



WILDLIFE TECHNICAL REPORT FOR THE TRANS MOUNTAIN PIPELINE ULC TRANS MOUNTAIN EXPANSION PROJECT

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Prepared for:



TRANSMOUNTAIN

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- Saddle Lake Cree Nation;
- Enoch Cree Nation;
- Alexander First Nation;
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- Louis Bull Tribe;
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- Paul First Nation;
- Nakcowinewak Nation of Canada;
- Sunchild First Nation;
- Lheidli T'enneh;
- Aseniwuche Winewak Nation;
- Simpcw First Nation;
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- Yale First Nation;
- Chawathil First Nation;
- Shxw'ow'hamel First Nation;
- Seabird Island Band;
- Popkum First Nation;
- Scowlitz First Nation;
- Le'qa:mel First Nation; and
- Kwantlen First Nation.

All of their time, effort, commitment and participation is much appreciated and was fundamental to the success of the wildlife field surveys for the proposed Trans Mountain Expansion Project.

EXECUTIVE SUMMARY

Trans Mountain Pipeline ULC (Trans Mountain) is a Canadian corporation with its head office located in Calgary, Alberta. Trans Mountain is a general partner of Trans Mountain Pipeline L.P., which is operated by Kinder Morgan Canada Inc. (KMC), and is fully owned by Kinder Morgan Energy Partners, L.P. Trans Mountain is the holder of the National Energy Board (NEB) certificates for the Trans Mountain pipeline system (TMPL system). The proposed expansion will comprise the following.

- Pipeline segments that complete a twinning (or “looping”) of the pipeline in Alberta and BC with about 987 km of new buried pipeline.
- New and modified facilities, including pump stations and tanks.
- Three new berths at the Westridge Marine Terminal in Burnaby, BC, each capable of handling Aframax class vessels.

Application is being made pursuant to Section 52 of the *National Energy Board Act (NEB Act)* for the proposed Trans Mountain Expansion Project (referred to as “TMEP” or “the Project”).

TERA Environmental Consultants (TERA) was commissioned to prepare the following Wildlife Technical Report. This report provides the results of the desktop/literature review and wildlife field program conducted for the Project, as well as the results of the Aboriginal participation during the wildlife field surveys. Approval to treat collected Traditional Ecological Knowledge (TEK) within this report as public knowledge was received by the participating Aboriginal communities listed herein.

Wildlife field surveys were conducted to collect information on wildlife distribution and habitat use within the Wildlife local study area (LSA). Provincial protocols were used, where available and relevant, to design the field program and the methods used. Consultation was completed with federal and provincial regulatory authorities to discuss and receive input on the methods proposed prior to the field work being undertaken. Field surveys focused on the new pipeline segments (*i.e.*, did not include the segments to be reactivated between Hinton to Hargreaves and Darfield to Black Pines), as well as new facilities or existing facilities that required clearing of native vegetation. Field surveys included: general aerial reconnaissance and wildlife feature review; winter track survey; aerial waterbird surveys (breeding and fall staging); sharp-tailed grouse survey; snake survey; breeding bird survey; and common nighthawk, short-eared owl, yellow rail and spotted owl surveys; and pond and stream-dwelling amphibian surveys. Field work was also completed to ground-truth preliminary wildlife habitat for species habitat models. Potentially affected Aboriginal communities participated in the wildlife field surveys to incorporate Aboriginal views and the experiential knowledge of the land that has accumulated over generations and passed down from the Elders into the consideration of potential Project-related environmental effects. The collection of TEK focused on Aboriginal experiential knowledge of the land and field reconnaissance was conducted along Crown lands potentially disturbed by Project construction, including associated physical works and activities.

Recommended mitigation measures are provided to reduce potential environmental effects to wildlife and wildlife habitat during construction and operation of the Project. The recommended mitigation measures provided were principally developed in accordance with industry and regulatory guidelines, including relevant recommendations in land use planning documents, as well as consultation with provincial regulatory authorities. A comprehensive review of the recommended mitigation measures and of all the issues raised by participating Aboriginal communities was conducted with each community during the field surveys and during follow-up results review. Concerns related to wildlife resources were addressed by the proposed mitigation measures and participants have not recommended any mitigation strategies related to wildlife resources additional to those described in the Environmental Protection Plans to be implemented for the Project. A Post-Construction Environmental Monitoring (PCEM) Program will also be implemented to collect sufficient information to determine the effectiveness of mitigation, identify the need for adaptive measures, and detect changes in wildlife and wildlife habitat resulting from the Project.

Supplemental wildlife field work is recommended in 2014 and will include areas where land access was not available in 2013, or was granted too late to conduct appropriately timed wildlife surveys; facility sites (Gainford, Hinton, Black Pines and Kingsvale pump stations and Sumas Terminal) and along the proposed Kingsvale and Black Pines power lines; and along any re-routed segments of the Project that were not previously surveyed in 2013.

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DEFINITIONS AND ACRONYM LIST

| Definition/Acronym | Full Name |
|------------------------------|--|
| AB | Alberta |
| ACIMS | Alberta Conservation Information Management System |
| AESRD | Alberta Environment and Sustainable Resource Development |
| ASRD | Alberta Sustainable Resource Development |
| ATK | Aboriginal Traditional Knowledge |
| ATPR | Alberta Tourism, Parks and Recreation |
| Avoidance | a means to prevent a potential adverse effect through routing/siting of the Project, changes to Project design or construction timing |
| BC | British Columbia |
| BC CDC | British Columbia Conservation Data Centre |
| BC MELP | British Columbia Ministry of Environment, Lands and Parks |
| BC MFLNRO | British Columbia Ministry of Forests, Lands and Natural Resource Operations |
| BC MFR | British Columbia Ministry of Forests and Range |
| BC MOE | British Columbia Ministry of Environment |
| BC MSRM | British Columbia Ministry of Sustainable Resource Management |
| BC MWLAP | British Columbia Ministry of Water, Land and Air Protection |
| BC OGC | British Columbia Oil and Gas Commission |
| BSC | Bird Studies Canada |
| Compensation | a means intended to compensate unavoidable and potentially significant or unacceptable effects any may consist of offsets (no net loss), research, education programs, and financial compensation (considered only when all other options have been exhausted) |
| COSEWIC | Committee on the Status of Endangered Wildlife in Canada |
| CPCN | Certificate of Public Convenience and Necessity |
| CWS | Canadian Wildlife Service |
| DUC | Ducks Unlimited Canada |
| Element | a technical discipline or discrete component of the biophysical or human environment identified in the NEB <i>Filing Manual</i> |
| EPP | Environmental Protection Plan |
| ERA | Environmental Risk Assessment |
| ESA | Environmental and Socio-economic Assessment |
| ESCC | Endangered Species Conservation Committee |
| FWMIS | Fisheries and Wildlife Management System |
| IBA | Important Bird Area, as defined by Birds Studies Canada and Nature Canada |
| IBP | Indicated Breeding Pair |
| Indicator | a biophysical, social, or economic property or variable that society considers to be important and is assessed to predict Project-related changes and focus the effects assessment on key issues. One or more indicators are selected to describe the present and predicted future condition of an element. Societal views are understood by the assessment team through published information such as management plans and engagement with regulatory authorities, public, Aboriginal communities, and other interested groups. |
| KMC | Kinder Morgan Canada Incorporated |
| KP | Kilometre Post. Based on existing Trans Mountain pipeline. |
| Local Study Area (LSA) | Zone of influence or area where the element and associated indicators are most likely to be affected by Project construction and operation. This generally represents a buffer from the centre of the proposed pipeline corridor. |
| LTOHA | Long-Term Owl Habitat Area |
| Mitigation measures | mean measures for the elimination, reduction or control of a project's adverse environmental effects, including restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means. |
| NEB | National Energy Board |
| OD | outside diameter |
| PNT | Protective Notation (AB) |
| Post-construction monitoring | a type of monitoring program that may be used to verify that mitigation measures effectively mitigated the predicted adverse environmental effects. |
| Proposed pipeline corridor | generally a 150 m wide corridor encompassing the pipeline construction right-of-way and temporary workspace. |
| Regional Study Area (RSA) | area extending beyond the Local Study Area boundary where the direct and indirect influence of other activities could overlap with Project-specific effects and cause cumulative effects on the environmental or socio-economic indicator |
| RISC | Resources Information Standards Committee |
| RK | Reference Kilometre. Based on proposed pipeline. |
| SARA | <i>Species at Risk Act</i> |
| Supplemental studies | studies to be conducted post submission of the application to confirm the effects assessment conclusions and gather site-specific information for the implementation of mitigation from the Project-specific environmental protection plans |
| TEK | Traditional Ecological Knowledge |
| TEM | Terrestrial Ecosystem Mapping |

| Definition/Acronym | Full Name |
|--------------------|--|
| TLU | Traditional Land Use |
| the Project | Trans Mountain Expansion Project |
| TMPL system | Trans Mountain pipeline system |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |
| UWR | Ungulate Winter Range (BC) |
| WHA | Wildlife Habitat Area (BC) |
| WHSRN | Western Hemisphere Shorebird Reserve Network |

1.0 INTRODUCTION

1.1 Project Overview

Trans Mountain Pipeline ULC (Trans Mountain) is a Canadian corporation with its head office located in Calgary, Alberta. Trans Mountain is a general partner of Trans Mountain Pipeline L.P., which is operated by Kinder Morgan Canada Inc. (KMC), and is fully owned by Kinder Morgan Energy Partners, L.P. Trans Mountain is the holder of the National Energy Board (NEB) certificates for the Trans Mountain pipeline system (TMPL system).

The TMPL system commenced operations 60 years ago and now transports a range of crude oil and petroleum products from Western Canada to locations in central and southwestern British Columbia (BC), Washington State and offshore. The TMPL system currently supplies much of the crude oil and refined products used in BC. The TMPL system is operated and maintained by staff located at Trans Mountain's regional and local offices in Alberta (Edmonton, Edson, and Jasper) and BC (Clearwater, Kamloops, Hope, Abbotsford, and Burnaby).

The TMPL system has an operating capacity of approximately 47,690 m³/d (300,000 bbl/d) using 23 active pump stations and 40 petroleum storage tanks. The expansion will increase the capacity to 141,500 m³/d (890,000 bbl/d).

The proposed expansion will comprise the following (Figure 1.1);

- pipeline segments that complete a twinning (or “looping”) of the pipeline in Alberta and BC with about 987 km of new buried pipeline;
- new and modified facilities, including pump stations and tanks; and
- three new berths at the Westridge Marine Terminal in Burnaby, BC, each capable of handling Aframax class vessels.

The expansion has been developed in response to requests for service from Western Canadian oil producers and West Coast refiners for increased pipeline capacity in support of growing oil production and access to growing West Coast and offshore markets. NEB decision RH-001-2012 reinforces market support for the expansion and provides Trans Mountain the necessary economic conditions to proceed with design, consultation, and regulatory applications.

Application is being made pursuant to Section 52 of the *NEB Act* for the proposed Trans Mountain Expansion Project (referred to as “TMEP” or “the Project”). The NEB will undertake a detailed review and hold a Public Hearing to determine if it is in the public interest to recommend a Certificate of Public Convenience and Necessity (CPCN) for construction and operation of the Project. Subject to the outcome of the NEB Hearing process, Trans Mountain plans to begin construction in 2016 and go into service in 2017.

Trans Mountain has embarked on an extensive program to engage Aboriginal communities and to consult with landowners, regulatory authorities (*e.g.*, regulators and municipalities), stakeholders, and the general public. Information on the Project is also available at www.transmountain.com.

The scope of the Project will involve:

- using existing active 610 mm (NPS 24) and 762 mm (NPS 30) O.D. buried pipeline segments;
- constructing three new 914 mm (NPS 36) O.D. buried pipeline segments totalling approximately 987 km:
 - Edmonton to Hinton – 339.4 km,
 - Hargreaves to Darfield – 279.4 km, and
 - Black Pines to Burnaby – 367.9 km;

- reactivating two 610 mm (NPS 24) O.D. buried pipeline segments that have been maintained in a deactivated state:
 - Hinton to Hargreaves – 150 km, and
 - Darfield to Black Pines – 43 km;
- constructing two, 3.6 km long 762 mm (NPS 30) O.D. buried delivery lines from Burnaby Terminal to Westridge Marine Terminal (the Westridge delivery lines);
- installing 23 new sending or receiving traps (16 on the Edmonton-Burnaby mainlines), for in-line inspection tools, at nine existing sites and one new site;
- adding 35 new pumping units at 12 locations (*i.e.*, 11 existing and one new pump station site);
- reactivating the existing Niton Pump Station that has been maintained in a deactivated state;
- constructing 20 new tanks located at the Edmonton (5), Sumas (1) and Burnaby (14) Terminals, preceded by demolition of 2 existing tanks at Edmonton (1) and Burnaby (1), for a net total of 18 tanks to be added to the system; and
- constructing one new dock complex, with a total of three Aframax-capable berths, as well as a utility dock (for tugs, boom deployment vessels, and emergency response vessels and equipment) at Westridge Marine Terminal, followed by the deactivation and demolition of the existing berth.

TERA Environmental Consultants (TERA) was commissioned to prepare the following Wildlife Technical Report. This report provides the results of the desktop/literature review and wildlife field program completed for the Project, as well as recommended mitigation measures to minimize potential effects. All Figures referenced in this report are provided in Appendix A.

1.2 Traditional Ecological Knowledge

Trans Mountain has engaged with Aboriginal communities and organisations that may be affected by the Project or that may have an interest in the Project based on the proximity of their community and their assertion of traditional and cultural use of the land along the proposed pipeline corridor to maintain a traditional lifestyle.

TERA was commissioned to facilitate the participation of potentially affected Aboriginal communities during the wildlife field surveys conducted for the Project. The purpose is to incorporate Aboriginal views and the experiential knowledge of the land that has accumulated over generations and passed down from the Elders into the consideration of potential Project-related environmental effects. The collection of Traditional Ecological Knowledge (TEK) focused on Aboriginal experiential knowledge of the land and field reconnaissance was conducted along Crown lands potentially disturbed by Project construction, including associated physical works and activities. This report includes the results of the Aboriginal participation during the wildlife field surveys. Approval to treat collected TEK within this report as public knowledge was received by the participating Aboriginal communities listed herein.

1.3 Objectives

The purpose of the desktop/literature review and wildlife field surveys was to:

- determine wildlife presence, relative abundance and distribution within the Wildlife Local Study Area (LSA), including wildlife species with special conservation status;
- identify site-specific habitats and habitat features (*e.g.*, stick nest) important to wildlife that may be impacted by construction and/or operation of the Project; and
- recommend technically and economically feasible site-specific mitigation measures, where warranted, to avoid or reduce potential impacts on wildlife (particularly species of concern) and important site specific habitats identified during the field work.

The objectives of Aboriginal participation during the wildlife field surveys are to:

- document the TEK of Aboriginal communities;
- augment the design and execution of the field surveys;
- inform existing environmental conditions;
- identify potential effects of the Project on environmental resources;
- integrate TEK into the consideration and mitigation of environmental effects; and
- contribute to final Project design.

The results of this report do not identify residual environmental or socio-economic effects nor provide conclusions regarding significance. The potential residual and cumulative effects of the pipeline and facilities components of the Project on wildlife, including an evaluation of significance, are presented in Volume 5A ESA - Biophysical.

1.4 Regulatory Standards

Design, construction and operation of the Project will be in compliance with all applicable codes, standards and regulations. Aboriginal Traditional Knowledge (ATK) is considered within this wildlife report as per guidance from the NEB *Filing Manual* (2013) and Section 19(3) of the *Canadian Environmental Assessment Act, 2012*.

1.4.1 Federal Standards

Species at Risk Act, S.C. 2002, c. 29

The *Species at Risk Act* (SARA) protects species listed as Extirpated, Endangered, Threatened and Special Concern on Schedule 1 of SARA. Species included on Schedule 1 are established by the federal Cabinet and are based on recommendations by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and consultation with government, Aboriginal peoples and the public. SARA applies to federal lands, however, may also apply to other lands when provincial protection is deemed inadequate by the Federal Minister of the Environment. SARA also applies to all lands in Canada for Schedule 1 bird species cited in the *Migratory Birds Convention Act*.

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

Migratory Birds Convention Act, S.C. 1994, c. 22

The *Migratory Birds Convention Act* protects migratory birds and their habitat in Canada. Environment Canada administers the *Act* through the Canadian Wildlife Service. The *Act* allows for regulations to be made by the Governor in Council that prohibit “the killing, capturing, injuring, taking or disturbing of migratory birds or the damaging, destroying, removing or disturbing of nests.” The *Act* also protects migratory bird habitat and prescribes for the control and management of the habitat. Under the *Act*, no person shall “disturb, destroy, or take a nest, egg, nest shelter, eider duck shelter, or duck box of a migratory bird” except when authorized with a permit.

NEB Filing Manual, 2013

The NEB *Filing Manual* (2013) provides regulatory guidance for the assessment of wildlife and wildlife habitat, as well as species with conservation status. The guidance in the *Filing Manual* was used in planning the scope and methods for the assessment of wildlife and wildlife habitat and species with conservation status.

1.4.2 Provincial Standards in Alberta

Provincial Acts, standards, guidelines and best management practices in Alberta were reviewed and considered in the preparation of this report. These include, but are not limited to the following:

- Alberta Wildlife Act;
- Recommended Land Use Guidelines for Protection of Selected Wildlife Species and Habitat within the Grassland and Parkland Natural Regions of Alberta (Alberta Sustainable Resource Development [ASRD] 2011a);
- Integrated Standards and Guidelines – Enhanced Approval Process (Government of Alberta 2013);
- regional and municipal land use planning documents; and
- Alberta Environment and Sustainable Resource Development (AESRD) Sensitive Species Inventory Guidelines (2013a).

1.4.3 Provincial Standards in British Columbia

Provincial Acts, standards, guidelines and best management practices in BC were reviewed and considered in the preparation of this report. These include, but are not limited to the following:

- BC Wildlife Act;
- Resources Information Standards Committee (RISC) standard protocols for wildlife surveys;
- Environmental Protection and Management Guide (BC Oil and Gas Commission [BC OGC] 2013);
- Wildlife Habitat Features Summary of Management Guidelines Northern Interior Forest Region (BC Ministry of Water, Land and Air Protection [BC MWLAP] 2004a);
- Guidelines for Raptor Conservation during Urban and Rural Land Development in British Columbia (BC MOE 2013c);
- Develop with Care 2012 (BC MOE 2012a);
- Standards and Best Practices for Instream Works (BC MWLAP 2004b);
- Accounts and Measures for Managing Identified Wildlife (BC MWLAP 2004c);
- Guidelines for Evaluating, Avoiding and Mitigating Impacts of Major Development Projects on Wildlife in British Columbia (Harper *et al.* 2001);
- best management practices for various wildlife species;
- regional and municipal land use planning documents;
- relevant recovery planning documents; and
- Orders and General Wildlife Measures for Wildlife Habitat Area (WHA) and Ungulate Winter Range (UWR).

2.0 CONSULTATION AND ENGAGEMENT

Trans Mountain and its consultants have conducted a number of consultative activities to inform Aboriginal communities, stakeholders, the public and regulatory authorities about the approach to assessing potential environmental and socio-economic effects of the Project, and to seek input throughout the Project planning process.

2.1 Public Consultation, Aboriginal Engagement and Landowner Relations

Trans Mountain has implemented and continues to conduct open, extensive and thorough public consultation, Aboriginal engagement and landowner relations programs. These programs were designed to reflect the unique nature of the Project as well as the diverse and varied communities along the proposed pipeline and marine corridors. These programs were based on Aboriginal communities, landowner and stakeholder groups' interests and inputs, knowledge levels, time and preferred methods of engagement. In order to build relationships for the long-term, these programs were based on the principles of accountability, communication, local focus, mutual benefit, relationship building, respect, responsiveness, shared process, sustainability, timeliness and transparency.

Feedback related to wildlife and wildlife habitat that was raised through various Aboriginal engagement and public consultation activities including public open houses, ESA Workshops, Community Workshops and one-on-one meetings, is summarized below and was considered in the development of this technical report, and the assessment of wildlife and wildlife habitat in Volume 5A.

- Protection of migratory birds.
- Wildlife health and well-being.
- Potential effects to important waterbodies for birds.
- Potential effects to forested area birds.
- Potential effects on wildlife and wildlife habitat, movement corridors and migration patterns.
- Potential effects on specific species and areas, such as the Pacific water shrew in Surrey Bend and east of Port Mann Bridge.
- Protection of parks and ecologically sensitive areas.
- Potential effects to wildlife species at risk.

Concerns related to the potential effects of spills were also raised and detailed information on pipeline spills is provided in Volume 7A.

The full description of the public consultation, Aboriginal engagement and landowner relations programs are located in Volumes 3A, 3B and 3C, respectively. Section 3.0 of Volume 5A summarizes the consultation and engagement activities that have focused on identifying and assessing potential issues and concerns related to wildlife and wildlife habitat which may be affected by the construction and operation of the Project. Information collected through the public consultation, Aboriginal engagement and landowner relations programs for the Project was considered in the development of this technical report, and the assessment of wildlife and wildlife habitat in Volume 5A.

2.2 Regulatory Consultation

A summary of consultation related to wildlife and wildlife habitat conducted for the Project is provided in Table 2.2.1. Key contacts for the Project included Environment Canada and provincial regulatory authorities in Alberta and BC. Local biologists were also contacted for species- and habitat-specific information. Consultation related to wildlife and wildlife habitat is ongoing.

TABLE 2.2.1

SUMMARY OF CONSULTATION ACTIVITIES RELATED TO WILDLIFE AND WILDLIFE HABITAT

| Name and Title of Contact | Method of Contact | Date of Consultation Activity | Reason For Engagement and Issues/Concerns | Commitments/Follow-up Actions/Comments |
|--|-------------------|-------------------------------|--|--|
| ENVIRONMENT CANADA (EC) | | | | |
| Harp Gill Senior Environmental Assessment Officer, Pacific and Yukon Region, CWS | Email | August 25, 2013 | Provide updated Meeting Minutes from April 17, 2013 meeting. Send for review the following: updated wildlife indicator list, information on the LSA and RSA boundaries; send information and maps showing proposed grizzly bear and caribou RSA boundaries. Request if the proposed pipeline corridor encounters any known habitat sites for band-tailed pigeon, and if there are any other conflicts with important habitat (not publically available) with the proposed pipeline corridor. Ask for clarification that the Pacific and Yukon Region is the primary contact for the Project and that all correspondence will be provided to P. Gregoire (Prairie and Northern Region, Edmonton). | <p>September 4, 2013: EC responds that the Pacific and Yukon Region will be the primary contact and correspondence will be forwarded to P. Gregoire (Edmonton).</p> <p>September 19, 2013: EC responds they do not have any comments on the study area boundaries.</p> <p>September 30, 2013: EC provides a response related to band-tailed pigeon and notes that they do not have specific mapping layers for band-tailed pigeon, however, they may be encountered throughout the Coast Range at low and mid-elevations up to the central coast. EC recommends that they be considered as a sensitive species for the coastal portion of the Project, as this area is within the species range and contains suitable habitat.</p> |
| Jennifer Wilson Special Projects Officer, Pacific and Yukon Region, CWS | Email | September 17, 2013 | Request information on migratory bird timing guidelines in BC that are relevant to the proposed Project, as well as timing windows that may apply at the Important Bird Area (Douglas Lake Plateau). | September 18, 2013: EC provides information on the migratory bird timing guidelines in BC. No specific information is provided on the Important Bird Area (Douglas Lake Plateau). |
| | Email | September 19, 2013 | EC requests information on which caribou ranges the proposed pipeline corridor will cross. | September 23, 2013: Provide a response that the proposed pipeline corridor crosses through the Wells Gray caribou range for approximately 31 km, including Ungulate Winter Range (UWR u-3-004) for mountain caribou, as well as the Groundhog caribou range for approximately 10 km. |
| | Email | September 25, 2013 | <p>EC requests a listing and/or map of the First Nations Indian Reserves in both BC and Alberta that the proposed pipeline corridor may cross.</p> <p>EC provides comment on yellow rail (if the Project's proposed right of way may impact yellow rail habitat, then EC recommends that this species be included as an indicator).</p> <p>EC requests the opportunity to fly the proposed pipeline corridor.</p> <p>EC provides the guidance document "<i>Petroleum Industry Activity Guidelines for Wildlife Species at Risk in the Prairie and Northern Region</i>" as a useful working document in considering species at risk in Alberta.</p> | <p>October 24, 2013: Provide a response that includes a list of First Nations Indian Reserves in both BC and Alberta that the proposed pipeline corridor may cross.</p> <p>Coordinate a helicopter overflight of the proposed pipeline corridor.</p> |

TABLE 2.2.1 Cont'd

| Name and Title of Contact | Method of Contact | Date of Consultation Activity | Reason For Engagement and Issues/Concerns | Commitments/Follow-up Actions/Comments |
|--|-----------------------|--|--|---|
| Jennifer Wilson Special Projects Officer, Pacific and Yukon Region, CWS | Email | September 30, 2013 | EC provides additional feedback on wildlife indicators. | --- |
| Harp Gill Senior Environmental Assessment Officer, Pacific and Yukon Region, CWS Jennifer Wilson Special Projects Officer, Pacific and Yukon Region, CWS | Email | October 16, 2013 | Provide updated shapefile of the proposed pipeline corridor. | --- |
| Jennifer Wilson, Special Projects Officer Coral deShield, Head – Environmental Assessment Wendy Easton, Landbird Assessment Biologist Kella Sadler, Senior Species at Risk Biologist Andre Breault, Waterfowl and Waterbird Biologist | Helicopter Overflight | October 22, 2013 | Members of Pacific and Yukon Region flew in a Bell 407 helicopter from Hope to the Sumas tank facility, and also from Hope to Kamloops with a representative from KMC to review the proposed pipeline corridor, as well as look at the existing TMPL right-of-way and why it could not be paralleled in particular sections. The remainder of the proposed corridor could not be reviewed due to weather. | Schedule a follow-up meeting for October 30, 2013. |
| Jennifer Wilson, Special Projects Officer Coral deShield, Head – Environmental Assessment Wendy Easton, Landbird Assessment Biologist Kella Sadler, Senior Species at Risk Biologist (on phone) Phil Wong, Sector Support Section (on phone) | Meeting in Delta, BC | October 30, 2013 | A follow-up meeting was held to review an immersive video of the remaining sections of the proposed pipeline corridor that were not seen during the October 22, 2013 overflight. Areas reviewed included the re-routed segment associated with the Ajax Mine, Lac du Bois Grasslands Protected Area, caribou range, the lower BC mainland and Alberta. Candidate critical habitat was discussed and consultation on this topic will continue. | Consultation with EC will be ongoing and discussions will continue related to candidate critical habitat areas crossed by the proposed pipeline corridor. |
| PROVINCIAL GOVERNMENT – ALBERTA | | | | |
| AESRD: Edmonton | | | | |
| Lonnie Bilyk, Resource Data Biologist | Email | August 16, 2012 July 11, 2013 | Request FWMIS records in 2012 and 2013. | Files received. |
| Hugh Wallis, Wildlife Biologist | Telephone | November 12, 2012 | Provide Project introduction. | --- |
| Delaney Anderson, Wildlife Biologist | Email | October 3, 2013 | Request if any concerns with proposed pipeline corridor, in particular, Protective Notation (PNT) 980061. | --- |
| Delaney Anderson, Wildlife Biologist | Email | October 16, 2013 | Provide shapefile of the proposed pipeline corridor | --- |
| AESRD: Upper Athabasca Region, Edson | | | | |
| Dave Hobson, Wildlife Biologist | Email | October 4, 2012 June 25, 2013 October 16, 2013 | Provide shape-file of the proposed pipeline corridor as it is updated. | --- |
| | Email | October 14, 2012 | Provide Project introduction and request feedback on routing concerns (e.g., trumpeter swan breeding lakes). | October 15, 2012: AESRD responds and noted the proximity of the proposed pipeline corridor to a trumpeter swan nesting lake at SW 22-53-18 W5M. |

TABLE 2.2.1 Cont'd

| Name and Title of Contact | Method of Contact | Date of Consultation Activity | Reason For Engagement and Issues/Concerns | Commitments/Follow-up Actions/Comments |
|--|--------------------|--------------------------------------|---|--|
| Dave Hobson, Wildlife Biologist (cont'd) | Email | November 25, 2013 | Request input on winter tracking field program in Alberta (locations and methods), as well as information on the PNTs that are crossed by the proposed pipeline corridor (e.g., concerns and mitigation). | November 30, 2012: AESRD requests that winter track counts should include PNTs that are important as ungulate winter range, and noted that pipeline expansion through these PNTs should minimize tree cover loss as much as possible. |
| | Telephone | June 28, 2013 | Provide a review of summer field surveys and note that the breeding bird survey may extend into early July. AESRD noted that our scheduled surveys to July 9 would be acceptable. | --- |
| | Email | August 26, 2013 | Provide a summary of the PNTs and trumpeter swan lakes that are encountered by the proposed pipeline corridor and request feedback related to mitigation. Provide information on the LSA and RSA study area boundaries, including the grizzly bear RSA for review. | September 6, 2013: AESRD notes that the proposed pipeline corridor is generally close to Highway 16 and the primary concern for grizzly bears relates to the creation of new access. Feedback was provided on trumpeter swan lakes and the PNTs within the area covered by the Edson office. September 17, 2013: AESRD notes that PNT 970253 (Habitat Management Area, Wildlife Study Plots) are associated with a study that is no longer active and suggests follow-up with the Foothills Research Institute. |
| | Email | September 18, 2013 | Confirm mitigation for PNTs 870456 (Ungulate Winter Range) and 780290 (Fish & Wildlife Resource Management Area). | September 19, 2013: AESRD confirms that maintaining tree cover is the primary concern and prefers that the proposed pipeline corridor parallel the existing TMPL right-of-way and tree removal is minimized. |
| Lisa Wilkinson, Species at Risk Biologist | Email | October 11, 2013 | Provide summary of proposed corridor (and screen shot) of proposed pipeline corridor through PNT 020232 (Rare and Endangered Species Habitat Protection Area for long-toed salamander). Described that the proposed corridor is not located within 100 m of the ponds in NW 3-50-26 W5M, and that construction is not scheduled for the breeding season (April 1 to Sept 30). Requested recommendations for mitigation to address salamanders dispersing in the fall. | October 15, 2013: AESRD responds that by December, the salamanders will be hibernating in the ground and there is no way to know exactly where they hibernate (other than in nearby forests), so there is little that can be done to protect them in the winter. It is recommended that vehicular activity in spring and early-fall is limited to reduce effects during their breeding and dispersal periods. |
| Dave Hugelschaffer, Acting Range and Program Manager, Operations Section Head. | Telephone | October 21, 2013 | Request information on the status of PNT 980160 (Research Site Structure) in NE 12-51-25 W5M. | --- |
| Gary Dodsworth, Forest Officer Stefan Bittner, Forest Officer | Telephone Email | October 29, 2013 October 30, 2013 | Request information on the status of PNT 980160 (Research Site Structure) in NE 12-51-25 W5M. | --- |

TABLE 2.2.1 Cont'd

| Name and Title of Contact | Method of Contact | Date of Consultation Activity | Reason For Engagement and Issues/Concerns | Commitments/Follow-up Actions/Comments |
|--|-------------------|--|--|--|
| AESRD: Upper Athabasca Region, Hinton | | | | |
| Jeff Kneteman, Senior Wildlife Biologist | Email | September 11, 2013 | Provide an introduction to the Project and a summary of the PNTs that are encountered by the proposed pipeline corridor and request feedback related to mitigation. Request feedback on long-toed salamander breeding pond located north of the existing Hinton pump station. Provide information on the LSA and RSA study area boundaries, including the grizzly bear RSA for review. | September 15, 2013: AESRD responds that primary recommendation is to prioritize the conservation and immediate placement of topsoil, including protecting native species propagules, and restoration of the native plant community composition and structure as quickly as possible. AESRD will be consulted to discuss mitigation options for work at the Hinton pump station. |
| | Email | October 5, 2013 | Reminder for recommendations for mitigation in PNTs 980160 (Research Site Structure) and 020232 (Rare and Endangered Species Habitat Protection Area for long-toed salamander). | October 7, 2013: AESRD responds that PNT 980160 may have been a research plot that may not be active (contact Foothills Research Institute), and for PNT 020232 to contact L. Wilkinson (Species at Risk Biologist) to discuss long-toed salamanders in this area. |
| | Email | October 16, 2013 | Provide shapefile of the proposed pipeline corridor. | --- |
| | Email | November 18, 2013 | Provide further information on the construction schedule associated with both the Hinton Pump Station (summer) and the proposed pipeline (winter) and suggest mitigation measures for the long-toed salamander breeding pond (e.g., exclusion fencing/monitoring for work in summer). | --- |
| PROVINCIAL GOVERNMENT - BRITISH COLUMBIA | | | | |
| BC MOE: Victoria | | | | |
| Katrina Stipek, Species at Risk Information Specialist | Email | August 16, 2012 July 11, 2013 | Request BC CDC data. | Files received. |
| Richard Weir, Carnivore Conservation Specialist | Email | March 11, 2013 | Request information on any new badger initiatives, or availability of a habitat model for badgers. | March 21, 2013: R. Weir responds that there are no new badger initiatives, although EC is in the process of defining critical habitat for badgers. Noted that there is a predictive model for badgers in this report: <i>Conservation Strategies for North American Badgers in the Thompson and Okanagan Regions. Final Report for the Thompson-Okanagan Badger Project</i> (Artemis Wildlife Consultants, 2003). This model will be difficult to reconstruct and apply easily. A revision is being prepared for application across the Thompson Region and is not available at this time. |
| BC MFLNRO: West Coast Region, Nanaimo | | | | |
| Melissa Todd, Research Wildlife Ecologist | Telephone/Email | June 3, 2013 June 10, 2013 July 15, 2013 | During other consultation, it was noted that M. Todd was developing a model for coastal-tailed frog. Contact was made on several occasions to discuss this model. | --- |
| John Sunde, Land and Resource Specialist | Telephone/Email | February 26, 2013 | Request information on habitat models that are available from the province. | February 28, 2013: BC MFLNRO provides information for the northern goshawk (South Coast Conservation Region). |

TABLE 2.2.1 Cont'd

| Name and Title of Contact | Method of Contact | Date of Consultation Activity | Reason For Engagement and Issues/Concerns | Commitments/Follow-up Actions/Comments |
|--|-------------------|--|--|--|
| Melissa Todd, Research Wildlife Ecologist John Sunde, Land and Resource Specialist (also emailed to BM MFLNRO in Surrey – see below) | Email | July 15, 2013 | Request for existing information on coastal tailed frog model. Provided a list of information that was available and in the absence of further information, our suggested approach to construct a habitat suitability model. | --- |
| BC MFLNRO: Omineca Region, Prince George | | | | |
| Brady Nelless, A/Landbase Stewardship Section Head | Email | August 10, 2012 | Provide introduction to the Project and a preliminary list of wildlife indicators, and background information on indicator selection. Request a meeting to discuss the following: <ul style="list-style-type: none"> • habitats of concern in proximity to the proposed route in your region (e.g., protected areas, sensitive habitat features, etc.); • a review of preliminary wildlife indicators to be used in the environmental assessment; • available data that would be useful in supporting a thorough examination of potential effects on wildlife in the region; • recommended field protocols, particularly any that may differ from the RISC standard protocols; • recent habitat models that have been developed and validated for species of interest in the region; • recommended individuals or groups for further consultation; and • any other concerns or questions. | August 20, 2012: MFLNRO responds that Kevin Hoekstra will be the Regional contact for this Project. |
| Kevin Hoekstra, Ecosystem Biologist | Email | August 28, 2012 May 23, 2013 July 31, 2013 October 16, 2013 | Provide shape-file of the proposed pipeline corridor as it is updated. | --- |
| | Telephone | September 7, 2012 | Project Introduction and routing review. BC MFLNRO noted that the proposed corridor is located in valley and will parallel other linear corridors and would like to see the natural buffer that is between the existing highway and existing TMPL right-of-way maintained. The pipeline does not cross known wildlife features, WHA or UWR, however there are elk and white-tail deer in the area. Reclamation should avoid using seed that is palatable to wildlife to prevent an increased chance of wildlife mortality. | September 7, 2012: Will contact again to discuss the Project in more detail (indicator species, study boundaries and recommended surveys). |
| | Email | January 8, 2013 | Send preliminary winter transect locations and proposed field survey methods for review. | January 11, 2013: MFLNRO recommends a winter transect near the interface between Cranberry Marsh and the crown land to the west, and notes the other locations are suitable including a transect located in the riparian area of Camp Creek. |

TABLE 2.2.1 Cont'd

| Name and Title of Contact | Method of Contact | Date of Consultation Activity | Reason For Engagement and Issues/Concerns | Commitments/Follow-up Actions/Comments |
|---|-------------------------|--|---|--|
| Kevin Hoekstra, Ecosystem Biologist (cont'd) | Email | March 11, 2013 | Request information on existing models for mountain caribou and concerns related to routing within caribou range. | March 12, 2013: BC MFLNRO responds that the only habitat modelling is related to the caribou recovery plan. Within the Omineca Region, the proposed pipeline corridor parallels the existing TMPL right-of-way and is outside the known caribou range. |
| | E-mail | August 16, 2013 | Provide a description of RSA and LSA boundaries; maps showing proposed grizzly bear and caribou RSA; and an updated wildlife indicator list for review and feedback. | --- |
| | Telephone | October 24, 2013 | Discuss information provided on August 16, 2013. No concerns associated with the proposed study area boundaries and indicator list. | October 24, 2013: provide preliminary moose model (Draft Species Account/Model Assumptions/TEM ratings) for review. |
| BC MFLNRO: Thompson/Okanagan Region, Kamloops | | | | |
| John Surgenor, Wildlife Biologist Robyn Reudink, Ecosystem Biologist | Email | July 4, 2012 | Provide introduction to the Project and a preliminary list of wildlife indicators and background information on indicator selection. Request a meeting to discuss the following: <ul style="list-style-type: none"> • habitats of concern in proximity to the proposed route in your region (e.g., protected areas, sensitive habitat features, etc.); • a review of preliminary wildlife indicators to be used in the environmental assessment; • available data that would be useful in supporting a thorough examination of potential effects on wildlife in the region; • recommended field protocols, particularly any that may differ from the RISC standard protocols; • recent habitat models that have been developed and validated for species of interest in the region; • recommended individuals or groups for further consultation; and • any other concerns or questions. | August 14, 2012: BC MFLNRO responds that Robyn Reudink will be the Regional contact for this Project. |
| Robyn Reudink, Ecosystem Biologist John Surgenor, Wildlife Biologist | Email | August 15, 2012 March 6, 2013 May 6, 2013 May 23, 2013 July 31, 2013 October 16, 2013 | Provide shape-file of the proposed pipeline corridor as it is updated. | --- |
| Robyn Reudink, Ecosystem Biologist | Telephone | September 24, 2012 | Provide introduction to the Project. Discuss preliminary wildlife field program, as well as wildlife surveys that could be completed in Fall 2012 such as snake surveys. If this was not possible due to land access, snake surveys could also be completed in the spring. | --- |
| | Meeting in Kamloops, BC | October 30, 2012 | Review wildlife indicator species and selection criteria, available data for the Region, information on timing restrictions and setback distances, and methods for the wildlife field program. | December 3, 2012: in response to the meeting on October 30, 2012, BC MFLNRO provides a letter that outlines provincial information and data sources and general recommendations for project assessments from the Thompson-Nicola District (Ecosystem Section). |

TABLE 2.2.1 Cont'd

| Name and Title of Contact | Method of Contact | Date of Consultation Activity | Reason For Engagement and Issues/Concerns | Commitments/Follow-up Actions/Comments |
|---|---------------------|---|---|--|
| Robyn Reudink, Ecosystem Biologist (cont'd) | Email | December 14, 2012 | BC MFLNRO requests the following: <ul style="list-style-type: none"> provide study area used to develop the list of wildlife indicators and advise if any updates have been made; and information on routing (e.g., segment from Darfield to Black Pines will not have new construction). | December 19/20, 2012: provide responses to questions and provide the list of wildlife indicators, as well as a list of winter transect locations for review. |
| | Email | December 21, 2012 | BC MFLNRO provides shapefiles for Sheep Winter Range and Mountain Goat Winter Range, as well as Critical Deer and Critical Moose Winter Range from the Kamloops LRMP. | --- |
| | Email | January 9, 2013 | Provide proposed field survey methods for winter tracking for review, and a reminder to provide feedback on transect locations. | February 13, 2013: BC MFLNRO notes feedback has not been provided on winter transect locations due to busy schedule of wildlife staff in the Kamloops office. Feedback on candidate wildlife indicators will be forthcoming. February 13, 2013: Provide a revised list of wildlife indicators to BC MFLNRO since updates had been made to the list and want to ensure the most current version is being reviewed. |
| | Email | February 18, 2013 | Advise BC MFLNRO that the Kamloops ESA Workshop will be held in Kamloops on March 6, 2013. Suggest a meeting at this time to discuss summer wildlife field surveys. Request information on available wildlife capability-suitability products for the following species: moose; mountain goat; American badger; bobolink; Brewer's sparrow; flammulated owl; lark sparrow; long-billed curlew; Lewis' woodpecker; short-eared owl; sharp-tailed grouse; Williamson's sapsucker; and western screech-owl. | --- |
| Robyn Reudink, Ecosystem Biologist John Surgenor, Wildlife Biologist Megan Williams, Licensed Resource Specialist | Meeting in Kamloops | March 6, 2013 | In conjunction with the Kamloops ESA Workshop, meet separately with BC MFLNRO to discuss wildlife indicators and schedule a follow-up conference call for March 12, 2013. | March 6 and 11, 2013: to prepare for conference call, provide to BC MFLNRO a current shapefile of the proposed corridor, NEB filing guidelines and list of topics/questions to discuss. |
| Robyn Reudink, Ecosystem Biologist John Surgenor, Wildlife Biologist | Conference Call | March 12, 2013 | Detailed review of wildlife indicator list, review proposed pipeline corridor within caribou range and UWRs, discuss available information for the Region and review wildlife surveys to be completed (locations and methods). | --- |
| Robyn Reudink, Ecosystem Biologist | Email | March 18, 2013 March 22, 2013 April 1, 2013 April 10, 2013 April 23, 2013 April 24, 2013 | March 18: Provide information on preliminary sharp-tailed grouse survey locations and methods and request feedback. | March 22, 2013: BC MFLNRO provides more information on sharp-tailed grouse leks and survey locations. April 1, 2013: Review BC MFLNRO suggestions and note that some sites cannot be surveyed since land access has not been granted. April 10/23/24, 2013: review and exchange of information related to sharp-tailed grouse survey locations. |

TABLE 2.2.1 Cont'd

| Name and Title of Contact | Method of Contact | Date of Consultation Activity | Reason For Engagement and Issues/Concerns | Commitments/Follow-up Actions/Comments |
|---|-------------------|-------------------------------|---|--|
| Robyn Reudink, Ecosystem Biologist (cont'd) | Email | April 1, 2013 | Request if there are models for flammulated owl, Lewis' woodpecker, Williamson's sapsucker and coastal-tailed frog. location data on breeding locations for amphibians including: Great Basin spadefoot; and request referencing information on the Kamloops LRMP Critical Deer and Moose Winter Range; and information on mitigation in these areas. | April 4, 2013: BC MFLNRO provides available information on models for flammulated owl, Lewis' woodpecker and Williamson's sapsucker. April 10, 2013: BC MFLNRO noted mitigation for Critical Deer and Moose Winter Range will be in the Kamloops LRMP, although the information is specific to forestry activity and was not developed for linear developments. BC MFLNRO also provides feedback on sharp-tailed grouse and snake den surveys, and notes that these can be completed by the last week of April. April 25, 2013: BC MFLNRO provides additional information related to models for flammulated owl, Lewis' woodpecker and Williamson's sapsucker. |
| | Email | May 13, 2013 | Request for information on known locations important to amphibians (e.g., Oregon spotted frog, western toad, spadefoot toad and Pacific giant salamander). | May 27, 2013: BC MFLNRO elaborates and provides additional information on the flammulated owl, Lewis' woodpecker and Williamson's sapsucker. Also provides known occurrences of spadefoot toad, western toad, Oregon spotted frog and coastal tailed frog within 2 km on either side of the existing TMPL right-of-way, and notes that this inventory is not complete and some ponds/wetlands may not have been surveyed. |
| John Surgenor, Wildlife Biologist | Email | August 16, 2013 | Provide a description of RSA and LSA boundaries; maps showing proposed grizzly bear and caribou RSA; and an updated wildlife indicator list for review and feedback. | --- |
| | Email | September 11, 2013 | Provide draft moose habitat model for review. | September 25, 2013: BC MFLNRO provides feedback on the draft moose habitat model. |
| | Email | September 24, 2013 | Provide draft mitigation table for review and discussion. Also send Table of provincially identified wildlife areas that the proposed pipeline corridor crosses to confirm the information is correct (i.e., specifically the Critical Deer and Moose Winter Range referenced in the Kamloops LRMP). | September 24, 2013: BC MFLNRO responds that deer are dispersed along the proposed pipeline corridor (including the UWR u-3-003 for mule deer) early in the season and are more concentrated at the lower elevation as snow depth increases. Given the nature of pipeline work and its location largely following the existing TMPL right-of-way, the risk to mule deer is low and would not require a construction timing window. risk of predation on moose from wolves. |
| | See above | See above | See above | Avoiding and minimizing disturbance to moose winter habitat (e.g., riparian areas, shrub willow complexes, wetlands) is important, as well as restoring disturbed areas to original shrub productivity and minimizing or reducing road/trail access. The riparian area along the North Thompson is important moose habitat. Construction in this area in the winter may increase the |
| | Telephone | October 1, 2013 | Review mitigation measures for the following: Wells Gray Caribou Range and UWR u-3-004 (for mountain caribou); Groundhog Caribou Range; UWR for Mule Deer (u-3-003); and WHA for Williamson's Sapsucker (3-143). | October 1, 2013: BC MFLNRO provides the following information: occurrences of Williamson's Sapsucker, and <i>Appendix 10: Objectives and Considerations for Managing Mountain Caribou Developed by the Kamloops LRMP Mountain Caribou Subcommittee (February 15, 2006)</i> |
| | | | | |

TABLE 2.2.1 Cont'd

| Name and Title of Contact | Method of Contact | Date of Consultation Activity | Reason For Engagement and Issues/Concerns | Commitments/Follow-up Actions/Comments |
|---|-------------------|--|--|---|
| John Surgenor, Wildlife Biologist (cont'd) | Telephone | October 4, 2013 | Discuss with BC MFLNRO that the Critical Deer and Moose Winter Range referenced in the Kamloops LRMP has been repealed. Request if there is more current information. | --- |
| | Email | October 7, 2013 | Provide map that shows Williamson's Sapsucker nests in relation to the proposed Kingsvale transmission line and WHA 3-143. | --- |
| | Email | November 4, 2013 | Provide a list of follow-up items and questions (<i>i.e.</i> , Critical Deer and Moose Winter Range; Williamson's Sapsucker nests; guidance documents for mountain caribou; referencing of data, etc). | November 8, 2013: BC MFLNRO provides guidance on referencing/confidentiality of data; notes that an exemption is still required even if a nest is not active in WHA 3-143 for Williamson's Sapsucker. |
| | Telephone | November 15, 2013 | Request additional information related to activity within caribou range, specifically UWR (u-3-004) for mountain caribou and potential Project effects. BC MFLNRO re-emphasizes that despite the relatively low value of the habitat within the proposed corridor for caribou (due to its low elevation location and existing disturbances), the concern is improving habitat conditions for moose forage and for wolves (prey availability, ease of travel). | --- |
| BC MFLNRO: South Coast Region, Surrey | | | | |
| Scott Barrett, Resource Stewardship Manager Sylvia Letay, Ecosystem Officer | Email/Telephone | July 4, 2012 | Provide introduction to the Project and a preliminary list of wildlife indicators and background information on indicator selection. Request a meeting to discuss the following: <ul style="list-style-type: none"> • habitats of concern in proximity to the proposed route in your region (<i>e.g.</i>, protected areas, sensitive habitat features, etc.); • a review of preliminary wildlife indicators to be used in the environmental assessment; • available data that would be useful in supporting a thorough examination of potential effects on wildlife in the region; • recommended field protocols, particularly any that may differ from the RISC standard protocols; | August 10, 2012: no response from BC MFLNO, therefore, sent email to Daniel Hirner (BC MFLNRO in Surrey) to request clarification on who will be the Regional contact for this Project. J. Hirner (Conservation Specialist) responds to clarify that Scott Barrett will be the Regional contact for the South Coast Region. |
| Scott Barrett, Resource Stewardship Manager Sylvia Letay, Ecosystem Officer (cont'd) | See above | See above | <ul style="list-style-type: none"> • recent habitat models that have been developed and validated for species of interest in the region; • recommended individuals or groups for further consultation; and • any other concerns or questions. | See above. |
| Scott Barrett, Resource Stewardship Manager | Email | February 27, 2013 May 23, 2013 July 31, 2013 October 16, 2013 | Provide shape-file of the proposed pipeline corridor as it is updated. | --- |

