxwing, and American Tree Sparrow, and it supports the only breeding population of the dark race (harlani) of the Red-tailed Hawk.

A regional query of the Conservation Data Center for species of conservation concern based on the geographical location and potential habitat present is summarized in Table 5. One amphibian, 14 birds, 11 insects, and nine mammals were identified (BC CDC 2021).

Table 5: Summary of BC Ecosystems Explorer Regional Query Results

Species Group	Common Name	Scientific Name	BC List	COSEWIC	MBCA	SARA
Amphibians	Western Toad	*Anaxyrus boreas*	Yellow	SC (Nov 2012)	-	1-SC (Jun 2018)
Birds	Nelson's Sparrow	*Ammospiza nelsoni*	Red	NAR (May 1998)	Y	-
Birds	Short-eared Owl	*Asio flammeus*	Blue	SC (Mar 2008)	-	1-SC (Jul 2012)
Birds	Upland Sandpiper	*Bartramia longicauda*	Red	-	Y	-
Birds	American Bittern	*Botaurus lentiginosus*	Blue	-	Y	-
Birds	Swainson's Hawk	*Buteo swainsoni*	Red	-	-	-
Birds	Canada Warbler	*Cardellina canadensis*	Blue	SC (Nov 2020)	Y	1-T (Feb 2010)
Birds	Common Nighthawk	*Chordeiles minor*	Yellow	SC (May 2018)	Y	1-T (Feb 2010)
Birds	Evening Grosbeak	*Coccothraustes vespertinus*	Yellow	SC (Nov 2016)	Y	1-SC (May 2019)
Birds	Olive-sided Flycatcher	*Contopus cooperi*	Blue	SC (May 2018)	Y	1-T (Feb 2010)
Birds	Rusty Blackbird	*Euphagus carolinus*	Blue	SC (Apr 2017)	-	1-SC (Mar 2009)
Birds	Peregrine Falcon, *anatum* subspecies	*Falco peregrinus anatum*	Red	NAR (Dec 2017)	-	1-SC (Jun 2012)
Birds	Bay-breasted Warbler	*Setophaga castanea*	Red	-	Y	-
Birds	Cape May Warbler	*Setophaga tigrina*	Blue	-	Y	-
Birds	Black-throated Green Warbler	*Setophaga virens*	Blue	-	Y	-
Insects	Eastern Pine Elfin	*Callophrys niphon*	Red	-	-	-
Insects	Arctic Skipper, *mandan* subspecies	*Carterocephalus palaemon mandan*	Red	-	-	-
Insects	Prairie Bluet	*Coenagrion angulatum*	Blue	-	-	-
Insects	Cranberry Blue	*Agriades optilete*	Blue	-	-	-
Insects	Yellow-dotted Alpine	*Erebia pawloskii*	Red	-	-	-
Insects	Assiniboine Skipper	*Hesperia assiniboia*	Red	-	-	-
Insects	Plains forktail	*Ischnura damula*	Red	‘-	‘-	‘-
Insects	Bronze Copper	*Lycaena hyllus*	Blue	-	-	-
Insects	Philip's Arctic	*Oeneis philipi*	Red	-	-	-
Insects	Tawny Crescent	*Phyciodes batesii*	Blue	-	-	-

Species Group	Common Name	Scientific Name	BC List	COSEWIC	MBCA	SARA
Insects	Kennedy's Emerald	*Somatochlora kennedyi*	Blue	-		-
Mammals	Wood Bison	*Bos bison athabascae*	Red	SC (Nov 2013)	-	1-T (Jun 2003)
Mammals	Wolverine, *luscus* subspecies	*Gulo gulo luscus*	Blue	SC (May 2014)	-	1-SC (Jun 2018)
Mammals	Little Brown Myotis	*Myotis lucifugus*	Yellow	E (Nov 2013)	-	1-E (Dec 2014)
Mammals	Northern Myotis	*Myotis septentrionalis*	Blue	E (Nov 2013)	-	1-E (Dec 2014)
Mammals	Mountain Goat	*Oreamnos americanus*	Blue	-	-	-
Mammals	Stone's Sheep	*Ovis dalli stonei*	Blue	-	-	-
Mammals	Caribou (Boreal Population)	*Rangifer tarandus pop. 14*	Red	T (Nov 2014)	-	1-T (Jun 2003)
Mammals	Caribou (Northern Mountain Population)	*Rangifer tarandus pop. 15*	Blue	SC (May 2014)	-	1-SC (Jan 2005)
Mammals	Grizzly Bear	*Ursus arctos*	Blue	SC (May 2012)	-	1-SC (Jun 2018)