TABLE 2.2.1 Cont'd

| Name and Title of Contact | Method of Contact | Date of Consultation Activity | Reason For Engagement and Issues/Concerns | Commitments/Follow-up Actions/Comments |
|--|-----------------------|--|--|--|
| Scott Barrett, Resource Stewardship Manager (cont'd) | Email | March 1, 2013 | Provide preliminary wildlife indicator list for review and feedback. | April 2, 2013: BC MFLNRO noted they did not have additional comments on the wildlife indicators at this time. Noted that the proposed corridor passes through the Sowaqua Spotted Owl WHA which is a Long-Term Owl Habitat Area (LTOHA) which provides the highest level of protection afforded for Spotted Owls. This will require a WHA exemption and appropriate mitigation/off-set. It was also noted that the proposed corridor appears to pass through the Mountain View Conservation Centre (owl captive breeding facility in Langley). |
| Scott Barrett, Resource Stewardship Manager Ian Blackburn, Spotted Owl Recovery Coordinator | Meeting in Surrey, BC | April 16, 2013 | Discuss spotted owl surveys and offset required for working in WHA; preliminary wildlife indicators; proposed field program and protocols; initial concerns related to proposed corridor. | --- |
| | Meeting in Surrey, BC | May 28, 2013 | Discuss spotted owl survey protocols in detail with Mr. Blackburn including timing and locations. Discuss species of concern in the Region, wildlife indicators, potential surveys and mitigation. | May 28, 2013 and June 3, 2013: BC MFLNRO provides references discussed at the meeting on May 28, 2013. |
| Scott Barrett, Resource Stewardship Manager Josh Malt, Ecosystem Biologist | Email | July 15, 2013 | Request for existing information on coastal tailed frog model. Provided a list of information that was available and in the absence of further information, the suggested approach to construct a habitat suitability model. | --- |
| Ian Blackburn, Spotted Owl Recovery Coordinator | Email | July 31, 2013 | Provide a draft spotted owl habitat model (Draft Species Account/Model Assumptions/TEM ratings) for review. | --- |
| Scott Barrett, Resource Stewardship Manager | Email | August 16, 2013 | Provide a description of RSA and LSA boundaries; maps showing proposed grizzly bear and caribou RSA; and an updated list of wildlife indicators for review and feedback. | --- |
| Scott Barrett, Resource Stewardship Manager Josh Malt, Ecosystem Biologist | Email | August 28, 2013 | Provide a preliminary draft of coastal tailed frog model and request feedback. | --- |
| Scott Barrett, Resource Stewardship Manager | | September 17, 2013 September 19, 2013 September 22, 2013 | Request to discuss mitigation, including measures for UWR for mule deer and black-tailed deer (u-2-006). | September 19, 2013: BC MFLNRO responds they would like to discuss, however, want a better understanding of the Project timeline and regulatory context. September 19 and 22, 2013: Provide BC MFLNRO with the NEB filing guidelines and the NEB contact for the Project if they want to contact. |
| | Email | October 14, 2013 | Request a discussion or meeting to follow-up on the following items: feedback on study area boundaries; comments on coastal tailed frog model; mitigation measures; other concerns. | October 25, 2013: BC MFLNRO provides an email with an example of key components of an environmental assessment. A telephone call is scheduled for October 28, 2013 to discuss the Project approach and any other concerns prior to completion of the Application. |

TABLE 2.2.1 Cont'd

| Name and Title of Contact | Method of Contact | Date of Consultation Activity | Reason For Engagement and Issues/Concerns | Commitments/Follow-up Actions/Comments |
|--|-------------------|--------------------------------------|--|--|
| Scott Barrett, Resource Stewardship Manager Ian Blackburn, Spotted Owl Recovery Coordinator | Email | October 23, 2013 | Provide the results of the spotted owl survey conducted for the Project. Reminder for comments or feedback on draft spotted owl model sent on July 31, 2013. | --- |
| Scott Barrett, Resource Stewardship Manager | Telephone | October 28, 2013 | Discuss WHA and UWR crossed by the proposed pipeline corridor, the regulatory process and timelines for the Project. | November 2, 2011: provide a very preliminary schedule to BC MFLNRO on the Project schedule (e.g., submission of application to the NEB; Information Requests; Hearing). |
| Other | | | | |
| Jared Hobbs, HEMMERA | Email | August 7, 2012 | Request information on existing knowledge of reptiles along the proposed pipeline corridor including specific concerns, known features (e.g., hibernacula, rock outcrops), and recommendations on survey locations, methods and timing. | August 8, 2012: provides response on species of concern, timing and location of surveys and existing information. |
| Mike Sarell, Ophiuchus Consulting | Email | August 7, 2012 | Request information on existing knowledge of reptiles along the proposed pipeline corridor including specific concerns known features (e.g., hibernacula, rock outcrops), and recommendations on survey locations, methods and timing. | August 8, 2012: provides response on timing and location of surveys and existing information. |
| Denis Knopp, BC's Wild Heritage Environmental | Email | August 7, 2012 September 14, 2012 | Request information on existing knowledge of pacific giant salamander along the proposed pipeline corridor and recommendations on survey locations, methods and timing. | August 8, 2012: provides feedback on existing information, species range and locations for surveys. |
| Monica Pearson, Balance Ecological | Email | May 1, 2013 | Requested information related to Oregon Spotted frog and information on known occurrences. | May 1, 2013: response was that there are three known remnant sites on the north side of the Fraser River. Information is limited on the south side of the Fraser River. Any wetlands with potential to support Oregon spotted frog should be surveyed. |
| Dawn Brodie, Burrowing Owl Conservation Society | Email | October 4, 2013 | Request known release sites for captive-bred burrowing owls, as well as any other information related to presence of burrowing owl burrows in relation to the proposed Project. | --- |
| Stephen Godwin, Environmental Coordinator, City of Surrey, | Email | July 14, 2013 | Follow-up from a Community Workshop in Surry for the Project held on June 20, 2013. It was noted that Surrey Bend is being considered as critical habitat for pacific water shrew and a map may be available for review, as well as the presence of a wildlife habitat corridor. | July 15, 2013: Mr. Godwin suggested that Environment Canada be contacted in regards to pacific water shrew habitat. It was also noted that the City of Surrey is currently developing a Biodiversity Conservation Strategy (BCS) that will enable to the City manage biodiversity under the pressures of development. A draft map was provided that identifies a corridor near the proposed pipeline corridor. The mapping is considered draft and has not yet been approved by Council. |

TABLE 2.2.1 Cont'd

| Name and Title of Contact | Method of Contact | Date of Consultation Activity | Reason For Engagement and Issues/Concerns | Commitments/Follow-up Actions/Comments |
|---|---|--------------------------------------|---|---|
| Malcolm Weatherston, GM Mountainview Conservation and Breeding Centre Bob Puls, Chair of LEPS and Director of Langley Field Naturalists Ian Blackburn, Spotted Owl Recovery Coordinator | Meeting at Mountainview Conservation and Breeding Centre, Langley, BC | July 29, 2013 | Tour of the Mountain View Conservation and Breeding Centre and review the proposed pipeline corridor in this area. Discuss preferred scheduling for activity to provide the least disturbance to animals (particularly spotted owl) at this facility. Discuss existing information collected by Langley Field Naturalists on this property. | --- |
| Bill Tinge, Foothills Research Institute Hinton, AB | Telephone | October 21, 2013 | In response to the September 17, 2013 recommendation from AESRD, follow-up on the status of PNT 970253 (Habitat Management Area, Wildlife Study Plots). | --- |
| Elaine Bell, Shellburn Terminal Manager Burnaby, BC | Telephone | November 5, 2013 | Request information on the status of heron colony and active bald eagle nests on the Shell property. It was noted that the heron colony is not active and has not been active for approximately 3 to 4 years; and wasn't aware of any active bald eagle nests though they are commonly observed in the area. | --- |

3.0 METHODS

3.1 Project Interactions and Identification of Potential Effects

Pipeline and facility construction and operation activities have the potential to directly and indirectly affect wildlife resources through alteration of vegetation, terrain and drainage, causing changes in habitat availability and effectiveness, wildlife movement and wildlife mortality risk. These key issues are summarized below and discussed in further detail in Section 7.0 of Volume 5A.

Habitat availability is affected by construction and clearing both directly and indirectly. Clearing of the right-of-way and facility sites and other construction activities result in direct habitat loss. Indirect habitat loss may occur in areas immediately adjacent to the Project where wildlife species may avoid or reduce their use of areas in response to sensory disturbance, presence of a habitat edge, or increased fragmentation, changing overall habitat use patterns in the area. Alteration of habitat suitability can affect many species of wildlife, particularly those with small home ranges or site-specific habitat requirements (*i.e.* dens) within the affected area. Habitat loss and reduced habitat effectiveness can cause displacement of wildlife, potentially resulting in use of less suitable habitat, reduced foraging ability (Bird *et al.* 2004), increased energy expenditure (Jalkotzy *et al.* 1997) and lower reproductive success (Habib *et al.* 2007). The degree to which a species will be affected depends on the amount and the type of habitat loss and on the habitat use by the species/species group, as well as the size, mobility and home range/territory size of the species.

Movements by most species will be altered to avoid construction areas; however, some species may be drawn to these areas, either during active hours or after hours, by curiosity, machine oils and/or garbage. Typically, more substantial changes in movement patterns occur in areas where a new pipeline right-of-way is constructed along a route that does not parallel existing linear developments (*e.g.*, pipelines, seismic lines, power lines, roads, railways). In these areas, travel corridors, feeding sites and nesting sites could be lost, and individuals may adjust their movement patterns.

The level of mortality that may occur as a result of pipeline construction will depend on the timing of construction activities and on the species in question. Clearing during the breeding season has the potential to result in high levels of mortality for nesting birds. Grubbing and soil removal will result in mortality for small mammals, amphibians and reptiles that inhabit woody debris, litter and soil. In less frequent situations, collisions with construction vehicles may result in mortality for a wide range of species, including the more conspicuous ungulate and carnivore species.

3.2 Species with Special Conservation Status

Within the body of this report, species with special conservation status refer to those species listed federally (*i.e.*, by SARA Schedule 1 and COSEWIC), provincially in Alberta (*i.e.*, At Risk or May Be at Risk, or classified as Threatened or Endangered under Alberta's *Wildlife Act* or classified as Special Concern by the Endangered Species Conservation Committee [ESCC]) and provincially in BC (*i.e.*, Red and Blue-listed and listed by the BC *Wildlife Act*). Species status designations provided herein are current as of November 28, 2013. A list of wildlife species with special conservation status that have the potential to occur along the proposed pipeline corridor is provided in Appendix B. The tables include a complete listing of federal designations as listed by SARA (Environment Canada 2013a) and COSEWIC (2013), as well as provincial status designations. The tables are based on wildlife species identified as having the potential to occur in the Central Parkland, Central Mixedwood, Dry Mixedwood, Lower Foothills and Montane natural subregions of the Parkland, Boreal Forest, Foothills and Rocky Mountain natural regions in Alberta (Appendix B, Table B1) and the Bunchgrass, Coastal Western Hemlock, Engelmann Spruce-Subalpine Fir, Interior Cedar-Hemlock, Interior Douglas-Fir, Montane Spruce, Mountain Hemlock, Ponderosa Pine and Sub-Boreal Spruce biogeoclimatic zones in BC (Appendix B, Table B2). These tables were reviewed and further refined based on available information from the Project area, species range and species habitat requirements.

Environment Canada was consulted on the presence of critical habitat along the proposed pipeline corridor (Table 2.2.1) and provided Project-specific, hard-copy maps of critical habitat for species at risk in BC (Environment Canada 2013b). The information on critical habitat is provided in this report with permission from Environment Canada and is subject to change since critical habitat mapping is not final

until posted in a final recovery strategy on the Species at Risk Public Registry. Environment Canada makes no representation and gives no warranty of any kind with respect to the accuracy, usefulness, novelty, validity, scope, completeness or currency of the Canada Digital Data and expressly disclaims any implied warranty of merchantability or fitness for a particular purpose of the Canada Digital Data. The different categories/stages of critical habitat include:

- *Proposed* (transmitted): the recovery strategy has completed all stages of regional review and pre-registry consultation and the next step is to post on the Species at Risk Public Registry for a 60-day consultation as a proposed recovery strategy;
- *Candidate* (jurisdictional review): the recovery strategy has completed an internal review and has been partially vetted by BC and (if relevant) other SARA participating agencies; and
- *Early Candidate* (pre-review): an internal review has not been completed for the recovery strategy.

3.3 Assessment Indicators and Measurement Endpoints

Indicator species are commonly used to focus environmental assessments. Candidate wildlife indicators were selected to reflect known conservation, public and management concerns and the NEB *Filing Manual* requirements, and were refined through consultation with resource managers, species specialists, interested groups and individuals and engagement with potentially affected Aboriginal communities. A combination of indicators was selected to include:

- wildlife communities by habitat type (e.g., old-forest bird community, waterbirds);
- species groups (e.g., bats, forest furbearers);
- species at risk (e.g., woodland caribou, rusty blackbird); and
- species of management and/or social/cultural importance (e.g., moose, harlequin duck).

Selection criteria considered when identifying the indicators for wildlife and wildlife habitat included:

- potential Project interaction (i.e., species range and preferred habitat overlap with the proposed Project);
- special conservation status (i.e., species that require specific habitat features and can provide an indication of ecological change due to their sensitivity to habitat changes);
- representative of a wildlife community or species group due to similar habitat requirements, or species that are representative of predominant habitats within the spatial boundaries for the Project;
- human importance (e.g., commercial, subsistence, traditional, cultural value; social or political initiatives for active management and conservation);
- overlap with indicators selected for the Environmental Risk Assessment (spill scenarios) and marine components of the Project application;
- feedback received in consultation with regulatory authorities, local biologists and other stakeholders;
- availability of existing literature, baseline data, analysis tools and/or established or accepted thresholds by which to complete a meaningful quantitative and/or qualitative assessment; and
- practical limitations of data processing, limiting repetition (i.e., many species would have the same effects pathways and assessment conclusions as an indicator with similar habitat requirements, sensitivity, response to disturbance, etc.), and providing information that supports regulator evaluation and decisions regarding the Project.

The selection of indicators for the wildlife and wildlife habitat assessment allows for a focused evaluation of potential Project effects. The field studies and mitigation planning are designed to be inclusive of

species, communities and habitats that are not specifically addressed as an indicator. The indicator species for wildlife and wildlife habitat that were selected are summarized in Table 3.3.1.

The Wildlife Modelling and Species Accounts Technical Report of Volume 5C provides the approach and methods for the habitat models prepared for the Project.

TABLE 3.3.1

INDICATORS FOR WILDLIFE AND WILDLIFE HABITAT

| Wildlife Indicators | Rationale for Indicator Selection |
|--------------------------------|---|
| Grizzly bear | Potential for Project interaction; conservation status; management and cultural importance; environmental indicator (sensitive to disturbance). |
| Woodland caribou | Potential for Project interaction; conservation status; management and cultural importance; environmental indicator (sensitive to disturbance). |
| Moose | Potential for Project interaction; management and cultural importance. |
| Forest furbearers | Potential for Project interaction; several furbearer species (e.g., marten, fisher and wolverine) are of conservation, management and cultural importance; environmental indicator (sensitive to environmental change). |
| Coastal riparian small mammals | Potential for Project interaction; group includes species with conservation status of concern; environmental indicator (sensitive to change); indicative of potential effects on species relying on coastal riparian habitat. |
| Bats | Potential for Project interaction; group includes several species with conservation status of concern; environmental indicator (sensitive to change). |
| Grassland/ shrub-steppe birds | Potential for Project interaction; addresses the broader suite of bird species potentially affected in grassland/shrub-steppe habitats; represents an important habitat type affected by the Project (i.e., native grasslands in the southern interior region of BC); various species (at risk and common) are addressed. |
| Mature/old forest birds | Potential for Project interaction; addresses the broader suite of bird species potentially affected in mature/old forest habitats; represents an important habitat type affected by the Project; various species (at risk and common) are addressed. |
| Early seral forest birds | Potential for Project interaction; addresses the broader suite of bird species potentially affected in early seral forest habitats; represents an important habitat type affected by the Project; various species (at risk and common) are addressed. |
| Riparian and wetland birds | Potential for Project interaction; addresses the broader suite of riparian and wetland bird species potentially affected; represents important habitat types affected by the Project; various species (at risk and common) are addressed. |
| Wood warblers | Potential for Project interaction; addresses the community of bird species (in particular warblers) potentially affected in mature spruce-dominant and mixedwood forests along the corridor in Alberta; conservation/management concern in Alberta; environmental indicators (sensitive to disturbance). |
| Short-eared owl | Potential for Project interaction; conservation status; indicative of potential effects on species relying on open habitats in grassland and forested regions over the length of the proposed corridor. |
| Rusty blackbird | Potential for Project interaction (primarily in Alberta); conservation status; environmental indicator (sensitive to disturbance); indicative of potential effects on species relying on treed wetland and riparian habitats. |
| Flammulated owl | Potential for Project interaction; conservation status; environmental indicator (sensitive to disturbance); indicative of potential effects on species relying on Douglas-fir and ponderosa pine forest habitats in the southern interior region of BC. |
| Lewis's woodpecker | Potential for Project interaction; conservation status; environmental indicator (sensitive to disturbance); indicative of potential effects on species relying on ponderosa pine and deciduous forest habitats in the southern interior region of BC. |
| Williamson's sapsucker | Potential for Project interaction; conservation status; environmental indicator (sensitive to disturbance); indicative of potential effects on species relying on mixed deciduous Douglas-fir and ponderosa pine forest habitats in the southern interior region of BC. |
| Western screech-owl | Potential for Project interaction; conservation status; environmental indicator (sensitive to disturbance); indicative of potential effects on species relying on old/mature deciduous and mixedwood forest habitats in the interior and coastal regions of BC. |
| Great blue heron | Potential for Project interaction; conservation status; environmental indicator (sensitive to disturbance). |
| Spotted owl | Potential for Project interaction (proposed corridor intersects Wildlife Habitat Area); conservation status; high regulator/public profile and concern; environmental indicator (sensitive to disturbance). |
| Bald eagle | Potential for Project interaction; cultural importance. |
| Common nighthawk | Potential for Project interaction; conservation status; species of interest for regulatory authorities. |
| Northern goshawk | Potential for Project interaction; conservation concern; environmental indicator (sensitive to disturbance); indicative of potential effects on species relying on mature/old forest. |
| Olive-sided flycatcher | Potential for Project interaction; conservation status; indicative of potential effects on species relying on open forests with complex overstory characteristics, and species that use forest edges, openings and disturbed habitats. |
| Pond-dwelling amphibians | Potential for Project interaction; addresses the broader suite of pond-dwelling amphibian species potentially affected by the Project; represents an important habitat type affected by the Project; various species (at risk and common) are addressed; environmental indicator (sensitive to disturbance). |

TABLE 3.3.1 Cont'd

| Wildlife Indicators | Rationale for Indicator Selection |
|----------------------------|--|
| Stream-dwelling amphibians | Potential for Project interaction; addresses the broader suite of stream-dwelling amphibian species potentially affected by the Project; represents an important habitat type affected by the Project; various species (at risk and common) are addressed; environmental indicator (sensitive to disturbance). |
| Arid habitat snakes | Potential for Project interaction; addresses the broader suite of snake species potentially affected by the Project; conservation status; environmental indicator (sensitive to disturbance). |

3.4 Spatial Boundaries

The spatial boundaries considered for the assessment of wildlife and wildlife habitat include:

- Footprint Study area (as defined in Section 7.1.3 and Table 7.1-2 of Volume 5A);
- Wildlife LSA (Figures 3.4.1 to 3.4.4), defined generally as the area within a 1 km buffer of the centre of the proposed pipeline corridor and power lines, and within a 1 km buffer around the boundary of the proposed pump station and terminal facilities;
- Wildlife RSA (Figures 3.4.1 to 3.4.4), defined generally as the area within a 15 km buffer of the centre of the proposed pipeline corridor and power lines, and within a 15 km buffer around the boundary of the proposed pump station and terminal facilities;
- Grizzly Bear RSA (Figure 3.4.5), defined by the Grizzly Bear Population Units (GBPUs) traversed by the proposed pipeline corridor; and
- Caribou RSA (Figure 3.4.6), defined by the Wells Gray and Groundhog caribou ranges and associated mountain caribou UWR and WHA.

The study area boundaries were reviewed by federal and provincial regulatory authorities (see Table 2.2.1).

3.5 Existing Conditions

Existing conditions represent the current state of the environment as determined from the field surveys, available literature, Aboriginal Traditional Knowledge (ATK), consultation and spatial data. This report presents existing conditions for wildlife and wildlife habitat, which provides context and a reference point against which the potential changes from the Project and foreseeable future conditions can be compared and assessed.

3.6 Literature/Desktop Review

Several information sources were consulted prior to field work and used in the preparation of this report, including, but not limited to, the following:

- Fisheries and Wildlife Management Information System (FWMIS) wildlife occurrence records (AESRD 2013b);
- Alberta provincial wildlife mapping (AESRD 2013c);
- Alberta Environmentally Significant Areas (Alberta Tourism, Parks and Recreation [ATPR] 2009) and Parks and Protected Areas (ATPR 2012);
- previously completed survey data and information for the Alberta portion of the proposed Project;
- BC identified wildlife areas (e.g., caribou ranges, UWR, WHA) (BC MOE 2010, 2012b,c);
- BC Conservation Data Centre (BC CDC) element occurrence database (BC CDC 2012, 2013a);
- BC Parks and Protected Areas (BC MOE 2012d);

- BC Breeding Bird Atlas (Bird Studies Canada 2012);
- previously completed survey data and information for the BC portion of the proposed Project; and
- Important Bird Areas (Bird Studies Canada and Nature Canada 2012), Migratory Bird Sanctuaries (Environment Canada 2012a,b), National Wildlife Areas (Environment Canada 2012a,b), Western Hemisphere Shorebird Reserves (Western Hemisphere Shorebird Reserve Network [WHSRN] 2012), Ramsar wetlands (Bureau of the Convention on Wetlands 2012) and World Biosphere Reserves (United Nations Educational, Scientific and Cultural Organization [UNESCO] 2012).

Consultation with federal and provincial regulatory authorities and species specialists, local biologists, and Aboriginal communities was also completed. Information received from consultation has been incorporated into this report. Other studies conducted for the Project that provided useful information on the biophysical environment encountered by the Project were also reviewed and relevant information has been incorporated. These included the following presented in Volume 5C ESA – Biophysical Technical Reports:

- Wetland Evaluation Technical Report;
- Fisheries (Alberta) Technical Report;
- Fisheries (British Columbia) Technical Report;
- Vegetation Technical Report; and
- Wildlife Modeling and Species Accounts Technical Report.

Terrestrial Ecosystem Mapping (TEM) was also completed for the Project to describe the diversity, relative abundance and distribution of vegetation communities and structural stages for lands where vegetation may be affected by the Project. A separate report, TEM Methods and Results, can be found as an Appendix to the Vegetation Technical Report in Volume 5C.

The biophysical disciplines worked collaboratively to share information. Available ATK related to wildlife, including, but not limited to, species of traditional importance, wildlife presence, wildlife signs and important habitats, traditional hunting and trapping techniques, and wildlife movement and migration has also been incorporated into this report.

3.6.1 *Aboriginal Traditional Knowledge*

ATK is typically documented as a means to “preserve” historical and familial connections, territorial occupation, land and resource use, and temporal execution strategies. ATK includes, but is not limited to, the collection of TEK during biophysical field survey participation for the Project and Traditional Land Use (TLU) study information from potentially affected Aboriginal communities. Prior to TEK field data collection, preliminary background ATK data was compiled. The following sources were used:

- publicly available ATK, TEK and TLU reports;
- open houses and community gatherings;
- meetings and conversations with Aboriginal community representatives;
- public record of comparable past projects or previous environmental assessments;
- published reports from regulatory authorities involved in administering or regulating a specified area or resource (e.g., integrated resource plans, land and resource management plans, etc); and
- Geographical Information System (GIS) tools to determine spatial relationships of source data to the Project.

The preliminary background ATK data was verified and augmented as a result of the TEK field data collection.

3.7 Field Data Collection

Wildlife field studies were focused at the Wildlife LSA scale and were conducted to collect information on wildlife distribution and habitat use within the Wildlife LSA. Provincial protocols were used, where available and relevant, to design the field program and the methods used. Consultation was completed with federal and provincial regulatory authorities to discuss and receive input on the methods proposed prior to the field work being undertaken (see Table 2.2.1). Field surveys were focused on the new pipeline segments (*i.e.*, did not include the segments to be reactivated between Hinton to Hargreaves and Darfield to Black Pines), as well as new facilities or existing facilities that required clearing of native vegetation. The results are presented by pipeline segment (*e.g.*, Edmonton to Hinton, Hargreaves to Darfield, Black Pines to Hope and Hope to Westridge), as well as Natural Region in Alberta and either Ecoprovince or Ecosection in BC (Table 3.7.1 and Figure 3.7.1). The field surveys are discussed below in more detail. All wildlife observations, evidence of wildlife use and wildlife habitat features were documented during the field surveys and their location recorded (*i.e.*, field data sheets, UTM's taken with a hand-held GPS and photographs for record-keeping).

For the purpose of the application, a 150 m wide proposed pipeline corridor was studied. For ease of description, the proposed pipeline corridor will use Reference Kilometres (RKs): Edmonton to Hinton (RK 0.0 to RK 339.4); Hargreaves to Darfield (RK 489.6 to RK 769.0); Black Pines to Hope (RK 811.9 to RK 1043.7); Hope to Burnaby (RK 1043.7 to RK 1179.8) and Burnaby to Westridge (RK 0.0 to RK 3.6).

TABLE 3.7.1

**NATURAL REGION OR ECOPROVINCE AND ECOSECTION
CROSSED BY THE PROPOSED PIPELINE CORRIDOR**

| Pipeline Segment | Natural Region (AB) or Ecoprovince (BC) | Ecosection (BC) | Length (km) ¹ |
|------------------------|---|-----------------------------|--------------------------|
| Edmonton to Hinton | Parkland | -- | 68.8 |
| | Boreal Forest | -- | 79.6 |
| | | -- | 21.5 |
| | Foothills | -- | 146.8 |
| | Rocky Mountain | -- | 22.7 |
| | Segment Total | | 339.4 |
| Hargreaves to Darfield | Southern Interior Mountains | Northern Park Ranges | 16.0 |
| | | Upper Fraser Trench | 31.5 |
| | | Cariboo Mountains | 71.6 |
| | | Northern Shuswap Highlands | 108.0 |
| | Southern Interior | Northern Thompson Upland | 52.3 |
| | Segment Total | | 279.4 |
| Black Pines to Hope | Southern Interior | Thompson Basin | 53.1 |
| | | Guichon Upland | 25.9 |
| | | Nicola Basin | 80.8 |
| | | Hozameen Range | 27.9 |
| | Coast and Mountains | Eastern Pacific Ranges | 44.1 |
| | Segment Total | | 231.8 |
| Hope to Westridge (BC) | Coast and Mountains | Eastern Pacific Ranges | 32.5 |
| | | Northwestern Cascade Ranges | 2.1 |
| | Georgia Depression | Fraser Lowland | 105.5 |
| | Segment Total | | 139.7 |

Note: All lengths are approximate.

3.7.1 General Aerial Reconnaissance and Wildlife Feature Review

Aerial reconnaissance overflights were conducted to review and collect general information on land use, vegetation cover, suitability of ground survey sites, type and location of access to ground survey sites, areas that merited more detailed investigation, and identification of wildlife features (*e.g.*, stick nests,

mineral licks, rocky outcrops and cliffs, wetlands). An overflight specific to the review of wetlands was completed from August 19 to 20, 2012 and from September 23 to 24, 2012. Aerial reconnaissance overflights along the length of the proposed pipeline corridor were conducted from April 1 to 4, 2013 (BC segment) and from May 8 to 9, 2013 (Alberta segment).

3.7.2 Winter Track Survey

Winter track surveys were used to collect information on the presence, distribution, relative abundance, and habitat associations of mammals and upland bird species in the Project area. The protocols used for the winter track surveys were adapted from those outlined in the *Inventory Methods for Medium-Sized Territorial Carnivores: Coyote, Red Fox, Lynx, Bobcat, Wolverine, Fisher & Badger* (BC Ministry of Environment, Lands and Parks [BC MELP] 1999a), *Inventory Methods for Marten and Weasel* (BC MELP 1998a), and *Ground-Based Inventory Methods for Ungulates Snow-Track Surveys* (D'Eon *et al.* 2006). Ground transects were located in the Wildlife LSA. A 1.5 km (500 m x 3 sides) triangular transect design, adapted from the Finnish track transect method (Linden *et al.* 1996) was used.

The locations of the transects were selected prior to field work using a review of 1:20,000 base maps and aerial imagery. Disturbed areas and potential wildlife movement corridors were included and attempts were made to locate transects in homogeneous habitat types. Each transect was assigned an alternate transect location in the event the preferred location was not considered suitable based on field conditions (e.g., no access, high avalanche risk, recently cleared or altered). The locations of both the preferred and alternate transects were provided to provincial regulatory authorities for review prior to commencement of field work. In Alberta, AESRD suggested that winter track transects be located in the PNTs crossed by the proposed pipeline corridor that are important as ungulate winter range (Hobson pers. comm.). The portion of the proposed pipeline corridor within the Parkland Natural Region is located within previously disturbed areas (e.g., urban, agricultural) and, therefore, winter track surveys were not completed. BC MFLNRO (Omineca Region), suggested a transect in the area of Cranberry Marsh and the Crown land to the west (Hoekstra pers. comm.). Survey locations along the Hargreaves to Darfield Segment were limited by land access and survey locations along the southern portion of the Black Pines to Hope Segment was surveyed by aerial overflight, rather than winter track transects, because of the high avalanche risk throughout the Coquihalla Valley.

Winter track surveys were completed from January 12 to March 11, 2013 and 45 transects (10 in Alberta and 35 in BC) were completed (Table 3.7.2). The surveys were completed between 12 hours and 8 days following a major snowfall event (*i.e.*, complete ground cover and obliteration of previous wildlife tracks) to allow for accumulation and accurate identification of tracks. Professional judgment was used to determine if conditions were suitable to complete winter tracking at the extremes of this time range. Locations of winter track transects were limited by avalanche risk and land access. No transects were completed along the Hope to Westridge Segment or within the Coast and Mountains Ecoprovince along the Black Pines to Hope Segment due to insufficient snowfall in these areas.

TABLE 3.7.2

**WINTER TRACK TRANSECTS BY PIPELINE SEGMENT
AND NATURAL REGION OR ECOPROVINCE**

| Pipeline Segment | Natural Region (Alberta) or Ecoprovince (BC) | Number of Transects | Distance Surveyed (km) |
|------------------------|--|---------------------|------------------------|
| Edmonton to Hinton | Parkland ¹ | 0 | 0.0 |
| | Boreal Forest | 2 | 2.9 |
| | Foothills | 7 | 10.5 |
| | Rocky Mountain | 1 | 1.5 |
| Hargreaves to Darfield | Southern Interior Mountains | 20 | 29.9 |
| | Southern Interior | 14 | 1.5 |
| Black Pines to Hope | Southern Interior | 1 | 20.1 |
| | Coast and Mountains ² | 0 | 0.0 |
| Hope to Westridge | Coast and Mountains ² | 0 | 0.0 |
| | Georgia Depression ² | 0 | 0.0 |
| Total | | 45 | 66.4 |

TABLE 3.7.2 Cont'd

- Notes:**
- 1 No transects were completed within the Parkland Natural Region since the proposed pipeline corridor is located in previously disturbed areas (e.g., urban, agricultural).
 - 2 No transects were completed within the Coast and Mountains or Georgia Depression ecoprovinces due to limited snowfall in these areas.

All wildlife tracks that either crossed the transect or were observed within 1 m of the transect mid-line were recorded. In the case where the exact number of individuals could not always be determined for hare and squirrel 'runs', track categories of five tracks/hare run and three tracks/squirrel run were used in calculating track densities. Wildlife tracks were identified to species, where possible, or assigned to broader categories: deer (mule deer and white-tailed deer); upland game birds (spruce, ruffed, blue, sharp-tailed, white-tailed ptarmigan, willow ptarmigan and rock ptarmigan); fisher/marten (when unclear on distinguishing female fisher and male marten tracks); and weasel (weasels, mink and ermine).

Detailed habitat information was recorded every 50 m and included the abundance of cavity trees, snags, and arboreal lichen, canopy composition, structural information, amount of browse and amount of cover. Browse and cover were categorized as nil (0-5%), low (6-25%), moderate (26-50%), high (51-75%), or very high (>75%). Snow depths were recorded with a graduated probe (mean of 3 depths at each location) and snow condition (e.g., crust, powder) was noted every 100 m. Habitat features (e.g., stick nests) and incidental wildlife observations were recorded.

Track density was calculated for each species along each transect using the following formula (Thompson *et al.* 1989):

$$\text{Tracks/km/day} = \frac{\text{total \# of tracks}}{\sum[(\text{segment length in km}) \times (\text{days since last snow})]}$$

Species richness was calculated as the total number of species observed along each transect. Species diversity along each transect was calculated using the Shannon-Wiener Index (Shannon and Weaver 1963) as shown here:

$$H = -\sum[(n_i/N) \times \ln(n_i/N)]$$

Where:

n_i is the number of the i^{th} bird species observed; and

N is the total number of birds observed.

Mean track density, species richness and species diversity were then calculated for each pipeline segment and each Natural Region or Ecoprovince. Incidental information on the presence of all wildlife species and site-specific habitat features observed during the survey was recorded separately and included incidental observations en route to or from the survey locations.

3.7.3 Aerial Waterbird Survey

Aerial waterbird surveys were conducted to collect information on waterfowl richness, abundance and breeding pair density. Important migratory staging or stop-over locations, concentration areas and possible breeding wetlands were identified. Aerial survey protocols were modified from the presence/not detected helicopter survey protocols outlined in *Inventory Methods for Waterfowl and Allied Species: Loons, Grebes, Swans, Geese, Ducks, American Coot and Sandhill Crane* (BC MELP 1999b). For breeding season surveys, the Indicated Breeding Pairs (IBP) method was used to calculate breeding pair density. The IBP method follows the protocol outlined by the United States Fish and Wildlife Service and the Canadian Wildlife Service in *Standard Operating Procedures for Aerial Breeding Ground Population and Habitat Surveys in North America* (1987). Methods used for IBP surveys also conform to the *Inventory Methods for Waterfowl and Allied Species: Loons, Grebes, Swans, Geese, Ducks, American Coot and Sandhill Crane* (BC MELP 1999b). The IBP method identifies lone males, a male/female pair, a female with a brood of young, or a female on a nest as a pair and assumes that a female is associated with any lone males. Small groups of males (2-4) are also considered to represent breeding pairs, with one pair for each male in the group. The IBP method was modified in order to adequately survey the

proposed 987 km long pipeline corridor. Each waterbody encountered, in whole or in part, within 500 m on either side of the centre of the proposed pipeline corridor were surveyed for waterbirds. Waterbodies (e.g., open-water wetlands, lakes, streams and rivers) that extended beyond the 500 m buffer and were too large to survey adequately (e.g., Wabamun Lake, Starrat-Cranberry Marsh, Fraser River) were not included in the IBP analysis. Three aerial surveys were completed along the proposed pipeline corridor (Table 3.7.3).

TABLE 3.7.3

SCHEDULE OF AERIAL WATERBIRD SURVEYS

| Pipeline Segment | Fall 2012 | Spring 2013 | Fall 2013 |
|---------------------------------|------------------|---------------|-----------------|
| Edmonton to Hinton ¹ | September 27 | June 4 | September 24 |
| Hargreaves to Darfield | October 3 | June 21 | October 2 |
| Black Pines to Westridge | October 9 and 17 | May 23 and 24 | October 8 and 9 |

Note: 1 The 2012 fall staging survey included the proposed pipeline corridor from Edmonton to Edson, since this was the proposed scope at that time, while the 2013 surveys included the entire segment from Edmonton to Hinton.

The surveys were conducted using a Bell 206 Jet Ranger equipped with rear bubble windows. To ensure consistent survey effort, constant altitude and speed were maintained. All surveys were conducted in standardized weather conditions (wind ≤ 25 km/h, no precipitation, overcast sky if possible, water surface with no whitecaps) to minimize differences in sightability. A summary of the number of waterbodies with waterbird observations is provided in Table 3.7.4.

TABLE 3.7.4

NUMBER OF WATERBODIES WITH WATERBIRD OBSERVATIONS BY PIPELINE SEGMENT AND NATURAL REGION OR ECOPROVINCE

| Pipeline Segment | Natural Region (AB) or Ecoprovince (BC) | Total Waterbodies ¹ Surveyed | | |
|---------------------------------|---|---|-------------|-----------|
| | | Fall 2012 | Spring 2013 | Fall 2013 |
| Edmonton to Hinton ² | Parkland | 0 | 0 | 3 |
| | Boreal Forest | 3 | 43 | 6 |
| | Foothills | 2 | 37 | 3 |
| | Rocky Mountain | 0 | 1 | 0 |
| | Segment Total | 5 | 81 | 12 |
| Hargreaves to Darfield | Southern Interior Mountains | 7 | 20 | 10 |
| | Southern Interior | 1 | 7 | 2 |
| | Segment Total | 8 | 27 | 12 |
| Black Pines to Hope | Southern Interior | 9 | 43 | 17 |
| | Coast and Mountains | 1 | 4 | 2 |
| | Segment Total | 10 | 47 | 19 |
| Hope to Westridge | Coast and Mountains | 4 | 6 | 4 |
| | Georgia Depression | 11 | 21 | 18 |
| | Segment Total | 15 | 27 | 23 |
| Total | | 38 | 182 | 66 |

Notes: 1 Waterbodies includes open-water wetlands, lakes, streams and rivers.

2 The 2012 fall staging survey included the proposed pipeline corridor from Edmonton to Edson since this was the proposed scope at that time, while the 2013 surveys included the entire segment from Edmonton to Hinton.

All waterbirds observed were counted and identified to species, sex and age where possible (e.g., number of pairs, lone males, males in groups, females on nests, or females with broods). For fall surveys, (a time of transitional plumages), identification to species was often not possible. When identification to species was not possible, birds were recorded as belonging to a broader bird type (e.g., duck, swan, grebe). A waypoint was taken for each observation and habitat notes were recorded for each waterbody. For each flight path the following information was recorded: crew; location; date; weather conditions; start and end time; and average altitude. Habitat and wildlife observations were recorded, including the species, number, age class (e.g., adult, juvenile, unclassified) of detected

waterbirds, the number of unoccupied or occupied nests and habitat feature descriptions. Incidental information on the presence of all wildlife species and site-specific habitat features observed during the surveys was also recorded. Observations of waterbirds on wetlands >500 m from the centre of the proposed pipeline corridor were recorded as incidental observations, as were observations from ephemeral wetlands and agricultural ditches (Smith 1995). Waterbirds that were observed in flight and could not be associated with a waterbody were recorded as incidental observations.

The relative abundance, species richness and species diversity of waterbirds were determined by survey type (breeding or staging) for all waterbodies surveyed. Species richness was calculated as the total number of bird species observed per waterbody, with 1 being the lowest. Species diversity was calculated using the Shannon-Wiener Index (Shannon and Weaver 1963) as shown here:

$$H = -\sum[(n_i/N) \times \ln(n_i/N)]$$

Where:

n_i is the number of the i^{th} bird species observed; and

N is the total number of birds observed.

Species diversity accounts for the total number of species observed, as well as the relative abundances of each species. A high value represents an area with numerous individuals of multiple species and a low value represents an area with low abundance of only a few species. High values of only one or two species can negatively bias the overall value for species richness and a value of zero results when only one species is recorded in an area.

Mean species richness and species diversity were then calculated for each pipeline segment and each Natural Region or Ecoprovince.

The IBP method was used to estimate the number of breeding pairs observed at each waterbody. Observations that were not identified to species and sex were removed from the analysis. The number of breeding pairs per wetland was calculated as follows (Breault 2011).

$$\text{Breeding Pairs} = \text{pairs} + \frac{m_1 + 2m_2 + 3m_3 + 4m_4}{2} + f_n + \text{birds}_{\text{nest}}$$

Where:

pairs = number of pairs observed;

m_n = number of sighted all-male groups containing 1 to 4 members (each male in these groups is assumed to associate with a breeding female);

f_n = number of lone females or females with broods; and

$\text{birds}_{\text{nest}}$ = number of birds on nests.

The density of breeding waterbird species was then calculated as the total number of pairs observed divided by the total area in ha (waterbody) or total length in km (watercourse, including streams and rivers) surveyed. Mean IBP/ha was calculated for waterbodies of different sizes, based on the size classification outlined in Breault 2011, and for each pipeline segment. Watercourses were classified by stream order, wherein the order increases with the size and strength of the stream. First through third order streams are considered headwaters, fourth through sixth order streams are medium streams, and seventh to twelfth order streams are rivers (Briney 2013). Incidental information on the presence of all wildlife species and site-specific habitat features observed during the survey was recorded separately.

3.7.4 Sharp-Tailed Grouse Survey

Sharp-tailed grouse surveys were conducted to identify sharp-tailed grouse leks within the Wildlife LSA. Survey protocols were modified from those outlined in the *Sensitive Species Inventory Guidelines*

(AESRD 2013c) and *Upland Gamebirds: Grouse, Quail and Columbids* (BC MELP 1997). Surveys focussed on the *columbianus* ssp., which is Blue-listed in BC (BC CDC 2013b) and listed as Sensitive in Alberta (AESRD 2012a).

The location of survey stations was determined based on previous records of occurrence (AESRD 2013b, BC CDC 2012, 2013a), consultation, review of aerial imagery and professional knowledge to identify suitable habitat. The proposed pipeline corridor is located within a provincially identified sharp-tailed grouse range from RK 0.0 to RK 68.8 in Alberta. This area is highly developed (both urban and agricultural) and there are no Fisheries and Wildlife Management Information System (FWMIS) records of sharp-tailed grouse leks along the proposed pipeline corridor (AESRD 2013b). In BC, the proposed pipeline corridor is located within the range of sharp-tailed grouse near Kamloops. Survey timing, methods and specific locations, as well as existing information on sharp-tailed grouse lek sites were discussed with BC Ministry of Forests, Lands and Natural Resource Operations (BC MFLNRO) (Thompson/Okanagan Region) (Reudink pers. comm.). As a result, sharp-tailed grouse surveys were conducted in targeted locations where land access was in place.

Surveys in BC were completed from April 27 to 28, 2013 during the breeding season when male birds gather and display at lek sites. Surveys extended from approximately half an hour before sunrise to two hours after sunrise. Survey locations were approximately 800 m apart and each survey was 2 to 4 km in length. Observers remained at each station for approximately three minutes, listening for sounds of displaying males. Locations of known lek sites within 500 m of the proposed pipeline corridor were checked for activity.

The total number of birds detected on each lek was recorded, including the number of each sex when possible. The location of each lek was recorded using a handheld GPS. Surveys were conducted during suitable weather conditions (wind <20 km/h, temperature close to seasonal average, minimal precipitation, and limited noise) to get the most accurate results. Additional information recorded at each station included the date, time, weather conditions, GPS location, and habitat description and features. Incidental information on the presence of all wildlife species and site-specific habitat features observed during the survey was recorded separately and included incidental observations en pipeline to or from the survey locations.

3.7.5 Snake Survey

Snake surveys were conducted in BC to target previously unsurveyed core habitat of the western rattlesnake bordering Lac du Bois Grasslands Protected Area. The survey focused on determining the presence and distribution of snakes in relation to the proposed pipeline corridor by identifying potential denning locations of western rattlesnake, observing the distribution and habitat use of western rattlesnake, and identifying the presence of other snake species. Survey protocols were modified from those outlined in *Inventory Methods for Snakes* (BC MELP 1998b) and the *Den Survey and Population Assessment of Northern Pacific Rattlesnake in BC – Final Report* (Hobbs 2013). Survey timing, methods and specific locations, as well as existing information on known snake dens were discussed with BC MFLNRO (Reudink pers. comm.) and biologists with knowledge of this species (Hobbs, Sarrell pers. comm.).

Surveys were completed from April 26 to 28, 2013 along the targeted segment near Lac du Bois Grasslands Protected Area during the period when snakes were most likely to emerge from the hibernacula and engage in pre-migration basking behaviour at the den entrance. It was confirmed that snake den surveys could be completed until the end of April (Reudink pers. comm.). Surveys were weather dependent and occurred on warm days with no precipitation. The survey area was traversed on foot and potential hibernacula sites were identified based on the following criteria: rock outcrops and cliffs with fracturing and associated with talus or vegetation at the toe; rocks with sufficient mass to retain heat through the winter; and/or the presence of snakes, snake tracks, shed skin or faeces.

All potential and confirmed hibernacula were photographed, geo-referenced and described. The number and species of snakes present were also recorded, along with the date, start time and weather conditions. Incidental information on the presence of all wildlife species and site-specific habitat features observed during the survey was recorded separately and included incidental observations en route to or from the survey locations.

3.7.6 Breeding Bird Survey

Breeding bird surveys were used to collect information on the presence of breeding bird species (particularly songbirds) and information on bird species habitat use. Survey protocols were modified from the point count survey protocols outlined in the *Inventory Methods for Forest and Grassland Songbirds* (BC MELP 1999c) and the *Sensitive Species Inventory Guidelines* (AESRD 2013a).

Survey locations were selected to represent a variety of habitat types, maintain a minimum separation of 200 m between point count locations to avoid detection of individual birds in more than one count, and to maintain a minimum 100 m buffer from any habitat edge or transitional area (BC MELP 1999c). Additional survey locations were determined in the field and included select locations along the riparian areas of rivers, streams and other notable habitats and/or features. Survey locations were limited by land access along the Black Pines to Hope Segment, specifically RK 812 to RK 890 and RK 951 to RK 985. Survey locations were limited along the Hope to Westridge Segment since most of this area is urban development.

The breeding bird surveys were conducted from May 28 to July 9, 2013. Survey timing was acceptable to provincial regulatory authorities (Reudink, Hobson pers. comm.). Observers positioned themselves at a good vantage point to observe the surrounding habitat. A two minute quiet period was observed to allow for any disturbances in accessing the site to subside. Species observed during this time period were recorded as incidental observations. At each survey point, both acoustic and visual records of songbirds were recorded over a five minute period. Binoculars were used to observe species at a distance and to confirm identification. Birds observed by sight or sound within a 50 m radius of the observer were recorded. The approximate location, species, age, gender (where possible) and number of all birds detected were recorded at each point count station. Birds outside the 50 m radius, detected outside of the 5 minute survey period, fly-overs and fly-throughs were recorded as incidental. Surveys were completed between sunrise and 10:00 AM (AESRD 2013a).

Surveys were conducted during suitable weather conditions (wind <10 km/h, temperature >7 °C, minimal precipitation, and visibility >10 km) to get the most accurate results. Additional information recorded at each station included the date, time, weather conditions, noise level, GPS location, and description of the general habitat and any site-specific features. Incidental species (e.g. mammals and amphibians) were recorded separately, as were all incidental observations en route to or from the point count stations.

Point count surveys were located across four natural regions (Alberta) and eight ecosections (BC) (Table 3.7.5). The relative abundance, species richness and species diversity of breeding birds were determined for each point count location. Species richness was calculated as the maximum number of bird species observed at each point count location and species diversity was calculated using the Shannon-Wiener Index (Shannon and Weaver 1963) as shown here.

$$H = -\sum[(n_i/N) \times \ln(n_i/N)]$$

Where:

n_i is the number of the i^{th} bird species observed; and

N is the total number of birds observed.

Density of breeding territories was based on the number of individuals within 50 m of the point count survey location (an area of 0.785 ha). Birds heard or observed outside of the 50 m point count radius or the 5 minute time period and birds flying through or over the survey location were recorded as incidental observations. Mean species richness, species diversity and density were then calculated for each pipeline segment and each Natural Region or Ecosection.

TABLE 3.7.5

BREEDING BIRD SURVEY LOCATIONS BY NATURAL REGION AND ECOSECTION

| Pipeline Segment | Natural Region (AB) or Ecosection (BC) | Number of Point Counts |
|------------------------|--|------------------------|
| Edmonton to Hinton | Parkland | 3 |
| | Boreal Forest | 59 |
| | Foothills | 73 |
| | Rocky Mountain | 12 |
| | Segment Total | 147 |
| Hargreaves to Darfield | Northern Park Ranges | 10 |
| | Upper Fraser Trench | 13 |
| | Cariboo Mountains | 40 |
| | Northern Shuswap Highlands | 52 |
| | Northern Thompson Upland | 33 |
| | Segment Total | 148 |
| Black Pines to Hope | Nicola Basin | 10 |
| | Eastern Pacific Ranges | 5 |
| | Segment Total | 15 |
| Hope to Westridge | Eastern Pacific Ranges | 11 |
| | Fraser Lowland | 36 |
| | Segment Total | 47 |
| Total | | 357 |

3.7.7 Common Nighthawk and Short-Eared Owl Survey

Common nighthawk and short-eared owl surveys were used to collect information on the presence of these two species. Survey protocols were modified from the *Sensitive Species Inventory Guidelines* (AESRD 2013a), *Inventory Methods for Raptors* (BC Ministry of Sustainable Resource Management [MSRM] 2001) and *Inventory Methods for Nighthawk and Poorwill* (BC MELP 1998c).

Common nighthawk and short-eared owl survey locations were selected based on the presence of suitable habitat along the proposed pipeline corridor. Potentially suitable habitat (open areas with short grasslands, marshes, farmlands, forest clearings and human-altered habitats) was identified through a review of 1:20,000 aerial photos, information from aerial overflights, as well as during other wildlife survey work completed for the Project.

Surveys were completed on July 9, 2013 (Edmonton to Hinton Segment) and from June 14 to June 15, 2013 (Hargreaves to Darfield Segment). A total of 26 surveys were completed (5 surveys along the Edmonton to Hinton Segment and 21 surveys along the Hargreaves to Darfield Segment). Common nighthawk and short-eared owl surveys were conducted from approximately one hour before sunset to one half hour after sunset (approximately 9:00 PM to 10:30 PM). Each survey consisted of a three minute passive listening period for both species, followed by a three minute call playback for common nighthawk. No call playback was used for short-eared owl. The common nighthawk call playback consisted of a 30 second broadcasted call followed by a 30 second passive listening period. This sequence was repeated three times for a total of three minutes. A bearing and approximate distance were recorded for each common nighthawk or short-eared owl detected during the passive listening period and during the call playback period.

Surveys were conducted during suitable weather conditions (wind <20 km/h, temperature close to seasonal average, minimal precipitation and limited noise). Additional information recorded at each survey location included the date, start and end time, weather conditions, GPS location and description of the habitat and any site-specific features. Incidental species were recorded separately, as were all incidental observations en route to or from the survey locations.

3.7.8 Yellow Rail

Yellow rail surveys were conducted to determine the presence of yellow rail within the Wildlife LSA. Survey protocols were modified from those outlined in *Sensitive Species Inventory Guidelines* (AESRD 2013a), *Inventory Methods for Marsh Birds: Bitterns and Rails* (BC MELP 1998d) and *Canadian*

Wildlife Service Standardized Protocol for the Survey of Yellow Rails in the Prairie and Northern Region (Bazin and Baldwin 2007). The proposed pipeline corridor is located in the outer extent of yellow rail range in Alberta; therefore, survey locations were determined in the field in areas of suitable habitat. Three candidate sites were selected along the Edmonton to Hinton Segment. The proposed pipeline corridor does not cross the range of yellow rail in BC.

Surveys were completed on July 9, 2013 and occurred after nightfall when yellow rail are most active. Each survey consisted of a five minute passive listening period, followed by a three minute call playback period. The call playback consisted of a five second broadcasted call, followed by a five second passive listening period. The sequence was repeated 18 times for a total of three minutes. The call playback was followed by an additional two minute passive listening period.

The total number of birds detected at each site was recorded, including the number of each sex when possible. The location of each survey location was recorded using a handheld GPS. Additional information recorded at each location included the date, time, weather conditions, GPS location, and habitat description and features. Incidental species were recorded separately, as were all incidental observations en route to or from the survey locations.

3.7.9 Spotted Owl Survey

The proposed pipeline corridor crosses through the Sowaqua Spotted Owl WHA, which is classified as a Long-Term Owl Habitat Area (LTOHA). Spotted owl surveys were conducted based on the *Inventory Methods for Owl Surveys* (Hausleitner 2006), as well as consultation with the BC MFLNRO Spotted Owl Recovery Coordinator (Blackburn pers. comm.). The survey was completed by a qualified field crew that had knowledge of spotted owl calls and ecology, including the ability to distinguish spotted owl calls from those of barred owl and any hybridized “sparred” owls, as well as to identify the territorial calls of all other provincial owls with potential to occur in the area.

Initial detection call-playback surveys were conducted on the nights of June 13 and 14, June 24 and 25 and September 9 and 10, 2013. Two call-playback transects were selected during a pre-field planning phase and were based on known locations of spotted owls within the WHA and mapped suitable habitat for spotted owl. Inter-station distances for call-playback surveys was 500 m for driving transects and 250 to 300 m apart for walking stations to avoid detection of individuals at more than one station. Each call-playback station was a minimum of 15 minutes in duration for driving transects (surveyor was outside of vehicle, with vehicle turned off). For walking transects, surveyors spent at least 15 minutes of total search effort per 500 m. Transects of approximately 8 km were targeted, with a minimum of 17 sample stations. Time spent traversing from one station to the next was included as total search effort for walking stations. Both transects used a combination of walking and driving with Transect 1 having 14 driving stations and 3 walking stations, while Transect 2 had 10 driving and 7 walking stations. The survey crew recorded the total time spent at each survey location as total sample effort. Total survey effort was at least 13 hours for each transect.

Upon arrival at each survey station, with surveyors positioned 50 m apart to maximize listening capacity and area, a call was broadcast for approximately one minute, followed by four minutes of silence to listen for responses. The call was broadcast at least three times per survey station. The survey crew held the megaphone and audio device at chest height or higher and aimed the unit at various directions for each broadcast. Broadcasts were not distorted and were loud enough to be heard from one station to the next. The quality of the broadcasts was checked to ensure there were no distortions in the recordings. The surveys started approximately 30 minutes after sunset and ended 30 minutes prior to sunrise to coincide with the peak activity period of spotted owls.

To determine occupancy, the 4-note male location call was used. If no owl was detected, the survey crew recorded “Not Detected” on the field data form and moved to the next survey location. If a spotted owl was detected, the survey crew ceased broadcasting immediately and continued listening for subsequent calls from that individual (including juveniles or mates). The survey crew determined the direction of the calling owl from at least 2 listening positions within the survey, plotted the compass bearings on a map and used triangulation to estimate the owl's location. For non-target species owl detections, such as barred owl, surveyors ceased broadcasting immediately and determined the distance and direction of the calling owls. All detections were recorded on field data forms.

Surveys were conducted during suitable weather conditions (wind <20 km/h, temperature close to seasonal average, minimal precipitation, and limited noise) to get the most accurate results. Additional information recorded at each station included the date, time, weather conditions, noise level, GPS location, and description of the general habitat and any site-specific features. Incidental species were recorded separately, as were all incidental observations en route to or from the point count stations.

3.7.10 Amphibian Survey

3.7.10.1 Pond-Dwelling Amphibian Survey

Pond-dwelling amphibian surveys were used to collect information on the presence of amphibian species (by identifying egg masses, larvae and individuals), relative abundance, distribution and habitat associations of amphibian species. Pond-dwelling amphibian survey protocols were modified from the presence/not-detected survey protocols outlined in the *Sensitive Species Inventory Guidelines* (AESRD 2013a) and the *Inventory Methods for Pond-Breeding Amphibians and Painted Turtle* (BC MELP 1998e). Time-constrained searches are the most effective technique for determining presence/not detected of a species within a specific area (BC MELP 1998e). This technique also provides the number of individuals per unit of search effort and eliminates the bias of clustered populations. The time limit per site was set at two hours (e.g., two people searching for one hour).

The location of survey stations was determined based on previous records of occurrence (AESRD 2013b, BC CDC 2012, 2013a), consultation, review of aerial imagery and professional knowledge to identify suitable habitat. As noted in Section 3.7.1, an aerial overflight of the proposed pipeline corridor specific to the review of wetlands was completed from August 19 to 20, 2012 and from September 23 to 24, 2012. An amphibian specialist participated in this overflight to review locations suitable for amphibians and to help plan for the summer 2013 field program. The wetlands identified for surveys were selected to include a variety of habitats and wetland type (bog, fen, marsh, swamp, shallow pond, shallow margin of large waterbody), site access, previous records of occurrence (AESRD 2013a, BC CDC 2012, 2013a), consultation, review of aerial imagery and professional knowledge. Additional information on known locations for amphibians in the Thompson/Okanagan Region was provided by BC MFLNRO (Reudink pers. comm.), and local biologists were consulted for additional species specific information (Pearson pers. comm.). Survey locations were limited by land access along the Black Pines to Hope Segment, specifically RK 812 to RK 890 and RK 951 to RK 985. Survey locations were also limited along the Hope to Westridge Segment given the amount of urban development along this segment.

Pond-dwelling amphibian surveys were completed from June 20 to July 9, 2013 in Alberta and from May 22 to June 15, 2013 and from August 13 to 18, 2013 in BC. Surveys were completed at 159 locations (21 in Alberta and 138 in BC) (Table 3.7.6).

TABLE 3.7.6

**NUMBER OF WETLANDS SURVEYED FOR POND-DWELLING AMPHIBIANS
BY PIPELINE SEGMENT AND NATURAL REGION OR ECOSECTION**

| Pipeline Segment | Natural Region (AB) or Ecoregion (BC) | Total Wetlands Surveyed |
|------------------------|---------------------------------------|-------------------------|
| Edmonton to Hinton | Parkland | 1 |
| | Boreal Forest | 11 |
| | Foothills | 9 |
| | Rocky Mountain | 0 |
| | Segment Total | 21 |
| Hargreaves to Darfield | Northern Park Ranges | 1 |
| | Upper Fraser Trench | 4 |
| | Cariboo Mountains | 14 |
| | Northern Shuswap Highland | 38 |
| | Northern Thompson Upland | 22 |
| | Segment Total | 79 |

TABLE 3.7.6 Cont'd

| Pipeline Segment | Natural Region (AB) or Ecoregion (BC) | Total Wetlands Surveyed |
|---------------------|---------------------------------------|-------------------------|
| Black Pines to Hope | Thompson Basin | 11 |
| | Guichon Upland | 8 |
| | Nicola Basin | 10 |
| | Hozameen Range | 6 |
| | Eastern Pacific Ranges | 1 |
| | Segment Total | 36 |
| Hope to Westridge | Eastern Pacific Ranges | 0 |
| | Northwestern Cascade Ranges | 0 |
| | Fraser Lowland | 23 |
| | Segment Total | 23 |
| Total | | 159 |

Pond-dwelling amphibian surveys were conducted in the morning and early afternoon and consisted of circumnavigating the selected wetland and searching for all amphibian life stages. If the wetland was too large to be completely searched in one hour, then at least two 50 m transects were searched in representative areas of the wetland. In either case, the area searched and waypoints were recorded for each survey site or start and end points of each transect. The search included the shoreline and first 3 m of water, unless the water was shallow enough to include the entire wetland. Observers walked slowly and stopped every few minutes to conduct thorough searches, including scanning the water's surface, the pond bottom and any vegetation and debris for individual amphibians and egg masses.

Observed adults, juveniles, metamorphs (recently metamorphosed frogs and toads), tadpoles and egg masses (if still present) were identified to species and recorded. Additional information recorded at each site included the date, start and end time, weather conditions, and description of the microhabitat and any site-specific features. Incidental species were recorded separately, as were all incidental observations en route to or from the survey locations.

Exact numbers of each developmental stage could not always be determined; therefore, analysis was limited to determining species richness. Species richness was calculated as the total number of amphibian species observed at each surveyed wetland. Mean species richness was then calculated for each pipeline segment and Natural Region or Ecoregion.

3.7.10.2 Stream-Dwelling Amphibian Survey

Stream-dwelling amphibian surveys were used to collect information on the presence, relative abundance, distribution and habitat associations of stream-dwelling amphibians. Survey protocols were modified from the presence/not-detected survey protocols outlined in *Inventory Methods for Tailed Frogs and Pacific Giant Salamanders* (BC MELP 2000). Time-constrained searches are the most effective technique for determining presence/not detected of a species within a specific area (Dupuis *et al.* 2000). This technique also provides the number of individuals per unit of search effort and eliminates the bias of clustered populations. The time limit per site was set at one hour (e.g., two people searching for half an hour). In areas of high habitat quality, the one hour time limit was extended until a coastal tailed frog was observed.

Potential streams along the proposed pipeline corridor were identified through a review of 1:20,000 base maps and aerial photos, as well as professional knowledge, and were stratified into four classes (Good, Moderate, Poor, Unsuitable) based on habitat potential for coastal tailed frogs and pacific giant salamanders. Surveys focussed on streams classified as Good, which were characterized by narrow width, moderate gradient and step-wise morphology.

Coastal tailed frog surveys were completed from July 23 to August 15, 2013. Surveys were completed within the expected range of species occurrence based on range maps, existing information and professional knowledge. A total of 104 sites were visited, of which 16 sites were dry and 15 sites had no evidence of a stream. At 14 sites, a formal survey was not completed due to the lack of suitable habitat

including a combination of low flow, low gradient, no rock substrate, high silt and subsurface flow. Overall, 59 surveys were completed (Table 3.7.7).

TABLE 3.7.7

**NUMBER OF STREAMS SURVEYED FOR COASTAL TAILED FROG
BY PIPELINE SEGMENT AND ECOSECTION**

| Pipeline Segment | Ecosection | Total Streams Surveyed |
|---------------------|-----------------------------|------------------------|
| Black Pines to Hope | Nicola Basin | 1 |
| | Hozameen Range | 9 |
| | Eastern Pacific Ranges | 37 |
| | Segment Total | 47 |
| Hope to Westridge | Northwestern Cascade Ranges | 2 |
| | Eastern Pacific Ranges | 8 |
| | Fraser Lowland | 2 |
| | Segment Total | 12 |
| Total | | 59 |

Pacific giant salamander surveys were completed from July 23 to July 26, 2013. Survey locations were based on the species range, which extends west from approximately RK 1035 to RK 1107 along the proposed pipeline corridor, as well as consultation with biologists knowledgeable with this species (Knopp pers. comm.). A total of 25 sites were visited, 5 of which were not streams and 6 did not have suitable habitat. Overall, 14 surveys were completed (Table 3.7.8)

TABLE 3.7.8

**NUMBER OF STREAMS SURVEYED FOR PACIFIC GIANT SALAMANDER
BY PIPELINE SEGMENT AND ECOSECTION**

| Pipeline Segment | Ecosection | Total Streams Surveyed |
|-------------------|-----------------------------|------------------------|
| Hope to Westridge | Northwestern Cascade Ranges | 2 |
| | Eastern Pacific Ranges | 6 |
| | Fraser Lowland | 6 |
| Total | | 14 |

The surveys were conducted when stream flow was average and the maximum number of metamorphic phases was detectable. Surveys occurred during rainless periods to avoid extra runoff in streams and during the day when lighting was best to observe amphibians. Stratified streams were searched from downstream to upstream and stream banks were examined for individuals in the open. Cover objects, logs, and rocks were searched for tadpoles by sweeping with the hand to avoid destruction of important stream structure. Upon detection of an amphibian, the position, species, phase and location was recorded. Additional information recorded at each stream included the date, start and end time, weather conditions, and description of the microhabitat and any site-specific features. Incidental species were recorded separately, as were all incidental observations en route to or from the survey locations.

3.7.11 Wildlife Habitat Ratings Field Sampling

Wildlife habitat modelling methods are discussed in detail in the *Wildlife Modelling and Species Accounts Technical Report* (Volume 5C). TEM ecosystem units were rated in the field for the wildlife indicators modelled for the Project. Field sampling methods were adapted from the protocols outlined in the *Field Manual for Describing Terrestrial Ecosystems* (BC Ministry of Forests and Range and BC MOE 2010) and the *BC Wildlife Habitat Rating Standards* (BC MELP 1999d). The wildlife habitat ratings from the field sampling were used to evaluate the preliminary desktop habitat ratings for each TEM unit by providing field-based observations and a habitat suitability assessment (BC Ministry of Forests and Range and BC MOE 2010). Field sampling provided ground-truthing of the preliminary habitat ratings and a basis for revising the species-habitat models.

The method for selection of TEM survey sites is summarized in Appendix C of the Vegetation Technical Report in Volume 5C. Sites were selected to cover a wide range of TEM units found within the Wildlife LSA. Criteria for evaluating wildlife habitat ratings were developed prior to field surveys to aid observers and ensure consistency of field ratings.

All habitat ratings were completed out-of-context (*i.e.*, not relative to adjacent habitat or disturbance) to ensure that ratings could be applied to other TEM units of the same classification. Nearby disturbances were recorded and used to evaluate preliminary habitat ratings, which include adjustments for anthropogenic disturbances. During the field sampling, signs of wildlife use were recorded to support model evaluation and adjustments. Incidental species were recorded separately, as were all incidental observations en route to or from the survey locations.

3.7.12 ***Incidental Wildlife Observations***

Incidental wildlife observations include all wildlife observations recorded when travelling to and from or between survey locations, non-focal species observed during surveys (*e.g.*, waterbirds observed during pond-amphibian surveys), observations that occurred outside of the specified survey locations and/or time period (*e.g.*, birds observed outside of the 50 m radius during breeding bird surveys) and observations made by other disciplines conducting field work (*e.g.*, vegetation, wetlands, aquatics, archaeology). All incidental wildlife observations (visual/auditory) and sign (*e.g.*, tracks, scat/pellets, foraging), as well as habitat features (*e.g.*, stick nest), were recorded during field surveys. Where possible, information recorded for each observation included the date, time, species, number, age and sex, general habitat description and GPS location. Photographs were also taken where possible. Not all incidental observations were located within the Wildlife LSA. The results of ATK studies provided additional information on wildlife use and important wildlife features.

3.7.13 ***Collection of Traditional Ecological Knowledge***

TERA, on behalf of Trans Mountain, facilitated the participation of potentially affected Aboriginal communities during the wildlife field studies conducted for the Project. Opportunities for Project participation were made available to potentially affected Aboriginal communities that have an interest in the Project, based on their proximity to the Project and/or their assertion of traditional and cultural rights of the land. All Aboriginal communities potentially affected by the Project were invited to participate in the wildlife field studies conducted for the Project to allow for the collection of TEK.

3.7.13.1 ***Wildlife Field Work***

Engagement for the Project was initiated in the spring of 2012 and continued throughout 2013. The methods used to determine how participants were to be involved in Project field surveys were the same for all Aboriginal communities. Each field survey was discussed with the individual community, usually with staff from the community lands department. This discussion included details regarding the type, timing and locations of work to be conducted and, based on this information, each community chose which of their members would participate in each field survey. The participating Aboriginal communities are listed in Table 3.7.9 from east to west in relation to the Project.

TABLE 3.7.9

ABORIGINAL WILDLIFE FIELD SURVEY PARTICIPATION FOR THE PROJECT

| Aboriginal Community | Wildlife | Results Review Follow-up |
|-----------------------------------|--|-----------------------------|
| Edmonton to Hinton Segment | | |
| Saddle Lake Cree Nation | June 18 to 27, 2013 July 4 to 9, 2013 | November 28, 2013 |
| Enoch Cree Nation | March 5 to 10, 2013 | November 28, 2013 |
| Alexander First Nation | March 5 to 10, 2013 June 18 to 27, 2013 July 4 to 9, 2013 July 26 to August 1, 2013 | November 28, 2013 |

TABLE 3.7.9 Cont'd

| Aboriginal Community | Wildlife | Results Review Follow-up |
|---------------------------------------|--|--------------------------|
| Samson Cree Nation | September 28 to 29, 2012 March 5 to 10, 2013 June 18 to 27, 2013 | November 28, 2013 |
| Ermineskin Cree Nation | June 18 to 27, 2013 July 4 to 9, 2013 September 28 to 29, 2012 | October 31, 2013 |
| Montana First Nation | September 28 to 29, 2012 March 5 to 10, 2013 July 4 to 9, 2013 | November 28, 2013 |
| Louis Bull Tribe | July 4 to 9, 2013 | November 28, 2013 |
| Alexis Nakota Sioux First Nation | June 18 to 27, 2013 September 28 to 29, 2012 | November 28, 2013 |
| Paul First Nation | March 7 to 10, 2013 June 18 to 27, 2013 July 4 to 9, 2013 July 26 to August 1, 2013 | November 8, 2013 |
| Nakcowinewak Nation of Canada | March 5 to 10, 2013 June 18 to 27, 2013 | November 25, 2013 |
| Sunchild First Nation | September 28 to 29, 2012 March 5 to 10, 2013 June 18 to 27, 2013 | November 28, 2013 |
| Hargreaves to Darfield Segment | | |
| Lheidli T'enneh | June 3 to 14, 2013 | November 28, 2013 |
| Aseniwuche Winewak Nation | June 3 to 14, 2013 | November 28, 2013 |
| Simpcw First Nation | June 3 to 14, 2013 August 13 to 16, 2013 | N/A |
| Black Pines to Hope | | |
| Nicola Tribal Association | June 12 to 14, 2013 | November 28, 2013 |
| Hope to Burnaby | | |
| Yale First Nation | May 28 to June 7, 2013 June 13 to 14, 2013 June 28, 2013 July 28 to 31, 2013 September 9 to 10, 2013 | November 28, 2013 |
| Chawathil First Nation | May 28 to June 7, 2013 June 13, 2013 June 28, 2013 | November 28, 2013 |
| Shxw'ow'hamel First Nation | May 28 to June 7, 2013 July 23 to August 1, 2013 September 9 to 10, 2013 | November 28, 2013 |
| Seabird Island Band | September 9 to 10, 2013 | November 28, 2013 |
| Popkum First Nation | May 28 to June 7, 2013 July 23 to August 1, 2013 | November 28, 2013 |
| Scowlitz First Nation | May 23 to 28, 2013 | November 28, 2013 |
| Le'qa:mel First Nation | May 23 to 28, 2013 May 28 to June 7, 2013 July 23 to August 1, 2013 | November 8, 2013 |
| Kwantlen First Nation | May 23 to June 7, 2013 | November 28, 2013 |

A Band Counsel Resolution letter was received by Trans Mountain which delegated authority to the Nicola Tribal Association to act on behalf of Nooaitch Indian Band, Nicomen Indian and Shackan Indian Band for Project engagement. Simpcw First Nation field participants did not share TEK with TERA for the purpose of the Project; however, all field participants contributed to the discussion of potential Project-related effects on resources and participated in the discussion of potential mitigation measures to reduce potential Project-related effects.

The dates provided in Table 3.7.9 may not correspond to the dates noted elsewhere in this report since additional time was spent in the field with the Aboriginal participants for mobilization and demobilization to the field, pre-field work meetings and wrap-up meetings. The field crew consisted of wildlife specialists, Aboriginal participants and a TERA facilitator. Translators were available in the field upon the request of a community. TERA facilitators accompanied participants during the field surveys to identify potential effects of the Project on environmental resources, to explain potential construction techniques, to describe Project specifications, to document TEK and to ensure that proprietary information was kept in confidence.

During the field surveys, traditional methods of resource procurement were discussed, as well as modern methods currently employed. Seasonality of resource harvesting was also important information shared by the Aboriginal participants. Geographical locations were identified, as were areas that are not used and the reasons why. Potential mitigation measures to reduce any Project-related effects on a resource were also discussed during the wildlife field surveys. Open discussions occurred regularly between participants and wildlife specialists regarding the resources present and available to Aboriginal communities. These discussions were important to help build relationships among the field crews. Aboriginal participants spoke about aspects of the environment that were important to them, and the importance of the resource from a western science perspective was also discussed. The wildlife TEK collected during all biophysical field surveys for the Project has added results that western science may not have gathered or considered, confirmed results that had been collected through the field surveys, as well as identified and confirmed issues of concern to be addressed in Volume 5A. The TEK collected was also used to assist in the review of potential Project-related effects on wildlife and wildlife habitat.

3.7.13.2 Results Review/Reporting

Review of collected TEK and discussions of potential Project-related effects and mitigation strategies described in this report were conducted directly with participating community members during the field surveys. Confirmation of the accuracy of the information incorporated and approval of the inclusion of the confidential and proprietary information in Project planning occurred during community results review follow-up (Table 3.7.9). Information collected during the field surveys that relate primarily to traditional land and resource use or to other elements has been incorporated into the following reports with permission of the participating communities:

- Traditional Land and Resource Use Technical Report (Volume 5D);
- Socio-Economic Technical Report (Volume 5D);
- Community Health Technical Report (Volume 5D); and
- Screening Level Human Health Risk Assessment of Pipeline and Facilities (Volume 5D).

A detailed summary of Trans Mountain's engagement activities with each potentially affected Aboriginal community is provided in Volume 3B of the application.

4.0 RESULTS OF LITERATURE/DESKTOP REVIEW

4.1 Land Use and Environmental Setting

A general summary of the land use and environmental setting along the proposed pipeline corridor is provided in Table 4.1.1. The proposed pipeline corridor is divided into five segments for the wildlife assessment using applicable RKs. For additional clarity, legal locations and/or UTM coordinates of site-specific issues are included in tables and text throughout the report.

TABLE 4.1.1

GENERAL LAND USE AND ENVIRONMENTAL SETTING

| Setting Information | Edmonton to Hinton | Hargreaves to Darfield | Black Pines to Hope | Hope to Burnaby | Burnaby to Westridge |
|---|---|--|---|--|--|
| RK Range | 0.0 to 339.4 | 489.6 to 769.0 | 811.9 to 1043.7 | 1043.7 to 1179.8 | 0.0 to 3.6 |
| Legal Location | 4-5-53-23 W4M to 14-33-49-26 W5M | b-20-B/83-E-3 to d-75-B/92-P-8 | d-41-K/92-I-16 to c-44-E/92-H-06 | c-44-E/92-H-06 to a-25-D/92-G-07 | b-25-D/92-G-07 to d-47-D/92-G-07 |
| Total Length | 339.4 km | 279.4 km | 231.8 km | 136.1 km | 3.6 km |
| Length on Crown Land | 137.8 km | 156.2 km | 148.3 km | 13.2 km | -- |
| Length on Privately-Owned Land | 204.2 km | 113.9 km | 82.5 km | 106.4 km | 2.6 |
| Length Parallel to Existing Linear Corridor | 233.0 km | 205.3 km | 129.3 km | 93.4 | 0.6 |
| Regional District | North Saskatchewan, Upper Athabasca | Omineca, Thompson/Okanagan | Thompson/Okanagan, South Coast | South Coast | South Coast |
| Forest District (FD) | -- | Prince George FD, Thompson Rivers FD | Thompson Rivers FD, Cascades FD, Chilliwack FD | Chilliwack FD | Chilliwack FD |
| Land Use Management Plans ¹ | Capital Region LUP, Edmonton MDP and ESP, Strathcona County MDP, Spruce Grove MDP, Stony Plain MDP and CSP, Parkland County MDP and ICSP, Lake Wabamun MP, Wabamun MDP, Entwistle ASP, Yellowhead County MDP, Northern East Slopes SREMS, Coal Branch SIRP, Edson MDP and UFIDP, Hinton MDP and CSP | Regional District of Fraser-Fort George, Robson Valley LRMP, Robson Valley SRMP, Village of Valemount OCP, Blue River OCP, Thompson-Nicola RGS, Avola OCP, District of Clearwater OCP, Kamloops LRMP | Thompson-Nicola RGS, Kamloops LRMP, Kamloops KAMPLAN, Kamloops North OCP, Kamloops South OCP, Merritt SRMP, Merritt OCP, Hope OCP | Greater Vancouver RGS and SDBC, Hope OCP, Chilliwack SRMP, Chilliwack OCP, Abbotsford OCP and CSS, Sumas Mountain EMS, Surrey OCP and EMS, Surrey Bend MP, Coquitlam OCP, Fraser River Estuary MP, Burnaby OCP and ESAS, Burnaby State of the Environment Report | Greater Vancouver RGS and SDBC, Fraser River Estuary MP, Burrard Inlet EAP and Shoreline Development Guidelines, Burnaby OCP and ESAS, Burnaby State of the Environment Report |
| Wildlife Management Units (WMUs) | 248, 336, 337, 338, 342, 346, 348, 438 | 7-2, 7-3, 3-28, 3-39, 3-40, 3-41, 3-43, 3-44 | 2-17, 3-12, 3-13, 3-19, 3-28, 3-29 | 2-2, 2-3, 2-4, 2-8, 2-17 | 2-8 |
| Registered Trapping Areas | 1995, 1957, 1517, 1430, 1742, 2821, 1987, 1255, 1272, 2192, 2203, 2039, 2202 | 68548, 68546, 68555, 66706, 66707, 66708, 66709, 66747, 66767, 66712, 66766, 66711, 66710, 66729, 66710, 66729, 66733, 66742 | 66545, 66684, 66722, 66723, 66724, 66744, 66781, 66782, 66786, 66787, 66789, 66790, 66794, 66805, 66806, 66807 | 66686, 66688, 66546 | 66546 |
| River Basins | North Saskatchewan, Athabasca | Fraser, Columbia | Fraser | Fraser | Fraser |
| Named Watercourse Crossings | Goldbar Creek, Blackmud Creek, Whitemud Creek, North Saskatchewan River, Dog Creek, | Bear Creek, Marathon Creek, Terry Fox Creek, Fraser River (x2), Teepee Creek, Crooked Creek, | Ipsoot Creek, Chinook Creek, Nelson Creek, Peterson Creek (x2), Fishtrap Creek, Poison Creek, | -- | -- |

TABLE 4.1.1 Cont'd

| Setting Information | Edmonton to Hinton | Hargreaves to Darfield | Black Pines to Hope | Hope to Burnaby | Burnaby to Westridge |
|--|--|--|---|--|--|
| Named Watercourse Crossings (cont'd) | Atim Creek, Kilini Creek, Pembina River, Zeb-igler Creek, Little Brule Creek, Brule Creek, Lobstick River, Carrot Creek, January Creek, Wolf Creek, McLeod River, Bench Creek, Rooster Creek, Ponoka Creek, Roundcroft Creek, Hunt Creek, Trail Creek, Cache Percotte Creek, Hardisty Creek, Maskuta Creek | Swift Creek (x2), Cranberry Creek (x2), Canoe River, Camp Creek (x3), Albreda River (x4), Robina Creek, Clemina Creek, Dora Creek, Dominion Creek, Oasis Creek, North Thompson River (x7), Moonbeam Creek, Chappell Creek, Miledge Creek, Thunder River, Whitewater Creek, Cook Creek, Cedar Creek, Blue River, Goose Creek, Froth Creek, Foam Creek, Finn Creek, Sundt Creek, Tumtum Creek, Avola Creek, Sager Creek, Mad River, Bill Creek, Crossing Creek, Noblequartz Creek, Raft River, Clearwater River, Mann Creek, Lemieux Creek, Eakin Creek, Monigny Creek, Thuya Creek, Darlington Creek, Lindquist Creek | Whitewood Creek, Jamieson Creek, Lanes Creek, Dairy Creek, McQueen Creek, Thompson River, Anderson Creek (x2), Droppingwater Creek (x2), Moore Creek, Cultus Creek, Disappearing Stream, Rocky Gulch, Klup Creek, Zoht Creek, Clapperton Creek, Shuta Creek, Nicola River, Hamilton Creek, Godey Creek, Spanish Creek, Stirling Creek, Kwinshatin Creek, Skuagam Creek, Castillion Creek, Salem Creek, Voght Creek, Shouz Creek, Coldwater River (x9), Bottletop Creek, Juliet Creek, Coquihalla River (x17), Baldwin Creek, Hidden Creek, Needle Creek, Norley Creek, Boston Bar Creek, Ladner Creek, Fifteen Mile Creek, Jessica Creek, Railway Creek, Kopp Creek, Silverhope Creek, Chawuthen Creek, Hunter Creek, Lorenzetta Creek, Wahleach Creek, Bridal Creek, Nevin Creek, Dunville Creek, Elk Creek, Semmihault Creek, Chilliwack Creek, Veddar River (x2), Street Creek, Stewart Slough, Sumas River, Neufeld Creek, Clayburn Creek (x2), Downes Creek, McLennan Creek, Nathan Creek, West Creek, Davidson Creek, Munday Creek, Yorkson Creek, Bon Accord Creek, Fraser River, Booth Creek, MacDonald Creek, Como Creek, Stoney Creek | -- | -- |
| Natural Regions (Natural Subregions) or Ecoprovinces (Ecosections) | Parkland (Central Parkland), Boreal (Dry Mixedwood, Central Mixedwood), Foothills (Lower Foothills), Rocky Mountain (Montane) | Southern Interior Mountains (Northern Pacific Ranges, Upper Fraser Trench, Cariboo Mountains, Northern Shuswap Highland), Southern Interior (Northern Thompson Uplands) | Southern Interior (Thompson Basin, Guichon Upland, Nicola Basin, Hozameen Range), Coast and Mountains (Eastern Pacific Ranges) | Coast and Mountains (Eastern Pacific Ranges, Northwestern Cascade Ranges), Georgia Depression (Fraser Lowland) | Georgia Depression (Fraser Lowland, Strait of Georgia) |

TABLE 4.4.1 Cont'd

| | |
|-----------------|--|
| Sources: | AESRD 2012b, BC MFLNRO 2006a, BC ILMB 2009, Demarchi 2011, Government of AB 2012, Natural Regions Committee 2006 |
| Note: | 1 Land Use Management Plans include the following types of plans: ASP – Area Structure Plan, CSP – Community Sustainability Plan, CSS – Community Sustainability Strategy, EAP – Environmental Action Plan, EMS – Ecosystem Management Study, ESAS – Environmentally Sensitive Areas Strategy, ESP – Environmental Strategic Plan, ICSP – Integrated Community Sustainability Plan, LRMP – Land and Resource Management Plan, LUP – Land Use Plan, MDP – Municipal Development Plan, MP – Management Plan, OCP – Official Community Plan, RGS – Regional Growth Strategy, SDBC – Strategic Direction for Biodiversity Conservation, SIRP – Sub-Regional Integrated Resource Plan, SREMS – Sustainable Resource and Environmental Management Strategy, SRMP – Sustainable Resource Management Plan, UFIDP – Urban Fringe Intermunicipal Development Plan. |

4.2 Aboriginal Traditional Knowledge

Wildlife holds significant cultural, social and economic value to Aboriginal communities. Historically, Aboriginal people used animal skins and fur to make clothing and thread as well as the bones for utensils and the fat to burn in oil lamps. Hunting remains an important activity for Aboriginal communities and these communities have indicated that protecting wildlife is critical to preserve and sustain important habitats and traditional activities (Northern Gateway Pipelines Limited Partnership [NGPLP] 2010).

Where available, background ATK information collected for each component of the Project is included in the corresponding subsections below.

4.3 Edmonton to Hinton Segment

4.3.1 Land Use Planning

The Edmonton to Hinton Segment crosses four regional districts or counties, seven municipalities, and three resource or land use areas. Details of the wildlife and environmental objectives in each of the corresponding resource or land use plans are provided in Appendix C, Table C1.

4.3.2 Provincial Database

A search of the FWMIS records identified occurrences of wildlife species listed under Schedule 1 of SARA (Environment Canada 2013a) and/or COSEWIC (2013), as well as provincially listed wildlife species (AESRD 2012a) within 2 km of the Project (Table 4.3.1).

TABLE 4.3.1

FISHERIES AND WILDLIFE MANAGEMENT INFORMATION SYSTEM RECORDS FOR OCCURRENCES OF SPECIES WITH SPECIAL CONSERVATION STATUS – EDMONTON TO HINTON SEGMENT

| Common Name | Date of Record (Year) | Provincial Designations | Federal Designations |
|---------------------------|---|---|---------------------------|
| BIRDS | | | |
| American kestrel | 2005, 2006, 2012 | S4 (W) ¹ Sensitive ³ | -- |
| Bald eagle | 2012 | S4 (W) ¹ Sensitive ³ | -- |
| Barn swallow | 2011 | S4 (W) ¹ Sensitive ³ | Threatened ⁶ |
| Barred owl | 1966; 1981; 1984; 1987; 1988; 1992; 1994; 1995; 1996 | S3S4 (W) ¹ Special Concern ² Sensitive ³ | -- |
| Bay-breasted warbler | 1935 | S3 (W) ¹ Sensitive ³ | -- |
| Black tern | 2009 | S4 (W) ¹ Sensitive ³ | -- |
| Black-crowned night heron | 2010 | S2 (T) ¹ Sensitive ³ | -- |
| Canada warbler | 2000 | S3S4 (T) ¹ Sensitive ³ | Threatened ^{5,6} |

TABLE 4.3.1 Cont'd

| Common Name | Date of Record (Year) | Provincial Designations | Federal Designations |
|--------------------------------------|---|---|--------------------------------|
| Cape May warbler | 1975; 1976 | S3 (W) ¹ Sensitive ³ | -- |
| Common yellowthroat | 2010; 2012 | S4 (W) ¹ Sensitive ³ | -- |
| Eastern phoebe | 2009 | S4 (W) ¹ Sensitive ³ | -- |
| Great blue heron | 1992; 1993; 1998 | S3 (W) ¹ Sensitive ³ | -- |
| Great gray owl | 2001; 2005 | S4 (W) ¹ Sensitive ³ | -- |
| Green-winged teal | 2010; 2012 | S4S5 (W) ¹ Sensitive ³ | -- |
| Harlequin duck | 1977; 1982; 1990; 1991; 1993; 1995; 1996; 1997; | S3 (T) ¹ Special Concern ² Sensitive ³ | -- |
| Least flycatcher | 2006; 2012 | S5 (W) ¹ Sensitive ³ | -- |
| Lesser scaup | 2009; 2012 | S5 (W) ¹ Sensitive ³ | -- |
| Northern pygmy-owl | 1989; 1990; 1998 | S3 (W) ¹ Sensitive ³ | -- |
| Osprey | 2007; 2012 | S4 (W) ¹ Sensitive ³ | -- |
| Peregrine falcon, <i>anatum</i> ssp. | 1943; 1960; 1964; 1996; 1997; 1998; 1999; 2000; 2009; 2010; 2011; 2012 | S2S3 (T) ¹ Threatened ² At Risk ³ | Special Concern ^{4,5} |
| Pied-billed grebe | 2009 | S4 (W) ¹ Sensitive ³ | -- |
| Pileated woodpecker | 2009 | S3S4 (W) ¹ Sensitive ³ | -- |
| Sharp-tailed grouse | 2007 | S3S4 (W) ¹ Sensitive ³ | -- |
| Short-eared owl | 1935; 1971; 1975; 1977 | S3 (T) ¹ May Be at Risk ³ | Special Concern ^{4,5} |
| Sora | 2012 | S5 (W) ¹ Sensitive ³ | -- |
| Swainson's hawk | 1995; 2005; 2006; 2007; 2008; 2009; 2010; 2012 | S4 (W) ¹ Sensitive ³ | -- |
| Trumpeter swan | 1982; 1985; 1987; 1988; 1993; 1994; 1998; 2005; 2011 | S2S3 (T) ¹ Threatened ² At Risk ³ | -- |
| Western grebe | 2001; 2002; 2003; 2004 | S3 (W) ¹ Special Concern ² Sensitive ³ | -- |
| Western wood-pewee | 2012 | S4 (W) ¹ Sensitive ³ | -- |
| MAMMALS | | | |
| Grizzly bear, western population | 1999; 2000; 2004; 2010; 2012 | S2 (T) ¹ Threatened ² At Risk ³ | Special Concern ⁵ |
| Little brown myotis | 1977; 1978; 1979; 1986; 1990 | S5 (T.h) ¹ Secure ³ | Endangered ⁵ |
| Northern myotis | 1976; 1980; 1990; 1991 | S2S3 (T.h) ¹ May Be at Risk ³ | Endangered ⁵ |
| REPTILES AND AMPHIBIANS | | | |
| Canadian toad | 1939; 1950; 1964; 1965; 2002; 2006 | S3 (T) ¹ May Be at Risk ³ | Not at Risk ⁵ |

TABLE 4.3.1 Cont'd

| Common Name | Date of Record (Year) | Provincial Designations | Federal Designations |
|------------------------|--|---|--------------------------------|
| Long-toed salamander | 1987; 1988; 1989; 1994; 1995; 1996; 1999; 2000; 2001; 2002; 2003; 2004; 2005; 2006; 2009; 2011 | S3 (T) ¹ Special Concern ² Sensitive ³ | -- |
| Red-sided garter snake | 1999 | S4 (W) ¹ Sensitive ³ | -- |
| Western toad | 1994; 1995; 1996; 1998; 2000; 2001; 2002; 2003; 2004; 2005; 2006; 2007; 2008; 2011 | S3 (T) ¹ Sensitive ³ | Special Concern ^{4,5} |

Notes: Definitions of Status Designations are provided in Appendix B.

- 1 Provincial (S) rank assigned by ACIMS (2013a).
- 2 Species listed under the Alberta *Wildlife Act* and Wildlife Regulation (AESRD 2012a).
- 3 Status designation assigned in *The 2010 General Status of Alberta Wild Species* (ASRD 2011b).
- 4 Species listed under Schedule 1 of SARA (Environment Canada 2013a).
- 5 Species listed under COSEWIC (2013).

4.3.3 Provincially Identified Wildlife Areas

A summary of provincially identified wildlife areas in relation to the Edmonton to Hinton Segment is provided in Table 4.3.2 and Figure 4.3.1.

TABLE 4.3.2

PROVINCIALY IDENTIFIED WILDLIFE AREAS – EDMONTON TO HINTON SEGMENT

| Wildlife Area | Detail | Legal Location | RK Range | Approximate Length (km) |
|------------------------------------|---|------------------------------------|----------------|-------------------------|
| Key Wildlife and Biodiversity Zone | North Saskatchewan River | 3 and 4-52-25 W4M | 32.8 to 34.1 | 1.3 |
| | North Saskatchewan River | NW 8-52-25 W4M | 36.6 to 37.1 | 0.5 |
| | Athabasca River | 1-10-52-24 W5M to 16-32-51-24 W5M | 307.5 to 311.5 | 3.7 |
| Special Access Area | -- | 7-4-53-22 W5M to 12-36-52-23 W5M | 286.8 to 292.5 | 5.9 |
| | | 16-25-50-26 W5M to 11-33-49-26 W5M | 329.0 to 339.6 | 10.6 |
| Grizzly Bear Secondary Area | Grande Cache Population Unit | 4-27-52-23 W5M to 4-33-51-24 W5M | 297.2 to 312.4 | 15.2 |
| | | 1-36-50-26 W5M to 15-33-49-26 W5M | 329.0 to 339.4 | 10.4 |
| Grizzly Bear Core Area | Yellowhead Population Unit | 4-33-51-24 W5M to 16-25-50-26 W5M | 312.4 to 329.0 | 16.6 |
| Sensitive Raptor Range | Bald Eagle | 4-5-53-23 W4M to 11-2-53-1 W5M | 0.0 to 68.8 | 68.8 |
| Sharp-Tailed Grouse Range | -- | 4-5-53-23 W4M to 14-2-53-1 W5M | 0.0 to 68.8 | 68.8 |
| Trumpeter Swan Waterbody | Unnamed Lake (400 m from pipeline corridor) | SW 22-53-18 W5M | 241.4 to 243.1 | 1.7 |
| | Annabel Lake (700 m from pipeline corridor) | 34-52-19 W5M | 253.9 to 254.6 | 0.7 |
| | Unnamed Lake (200 m from pipeline corridor) | W 5-53-19 W5M | 256.8 to 258.6 | 1.8 |

Source: AESRD 2013c

4.3.4 Environmentally Significant Areas

The proposed Edmonton to Hinton Segment is located within five provincial Environmentally Significant Areas (70; 99; 441; 442; 690) (ATPR 2009) (Table 4.3.3; Figure 4.3.1).

TABLE 4.3.3

ENVIRONMENTALLY SIGNIFICANT AREAS - EDMONTON TO HINTON SEGMENT

| Environmentally Significant Area | Legal Location | RK Range | Approximate Length (km) | Importance ¹ |
|----------------------------------|---|--|---------------------------|---|
| 690 | 3-3-52-25 W4M to 10-4-52-25 W4M | 32.5 to 34.9 | 2.4 | <ul style="list-style-type: none"> Contains 65 elements of conservation concern, including leopard frog, ferruginous hawk, peregrine falcon, and western burrowing owl. Contains habitat for focal species and important wildlife habitat. Contains riparian areas, including headwater streams, intact riparian areas, and six major rivers. Contains large natural areas. Contains sites of recognized significance. The Project does not parallel the existing TMPL right-of-way through Environmentally Significant Area 690. Deviation from the existing Trans Mountain pipeline in this Environmentally Significant Area is to avoid routing through residential areas in the city of Edmonton. |
| 442 | 11-10-53-4 W5M to 9-9-53-4 W5M; 16-16-53-5 W5M to 15-17-53-5 W5M | 100.7 to 101.6 112.4 to 114.8 | 0.9 2.2 | <ul style="list-style-type: none"> Contains eight elements of conservation concern, including peregrine falcon. Contains important wildlife habitat. The Project parallels the existing TMPL right-of-way for approximately 26.1% (0.86 km) of the length through Environmentally Significant Area 442. Deviation from the existing TMPL right-of-way in this Environmentally Significant Area is due to a power line that is routed parallel to the existing TMPL right-of-way from RK 112.4 to RK 114.8. |
| 441 | 16-16-53-6 W5M to 13-17-53-6 W5M | 122.2 to 125.5 | 3.3 | <ul style="list-style-type: none"> Contains seven elements of conservation concern. Contains important wildlife habitat. The Project parallels the existing TMPL right-of-way for approximately 100% (3.3 km) of the length through Environmentally Significant Area 441. |
| 70 | 7-31-52-21 W5M to 5-36-52-22 W5M | 279.7 to 282.3 | 2.6 | <ul style="list-style-type: none"> Contains three elements of conservation concern. Contains riparian areas, including headwater streams and intact riparian areas. The Project parallels the existing TMPL right-of-way for approximately 68.7% (1.8 km) of the length through Environmentally Significant Area 70. Deviation from the existing TMPL right-of-way in the Environmentally Significant Area is to avoid a small unnamed waterbody at 6-31-52-21 W5M and parallel other pipeline rights-of-way. |
| 99 | 1-28-52-23 W5M; 3-20-52-23 W5M; 14-3-52-24 W5M to 3-4-52-24 W5M | 297.4 to 297.6 300.3 to 300.8 308.1 to 310.6 | 0.2 0.5 2.5 | <ul style="list-style-type: none"> Contains 27 elements of conservation concern, including peregrine falcon, trumpeter swan, and long-legged bat. Contains rare or unique landforms and large natural areas. Contains riparian areas, including headwater streams, intact riparian areas, six major rivers. The Project parallels the existing TMPL right-of-way for approximately 76.2% (2.4 km) of the length through Environmentally Significant Area 99. Deviation from the existing TMPL right-of-way in the Environmentally Significant Area is to cross and parallel a road that is adjacent to the existing TMPL right-of-way. |

Source: ATPR 2009

4.3.5 Parks and Protected Areas

A summary of parks and protected areas near to the Edmonton to Hinton Segment is provided in Table 4.3.4 and Figure 4.3.1. The proposed pipeline corridor is not located within a provincial park but is located near to Wabamun Lake and Obed Lake provincial parks and the Yates Natural Area. It is also located within the Ducks Unlimited Canada (DUC) Level 1 Priority Landscapes, Prairie Pothole Region and Western Boreal Forest. The Prairie Pothole Region is a primary breeding area for waterfowl and the Western Boreal Forest provides breeding, migration, moulting, and staging habitat for waterfowl (DUC 2013). The proposed pipeline corridor is not located within or adjacent to an IBA, Migratory Bird Sanctuary, National Wildlife Area, Western Hemisphere Shorebird Reserve, Ramsar wetland or biosphere reserve (AltaLIS 2008, Bird Studies Canada and Nature Canada 2012, Bureau of the Convention on Wetlands 2013, Environment Canada 2012a, UNESCO 2012, WHSRN 2012).

TABLE 4.3.4

PARKS AND PROTECTED AREAS – EDMONTON TO HINTON SEGMENT

| Park or Protected Area | Legal Location | RK Range | Approximate Length (km) |
|------------------------------|---------------------------|----------------|--|
| Wabamun Lake Provincial Park | 7-53-3 W5M to 12-53-4 W5M | Nearest: 96.0 | Adjacent: within 200 m at nearest point; separated by Highway 16 and a rural access road |
| Yates Natural Area | 21-53-16 W5M | Nearest: 222.0 | Adjacent: within 120 m at nearest point; separated by rural residences and forested land |
| Obed Lake Provincial Park | 53-21 W5M to 53-22 W5M | Nearest: 278.0 | Adjacent: within 220 m at nearest point; separated by Highway 16 and a railway; parallels existing line; located in an area of oil and gas development |

Source: ATPR 2012

4.3.6 Protective Notation

A search of the Geographic Land Information Management and Planning System for wildlife-related Crown dispositions found six PNTs crossed by the Edmonton to Hinton Segment (Alberta Energy 2013). Table 4.3.5 describes the PNTs that are held by the AESRD Fish and Wildlife Division pertaining to habitat conservation.

TABLE 4.3.5

PROTECTIVE NOTATIONS FOR WILDLIFE HABITAT – EDMONTON TO HINTON SEGMENT

| Code | Type | Legal Location | RK Range | Activity Detail Information and Relevance to the Project |
|------------|---|-----------------|----------------|---|
| PNT 980061 | PNT (Fragmented Land Pattern) | NW 13-53-6 W5M | 118.1 to 118.9 | <u>Activity Detail Information:</u> n/a <u>Relevance to Project:</u> Forested. Railway runs southeast to northwest across quarter section. Proposed corridor parallels the existing TMPL right-of-way. |
| PNT 870456 | PNT (Ungulate Winter Range) | NW 22-53-10 W5M | 161.0 to 161.8 | <u>Activity Detail Information:</u> n/a <u>Relevance to Project:</u> Forested. Proposed pipeline corridor parallels the existing TMPL right-of-way. |
| PNT 780290 | PNT (Fish and Wildlife Resource Management Area) | SW 35-53-13 W5M | 189.1 to 189.9 | <u>Activity Detail Information:</u> n/a <u>Relevance to Project:</u> Forested. Proposed pipeline corridor parallels the existing TMPL right-of-way. |
| PNT 980160 | PNT (Research Site Structure) | NE 12-51-25 W5M | 319.3 to 319.9 | <u>Activity Detail Information:</u> Exclosure established to determine the effects of wildlife and horse grazing on tree regeneration and species composition in a regenerating black spruce/white spruce forest. <u>Relevance to Project:</u> Forested. New clearing required. |
| PNT 020232 | PNT (Rare and Endangered Species Habitat Protection Area) | NW 3-50-26 W5M | 336.9 to 337.8 | <u>Activity Detail Information:</u> Fish and Wildlife Division recommends the following conditions be applied near long-toed salamander breeding ponds through the land use permit system: 1) April 1 to Sept 30 (breeding season), no activity within 100 m of the water's edge of identified ponds, 2) no roads, wells, or pipelines within 100 m of the water's edge of identified ponds, 3) seismic lines must be hand-cut within 100 m of the water's edge of identified ponds, 4) no timber harvesting within 100 m of the water's edge of identified ponds, 5) no grazing or range improvements. Contact: Regional Endangered species specialist in Edson. <u>Relevance to Project:</u> Forested. Proposed pipeline corridor parallels the existing TMPL right-of-way. The proposed pipeline corridor is not located within 100 m of a wetland. |
| PNT 970253 | PNT (Habitat Management Area) | SE 4-50-26 W5M | 337.8 | <u>Activity Detail Information:</u> "Wildlife Study Plots of Camp 1. Clearcuts and mature forests." Project monitors vegetation changes over time. No development which vegetation will be altered. <u>Relevance to Project:</u> Forested. Proposed pipeline corridor parallels the existing TMPL right-of-way. This study is no longer active and the PNT will likely be removed (Hobson pers. comm.) |

Source: Alberta Energy 2013.