Notes: British Columbia List Status: Red = Extirpated, Endangered or Threatened Status, Blue = Special Concern, Yellow = Apparently Secure
COSEWIC = Committee on the Status of Endangered Wildlife in Canada, MBCA = Migratory Bird Convention Act, *SARA* = *Species at Risk Act*, Y = Yes, T = Threatened, SC =Special Concern, E = Endangered

3.3.2. WILDLIFE SPECIES OF CONSERVATION CONCERN AND ASSOCIATED WILDLIFE HABITAT

There are two wildlife species of conservation concern that have known publicly available occurrences identified within the Project study area (Table 6, Figure 2). This includes the Rabbit herd of Northern Mountain Population of Caribou and the wood bison

Table 6: Wildlife Species of Conservation Concern under Provincial and / or Federal Legislation that may Inhabit the Project Area

Common Name	Scientific Name	BC Listing	COSEWIC	*SARA*	Last Date Observed
Caribou (Northern Mountain Population)	*Rangifer tarandus* pop. 15	Blue	SC (2014)	1-SC	2007
Wood bison	*Bos bison athabascae*	Red	SC (2013)	1-T	2004

Notes: British Columbia List Status: Red = Extirpated, Endangered or Threatened Status, Blue = Special Concern, Yellow = Apparently Secure
COSEWIC = Committee on the Status of Endangered Wildlife in Canada, *SARA* = *Species at Risk Act*, T = Threatened, SC =Special Concern, E = Endangered, N/A = Not applicable.

The Project location intersects with the Northern Mountain Caribou Population which is provincially blue-listed as well as Special Concern on Schedule 1 of SARA. Caribou have complex movement patterns. In the summer, herds spend time on the alpine and upper subalpine ranges, in the winter some herds move down to coniferous forests and lower subalpine and other herds winter in the alpine. Movement is dependent on forage ability and security. Roads may adversely affect their access to important habitat (Environment Canada 2012). Calving occurs in late May to early June and pregnant females may disperse into high mountain terrain. Important food sources in summer include the leaves of willow and sedges. They are sensitive to noise and infrastructure development (Environment Canada 2012). Due to the confined area of the proposed works which are located between the Alaska Highway and the Liard River it is very unlikely that caribou will inhabit this area or be impacted by project activities.

Four small herds occupy isolated areas of northeastern British Columbia; range expansion is limited by agricultural development. Potential threats include disease transmission and genetic contamination that may result from contact with plains or commercial bison. Bison in British Columbia are located in three separate herds – two along the Liard River near the Yukon-Northwest Territories border and one at Etthithun Lake near the Alberta border.

4. POTENTIAL PROJECT INTERACTIONS

4.1 PROPOSED WORKS

To provide temporary erosion protection to the existing highway embankment of the Alaska Highway riprap revetment will be installed on the eroding bank. The riprap will be comprised of

larger rocks (modified Class 2000 kg) placed 1.5 m thick 1.8 m long from the bottom, and smaller rocks (Class 500 kg) placed 1.2 m thick up to the 1 in 50-year flow elevation, both placed on trimmed slope at 1.5H:1V. The upstream extent of the riprap is located just upstream of where the flow is expected to attack the bank as it passes a shoreline rock outcrop. The longitudinal extent of the revetment is limited to the most critical 200 m section to provide temporary protection against annual peak flows. The toe of excavation elevation is set at 0.5m above the estimated construction water elevation to minimize in-stream impact during construction. The modified Class 2000 kg riprap is trenched into the bank to maximize the riprap quantity for launching while minimizing the in-stream footprint. The estimated riprap footprint is 1950 m^2 and the estimated Class 500 kg and Modified Class 2000 kg riprap volume is 1320 m^3 and 540 m^3, respectively.

In order to complete the erosion protection measures the following steps are proposed:

- Bench existing embankment slope to create access to the edge of water elevation
- Install silt fence surrounding the proposed toe of excavation area, if possible
- Trim embankment slope to 1.5H:1V slope
- Lay down non-woven geotextile on the prepared surface
- Size boulders stocked piled at the edge of highway to make modified Class 2000 kg riprap
- Build up base riprap layer with modified Class 2000 kg riprap, 1.5 m thick, 1.8 m long (sloping length) at 1.5H:1V slope.
- Build up riprap with Class 500 kg riprap, 1.2 m thick, up to the 1 in 50-year flow elevation at 1.5H:1V slope.
- Reseed all exposed soils following the completion of works

Works will start at the south end of the work area. The excavator will move north, excavating out the bench. Excavated soils will be transferred to trucks and removed from Site. Once the bench has been created the placement of the non-woven geotextile and riprap will commence at the north end and progress south.