Note: Activity detail information as provided in the protective notation (Alberta Energy 2013); n/a = no activity detail information provided.

4.3.7 Species with Special Conservation Status

Species with special conservation status that are provincially listed (ASRD 2011b) or federally listed on Schedule 1 of SARA (Environment Canada 2013a) or by COSEWIC (2013) that have the potential to occur along the Edmonton to Hinton Segment based on the desktop/literature review are provided in Table 4.3.6.

TABLE 4.3.6

SPECIES WITH SPECIAL CONSERVATION STATUS – EDMONTON TO HINTON SEGMENT

| Common Name | Provincial Designations | Federal Designations |
|--------------------------------------|---|--------------------------------|
| BIRDS | | |
| Bank swallow | S5 ¹ Secure ³ | Threatened ⁵ |
| Barn swallow | S4 (W) ¹ Sensitive ³ | Threatened ⁵ |
| Barred owl | S3S4 (W) ¹ Special Concern ² Sensitive ³ | -- |
| Bobolink | S2S3 (W) ¹ Sensitive ³ | Threatened ⁵ |
| Canada warbler | S3S4 (T) ¹ Sensitive ³ | Threatened ^{4,5} |
| Common nighthawk | S4 (T) ¹ Sensitive ³ | Threatened ^{4,5} |
| Harlequin duck | S3 (T) ¹ Special Concern ² Sensitive ³ | -- |
| Horned grebe | S3 (W) ¹ Sensitive ³ | Special Concern ⁵ |
| Lewis's woodpecker | SU (W) ¹ Sensitive ³ | Threatened ^{4,5} |
| Loggerhead shrike | S3 (T) ¹ Special Concern ² Sensitive ³ | Threatened ^{4,5} |
| Olive-sided flycatcher | S3 (T) ¹ May Be at Risk ³ | Threatened ^{4,5} |
| Peregrine falcon, <i>anatum</i> ssp. | S2S3 ¹ Threatened ² At Risk ³ | Special Concern ^{4,5} |
| Rusty blackbird | S4 (T) ¹ Sensitive ³ | Special Concern ^{4,5} |
| Short-eared owl | S3 (T) ¹ May Be at Risk ³ | Special Concern ^{4,5} |
| Sprague's pipit | S3S4 (T) ¹ Special Concern ² Sensitive ³ | Threatened ^{4,5} |
| Trumpeter swan | S2S3 (T) ¹ Threatened ² At Risk ³ | Not at Risk ⁵ |
| Western grebe | S3 (W) ¹ Special Concern ² Sensitive ³ | -- |
| White-winged scoter | S3S4 (W) ¹ Special Concern ² Sensitive ³ | -- |
| Yellow rail | SU (T) ¹ | Special Concern ^{4,5} |

TABLE 4.3.6 Cont'd

| Common Name | Provincial Designations | Federal Designations |
|------------------------------------|---|--------------------------------|
| MAMMALS | | |
| American badger, <i>taxus</i> ssp. | S4 ¹ Sensitive ³ | Special Concern ⁵ |
| Grizzly bear, western population | S2 (T) ¹ Threatened ² At Risk ³ | Special Concern ⁵ |
| Little brown myotis | S5 (T.h) ¹ Secure ³ | Endangered ⁵ |
| Northern myotis | S2S3 (T.h) ¹ May Be at Risk ³ | Endangered ⁵ |
| Vagrant shrew | S1 (T) ¹ May Be at Risk ³ | -- |
| Wolverine | S3 (T) ¹ May Be at Risk ³ | Special Concern ⁵ |
| REPTILES AND AMPHIBIANS | | |
| Canadian toad | S3 (T) ¹ May Be at Risk ³ | Not at Risk ⁶ |
| Long-toed salamander | S3 (T) ¹ Special Concern ² Sensitive ³ | -- |
| Tiger salamander | S4 ¹ Secure ³ | Special Concern ⁵ |
| Western toad | S3 (T) ¹ Sensitive ³ | Special Concern ^{4,5} |
| INVERTEBRATES | | |
| Monarch | S3 ¹ Sensitive ³ | Special Concern ^{4,5} |

Notes: Definitions of Status Designations are provided in Appendix B.

- 1 Provincial (S) rank assigned by ACIMS (2013a).
- 2 Species listed under the Alberta *Wildlife Act* and Wildlife Regulation (AESRD 2012a).
- 3 Status designation assigned in *The 2010 General Status of Alberta Wild Species* (ASRD 2011b).
- 4 Species listed under Schedule 1 of SARA (Environment Canada 2013a).
- 5 Species listed under COSEWIC (2013).

4.3.8 Aboriginal Traditional Knowledge

Along the Edmonton to Hinton Segment, the desktop review identified that Aboriginal people in this region continue to harvest wildlife for sustenance and for traditional and ceremonial purposes. Concerns and recommendations identified during the background research on other proposed projects within the region include the following: accessibility to hunting lands; protection of mineral licks; impacts to bear dens and large game; and requests for water quality monitoring and animal tissue testing. Changes in wildlife habitat and patterns were also identified as a concern, specifically wildlife use of cutlines as trails, fragmentation of lands, and migration disruption caused by noise pollution (Lifeways of Canada Ltd. 2012). Wildlife found in the Swan Hills area is no longer hunted by the Aboriginal people due to the presence of a hazardous waste treatment facility (NGPLP 2010).

Animals that were traditionally hunted are not considered to be of the same quality or abundance by Aboriginal people as they once were. Deer were documented to be affected by chronic wasting disease and moose were infested with ticks, which have been attributed to air pollutants, toxic waste management and the oil and gas industry. The moose population has been in decline since the 1940s and 1950s due to an increase in human density and farming. Moose behavior has been affected by industrial development, and the animals seem to have been displaced. Waterfowl are perceived to not be as pure as they once were due to sewage and oil spills. The decline in bird populations is attributed to industrial development and loss of habitat (NGPLP 2010).

4.4 Hargreaves to Darfield Segment

4.4.1 Land Use Planning

The Hargreaves to Darfield segment crosses one regional district, four municipalities, and four resource or land use areas. Details of the wildlife and environmental objectives in each of the corresponding resource or land use plans are provided in Appendix C, Table C2.

4.4.2 Provincial Database

A search of the BC CDC records identified no occurrences of wildlife species listed under Schedule 1 of SARA (Environment Canada 2013a) and/or COSEWIC (2013), or any provincially listed wildlife species within 2 km of the Project (BC CDC 2012, 2013a).

4.4.3 Provincially Identified Wildlife Areas

A summary of provincially identified wildlife areas that are crossed by the Hargreaves to Darfield Segment is provided in Table 4.4.1 and Figure 4.4.1.

TABLE 4.4.1

PROVINCIALY IDENTIFIED WILDLIFE AREAS - HARGREAVES TO DARFIELD SEGMENT

| Wildlife Area | Legal Location | RK Range | Approximate Length (km) |
|--|----------------------------------|----------------|-------------------------|
| Caribou Range – Wells Gray ¹ | b-53-G/83-D-11 to a-42-G/83-D-11 | 550.0 to 551.6 | 1.6 |
| | b-41-J/83-D-6 to d-49-J/83-D-3 | 573.1 to 602.7 | 29.6 |
| Caribou Range – Groundhog ¹ | d-86-K/82-M-14 to c-26-K/82-M-14 | 629.8 to 635.8 | 6.0 |
| | a-7-K/82-M-14 to c-65-F/82-M-14 | 638.8 to 642.3 | 3.5 |
| | c-24-F/82-M-14 to a-24-F/82-M-14 | 645.9 to 646.3 | 0.4 |
| | c-93-C/82-M-14 to b-93-C/82-M-14 | 649.1 to 649.4 | 0.3 |
| UWR (u-3-004 for mountain caribou) ² Located within Wells Gray Caribou Range | a-75-B/83-D-6 to b-75-B/83-D-6 | 590.0 to 590.2 | 0.2 |
| | d-26-B/83-D-6 to b-16-B/83-D-6 | 594.4 to 595.9 | 1.5 |
| | a-7-B/83-D-6 to a-78-J/83-D-3 | 597.3 to 600.0 | 2.7 |

Notes: 1 Caribou herd ranges defined by BC MOE (2010).
2 UWRs defined by BC MOE (2012b).

4.4.4 Parks and Protected Areas

A summary of parks and protected areas near to the Hargreaves to Darfield Segment is provided in Table 4.4.2 and Figure 4.4.1). The proposed pipeline corridor is located within the Finn Creek and North Thompson River provincial parks and is adjacent to the Jackman Flats and Blue River Black Spruce provincial parks. The proposed pipeline corridor is not located within or adjacent to an IBA, DUC Priority Area, Migratory Bird Sanctuary, National Wildlife Area, Western Hemisphere Shorebird Reserve, Ramsar wetland or biosphere reserve (Bird Studies Canada and Nature Canada 2012, Bureau of the Convention on Wetlands 2013, DUC 2013, Environment Canada 2012b, UNESCO 2012, WHSRN 2012).

TABLE 4.4.2

PARKS AND PROTECTED AREAS – HARGREAVES TO DARFIELD SEGMENT

| Park or Protected Area | Legal Location | RK Range | Approximate Length (km) |
|---|---------------------------------|----------------|---|
| Jackman Flats Provincial Park | 83-D-14 | Nearest: 509.0 | Adjacent: within 120 m at nearest point; separated by Highway 5; parallels existing TMPL right-of-way |
| Blue River Black Spruce Provincial Park | F/83-D-3 | Nearest: 611.0 | Adjacent: within 50 m at nearest point; separated by secondary road |
| Finn Creek Provincial Park | a-7-K/82-M-14 to c-96-F/82-M-14 | 638.6 to 644.0 | 0.7 |
| North Thompson River Provincial Park | a-67-H/92-P-9 to b-67-H/92-P-9 | 725.5 to 725.9 | Adjacent: within 20 m at nearest point; separated by Highway 5 |

Source: BC MOE 2012d

4.4.5 Species with Special Conservation Status

Species with special conservation status that are provincially listed (BC CDC 2013b) or federally listed on Schedule 1 of SARA (Environment Canada 2013a) or by COSEWIC (2013) that have the potential to occur along the Hargreaves to Darfield Burnaby Segment based on the desktop/literature review are provided in Table 4.4.3.

Environment Canada has identified *Early Candidate* critical habitat for American badger south of Clearwater (Environment Canada 2013b).

TABLE 4.4.3

SPECIES WITH SPECIAL CONSERVATION STATUS – HARGREAVES TO DARFIELD SEGMENT

| Common Name | Provincial Designations | Federal Designations |
|---|---|--------------------------------|
| BIRDS | | |
| American avocet | S2S3B ¹ Blue ³ Priority 2 ⁴ Goal 3 ⁴ | -- |
| American bittern | S3B ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | -- |
| Bank swallow | S4S5B ¹ Yellow ³ Priority 5 ⁴ Goal 1,3 ⁴ | Threatened ⁶ |
| Barn swallow | S3S4B ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Threatened ⁶ |
| California gull | S3B ¹ Blue ³ Priority 4 ⁴ Goal 3 ⁴ | -- |
| Common nighthawk | S4B ¹ Yellow ³ Priority 2 ⁴ Goal 2 ⁴ | Threatened ^{5,6} |
| Horned grebe | S4B ¹ Yellow ³ Priority 4 ⁴ Goal 1,2 ⁴ | Special Concern ⁶ |
| Horned lark, <i>merrilli</i> subspecies | S3S4B ¹ Blue ³ Priority 4 ⁴ Goal 2,3 ⁴ | -- |
| Long-billed curlew | S3B ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Long-tailed duck | S2S3B,S4N ¹ Blue ³ Priority 2 ⁴ Goal 3 ⁴ | -- |

TABLE 4.4.3 Cont'd

| Common Name | Provincial Designations | Federal Designations |
|---|---|--------------------------------|
| Olive-sided flycatcher | S3S4B ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Threatened ^{5,6} |
| Rusty blackbird | S3S4B ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Short-eared owl | S3B,S2N ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Surf scoter | S3B,S4N ¹ Blue ³ Priority 4 ⁴ Goal 2,3 ⁴ | -- |
| Upland sandpiper | S1S2B ¹ Red ³ Priority 1 ⁴ Goal 3 ⁴ | -- |
| Western grebe | S1B,S2N ¹ Red ³ Priority 1 ⁴ Goal 3 ⁴ | -- |
| MAMMALS | | |
| Fisher | S2S3 ¹ Blue ³ Priority 2 ⁴ Goal 3 ⁴ | -- |
| Grizzly bear, western population | S3 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ⁶ |
| Little brown myotis | S4 ¹ Yellow ³ Priority 5 ⁴ Goal 3 ⁴ | Endangered ⁶ |
| Northern myotis | S2S4 ¹ Blue ³ Priority 2 ⁴ Goal 3 ⁴ | Endangered ⁶ |
| Townsend's big-eared bat | S3 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | -- |
| Wolverine, <i>luscus</i> ssp. | S3 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ⁶ |
| Woodland caribou, southern mountain population | S1 ¹ Red ³ Priority 2 ⁴ Goal 1,3 ⁴ | Threatened ^{5,6} |
| REPTILES AND AMPHIBIANS | | |
| Great Basin gopher snake, <i>deserticola</i> ssp. | S2S3 ¹ Blue ³ Priority 2 ⁴ Goal 3 ⁴ | Threatened ^{5,6} |

TABLE 4.4.3 Cont'd

| Common Name | Provincial Designations | Federal Designations |
|---|--|--------------------------------|
| Painted turtle, Intermountain-Rocky Mountain population | S2S3 ¹ Blue ³ Priority 2 ⁴ Goal 3 ⁴ | Special Concern ^{5,6} |
| Northern rubber boa | S4 ¹ Yellow ³ Priority 1 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Western toad | S3S4 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| INVERTEBRATES | | |
| Magnum mantleslug | S2S3 ¹ Blue ³ Priority 2 ⁴ Goal 3 ⁴ | Special Concern ⁶ |
| Monarch | S3B ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |

Notes: Status definitions are provided in Appendix B.

- 1 Provincial (S) rank assigned by the BC CDC (2013c).
- 2 Species listed under the BC *Wildlife Act* (BC CDC 2013c).
- 3 Provincial Red and Blue designations assigned by BC CDC (2013b).
- 4 Conservation goals and priorities established under the BC Conservation Framework (BC MOE 2009a,b).
- 5 Species listed under Schedule 1 of SARA (Environment Canada 2013a).
- 6 Species listed under COSEWIC (2013).

4.4.6 Aboriginal Traditional Knowledge

Along the Hargreaves to Darfield Segment, the desktop review identified that Aboriginal people in this area continue to harvest wildlife for sustenance and for traditional and ceremonial purposes. Aboriginal people report that they still harvest game in the mountains above the North Thompson and Fraser rivers. Aboriginal communities report that there has been an increase in elk and white-tailed deer and a decrease in mule deer, woodland caribou, and mountain goat populations, while moose populations have remained steady. Concerns and recommendations identified during the background research on other proposed projects within the region include a noted decline in animal health attributed to contaminant release through industrial activities. Animals are reported to be noticeably thinner, have discoloured flesh and have blisters on their organs (NGPLP 2010). Higher incidences of road kill have also been observed (Lifeways of Canada Ltd. 2012). Aboriginal harvesters have seen the quantity, quality and availability of their traditional resources shrink dramatically due to development. Clear cutting, logging road networks and herbicides have altered the forest ecology, and Aboriginal people suspect herbicides have entered the food chain, impacting game and, therefore, the surrounding communities that consume wild meat. Logging roads have increased access to traditional territories and Aboriginal communities have noticed more big game animals near settled areas, linking these changes to food shortages from loss of habitat (Archaeo Research Limited 2002).

4.5 Black Pines to Hope Segment

4.5.1 Land Use Planning

The Black Pines to Hope Segment crosses one regional district, three municipalities, and one resource or land use area. Details of the wildlife and environmental objectives in each of the corresponding resource or land use plans are provided in Appendix C, Table C2.

4.5.2 Provincial Database

A search of the BC CDC records identified occurrences of wildlife species listed under Schedule 1 of SARA (Environment Canada 2013a) and/or COSEWIC (2013), as well as provincially listed wildlife species within 2 km of the Project (Table 4.4.4) (BC CDC 2012, 2013a).

TABLE 4.4.4

BRITISH COLUMBIA CONSERVATION DATA CENTRE RECORDS FOR OCCURRENCES OF SPECIES WITH SPECIAL CONSERVATION STATUS – BLACK PINES TO HOPE SEGMENT

| Common Name | Date of Record (Year) | Provincial Designations | Federal Designations |
|--|-----------------------|---|--|
| BIRDS | | | |
| Burrowing owl | 1994 | S1B ¹ Endangered ² Red ³ Priority 2 ⁴ Goal 3 ⁴ | Endangered ^{5,6} |
| Lewis's woodpecker | 2006 | S2B ¹ Red ³ Priority 2 ⁴ Goal 3 ⁴ | Threatened ^{5,6} |
| Sharp-tailed grouse, <i>columbianus</i> ssp. | 2003 | S2S3 ¹ Blue ³ Priority 2 ⁴ Goal 1,3 ⁴ | -- |
| Spotted owl | 2004 | S1 ¹ Red ³ Priority 2 ⁴ Goal 3 ⁴ | Endangered ^{5,6} |
| Western screech owl, <i>macfarlanei</i> ssp. | 2007 | S2 ¹ Red ³ Priority 1 ⁴ Goal 3 ⁴ | Endangered ⁵ Threatened ⁶ |
| Williamson's sapsucker | 2008 | S3B ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Endangered ^{5,6} |
| MAMMALS | | | |
| American badger, <i>jeffersoni</i> ssp. | 2001 | S1 ¹ Red ³ Priority 1 ⁴ Goal 3 ⁴ | Endangered ^{5,6} |
| Mountain beaver, <i>rainier</i> ssp. | 2002 | S3 ¹ Blue ³ Priority 1 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Mountain beaver, <i>rufa</i> ssp. | 1947 | S3 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| REPTILES AND AMPHIBIANS | | | |
| Townsend's big-eared bat | 1948 | S3 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | -- |
| Trowbridge's shrew | 1951 (dead) | S3 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | -- |

TABLE 4.4.4 Cont'd

| Common Name | Date of Record (Year) | Provincial Designations | Federal Designations |
|-----------------------|-----------------------|--|---------------------------|
| Great Basin spadefoot | 2007 | S3 ¹ Blue ³ Priority 1 ⁴ Goal 2 ⁴ | Threatened ^{5,6} |
| Western rattlesnake | 2007, 2012 | S3 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Threatened ^{5,6} |

Notes: Status definitions are provided in Appendix B.

- 1 Provincial (S) rank assigned by the BC CDC (2013c).
- 2 Species listed under the BC *Wildlife Act* (BC CDC 2013c).
- 3 Provincial Red and Blue designations assigned by BC CDC (2013b).
- 4 Conservation goals and priorities established under the BC Conservation Framework (BC MOE 2009a,b).
- 5 Species listed under Schedule 1 of SARA (Environment Canada 2013a).
- 6 Species listed under COSEWIC (2013).

4.5.3 Provincially Identified Wildlife Areas

A summary of provincially identified wildlife areas in relation to the Black Pines to Hope Segment is provided in Table 4.5.1 and Figure 4.5.1.

TABLE 4.5.1

PROVINCIALY IDENTIFIED WILDLIFE AREAS - BLACK PINES TO HOPE SEGMENT

| Wildlife Area | Legal Location | RK Range | Approximate Length (km) |
|--|----------------------------------|------------------|-------------------------|
| UWR (u-3-003 for mule deer) ¹ | c-96-D/92-I-8 to b-86-D/92-I-8 | 892.0 to 893.4 | 1.4 |
| | c-27-D/92-I-8 to d-28-D/92-I-8 | 898.9 to 899.1 | 0.2 |
| | c-28-D/92-I-8 to d-73-I/92-I-2 | 899.5 to 906.0 | 6.5 |
| | b-78-I/92-I-2 to b-79-I/92-I-2 | 911.2 to 912.0 | 0.8 |
| | d-61-J/92-I-2 | 913.6 to 913.6 | <0.1 |
| | c-51-J/92-I-2 to b-51-J/92-I-2 | 914.7 to 915.0 | 0.3 |
| | d-42-J/92-I-2 to b-42-J/92-I-2 | 915.8 to 916.3 | 0.5 |
| | a-93-C/92-I-2 to b-74-C/92-I-2 | 933.7 to 935.9 | 2.2 |
| | c-65-C/92-I-2 to b-20-C/92-I-2 | 937.1 to 945.3 | 8.2 |
| | a-84-L/92-H-15 to a-74-L/92-H-15 | 949.6 to 950.4 | 0.8 |
| | c-64-L/92-H-15 to b-23-L/92-H-15 | 950.9 to 955.7 | 4.8 |
| | c-13-L/92-H-15 to b-13-L/92-H-15 | 956.1 to 956.8 | 0.7 |
| | b-94-E/92-H-15 to b-85-D/92-H-15 | 959.1 to 970.0 | 10.9 |
| UWR (u-2-006 for mule deer and black-tailed deer) ¹ | a-25-K/92-H-6 to c-5-K/92-H-6 | 1030.0 to 1031.4 | 1.4 |

TABLE 4.5.1 Cont'd

| Wildlife Area | Legal Location | RK Range | Approximate Length (km) |
|---|--------------------------------|------------------|-------------------------|
| WHA (2-498 Sowaqua Long Term Owl Habitat Area for spotted owl) ² | d-61-K/92-H-6 to d-32-K/92-H-6 | 1023.3 to 1026.9 | 3.6 |
| | c-24-K/92-H-6 to a-96-F/92-H-6 | 1029.2 to 1032.6 | 3.4 |
| | a-96-F/92-H-6 to c-57-F/92-H-6 | 1033.0 to 1037.1 | 4.1 |
| | d-59-F/92-H-6 to a-69-F/92-H-6 | 1038.2 to 1038.6 | 0.4 |

- Notes:**
- 1 UWRs defined by BC MOE (2012b).
 - 2 WHAs defined by BC MOE (2012c).

4.5.4 *Parks and Protected Areas*

A summary of parks and protected areas near to the Black Pines to Hope Segment is provided in Table 4.5.2 and shown in Figure 4.5.1). The proposed pipeline corridor is located within Lac du Bois Grasslands Protected Area and the Coquihalla Summit Recreation Area and is adjacent to the Coldwater River, Coquihalla River and Coquihalla Canyon provincial parks. It is also located within the Douglas Lake Plateau IBA (BC172) from RK 850.6 (d-94-E/92-I-9) to RK 865.8 (c-61-D/92-I-9), RK 886.2 (d-54-E/92-I-8) to RK 889.2 (c-25-E/92-I-8) and RK 898.0 (d-37-D/92-I-8) to RK 898.6 (b-37-D/92-I-8) (Bird Studies Canada and Nature Canada 2012) and the DUC Level 3 Priority Landscape, Eastern Boreal Forest, which encompasses areas rich in wetlands, lakes, ponds, rivers, and streams and supports breeding, migrating, mounting, and staging waterfowl (DUC 2013). The proposed pipeline corridor is not located within or adjacent to a Migratory Bird Sanctuary, National Wildlife Area, Western Hemisphere Shorebird Reserve, Ramsar wetland or biosphere reserve (Bureau of the Convention on Wetlands 2013, Environment Canada 2012b, UNESCO 2012, WHSRN 2012).

TABLE 4.5.2

PARKS AND PROTECTED AREAS – BLACK PINES TO HOPE SEGMENT

| Park or Protected Area | Legal Location | RK Range | Approximate Length (km) |
|---------------------------------------|----------------------------------|-----------------|---|
| Lac Du Bois Grasslands Protected Area | b-98-C/92-I-16 to b-19-C/92-I-16 | 829.0 to 836.9 | 7.9 |
| Douglas Lake Plateau IBA (BC172) | d-94-E/92-I-9 to c-61-D/92-I-9 | 850.6 to 865.8 | 15.2 |
| | d-54-E/92-I-8 to c-25-E/92-I-8 | 886.2 to 889.2 | 3.0 |
| | d-37-D/92-I-8 to b-37-D/92-I-8 | 898.0 to 898.6 | 0.6 |
| Coldwater River Provincial Park | I/92-H-11 | Nearest: 980.0 | Adjacent: within 70 m at nearest point; separated by Highway 5; parallels linear disturbance |
| Coquihalla Summit Recreation Area | d-61-H/92-H-11 to a-13-G/92-H-11 | 992.8 to 1005.6 | 12.8 |
| Coquihalla River Provincial Park | K/92-H-6 | Nearest: 1023.0 | Adjacent: within 110 m at nearest point; separated by Highway 5 and a secondary road |
| Coquihalla Canyon Provincial Park | 60-F/92-H-6 | 1039.0 | Adjacent: within 210 m at nearest point; separated by two secondary roads and three access roads; located within the municipality of Hope |

- Notes:**
- 1 Parks and protected areas defined by BC MOE (2012d).
 - 2 Important bird areas defined by Bird Studies Canada and Nature Canada (2012).

4.5.5 *Species with Special Conservation Status*

Species with special conservation status that are provincially listed (BC CDC 2013b) or federally listed on Schedule 1 of SARA (Environment Canada 2013a) or by COSEWIC (2013) that have the potential to occur along the Black Pines to Hope Segment based on the desktop/literature review are provided in Table 4.5.3.

Environment Canada has identified *Early Candidate* critical habitat for American badger and Lewis's woodpecker north and south of Kamloops. *Early Candidate* critical habitat for Lewis's woodpecker extends south to Merritt. *Proposed* critical habitat for Williamson's sapsucker has been identified south of Merritt to approximately the Kingsvale Pump Station (Environment Canada 2013b).

TABLE 4.5.3

SPECIES WITH SPECIAL CONSERVATION STATUS – BLACK PINES TO HOPE SEGMENT

| Common Name | Provincial Designations | Federal Designations |
|---------------------------------------|---|---|
| BIRDS | | |
| American avocet | S2S3B ¹ Blue ³ Priority 2 ⁴ Goal 3 ⁴ | -- |
| American bittern | S3B ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | -- |
| Band-tailed pigeon | S3S4B ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Bank swallow | S4S5B ¹ Yellow ³ Priority 5 ⁴ Goal 1,3 ⁴ | Threatened ⁶ |
| Barn owl | S3 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ⁵ Threatened ⁶ |
| Barn swallow | S3S4B ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Threatened ⁶ |
| Bobolink | S3B ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Threatened ⁶ |
| Brewer's sparrow, <i>breweri</i> ssp. | S2B ¹ Red ³ Priority 2 ⁴ Goal 3 ⁴ | -- |
| Burrowing owl | S1B ¹ Endangered ² Red ³ Priority 2 ⁴ Goal 3 ⁴ | Endangered ^{5,6} |
| California gull | S3B ¹ Blue ³ Priority 4 ⁴ Goal 3 ⁴ | -- |
| Canyon wren | S3 ¹ Blue ³ Priority 4 ⁴ Goal 2,3 ⁴ | Not at Risk ⁶ |
| Common nighthawk | S4B ¹ Yellow ³ Priority 2 ⁴ Goal 2 ⁴ | Threatened ^{5,6} |

TABLE 4.5.3 Cont'd

| Common Name | Provincial Designations | Federal Designations |
|--|---|--------------------------------|
| Ferruginous hawk | SNRN ¹ | Threatened ^{5,6} |
| Flammulated owl | S3S4B ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Grasshopper sparrow | S1S2B ¹ Red ³ Priority 1 ⁴ Goal 3 ⁴ | -- |
| Great blue heron, <i>herodias</i> ssp. | S3B,S4N ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | -- |
| Gyr Falcon | S3S4B ¹ Blue ³ Priority 4 ⁴ Goal 3 ⁴ | Not at Risk ⁶ |
| Horned grebe | S4B ¹ Yellow ³ Priority 4 ⁴ Goal 1,2 ⁴ | Special Concern ⁶ |
| Horned lark, <i>merrilli</i> ssp. | S3S4B ¹ Blue ³ Priority 4 ⁴ Goal 2,3 ⁴ | -- |
| Lark sparrow | S2B ¹ Red ³ Priority 2 ⁴ Goal 3 ⁴ | -- |
| Lewis's woodpecker | S2B ¹ Red ³ Priority 2 ⁴ Goal 3 ⁴ | Threatened ^{5,6} |
| Long-billed curlew | S3B ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Long-tailed duck | S2S3B,S4N ¹ Blue ³ Priority 2 ⁴ Goal 3 ⁴ | -- |
| Olive-sided flycatcher | S3S4B ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Threatened ^{5,6} |
| Prairie falcon | S1S2B ¹ Red ³ Priority 2 ⁴ Goal 3 ⁴ | -- |
| Rusty blackbird | S3S4B ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Sharp-tailed grouse, <i>columbianus</i> ssp. | S2S3 ¹ Blue ³ Priority 2 ⁴ Goal 1,3 ⁴ | -- |

TABLE 4.5.3 Cont'd

| Common Name | Provincial Designations | Federal Designations |
|---|---|--|
| Short-eared owl | S3B,S2N ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Sooty grouse | S3S4 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | -- |
| Spotted owl | S1 ¹ Red ³ Priority 2 ⁴ Goal 3 ⁴ | Endangered ^{5,6} |
| Surf scoter | S3B,S4N ¹ Blue ³ Priority 4 ⁴ Goal 2,3 ⁴ | -- |
| Swainson's hawk | S2B ¹ Red ³ Priority 2 ⁴ Goal 3 ⁴ | -- |
| Upland sandpiper | S1S2B ¹ Red ³ Priority 1 ⁴ Goal 3 ⁴ | -- |
| Western grebe | S1B,S2N ¹ Red ³ Priority 1 ⁴ Goal 3 ⁴ | -- |
| Western screech-owl, <i>macfarlanei</i> ssp. | S2 ¹ Red ³ Priority 1 ⁴ Goal 3 ⁴ | Endangered ⁵ Threatened ⁶ |
| Williamson's sapsucker | S3B ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Endangered ^{5,6} |
| Yellow-breasted chat, <i>auricollis</i> ssp. | S1S2B ¹ Red ³ Priority 1 ⁴ Goal 3 ⁴ | Endangered ^{5,6} |
| MAMMALS | | |
| American badger, <i>jeffersonii</i> ssp. | S1 ¹ Red ³ Priority 1 ⁴ Goal 3 ⁴ | Endangered ^{5,6} |
| Bighorn sheep | S3 ¹ Blue ³ Priority 3 ⁴ Goal 2 ⁴ | -- |
| Fisher | S2S3 ¹ Blue ³ Priority 2 ⁴ Goal 3 ⁴ | -- |
| Fringed myotis | S3 ¹ Blue ³ Priority 3 ⁴ Goal 3 ⁴ | Data Deficient ⁶ |

TABLE 4.5.3 Cont'd

| Common Name | Provincial Designations | Federal Designations |
|---|--|--------------------------------|
| Great Basin pocket mouse | S2 ¹ Red ³ Priority 2 ⁴ Goal 3 ⁴ | -- |
| Grizzly bear, western population | S3 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ⁶ |
| Little brown myotis | S4 ¹ Yellow ³ Priority 5 ⁴ Goal 3 ⁴ | Endangered ⁶ |
| Mountain beaver, <i>rainieri</i> ssp. | S3 ¹ Blue ³ Priority 1 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Mountain beaver, <i>rufa</i> ssp. | S3 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Northern myotis | S2S4 ¹ Blue ³ Priority 2 ⁴ Goal 3 ⁴ | Endangered ⁶ |
| Spotted bat | S3S4 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Townsend's big-eared bat | S3 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | -- |
| Trowbridge's shrew | S3 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | -- |
| Western small-footed myotis | S2S3 ¹ Blue ³ Priority 3 ⁴ Goal 3 ⁴ | -- |
| Wolverine, <i>luscus</i> ssp. | S3 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ⁶ |
| REPTILES AND AMPHIBIANS | | |
| Coastal tailed frog | S3S4 ¹ Blue ³ Priority 1 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Great Basin gopher snake, <i>deserticola</i> ssp. | S2S3 ¹ Blue ³ Priority 2 ⁴ Goal 3 ⁴ | Threatened ^{5,6} |
| Great Basin spadefoot | S3 ¹ Blue ³ Priority 1 ⁴ Goal 2 ⁴ | Threatened ^{5,6} |

TABLE 4.5.3 Cont'd

| Common Name | Provincial Designations | Federal Designations |
|---|--|--------------------------------|
| North American racer | S3 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Northern rubber boa | S4 ¹ Yellow ³ Priority 1 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Painted turtle, Intermountain-Rocky Mountain population | S2S3 ¹ Blue ³ Priority 2 ⁴ Goal 3 ⁴ | Special Concern ^{5,6} |
| Western rattlesnake | S3 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Threatened ^{5,6} |
| Western toad | S3S4 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| INVERTEBRATES | | |
| Monarch | S3B ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Olive clubtail | S1S2 ¹ Red ³ Priority 1 ⁴ Goal 3 ⁴ | Endangered ⁶ |

Notes: Status definitions are provided in Appendix B.

- 1 Provincial (S) rank assigned by the BC CDC (2013c).
- 2 Species listed under the BC *Wildlife Act* (BC CDC 2013c).
- 3 Provincial Red and Blue designations assigned by BC CDC (2013b).
- 4 Conservation goals and priorities established under the BC Conservation Framework (BC MOE 2009a,b).
- 5 Species listed under Schedule 1 of SARA (Environment Canada 2013a).
- 6 Species listed under COSEWIC (2013).

4.5.6 Aboriginal Traditional Knowledge

Along the Black Pines to Hope Segment, Aboriginal people would traditionally hunt in subalpine forest edges and alpine forests in the late summer and early fall for large game as part of the seasonal round. The mountain forests yielded mountain goat, bighorn sheep, elk, moose and deer. Ceremonial restrictions and protocols were considered to be important to the success of harvesting practices and a strict division of labor, organized according to gender, was observed to ensure the success of the harvest (Golder Associates 2008).

Concerns and recommendations identified during the desktop review, including research conducted for other proposed projects within the region focus on the sustainability of ungulate populations in the Thompson/Okanagan region namely, moose, bighorn sheep, mountain goat, mule deer and white-tailed deer. Aboriginal harvesters report overharvesting of mule deer and poaching as issues contributing to declining ungulate populations and, when combined with the building of new roads and corridors, increased access to game will contribute to further declines (First Nations Environmental Contaminants Program n.d.).

4.6 Hope to Burnaby Segment

4.6.1 Land Use Planning

The Hope to Burnaby Segment crosses one regional district, seven municipalities, and three resource or land use areas. Details of the wildlife and environmental objectives in each of the corresponding resource or land use plans are provided in Appendix C, Table C2.

4.6.2 Provincial Database

A search of the BC CDC records identified occurrences of wildlife species listed under Schedule 1 of SARA (Environment Canada 2013a) and/or COSEWIC (2013), as well as provincially listed wildlife species within 2 km of the Project (Table 4.6.1) (BC CDC 2012, 2013a).

TABLE 4.6.1

BRITISH COLUMBIA CONSERVATION DATA CENTRE RECORDS FOR OCCURRENCES OF SPECIES WITH SPECIAL CONSERVATION STATUS – HOPE TO BURNABY SEGMENT

| Common Name | Date of Record (Year) | Provincial Designations | Federal Designations |
|---------------------------------------|-----------------------|---|--------------------------------|
| BIRDS | | | |
| Great blue heron, <i>fannini</i> ssp. | 2002, 2009 | S2S3B,S4N ¹ Blue ³ Priority 1 ⁴ Goal 3 ⁴ | Special Concern ^{5,6} |
| Peregrine falcon, <i>anatum</i> ssp. | 2000, 2005, 2007 | S2?B ¹ Red ³ Priority 2 ⁴ Goal 3 ⁴ | Special Concern ^{5,6} |
| MAMMALS | | | |
| Mountain beaver, <i>rufa</i> ssp. | 1997 | S3 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Pacific water shrew | 2003 (dead), 1995 | S1S2 ¹ Red ³ Priority 1 ⁴ Goal 3 ⁴ | Endangered ^{5,6} |
| Townsend's big-eared bat | 1948 | S3 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | -- |
| Townsend's mole | 2001 | S1 ¹ Red ³ Priority 1 ⁴ Goal 3 ⁴ | Endangered ^{5,6} |
| Trowbridge's shrew | 2001 | S3 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | -- |
| Northern red-legged frog | 2010 | S3S4 ¹ Blue ³ Priority 1 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Oregon spotted frog | 2008 | S1 ¹ Red ³ Priority 1 ⁴ Goal 1,3 ⁴ | Endangered ^{5,6} |

TABLE 4.6.1 Cont'd

| Common Name | Date of Record (Year) | Provincial Designations | Federal Designations |
|---|-----------------------|---|---------------------------|
| REPTILES AND AMPHIBIANS | | | |
| Pacific giant salamander | 1994, 2007, 2011 | S2 ¹ Red ³ Priority 1 ⁴ Goal 3 ⁴ | Threatened ^{5,6} |
| Painted turtle, Pacific Coast population | 2010 | S2 ¹ Red ³ Priority 2 ⁴ Goal 3 ⁴ | Endangered ^{5,6} |

Notes: Status definitions are provided in Appendix B.

- 1 Provincial (S) rank assigned by the BC CDC (2013c).
- 2 Species listed under the BC *Wildlife Act* (BC CDC 2013c).
- 3 Provincial Red and Blue designations assigned by BC CDC (2013b).
- 4 Conservation goals and priorities established under the BC Conservation Framework (BC MOE 2009a,b).
- 5 Species listed under Schedule 1 of SARA (Environment Canada 2013a).
- 6 Species listed under COSEWIC (2013).

4.6.3 Provincially Identified Wildlife Areas

The Hope to Burnaby Segment is not located within or adjacent to a provincially identified wildlife area (BC MOE 2010, 2012b,c).

4.6.4 Parks and Protected Areas

Parks and protected areas near to the Hope to Burnaby Segment are shown in Figure 4.6.1. The proposed pipeline corridor is adjacent to the F.H. Barber Provincial Park from RK 1062.8 (d-62-B/92-H-5), which is situated in the Coastal Western Hemlock Biogeoclimatic Zone with vegetation representative of the undisturbed Fraser floodplain and provides habitat for birds and small mammals (BC MOE 2012d). The Hope to Burnaby Segment is also located within the DUC Priority 2 Landscape, BC Coastal Areas and Estuaries, which provides important migration and winter habitat that supports a wintering population of over one million waterfowl (DUC 2013). The proposed pipeline corridor is not located within or adjacent to an IBA, Migratory Bird Sanctuary, National Wildlife Area, western hemisphere shorebird reserve, Ramsar wetland or biosphere reserve (Bird Studies Canada and Nature Canada 2012, Bureau of the Convention on Wetlands 2013, Environment Canada 2012b, UNESCO 2012, WHSRN 2012).

The Hope to Burnaby Segment crosses the Cheam Lakes Wetland Regional Park from RK 1079.9 to RK 1080.0 and is adjacent (within 10 m at its closest point) to the southeast corner from RK 1080.0 to RK 1080.4. Along this segment, the proposed pipeline corridor is located on private land and is separated from the Park by a secondary road along the southern boundary. The Cheam Lakes Wetland Regional Park protects 93 ha of marsh, lake and uplands. Over 160 bird species have been identified within the Park and over 60 bird species have been recorded as nesting within the Park. Black bear, mink, river otter, short-tailed weasel, coyote, bobcat, black-tailed deer and American beaver have been recorded in the Park. The Park also provides habitat for rough-skinned newt, northwestern salamander, western toad and red-legged frog (Fraser Valley Regional District 2008).

The Hope to Burnaby Segment (RK 1102 to RK 1106) is located within 1.5 km of the Great Blue Heron Nature Reserve in Chilliwack, BC. The proposed pipeline corridor parallels the existing TMPL right-of-way for most of its length in proximity to the nature reserve and is located in residential and agricultural areas.

The proposed pipeline corridor will parallel the existing TMPL right-of-way through the segment of land that is leased by the Mountain View Conservation and Breeding Centre (Mountain View Conservation and Breeding Centre 2013). The Mountain View Conservation and Breeding Centre leases land that is owned privately and by the Crown. A field tour of the site was conducted on July 29, 2013 to review the routing of the proposed pipeline and to discuss the preferred timing for construction activities. It was determined

that August is the most suitable time in consideration of wildlife species at the Centre (particularly spotted owl), and site conditions would be dry at this time.

The Hope to Burnaby Segment crosses the Sumas Mountain Interregional Park from RK 1115.2 to RK 1120.7 and is parallel to the existing TMPL right-of-way for the entire length. The Park falls under the jurisdiction of both the Fraser Valley Regional District and the Metro Vancouver Regional District. The Sumas Mountain Interregional Park is centred on Sumas Mountain, which is a relatively isolated mountain surrounded by flat floodplains and the Fraser River. The area has been identified as having high biodiversity and supports species and ecosystems designated as at risk by the provincial and/or federal government. Amphibians and reptiles include the following: northern red-legged frog, pacific giant salamander, western toad, Oregon spotted frog, coastal tailed frog and rubber boa. Birds include American bittern, barn owl, double-crested cormorant, marbled murrelet, short-eared owl, western screech owl, band-tailed pigeon, barn swallow, great blue heron, peregrine falcon and spotted owl. Mammals include mountain beaver, snowshoe hare, Townsend's mole, pacific water shrew, Townsend's big-eared bat and Trowbridge's shrew (City of Abbotsford 2012). See Appendix C, Table C2 for further detail on the management plan for the Park.

The Hope to Burnaby Segment is located along the southwest boundary of the Surrey Bend Regional Park from RK 1160.5 to RK 1163.7. Urban development in Surrey does not allow for the proposed pipeline corridor to parallel the existing TMPL right-of-way and instead, the CN railway will be paralleled. Surrey Bend Regional Park provides a mosaic of foreshore and upland habitats that support a variety of wildlife species and provides a habitat reservoir for many species. Great blue herons, red-legged frog, and Pacific water shrew have been identified by local naturalists (Metro Vancouver and City of Surrey 2010). See Appendix C, Table C2 for further detail on the management plan for the Park.

4.6.5 Species with Special Conservation Status

Species with special conservation status that are provincially listed (BC CDC 2013b) or federally listed on Schedule 1 of SARA (Environment Canada 2013a) or by COSEWIC (2013) that have the potential to occur along the Hope to Burnaby Segment based on the desktop/literature review are provided in Table 4.6.2.

Along the Hope to Burnaby Segment, Environment Canada has identified *Proposed* critical habitat for Pacific water shrew and *Candidate* critical habitat for Oregon forest snail near the Cheam Lakes Wetland Regional Park. *Proposed* critical habitat for Pacific water shrew, *Candidate* critical habitat for Oregon forest snail and *Early Candidate* critical habitat for Townsend's mole has been identified near Sumas Mountain. *Proposed* critical habitat for Pacific water shrew has been identified at and south of Surrey Bend Regional Park. *Candidate* critical habitat for Oregon forest snail is located along the Vedder River south of Chilliwack, and *Early Candidate* critical habitat for barn owl (western population) is scattered along the proposed pipeline corridor in the Lower Mainland (Environment Canada 2013b).

TABLE 4.6.2

SPECIES WITH SPECIAL CONSERVATION STATUS – HOPE TO BURNABY SEGMENT

| Common Name | Provincial Designations | Federal Designations |
|--------------------|---|---|
| BIRDS | | |
| American bittern | S3B ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | -- |
| Band-tailed pigeon | S3S4B ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Barn owl | S3 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ⁵ Threatened ⁶ |

TABLE 4.6.2 Cont'd

| Common Name | Provincial Designations | Federal Designations |
|--|---|--------------------------------|
| Barn swallow | S3S4B ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Threatened ⁶ |
| California gull | S3B ¹ Blue ³ Priority 4 ⁴ Goal 3 ⁴ | -- |
| Canada goose, <i>occidentalis</i> ssp. | S2M ¹ Red ³ Priority 2 ⁴ Goal 3 ⁴ | -- |
| Common nighthawk | S4B ¹ Yellow ³ Priority 2 ⁴ Goal 2 ⁴ | Threatened ^{5,6} |
| Double-crested cormorant | S3S4B ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | -- |
| Ferruginous hawk | SNRN ¹ | Threatened ^{5,6} |
| Great blue heron, <i>fannini</i> ssp. | S2S3B, S4N ¹ Blue ³ Priority 1 ⁴ Goal 3 ⁴ | Special Concern ^{5,6} |
| Green heron | S3S4B ¹ Blue ³ Priority 4 ⁴ Goal 3 ⁴ | -- |
| Gyr Falcon | S3S4B ¹ Blue ³ Priority 4 ⁴ Goal 3 ⁴ | -- |
| Horned lark, <i>strigata</i> ssp. | SXB ¹ Red ³ Priority 1 ⁴ Goal 3 ⁴ | Endangered ^{5,6} |
| Long-tailed duck | S2S3B, S4N ¹ Blue ³ Priority 2 ⁴ Goal 3 ⁴ | -- |
| Marbled murrelet | S3B, S3N ¹ Blue ³ Priority 1 ⁴ Goal 1, 2 ⁴ | Threatened ^{5,6} |
| Northern goshawk, <i>laingi</i> ssp. | S2B ¹ Red ³ Priority 1 ⁴ Goal 1, 3 ⁴ | Threatened ^{5,6} |
| Olive-sided flycatcher | S3S4B ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Threatened ^{5,6} |
| Peregrine falcon, <i>anatum</i> ssp. | S2?B ¹ Red ³ Priority 2 ⁴ Goal 3 ⁴ | Special Concern ^{5,6} |

TABLE 4.6.2 Cont'd

| Common Name | Provincial Designations | Federal Designations |
|--|---|---|
| Short-eared owl | S3B,S2N ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Sooty grouse | S3S4 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | -- |
| Surf scoter | S3B,S4N ¹ Blue ³ Priority 4 ⁴ Goal 2,3 ⁴ | -- |
| Western grebe | S1B,S2N ¹ Red ³ Priority 1 ⁴ Goal 3 ⁴ | -- |
| Western screech-owl, <i>kennicottii</i> ssp. | S3 ¹ Blue ³ Priority 1 ⁴ Goal 2 ⁴ | Special Concern ⁵ Threatened ⁶ |
| MAMMALS | | |
| Eastern red bat | S1 ¹ Red ³ | -- |
| Keen's myotis | S2S3 ¹ Blue ³ Priority 1 ⁴ Goal 1,3 ⁴ | Data Deficient ⁶ |
| Little brown myotis | S4 ¹ Yellow ³ Priority 5 ⁴ Goal 3 ⁴ | Endangered ⁶ |
| Long-tailed weasel, <i>altifrontalis</i> ssp. | SH ¹ Red ³ | -- |
| Mountain beaver, <i>rufa</i> ssp. | S3 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Olympic shrew | S1S2 ¹ Red ³ Priority 1 ⁴ Goal 3 ⁴ | -- |
| Pacific water shrew | S1S2 ¹ Red ³ Priority 1 ⁴ Goal 3 ⁴ | Endangered ^{5,6} |
| Snowshoe hare, <i>washingtonii</i> ssp. | S1 ¹ Red ³ Priority 1 ⁴ Goal 3 ⁴ | -- |
| Southern red-backed vole, <i>occidentalis</i> ssp. | S1 ¹ Red ³ Priority 1 ⁴ Goal 3 ⁴ | -- |
| Townsend's big-eared bat | S3 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | -- |

TABLE 4.6.2 Cont'd

| Common Name | Provincial Designations | Federal Designations |
|--|--|--------------------------------|
| Townsend's mole | S1 ¹ Red ³ Priority 1 ⁴ Goal 3 ⁴ | Endangered ^{5,6} |
| Trowbridge's shrew | S3 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | -- |
| REPTILES AND AMPHIBIANS | | |
| Coastal tailed frog | S3S4 ¹ Blue ³ Priority 1 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Northern red-legged frog | S3S4 ¹ Blue ³ Priority 1 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Northern rubber boa | S4 ¹ Yellow ³ Priority 1 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Oregon spotted frog | S1 ¹ Red ³ Priority 1 ⁴ Goal 1,3 ⁴ | Endangered ^{5,6} |
| Pacific giant salamander | S2 ¹ Red ³ Priority 1 ⁴ Goal 3 ⁴ | Threatened ^{5,6} |
| Painted turtle, Pacific Coast population | S2 ¹ Red ³ Priority 2 ⁴ Goal 3 ⁴ | Endangered ^{5,6} |
| Western toad | S3S4 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| INVERTEBRATES | | |
| Dun skipper | S3 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Threatened ^{5,6} |
| Monarch | S3B ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Oregon forestsnail | S1S2 ¹ Red ³ Priority 1 ⁴ Goal 3 ⁴ | Endangered ^{5,6} |

Notes: Status definitions are provided in Appendix B.

- 1 Provincial (S) rank assigned by the BC CDC (2013c).
- 2 Species listed under the BC *Wildlife Act* (BC CDC 2013c).
- 3 Provincial Red and Blue designations assigned by BC CDC (2013b).
- 4 Conservation goals and priorities established under the BC Conservation Framework (BC MOE 2009a,b).
- 5 Species listed under Schedule 1 of SARA (Environment Canada 2013a).
- 6 Species listed under COSEWIC (2013).

4.6.6 **Aboriginal Traditional Knowledge**

Along the Hope to Burnaby Segment, Aboriginal people continue to harvest wildlife for sustenance and for traditional and ceremonial purposes. Large game is harvested in Fraser Canyon, approximately 1.8 km northwest of RK 1045 (Tomkins 2008). Communities gathered in permanent villages in winter and used upland areas for hunting, trapping beaver and marten, and collecting eggs of local bird species. Historically, the Stave River area (approximately 43 km north of RK 1138) was used extensively for hunting activities (Kwantlen First Nation 2013). Concerns and recommendations identified during the desktop review on other proposed projects within the region include declining mountain goat populations and the impacts of logging on wildlife and their habitat (Wonders 2008).

4.7 **Burnaby to Westridge Segment**

4.7.1 **Land Use Planning**

The Burnaby to Westridge Segment crosses one regional district, one municipality, and three resource or land use areas. Details of the wildlife and environmental objectives in each of the corresponding resource or land use plans are provided in Appendix C, Table C2.

4.7.2 **Provincial Database**

A search of the BC CDC records identified occurrences of wildlife species listed under Schedule 1 of SARA (Environment Canada 2013a) and/or COSEWIC (2013), as well as provincially listed wildlife species within 2 km of the Project (Table 4.7.1) (BC CDC 2012, 2013a).

TABLE 4.7.1

BRITISH COLUMBIA CONSERVATION DATA CENTRE RECORDS FOR OCCURRENCES OF SPECIES WITH SPECIAL CONSERVATION STATUS – BURNABY TO WESTRIDGE SEGMENT

| Common Name | Date of Record (Year) | Provincial Designations | Federal Designations |
|---------------------------------------|-----------------------|---|--------------------------------|
| BIRDS | | | |
| Great blue heron, <i>fannini</i> ssp. | 2003 | S2S3B,S4N ¹ Blue ³ Priority 1 ⁴ Goal 3 ⁴ | Special Concern ^{5,6} |
| MAMMALS | | | |
| Pacific water shrew | 1977 | S1S2 ¹ Red ³ Priority 1 ⁴ Goal 3 ⁴ | Endangered ^{5,6} |

Notes: Status definitions are provided in Appendix B.

- 1 Provincial (S) rank assigned by the BC CDC (2013c).
- 2 Species listed under the BC *Wildlife Act* (BC CDC 2013c).
- 3 Provincial Red and Blue designations assigned by BC CDC (2013b).
- 4 Conservation goals and priorities established under the BC Conservation Framework (BC MOE 2009a,b).
- 5 Species listed under Schedule 1 of SARA (Environment Canada 2013a).
- 6 Species listed under COSEWIC (2013).

4.7.3 **Provincially Identified Wildlife Areas**

The Burnaby to Westridge Segment is not located within or adjacent to a provincially identified wildlife area (BC MOE 2010, 2012b,c).

4.7.4 **Parks and Protected Areas**

Parks and protected areas near to the Burnaby to Westridge Segment are shown in Figure 4.6.1. The proposed pipeline corridor is located within the English Bay and Burrard Inlet IBA (BC020) from RK 3.2 (b-47-D/92-G-7) to RK 3.6 (d-47-D/92-G-7), which includes the shores of Burrard Inlet and English Bay.

The entire length of the proposed pipeline corridor in the IBA will be new cut, mostly through forested areas on private property. The IBA was designated primarily to protect western grebe, Barrow's goldeneye, surf scoter and great blue heron (*fannini* subspecies). The area also provides nesting habitat for pelagic and double-crested cormorants, osprey and bald eagle and the purple martin is commonly found nesting in nest-boxes along the shores (Bird Studies Canada and Nature Canada 2012).

The proposed pipeline corridor is also located within the DUC Priority 2 Landscape, BC Coastal Areas and Estuaries, which provides important migration and winter habitat that supports a wintering population of over one million waterfowl (DUC 2013). The Burnaby to Westridge Segment is not located within or adjacent to a provincial park or protected area, Migratory Bird Sanctuary, National Wildlife Area, Western Hemisphere Shorebird Reserve, Ramsar wetland or biosphere reserve (BC MOE 2012d, Bureau of the Convention on Wetlands 2013, Environment Canada 2012b, UNESCO 2012, WHSRN 2012).

The Burnaby to Westridge Segment is located along the southwest boundary of the Burnaby Mountain Conservation Area from RK 0.6 to RK 2.0. The proposed pipeline corridor parallels the Burnaby Mountain Parkway along this portion and is located within a forested area. The Burnaby Mountain Conservation Area is a forested mountain ecosystem that provides habitat for a variety of species, including blacktail deer, coyote, bald eagle, black bear and cougar (City of Burnaby 2013). See Appendix C, Table C2 for further detail on the management plans in the area.

4.7.5 Species with Special Conservation Status

Species with special conservation status that are provincially listed (BC CDC 2013b) or federally listed on Schedule 1 of SARA (Environment Canada 2013a) or by COSEWIC (2013) that have the potential to occur along the Burnaby to Westridge Segment based on the desktop/literature review are provided in Table 4.7.2.

TABLE 4.7.2

SPECIES WITH SPECIAL CONSERVATION STATUS – BURNABY TO WESTRIDGE SEGMENT

| Common Name | Provincial Designations | Federal Designations |
|--------------------------|---|---|
| BIRDS | | |
| American bittern | S3B ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | -- |
| Band-tailed pigeon | S3S4B ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Barn owl | S3 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ⁵ Threatened ⁶ |
| Barn swallow | S3S4B ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Threatened ⁶ |
| California gull | S3B ¹ Blue ³ Priority 4 ⁴ Goal 3 ⁴ | -- |
| Common nighthawk | S4B ¹ Yellow ³ Priority 2 ⁴ Goal 2 ⁴ | Threatened ^{5,6} |
| Double-crested cormorant | S3S4B ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | -- |

TABLE 4.7.2 Cont'd

| Common Name | Provincial Designations | Federal Designations |
|--|---|---|
| Great blue heron, <i>fannini</i> ssp. | S2S3B,S4N ¹ Blue ³ Priority 1 ⁴ Goal 3 ⁴ | Special Concern ^{5,6} |
| Green heron | S3S4B ¹ Blue ³ Priority 4 ⁴ Goal 3 ⁴ | -- |
| Gyrfalcon | S3S4B ¹ Blue ³ Priority 4 ⁴ Goal 3 ⁴ | -- |
| Horned lark, <i>strigata</i> ssp. | SXB ¹ Red ³ Priority 1 ⁴ Goal 3 ⁴ | Endangered ^{5,6} |
| Long-tailed duck | S2S3B,S4N ¹ Blue ³ Priority 2 ⁴ Goal 3 ⁴ | -- |
| Marbled murrelet | S3B,S3N ¹ Blue ³ Priority 1 ⁴ Goal 1,2 ⁴ | Threatened ^{5,6} |
| Northern goshawk, <i>laingi</i> ssp. | S2B ¹ Red ³ Priority 1 ⁴ Goal 1,3 ⁴ | Threatened ^{5,6} |
| Olive-sided flycatcher | S3S4B ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Threatened ^{5,6} |
| Short-eared owl | S3B,S2N ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Sooty grouse | S3S4 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | -- |
| Surf scoter | S3B,S4N ¹ Blue ³ Priority 4 ⁴ Goal 2,3 ⁴ | -- |
| Western grebe | S1B,S2N ¹ Red ³ Priority 1 ⁴ Goal 3 ⁴ | -- |
| Western screech-owl, <i>kennicottii</i> ssp. | S3 ¹ Blue ³ Priority 1 ⁴ Goal 2 ⁴ | Special Concern ⁵ Threatened ⁶ |
| MAMMALS | | |
| Keen's myotis | S2S3 ¹ Blue ³ Priority 1 ⁴ Goal 1,3 ⁴ | Data Deficient ⁶ |

TABLE 4.7.2 Cont'd

| Common Name | Provincial Designations | Federal Designations |
|---|--|--------------------------------|
| Little brown myotis | S4 ¹ Yellow ³ Priority 5 ⁴ Goal 3 ⁴ | Endangered ⁶ |
| Pacific water shrew | S1S2 ¹ Red ³ Priority 1 ⁴ Goal 3 ⁴ | Endangered ^{5,6} |
| Snowshoe hare, <i>washingtonii</i> ssp. | S1 ¹ Red ³ Priority 1 ⁴ Goal 3 ⁴ | -- |
| REPTILES AND AMPHIBIANS | | |
| Northern red-legged frog | S3S4 ¹ Blue ³ Priority 1 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Northern rubber boa | S4 ¹ Yellow ³ Priority 1 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| Western toad | S3S4 ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |
| INVERTEBRATES | | |
| Monarch | S3B ¹ Blue ³ Priority 2 ⁴ Goal 2 ⁴ | Special Concern ^{5,6} |

Notes: Status definitions are provided in Appendix B.

- 1 Provincial (S) rank assigned by the BC CDC (2013c).
- 2 Species listed under the BC *Wildlife Act* (BC CDC 2013c).
- 3 Provincial Red and Blue designations assigned by BC CDC (2013b).
- 4 Conservation goals and priorities established under the BC Conservation Framework (BC MOE 2009a,b).
- 5 Species listed under Schedule 1 of SARA (Environment Canada 2013a).
- 6 Species listed under COSEWIC (2013).

4.7.6 **Aboriginal Traditional Knowledge**

Along the proposed Burnaby to Westridge Segment, traditional harvesting continues to be an important element of livelihood and culture for Aboriginal communities in the region (NGPLP 2010). Concerns and recommendations identified on other proposed projects within the Tsleil-Waututh Nation traditional territory include concerns about the terrestrial impacts resulting from oil tankers traveling off the coast (NGPLP 2010).

4.8 **Facilities and Associated Infrastructure**

Existing and new facilities are located and/or proposed along the existing TMPL right-of-way and proposed pipeline corridor, including two proposed power lines. Work on the following facilities will be contained within the existing footprint and no new disturbance is planned: Edmonton Terminal, Wolf Pump Station, Edson Pump Station, Jasper Pump Station, Blue River Pump Station, Blackpool Pump Station, Darfield Pump Station, Kamloops Pump Station, Sumas Pump Station, Burnaby Terminal and Westridge Marine Terminal. Information on land use and the environmental setting for all other facilities is provided in Table 4.8.1.

TABLE 4.8.1

**DESKTOP/LITERATURE REVIEW RESULTS FOR FACILITIES
AND ASSOCIATED INFRASTRUCTURE**

| Facility | Pipeline Segment | Legal Location | RK | Land Use Planning | Provincial Database Records | Provincially Identified Wildlife Area | Environmentally Significant Areas or Parks and Protected Areas |
|--------------------------|--------------------------------|-----------------|-------|--|---|--|---|
| Gainford Pump Station | Edmonton to Hinton Segment | NE 13-53-6 W5M | 117.5 | Parkland County (see Appendix C, Table C1) | No FWMIS records within 2 km | N/A | DUC Level 1 Priority Landscape, Prairie Pothole Region and Western Boreal Forest |
| Hinton Pump Station | Edmonton to Hinton Segment | NW 33-49-26 W5M | 339.4 | Yellowhead County, Northern East Slopes SREMS (see Appendix C, Table C1) | Western toad (recorded from 2001 to 2011) Long-toed salamander (recorded from 1987 to 2011) Grizzly bear (recorded in 2000) | Special Access Area, Grizzly Bear Secondary Area (see Table 4.3.2) | DUC Level 1 Priority Landscapes, Prairie Pothole Region and Western Boreal Forest |
| Rearguard Pump Station | Hargreaves to Darfield Segment | d-68-K/83-D-14 | 498.3 | Regional District of Fraser-Fort George, Robson Valley LRMP (see Appendix C, Table C2) | No CDC records within 2 km | N/A | located 400 m to the east of the Rearguard Falls Provincial Park |
| Black Pines Pump Station | Black Pines to Hope Segment | d-41-K/92-I-16 | 811.9 | Thompson-Nicola Region, Kamloops LRMP (see Appendix C, Table C2) | American badger (recorded in 2001) | N/A | DUC Level 3 Priority Landscape, Eastern Boreal Forest |
| Black Pines power line | Black Pines to Hope Segment | d-41-K/92-I-16 | 811.9 | Thompson-Nicola Region, Kamloops LRMP (see Appendix C, Table C2) | No CDC records within 2 km | N/A | N/A |
| Kingsvale Pump Station | Black Pines to Hope Segment | b-23-L/92-H-15 | 956.0 | Thompson-Nicola Region, Kamloops LRMP (see Appendix C, Table C2) | No CDC records within 2 km | Located 40 m south of UWR u-3-003 (mule deer) | N/A |
| Kingsvale power line | Black Pines to Hope Segment | b-23-L/92-H-15 | 956.0 | Thompson-Nicola Region, Kamloops LRMP (see Appendix C, Table C2) | No CDC records within 2 km | Located within UWR u-3-003 (mule deer) for 6.2 km and within WHA 3-143 (Williamson's sapsucker) for 952 m. See Figure 4.8.1. | N/A |

TABLE 4.8.1 Cont'd

| Facility | Pipeline Segment | Legal Location | RK | Land Use Planning | Provincial Database Records | Provincially Identified Wildlife Area | Environmentally Significant Areas or Parks and Protected Areas |
|----------------|-------------------------|----------------|--------|--|--|---------------------------------------|--|
| Sumas Terminal | Hope to Burnaby Segment | a-97-B/92-G-01 | 1117.5 | City of Abbotsford in the Fraser Valley Region District (see Appendix C, Table C2) | Mountain beaver, <i>rufa</i> ssp. (recorded in 1974; 1997) Oregon forest snail (recorded in 2009) | N/A | DUC Level 2 Priority Landscape, BC Coastal Areas and Estuaries |

Sources: AESRD 2013b, BC CDC 2012, 2013a, BC MOE 2012d

5.0 RESULTS OF FIELD DATA COLLECTION

5.1 General Habitat Information

A general description of the pipeline segments is provided below and additional information can be found in the relevant study conducted for the Project in Volume 5C (e.g., Wetland Evaluation Technical Report, Fisheries Technical Reports and Vegetation Technical Report). Select Photoplates for each pipeline segment are provided in Appendix D.

5.1.1 Edmonton to Hinton Segment

The Edmonton to Hinton Segment crosses a mosaic of land uses and habitat types, including suburban areas associated with cities and towns, agricultural fields (*i.e.*, cultivation and hay fields), pasture and forested areas (Plate D-1). Suburban and agricultural areas are predominant along the east end of this segment, whereas forested areas are predominant along the west end. These forested areas include sections of deciduous, coniferous and mixedwood forest consisting of trembling aspen, white spruce, black spruce, jack pine, balsam fir and less commonly balsam poplar and paper birch. Timber harvest has occurred in upland mixedwood forests and these areas are at various stages of regeneration. The Edmonton to Hinton Segment crosses two wildfire burns that occurred within the last 40 years: 2009 (RK 188.7 to RK 189.4); and 2010 (RK 135.9 to RK 136.3) (AESRD 2013d). Most of the wetlands crossed or located in the vicinity of the proposed pipeline corridor along this segment are surrounded by cultivation or tame pasture with larger expanses of treed bogs and fens encountered towards the western half of the proposed pipeline segment. Terrain is generally level to gently undulating along the Edmonton to Hinton Segment with moderate to steep slopes encountered at watercourse crossings (*i.e.*, the North Saskatchewan, Pembina, McLeod and Athabasca rivers) and gently to moderately undulating terrain within the Lower Foothills and Montane natural subregions.

5.1.2 Hargreaves to Darfield Segment

The Hargreaves to Darfield Segment crosses a mosaic of land uses and habitat types, including suburban areas associated with cities and towns, agricultural fields, pasture and forested areas. Agricultural areas are generally located within the vicinity of towns and cities. Forested areas generally consist of Douglas-fir, Engelmann spruce, white spruce, lodgepole pine, and trembling aspen with ponderosa pine encountered on warm dry slopes towards the southern end of the proposed pipeline segment. The northern portion of the proposed pipeline corridor is located within the North Thompson River valley. The existing TMPL right-of-way, Highway 5 and a railway also occur in this valley (Plate D-2). There are a number of cutblocks in various stages of regeneration along this segment and selective harvesting occurs in many areas. The Hargreaves to Darfield Segment crosses two wildfire burns that occurred within the last 40 years: 1998 (RK 639.6 to RK 647.3); and 2007 (RK 706.4 to RK 706.5) (BC MFLNRO 2013). Wetlands encountered along the Hargreaves to Darfield Segment are generally associated with streams and oxbow lakes, with a small number of shrubby/treed fens and bogs. Terrain varies from flat to gently undulating on wide valley bottoms to moderately undulating hills and steeper slopes along some watercourses and narrow valleys.

5.1.3 Black Pines to Hope Segment

The Black Pines to Hope Segment crosses a mosaic of land uses and habitat types, including suburban areas associated with cities and towns, agricultural fields (*i.e.*, cultivation and hay fields), pasture, grasslands and forested areas. The grasslands north and south of Kamloops show signs of human disturbance in the form of trails, access roads and cattle grazing. Forested areas are generally dominated by Douglas-fir and ponderosa pine with open, grassy understories, particularly in ponderosa pine stands. Areas of ponderosa pine forest also contain large open grassland areas interspersed with big sage brush (Plate D-3). Selective forest harvest is common along this segment, as evidenced by old stumps on the forest floor and sporadic large veteran Douglas-fir trees. Cattle grazing is prevalent in replanted and naturally regenerating forest cutblocks within southern BC (Krzic *et al.* 2001). The Black Pines to Hope Segment crosses three wildfire burns that occurred within the last 40 years: 1987 (RK 830.1 to RK 830.7); 2008 (RK 826.5 to RK 826.6); and 2009 (RK 826.3 to RK 826.7) (BC MFLNRO 2013). Wetlands encountered along the Black Pines to Hope Segment are generally associated with streams and oxbow lakes, with a number of shrubby/treed fens and bogs. Terrain along the proposed pipeline segment varies

from flat to gently undulating in large valley bottoms to moderately and steeply undulating hills through the grasslands and forested areas north and south of Kamloops. Steeper slopes are encountered along some watercourses and narrow valleys (e.g., Coquihalla Valley).

5.1.4 *Hope to Burnaby Segment*

There is a high level of anthropogenic disturbance along the Hope to Burnaby Segment, which is characterized by agricultural fields and urban, residential and industrial complexes (Plate D-4). Throughout this area are residual pockets of suitable habitat for several species, which are of increasing importance with the level of disturbance. Forested areas typically have open understories and are dominated by Douglas-fir, western hemlock and western red cedar. Riparian areas are dominated by black cottonwood. Wetlands encountered along this segment are generally associated with streams and oxbow lakes, with a number of shrubby/treed fens and bogs. The Hope to Burnaby Segment follows south of the Fraser River and the terrain is generally flat with some undulating hills.

5.1.5 *Burnaby to Westridge Segment*

The Burnaby to Westridge Segment is characterized by residential neighborhoods and industrial complexes within Burnaby. There is a small residual forest stand that is dominated by western red cedar, western hemlock and Douglas-fir. This area is located adjacent to the coast and is flat with a small stream running through the centre.

5.1.6 *Facilities and Associated Infrastructure*

A summary of the area potentially affected by new clearing for facilities and associated infrastructure is provided in Table 5.1.1.

TABLE 5.1.1

GENERAL REVIEW FOR FACILITIES AND ASSOCIATED INFRASTRUCTURE

| Facility | Pipeline Segment | Description ¹ |
|--------------------------|--------------------------------|---|
| Gainford Pump Station | Edmonton to Hinton Segment | Existing facility; new clearing required on industrial and forested land extending approximately 35 m west of the currently fenced boundary. |
| Edson Pump Station | Edmonton to Hinton Segment | Existing facility; clearing of small patch of trees required within the existing fenced boundary. |
| Hinton Pump Station | Edmonton to Hinton Segment | Existing facility; new clearing required on industrial and forested land extending approximately 35 m west of the currently fenced boundary. |
| Rearguard Pump Station | Hargreaves to Darfield Segment | Existing facility; new clearing required on industrial and previously disturbed grassy area with low shrub cover east of the existing fenced boundary. |
| Black Pines Pump Station | Black Pines to Hope Segment | New facility; new clearing of approximately 150 m by 150 m of forested land. |
| Black Pines power line | Black Pines to Hope Segment | New 138 kV power line, approximately 2.2 km in length; new clearing of forested land required for length of power line |
| Kingsvale Pump Station | Black Pines to Hope Segment | Existing facility; new clearing and grading required to expand the facility boundary approximately 40 m to the southeast. |
| Kingsvale power line | Black Pines to Hope Segment | New 138 kV power line, approximately 23.5 km in length; parallels existing power line and pipeline rights-of-way for approximately 8.4 km; requires new clearing of forested lands for approximately 15.1 km. |
| Sumas Terminal | Hope to Burnaby Segment | Existing facility; new clearing required forested land extending approximately 20 m north of the existing fenced boundary. |
| Burnaby Terminal | Hope to Burnaby Segment | Existing facility; clearing of remnant patches of trees required within the fenced boundary of the existing facility. |

Note: All distances are approximate

5.2 **Results of Field Data Collection**

The results of the wildlife field surveys are provided below and a list of all wildlife species observed during the field surveys (i.e., does not include incidental wildlife observations) is provided in Appendix E. All distances of observations are generally from the centreline of the corridor rather than the outer edge of the proposed pipeline corridor.

5.2.1 General Aerial Reconnaissance and Wildlife Feature Review

Aerial reconnaissance overflights were completed from May 8 to 9, 2013 in Alberta, from April 1 to 4, 2013 in BC, and from August 19 to 20, 2012 and September 23 to 24, 2012 specifically for wetlands. A total of 62 occupied stick nests (1 golden eagle, 35 bald eagle, 5 osprey, 8 red-tailed hawk, 1 Cooper's hawk, 1 peregrine falcon, 1 Canada goose, 2 great horned owl and 8 unknown raptor species nests) were observed during the aerial reconnaissance overflights. Of these, the peregrine falcon nest and two red-tailed hawk nests are located within the proposed pipeline corridor. The bald eagle, osprey, three red-tailed hawk and four unknown raptor species nests are located outside of the proposed pipeline corridor but are located within a species-specific recommended setback.

5.2.2 Winter Track Survey

Winter track surveys were completed from January 12 to March 11, 2013. Transects were completed along three pipeline segments; due to limited snow cover and land access, no transects were surveyed from Hope to Westridge. The locations of the 45 completed winter track transects (10 in Alberta and 35 in BC) are provided in Figures 5.2.1 to 5.2.3.

During the winter track surveys, a total of 3,192 tracks were observed and 17 species groups were identified (Table 5.2.1). Hare were the most commonly observed tracks ($n = 1,210$), followed by deer ($n = 884$), and squirrel ($n = 505$). Fox tracks were observed only along the Edmonton to Hinton Segment; wolf and wolverine tracks were observed only along the Hargreaves to Darfield Segment; and chipmunk tracks were observed only along the Hope to Westridge Segment. The mean number of track types was consistent across pipeline segments and estimated species richness ranged from 4.1 (Black Pines to Hope Segment) to 4.9 (Edmonton to Hinton Segment). Mean track density per km per day since last snow fall was also calculated. Along the Edmonton to Hinton Segment, mean track density ranged from 0.04 tracks/km/day (weasel) to 8.0 tracks/km/day (hare); mean track density along the Hargreaves to Darfield Segment ranged from <0.1 tracks/km/day (wolverine and cougar) to 7.9 tracks/km/day (hare); and mean track density along the Black Pines to Hope Segment ranged from <0.1 tracks/km/day (marten/fisher) to 6.9 tracks/km/day (deer) (Table 5.2.2).

Small mammals were present along all surveyed segments of the proposed pipeline corridor. Where present, mean track densities for small mammals ranged from <0.1 to 8.0 tracks/km/day. Hares were the most common small mammal identified in all three pipeline segments and were most abundant in the eastern two pipeline segments. Squirrels were the next most common small mammal with an increase in track density from east to west.

Mustelids were present along all surveyed segments and a total of three types of mustelid (weasel, fisher/marten, and wolverine) were identified during the winter track surveys. Where present, mean track densities for mustelids ranged from <0.1 to 0.7 tracks/km/day. Weasels were overall the most common mustelids identified and their track density increased from east to west. However, more marten/fisher tracks were observed in both the Edmonton to Hinton and Hargreaves to Darfield segments. Wolverine were identified only along the Hargreaves to Darfield Segment (<0.1 tracks/km/day).

Large carnivores were present along all surveyed segments and a total of five types of large carnivore (two felids and three canids) were identified during the winter track surveys. Where present, mean track densities for large carnivores ranged from <0.1 to 2.3 tracks/km/day. Coyotes were the most common large carnivore identified and had the highest track densities along the Hargreaves to Darfield Segment (2.3 tracks/km/day). Cougar was the least common large carnivore identified, however, the density of cougar tracks was higher than all other groups along the Black Pines to Hope Segment (0.1 tracks/km/day). Fox tracks were identified only along the Edmonton to Hinton Segment (0.2 tracks/km/day) and wolf tracks were identified only along the Hargreaves to Darfield Segment (0.2 tracks/km/day). Unknown canid tracks were observed on two separate transects along the Hargreaves to Darfield Segment.

Ungulates were present along all surveyed segments and were identified as either deer or moose. Where present, mean track densities for ungulates ranged from 0.1 to 6.9 tracks/km/day. Deer were the most common ungulates identified in all three pipeline segments and had the highest track densities within the Black Pines to Hope Segment (6.9 tracks/km/day). Track densities of moose were much lower than for

deer, and the highest track densities were along the Hargreaves to Darfield Segment (1.4 tracks/km/day). No woodland caribou tracks were observed.

Bird tracks were observed along all surveyed segments and were identified as either upland game birds or owls/raptors. Where present, mean track densities for birds ranged from <0.1 to 1.0 tracks/km/day. Upland game birds were more common than owls/raptors and the highest track density was along the Hargreaves to Darfield Segment (1.0 tracks/km/day). All other observed track densities for birds were ≤ 0.1 tracks/km/day.

During winter track surveys, two species with special conservation status were identified. Wolverine (Hargreaves to Darfield Segment) was the only confirmed species with special conservation status, and potential fisher tracks (Hargreaves to Darfield Segment) were also observed but were not confirmed.

TABLE 5.2.1

OBSERVED WINTER TRACK COUNTS BY PIPELINE SEGMENT AND NATURAL REGION OR ECOPROVINCE

| Pipeline Segment | Natural Region/ Ecoprovince | Mouse/ Vole | Chipmunk | Squirrel | Hare | Weasel | Marten/ Fisher | Wolverine | Lynx | Cougar | Fox | Coyote | Wolf | Canid | Deer | Moose | Owl/ Raptor | Upland Game Bird |
|------------------------|--------------------------------|----------------|----------|------------|-------------|-----------|-------------------|-----------|-----------|----------|-----------|------------|-----------|----------|------------|------------|----------------|---------------------|
| Edmonton to Hinton | Boreal Forest | 0 | 0 | 9 | 76 | 0 | 2 | 0 | 0 | 0 | 10 | 41 | 0 | 0 | 78 | 0 | 2 | 0 |
| | Foothills | 8 | 0 | 17 | 288 | 2 | 4 | 0 | 9 | 0 | 0 | 10 | 0 | 0 | 159 | 24 | 1 | 4 |
| | Rocky Mountains | 1 | 0 | 2 | 67 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 12 | 21 | 0 | 0 |
| | Segment Total | 9 | 0 | 28 | 431 | 2 | 6 | 0 | 13 | 0 | 10 | 51 | 0 | 0 | 249 | 45 | 3 | 4 |
| Hargreaves to Darfield | Southern Interior Mountains | 2 | 0 | 151 | 392 | 9 | 24 | 2 | 7 | 2 | 0 | 109 | 12 | 9 | 132 | 68 | 5 | 47 |
| | Southern Interior | 1 | 0 | 11 | 3 | 2 | 3 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 1 | 1 | 0 | 1 |
| | Segment Total | 3 | 0 | 162 | 395 | 11 | 27 | 2 | 7 | 2 | 0 | 114 | 12 | 9 | 133 | 69 | 5 | 48 |
| Black Pines to Hope | Southern Interior | 62 | 4 | 315 | 384 | 49 | 1 | 0 | 0 | 7 | 0 | 2 | 0 | 0 | 502 | 10 | 3 | 3 |
| Total Count | | 74 | 4 | 505 | 1210 | 62 | 34 | 2 | 20 | 9 | 10 | 167 | 12 | 9 | 884 | 124 | 11 | 55 |

TABLE 5.2.2

MEAN DENSITY OF WINTER TRACKS BY PIPELINE SEGMENT AND NATURAL REGION OR ECOPROVINCE

| Pipeline Segment | Natural Region/ Ecoprovince | Mouse/ Vole | Chipmunk | Squirrel | Hare | Weasel | Marten/ Fisher | Wolverine | Lynx | Cougar | Fox | Coyote | Wolf | Canid | Deer | Moose | Owl/ Raptor | Upland Game Bird |
|-------------------------------|--------------------------------|----------------|-----------|------------|------------|----------------|-------------------|----------------|------------|----------------|------------|------------|------------|------------|------------|------------|----------------|---------------------|
| Edmonton to Hinton | Boreal Forest | -- | -- | 2.0 | 17.3 | -- | 0.5 | -- | -- | -- | 2.3 | 9.3 | -- | -- | 17.7 | -- | 0.5 | -- |
| | Foothills | 0.2 | -- | 0.4 | 6.0 | <0.1 | 0.1 | -- | 0.2 | -- | -- | 0.2 | -- | -- | 3.3 | 0.5 | <0.1 | 0.1 |
| | Rocky Mountains | 0.7 | -- | 1.4 | 46.2 | -- | -- | -- | 2.8 | -- | -- | -- | -- | -- | 8.3 | 14.5 | -- | -- |
| | Segment Total | 0.2 | -- | 0.5 | 8.0 | <0.1 | 0.1 | -- | 0.2 | -- | 0.2 | 0.9 | -- | -- | 4.6 | 0.8 | 0.1 | 0.1 |
| Hargreave s to Darfield | Southern Interior Mountains | <0.1 | -- | 3.1 | 8.1 | 0.2 | 0.5 | <0.1 | 0.1 | <0.1 | -- | 2.3 | 0.2 | 0.2 | 2.7 | 1.4 | 0.1 | 1.0 |
| | Southern Interior | 0.7 | -- | 7.3 | 2.0 | 1.3 | 2.0 | -- | -- | -- | -- | 3.3 | -- | -- | 0.7 | 0.7 | -- | 0.7 |
| | Segment Total | 0.1 | -- | 3.3 | 7.9 | 0.2 | 0.5 | <0.1 | 0.1 | <0.1 | -- | 2.3 | 0.2 | 0.2 | 2.7 | 1.4 | 0.1 | 1.0 |
| Black Pines to Hope | Southern Interior | 0.9 | 0.1 | 4.3 | 5.3 | 0.7 | <0.1 | -- | -- | 0.1 | -- | <0.1 | -- | -- | 6.9 | 0.1 | <0.1 | <0.1 |

5.2.3 *Aerial Waterbird Survey*

Aerial waterbird surveys were completed for both the breeding and fall staging periods. Aerial waterbird breeding surveys were completed from May 22 to June 21, 2013 and aerial waterbird fall staging surveys were completed from September 27 to October 17, 2012 and from September 24 to October 9, 2013 (Figures 5.2.4 to 5.2.11). The 2012 fall staging survey included the proposed pipeline corridor from Edmonton to Edson. The Project scope was expanded following the 2012 survey to include the portion from Edson to Hinton. The 2013 breeding and fall staging surveys included the entire length of the proposed pipeline corridor. Results of the aerial waterbird surveys are summarized in Table 5.2.3.

TABLE 5.2.3

RESULTS OF THE AERIAL WATERBIRD BREEDING AND FALL STAGING SURVEYS BY PIPELINE SEGMENT

| Species | Edmonton to Hinton | | | Hargreaves to Darfield | | | Black Pines to Hope | | | Hope to Westridge | | |
|--------------------------------|--------------------------------|---------------|-------------------|--------------------------------|---------------|-------------------|--------------------------------|---------------|-------------------|-------------------|---------------|-------------------|
| | Fall Staging 2012 ¹ | Breeding 2013 | Fall Staging 2013 | Fall Staging 2012 ¹ | Breeding 2013 | Fall Staging 2013 | Fall Staging 2012 ¹ | Breeding 2013 | Fall Staging 2013 | Fall Staging 2012 | Breeding 2013 | Fall Staging 2013 |
| American coot | 0 | 4 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| American wigeon | 0 | 8 | 0 | 3 | 2 | 7 | 0 | 8 | 187 | 0 | 0 | 6 |
| Barrow's goldeneye | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 45 | 0 | 0 | 0 | 0 |
| Blue-winged teal | 0 | 35 | 0 | 0 | 0 | 9 | 0 | 2 | 0 | 0 | 0 | 0 |
| Bonaparte's gull | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bufflehead | 0 | 38 | 0 | 0 | 3 | 0 | 2 | 6 | 5 | 0 | 0 | 5 |
| Canada goose | 78 | 76 | 349 | 58 | 82 | 0 | 435 | 134 | 73 | 43 | 26 | 380 |
| Canvasback | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cinnamon teal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 |
| Common goldeneye | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Common loon | 0 | 12 | 0 | 0 | 4 | 1 | 0 | 5 | 2 | 0 | 0 | 0 |
| Common merganser | 0 | 2 | 0 | 2 | 1 | 8 | 0 | 1 | 0 | 0 | 1 | 2 |
| Double-crested cormorant | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 |
| Gadwall | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 2 | 0 | 0 | 7 |
| Glaucous-winged gull | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 20 | 2 | 0 |
| Great blue heron | 1 | 2 | 0 | 0 | 0 | 0 | 5 | 1 | 4 | 2 | 5 | 5 |
| Greater scaup | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Green-winged teal | 0 | 4 | 0 | 0 | 2 | 0 | 29 | 6 | 22 | 6 | 0 | 2 |
| Hooded merganser | 0 | 0 | 0 | 6 | 1 | 5 | 0 | 3 | 3 | 0 | 0 | 0 |
| Horned grebe | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Lesser scaup | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 0 |
| Mallard | 0 | 104 | 45 | 51 | 15 | 17 | 78 | 142 | 125 | 44 | 23 | 243 |
| Northern pintail | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Northern shoveler | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 15 | 15 | 0 | 0 | 0 |
| Pied-billed grebe | 0 | 0 | 0 | 2 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| Redhead | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| Red-necked grebe | 0 | 8 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ring-necked duck | 0 | 44 | 0 | 0 | 17 | 0 | 0 | 55 | 11 | 10 | 0 | 0 |
| Sandhill crane | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trumpeter swan | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wood duck | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 2 | 50 |
| Unidentified | 169 | 271 | 1,292 | 2 | 18 | 39 | 10 | 22 | 38 | 1 | 0 | 550 |
| Total Number of Birds | 252 | 643 | 1,686 | 125 | 148 | 93 | 559 | 471 | 488 | 141 | 61 | 1,250 |
| Species Richness ² | 0.7 | 1.8 | 1.0 | 1.3 | 1.0 | 1.6 | 1.4 | 1.7 | 2.1 | 1.4 | 1.6 | 1.3 |
| Species Diversity ³ | 0 | 0.5 | 0 | 0.2 | 0.1 | 0.3 | 0.2 | 0.4 | 0.5 | 0.2 | 0.2 | 0.1 |

Note:

1

The 2012 fall staging survey included the proposed pipeline corridor from Edmonton to Edson (the section from Edson to Hinton was added later); the 2013 breeding and fall staging surveys included the entire length of the proposed pipeline corridor along the Edmonton to Hinton Segment.

2

Mean species richness, calculated as the total number of species observed on each waterbody surveyed divided by the total number of waterbodies surveyed along the route segment.

3

Mean species diversity, calculated as the sum of species diversity for each waterbody surveyed divided by the total number of waterbodies surveyed along the route segment. The Shannon-Wiener Index was used to calculate species diversity (see Section 3.7.3).

5.2.3.1 *Aerial Waterbird Breeding Surveys*

During the breeding survey, waterbirds were observed at 182 waterbodies within 500 m of the centre of the proposed pipeline corridor. A total of 1,323 birds were observed and 28 species were identified (Table 5.2.3). Three species with special conservation status were observed during the breeding surveys: double-crested cormorant (Edmonton to Hinton and Hope to Westridge segments), great blue heron (Edmonton to Hinton, Black Pines to Hope, and Hope to Westridge segments) and horned grebe (Edmonton to Hinton Segment). During the breeding surveys, Canada goose was the most commonly observed species ($n = 318$), followed by mallard ($n = 284$) and ring-necked duck ($n = 116$). Canada goose, mallard and common merganser were observed along all four segments. There were four species observed only once during the surveys and these occurred along the Edmonton to Hinton Segment: Bonaparte's gull, canvasback, common goldeneye and sandhill crane. During the breeding surveys, mean species richness ranged from 1.0 (Hargreaves to Darfield Segment) to 1.8 (Edmonton to Hinton Segment) and mean species diversity ranged from 0.1 (Hargreaves to Darfield Segment) to 0.5 (Edmonton to Hinton Segment) (Table 5.2.3).

Results of the breeding survey for each pipeline segment are presented in the following paragraphs. Mean species richness and diversity were calculated for each Natural Region or Ecoprovince along each segment (Table 5.2.4).

Along the Edmonton to Hinton Segment, a total of 643 birds were observed and 24 species were identified (Table 5.2.3). Mallard was the most commonly observed species ($n = 104$), followed by Canada goose ($n = 76$), ring-necked duck ($n = 44$), bufflehead ($n = 38$) and blue-winged teal ($n = 35$). Seven species were observed only along this segment: red-necked grebe; northern pintail; horned grebe; Bonaparte's gull; canvasback; common goldeneye; and sandhill crane. Mean species richness ranged from 1.0 (Rocky Mountain Natural Region) to 1.9 (Boreal Forest Natural Region) and mean species diversity ranged from 0 (Rocky Mountain Natural Region where only one bird was observed) to 0.5 (Boreal Forest Natural Region) (Table 5.2.4).

Along the Hargreaves to Darfield Segment, a total of 148 birds were observed and 13 species were identified (Table 5.2.3). Canada goose was the most commonly observed species ($n = 82$), followed by ring-necked duck ($n = 17$) and mallard ($n = 15$). Mean species richness was 1.0 for both the Southern Interior Mountains and Southern Interior ecoprovinces. Mean species diversity ranged from 0.09 (Southern Interior Mountains Ecoprovince) to 0.1 (Southern Interior Ecoprovince) (Table 5.2.4).

Along the Black Pines to Hope Segment, a total of 471 birds were observed and 18 species were identified (Table 5.2.3). Mallard was the most commonly observed species ($n = 142$), followed by Canada goose ($n = 134$), ring-necked duck ($n = 55$) and Barrow's goldeneye ($n = 45$). Barrow's goldeneye, gadwall and cinnamon teal were observed only along this segment. Mean species richness ranged from 0.8 (Coast and Mountains Ecoprovince) to 1.8 (Southern Interior Ecoprovince) and mean species diversity ranged from 0 (Coast and Mountains Ecoprovince where only one species was observed on each waterbody with observations) to 0.4 (Southern Interior Ecoprovince) (Table 5.2.4).

Along the Hope to Westridge Segment, a total of 61 birds were observed and 7 species were identified (Table 5.2.3). Canada goose was the most commonly observed species ($n = 26$), followed by mallard ($n = 23$) and great blue heron ($n = 5$). Glaucous-winged gull and wood duck were observed only along this segment. Mean species richness ranged from 0.2 (Coast and Mountains Ecoprovince) to 1.7 (Georgia Depression Ecoprovince) and mean species diversity ranged from 0.02 (Coast and Mountains Ecoprovince) to 0.3 (Georgia Depression Ecoprovince) (Table 5.2.4).

TABLE 5.2.4

**AERIAL WATERBIRD BREEDING SURVEY SPECIES RICHNESS, DENSITY AND DIVERSITY
BY NATURAL REGION OR ECOPROVINCE**

| Pipeline Segment | Natural Region or Ecoprovince | Number of Waterbodies | Species Richness | Species Diversity |
|------------------------|-------------------------------|-----------------------|------------------|-------------------|
| Edmonton to Hinton | Boreal Forest | 43 | 1.9 | 0.5 |
| | Foothills | 37 | 1.8 | 0.5 |
| | Rocky Mountains | 1 | 1.0 | 0 |
| | Segment Total | 81 | 1.8 | 0.5 |
| Hargreaves to Darfield | Southern Interior Mountains | 20 | 1.0 | 0.1 |
| | Southern Interior | 7 | 1.0 | 0.1 |
| | Segment Total | 27 | 1.0 | 0.1 |
| Black Pines to Hope | Southern Interior | 43 | 1.8 | 0.4 |
| | Coast and Mountains | 4 | 0.8 | 0.0 |
| | Segment Total | 47 | 1.7 | 0.4 |
| Hope to Westridge | Coast and Mountains | 6 | 0.2 | <0.1 |
| | Georgia Depression | 21 | 1.7 | 0.3 |
| | Segment Total | 27 | 1.6 | 0.2 |
| Total | | 182 | 1.6 | 0.4 |

IBP was calculated for all waterbird observations that were identified to species and sex during the breeding surveys. Observations that were recorded as “unclassified” were removed from the analysis. IBP was calculated for both wetlands (e.g., wetlands, marshes and lakes) and watercourses (e.g., streams and rivers). Included in the analysis were 94 wetlands and 8 watercourses, including the Albreda and North Thompson rivers (Hargreaves to Darfield Segment), the Coquihalla, Coldwater and Nicola rivers and Zoht Creek (Black Pines to Hope Segment), and the Elk Brook and Sumas Lake Canal (Hope to Westridge Segment).

Breeding pairs were observed on all wetland size classes and results of the IBP analysis are presented in Table 5.2.5. The following summary of results is based on mean IBP/wetland and mean density of IBP/ha. For the entire proposed pipeline corridor, there was a mean IBP of 2.9 ± 4.7 IBP/wetland and a mean density of 2.6 ± 3.9 IBP/ha. The most IBP were observed on wetland size class >50 ha (14.8 ± 21.0 IBP/wetland) and the fewest IBP were observed wetland size class 0-1 ha (1.9 ± 2.0 IBP/wetland). The highest IBP density was recorded for wetland size class 0-1 ha (5.8 ± 5.3 IBP/ha) and the lowest IBP density was recorded for wetland size class 20-50 ha (0.1 ± 0.2 IBP/ha).

Along the Edmonton to Hinton Segment, there was a mean IBP of 2.5 ± 1.9 IBP/wetland and a mean density of 2.1 ± 3.5 IBP/ha. The most IBP were observed on wetland size class 20-50 ha (9.0 IBP/wetland) and the fewest IBP were observed wetland size class 0-1 ha (1.8 ± 1.3 IBP/wetland). The highest IBP density was recorded for wetland size class 0-1 ha (5.2 ± 5.3 IBP/ha) and the lowest IBP density was recorded for wetland size class >50 ha (0.05 IBP/ha).

Along the Hargreaves to Darfield Segment, there was a mean IBP of 1.7 ± 1.6 IBP/wetland and a mean density of 1.0 ± 1.8 IBP/ha. The most IBP were observed on wetland size class 2-3 ha (6.0 IBP/wetland) and the fewest IBP were observed wetland size class 5-10 ha (0.5 IBP/wetland). The highest IBP density was recorded for wetland size class 0-1 ha (3.9 ± 2.8 IBP/ha) and the lowest IBP density was recorded for wetland size class >50 ha (<0.1 IBP/ha).

Along the Black Pines to Hope Segment, there was a mean IBP of 3.0 ± 3.8 IBP/wetland and a mean density of 3.5 ± 4.8 IBP/ha. The most IBP were observed on wetland size class 5-10 ha (19.0 IBP/wetland) and the fewest IBP were observed wetland size class 0-1 ha (2.1 ± 6.8 IBP/wetland). The highest IBP density was recorded for wetland size class 0-1 ha (6.8 ± 6.0 IBP/ha) and the lowest IBP density was recorded for wetland size class 10-20 ha (0.4 IBP/ha).

Along the Hope to Westridge Segment, there was a mean IBP of 5.4 ± 12.6 IBP/wetland and a mean density of 2.7 ± 3.5 IBP/ha. The most IBP were observed on wetland size class >50 ha (39.0 IBP/wetland)

and the fewest IBP were observed wetland size class 5-10 ha (0.5 IBP/wetland). The highest IBP density was recorded for wetland size class 0-1 ha (5.2 ± 4.3 IBP/ha) and the lowest IBP density was recorded for wetland size class 5-10 ha (0.1 IBP/ha).

TABLE 5.2.5

**MEAN INDICATED BREEDING PAIRS AND INDICATED BREEDING PAIR DENSITY
OF WATERBIRDS OBSERVED ON WETLANDS WITHIN 500 M
OF THE GENERAL CENTRE OF THE PROPOSED PIPELINE CORRIDOR**

| Pipeline Segment | Wetland Size Class (ha) ¹ | Number of Wetlands | Mean IBP (+/- SD) | Mean IBP/ha (+/- SD) |
|------------------------|--------------------------------------|--------------------|----------------------------------|---------------------------------|
| Edmonton to Hinton | 0-1 | 11 | 1.8 ± 1.3 | 5.2 ± 5.3 |
| | 1-2 | 10 | 2.8 ± 2.1 | 1.8 ± 1.4 |
| | 2-3 | 3 | 2.5 ± 0.9 | 1.0 ± 0.5 |
| | 3-5 | 3 | 2.2 ± 1.4 | 0.5 ± 0.3 |
| | 5-10 | 4 | 3.0 ± 1.7 | 0.5 ± 0.3 |
| | 10-20 | 6 | 2.1 ± 1.6 | 0.2 ± 0.1 |
| | 20-50 | 1 | 9.0 | 0.3 |
| | >50 | 1 | 4.5 | 0.1 |
| | Segment Total | 39 | 2.5 ± 1.9 | 2.1 ± 3.5 |
| Hargreaves to Darfield | 0-1 | 2 | 2.0 ± 1.4 | 3.9 ± 2.8 |
| | 1-2 | 1 | 1.0 | 0.8 |
| | 2-3 | 1 | 6.0 | 1.8 |
| | 3-5 | 0 | -- | -- |
| | 5-10 | 1 | 0.5 | 0.1 |
| | 10-20 | 3 | 1.0 ± 0.0 | 0.1 ± 0.01 |
| | 20-50 | 2 | 1.5 ± 0.7 | $<0.1 \pm 0.007$ |
| | >50 | 1 | 1.0 | <0.1 |
| | Segment Total | 11 | 1.7 ± 1.6 | 1.0 ± 1.8 |
| Black Pines to Hope | 0-1 | 14 | 2.1 ± 2.7 | 6.8 ± 6.0 |
| | 1-2 | 5 | 2.5 ± 3.4 | 2.1 ± 3.0 |
| | 2-3 | 10 | 2.3 ± 2.2 | 1.0 ± 1.0 |
| | 3-5 | 4 | 4.0 ± 3.2 | 1.0 ± 0.7 |
| | 5-10 | 1 | 19.0 | 2.2 |
| | 10-20 | 1 | 5.0 | 0.4 |
| | 20-50 | 0 | -- | -- |
| | >50 | 0 | -- | -- |
| | Segment Total | 35 | 3.0 ± 3.8 | 3.5 ± 4.8 |
| Hope to Westridge | 0-1 | 4 | 1.1 ± 0.6 | 5.2 ± 4.3 |
| | 1-2 | 2 | 1.0 ± 0.7 | 0.8 ± 0.8 |
| | 2-3 | 1 | 3.0 | 1.2 |
| | 3-5 | 0 | -- | -- |
| | 5-10 | 1 | 0.5 | 0.1 |
| | 10-20 | 0 | -- | -- |
| | 20-50 | 0 | -- | -- |
| | >50 | 1 | 39.0 | 0.6 |
| | Segment Total | 9 | 5.4 ± 12.6 | 2.7 ± 3.5 |
| All Segments | 0-1 | 31 | 1.9 ± 2.0 | 5.8 ± 5.3 |
| | 1-2 | 18 | 2.4 ± 2.3 | 1.7 ± 1.8 |
| | 2-3 | 15 | 2.6 ± 2.0 | 1.1 ± 0.9 |
| | 3-5 | 7 | 3.2 ± 2.6 | 0.8 ± 0.6 |
| | 5-10 | 7 | 4.6 ± 6.6 | 0.6 ± 0.7 |
| | 10-20 | 10 | 2.1 ± 1.6 | 0.2 ± 0.1 |
| | 20-50 | 3 | 4.0 ± 4.4 | 0.1 ± 0.2 |
| | >50 | 3 | 14.8 ± 21.0 | 0.2 ± 0.3 |
| | Total | 94 | 2.9 ± 4.7 | 2.6 ± 3.9 |

Note: 1 Wetland size class includes wetlands, marshes and lakes, and is based on Breault 2011.