Although works will be conducted below the high water mark it will be timed to take place in late summer and early fall when water levels will be located at an elevation lower than the proposed work area. All works will be in isolation of water. The proposed works will take place outside of the instream fisheries work window but will not pose a risk to fish spawning or fish movement. These works will be overseen by a QEP and all best management practices will be followed, focusing on the sediment and erosion control plan, as the introduction of sediments into the Liard River poses the highest risk. The placement of rock where once there was soil will not result in a loss of riparian habitat. This area is actively eroding and is mostly devoid of riparian vegetation with the exception of scattered shrubs, herbaceous plants and several trees that show signs of root failure. The stabilization of the slope will reduce the degradation of fish habitat in the immediate area as it will reduce the sediment load into the channel.

4.2 POTENTIAL EFFECTS

High-level potential project interactions with fish and fish habitat are summarized in Table 7. In addition to the potential aquatic effects the project may also include effects to terrestrial resources including indirect effects to wildlife in the general area.

Table 7: Project Activities and Potential Pathways of Effects (DFO 2018) associated with the Project.

Pathway of Effect		Potential Effects
Land-based activities	Riparian vegetation clearing / disturbance	– Change in habitat structure and cover – Change in sediment concentrations – Change in water temperature – Change in food supply – Change in nutrient concentrations – Change in contaminant concentrations
	Use of industrial equipment	– Potential mortality of fish/eggs from equipment – Change in sediment concentrations – Change in contaminant concentrations
Both	Placement of materials below high-water mark	– Change in sediment concentrations – Change in habitat structure and cover – Change in food supply – Change in nutrient concentrations
In-water activities	Streambank Materials Removal	– Change in food supply – Change in habitat structure and cover – Change in sediment concentration

4.3 PERMITS AND APPROVALS

Due to the bank stabilization works which will take place below the high water mark both a B.C. Water Sustainability Act Section 11 Authorization and a Fisheries and Oceans Canada Request for Review will be required. Details are presented below in Table 8.

Table 8: Potential Permits and Approvals

Potential Project Activity	Potential Permits and Approvals	Timing Constraints and Considerations
– Instream works – Works on banks of stream or within riparian areas	– DFO Request for Review, potentially a Letter of Authorization under paragraph 35(2) of the *Fisheries Act.* – BC *Water Sustainability Act* Section 11 Notification.	– DFO - 60-day time limit to review an application to determine whether the required information has been submitted, and a 90-day time limit form the date of notification that the application is complete to issue the authorization (additional time would be required if Habitat Offsetting is required). – BC *Water Sustainability Act* notification estimated to be 140 days.

Potential Project Activity	Potential Permits and Approvals	Timing Constraints and Considerations
		– The reduced risk work window for the Project area for both spring and fall spawner, ranges between July 15 and August 15 for the Northeast Region (BC MFLNRO 2016).

4.4 MITIGATION MEASURES

Mitigation will be required to protect the environment and if required, satisfy permit and approval requirements. Mitigation measures will need to address the potential effects of all stages of the construction, as well as on-going operations. A Construction Environmental Management Plan (CEMP) and various other mitigation plans will need to be developed, the level of detail for which will be determined by the contractor based on specific Project activities. Table 9 provides a summary of example Mitigation Plans that may be required.

Table 9:Mitigation Plans that may be Required

Project Activity	Environmental Protection Plans that may be Required
– Vehicle and equipment movement and maintenance – Bank stabilization activities	– CEMP which includes best management practices for construction / rehabilitation activities and specifically outlines protection measures for avoiding effects to the Liard River and adjacent riparian / forest environments. – Spill Response Plan (specifically outlining protection measures that limit the use and discharge of deleterious substances used for bridge rehabilitation / construction activities) – Contractor Environmental Protection Plan (EPP) – Specific bird management plans – Caribou Protection Plan (CPP)