Breeding pairs were observed on watercourses that ranged in size from 1st order to 8th order. No breeding waterbirds were observed on watercourses along the Edmonton to Hinton Segment. Across the remaining three segments, the mean IBP ranged from 1.4 ± 0.8 IBP/stream (Black Pines to Hope Segment) to 2.3 ± 0.4 IBP/stream (Hope to Westridge Segment) (Table 5.2.6). The low number of IBP observed, combined with the distances surveyed for each stream, resulted in IBP densities of <0.01 IBP/km.

TABLE 5.2.6

**MEAN INDICATED BREEDING PAIRS AND INDICATED BREEDING PAIR DENSITY
OF WATERBIRDS OBSERVED ON WATERCOURSES WITHIN 500 M
OF THE GENERAL CENTRE OF THE PROPOSED PIPELINE CORRIDOR**

| Pipeline Segment | Stream Order ¹ | Number of Watercourses | Length Surveyed (km) | Mean IBP (+/- SD) |
|------------------------|---------------------------|------------------------|----------------------|---------------------------------|
| Edmonton to Hinton | 1 | 0 | -- | -- |
| | 2 | 0 | -- | -- |
| | 3 | 0 | -- | -- |
| | 4 | 0 | -- | -- |
| | 5 | 0 | -- | -- |
| | 6 | 0 | -- | -- |
| | 7 | 0 | -- | -- |
| | 8 | 0 | -- | -- |
| | Segment Total | 0 | -- | -- |
| Hargreaves to Darfield | 1 | 0 | -- | -- |
| | 2 | 0 | -- | -- |
| | 3 | 0 | -- | -- |
| | 4 | 1 | 17.3 | 1.0 |
| | 5 | 0 | -- | -- |
| | 6 | 0 | -- | -- |
| | 7 | 0 | -- | -- |
| | 8 | 1 | 2.6 | 2.0 |
| | Segment Total | 2 | 19.8 | 1.5 ± 0.7 |
| Black Pines to Hope | 1 | 0 | -- | -- |
| | 2 | 1 | 1.4 | 2.0 |
| | 3 | 0 | -- | -- |
| | 4 | 0 | -- | -- |
| | 5 | 1 | 21.6 | 1.0 |
| | 6 | 1 | 16.0 | 0.5 |
| | 7 | 1 | 0.2 | 2.0 |
| | 8 | 0 | -- | -- |
| | Segment Total | 4 | 39.2 | 1.4 ± 0.8 |
| Hope to Westridge | 1 | 1 | 1.0 | 2.0 |
| | 2 | 1 | 1.0 | 2.5 |
| | 3 | 0 | -- | -- |
| | 4 | 0 | -- | -- |
| | 5 | 0 | -- | -- |
| | 6 | 0 | -- | -- |
| | 7 | 0 | -- | -- |
| | 8 | 0 | -- | -- |
| | Segment Total | 2 | 2.1 | 2.3 ± 0.4 |
| All Segments | 1 | 1 | 1.0 | 2.0 |
| | 2 | 2 | 2.4 | 2.3 ± 0.4 |
| | 3 | 0 | -- | -- |
| | 4 | 1 | 17.3 | 1.0 |
| | 5 | 1 | 21.6 | 1.0 |
| | 6 | 1 | 16.0 | 0.5 |
| | 7 | 1 | 0.2 | 2.0 |
| | 8 | 1 | 2.6 | 2.0 |
| | Segment Total | 8 | 61.0 | 1.6 ± 0.7 |

TABLE 5.2.6 Cont'd

Note: 1 Stream order was used to classify the size of streams as outlined in Breault 2011.

5.2.3.2 *Aerial Waterbird Fall Staging Surveys (2012 and 2013)*

During the 2012 fall staging survey, waterbirds were observed at 38 waterbodies within 500 m of the centre of the proposed pipeline corridor. A total of 1,077 birds were observed and 15 species were identified (Table 5.2.3). A total of 895 observations (83% of total) were identified to species. Three species with special conservation status were identified during the 2012 fall staging survey: double-crested cormorant (Hope to Westridge Segment); great blue heron (Edmonton to Hinton, Black Pines to Hope, and Hope to Westridge segments); and trumpeter swan (Edmonton to Hinton Segment). Canada goose was the most commonly identified species ($n = 614$), followed by mallard ($n = 173$) and green-winged teal ($n = 35$). Canada goose was the only species observed along all four segments. Greater scaup was observed only once along the proposed pipeline corridor along the Hargreaves to Darfield Segment. Mean species richness ranged from 1.0 (Edmonton to Hinton Segment) to 1.6 (Hargreaves to Darfield Segment) and mean species diversity ranged from 0 (Edmonton to Hinton Segment where only one species was observed on each waterbody with observations) to 0.2 (Hargreaves to Darfield, Black Pines to Hope and Hope to Westridge segments) (Table 5.2.3).

Results of the 2012 fall staging survey for each pipeline segment are presented in the following paragraphs. Mean species richness and diversity were calculated for each Natural Region or Ecoprovince along each pipeline segment (Table 5.2.7).

Along the Edmonton to Hinton Segment, a total of 252 birds were observed and 3 species were identified (Table 5.2.3). A total of 83 observations were identified to species (33% of the total). The identified species were Canada goose ($n = 78$), trumpeter swan ($n = 4$) and great blue heron ($n = 1$). Trumpeter swan was observed only along this segment. Mean species richness was 1.0 (Boreal Forest and Foothills natural regions) and mean species diversity was 0 (Boreal Forest and Foothills natural regions where only one species was observed at each wetland) (Table 5.2.7).

Along the Hargreaves to Darfield Segment, a total of 125 birds were observed and 7 species were identified (Table 5.2.3). Canada goose was the most commonly observed species ($n = 58$), followed by mallard ($n = 51$) and hooded merganser ($n = 6$). Five species were observed only along this segment: hooded merganser; American wigeon; common merganser; pied-billed grebe; and greater scaup. Mean species richness ranged from 1.6 (Southern Interior Mountains Ecoprovince) to 2.0 (Southern Interior Ecoprovince) and mean species diversity ranged from 0.1 (Southern Interior Ecoprovince) to 0.2 (Southern Interior Mountains Ecoprovince) (Table 5.2.7).

Along the Black Pines to Hope Segment, a total of 559 birds were observed and 5 species were identified (Table 5.2.3). Canada goose was the most commonly observed species ($n = 435$), followed by mallard ($n = 78$) and green-winged teal ($n = 29$). Bufflehead was observed only along this pipeline segment. Mean species richness ranged from 1.0 (Coast and Mountains Ecoprovince) to 1.6 (Southern Interior Ecoprovince) and mean species diversity ranged from 0 (Coast and Mountains Ecoprovince where only one species was observed at each waterbody) to 0.2 (Southern Interior Ecoprovince) (Table 5.2.7).

Along the Hope to Westridge Segment, a total of 141 birds were observed and 8 species were identified (Table 5.2.3). Mallard was the most commonly observed species ($n = 44$), followed by Canada goose ($n = 43$) and glaucous-winged gull ($n = 20$). Glaucous-winged gull, wood duck, ringed-neck duck and double-crested cormorant were observed only along this segment. Mean species richness ranged from 1.3 (Coast and Mountains Ecoprovince) to 1.5 (Georgia Depression Ecoprovince) and mean species diversity ranged from 0.1 (Coast and Mountains Ecoprovince) to 0.3 (Georgia Depression Ecoprovince) (Table 5.2.7).

TABLE 5.2.7

AERIAL WATERBIRD 2012 FALL STAGING SURVEY OBSERVATION LOCATIONS, SPECIES RICHNESS AND DIVERSITY BY NATURAL REGION OR ECOPROVINCE

| Pipeline Segment | Natural Region or Ecoprovince | Number of Waterbodies | Species Richness | Species Diversity |
|------------------------|-------------------------------|-----------------------|------------------|-------------------|
| Edmonton to Hinton | Boreal Forest | 3 | 1.0 | 0 |
| | Foothills | 2 | 1.0 | 0 |
| | Segment Total | 5 | 1.0 | 0 |
| Hargreaves to Darfield | Southern Interior Mountains | 7 | 1.6 | 0.2 |
| | Southern Interior | 1 | 2.0 | 0.1 |
| | Segment Total | 8 | 1.6 | 0.2 |
| Black Pines to Hope | Southern Interior | 9 | 1.6 | 0.2 |
| | Coast and Mountains | 1 | 1.0 | 0 |
| | Segment Total | 10 | 1.5 | 0.2 |
| Hope to Westridge | Coast and Mountains | 4 | 1.3 | 0.1 |
| | Georgia Depression | 11 | 1.5 | 0.3 |
| | Segment Total | 15 | 1.4 | 0.2 |
| Total | | 38 | 1.4 | 0.2 |

During the 2013 fall staging survey, waterbirds were observed at 66 waterbodies within 500 m of the general centre of the proposed pipeline corridor. A total of 3,517 birds were observed and 15 species were identified (Table 5.2.3). A total of 1,598 observations (45% of the total) were identified to species. Two species with special conservation status were identified during the 2013 fall staging survey: great blue heron (Black Pines to Hope and Hope to Westridge segments) and horned grebe (Black Pines to Hope Segment). Canada goose was the most commonly identified species (n = 802), followed by mallard (n = 430) and American wigeon (n = 200). Mallard was the only species observed along all four segments. There were three species observed only once along the proposed pipeline corridor: common goldeneye (Hargreaves and Darfield Segment); red-necked grebe (Hargreaves to Darfield); and horned grebe (Black Pines to Hope Segment). Mean species richness ranged from 1.0 (Edmonton to Hinton Segment) to 2.1 (Black Pines to Hope Segment) and mean species diversity ranged from 0 (Edmonton to Hinton Segment) to 0.5 (Black Pines to Hope Segment) (Table 5.2.3).

Results of the 2013 fall staging survey for each pipeline segment are presented in the following paragraphs. Mean species richness and diversity were calculated for each Natural Region or Ecoprovince along each segment.

Along the Edmonton to Hinton Segment, a total of 1,686 birds were observed and 2 species were identified (Table 5.2.3). A total of 394 observations (23% of the total) were identified to species. The identified species were Canada goose (n = 349) and mallard (n = 45). Mean species richness was 1.0 and mean species diversity was 0 (only one species was observed at each wetland) for the Parkland, Boreal Forest and Foothills natural regions (Table 5.2.8).

Along the Hargreaves to Darfield Segment, a total of 93 birds were observed and 9 species were identified (Table 5.2.3). A total of 54 observations (58% of the total) were identified to species. Mallard was the most commonly observed species (n = 58), followed by blue-winged teal (n = 9), common merganser (n = 8) and American wigeon (n = 7). Four species were observed only along this pipeline segment: blue-winged teal; pied-billed grebe; common goldeneye; and red-necked grebe. Mean species richness ranged from 1.5 (Southern Interior Ecoprovince) to 1.6 (Southern Interior Mountains Ecoprovince) and mean species diversity was 0.3 for both the Southern Interior Mountains and the Southern Interior ecoprovinces (Table 5.2.8).

Along the Black Pines to Hope Segment, a total of 488 birds were observed and 12 species were identified (Table 5.2.3). American wigeon was the most commonly observed species (n = 187), followed by mallard (n = 125) and Canada goose (n = 73). Three species were observed only along this pipeline segment: northern shoveler; ring-necked duck; and horned grebe. Mean species richness ranged from 1.5 (Coast and Mountains Ecoprovince) to 2.1 (Southern Interior Ecoprovince) and mean species

diversity ranged from 0.3 (Coast and Mountains Ecoprovince) to 0.5 (Southern Interior Ecoprovince) (Table 5.2.8).

Along the Hope to Westridge Segment, a total of 1,250 birds were observed and 9 species were identified (Table 5.2.3). A total of 700 observations (56% of the total) were identified to species. Canada goose was the most commonly observed species ($n = 380$), followed by mallard ($n = 243$) and wood duck ($n = 50$). Wood duck were observed only along this segment. Mean species richness ranged from 1.0 (Coast and Mountains Ecoprovince) to 1.4 (Georgia Depression Ecoprovince) and mean species diversity ranged from 0.1 (Coast and Mountains Ecoprovince) to 0.2 (Georgia Depression Ecoprovince) (Table 5.2.8).

TABLE 5.2.8

AERIAL WATERBIRD 2013 FALL STAGING SURVEY OBSERVATION LOCATIONS, SPECIES RICHNESS AND DIVERSITY BY NATURAL REGION OR ECOPROVINCE

| Pipeline Segment | Natural Region or Ecoprovince | Number of Waterbodies | Species Richness | Species Diversity |
|------------------------|-------------------------------|-----------------------|------------------|-------------------|
| Edmonton to Hinton | Parkland | 3 | 1.0 | 0 |
| | Boreal Forest | 6 | 1.0 | 0 |
| | Foothills | 3 | 1.0 | 0 |
| | Segment Total | 12 | 1.0 | 0 |
| Hargreaves to Darfield | Southern Interior Mountains | 10 | 1.6 | 0.3 |
| | Southern Interior | 2 | 1.5 | 0.3 |
| | Segment Total | 12 | 1.6 | 0.3 |
| Black Pines to Hope | Southern Interior | 17 | 2.1 | 0.5 |
| | Coast and Mountains | 2 | 1.5 | 0.3 |
| | Segment Total | 19 | 2.1 | 0.5 |
| Hope to Westridge | Coast and Mountains | 5 | 1.0 | 0.1 |
| | Georgia Depression | 18 | 1.4 | 0.2 |
| | Segment Total | 23 | 1.3 | 0.1 |
| Total | | 66 | 1.5 | 0.2 |

Four species were observed only in 2012: double-crested cormorant; glaucous-winged gull; greater scaup; and trumpeter swan. Seven species were observed only in 2013: blue-winged teal; common goldeneye; common loon; horned grebe; northern shoveler; red-necked grebe; and snow goose.

Waterbirds were observed on more wetlands during the breeding survey ($n = 182$) than either of the staging surveys ($n_{2012} = 38$, $n_{2013} = 66$). On average, there were more waterbirds observed during the staging surveys than during the breeding survey; however, overall species richness was higher for the breeding surveys (breeding = 28; staging [2012 and 2013] = 22). Ten species were observed during the breeding survey that were not identified during the staging surveys (American coot, Barrow's goldeneye, Bonaparte's gull, canvasback, cinnamon teal, gadwall, lesser scaup, northern pintail, redhead and sandhill crane), whereas, only three species were observed during the staging surveys that were not identified during the breeding survey (greater scaup, pied-billed grebe and trumpeter swan).

During the breeding survey, there were nine waterbodies with 31-50 observations of waterbirds (see Figures 5.2.4 to 5.2.11). These included two waterbodies along the Edmonton to Hinton Segment, two along the Hargreaves to Darfield Segment, two along the Black Pines to Hope Segment and three along the Hope to Westridge Segment. There was one waterbody with >50 observations along the Black Pines to Hope Segment.

During the fall staging surveys, there were seven waterbodies with 31-50 observations of waterbirds (see Figures 5.2.4 to 5.2.11). These included five waterbodies along the Edmonton to Hinton Segment and two along the Hope to Westridge Segment. There were nine waterbodies with >50 observations. These included five waterbodies along the Edmonton to Hinton Segment, two along the Black Pines to Hope Segment and one along the Hope to Westridge Segment.

There were two waterbodies that were located outside of the aerial waterbody sampling area where high numbers of waterbirds were observed. A total of 123 waterbirds were recorded at the Starrat-Cranberry

Marsh along the Hargreaves to Darfield Segment south of Valemount, and 9 species were identified within 1 km of the proposed pipeline corridor during the breeding waterbird survey. Observations of waterbirds using the Starrat-Cranberry Marsh were excluded from the IBP analysis since the majority of the marsh is located outside of the 500 m buffer. Sanborn Lake is located approximately 500 m west of the proposed pipeline corridor near RK 767 along the Hargreaves to Darfield Segment. Over the two fall staging waterbird surveys, a total of 185 waterbirds were recorded and 6 species were identified on Sanborn Lake.

5.2.3.3 Trumpeter Swan Breeding Waterbodies – Alberta

Three provincially identified trumpeter swan waterbodies are located along the Edmonton to Hinton Segment. These waterbodies are located north of RK 242, north of RK 257 and north of RK 258 and are within 800 m of the proposed pipeline corridor (the recommended set-back distance from a provincially identified trumpeter swan waterbody). A survey to determine if these waterbodies currently support breeding trumpeter swans was conducted in June and October 2013 in conjunction with the aerial waterbird survey. No trumpeter swan adults or cygnets were identified on these waterbodies during these surveys. AESRD also completed surveys of these waterbodies in September 2013 and did not identify any trumpeter swans (Hobson pers. comm.). During the 2012 fall staging survey, four adult trumpeter swans were observed at an open water pond located 20 m southwest of RK 87. No cygnets were observed.

5.2.4 Sharp-Tailed Grouse Survey

Sharp-tailed grouse surveys were completed from April 27 to 28, 2013. Surveys were completed from RK 857.4 to RK 861.5 along the proposed pipeline corridor and from KP 826.6 to KP 829 along the existing TMPL right-of-way (Figure 5.2.12). Additional locations were not surveyed since land access had not been granted at the time of the field work. Multiple grouse scats were observed near RK 860.3. Grouse scat was observed near KP 827.3, and approximately 30 m north of this location, a female grouse was flushed. No active sharp-tailed grouse leks were identified during the survey.

5.2.5 Snake Survey

Snake surveys were completed from April 26 to 28, 2013. Surveys were completed in areas of suitable habitat from RK 837.5 to RK 841.5, north of Kamloops and two existing dens were checked for occupancy (Figure 5.2.13).

Two suitable features for snake hibernacula were found 160 m west of RK 838.3 and 140 m northwest of RK 840.6. The feature at RK 838.3 was on a northeast aspect and consisted of one large vertical fissure and a horizontal crack, both penetrating deep into the rock. There was evidence of use by snakes (e.g., tracks and smoothing of the rock and silt), as well as the bones and scat of pack rats. The feature at RK 840.6 had a south aspect and consisted of a vertically angled crack with talus and sagebrush directly adjacent. There was a small entrance into a deep fissure in the rock. Several locations in the immediate vicinity showed signs of snake use (e.g., smoothing), although no evidence of snakes was present at the entrance.

Two previously known den locations were surveyed and occupancy was confirmed at both. Two adult western rattlesnakes were observed near the den located approximately 500 m southeast of RK 841. Five western rattlesnakes were observed at the den located approximately 900 m northwest of RK 842. One adult male was observed near the bottom of the slope and two juveniles and two adults were observed in the den entrance. No other occupied dens were identified during the survey.

5.2.6 Breeding Bird Survey

Breeding bird surveys were completed from May 28 to July 9, 2013. Point counts were completed at 357 locations (147 in Alberta and 210 in BC) (Figures 5.2.14 to 5.2.17). No surveys were undertaken along the Black Pines to Hope Segment from RK 812 to RK 890 and from RK 951 to RK 985 as land access was not available at the time of the surveys.

During the breeding bird surveys, a total of 1,636 birds were observed (auditory and/or visual) and 107 species were identified (Table 5.2.9). American robin was the most commonly observed species

(n = 111), followed by Swainson's thrush (n = 106) and yellow-rumped warbler (n = 104). Thirteen species were observed along all 4 surveyed pipeline segments and 17 species were observed only once along the proposed pipeline corridor. No birds were observed at 3 of the 357 point count locations and only incidental observations (e.g., detected outside the 50 m radius, detected outside of the 5 minute survey period, fly-overs and fly-throughs) were recorded at 36 locations. Species richness ranged from 2.3 (Edmonton to Hinton Segment) to 6.6 (Hope to Westridge Segment), density ranged from 3.8 birds/ha (Edmonton to Hinton Segment) to 15.0 birds/ha (Hope to Westridge Segment), and species diversity ranged from 0.7 (Edmonton to Hinton Segment) to 1.6 (Hope to Westridge Segment) (Table 5.2.9).

TABLE 5.2.9

BREEDING BIRD SURVEY OBSERVATIONS, SPECIES RICHNESS, DIVERSITY AND DENSITY BY PIPELINE SEGMENT

| Species | Edmonton to Hinton | Hargreaves to Darfield | Black Pines to Hope | Hope to Westridge | All Segments |
|--------------------------------|--------------------|------------------------|---------------------|-------------------|--------------|
| Alder flycatcher | 2 | 0 | 0 | 0 | 2 |
| American crow | 5 | 1 | 0 | 0 | 6 |
| American goldfinch | 0 | 0 | 0 | 11 | 11 |
| American redstart | 0 | 6 | 0 | 0 | 6 |
| American robin | 18 | 26 | 11 | 56 | 111 |
| American three-toed woodpecker | 2 | 1 | 0 | 0 | 3 |
| Bank swallow | 6 | 0 | 0 | 0 | 6 |
| Barn Swallow | 2 | 0 | 0 | 19 | 21 |
| Bewick's wren | 0 | 0 | 0 | 2 | 2 |
| Black-and-white warbler | 2 | 0 | 0 | 0 | 2 |
| Black-backed woodpecker | 1 | 0 | 0 | 0 | 1 |
| Black-capped chickadee | 17 | 13 | 2 | 26 | 58 |
| Black-headed grosbeak | 0 | 0 | 1 | 17 | 18 |
| Blackpoll warbler | 0 | 4 | 0 | 0 | 4 |
| Black-throated gray warbler | 0 | 0 | 0 | 1 | 1 |
| Bonaparte's gull | 1 | 0 | 0 | 0 | 1 |
| Boreal chickadee | 4 | 0 | 0 | 0 | 4 |
| Brown creeper | 0 | 1 | 0 | 3 | 4 |
| Brown-headed cowbird | 2 | 0 | 0 | 1 | 3 |
| Bushtit | 0 | 0 | 0 | 6 | 6 |
| Cape May warbler | 3 | 0 | 0 | 0 | 3 |
| Cassin's vireo | 0 | 8 | 2 | 1 | 11 |
| Cedar waxwing | 5 | 16 | 7 | 15 | 43 |
| Chestnut-backed chickadee | 0 | 0 | 2 | 0 | 2 |
| Chipping sparrow | 33 | 25 | 2 | 0 | 60 |
| Clark's nutcracker | 0 | 0 | 5 | 0 | 5 |
| Clay-coloured sparrow | 7 | 0 | 0 | 0 | 7 |
| Common raven | 3 | 0 | 2 | 2 | 7 |
| Common yellowthroat | 1 | 5 | 1 | 8 | 15 |
| Connecticut warbler | 1 | 0 | 0 | 0 | 1 |
| Dark-eyed junco | 8 | 15 | 7 | 12 | 42 |
| Downy woodpecker | 1 | 0 | 0 | 1 | 2 |
| Dusky flycatcher | 0 | 10 | 2 | 0 | 12 |
| Eared grebe | 1 | 0 | 0 | 0 | 1 |
| Eastern kingbird | 1 | 0 | 0 | 0 | 1 |
| European starling | 0 | 0 | 0 | 32 | 32 |
| Fox sparrow | 0 | 1 | 0 | 0 | 1 |
| Golden-crowned kinglet | 2 | 31 | 0 | 2 | 35 |
| Gray catbird | 0 | 1 | 1 | 0 | 2 |
| Gray jay | 6 | 2 | 0 | 0 | 8 |
| Hairy woodpecker | 0 | 2 | 0 | 2 | 4 |
| Hammond's flycatcher | 0 | 38 | 1 | 1 | 40 |
| Hermit thrush | 21 | 0 | 0 | 0 | 21 |

TABLE 5.2.9 Cont'd

| Species | Edmonton to Hinton | Hargreaves to Darfield | Black Pines to Hope | Hope to Westridge | All Segments |
|--------------------------|-----------------------|---------------------------|------------------------|----------------------|--------------|
| House finch | 0 | 0 | 0 | 1 | 1 |
| House sparrow | 0 | 0 | 0 | 32 | 32 |
| House wren | 0 | 0 | 2 | 0 | 2 |
| Lark bunting | 0 | 0 | 2 | 0 | 2 |
| Le Conte's sparrow | 6 | 0 | 0 | 0 | 6 |
| Least flycatcher | 18 | 1 | 0 | 0 | 19 |
| Lincoln's sparrow | 21 | 4 | 0 | 0 | 25 |
| McGillivray's warbler | 0 | 28 | 3 | 8 | 39 |
| Mallard | 3 | 0 | 0 | 2 | 5 |
| Marsh wren | 1 | 0 | 0 | 4 | 5 |
| Merlin | 0 | 0 | 0 | 1 | 1 |
| Mountain chickadee | 0 | 1 | 2 | 0 | 3 |
| Mourning warbler | 2 | 1 | 0 | 0 | 3 |
| Nashville warbler | 0 | 2 | 2 | 0 | 4 |
| Nelson's sparrow | 1 | 0 | 0 | 0 | 1 |
| Northern flicker | 1 | 0 | 2 | 2 | 5 |
| Northern waterthrush | 0 | 9 | 0 | 0 | 9 |
| Northwestern crow | 0 | 0 | 0 | 14 | 14 |
| Olive-sided flycatcher | 1 | 1 | 0 | 1 | 3 |
| Orange-crowned warbler | 2 | 4 | 1 | 3 | 10 |
| Ovenbird | 12 | 0 | 0 | 0 | 12 |
| Pacific wren | 0 | 8 | 2 | 24 | 34 |
| Pacific-slope flycatcher | 0 | 1 | 0 | 7 | 8 |
| Pileated woodpecker | 0 | 5 | 1 | 2 | 8 |
| Pine siskin | 4 | 6 | 0 | 4 | 14 |
| Purple finch | 0 | 0 | 0 | 2 | 2 |
| Pygmy nuthatch | 0 | 0 | 1 | 0 | 1 |
| Red crossbill | 0 | 0 | 0 | 1 | 1 |
| Red-breasted nuthatch | 5 | 6 | 2 | 3 | 16 |
| Red-eyed vireo | 8 | 11 | 0 | 5 | 24 |
| Red-naped sapsucker | 0 | 4 | 1 | 0 | 5 |
| Red-winged blackbird | 6 | 0 | 0 | 10 | 16 |
| Rose-breasted grosbeak | 9 | 0 | 0 | 0 | 9 |
| Ruby-crowned kinglet | 7 | 6 | 0 | 1 | 14 |
| Ruffed grouse | 1 | 0 | 0 | 0 | 1 |
| Rufous hummingbird | 0 | 9 | 2 | 1 | 12 |
| Savannah sparrow | 3 | 0 | 4 | 34 | 41 |
| Sedge wren | 1 | 0 | 0 | 0 | 1 |
| Song sparrow | 4 | 9 | 1 | 22 | 36 |
| Sora | 6 | 0 | 0 | 0 | 6 |
| Spotted towhee | 0 | 0 | 6 | 25 | 31 |
| Steller's jay | 0 | 4 | 0 | 2 | 6 |
| Swainson's thrush | 20 | 41 | 4 | 41 | 106 |
| Swamp sparrow | 6 | 0 | 0 | 0 | 6 |
| Tennessee warbler | 13 | 1 | 0 | 0 | 14 |
| Townsend's warbler | 0 | 22 | 3 | 2 | 27 |
| Tree swallow | 3 | 0 | 0 | 4 | 7 |
| Varied thrush | 4 | 4 | 0 | 4 | 12 |
| Veery | 0 | 3 | 0 | 0 | 3 |
| Vesper sparrow | 0 | 1 | 3 | 0 | 4 |
| Violet-green swallow | 0 | 1 | 0 | 1 | 2 |
| Warbling vireo | 3 | 37 | 3 | 3 | 46 |
| Western tanager | 0 | 19 | 6 | 12 | 37 |
| Western wood-pewee | 2 | 4 | 2 | 11 | 19 |

TABLE 5.2.9 Cont'd

| Species | Edmonton to Hinton | Hargreaves to Darfield | Black Pines to Hope | Hope to Westridge | All Segments |
|--------------------------------------|--------------------|------------------------|---------------------|-------------------|--------------|
| White-crowned sparrow | 0 | 0 | 0 | 21 | 21 |
| White-throated sparrow | 27 | 1 | 0 | 0 | 28 |
| White-winged crossbill | 1 | 0 | 0 | 0 | 1 |
| Willow flycatcher | 0 | 2 | 2 | 3 | 7 |
| Wilson's snipe | 1 | 0 | 0 | 0 | 1 |
| Wilson's warbler | 0 | 17 | 0 | 7 | 24 |
| Wood duck | 0 | 1 | 0 | 0 | 1 |
| Yellow warbler | 15 | 14 | 5 | 9 | 43 |
| Yellow-bellied sapsucker | 2 | 0 | 0 | 0 | 2 |
| Yellow-rumped warbler | 57 | 38 | 3 | 6 | 104 |
| Unidentified sp. | 6 | 3 | 0 | 0 | 9 |
| Total Number of Birds | 437 | 535 | 111 | 553 | 1,636 |
| Species Richness¹ | 2.3 | 3.0 | 5.2 | 6.6 | 3.3 |
| Species Diversity² | 0.7 | 0.9 | 1.4 | 1.6 | 0.9 |
| Density³ | 3.8 | 4.6 | 9.4 | 15.0 | 5.8 |

- Notes:**
- 1 Mean species richness, calculated as the total number of species observed at each point count divided by the total number of point counts surveyed along the route segment.
 - 2 Mean species diversity, calculated as the sum of species diversity at each point count divided by the total number of point counts surveyed along the route segment. The Shannon-Wiener Index was used to calculate species diversity (see Section 3.7.3).
 - 3 Mean density, calculated as the sum of all species observed at each point count divided by the total area surveyed (0.785 ha/point count) along the route segment.

Breeding bird surveys were undertaken within four natural regions and eight ecosections. Species richness, density and diversity were calculated for each Natural Region or Ecosection along each pipeline segment.

Along the Edmonton to Hinton Segment, a total of 437 birds were observed and 61 species were identified (Table 5.2.10). Yellow-rumped warbler was the most commonly observed species ($n = 57$), followed by chipping sparrow ($n = 33$) and white-throated sparrow ($n = 27$). Twenty-one species were observed only along this segment. Mean species richness ranged from 1.3 (Parkland Natural Region) to 5.2 (Rocky Mountain Natural Region), mean density ranged from 2.5 birds/ha (Parkland and Boreal Forest natural regions) to 7.9 birds/ha (Rocky Mountain Natural Region) and mean species diversity ranged from 0.3 (Parkland Natural Region) to 1.6 (Rocky Mountain Natural Region).

Along the Hargreaves to Darfield Segment, a total of 535 birds were observed and 55 species were identified (Table 5.2.10). Swainson's thrush was the most commonly observed species ($n = 41$), followed by yellow-rumped warbler ($n = 38$), Hammond's flycatcher ($n = 38$), and warbling vireo ($n = 37$). Six species were observed only along this segment. Mean species richness ranged from 2.5 (Cariboo Mountains Ecosection) to 3.9 (Northern Park Ranges Ecosection), mean density ranged from 2.9 birds/ha (Upper Fraser Trench Ecosection) to 6.2 birds/ha (Northern Park Ranges Ecosection) and mean species diversity ranged from 0.8 (Cariboo Mountains Ecosection) to 1.0 (Northern Park Ranges and Northern Thompson Upland ecosections).

Along the Black Pines to Hope Segment, a total of 111 birds were observed and 39 species were identified (Table 5.2.10). American robin was the most commonly observed species ($n = 11$), followed by cedar waxwing ($n = 7$) and dark-eyed junco ($n = 7$). Five species were observed only along this segment. Mean species richness ranged from 4.4 (Nicola Basin Ecosection) to 6.8 (Eastern Pacific Ranges Ecosection), mean density ranged from 8.7 birds/ha (Nicola Basin Ecosection) to 11.0 birds/ha (Eastern Pacific Ranges Ecosection) and mean species diversity ranged from 1.2 (Nicola Basin Ecosection) to 1.8 (Eastern Pacific Ranges Ecosection).

Along the Hope to Westridge Segment, a total of 553 birds were observed and 58 species were identified (Table 5.2.10). American robin was the most commonly observed species ($n = 56$), followed by Swainson's thrush ($n = 41$) and savannah sparrow ($n = 34$). Twelve species were observed only along

this segment. Mean species richness ranged from 6.4 (Fraser Lowland Ecosection) to 7.1 (Eastern Pacific Ranges Ecosection), mean density ranged from 13.6 birds/ha (Eastern Pacific Ranges Ecosection) to 15.4 birds/ha (Fraser Lowland Ecosection) and mean species diversity ranged from 1.6 (Fraser Lowland Ecosection) to 1.8 (Eastern Pacific Ranges Ecosection).

TABLE 5.2.10

BREEDING BIRD SURVEY LOCATIONS AND SPECIES RICHNESS, DENSITY AND DIVERSITY BY NATURAL REGION AND ECOSECTION

| Pipeline Segment | Natural Region (Alberta)/ Ecosection (BC) | Number of Point Counts | Area Surveyed (ha) ¹ | Species Richness | Density (No./ha) | Species Diversity |
|------------------------|--|------------------------|---------------------------------|---------------------|---------------------|----------------------|
| Edmonton to Hinton | Parkland | 3 | 2 | 1.3 | 2.5 | 0.3 |
| | Boreal Forest | 59 | 46 | 1.4 | 2.5 | 0.4 |
| | Foothills | 73 | 57 | 2.6 | 4.2 | 0.7 |
| | Rocky Mountain | 12 | 9 | 5.2 | 7.9 | 1.6 |
| | Segment Total | 147 | 115 | 2.3 | 3.8 | 0.7 |
| Hargreaves to Darfield | Northern Park Ranges | 10 | 8 | 3.9 | 6.2 | 1.0 |
| | Upper Fraser Trench | 13 | 10 | 3.3 | 2.9 | 0.9 |
| | Cariboo Mountains | 40 | 31 | 2.5 | 3.7 | 0.8 |
| | Northern Shuswap Highlands | 52 | 41 | 3.0 | 5.1 | 0.9 |
| | Northern Thompson Upland | 33 | 26 | 3.1 | 4.3 | 1.0 |
| | Segment Total | 148 | 116 | 3.0 | 4.6 | 0.9 |
| Black Pines to Hope | Nicola Basin | 10 | 8 | 4.4 | 8.7 | 1.2 |
| | Eastern Pacific Ranges | 5 | 4 | 6.8 | 11.0 | 1.8 |
| | Segment Total | 15 | 12 | 5.2 | 9.4 | 1.4 |
| Hope to Westridge | Eastern Pacific Ranges | 11 | 9 | 7.1 | 13.6 | 1.8 |
| | Fraser Lowland | 36 | 28 | 6.4 | 15.4 | 1.6 |
| | Segment Total | 47 | 37 | 6.6 | 15.0 | 1.6 |
| Total | | 357 | 280 | 3.3 | 5.8 | 0.9 |

Notes: 1 Based on 50 m radius plots (0.785 ha)

During the breeding bird survey, three species with special conservation status were identified: bank swallow (Edmonton to Hinton Segment); barn swallow (Edmonton to Hinton and Hope to Westridge segments); and olive-sided flycatcher (Edmonton to Hinton, Hargreaves to Darfield and Hope to Westridge segments).

5.2.7 Common Nighthawk and Short-Eared Owl Surveys

Along the Edmonton to Hinton Segment, common nighthawk and short-eared owl surveys were completed on June 9, 2013 in five locations near Hinton. Along the Hargreaves to Darfield Segment, surveys were completed from June 14 to June 15, 2013 at 21 locations (Figure 5.2.18). Surveys were not completed along the Black Pines to Hope or Hope to Westridge segments. There were no common nighthawk or short-eared owl detected along the Edmonton to Hinton Segment. A total of 26 common nighthawks were detected along the Hargreaves to Darfield Segment. During pond-dwelling amphibian surveys, one common nighthawk was observed along the Hargreaves to Darfield Segment and one was detected along the Black Pines to Hope Segment. One short-eared owl was detected during travel to a breeding bird point count location along the Edmonton to Hinton Segment.

5.2.8 Yellow Rail

Yellow rail surveys were completed on July 9, 2013 in areas of suitable habitat along the Edmonton to Hinton Segment. Surveys were completed south of RK 176, northwest of RK 199 and north of RK 222. Areas of suitable habitat surveyed included medium to large, sedge-dominated meadows and wetlands with little to no standing water. No yellow rails were detected during the call playback surveys.

5.2.9 Spotted Owl Surveys

Initial detection call-playback surveys were conducted during the nights of June 13 to 14, June 24 to 25 and September 9 to 10, 2013. Two call-playback transects were surveyed and each Transect had 17 stations (e.g., Transect 1 had Stations 1-17, and Transect 2 had Stations 18-34) (Figure 5.2.19). No spotted owls were detected on any of the surveys. Barred owls were detected at four Stations. One barred owl was detected 50 m east of Station 1 on June 14 at 10:05 PM; one barred owl (possibly a female) was detected 100 m north-northwest of Station 17 on June 25 at 10:34 PM; one barred owl was detected 150 m north of Station 10 on June 26 at 1:14 AM; and one barred owl was detected 300 m northeast of Station 33 on September 11 at 1:54 AM. The results of the survey were provided to the BC MFLNRO Spotted Owl Recovery Coordinator (see Table 2.2.1).

5.2.10 Amphibian Survey

5.2.10.1 Pond-Dwelling Amphibian Survey

Pond-dwelling amphibian surveys were completed from June 20 to July 9, 2013 in Alberta and from May 22 to June 15, 2013 and from August 13 to 18, 2013 in BC. A total of 159 locations (21 in Alberta and 138 in BC) were surveyed and used in the analysis (Figures 5.2.20 to 5.2.23). Amphibian egg masses, tadpoles/larvae, metamorphs or adults were observed at 91 of 159 ponds surveyed.

During the pond-dwelling amphibian surveys, a total of 11 species were identified, including 7 frog species, 1 toad species, 2 salamander species and 1 newt species (Table 5.2.11). Columbia spotted frog was observed in the most ponds (n = 35), followed by northern Pacific treefrog (n = 31) and western toad (n = 26).

Across pipeline segments, mean species richness ranged from 1.4 (Edmonton to Hinton and Hargreaves to Darfield segments) to 2.9 (Hope to Westridge Segment). The boreal chorus frog was observed only along the Edmonton to Hinton Segment and the American bullfrog, green frog, northern red-legged frog and roughskin newt were observed only along the Hope to Westridge Segment. The Fraser Lowland Ecoregion had the highest mean species richness (richness = 2.9), followed by the Eastern Pacific Ranges Ecoregion (richness = 2.0), the Upper Fraser Trench Ecoregion (richness = 2.0), the Nicola Basin Ecoregion (richness = 1.5) and the Hozomeen Range Ecoregion (richness = 1.5).

TABLE 5.2.11

AMPHIBIAN SPECIES OBSERVED DURING POND-DWELLING AMPHIBIAN SURVEYS BY PIPELINE SEGMENT AND NATURAL REGION OR ECOREGION

| Pipeline Segment | Natural Region or Ecoregion | American Bullfrog | Boreal Chorus Frog | Columbia Spotted Frog | Green Frog | Long-Toed Salamander | Northern Pacific Treefrog | Northern Red-Legged Frog | Northwestern Salamander | Roughskin Newt | Western Toad | Wood Frog | Mean Species Richness |
|------------------------|-----------------------------|-------------------|--------------------|-----------------------|------------|----------------------|---------------------------|--------------------------|-------------------------|----------------|--------------|-----------|-----------------------|
| Edmonton to Hinton | Foothills | -- | T | -- | -- | -- | -- | -- | -- | -- | T, A | M, A | 0.8 |
| Hargreaves to Darfield | Northern Park Ranges | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.0 |
| | Upper Fraser Trench | -- | -- | M, A | -- | -- | A | -- | -- | -- | M, A | -- | 1.5 |
| | Cariboo Mountains | -- | -- | A | -- | -- | -- | -- | -- | -- | T, A | -- | 0.3 |
| | Northern Shuswap Highland | -- | -- | E, T, M, A | -- | L | A | -- | -- | -- | T, A | T, A | 0.7 |
| | Northern Thompson Upland | -- | -- | T, A | -- | -- | A | -- | -- | -- | T, M, A | A | 1.1 |

TABLE 5.2.11 Cont'd

| Pipeline Segment | Natural Region or Ecoregion | American Bullfrog | Boreal Chorus Frog | Columbia Spotted Frog | Green Frog | Long-Toed Salamander | Northern Pacific Treefrog | Northern Red-Legged Frog | Northwestern Salamander | Roughskin Newt | Western Toad | Wood Frog | Mean Species Richness |
|---------------------|-----------------------------|-------------------|--------------------|-----------------------|------------|----------------------|---------------------------|--------------------------|-------------------------|----------------|--------------|-----------|-----------------------|
| Black Pines to Hope | Thompson Basin | -- | -- | M, A | -- | -- | M | -- | -- | -- | M, A | -- | 0.4 |
| | Guichon Upland | -- | -- | A | -- | -- | M, A | -- | -- | -- | -- | A | 1.0 |
| | Nicola Basin | -- | -- | A | -- | L | T | -- | -- | -- | T, M | -- | 1.2 |
| | Hozameen Range | -- | -- | E, T, A | -- | E | E, T, A | -- | -- | -- | A | -- | 1.5 |
| | Eastern Pacific Ranges | -- | -- | -- | -- | L | -- | -- | E, N | -- | -- | -- | 2.0 |
| Hope to Westridge | Fraser Lowland | T, A | -- | -- | T, A | -- | E, T, A | T, A | E | L | -- | -- | 2.4 |

Note: 1 Developmental stages: E = egg or egg mass, T = tadpole, L = larva, M = metamorph, N = neonate, and A = adult.

Western toad and northern red-legged frog (Hope to Westridge Segment) were the only species with special conservation status observed during the pond-amphibian surveys. Western toad was relatively common along the proposed pipeline corridor, except along the Burnaby to Westridge Segment. Although surveys were conducted in suitable habitat types, Oregon spotted frog was not found. Surveys for Great Basin spadefoot were not conducted since land access was not in place within their range during the period when breeding surveys should be conducted (before July).

The Edmonton to Hinton Segment crosses PNT 020232 located in NW 3-50-26 W5M, which includes long-toed salamander breeding ponds (Alberta Energy 2013). The proposed pipeline corridor is not located within 100 m of the ponds, and suitable habitat for long-toed salamander was not identified within the proposed corridor during field surveys in the summer of 2013. Also along the Edmonton to Hinton Segment, a long-toed salamander breeding pond was previously recorded and confirmed incidentally during field work in summer 2013. The pond is located approximately 30 m north of the Hinton Pump Station. As part of the Project, the existing Hinton Pump Station will be extended approximately 35 m to the west onto industrial and forested land.

5.2.10.2 Stream-Dwelling Amphibian Survey

Stream-dwelling amphibian surveys were completed from July 23 to Aug 15, 2013. A total of 59 locations were surveyed for coastal tailed frog and 14 locations were surveyed for Pacific giant salamander. Transects were located in the Black Pines to Hope and Hope to Westridge segments, which are within the range of these species. The locations where surveys were completed are shown in Figures 5.2.24 to 5.2.25.

Only coastal tailed frogs were detected during the stream-dwelling amphibian surveys. A total of 531 coastal tailed frogs were observed (Table 5.2.12) and 44 of the 59 (75%) streams surveyed were occupied. Most of the coastal tailed frogs observed were in the tadpole stage (96% of all observations); five adults were observed.

TABLE 5.2.12

COASTAL TAILED FROGS OBSERVED DURING STREAM-DWELLING AMPHIBIAN SURVEYS BY ECOREGION

| Ecoregion | Tadpoles | Metamorphs | Adults |
|-----------------------------|----------|------------|--------|
| Hozameen Range | 10 | 0 | 1 |
| Eastern Pacific Ranges | 494 | 12 | 4 |
| Northwestern Cascade Ranges | 8 | 0 | 0 |

TABLE 5.2.12 Cont'd

| Ecosection | Tadpoles | Metamorphs | Adults |
|----------------|------------|------------|----------|
| Fraser Lowland | 0 | 2 | 0 |
| Total | 512 | 14 | 5 |

5.2.11 Wildlife Habitat Ratings Field Sampling

Results of the TEM survey are provided in the *Wildlife Modeling and Species Accounts Technical Report* (Volume 5C).

5.2.12 Traditional Ecological Knowledge

Results of the wildlife TEK collected during field studies for the Project are compiled below and organized according to pipeline segment. Issues and concerns related to wildlife resources as well as proposed mitigation measures and/or response to those issues are provided below. Each Aboriginal community participated in comprehensive reviews of mitigation measures in the context of all the issues they had raised during the field study and follow-up review.

5.2.12.1 Edmonton to Hinton Segment

Evidence of ungulate species was observed by participants during the field studies along the proposed Edmonton to Hinton segment. Deer, elk and moose, historically and today, remain a traditional food source of Aboriginal people. Participants described that these ungulates use mineral licks to ingest salt from the mud, to retain water and prevent dehydration. Mineral licks are often found in wetlands and, in general, game trails will lead to mineral licks.

Moose will often travel long distances to find food preferring wetland habitat but also have the ability to adapt to new habitats when there are limited resources or when industrial and commercial development occurs. During the rutting season in September and October, moose seek low-lying areas with water. Moose travel upwind when looking for food and travel downwind when injured, also seeking out higher ground to pick up scents from the wind to determine where to feed or bed. Participants report that contaminated vegetation is leading to contaminated moose meat, and moose appear thinner and sickly. Participants stated that human health will be affected by animal health since everything is connected and that the health of the animals depends on the health of the land.

A participant shared a story about a man hunting in the woods who managed to shoot a moose. The moose got away from the man; however, he was able to follow the trail of blood. The amount of blood along the trail became less and less as the sun began to set. The man decided to make tea and sleep with the hopes of finding the injured moose in the morning. While asleep, the man had a strange dream. The moose told the man to leave him alone and showed the man how he treated the gunshot wound. The man watched as the moose first ate poplar leaves, then spruce bark, followed by some pinch berry and lastly some willow leaves. From these four substances the moose had cured himself. When the man woke up in the morning, he found that the moose had stayed in the same location, sacrificing himself to the man to feed his family. Not only did the moose provide the man with medicinal cures, he also gave his body to feed his family. The man mixed and boiled the moose blood with berries and thanked the moose for his generosity. When the man was praying he felt an Elder's hands squeezing his head, meaning that he was being blessed.

Evidence of gray wolf, fox and coyote were identified along the Edmonton to Hinton Segment and included tracks, scat, fur, dens and kill sites. Participants explained that these species typically den on higher ground, below tree roots (to avoid cave-ins), in remote locations with abundant food sources and water nearby. Sometimes hollowed out trees are used as dens and shelter. Wolf and fox dens generally have two holes, thought to be emergency exits to escape predators. Coyotes and foxes will use their dens for long periods of time and only abandon the den if disturbed. Abandoned fox dens may sometimes be used by coyotes and badgers. Fox and coyote eat small mammals such as mice, ducklings, duck and grouse. In the winter, they will forage for pine needles and dig up food from the ground. Participants noted that a change in weather is coming when coyotes howl. There is a healthy wolf population in the region

and participants believe wolves are responsible for the decrease in elk and deer populations. Participants shared that wolves will eat almost anything including geese, ducks, small mammals, plants, moose calves, coyote and even other wolves. On occasion, wolves are known to scavenge other animals' kills. Wolves migrate as a pack and typically hunt alone except when hunting large animals. The wolf plays a part in Cree tradition representing the hunter and, historically, wolf skins were worn while hunting to sneak up on game.

Participants observed evidence of black bear and grizzly bear along the Edmonton to Hinton Segment including scat, tracks, dens, chewed or clawed logs and claw marks on trees. Typically, claw marks on trees indicate a den is nearby, since bears do not tend to wander far from where they mark. Clawing trees is a way for bears to mark their territories and sharpen their claws. These claw marks can reach 9 m up the trunk. Black bears will also dig up spots at the bases of trees to mark their territory. Black bears prefer to den on ridges while grizzlies are found in lower-lying, valley lands of the Rocky Mountains. Grizzly bears travel long distances to hibernate and will mate at higher elevations. Hibernation begins with the first frost in the fall and ends in the spring. Bears are considered sacred animals and while rarely hunted today, bear hides were once traditionally worn while hunting or worn for protection and decorated with feathers and beads.

Participants reported that both beaver and muskrat are reluctant to travel far on land for fear of predators, tending to eat berries and vegetation that grow close to the ground and in aquatic environments. Wetlands are ideal habitat for these mammals, since they are close to the water and are abundant in vegetation to eat such as young willow and bulrush. Both animals can be dangerous when threatened and will spring up on their tails to bite. Beavers will also use their tails to slap the water to warn of predators. Felled trees, teeth marks on the ends of trees and beaver stumps are evidence of beaver habitat. The felled trees are dragged to the beaver dam to establish and build up their dams often inhabiting the same area for up to five years. Participants shared that length of winter can be predicted by the amount of food beavers collect. Typically, if a beaver dam is torn down in the spring, the beaver will relocate and make a new dam. Fall is thought to be the worst time to tear down a dam, since the beaver will have nowhere to rebuild in time for winter. The Stoney word for beaver is "chaba".

Members of the weasel family were identified during the field studies along the Edmonton to Hinton Segment including marten, mink, wolverine, otter, badger and skunk. These mammals are carnivorous and, on some occasions, scavenge for food. Participants shared that these animals are not trapped very often anymore since fur prices and demand are low. Ideal habitat for these mammals is characterized by larger spruce trees and areas with abundant squirrel activity. Marten fur is the thickest in spring and fall since they tend to prey on grouse and squirrel. Martens and mink prey on beavers as well. Wolverines remain close to forested habitats to hunt small prey. Badgers will make their homes near water if there is abundant prey to hunt, bark to eat and trees for shade.