4.4.1 MITIGATION STRATEGIES

Protection of Migratory Birds

The proposed works are not anticipated to have any impacts to bird populations or habitat as the slope is actively failing and has very low habitat values for colonizing nesting birds such as swallows. As well, the majority of the riparian area which will require stripping in order to access the top of bank consists of herbaceous species. Nonetheless measures will be put in place to avoid all interactions with birds throughout construction activities. The most effective mitigation strategy is to conduct the work before or after the breeding season for birds that could potentially occur in the region. The general breeding bird window for the Project study area located in Zone

B6 (Nesting Periods – Canada.ca) is from late April to mid-August (Birds Canada 2021). The Provincial *Wildlife Act* provides protection for the eggs and active nests of all birds during breeding season. Section 34 of the *Act* states "A person commits an offence if the person, except as provided by regulation, possesses, takes, injures, molests or destroys:

(a) a bird or its egg;
(b) the nest of eagle, peregrine falcon, gyrfalcon, osprey, heron or burrowing owl; or
(c) the nest of a bird not referred to in paragraph(b) when the nest is occupied by a bird or its egg."

Subsections 34(a) and (c) have generally been interpreted to protect the active nests of all birds during breeding season. The nests of the birds listed in subsection (b) of the Provincial *Wildlife Act* are protected regardless of the time of year, or whether or not they are active. At the Federal level the *Migratory Birds Convention Act* (1994) provides similar protection for all migratory birds. These nesting windows, which are provided for information purposes, must be confirmed with the local regulators and taken into consideration when scheduling Project activities.

Prior to any project activities occurring at the Liard River Site a Qualified Environmental Professional (QEP) should determine that the slope is not occupied by birds. Observed bird nests that are in good condition must be considered active until an assessment can determine otherwise. A no work buffer zone should be placed around any active nests and the QEP will determine the set back and develop a management plan. The buffer zone will depend on a number of factors including surrounding vegetative cover, species sensitivity, existing disturbance and the type of construction activity. If an active nest is present, a management plan can be completed to ensure that this nest is not disturbed by the construction. The slope stabilization repair works are proposed for late August to early September at which time all bird nesting should be completed, and therefore there is a very low probability that active nests will be encountered.

Protection of Caribou

A Caribou Protection Plan (CPP) should be available during construction to avoid or mitigate any adverse effects on caribou for the duration of the Project. The risk periods for Woodland Caribou in northern BC are as follows (MFLNRO 2014):

- Low risk: July 16 – September 14
- Caution: September 15 – January 14
- Critical: January 15 – July 15
- Critical: Migration period for caribou in north-central BC is April 1 to May 20 and December 1 to January 1

A CPP should identify strategies and best management practices and include the following information:

- Background information on caribou:
    - Description of caribou and protected areas near the project;
    - Conservation status and population status of the particular herd(s);
    - Habitat use and distribution including timing of movements;
    - Signs of caribou presence – include images of animal and scat for those people not familiar with caribou; and,
    - Sensitive times for caribou based on habitat and movements.

- Project activities and schedule:
    - Identify if project footprint/interactions are occurring within or near protected habitat and where the caribou may be during project duration.
- Identify any potential project effects if applicable.
- Identify specific mitigation and timing including:
    - General measures including presentation of the CPP to all relevant staff;
    - Project specific measures to protect caribou and their habitat including important environmental features such as mineral licks;
    - Do not block any noted game trails with equipment of laydown material;
    - Fence any temporary trenches/excavations;
    - Identify ways to abate excessive noise;
    - What to do if animal or recent sign is noted, create a record of event;
    - Describe harassment and how to avoid it; and,
    - Identify roles and implementation of CPP.
- Identify events that would require the consultation with a wildlife biologist. This would include any detection of mineral licks or presence of caribou at the site.

All construction works are to be scheduled for the dry season (late August – early September) when potential for water related erosion is at a minimum. The environmental monitor (EM) will be on site during work activities within 30 m of a waterbody.

Equipment to be used in the vicinity of the River should be inspected before commencing work and cleaned to remove oil, grease and other substances deleterious to aquatic life. Equipment should use only biodegradable hydraulic fluid. Equipment with fuel or fluid leaks should not be permitted to work within or above any watercourse. Any equipment that develops a leak should immediately be removed from the watercourse and repaired.

The monitor will take water quality throughout the entire construction process for turbidity and pH. This will allow the monitor to determine if construction activities are negatively impacting water quality using the B.C. Approved Water Quality Guidelines.

Sediment and Erosion Control Plan

A sediment control plan should be followed throughout and following the construction phase. The sediment control plan will consist of the following elements:

- If any soil or other erodible material is to be stockpiled for more than seven days, it will be covered with polyethylene sheeting that is anchored securely to prevent displacement by wind. It is unlikely that there will be space for stockpiling materials at the Site;
- Where necessary, silt fencing will be used to retain sediments on the construction site;
- The sediment control structures will be installed as the first construction activity. All sediment control structures will be inspected regularly, and repaired/maintained as necessary;
- Sediment and erosion control materials will be stockpiled on site for use in any emergency situation that may arise. Stockpiled materials will include filter cloth, hay bales, rip-rap, grass seed, drain rock, culverts, matting polyethylene, etc.; and,

As soon as practical after construction, any remaining disturbed soils in the riparian area will be revegetated using an appropriate grass seed mixture. Seeding will be conducted before the end of the growing season to allow establishment of germination/roots. It will be important to create a site-specific Sediment and Erosion Control Plan for the site prior to the commencement of construction to ensure that no construction related material can enter the watercourse.

Invasive Plant Species Management

The Project area contains several invasive plant species, the spread of which should be mitigated to the extent possible. An invasive plant management plan will be required that includes:

- Limiting the introduction of invasive plant via seed or runners;
- Early detection and eradication of small patches of invasive plants;
- Maintaining desired plant communities through good management;
- Revegetating disturbed sites with desired plants; and,
- Evaluating the effectiveness of prevention efforts and adapting plans for the following year.

Spill Prevention

A Project specific Spill Prevention Plan will be required that consists of the following elements:

- All fueling of vehicles and/or equipment must be done at least 30 m away from Liard River and should not be done where the ground slopes towards the watercourse.
- If fuel is stored on site it must be at least 30 m from the River in a bermed compound that is sized to contain 110% fuel if a spill should occur.
- Industry approved spill kits should be stored no further than 30 m away from each piece of equipment and should be sized to handle the largest piece of equipment used. Additional spill pads should be kept in all pieces of equipment to further aid in immediate spill response including those for oil and gas and antifreeze.
- If a spill does occur, it should immediately be reported to the environmental monitor and to the Environmental Emergency Program (1-800-663-3456). Written notification should follow within two weeks of the verbal report.
- If a spill does occur, site personnel should immediately take steps to stop the discharge (if possible). As quickly as possible, they should contain the spill, clean up the affected area and dispose of waste materials at an approved disposal site.

Storage and maintenance facilities should have spill clean-up and disposal equipment. They also should have Medical Safety Data Sheets (MSDS) for any hazardous substances, a list of emergency contact names and telephone numbers, and a written list of emergency response and spill-reporting procedures:

- All hydraulic systems, fuel systems and lubricating systems should be in good repair;
- Equipment should be inspected before commencing work. Equipment with fuel or fluid leaks should not be permitted to work within or above any watercourse. Any equipment that develops a leak should immediately be removed from the watercourse and repaired;

- Before commencing work, all equipment should be steam-cleaned to remove oil, grease and other substances deleterious to aquatic life; and,
- Equipment should use only biodegradable hydraulic fluid.

4.5 RECOMMENDATIONS

It is recommended A CEMP should be prepared and submitted to PSPC to ensure all mitigation measures can be met and should include those mitigation strategies identified above. A qualified Environmental Professional (QEP) should be onsite during works to ensure compliance with the CEMP and other environmental protection plans. The CEMP can also be used to support any permit application or discussions with regulatory agencies, if required. A CPP should also be included as part of the environmental protection plans required for the duration of the project.

It is also recommended, that prior to construction, a pre-screen for presence of bats and swallows that may be using the bridge should be conducted if construction will occur in the spring or summer.

5. CLOSURE

This memo was prepared by WSP Canada Inc. The assessment represents the conditions at the subject property only at the time of the assessment and is based on the information referenced and contained herein. The conclusions presented respecting current conditions represent the best judgment of the assessors based on current environmental standards. WSP Canada Inc. attests that to the best of our knowledge, the information presented in this report is accurate. The information in this report should be evaluated, interpreted, and implemented only in the context of the assignment. The use of this memo or any of its parts for other projects without written permission of the Client and WSP Canada Inc. is solely at the user's own risk. This report must be reviewed and approved by the relevant regulating agencies prior to being relied on for planning and/or construction purposes.