Signs of squirrel were identified during the field studies along the Edmonton to Hinton Segment including middens, lodges, holes and nests. Squirrel lodges consist of holes scattered throughout the forest floor indicating underground tunnels and evidence of the squirrel's search for pine and spruce cones, seeds and nuts. They will stock pile cones, nuts and mushrooms in their tunnels under the snow. Participants reported that squirrels also eat antlers that have been shed on the forest floor since antlers provide needed dietary minerals. Nests are found at the base of trees or high in the branches and are easily recognizable by piles of pine cones nearby. Squirrel middens are piles of leaves and pine and spruce cone pieces left by squirrels, becoming quite large and indicating the presence of several generations of squirrels. Squirrels also use middens to stockpile food and the length of winter can be predicted by the size of a squirrel's midden. Squirrels are a traditional food source for Cree people, and eaten when large game is not available. Squirrels are also important for conducting certain traditional ceremonies.

Evidence of rabbit signs, including trails, droppings and fur, were identified during field studies along the Edmonton to Hinton Segment. Moist, open areas near water with soft moss on the ground and tree cover characterize ideal rabbit habitat. Tree cover is used to hide from predators, the vegetation for sustenance, and the soft, mossy ground to den. Rabbit diets consist of mushrooms, tree bark, roots, grass, Labrador tea, spruce and pine bark, and willow and poplar branches. Rabbits eat tree bark and branches in the winter when vegetation is sparse. Participants shared that by watching which mushrooms a rabbit consumes helps determine which mushrooms are poisonous since rabbits will not eat poisonous

varieties. Rabbits dig their own rabbit holes instead of using existing holes from other animals, protecting the rabbit from predators that may return. Rabbits are preyed on by coyotes and lynx.

Cougar tracks were identified during the field studies along the Edmonton to Hinton Segment and participants reported that cougars travel over a broad range of habitat including grasslands, water, forest, hills and ridges. Cougars will dig out their dens on the side of ridges and their diet consists of large and small prey. Cougar tracks are heavier in snow than lynx or bobcat and typically do not “drag tail” unless the snow is deep. When sick or injured, cougars are sometimes spotted near residential areas. Lynx and bobcat signs were also observed and, like cougars, they prefer habitats with a water supply, grasslands and forest.

Birds of prey including golden and bald eagle, red-tailed hawk and osprey were identified during the field studies along the Edmonton to Hinton Segment. Participants reported that these birds tend to make their nests high in pine trees along river banks. Eggs will hatch in spring and the young will leave the nest by mid-July, often returning to the same area that they were hatched later in life. Osprey and eagle hunt for fish along large watercourses especially when fish are spawning. Hawks are territorial birds and fiercely defend their territories from other birds like the raven. Hawks prefer to nest near water and open fields ideal for hunting rodents. Not all hawks will migrate in the winter, instead taking shelter in thick trees. Red-tailed hawks typically make their nests in poplar trees since the trees have strong branches. When a hawk feels threatened it circles and chirps a warning. Participants reported that the most important bird for cultural reasons is the bald eagle. If a dead eagle is found, the bird must be placed in a fire in order for their spirit to rise. While rarely hunted, a ceremony will be held before the eagle is hunted and a bald eagle sighting represents good luck. The eagle symbolizes the thunder bird and the feather can represent the initiation to womanhood or wisdom. Participants shared that in traditional legends, the thunderbird, represented by thunder and lightning as one, hunts in summer and would come down to earth and take big snakes or serpents as prey. Locations where snakes were taken by the thunderbird resemble dried channels. Eagle feathers are used as a decorative detail in dance regalia. Different feathers are used for different parts of the regalia. Traditionally, the feathers from only one bird are used so the dress looks uniform. The feathers play an important role in ceremonies and powwows. Eagle bones have customary uses also. For example, the smaller bones under the wing are used for traditional jewellery. The bones are filed down and soaked in bleach. The larger, longer bones are used as whistles for ceremonial gatherings.

Several birds including ducks and geese species including woodpecker, owls, swallows, red-winged black birds, wrens, chickadees, Wilson snipe/rain birds, herons, cranes, grouse/bush chicken, Canada geese, mallard ducks, loons and mud hens were observed during the field studies along the Edmonton to Hinton Segment. Participants reported that the numerous sightings are due to the abundance of watercourses and tree species including spruce that makes for good nesting sites. “Nee-pin” in Cree means spring and chickadees are called spring birds since their call sounds like “nee-pin”. Participants shared that great horned owls are considered important messengers in Cree culture. Owls do not store food for the winter and, instead, hunt year-round. Grouse or bush chickens nest in muskeg areas and are able to travel effectively through mossy terrain. Their diet includes cranberries, blueberries and gooseberries. Like the partridge, grouse lay their eggs on the ground at the base of trees. Dyed grouse feathers are used in regalia decoration and women will decorate their braids with grouse feathers. A participant shared the meaning of different numbers of grouse feathers in the braids. One feather means the woman is single; two that she is married; and three means she is married; however, her husband is out of town. Another participant shared that when he was a boy he would use the feathers like drawing straws whereby only one feather per grouse has a brown tip and the rest have black tips. Drawing the brown-tipped feather would be comparable to drawing the short straw. “Heba” in the Stoney language means “egg lay moon” and “waheeba” means “egg hatch moon” signalling the time for ducks, birds and most animals to hatch or give birth. Participants shared the seasonal names related to the duck cycle: May is called “laying moon”, June is called “hatching moon”, and July is “losing feather”.

Downy, red-headed and pileated woodpeckers were identified during the field studies along the Edmonton to Hinton Segment and participants reports that woodpeckers are important in Cree culture. They are believed to be spiritual messengers. For example, if a woodpecker taps on your house for more than a few days in a row, it is warning the occupants of ill health. The woodpecker's diet consist of pine beetles, termites, worms and ants found in a variety of tree species; however, woodpeckers prefer softwood trees like poplar to make their homes.

Detailed TEK related to wildlife resources for the Project along the Edmonton to Hinton Segment and any issues and concerns raised are provided in Table 5.2.13. Concerns related to wildlife resources were addressed by the proposed mitigation measures discussed. Participants have not recommended any mitigation strategies related to wildlife resources additional to those described in the EPPs to be implemented for the Project. Concerns related to potential effects of spills on the terrestrial environment (Section 3.0 of Volume 5A) are considered within the assessment of various onshore facility spill scenarios provided in Volume 7A.

TABLE 5.2.13

**WILDLIFE TRADITIONAL ECOLOGICAL KNOWLEDGE RECORDED
ALONG THE EDMONTON TO HINTON SEGMENT**

| Description | Location(s) | Issue/Concern | Proposed Mitigation Measures/Response ¹ |
|---|---|---|---|
| SPECIES OR GROUP: Beaver | | | |
| Evidence of beaver activity (e.g., holes and chewed sticks) | At RK 4.8 At RK 28.5 112 m south of RK 125.9 60 m north of RK 158.1 23 m south of RK 178.9 453 m north of RK 192.8 180 m southwest of RK 247.3 912 m south of RK 259 | Potential loss of beaver habitat. | Use natural recovery as the preferred method of reclamation on level terrain and at wetlands. Seed disturbed and erosion prone areas with an approved native seed mix. Reduce the width of grubbing near watercourses, wetlands and through other wet areas to facilitate the restoration of shrub communities. |
| Inactive beaver run | 81 m south of RK 247.7 78 m southeast of RK 299.2 | -- | Reduce disturbance at riparian areas, and where practical, extend the riparian buffer by implementing trenchless pipeline crossing techniques, or cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration. |
| Suitable habitat for Beaver | 18 m north of RK 85 182 m southwest of RK 247.3 3 m north of RK 173.6 38 m north of RK 133.4 394 m south of RK 178.9 110 m north of RK 179 5 northwest of RK 248 21 m south of RK 257.8 0.4 m north of RK 102 3 m south of RK 173.6 369 m north of RK 173.7 | -- | Reduce disturbance at riparian areas, and where practical, extend the riparian buffer by implementing trenchless pipeline crossing techniques, or cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration. Use natural recovery as the preferred method of reclamation on level terrain and at wetlands. Seed disturbed and erosion prone areas with an approved native seed mix. Reduce the width of grubbing near watercourses, wetlands and through other wet areas to facilitate the restoration of shrub communities. |
| Dam/Lodge | At RK 64.2 11 m south of RK 65.5 48 m southwest of RK 62.9 37 m west of RK 96.5 33 m south of RK 97 23 m southeast of RK 101.1 0.5 m south of RK 102 196 m south of RK 127.1 18 m north of RK 126 68 m south of RK 126.1 143 m southeast of RK 127 15 m north of RK 133.4 162 m north of RK 142 At RK 164.2 3 m north of RK 173.5 408 m north of RK 173.7 394 m south of RK 178.9 8 m north of RK 178.9 4 m north of RK 181 144 m northwest of RK 198.7 182 m southwest of RK 247 55 m northwest of RK 248 18 m north of RK 236.5 630 m north of RK 287.9 | Request to trap and release live beaver during dam removal. | In the event that beaver dams or lodges will be disturbed, provide notification or obtain necessary provincial permits prior to commencing activities. Engage the registered trapper(s). Notify DFO 14 days prior to beaver dam removal and ensure that the removals are conducted in accordance with conditions of DFO's Alberta Operational Statement for Beaver Dam Removal (Fisheries and Oceans Canada 2007). In BC, in the event that beaver dams or lodges will be disturbed, submit a notification to the appropriate regional Habitat Officer of the Ministry of Forests, Lands and Natural Resource Operations at least 45 days prior to beaver dam removal, as per Section 44 of the <i>Water Regulation</i> . Following this notification, obtain a Ministry of Natural Resource Operations Wildlife Sundry Permit to remove a beaver dam. Standards and best practices for beaver dam removal identified in the BC Standards and Best Practices for Instream Works (BC MWLAP 2004b) will be applied. |

TABLE 5.2.13 Cont'd

| Description | Location(s) | Issue/Concern | Proposed Mitigation Measures/Response ¹ |
|---|---|--|--|
| Evidence of ungulates (e.g., droppings, browse, tracks, beds, rubs, mating sites and sheds) | 107.2 m west of RK 7.2 From RK 24 to RK 28.5 320 m north of RK 44.5 163 m south of RK 59.6 From RK 61.6 to RK 65.5 From RK 79.9 to RK 84.7 From RK 90.8 to RK 99.4 From RK 103.8 to RK 110.5 From RK 121.1 to RK 137 140 m north of RK 147 18 m north of RK 156.5 85 m north of RK 159.3 375 m south of RK 161.5 20 m north of RK 177.5 394 m south of RK 179 22 m north of RK 240 50 m north of RK 245 33 m south of RK 262.9 284 m south of RK 280.8 32 m southeast of RK 298 8 m northwest of RK 300.5 32 m northwest of RK 307 43 m northwest of RK 323.3 210 m east of RK 333.9 98 m southeast of RK 338.4 21 m northwest of RK 339 | Loss of ungulate browse during construction and request for native vegetation to be used during reclamation. | Do not clear timber, stumps, brush or other vegetation beyond the marked construction right-of-way boundary. Where grading is not required, cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration. Use natural recovery as the preferred method of reclamation on level terrain and at wetlands. Seed disturbed and erosion prone areas with an approved native seed mix. Plant native tree seedlings and/or shrubs at select locations. For the proposed Kingsvale power line and pipeline right-of-way, minimize the right-of-way width to the extent practical by utilizing shared workspace, avoid clearing large diameter trees on the edge of the right-of-way; minimizing extra temporary workspace (e.g., placing log decks, storage areas, other temporary construction areas outside of the UWR). Maintain root layer integrity on the right-of-way by clearing vegetation above ground level and restricting grubbing to the trench width. Avoid creation of new access. Use existing roads/linear corridors for access wherever practical. Deactivate and reclaim all temporary access. Implement measures to reduce access (human and predator). Measures include using woody debris as rollback, and planting trees and/or shrubs at select locations. |
| | | Potential increase in hunting access during construction. | Implement measures to reduce access (human and predator) along the pipeline right-of-way. Measures include using woody debris as rollback, and planting trees and/or shrubs at select locations along the pipeline right-of-way. Implement the measures included in the Traffic and Access Control Management Plan prepared for the Project (Appendix C of the Pipeline EPP). Where rollback and coarse woody debris are needed for access management, erosion control and habitat enhancement, ensure that a sufficient supply is set aside for this purpose during final clean-up. Consider the following at the proposed crossing of roads, railways, other pipelines or watercourses: extend the length of an Horizontal Directional Drilling (HDD) or bored crossings where this crossing technique has been proposed to leave a vegetated screen and/or narrow the right-of-way width if feasible. Use existing roads to access the pipeline right-of-way. Deactivate and reclaim any temporary roads that are no longer needed with native vegetation. Implement measures to reduce access (human and predator) along these temporary roads, as required. Install educational signs as needed at selected locations. |

TABLE 5.2.13 Cont'd

| Description | Location(s) | Issue/Concern | Proposed Mitigation Measures/Response ¹ |
|--------------------------------|--|---|--|
| Suitable habitat for Ungulates | <p>From RK 62 to RK 98</p> <p>107 m south of RK 87.6</p> <p>From RK 90.6 to RK 91.6</p> <p>From RK 100.4 to RK 108.5</p> <p>347 m south of RK 112.2</p> <p>14 m north of RK 136.8</p> <p>From RK 118.7 to RK 142.1</p> <p>8 m north of RK 178.9</p> <p>417 m north of RK 189.7</p> <p>734 m northwest of RK 198.9</p> <p>394 m north of RK 199.4</p> <p>39 m north of RK 224.2</p> <p>From RK 240.1 to RK 248</p> <p>316 m south of RK 252.1</p> <p>145 m west of RK 252</p> <p>174 m south of RK 269.2</p> <p>19 m northeast of RK 284.8</p> <p>25 m north of RK 288.5</p> <p>26 m south of RK 308.4</p> <p>20 m west of RK 311.7</p> <p>23 m southeast of RK 320</p> <p>392 m east of RK 333.1</p> <p>21 m northwest of RK 338.8</p> | <p>Potential impacts to wildlife and wildlife habitat and request to limit new disturbance as much as possible.</p> | <p>Schedule clearing and construction to avoid relevant UWRs in accordance with provincial timing constraints.</p> <p>Minimize the width of the pipeline right-of-way to the extent practical by utilizing shared workspace, avoiding clearing large diameter trees on the edge of the right-of-way; minimizing extra temporary workspace.</p> <p>Maintain root layer integrity on the right-of-way by clearing vegetation above ground level and restricting grubbing to the trench width.</p> <p>Avoid creation of new access. Use existing roads/linear corridors for access wherever practical. Deactivate and reclaim all temporary access.</p> <p>Where segments of the right-of-way require rollback for access management or erosion control, ensure sufficient timber is set aside for this purpose during final clean-up.</p> <p>Conduct work as expeditiously as practical (<i>i.e.</i>, interval between front-end work activities such as grading and back-end activities such as clean-up) to reduce the length and duration of the open trench and to reduce potential barriers and hazards to wildlife.</p> <p>Locate gaps in pipe to allow wildlife movement in places that also facilitate construction such as at slope changes, crossings (<i>i.e.</i>, watercourse, road, pipeline right-of-way, railway) and bends. The locations of the gaps should coincide with gaps in spoil, slash piles and snow windrows. The locations can be determined in the field by the Environmental Inspector.</p> <p>Restore habitat connectivity by redistributing large-diameter slash (rollback) over select locations on the pipeline right-of-way (<i>e.g.</i>, where high levels of coarse woody debris occur prior to construction), to provide cover and facilitate movement of wildlife (<i>e.g.</i>, furbearers). Specific locations are to be determined in the field by the Environmental Inspector and Wildlife Resource Specialist in discussion with provincial regulators.</p> <p>Schedule clearing and construction activities to avoid sensitive wildlife timing windows wherever feasible.</p> <p>Minimize traffic and prohibit recreational use of all-terrain vehicles or snowmobiles by construction personnel on the pipeline right-of-way and at facilities.</p> <p>Prohibit personnel from having pets on the pipeline right-of-way and at facilities.</p> <p>Prohibit personnel from feeding or harassing wildlife.</p> <p>Obey speed limits along access roads and the right-of-way</p> <p>Ensure that food waste and industrial waste are disposed of properly.</p> <p>Report any issues related to wildlife encountered during construction and operation to the appropriate regulatory authorities.</p> <p>Implement the measures in the Wildlife Conflict Management Plan to prevent human/wildlife conflict and wildlife mortality (Appendix C of the Pipeline and Facilities EPPs).</p> <p>Install educational signs as needed at selected locations.</p> |

TABLE 5.2.13 Cont'd

| Description | Location(s) | Issue/Concern | Proposed Mitigation Measures/Response ¹ |
|--|---|--|---|
| SPECIES OR GROUP: BEAR | | | |
| Evidence of bear (e.g., scat, tree markings, tracks) | 400 m north of RK 44.5 145 m west of RK 103.5 1.5 m north of RK 108.5 50 m south of KP 114.7 33 m southeast of RK 127 150 m north of KP 147.1 At RK 160 16 m north of RK 168 27 m north of RK 171.5 27 m north of RK 180.9 417 m north of RK 190 394 m north of RK 199.4 515 m south of RK 203.2 From RK 242 to RK 248 145 m west of RK 252 From RK 269.2 to RK 291.8 From RK 305.5 to RK 311.7 722 m northwest of RK 328.1 24 m west of RK 333.5 | Potential impacts to bear habitat. | Implement the measures included in the Traffic and Access Control Management Plan prepared for the Project (Appendix C of the Pipeline EPP). Do not clear timber, stumps, brush or other vegetation beyond the marked construction right-of-way boundary. Where grading is not required, cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration. Use natural recovery as the preferred method of reclamation on level terrain and at wetlands. Seed disturbed and erosion prone areas with an approved native seed mix. Plant native tree seedlings and/or shrubs at select locations. Implement recommended mitigation measures for construction activities within provincial grizzly bear zones. Apply measures noted for Special Access Zones to limit new access. All workers will receive Bear Awareness Training (Government of Alberta 2013). Coordinate access and new clearing requirements with other industrial users in the area to minimize human activity within grizzly bear habitat (Government of Alberta 2013). Delimb coniferous trees and leave limbs on-site to provide a seed source (Government of Alberta 2013). Prohibit construction personnel from feeding or harassing wildlife. Dispose of food wastes and industrial waste properly. Utilize multi-passenger vehicles for the transport of crews to and from the job sites, to the extent practicable, to reduce traffic during construction. Follow the <i>Bear-Human Conflict Management Plan for Camps</i> provided in the Integrated Standards and Guidelines if a camp is located within grizzly bear habitat (Government of Alberta 2013). In the event an active grizzly bear den is found, contact AESRD to discuss mitigation strategies. Recommended setbacks are 750 m for high disturbance activities (i.e., conventional pipelines) and 500 m for medium disturbance activities (i.e., conventional pipeline parallel to a linear corridor) from October 1 to April 30 (Government of Alberta 2013). |
| Suitable Habitat for Bears | 19 m east of RK 63 8 m south of RK 108.6 298 m north of RK 125.5 14 m north of RK 136.8 38 m north of RK 206.8 75 m north of RK 223 145 m west of RK 252 10 m south of RK 270.2 8 m south of RK 284.1 63 m southeast of RK 325.8 137 m northwest of RK 339.1 | -- | Apply measures noted for Special Access Zones to limit new access. Delimb coniferous trees and leave limbs on-site to provide a seed source (Government of Alberta 2013). In the event an active grizzly bear den is found, contact AESRD to discuss mitigation strategies. Recommended setbacks are 750 m for high disturbance activities (i.e., conventional pipelines) and 500 m for medium disturbance activities (i.e., conventional pipeline parallel to a linear corridor) from October 1 to April 30 (Government of Alberta 2013). |
| Bear Den | 422 m south of RK 223.6 | Disturbance of bear dens during construction. | In the event an active mammal den is found, a 100 m setback is recommended. Contact AESRD to discuss the appropriate mitigation. Examples may include monitoring the den and/or modifying the construction schedule to avoid activity until the den is inactive. Implement a setback of 750 m for high disturbance activities (i.e., conventional pipelines) and 500 m for medium disturbance activities (i.e., conventional pipeline parallel to a linear corridor) in the event an active grizzly bear den is discovered from October 1 to April 30. |

TABLE 5.2.13 Cont'd

| Description | Location(s) | Issue/Concern | Proposed Mitigation Measures/Response ¹ |
|---------------------------------------|---|---|---|
| SPECIES OR GROUP: Birds | | | |
| Red-tailed hawks observed | 24 m east of RK 10 27 m north of RK 44.6 | Disturbance of bird habitat during construction. Disturbance of nests and nesting grounds during construction and avoid nesting/rearing areas, if possible and/or the relocation/creation of additional suitable habitat (e.g., nest boxes). | Align route to parallel existing corridors (<i>i.e.</i> , existing TMPL right-of-way, Highway 5) to the extent feasible to reduce habitat disturbance. Do not clear timber, stumps, brush or other vegetation beyond the marked construction right-of-way boundary. Where grading is not required, cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration. Avoid clearing large wildlife trees/veteran trees and snags where feasible. Retain slow decaying tree species (<i>e.g.</i> cedar) where feasible (Blackburn <i>et al.</i> 2009). Plant native tree seedlings and/or shrubs at select locations. Reduce the width of grubbing near watercourses, wetlands and through other wet areas to facilitate the restoration of shrub communities. Reduce disturbance at riparian areas, and where practical, extend the riparian buffer by implementing trenchless pipeline crossing techniques, or cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration. Schedule clearing and construction activities outside of sensitive time periods for raptors. In the event clearing is scheduled within these periods, in areas of suitable habitat, conduct raptor nest searches prior to clearing to locate active raptor nests. In Alberta, schedule clearing and construction activities outside of the migratory bird restricted activity period (RAP) of May 7 to August 20. In BC, schedule clearing and construction activities outside the migratory bird breeding season of March 15 to August 15 (Wilson pers. comm.). In the event clearing or construction activities are scheduled during the migratory bird breeding season, follow measures for conducting migratory bird nest sweeps described below. In simple habitat types where active nests are easier to locate (<i>i.e.</i> , previously cleared areas and open areas with sparse vegetation and few trees), a nest sweep may be completed within 7 days of activity that is scheduled to occur within the migratory bird RAP. Use non-intrusive methods to conduct an area search for evidence of nesting (<i>e.g.</i> , presence of singing birds, territorial males, alarm calls, distraction displays). In the event an active nest is found, it will be subject to site-specific mitigation measures (<i>i.e.</i> , clearly marked protective buffer around the nest and/or non-intrusive monitoring). In complex habitats where active nests are more difficult to find (<i>e.g.</i> , forests), it is recommended that pre-clearing be conducted. In BC, in the event that an active Williamson's sapsucker or Lewis's woodpecker nest tree is found within or adjacent to the Project Footprint, consult with BC MFLNRO to discuss practical options and mitigation strategies. Consider implementing the following bird conservation strategies: for Lewis's woodpecker, retain cavity-bearing trees and snags as nesting habitat, initiate nest box programs in areas lacking cavities/snags, restore/expand riparian buffers (minimum 30m and >300m for at least 10% of stream length) where nests are found; for American white pelican, double-crested cormorant and Western grebe establish undisturbed buffer zones (100 m) around breeding colonies; for rusty blackbird maintain unharvested buffers of contiguous forest around bogs used for breeding; and for barn swallow avoid the use of pesticides to maintain invertebrate species (Environment Canada 2013c). |
| Bald eagle observed | 140 m south of RK 156.8 | | |
| Hawk observed | 185 m southwest of RK 104.5 | | |
| Woodpecker holes | 97 m south of RK 59.4 398 m south of RK 96.5 15 m south of RK 135.8 47 m south of RK 147.74 11 m north of RK 322.14 | | |
| Nest (species unconfirmed) | 28 m southwest of RK 61.7 207 m southwest of RK 61.8 58 m south of RK 65.1 21 m south of RK 91.1 396 m south of RK 96.5 70 m south of RK 126.1 21 m south of RK 129.8 34 m north of RK 135.8 73 m north of RK 158.0 58 m north of RK 168.1 225 m northwest of RK 198.8 311 m south of RK 205.6 400 m north of RK 227.6 64 m southeast of RK 275.5 52 m east of RK 309.4 | | |
| Nesting grounds (species unconfirmed) | 8 m south of RK 108.6 3 m north of RK 173.5 5 m north of RK 264.7 | | |

TABLE 5.2.13 Cont'd

| Description | Location(s) | Issue/Concern | Proposed Mitigation Measures/Response ¹ |
|--------------------|---|---|--|
| Bald eagle habitat | 11 m southwest of RK 62.9 12 m northeast of RK 63.4 11 m south of RK 65.5 | Disturbance of eagle habitat during construction. | <p>Schedule clearing and construction activities outside of sensitive time periods for raptors (provided below) to the extent feasible. In the event clearing is scheduled within these periods, in areas of suitable habitat, conduct raptor nest searches prior to clearing to locate active raptor nests. In the event an active raptor nest is discovered, consult with the appropriate regulatory authorities to discuss practical options and mitigation strategies.</p> <p>In Alberta, implement the appropriate setback in the event an active nest of a sensitive raptor is found (<i>i.e.</i>, ferruginous hawk, bald eagle, golden eagle, prairie falcon, peregrine falcon). These are: for high disturbance activities (<i>i.e.</i>, conventional pipeline), a 1,000 m setback is recommended year-round; for High impact activities (<i>i.e.</i>, conventional pipeline); for a 1,000 m setback is recommended for medium disturbance Medium impact activities (<i>i.e.</i>, conventional pipeline parallel to a linear corridor), a 1,000 m setback is recommended from March 15 to July 15 and a; and a 100 m setback is recommended from July 16 to March 14 (Government of Alberta 2013). . All other raptor nests (<i>e.g.</i>, red-tailed hawk) have a recommended 100 m setback when they are active (Government of Alberta 2013).</p> <p>In BC, eagle, peregrine falcon, gyrfalcon, osprey and burrowing owl nests are protected year-round by the BC <i>Wildlife Act</i> and may not be cleared. The Guidelines for Raptor Conservation (BC MOE 2013) provides information on sensitive breeding and nesting time periods and buffers for raptor nests according to their tolerance to human disturbance. These buffers range from 50 m to 500 m depending on the surrounding land use and species. During the breeding season, an additional 100 m "quiet" buffer is recommended. Clearly mark the appropriate buffers with fencing to prevent access to the nest.</p> <p>If construction is unavoidable within the recommended year-round and breeding buffers, a Nest Management Plan addressing various mitigation (including nest monitoring during the breeding period) is recommended.</p> <p>If construction activities require the removal of a raptor nest that is protected year-round under the BC <i>Wildlife Act</i> (<i>i.e.</i>, eagle, peregrine falcon, gyrfalcon, osprey and burrowing owl), Trans Mountain will work with the appropriate regulatory authorities to develop a Nest Removal Management and Compensation Plan. Upon confirmation the nest is inactive, nest removal should occur during the least risk window of August through December. When a nest is removed the installation of a replacement structure (<i>i.e.</i>, a platform on a pole or transplanted tree) should be erected in nearby suitable habitat (BC MOE 2013).</p> <p>In simple habitat types where active nests are easier to locate (<i>i.e.</i>, previously cleared areas and open areas with sparse vegetation and few trees), a nest sweep may be completed within 7 days of activity that is scheduled to occur within the migratory bird RAP. Use non-intrusive methods to conduct an area search for evidence of nesting (<i>e.g.</i>, presence of singing birds, territorial males, alarm calls, distraction displays). In the event an active nest is found, it will be subject to site-specific mitigation measures (<i>i.e.</i>, clearly marked protective buffer around the nest and/or non-intrusive monitoring).</p> <p>In complex habitats where active nests are more difficult to find (<i>e.g.</i>, forests), it is recommended that pre-clearing be conducted. If this is not feasible and activity is scheduled to occur within the migratory bird RAP, contact Environment Canada prior to activity to discuss the area to be cleared. Use non-intrusive methods to conduct an area search for evidence of nesting (<i>e.g.</i>, presence of singing birds, territorial males, alarm calls, distraction displays). In the event an active nest is found, it will be subject to site-specific mitigation measures (<i>i.e.</i>, clearly marked protective buffer around the nest and/or non-intrusive monitoring).</p> |

TABLE 5.2.13 Cont'd

| Description | Location(s) | Issue/Concern | Proposed Mitigation Measures/Response ¹ |
|--|--|---|--|
| Bald eagle habitat (cont'd) | See above | See above | Conduct species specific surveys to identify important wildlife features for species known to occur in the area (e.g., bald eagle nests, great blue heron colonies). In the event these are found, consult with BC MFLNRO to discuss practical options and mitigation strategies. |
| Whooping crane, blue heron habitat | From RK 62 to RK 96 | Disturbance of nesting grounds during construction. | Schedule clearing and construction activities outside of sensitive time periods for great blue heron. In the event clearing is scheduled within these periods, in areas of suitable habitat, conduct a nest search to locate nesting colonies. In the event an active colony is discovered, the appropriate buffer will be applied. Alberta, activities are not recommended within 1,000 m with the exception of Low and Medium impact activities (i.e., conventional pipeline along existing linear disturbances) that may occur up to 100 m from a colony when construction occurs from September 1 and February 28 (Government of Alberta 2013). In BC, great blue heron nests are protected year-round under the BC <i>Wildlife Act</i> . The following are the recommended setbacks: 300 m (undeveloped), 200 m (rural), 60 m (urban) and a 200 m "quiet" buffer during the breeding season from the outer perimeter of all nesting trees. The least risk window is from September 1 to February 15 (BC MOE 2012a). |
| Grouse habitat | 264 m southeast of RK 202.4 | Disturbance of bird habitat during construction. | In Alberta, implement a 500 m setback in the event an active sharp-tailed grouse lek is identified. Use noise reduction equipment to muffle or otherwise control noise so that operational noise does not exceed 49 decibels measured at 10 m from the source to the 500 m setback (Government of Alberta 2013). In the event an active sharp-tailed grouse lek is found, consult with AESRD to discuss practical options and mitigation strategies. In BC, avoid activity in the area of identified sharp-tailed grouse leks from April 1 to May 31 (Surgenor pers. comm.). Activities are not recommended within 400 m of a sharp-tailed grouse lek between April 1 and May 31 (BC MWLAP 2004c). In the event an active sharp-tailed grouse lek is identified, consult with BC MFLNRO to discuss practical options and mitigation strategies. |
| SPECIES OR GROUP: Furbearers including muskrat, rabbit, porcupine, squirrel, badger | | | |
| Suitable habitat for small furbearers | 40 m southwest of RK 61.6 11 m southwest of RK 62.9 From RK 90.6 to RK 91.6 145 m west of RK 103.5 1.5 m north of RK 108.5 50 m south of KP 114.7 33 m southeast of RK 127 394 m north of RK 199.4 88 m southeast of RK 245.2 182 m southwest of RK 247.3 67 m southeast of RK 248 145 m west of RK 252 174 m south of RK 269.2 20 m west of RK 311.7 392 m east of RK 333.1 | Potential impacts to wildlife and wildlife habitat. | Minimize the width of the pipeline right-of-way to the extent practical by utilizing shared workspace, avoiding clearing large diameter trees on the edge of the right-of-way; minimizing extra temporary workspace. Maintain root layer integrity on the right-of-way by clearing vegetation above ground level and restricting grubbing to the trench width. Avoid creation of new access. Use existing roads/linear corridors for access wherever practical. Deactivate and reclaim all temporary access. Use natural recovery as the preferred method of reclamation on level terrain and at wetlands. Seed disturbed and erosion prone areas with an approved native seed mix. Reduce the width of grubbing near watercourses, wetlands and through other wet areas to facilitate the restoration of shrub communities. |
| Evidence of small furbearers (e.g., mounds, chew, tracks, trails, dens) | At RK 28.5 61 m northeast of RK 61.7 At RK 77.5 111 m south of RK 87.5 18 m north of RK 91.1 From RK 101.7 to RK 118.8 At RK 147.1 70 m north of RK 227.5 From RK 247.9 to RK 252.7 11 m south of RK 264.6 48 m south of RK 267.9 91 m southeast of RK 301.5 13 m northwest of RK 338.7 | | Reduce disturbance at riparian areas, and where practical, extend the riparian buffer by implementing trenchless pipeline crossing techniques, or cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration. |

TABLE 5.2.13 Cont'd

| Description | Location(s) | Issue/Concern | Proposed Mitigation Measures/Response ¹ |
|---|--|---|---|
| SPECIES OR GROUP: Canids including coyote, wolf, fox | | | |
| Suitable habitat for Canids | 11 m southwest of RK 62.9 145 m west of RK 103.5 From RK 108.5 to RK 114.7 33 m southeast of RK 127 29 m south of RK 131.7 394 m north of RK 199.4 422 m south of RK 223.6 4 m southwest of RK 241.6 88 m southeast of RK 245.2 182 m southwest of RK 247.3 67 m southeast of RK 248 145 m west of RK 252 174 m south of RK 269.2 20 m west of RK 311.7 392 m east of RK 333.1 | Potential impacts to wildlife and wildlife habitat. | Do not clear timber, stumps, brush or other vegetation beyond the marked construction right-of-way boundary. Where grading is not required, cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration. Use natural recovery as the preferred method of reclamation on level terrain and at wetlands. Seed disturbed and erosion prone areas with an approved native seed mix. Plant native tree seedlings and/or shrubs at select locations to be determined in the field by the Environmental Inspector, in consultation with the Wildlife Resource Specialist. Reduce the width of grubbing near watercourses, wetlands and through other wet areas to facilitate the restoration of shrub communities. Reduce disturbance at riparian areas, and where practical, extend the riparian buffer by implementing trenchless pipeline crossing techniques, or cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration. Implement measures to reduce access (human and predator) along the pipeline right-of-way. Measures include using woody debris as rollback, and planting trees and/or shrubs at select locations along the pipeline right-of-way. Where rollback and coarse woody debris are needed for access management, erosion control and habitat enhancement, ensure that a sufficient supply is set aside for this purpose during final clean-up. Use existing roads to access the pipeline right-of-way. Deactivate and reclaim any temporary roads that are no longer needed with native vegetation. Implement measures to reduce access (human and predator) along these temporary roads, as required. |
| Evidence of canids (e.g., tracks, scat, sightings) | 8 m southwest of RK 62.9 60 m north of RK 79.1 108 m east of RK 99.5 From RK 108.5 to RK 114.7 22 m north of RK 189 58 m north of RK 202.5 19 m south of RK 282.2 61 m southeast of RK 275.8 31 m southeast of RK 293.5 58 m southeast of RK 320.5 72 m southeast of RK 337.7 31 m southeast of RK 293.5 | | |
| Canid Den | 31 m northwest of RK 71.8 540 m south of RK 155.3 33 m north of RK 276.2 4 m northwest of RK 299.5 11 m north of RK 322.1 | Disturbance of dens during construction. | In Alberta, in the event an active mammal den is found, a 100 m setback is recommended. Mitigation may include monitoring the den and/or modifying the construction schedule to avoid activity until the den is inactive. |

TABLE 5.2.13 Cont'd

| Description | Location(s) | Issue/Concern | Proposed Mitigation Measures/Response ¹ |
|--|---|---|---|
| SPECIES OR GROUP: Felids including cougar, lynx | | | |
| Suitable habitat for felids | 11 m southwest of RK 62.9 145 m west of RK 103.5 1.5 m north of RK 108.5 50 m south of KP 114.7 33 m southeast of RK 127 394 m north of RK 199.4 88 m southeast of RK 245.2 182 m southwest of RK 247.3 67 m southeast of RK 248 145 m west of RK 252 174 m south of RK 269.2 40 m northwest of RK 306.8 20 m west of RK 311.7 500 m north of RK 338.4 392 m east of RK 333.1 21 m northwest of RK 338.5 | Potential impacts to wildlife and wildlife habitat. | Do not clear timber, stumps, brush or other vegetation beyond the marked construction right-of-way boundary. Where grading is not required, cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration. Use natural recovery as the preferred method of reclamation on level terrain and at wetlands. Seed disturbed and erosion prone areas with an approved native seed mix. Plant native tree seedlings and/or shrubs at select locations to be determined in the field by the Environmental Inspector, in consultation with the Wildlife Resource Specialist. Reduce the width of grubbing near watercourses, wetlands and through other wet areas to facilitate the restoration of shrub communities. Reduce disturbance at riparian areas, and where practical, extend the riparian buffer by implementing trenchless pipeline crossing techniques, or cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration. Implement measures to reduce access (human and predator) along the pipeline right-of-way. Measures include using woody debris as rollback, and planting trees and/or shrubs at select locations along the pipeline right-of-way. Where rollback and coarse woody debris are needed for access management, erosion control and habitat enhancement, ensure that a sufficient supply is set aside for this purpose during final clean-up. Use existing roads to access the pipeline right-of-way. Deactivate and reclaim any temporary roads that are no longer needed with native vegetation. Implement measures to reduce access (human and predator) along these temporary roads, as required. |
| Evidence of cougar and lynx (e.g., tree markings, sightings, tracks) | 150 m north of KP 147.1 7 m north of RK 161.4 275 m east of RK 252.1 250 m northwest of RK 252.7 31 m southeast of RK 293.5 286 m northwest of RK 338.3 | | |
| SPECIES OR GROUP: Other wildlife features | | | |
| Wildlife tree | 151 m north of RK 107.8 42 m north of RK 227.5 | Removal of wildlife trees. | Avoid clearing large wildlife trees/veteran trees and snags where feasible. Retain slow decaying tree species (e.g. cedar) where feasible (Blackburn <i>et al.</i> 2009). |
| Amphibian breeding pond | 75 m south of RK 180 225 m northwest of RK 198.6 | Disturbance and loss of amphibian breeding habitat during construction. | Schedule clearing and construction activities outside of the breeding and seasonal migration periods for amphibians, where feasible. In Alberta, this is generally mid-April to mid-June (Government of Alberta 2013). In BC, this will vary depending on pipeline segment and can be from mid-April to mid-June (Hargreaves to Hope) and from February to late-July or August (Hope to Westridge) (Wind pers. comm.). In Alberta, in the event that a western toad breeding pond is found, a year-round 100 m setback distance is recommended (Government of Alberta 2013). In Alberta, in the event a long-toed salamander breeding pond is found, a year-round 200 m setback distance (where new-cut is required) and a 100 m setback distance (when paralleling existing linear disturbance) is recommended (Government of Alberta 2013). In reference to the long-toed salamander breeding pond at NW 33-49-26 W5M (RK 339.3) located approximately 30 m north of the Hinton Pump Station, AESRD will be consulted to discuss mitigation for both the proposed expansion of the pump station, as well as pipeline construction. For activity in the summer (breeding season), mitigation may include exclusion fencing, onsite monitors and relocation if warranted. |

TABLE 5.2.13 Cont'd

| Description | Location(s) | Issue/Concern | Proposed Mitigation Measures/Response ¹ |
|----------------------------------|------------------------|--|---|
| Amphibian breeding pond (cont'd) | See above | See above | <p>In BC, protect identified amphibian breeding ponds by implementing appropriate buffers (150 m undeveloped; 100 m rural; 30 m urban) (BC MOE 2012a).</p> <p>A year-round 400 m federal setback distance is recommended for western toad breeding ponds and wintering sites (Environment Canada 2011).</p> <p>If the proposed construction right-of-way is located within the recommended buffer, consult with the appropriate regulatory authorities to determine the appropriate mitigation measures.</p> <p>Apply standard wetland construction and reclamation mitigation (e.g., minimal disturbance, recontouring, reclamation, monitoring and remedial measures) to support habitat reclamation as needed.</p> <p>Use snow packing and mats to avoid excessive soil compaction in the proximity of wetlands and watercourses.</p> <p>Maintain natural hydrology of streams and wetlands during clearing, construction and clean-up activities.</p> <p>Install fencing around wetlands for clearing and construction activities scheduled during the amphibian breeding period (spring), where warranted, to protect important habitat (BC MWLAP 2004d).</p> <p>Install fencing along construction workspace near identified breeding ponds to prevent dispersing amphibians from entering the construction zone and limit vehicular activity in spring and early fall to reduce effects during the breeding and dispersal periods (Wilkinson pers. comm.). All fencing installed during clearing and construction activities should be removed once they are no longer necessary to prevent barriers to amphibian movement following construction.</p> <p>Reclaim borrow pits and avoid creating small artificial ponds by avoiding construction during wet conditions that would create excessive soil rutting; grade ruts in construction access and on the right-of-way where rutting cannot be avoided.</p> <p>Do not mow/brush vegetation within wetland riparian (fringe) areas during operation.</p> <p>Conduct an amphibian salvage prior to clearing and construction activities at known amphibian breeding pond locations. Ensure the appropriate permit(s) is obtained and adhere to the Best Management Practices for Amphibian and Reptile Salvages in BC (EDI Environmental Dynamics <i>et al. in prep</i>).</p> <p>If the proposed pipeline right-of-way is located within the recommended setback distance of an amphibian breeding pond, consult with the appropriate regulatory authorities to discuss practical options and mitigation strategies.</p> |
| Bat roost | 16 m north of RK 167.9 | Loss of bat roost during construction. | <p>In Alberta, roosts and hibernation sites of northern long-eared bats have a year round 300 m setback from high disturbance activities; 100 m setback from medium disturbance activities and a 50 m setback from low disturbance activities. (Government of Alberta 2013).</p> <p>In BC, protect bat roosts from disturbance by humans and other sensory disturbances (BC MOE 2012a). Implement a 125 m buffer from bat hibernacula (from October 1 to April 30 or maternity roost (from May 1 to August 31) (BC MWLAP 2004a). Consult with BC MFLNRO where disturbance of a hibernacula or maternity roost is unavoidable to discuss practical options and mitigation strategies.</p> <p>Do not blast, remove rock or talus, or construct new roads in the area surrounding a hibernacula or maternity roost unless there is no other practical option. Consult with BC MFLNRO to discuss alternate mitigation (BC MWLAP 2004a).</p> <p>Schedule blasting that may occur within 1 km of Keen's long-eared myotis maternity roosts and hibernacula, to occur outside the period from October 1 to May 31 (BC MWLAP 2004a). Consider applying this best practice to other bat species.</p> |

TABLE 5.2.13 Cont'd

| Description | Location(s) | Issue/Concern | Proposed Mitigation Measures/Response ¹ |
|--------------------------------|--|---|---|
| Mineral lick | 45 m south of RK 239.9 28 m south of RK 292.5 34 m southeast of RK 298.9 | Loss of mineral lick during pipeline construction. | Implement a 100 m setback in the event a mineral lick is identified (Government of Alberta 2013; BC OGC 2013). In the event that shifting/narrowing the pipeline right-of-way is not feasible to maintain the minimum setback from a mineral lick, consult with AESRD or BC MFLNRO to discuss practical options and mitigation strategies. Maintain the integrity of trails to mineral licks and do not isolate from nearby escape cover (e.g., dense forest) (BC MWLAP 2004a). Avoid activities (i.e., clearing, construction, helicopter overflights) near mineral licks during critical periods (May to November) (BC MWLAP 2004a), to the extent feasible. Deactivate access roads as soon as practical (BC MWLAP 2004a). Leave a gap in set-up pipe within the area of the mineral lick to allow wildlife to access the mineral lick. The locations of the gaps in strung pipe should coincide with gaps in strippings, spoil, snow and rollback windrows. |
| Well-used game trails/corridor | 80 m south of RK 59.4 14 m north of RK 65.5 60 m southwest of RK 61.6 341 m east of RK 99.5 22 m northwest of RK 100.4 47 m south of RK 107.7 12 m south of RK 108.9 143 m southeast of RK 127 30 m south of RK 131.6 6 m south of RK 154.2 3 m south of RK 154.5 306 m north of RK 171.8 2 m south of RK 173.6 24 m north RK 188.7 3 m south of RK 223.8 11 m north of RK 225 10 m south of RK 239.1 44 m north of RK 240.3 35 m northwest of RK 244.3 20 m north of RK 246 424 m north of RK 254.7 43 m south of RK 262.3 4 m southwest of RK 264.1 8 m south of RK 278.9 25 m north of RK 288.5 5 m north of RK 296 161 m northwest of RK 298.2 10 m south of RK 298.6 40 m northwest of RK 306.8 25 m southeast of RK 308 20 m west of RK 311.6 26 m northwest of RK 318.7 23 m southeast of RK 319.7 32 m northwest of RK 324.3 392 m east of RK 333.1 10 m west of RK 336.2 | Potential for construction activities to limit use of game trails, restricting wildlife movement. | Conduct work expeditiously to maintain a tight construction spread (i.e., interval between front-end work activities such as grading and back-end activities such as clean-up) to reduce the duration of the open trench and to reduce potential barriers and hazards to wildlife. Locate gaps in pipe to facilitate wildlife movement in places that also facilitate construction such as at slope changes, crossings (i.e., watercourse, road, pipeline right-of-way, railway) and bends. The locations of the gaps should coincide with gaps in spoil, slash piles and snow windrows. Restore habitat connectivity by redistributing large-diameter slash (rollback) over select locations on the pipeline right-of-way (e.g., where high levels of coarse woody debris occur prior to construction), to provide cover and facilitate movement of wildlife (e.g., furbearers). |
| | | Request for wildlife monitors during construction. | The EPPs (Volumes 6B, 6C and 6D) provide mitigation plans developed in response to issues identified during Project planning, stakeholder consultation, Aboriginal engagement and regulatory discussions. Aboriginal Monitors onsite through the construction of commissioning of the of the Project will work with environmental inspectors to provide traditional knowledge to the construction program to ensure protection of the environment; to discuss upcoming traditional and western science elements with the environmental inspector to insure protection and monitoring; and to monitor mitigation success in protecting the environment. Trans Mountain will continue to engage Aboriginal communities through all phases of the Project. Trans Mountain's commitment to retain Aboriginal Monitors is further described in Volume 6A. |

Note: 1 Detailed mitigation measures are outlined in the Project-specific EPPs (Volumes 6B and 6C).

5.2.12.2 *Hargreaves to Darfield Segment*

During the field studies along the Hargreaves to Darfield Segment, participants described an “interconnectedness” that exists in the forest between all elements of the ecosystem, including humans. Most wildlife will spend the majority of their time in the hills and mountains, moving to lower elevations if in need of food.

Participants described several methods to call animals when hunting in the forest. Blowing grass sounds like a baby deer or injured rabbit and will attract bears, particularly black bears. Knocking a stick against a small tree sounds like antlers knocking against each other. Doing this or knocking old antlers together will attract bucks during the rutting season. Knocking together larger antlers will attract larger bucks that are searching for their potential competition since the rattle sounds like two males fighting over a female.

In September, care must be taken with large game like moose, elk and deer since fall is their mating season. Large game will be aggressive during the fall rut and they will also be aggressive during the spring when their offspring are born. Before the fall rut, bull elk, moose and deer can be seen with velvet hanging off of their antlers. Mineral licks are used by ungulates like sheep, goats, elk and deer. Participants shared that Elders will not usually hunt at salt licks since it is unfair to hunt easy prey. Predators will hunt at mineral licks which are usually found in soils with heavy clay and calcium content. Animals will frequent mineral licks all year long.

Participants reported that the valley along the North Thompson River is a wildlife corridor. Animals make dens underground, in hollow trees and under boulders. Animals that use dens and wildlife trees include bats, chipmunks, owls, squirrels, flying squirrels, badgers, woodpeckers, bears, rabbits, hares, voles, porcupines, lynx, wolves, coyotes, wolverine and marten. Scaly bark is an indication of a wildlife tree, since scaly bark is good for bats and perching birds. Perching trees, used by hawks and owls, have more branches and leaves than wildlife trees. It is possible to identify an active cavity nest by the presence of whitewash around the hole. Birds often try to lead predators away from their nests by pretending they are injured.

Shrubs, bark, willow, spruce, wild rhubarb, fireweed, skunk cabbage and lilies are eaten by moose. Moose eat the bark and cambium of trees like balsam fir. Foliage that has been grazed upon by moose can be identified by the height and roughness of foliage chewed. The amount of grazing in an area can indicate whether moose use the area regularly. Moose will not normally eat smaller aspen, though will do so when there is not much else to eat. A participant reported that moose tend to go to high ground during the day or during the summer since it is cooler and at dusk they come down for water. Other participants reported that moose will rest near creeks to cool down, and that they move to lower elevations during the winter. Moose would not likely bed in an open area, preferring instead areas like wetlands for water and riparian vegetation, and willow and tall grasses, because ground conditions also inhibit predators. The open trees make a good location for the animals to rest out of the sun during summer. In the winter, the trees shade them from snow. Snow is shallower in areas with green trees. Man-made paths and rights-of-way can be good corridors for wildlife like moose; however, moose would only use such clearings for travel if there was a waterbody or wetland nearby. Calving moose also prefer tall grass near swamps to hide from predators and to access water for the calves. Moose is a traditional source of food for Aboriginal communities that is still consumed today.