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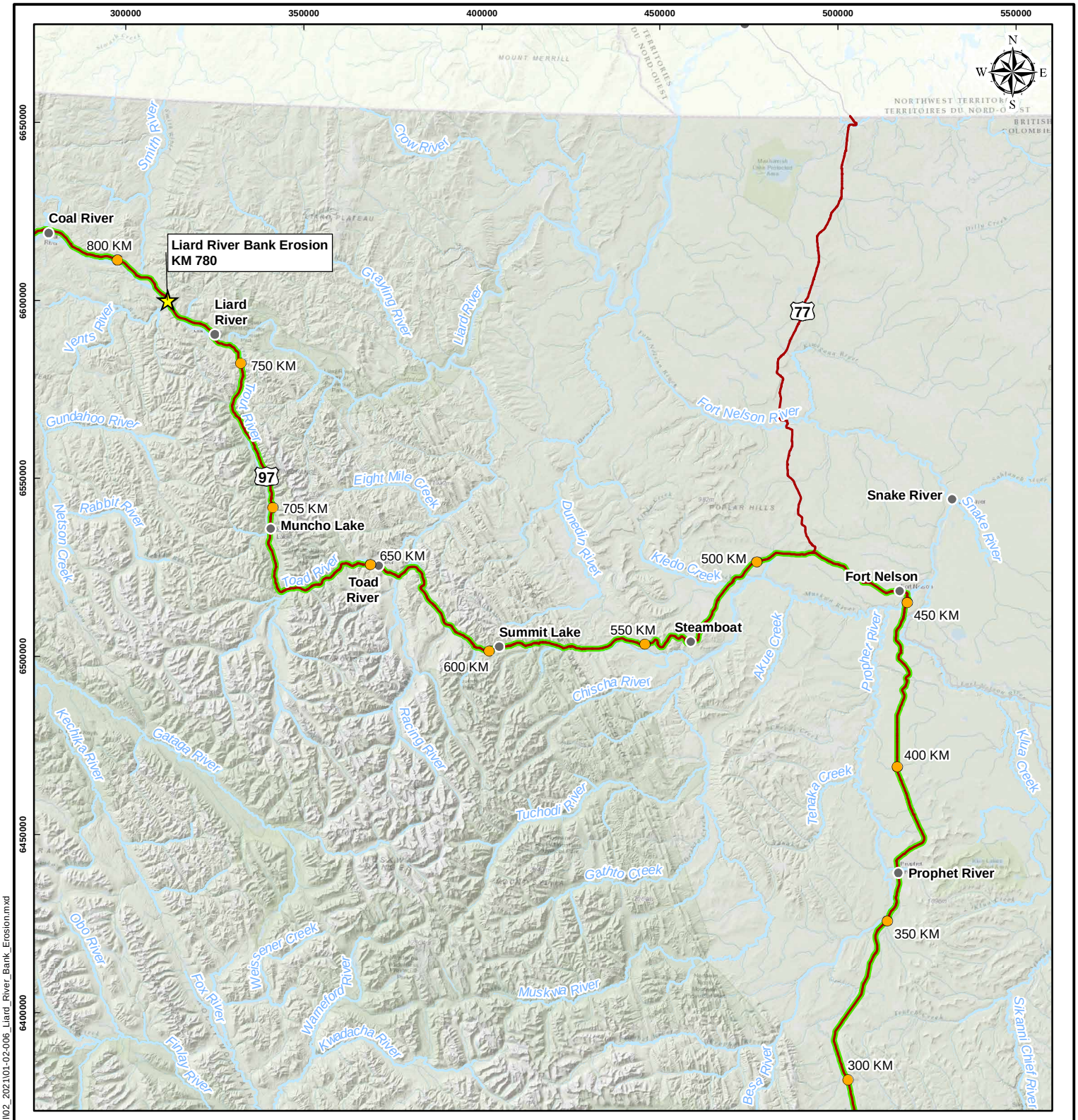
APPENDIX

A FIGURES



Legend

- Populated Place
- KM Post
- Project Site Location
- Highway
- Highway 97
- Watercourse

0 10 20 Kilometers

Scale: 1:1,500,000

References:
Data BC - BC Catalogue
Open Government License
(http://www.data.gov.bc.ca/)
NRCAN Geogratis
Open Government License
(http://geogratis.cgdi.gc.ca/)
MFLNRO - Archaeology Branch
Archaeological Sites RAAD

CLIENT: Public Services and Procurement Canada

PROJECT: Liard River Bank Erosion
KM 780

TITLE: Map Overview

DATE:	PROJECT NO:	
July 06, 2021	19M-01601-01	**Figure 1**

GIS FILE: 01-02-006_Liard_River_Bank_Erosion.mxd

COORDINATE SYSTEM:	ANALYST:	REVIEWED:
NAD 1983 UTM Zone 10N	MY	SB

wsp

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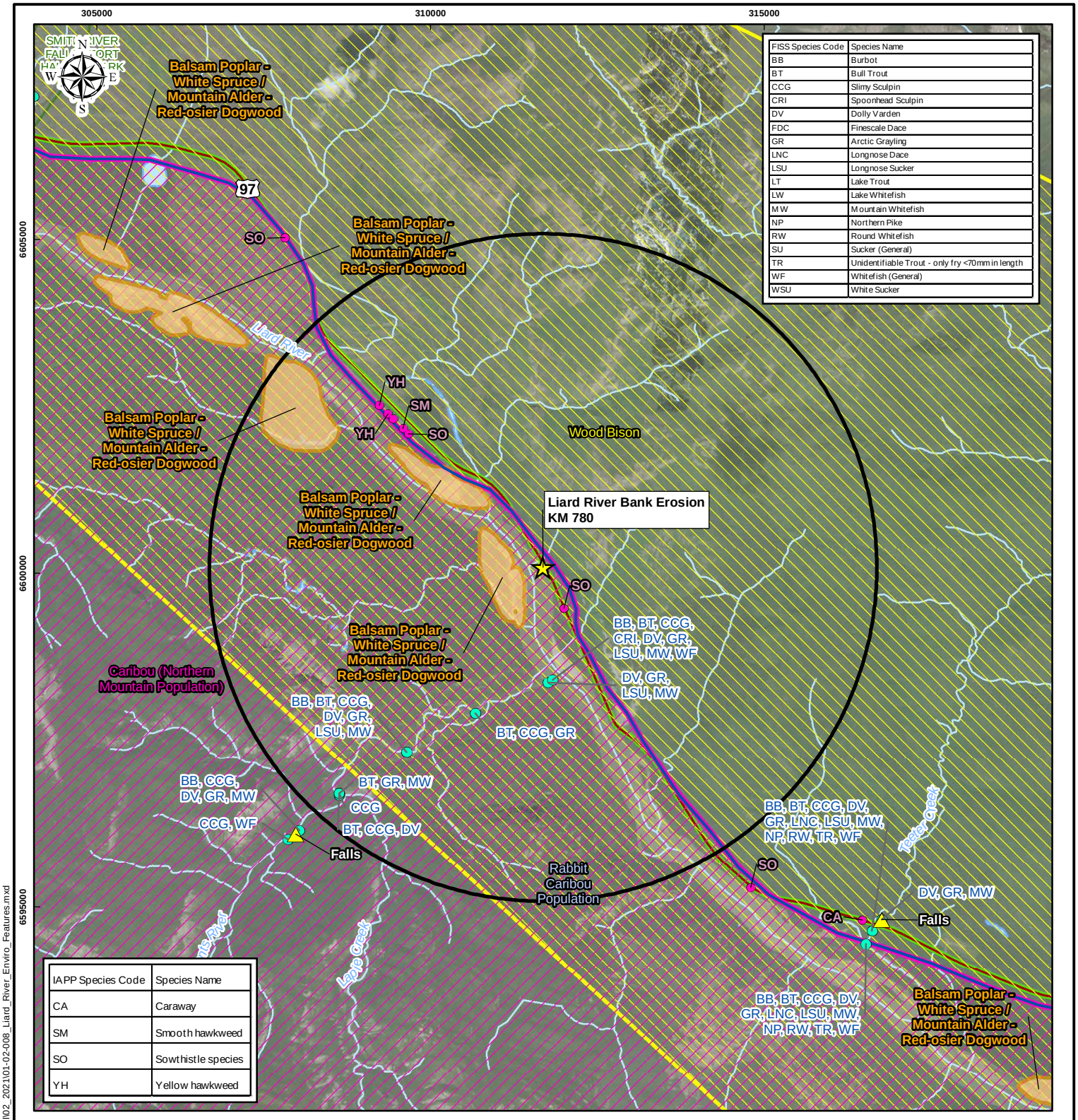

FISS Species Code	Species Name
BB	Burbot
BT	Bull Trout
CCG	Slimy Sculpin
CRI	Spoonhead Sculpin
DV	Dolly Varden
FDC	Finescale Dace
GR	Arctic Grayling
LNC	Longnose Dace
LSU	Longnose Sucker
LT	Lake Trout
LW	Lake Whitefish
MW	Mountain Whitefish
NP	Northern Pike
RW	Round Whitefish
SU	Sucker (General)
TR	Unidentifiable Trout - only fry <70mm in length
WF	Whitefish (General)
WSU	White Sucker

IAPP Species Code	Species Name
CA	Caraway
SM	Smooth hawkweed
SO	Sowthistle species
YH	Yellow hawkweed

Legend

- Populated Place
- KM Post
- Watercourse
- Highway
- Highway 97
- Project Site Location
- FISS Point
- FISS Obstacle
- Invasive Alien Plant Program (IAPP) Point
- Project 5km Buffer
- Rabbit Caribou Herd Population

CDC Animal Species of Conservation Concern
- Caribou (Northern Mountain Population)
- Wood Bison

CDC Ecological Communities of Conservation Concern
- Balsam Poplar - White Spruce / Mountain Alder - Red-osier Dogwood

0 1 2 Kilometers

Scale: 1:80,000

References:
Data BC - BC Catalogue
Open Government License
(http://www.data.gov.bc.ca/)
NRCAN Geogratis
Open Government License
(http://geogratis.cgdi.gc.ca/)
MFLNRO - Archaeology Branch
Archaeological Sites RAAD

CLIENT: Public Services and Procurement Canada

PROJECT: Liard River Bank Erosion KM 780

TITLE: Environmental Features

DATE:	PROJECT NO:	
July 06, 2021	19M-01601-01	**Figure 2**

GIS FILE: 01-02-008_Liard_River_Enviro_Features.mxd

COORDINATE SYSTEM:	ANALYST:	REVIEWED:
NAD 1983 UTM Zone 10N	MY	SB

wsp

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APPENDIX

B PHOTOPLATES

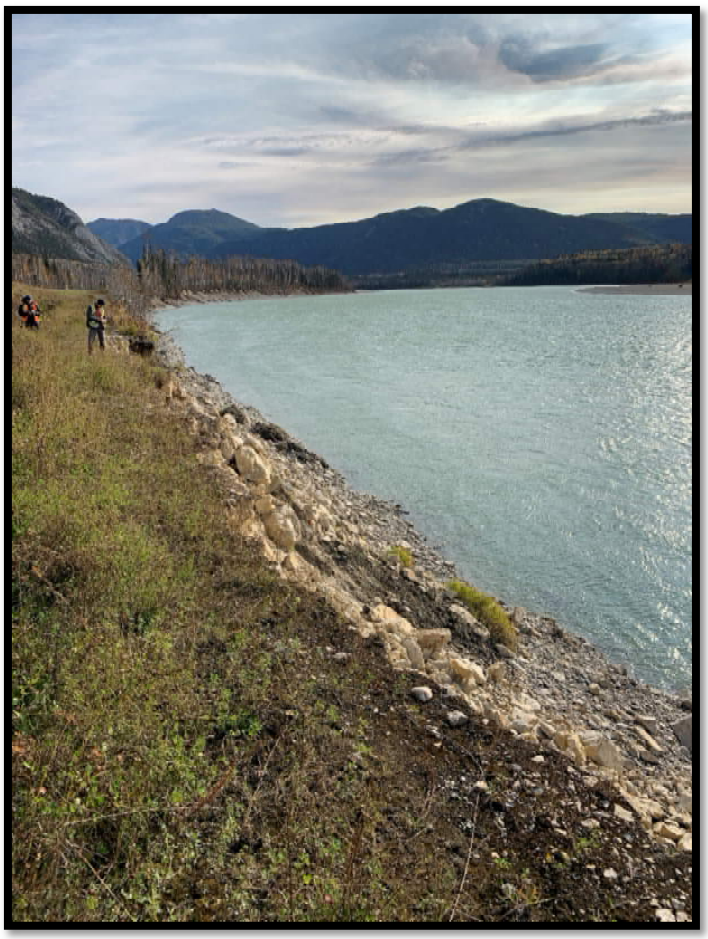
Photograph 1: Panorama of slope failure area along the east shoreline of Liard River

Photograph 2: Southern part of slope failure of Liard River bank

Photograph 3: Central part of slope failure of Liard River bank

Photograph 4: Northern part of slope failure of Liard River bank

Photograph 5: Looking north along top of bank of Liard River in bank failure area



Photograph 7: Looking south along top of bank of Liard River in bank failure area

Photograph 8: Looking downslope to Liard River from the top of the failing bank

Photograph 9: Looking north along the northern extent of the bank failure