White-tailed deer and mule deer were identified during the field studies along the proposed Hargreaves to Darfield Segment. Participants reported that there used to be more white-tailed deer than mule deer in this region; however, this dynamic has reversed. Good deer (and elk) habitat will have abundant plants and shrubs for browsing including kinnikinnick, rosehips, fireweed, aspen tree tips and thimbleberry leaves. Both kinds of deer as well as elk are traditional food sources for Aboriginal communities. Deer will rub their antlers against trees, and rattle trees to alert other males nearby. Rubbing trees leaves an identifying scent on them. Mule deer antlers fork while white-tailed deer antlers have all points coming off of one branch. Antlers can be used by people to dig up roots like potatoes, carrots, and wild ginger. Deer will travel along slopes and challenging terrain to avoid predators. Slopes allow for a better line-of-sight and prevent predators from attacking from behind.

Participants reported that the local caribou population has decreased since the use of snowmobiles, industrial and urban development, overhunting, and climate changes have increased over time. Lands

along the Hargreaves to Darfield Segment were once an important part of caribou ranges. Mountain caribou would travel in small herds and, in the winter, remain in their alpine habitat to eat moss, descending from the mountains in the summer. When caribou eat freckle pelt lichen, their meat will be very tender. Participants also reported that caribou would not be found near Valemount; however, there are many different herds located near Jasper. Large herds of caribou have not been seen in this region for decades. The valley crossed at RK 669.3 and surrounding lands was at one time populated by caribou. In the 1930s and 1940s caribou were so abundant that traffic had to be stopped when caribou were crossing. Herds in this valley now have only eight to ten individuals.

During the field studies along the Hargreaves to Darfield Segment, participants explained that bears are constantly on the move throughout their extensive ranges. Bears may travel existing rights-of-way, preferring open areas during spring and summer when berries are abundant. Good habitat for bears will be well away from human activity. Lands with abundant ground cover provide bears, especially sows and their young, with protection from the elements and predators. While bears are omnivores, most of their meat-eating is opportunistic, more often consuming berries, insects, grass, fish, and grubs. Bears prefer eating berries to pulling apart rotten logs to find grubs. Participants shared that bears play an important role in local culture and are sacred animals.

Carnivores identified during the field studies along the Hargreaves to Darfield Segment included coyotes, wolves and cougars. Coyotes prefer open lands along the banks of watercourses and will frequent the banks to communicate with other coyotes since the water carries their voices farther. Participants reported that up until the 1940s, wolves were culled to protect livestock and humans. Wolves are nomadic and travel according to the season and available game. Wolves run in packs with a single alpha male and pack sizes depend on prey abundance. Wolves will eat deer and sometimes even small bears. Cougars are unlikely to hunt where the forest is quite open and there is not much cover, avoiding human activity and preferring to live high in the mountains. Cougars will only go into more populated and developed areas if food is scarce elsewhere.

Many small and medium-sized mammals were identified by participants during the field studies along the Hargreaves to Darfield Segment and most were reported to be customarily hunted by local Aboriginal communities. Porcupine quills can be used to make jewellery such as earrings and necklaces, artisanal works, and ceremonial garb. However, participants reported that porcupines are not very common in this region. Rabbit meat is a source of food, and the fur is used for traditional purposes. Squirrels are a traditional food source and the fur is also used. Squirrels will eat songbird eggs and young nestlings, mushrooms and apples. Ground squirrels often den close to cedar or hemlock roots. A sloping, open field is good habitat for ground squirrels since the slope would allow for drainage of their tunnel systems.

Many bird species were identified by participants during the field studies along the Hargreaves to Darfield Segment including woodpeckers, flickers, owls and eagles. Woodpeckers are compulsive birds that will knock and drill holes on the same tree for years. When a person is said to have "woodpecker medicine" they have obsessive-compulsive attributes. A pileated woodpecker will call out to signal that humans are approaching. Flickers have distinct orange under their wings and fly in a "flitty" manner. Owls eat voles, birds and bats and are thought to be messengers of death. Characteristics of golden eagles and bald eagles were described by participants: eagles eat fish, gophers, and groundhogs and tend to nest in big trees, either living or dead, making their nests out of sticks and returning to the same nest for many years. Participants report that the local population of eagles is growing. Eagles represent protection to local communities, and Aboriginal people will carry eagle feathers for this reason. Additionally, spotting an eagle is considered good luck while dropping an eagle feather while dancing at a powwow is bad luck.

Blue, ruffed and willow grouse were also identified by participants during the field studies. The sound of a blue grouse drumming can be differentiated from ruffed grouse drumming by the way the blue grouse starts drumming slowly and the sound can be felt in the heart. Grouse drum to attract females and to defend and identify their territory. Willow grouse make a thumping noise. Participants reported that this thumping may be used to scare predators since the thumping is heard before the bird takes flight.

Detailed TEK related to wildlife resources for the Project along the Hargreaves to Darfield Segment and any issues and concerns raised are provided in Table 5.2.14. Concerns related to wildlife resources were addressed by the proposed mitigation measures discussed. Participants have not recommended any mitigation strategies related to wildlife resources additional to those described in the EPP to be

implemented for the Project. Concerns related to potential effects of spills on the terrestrial environment (Section 3.0 of Volume 5A) are considered within the assessment of various onshore facility spill scenarios provided in Volume 7A.

TABLE 5.2.14

**WILDLIFE TRADITIONAL ECOLOGICAL KNOWLEDGE RECORDED ALONG
THE HARGREAVES TO DARFIELD SEGMENT**

| Description | Location(s) | Issue/Concern | Proposed Mitigation Measures/Response |
|---|---|---|---|
| SPECIES OR GROUP: Beaver | | | |
| Evidence of beaver (e.g., holes and chewed sticks) | 263.8 m northeast of RK 526.4 19.7 m north of RK 552.1 39.2 m east of RK 609.9 37.8 m northwest of RK 675 | Potential loss of beaver habitat. | Use natural recovery as the preferred method of reclamation on level terrain and at wetlands. Seed disturbed and erosion prone areas with an approved native seed mix. Reduce the width of grubbing near watercourses, wetlands and through other wet areas to facilitate the restoration of shrub communities. |
| Suitable habitat for beaver | 192.2 m south of RK 552.4 | | Reduce disturbance at riparian areas, and where practical, extend the riparian buffer by implementing trenchless pipeline crossing techniques, or cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration. |
| Dam/lodge | 48.9 m west of RK 645.3 6.2 m southeast of RK 663.5 244.1 m southeast of RK 664.1 32.4 m southeast of RK 732.5 | Potential impacts to beaver and beaver lodges. | In the event that beaver dams or lodges will be disturbed, provide notification or obtain necessary provincial permits prior to commencing activities. Engage the registered trapper(s). |
| SPECIES OR GROUP: Woodland Caribou | | | |
| Suitable habitat for caribou | 391 m southwest of RK 527 6.4 m north of RK 555.2 443.9 m southwest of RK 553.5 | Potential impacts to caribou and caribou habitat. | Minimize the width of the pipeline right-of-way to the extent practical by utilizing shared workspace, avoiding clearing large diameter trees on the edge of the right-of-way; minimizing extra temporary workspace. Maintain root layer integrity on the right-of-way by clearing vegetation above ground level and restricting grubbing to the trench width. Avoid creation of new access. Use existing roads/linear corridors for access wherever practical. Deactivate and reclaim all temporary access. Where segments of the right-of-way require rollback for access management or erosion control, ensure sufficient timber is set aside for this purpose during final clean-up. |
| SPECIES OR GROUP: Ungulates including moose, deer, elk | | | |
| Evidence of ungulates (e.g., droppings, browse, tracks, beds, rubs) | 341.8 m northeast of RK 489.6 From RK 497.3 to RK 506.1 2.5 m southwest of RK 510 8.9 m west of RK 523.6 88 m southwest of RK 531.6 664.5 m east of RK 533.9 80.3 m northeast of RK 538.2 2.9 m southwest of RK 541.9 30 m north of RK 551.5 130.9 m east of RK 631 6.30 m west of RK 636.8 5.8 m east of RK 657.9 7.7 m east of RK 761.3 | Loss of vegetation important to ungulates. | Do not clear timber, stumps, brush or other vegetation beyond the marked construction right-of-way boundary. Where grading is not required, cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration. Use natural recovery as the preferred method of reclamation on level terrain and at wetlands. Seed disturbed and erosion prone areas with an approved native seed mix. Plant native tree seedlings and/or shrubs at select locations. Minimize the width of the pipeline right-of-way to the extent practical by utilizing shared workspace, avoiding clearing large diameter trees on the edge of the right-of-way; minimizing extra temporary workspace. |

TABLE 5.2.14 Cont'd

| Description | Location(s) | Issue/Concern | Proposed Mitigation Measures/Response |
|--|--|---|--|
| Evidence of ungulates (e.g., droppings, browse, tracks, beds, rubs) (cont'd) | See above | Potential impacts to ungulates and their habitat. | Minimize the width of the pipeline right-of-way to the extent practical by utilizing shared workspace, avoiding clearing large diameter trees on the edge of the right-of-way; minimizing extra temporary workspace. Maintain root layer integrity on the right-of-way by clearing vegetation above ground level and restricting grubbing to the trench width. Avoid creation of new access. Use existing roads/linear corridors for access wherever practical. Deactivate and reclaim all temporary access. Where segments of the right-of-way require rollback for access management or erosion control, ensure sufficient timber is set aside for this purpose during final clean-up. |
| | | Increased access for moose hunters during construction. Increased lines-of-sight impacting predator-prey dynamics due to clearing activities. | Implement measures to reduce access (human and predator) along the pipeline right-of-way. Measures include using woody debris as rollback, and planting trees and/or shrubs at select locations along the pipeline right-of-way. |
| Suitable habitat for ungulates | From RK 497.3 to RK 506.1 From RK 545.9 to RK 579.7 From RK 620.9 to RK 623.9 9.3 m east of RK 655 170.2 m west of RK 694.4 97.1 m southwest of RK 717.6 | Sensory disturbance during construction activities. | Prohibit recreational use of all-terrain vehicles or snowmobiles by construction personnel on the pipeline right-of-way. Prohibit construction personnel from having pets on the pipeline right-of-way. |
| SPECIES OR GROUP: Bear | | | |
| Evidence of bear (e.g., scat, tree markings, tracks, sightings) | From RK 497.5 to RK 498 82.7 m southeast of RK 506.4 262.3 m north of RK 497.5 370 m northeast of RK 526.4 29 m south of RK 506.4 392.2 m southwest of RK 513.5 From RK 532.8 to RK 579.7 35.7 m north of RK 580.3 207.6 m southeast of RK 607.6 30.9 m southeast of RK 654 | Potential impacts to wildlife and wildlife habitat. | Do not clear timber, stumps, brush or other vegetation beyond the marked construction right-of-way boundary. Where grading is not required, cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration. Use natural recovery as the preferred method of reclamation on level terrain and at wetlands. Seed disturbed and erosion prone areas with an approved native seed mix. Plant native tree seedlings and/or shrubs at select locations. |
| | 201.2 m north of RK 678.3 42.2 m east of RK 734.4 66.5 m south of RK 739.4 | Increased access for hunters during construction. Increased lines-of-sight impacting predator-prey dynamics due to clearing activities. | Implement measures to reduce access (human and predator) along the pipeline right-of-way. Measures include using woody debris as rollback, and planting trees and/or shrubs at select locations along the pipeline right-of-way. |
| Suitable habitat for bears | 29 m south of RK 506.4 205.6 m west of RK 522.5 56.7 m northeast of RK 563.8 46.3 m northwest of RK 572.9 35.7 m north of RK 580.3 170.2 m west of RK 694.4 42.2 m east of RK 734.4 | Sensory disturbance during construction activities. | Prohibit recreational use of all-terrain vehicles or snowmobiles by construction personnel on the pipeline right-of-way. Prohibit construction personnel from having pets on the pipeline right-of-way. Prohibit construction personnel from feeding or harassing wildlife. Dispose of food waste and industrial waste properly. Report any issues related to wildlife encountered during construction and operation to the appropriate regulatory authorities. |
| Bear Den | 46.5 m east of RK 642.5 44.3 m west of RK 643.8 | Sweep for bear dens prior to construction | In the event an active mammal den is found, activities should not occur within 50 m of an active bear den. |

TABLE 5.2.14 Cont'd

| Description | Location(s) | Issue/Concern | Proposed Mitigation Measures/Response |
|---------------------------------------|---|--|---|
| SPECIES OR GROUP: Birds | | | |
| Pileated woodpecker holes | 41.1 m west of RK 556.4 | Sensory disturbance during construction activities. Reduce clearing through bird habitat. | Do not clear timber, stumps, brush or other vegetation beyond the marked construction right-of-way boundary. Where grading is not required, cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration. |
| Owl habitat | 287 m west of KP 505.6 | See above | Plant native tree seedlings and/or shrubs at select locations. |
| Curlew observed | From RK 758.3 to RK 760.0 | | Reduce the width of grubbing near watercourses, wetlands and through other wet areas to facilitate the restoration of shrub communities. |
| Nest (species unconfirmed) | 28.1 m southwest of RK 510 28.1 m east of RK 523.8 41.4 m east of RK 561.6 321.3 m southeast of RK 663.7 65 m south of RK 735.5 | | Reduce disturbance at riparian areas, and where practical, extend the riparian buffer by implementing trenchless pipeline crossing techniques, or cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration. |
| Nesting grounds (species unconfirmed) | 244.1 m southeast of RK 664.1 | | Schedule clearing and construction activities outside of sensitive time periods for raptors. In the event clearing is scheduled within these periods, in areas of suitable habitat, conduct raptor nest searches prior to clearing to locate active raptor nests. |
| | | | Schedule clearing and construction activities outside the migratory bird breeding season of March 15 to August 15. |
| | | | In simple habitat types where active nests are easier to locate (<i>i.e.</i> , previously cleared areas and open areas with sparse vegetation and few trees), a nest sweep may be completed within 7 days of activity that is scheduled to occur within the migratory bird RAP. Use non-intrusive methods to conduct an area search for evidence of nesting (<i>e.g.</i> , presence of singing birds, territorial males, alarm calls, distraction displays). In the event an active nest is found, it will be subject to site-specific mitigation measures (<i>i.e.</i> , clearly marked protective buffer around the nest and/or non-intrusive monitoring). |
| | | | In complex habitats where active nests are more difficult to find (<i>e.g.</i> , forests), it is recommended that pre-clearing be conducted. |
| | | Request for community monitor of nests during construction activities. | The EPPs (Volumes 6B, 6C and 6D) provide mitigation plans developed in response to issues identified during Project planning, stakeholder consultation, Aboriginal engagement and regulatory discussions. Aboriginal Monitors onsite through the construction of the Project will work with environmental inspectors to provide traditional knowledge to the construction program to ensure protection of the environment; to discuss upcoming traditional and western science elements with the environmental inspector to ensure protection and monitoring; and to monitor mitigation success in protecting the environment. Trans Mountain will continue to engage Aboriginal communities through all phases of the Project. Trans Mountain's commitment to retain Aboriginal Monitors is further described in Volume 6A. |
| Blue heron observed | 64.7 m east of RK 608.7 | Disturbance of nesting grounds during construction. | Schedule clearing and construction activities outside of sensitive time periods for great blue heron. In the event clearing is scheduled within these periods, in areas of suitable habitat, conduct a nest search to locate nesting colonies. In the event an active colony is discovered, the appropriate buffer will be applied. |
| Grouse habitat | 489.8 m west of RK 561.7 | Disturbance of bird habitat during construction. | Implement provincial setbacks in the event an active sharp-tailed grouse lek is identified. |

TABLE 5.2.14 Cont'd

| Description | Location(s) | Issue/Concern | Proposed Mitigation Measures/Response |
|--|---|---|--|
| SPECIES OR GROUP: Furbearers including muskrat, rabbit, porcupine, squirrel, badger, marten | | | |
| Suitable habitat for small furbearers | 23.7 m east of RK 523.7 192.2 m south of RK 552.4 | Squirrel caches maintain forest health, avoid where possible. | Minimize the width of the pipeline right-of-way to the extent practical by utilizing shared workspace, avoiding clearing large diameter trees on the edge of the right-of-way; minimizing extra temporary workspace. Maintain root layer integrity on the right-of-way by clearing vegetation above ground level and restricting grubbing to the trench width. |
| Evidence of small furbearers (e.g., mounds, chew, tracks, trails, den, caches) | 31.6 m east of RK 523 8.9 m west of RK 523.6 12.9 m east of RK 524.9 35.3 m west of RK 534.9 30 m north of RK 551.5 341 m south of RK 552.4 46.7 m northwest of RK 574.9 15.6 m east of RK 556.7 51.2 m west of RK 623.8 9.6 m south of RK 739.3 | Potential impacts to wildlife and wildlife habitat. | Avoid creation of new access. Use existing roads/linear corridors for access wherever practical. Deactivate and reclaim all temporary access. Use natural recovery as the preferred method of reclamation on level terrain and at wetlands. Seed disturbed and erosion prone areas with an approved native seed mix. Reduce the width of grubbing near watercourses, wetlands and through other wet areas to facilitate the restoration of shrub communities. Reduce disturbance at riparian areas, and where practical, extend the riparian buffer by implementing trenchless pipeline crossing techniques, or cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration. |
| SPECIES OR GROUP: Canids including coyote, wolf, wolverine | | | |
| Suitable habitat for canids | 78.6 m west of RK 637.7 0.9 m southwest of RK 639.1 | Potential impacts to wildlife and wildlife habitat. | Use natural recovery as the preferred method of reclamation on level terrain and at wetlands. Seed disturbed and erosion prone areas with an approved native seed mix. |
| Evidence of canids (e.g., tracks, scat, sightings) | 370 m northeast of RK 526.4 8 m northeast of RK 507 164.1 m east of RK 582.9 10.1 m southeast of RK 607.6 | See above | Reduce the width of grubbing near watercourses, wetlands and through other wet areas to facilitate the restoration of shrub communities. Reduce disturbance at riparian areas, and where practical, extend the riparian buffer by implementing trenchless pipeline crossing techniques, or cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration. Implement measures to reduce access (human and predator) along the pipeline right-of-way. Measures include using woody debris as rollback, and planting trees and/or shrubs at select locations along the pipeline right-of-way. |
| Canid | At RK 576.1 94.2 m west of RK 618.5 138.1 m south of RK 678.3 42.2 m east of RK 734.4 | Disturbance of dens during construction. | Avoid active dens during the clearing and construction. |
| SPECIES OR GROUP: Felids cougar and lynx | | | |
| Evidence of cougar and lynx (e.g., tree markings, sightings, tracks) | At RK 576.3 164.1 m east of RK 582.9 7.1 m west of RK 593 | Potential impacts to wildlife and wildlife habitat. | Use natural recovery as the preferred method of reclamation on level terrain and at wetlands. Seed disturbed and erosion prone areas with an approved native seed mix. Reduce the width of grubbing near watercourses, wetlands and through other wet areas to facilitate the restoration of shrub communities. Reduce disturbance at riparian areas, and where practical, extend the riparian buffer by implementing trenchless pipeline crossing techniques, or cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration. Implement measures to reduce access (human and predator) along the pipeline right-of-way. Measures include using woody debris as rollback, and planting trees and/or shrubs at select locations along the pipeline right-of-way. |

TABLE 5.2.14 Cont'd

| Description | Location(s) | Issue/Concern | Proposed Mitigation Measures/Response |
|--|--|---|---|
| SPECIES OR GROUP: Other wildlife features | | | |
| Wildlife tree | 12.8 m northeast of RK 547.5 133 m east of RK 577.5 5.8 m southeast of RK 664.2 12.1 m southeast of RK 666.4 35.7 m north of RK 670.9 52.7 m west of RK 562.1 | Loss of wildlife tree and request to replant cleared tree following construction. | Avoid wildlife trees where possible. |
| Western toads | 33.2 m east of RK 523.7 36.9 m east of RK 523.8 65 m south of RK 735.5 11.6 m west of RK 750.1 | Disturbance and loss of amphibian habitat during construction. Restrict traffic to reduce loss of toads. | Identify pond dwelling amphibian breeding ponds within the pipeline corridor prior to construction in an effort to avoid during final routing. Schedule clearing and construction activities outside of the breeding and seasonal migration periods for amphibians and adhere to provincial and federal setbacks. |
| Columbia spotted frog | 56.7 m northeast of RK 563.8 | | Apply standard wetland construction and reclamation mitigation (e.g., minimal disturbance, recontouring, reclamation, monitoring and remedial measures) to support habitat reclamation as needed. Utilize snow packing and mats to avoid excessive soil compaction in the proximity of wetlands and watercourses. Maintain natural hydrology of streams and wetlands during clearing, construction and clean-up activities. |
| Bat tree | 119 m east of RK 584.3 | Loss of bat habitat during construction. | Avoid wildlife trees where possible. |
| Mineral lick | 0.4 m northeast of RK 513.9 1.6 m southwest of RK 515.3 | Loss of mineral licks. | Implement a 100 m setback in the event a mineral lick is identified. In the event that shifting/narrowing the pipeline right-of-way is not possible to maintain the minimum setback from a mineral lick, consult with appropriate provincial authorities. Maintain the integrity of trails to mineral licks and do not isolate from nearby escape cover (e.g., dense forest). Avoid activities (i.e., clearing, construction, helicopter overflights) near mineral licks during critical periods (May to November). Deactivate access roads as soon as possible. Leave a gap in strung pipe within the area of the mineral lick to allow wildlife to access the mineral lick. The locations of the gaps in strung pipe should coincide with gaps in strippings, spoil, snow and rollback windrows. |
| Well-used game trails/corridor | 88 m southwest of RK 531.6 32.5 m west of RK 575.6 1.1 m east of RK 734.1 1.8 m southeast of RK 741.1 26.7 m east of RK 752.4 | Potential for construction activities to limit use of game trails, restricting wildlife movement. | Conduct work expeditiously to maintain a tight construction spread (i.e., interval between front-end work activities such as grading and back-end activities such as clean-up) to reduce the duration of the open trench and to reduce potential barriers and hazards to wildlife. Locate gaps in pipe to facilitate wildlife movement in places that also facilitate construction such as at slope changes, crossings (i.e., watercourse, road, pipeline right-of-way, railway) and bends. The locations of the gaps should coincide with gaps in spoil, slash piles and snow windrows. Restore habitat connectivity by redistributing large-diameter slash (rollback) over select locations on the pipeline right-of-way (e.g., where high levels of coarse woody debris occur prior to construction), to provide cover and facilitate movement of wildlife (e.g., furbearers). |

5.2.12.3 Black Pines to Hope Segment

During the field studies along the Black Pines to Hope Segment, participants identified wildlife signs including tracks, browse and scat of ungulates such as mule deer, white-tailed deer and moose. Moose

and deer are present in the hills near Merritt. The hills on the north side of Nicola Lake are considered excellent habitat since there is good foraging with the presence of willow and rose bushes, water sources and a healthy wooded landscape. In the past, white-tailed deer were less common than mule deer; however, white-tailed deer are starting to move in from the east. White-tailed deer carry a disease or parasite that affects mule deer, which in turn has negatively affected the mule deer population. Elk are more common towards Brooksmuir. Participants reported that the proposed pipeline corridor encounters lands previously disturbed by power lines, fibre optic cables, and other pipeline rights-of-way and that wildlife in the region have already adjusted. There is a lot of browse for moose and deer like alder, grasses and willow to eat and the existing rights-of-way are like cleared paths which encourage wildlife movement. Good wildlife habitat will include trees like Douglas-fir, trembling aspen, spruce, and lodgepole pine with a source of water nearby as well as a generally healthy ecosystem with few pine beetles or spruce bud worms and ample vegetation and berry plants.

Game trails, primarily used by moose, deer and bear were identified along the Black Pines to Hope Segment. Game trails are often used to access existing rights-of-way, watercourses, and rest or bedding areas. Bear claw marks, some recent and some several years old, were identified on trees during the field studies. The size of the marks is an indicator of the size of the bear that created them. Participants described how cubs cannot gouge the tree but can scamper up a tree. In the past, bears likely foraged for berries in nearby farmers' fields; however, the installation of an electric fence has likely caused bears to retreat to the hills. Abundant blackberry bushes that grow at higher elevations and cherry trees that grow in the valleys provide food sources for black bears. Bears also fish for coho salmon from small watercourses in the region. Good habitat for bears will be close to water, berries and a path. Good grizzly bear habitat was identified near Juliet Creek due to the presence of salmon, abundance of denning habitat and berry plants, and minimal human presence. Over the past 20 years, the noted decline in salmon has also caused a decline in the regional grizzly bear population. Bears are moving further south and west for food sources at higher elevations. Bears once frequented the Fraser and Thompson rivers; however, participants believe that increased human presence in the region prevent bears from returning.

Coyote, wolf and cougar signs were identified by participants during field studies along the Black Pines to Hope Segment. Participants reported that wolves were once the dominant predator in the region but have since been hunted nearly to extinction and only recently are beginning to show signs of rebounding. Coyotes were traditionally trapped for their fur and are central figures in many traditional stories of Aboriginal communities in BC.

Participants reported that marten, otters, beavers, muskrat, lynx and rabbits are common along the proposed Black Pines to Hope Segment and that these animals are traditionally harvested. These furbearing animals are used for clothing and other accessories. Beaver dams and habitat are prevalent along the Nicola River and its smaller tributaries. Beavers will eat "anything they can sink their teeth into" and are traditionally trapped by Aboriginal communities. Participants also reported that beavers are a nuisance since they block salmon from migrating upstream. Groundhog holes were identified along Mine Creek and participants report that groundhogs will live anywhere with other groundhogs in colonies. Groundhogs are common animals and are not traditionally hunted by communities in this region.

Birds are important to communities along the Black Pines to Hope Segment. Birds indicate when spring has arrived whereby eagles arrive first, ducks will follow as will cranes. Once cranes have arrived, it is confirmed that spring has started. Grouse are plentiful and wild grouse were observed and heard by participants during the field studies. Ruffed, blue, and spruce grouse are found in the forest while sharp-tailed grouse prefer grasslands. Grouse are sometimes hunted by Aboriginal communities in the fall. Common names for grouse are "fool's hen" or "prairie chicken". Grouse will sacrifice themselves for the sake of their nest which is where the name "fools hen" is derived.

Detailed TEK related to wildlife resources for the Project along the Black Pines to Hope Segment and any issues and concerns raised are provided in Table 5.2.15. Concerns related to wildlife resources were addressed by the proposed mitigation measures discussed. Participants have not recommended any mitigation strategies related to wildlife resources additional to those described in the EPP to be implemented for the Project. Concerns related to potential effects of spills on the terrestrial environment (Section 3.0 of Volume 5A) are considered within the assessment of various onshore facility spill scenarios provided in Volume 7A.

TABLE 5.2.15

**WILDLIFE TRADITIONAL ECOLOGICAL KNOWLEDGE RECORDED
ALONG THE BLACK PINES TO HOPE SEGMENT**

| Description | Location(s) | Issue/Concern | Proposed Mitigation Measures/Response |
|---|--|--|--|
| SPECIES OR GROUP: Beaver | | | |
| Evidence of beaver (e.g., holes and chewed sticks) | 634 m northwest of RK 928.8 | Potential loss of beaver habitat. | Use natural recovery as the preferred method of reclamation on level terrain and at wetlands. Seed disturbed and erosion prone areas with an approved native seed mix. Reduce the width of grubbing near watercourses, wetlands and through other wet areas to facilitate the restoration of shrub communities. Reduce disturbance at riparian areas, and where practical, extend the riparian buffer by implementing trenchless pipeline crossing techniques, or cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration. |
| Suitable habitat for beaver | 117 m northwest of RK 918.3 At RK 918.3 | | |
| Dam/lodge | 1.6 m west of RK 865.2 117 m northwest of RK 918.3 At RK 918.3 | | Trap and relocate beaver prior to construction. Beavers are a nuisance; trap prior to construction. |
| SPECIES OR GROUP: Ungulates including moose, deer | | | |
| Evidence of ungulates (e.g., droppings, browse, tracks, beds, rubs) | From RK 868.6 to RK 892.1 25.6 m southeast of RK 912.8 From RK 941.4 to RK 997.2 52.6 m east of RK 1012.9 86.2 m south of RK 1018.0 2.5 m northwest of RK 1039.5 47.7 m south of RK 1042.3 | Potential impacts to ungulates and ungulate habitat. | Schedule clearing and construction to avoid relevant UWRs in accordance with provincial timing constraints. Minimize the width of the pipeline right-of-way to the extent practical by utilizing shared workspace, avoiding clearing large diameter trees on the edge of the right-of-way; minimizing extra temporary workspace. Maintain root layer integrity on the right-of-way by clearing vegetation above ground level and restricting grubbing to the trench width. Avoid creation of new access. Use existing roads/linear corridors for access wherever practical. Deactivate and reclaim all temporary access. Where segments of the right-of-way require rollback for access management or erosion control, ensure sufficient timber is set aside for this purpose during final clean-up. |
| Suitable habitat for ungulates | 25.8 m west of RK 865.3 From RK 903.0 to RK 912.3 78.8 m northwest of RK 950.9 16.2 m southeast of RK 974.5 495.4 m west of RK 978.9 64.6 m east of RK 980.7 49.7 m south of RK 1042.3 | | |
| SPECIES OR GROUP: Bear | | | |
| Evidence of bear (e.g., scat, tree markings, tracks, sightings) | 64.1 m east of RK 893.5 From RK 918.1 to RK 954.9 253.8 m northwest of RK 973.6 65.4 m east of RK 980.4 50.3 m west of RK 991.2 73.3 m west of RK 1023.4 150.5 m northwest of RK 1025.5 39.1 m northwest of RK 1105 | Potential impacts to wildlife and wildlife habitat. | Do not clear timber, stumps, brush or other vegetation beyond the marked construction right-of-way boundary. Where grading is not required, cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration. Use natural recovery as the preferred method of reclamation on level terrain and at wetlands. Seed disturbed and erosion prone areas with an approved native seed mix. Plant native tree seedlings and/or shrubs at select locations. |
| Suitable habitat for bears | 65.4 m east of RK 980.4 | | |

TABLE 5.2.15 Cont'd

| Description | Location(s) | Issue/Concern | Proposed Mitigation Measures/Response |
|---|---|---|---|
| SPECIES OR GROUP: Birds | | | |
| Hawk observed | 374.3 m southeast of RK 929.5 | Protect nests during construction. | <p>Where grading is not required, cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration.</p> <p>Plant native tree seedlings and/or shrubs at select locations.</p> <p>Reduce the width of grubbing near watercourses, wetlands and through other wet areas to facilitate the restoration of shrub communities.</p> <p>Reduce disturbance at riparian areas, and where practical, extend the riparian buffer by implementing trenchless pipeline crossing techniques, or cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration.</p> <p>Schedule clearing and construction activities outside of sensitive time periods for raptors. In the event clearing is scheduled within these periods, in areas of suitable habitat, conduct raptor nest searches prior to clearing to locate active raptor nests.</p> <p>Schedule clearing and construction activities outside the migratory bird breeding season of March 15 to August 15.</p> <p>In simple habitat types where active nests are easier to locate (i.e., previously cleared areas and open areas with sparse vegetation and few trees), a nest sweep may be completed within 7 days of activity that is scheduled to occur within the migratory bird RAP. Use non-intrusive methods to conduct an area search for evidence of nesting (e.g., presence of singing birds, territorial males, alarm calls, distraction displays). In the event an active nest is found, it will be subject to site-specific mitigation measures (i.e., clearly marked protective buffer around the nest and/or non-intrusive monitoring).</p> <p>In complex habitats where active nests are more difficult to find (e.g., forests), it is recommended that pre-clearing be conducted.</p> |
| Eagle observed | 336.1 m east of RK 928.4 135.9 m southeast of RK 994 | | |
| Warblers, thrush, sparrow observed | 16.2 m southeast of RK 974.5 495.4 m west of RK 978.9 231.1 m southeast of RK 1035.4 | | |
| Nest (species unconfirmed) | At RK 920.4 336.1 m east of RK 928.4 374.3 m southeast of RK 929.5 135.9 m southeast of RK 994 | | |
| Grouse observed | 45.4 m west of RK 893.5 24.2 m north of RK 965.4 | Disturbance of bird habitat during construction. | Implement provincial setbacks in the event an active sharp-tailed grouse lek is identified. |
| SPECIES OR GROUP: Furbearers including rabbit, porcupine, squirrel, badger | | | |
| Evidence of small furbearers (e.g., mounds, chew, tracks, trails, den, caches) | 225.5 m northwest of RK 929.2 371.7 m northwest of RK 949.8 | Potential impacts to wildlife and wildlife habitat. | <p>Minimize the width of the pipeline right-of-way to the extent practical by utilizing shared workspace, avoiding clearing large diameter trees on the edge of the right-of-way; minimizing extra temporary workspace.</p> <p>Maintain root layer integrity on the right-of-way by clearing vegetation above ground level and restricting grubbing to the trench width.</p> <p>Avoid creation of new access. Use existing roads/linear corridors for access wherever practical. Deactivate and reclaim all temporary access.</p> <p>Use natural recovery as the preferred method of reclamation on level terrain and at wetlands.</p> <p>Seed disturbed and erosion prone areas with an approved native seed mix.</p> <p>Reduce the width of grubbing near watercourses, wetlands and through other wet areas to facilitate the restoration of shrub communities.</p> <p>Reduce disturbance at riparian areas, and where practical, extend the riparian buffer by implementing trenchless pipeline crossing techniques, or cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration.</p> |

TABLE 5.2.15 Cont'd

| Description | Location(s) | Issue/Concern | Proposed Mitigation Measures/Response |
|--|--|---|---|
| SPECIES OR GROUP: CANIDS including coyote, wolf | | | |
| Evidence of canids (e.g., including tracks, scat, sightings) | 7.4 m northeast of RK 866.5 64.9 m east of RK 914.7 8.7 m northwest of RK 993.2 | Potential impacts to wildlife and wildlife habitat. | Use natural recovery as the preferred method of reclamation on level terrain and at wetlands. Seed disturbed and erosion prone areas with an approved native seed mix. Reduce the width of grubbing near watercourses, wetlands and through other wet areas to facilitate the restoration of shrub communities. Reduce disturbance at riparian areas, and where practical, extend the riparian buffer by implementing trenchless pipeline crossing techniques, or cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration. Implement measures to reduce access (human and predator) along the pipeline right-of-way. Measures include using woody debris as rollback, and planting trees and/or shrubs at select locations along the pipeline right-of-way. |
| Canid Den | 77 m southeast of RK 929.1 | Disturbance of dens during construction. | Avoid active dens during the clearing and construction. |
| SPECIES OR GROUP: Cougar, lynx, bobcat | | | |
| Evidence of cougar, lynx and bobcat (e.g., tree markings, sightings, tracks) | 2.5 m southeast of RK 900.3 | Potential impacts to wildlife and wildlife habitat. | Use natural recovery as the preferred method of reclamation on level terrain and at wetlands. Seed disturbed and erosion prone areas with an approved native seed mix. Reduce the width of grubbing near watercourses, wetlands and through other wet areas to facilitate the restoration of shrub communities. Reduce disturbance at riparian areas, and where practical, extend the riparian buffer by implementing trenchless pipeline crossing techniques, or cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration. |
| SPECIES OR GROUP: Other wildlife features | | | |
| Well-used game trails/corridor | 1.8 m southeast of RK 741.1 160.8 m west of RK 865.1 30.5 m southeast of RK 912.9 24.4 m northwest of RK 919.9 193 m southeast of RK 980.1 187.4 m west of RK 989.2 | Maintain game trail during construction. | Implement measures to reduce access (human and predator) along the pipeline right-of-way. Measures include using woody debris as rollback, and planting trees and/or shrubs at select locations along the pipeline right-of-way. Conduct work expeditiously to maintain a tight construction spread (i.e., interval between front-end work activities such as grading and back-end activities such as clean-up) to reduce the duration of the open trench and to reduce potential barriers and hazards to wildlife. Locate gaps in pipe to facilitate wildlife movement in places that also facilitate construction such as at slope changes, crossings (i.e., watercourse, road, pipeline right-of-way, railway) and bends. The locations of the gaps should coincide with gaps in spoil, slash piles and snow windrows. Restore habitat connectivity by redistributing large-diameter slash (rollback) over select locations on the pipeline right-of-way (e.g., where high levels of coarse woody debris occur prior to construction), to provide cover and facilitate movement of wildlife (e.g., furbearers). |

5.2.12.4 Hope to Burnaby Segment

Participants identified evidence of deer along the Hope to Burnaby Segment including tracks, scat, beds, browse and game trails, reporting that deer tend to be wide-ranging animals, adaptable and already accustomed to human disturbance due to the existing highways, power lines and pipeline rights-of-way within the proposed pipeline corridor. Deer are most commonly found on lands with a water source nearby and plenty of vegetative cover to provide shelter from the weather and predators. Deer can move quietly through tall grass due to their small stature, following the same trails each year and showing their young the same trails unless they become disturbed by humans or environmental changes such as

erosion. Deer will eat grasses and shrubs such as alfalfa, and wild mushrooms such as pine mushrooms. Deer are commonly hunted for food and hides.

Evidence of black bears was also observed during the field studies along the Hope to Burnaby Segment including tracks, scat, claw marks on trees, beds and trails. Sawdust under a bear-dug log indicates that the dig is relatively fresh because sawdust will eventually wash away over the year. Black bears dig at stumps for grubs, ants and termites in the early spring following hibernation and will also feed on berries and grasses in the spring and early summer and salmon during the late summer and fall. Participants reported that bears are seen more commonly near their communities, an indication that they are getting hungrier. Bear claws are commonly used as regalia in smokehouses, typically taken from a found carcass rather than through hunting. Grizzly bear tracks and scat were also identified by participants and it was reported that bears are likely using the existing right-of-way for habitat and food sources.

Cougar tracks, scat and appropriate habitat were observed by participants during the field studies along the Hope to Burnaby Segment. Cougars spend their summers in alpine environments, migrating to lower elevations during the winter. Cougars are wide-ranging mammals and are able to travel more than 30 km in a day using existing rights-of-way as travel corridors. Signs of coyote were also observed and participants noted that coyotes appear to be using an existing fibre optic cable right-of-way as a travel corridor, evidenced by scat along the right-of-way. An inactive coyote den might have grass in the tunnel passage and, generally, when humans find a coyote's den, the animal will move for the safety of the pups. The coyote is a central character in the local cultures including stories, mythology, and beliefs; good and bad, a trickster.

Birds of prey were identified during the field studies including eagle, osprey and red-tailed hawk. Eagle and hawk feathers are used in smokehouse ceremonies, and eagle feathers and claws are used for decorations and drumsticks. Feathers are also used to make headdresses for powwow dancing and hand fans and are used in sweetgrass ceremonies for cleansing. Eagle feathers are said to be good luck whereas white owls are thought to mean bad luck. Participants reported that hawks will abandon their nests and even their young if there is excessive noise pollution. Other birds identified by participants during the field studies along the Hope to Burnaby Segment included woodpeckers, turkey vultures, grouse, and a hummingbird. Woodpeckers are not a common sight or sound throughout the region and are heard only a few times a year.

Detailed TEK related to wildlife resources for the Project along the Hope to Burnaby Segment and any issues and concerns raised are provided in Table 5.2.16. Concerns related to wildlife resources were addressed by the proposed mitigation measures discussed. Participants have not recommended any mitigation strategies related to wildlife resources additional to those described in the EPP to be implemented for the Project. Concerns related to potential effects of spills on the terrestrial environment (Section 3.0 of Volume 5A) are considered within the assessment of various onshore facility spill scenarios provided in Volume 7A.

TABLE 5.2.16

**WILDLIFE TRADITIONAL ECOLOGICAL KNOWLEDGE RECORDED
ALONG THE HOPE TO BURNABY SEGMENT**

| Description | Location(s) | Issue/Concern | Proposed Mitigation Measures/Response |
|--|---|--------------------------------------|--|
| SPECIES OR GROUP: Beaver | | | |
| Evidence of beaver (e.g., holes and chewed sticks) | 13.6 m southeast of RK 980.1 10 m northwest of RK 1045.5 | Potential effects to beaver habitat. | Use natural recovery as the preferred method of reclamation on level terrain and at wetlands. Seed disturbed and erosion prone areas with an approved native seed mix. Reduce the width of grubbing near watercourses, wetlands and through other wet areas to facilitate the restoration of shrub communities. Reduce disturbance at riparian areas, and where practical, extend the riparian buffer by implementing trenchless pipeline crossing techniques, or cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration. |

TABLE 5.2.16 Cont'd

| Description | Location(s) | Issue/Concern | Proposed Mitigation Measures/Response |
|---|--|---|--|
| SPECIES OR GROUP: Ungulates including deer, elk | | | |
| Evidence of ungulates (e.g., droppings, browse, tracks, beds, rubs) | 1.9 m east of RK 914.6 101.3 m east of RK 955.5 30 m southeast of RK 1000.3 200 m west of RK 1010.2 From RK 1018.1 to RK 1019.2 12 m north of RK 1035.1 100 m northwest of RK 1102.7 186 m north of RK 1144 15 m southwest of RK 1050.8 200 m north of RK 1153.1 500 m north of RK 1155.4 80 m northwest of RK 1180.1 | Potential impacts to ungulates and their habitat. | Minimize the width of the pipeline right-of-way to the extent practical by utilizing shared workspace, avoiding clearing large diameter trees on the edge of the right-of-way; minimizing extra temporary workspace. Maintain root layer integrity on the right-of-way by clearing vegetation above ground level and restricting grubbing to the trench width. Avoid creation of new access. Use existing roads/linear corridors for access wherever practical. Deactivate and reclaim all temporary access. Where segments of the right-of-way require rollback for access management or erosion control, ensure sufficient timber is set aside for this purpose during final clean-up. |
| Suitable habitat for ungulates | From RK 1018.1 to RK 1019.2 100 m northwest of RK 1102.7 80 m northwest of RK 1180.1 | Request for community monitors during construction. | The EPPs (Volumes 6B, 6C and 6D) provide mitigation plans developed in response to issues identified during Project planning, stakeholder consultation, Aboriginal engagement and regulatory discussions. Aboriginal Monitors onsite through the construction of the Project will work with environmental inspectors to provide traditional knowledge to the construction program to ensure protection of the environment; to discuss upcoming traditional and western science elements with the environmental inspector to insure protection and monitoring; and to monitor mitigation success in protecting the environment. Trans Mountain will continue to engage Aboriginal communities through all phases of the Project. Trans Mountain's commitment to retain Aboriginal Monitors is further described in Volume 6A. |
| SPECIES OR GROUP: Bear | | | |
| Evidence of bear (e.g., scat, tree markings, tracks, sightings) | 43.1 m north of RK 1003.4 35 m west of RK 1006.5 25 m east of RK 1014.8 200 m southwest of RK 1018.6 From RK 1028.8 to RK 1037 89 m southeast of RK 1041.7 12 m southeast of RK 1045.6 300 m east of RK 1153.8 27.1 m northwest of RK 1056.7 From RK 1072.5 to RK 1074.7 120 m south of RK 1148.4 | Potential impacts to wildlife and wildlife habitat. | Do not clear timber, stumps, brush or other vegetation beyond the marked construction right-of-way boundary. Where grading is not required, cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration. Use natural recovery as the preferred method of reclamation on level terrain and at wetlands. Seed disturbed and erosion prone areas with an approved native seed mix. Plant native tree seedlings and/or shrubs at select locations. |
| Suitable habitat for bears | 1.6 m south of RK 1054.4 1.9 m northwest of RK 1056.2 13 m south of RK 1078 120 m south of RK 1148.4 | | |
| Bear Den | 104 m south of RK 1077.7 | Sweep for bear dens prior to construction | In BC, in the event an active mammal den is found, activities should not occur within 50 m of an active bear den. |

TABLE 5.2.16 Cont'd

| Description | Location(s) | Issue/Concern | Proposed Mitigation Measures/Response |
|--|--|---|---|
| SPECIES OR GROUP: Birds | | | |
| Woodpecker observed | 244 m southeast of RK 1044.8 | Avoid disturbing active nests during construction. | <p>Where grading is not required, cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration.</p> <p>Plant native tree seedlings and/or shrubs at select locations.</p> <p>Reduce the width of grubbing near watercourses, wetlands and through other wet areas to facilitate the restoration of shrub communities.</p> <p>Reduce disturbance at riparian areas, and where practical, extend the riparian buffer by implementing trenchless pipeline crossing techniques, or cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration.</p> <p>Schedule clearing and construction activities outside of sensitive time periods for raptors. In the event clearing is scheduled within these periods, in areas of suitable habitat, conduct raptor nest searches prior to clearing to locate active raptor nests.</p> <p>In BC, schedule clearing and construction activities outside the migratory bird breeding season of March 15 to August 15. In simple habitat types where active nests are easier to locate (i.e., previously cleared areas and open areas with sparse vegetation and few trees), a nest sweep may be completed within 7 days of activity that is scheduled to occur within the migratory bird RAP. Use non-intrusive methods to conduct an area search for evidence of nesting (e.g., presence of singing birds, territorial males, alarm calls, distraction displays). In the event an active nest is found, it will be subject to site-specific mitigation measures (i.e., clearly marked protective buffer around the nest and/or non-intrusive monitoring).</p> <p>In complex habitats where active nests are more difficult to find (e.g., forests), it is recommended that pre-clearing be conducted.</p> |
| Hummingbird observed | 84 m east of RK 1023.6 | | |
| Eagle observed | 248 m northwest of RK 1094.1 | | |
| Nest (species unconfirmed) | 60.9 m east of RK 927.2 499 m northeast of RK 1060.6 149 m east of RK 1132.5 | | |
| Grouse observed | 62.2 m southeast of RK 1019.9 320 m east of RK 1025.2 | Disturbance of bird habitat during construction. | Implement provincial setbacks in the event an active sharp-tailed grouse lek is identified. |
| SPECIES OR GROUP: Furbearers including racoon, rabbit, otter | | | |
| Evidence of small furbearers (e.g., mounds, chew, tracks, trails, den, caches) | 32.8 m east of RK 927.8 43.1 m north of RK 1003.4 193 m northwest of RK 1066 | Potential impacts to wildlife and wildlife habitat. | <p>Maintain root layer integrity on the right-of-way by clearing vegetation above ground level and restricting grubbing to the trench width.</p> <p>Avoid creation of new access. Use existing roads/linear corridors for access wherever practical. Deactivate and reclaim all temporary access.</p> <p>Use natural recovery as the preferred method of reclamation on level terrain and at wetlands.</p> <p>Seed disturbed and erosion prone areas with an approved native seed mix.</p> <p>Reduce the width of grubbing near watercourses, wetlands and through other wet areas to facilitate the restoration of shrub communities.</p> <p>Reduce disturbance at riparian areas, and where practical, extend the riparian buffer by implementing trenchless pipeline crossing techniques, or cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration.</p> |
| SPECIES OR GROUP: Canids including coyote | | | |
| Suitable habitat for canids | 80 m northwest of RK 1180.1 | Potential impacts to wildlife and wildlife habitat. | <p>Use natural recovery as the preferred method of reclamation on level terrain and at wetlands.</p> <p>Seed disturbed and erosion prone areas with an approved native seed mix.</p> <p>Reduce the width of grubbing near watercourses, wetlands and through other wet areas to facilitate the restoration of shrub communities.</p> <p>Reduce disturbance at riparian areas, and where practical, extend the riparian buffer by implementing trenchless pipeline crossing techniques, or cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration.</p> |

TABLE 5.2.16 Cont'd

| Description | Location(s) | Issue/Concern | Proposed Mitigation Measures/Response |
|--|--|--|---|
| Evidence of canids (e.g., including tracks, scat, sightings) | 5 m north of RK 993.5 80 m northwest of RK 1180.1 | See above | Implement measures to reduce access (human and predator) along the pipeline right-of-way. Measures include using woody debris as rollback, and planting trees and/or shrubs at select locations along the pipeline right-of-way. |
| Canid Den | 6.9 m east of RK 927.3 | Disturbance of dens during construction. | Avoid active dens during the clearing and construction. |
| SPECIES OR GROUP: Felids including bobcat, cougar | | | |
| Suitable habitat for felids | 76 m west of RK 1035.1 | Potential impacts to wildlife and wildlife habitat. | Use natural recovery as the preferred method of reclamation on level terrain and at wetlands. Seed disturbed and erosion prone areas with an approved native seed mix. Reduce the width of grubbing near watercourses, wetlands and through other wet areas to facilitate the restoration of shrub communities. Reduce disturbance at riparian areas, and where practical, extend the riparian buffer by implementing trenchless pipeline crossing techniques, or cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration. Implement measures to reduce access (human and predator) along the pipeline right-of-way. Measures include using woody debris as rollback, and planting trees and/or shrubs at select locations along the pipeline right-of-way. |
| Evidence of bobcat and cougar (e.g., tree markings, sightings, tracks) | 28.6 m east of RK 1013.5 67 m east of RK 1014.8 5 m north of RK 1029.8 15 m southeast of RK 1046.3 89 m east of RK 1072.2 | | |
| SPECIES OR GROUP: Other wildlife features | | | |
| Wildlife tree | 15 m west of RK 1014.3 5 m southwest of RK 1102.7 | Removal of wildlife trees. | Avoid wildlife trees where possible. |
| Coastal tailed frog | 42 m southeast of RK 998.8 | Disturbance and loss of amphibian habitat during construction. | Identify pond dwelling amphibian breeding ponds within the pipeline corridor prior to construction in an effort to avoid during final routing. For Project activities at streams identified as coastal tailed frog habitat, implement the species-specific measures described in Table 6.1.1. Schedule clearing and construction activities outside of the breeding and seasonal migration periods for amphibians and adhere to provincial and federal setbacks. Apply standard wetland construction and reclamation mitigation (e.g., minimal disturbance, recontouring, reclamation, monitoring and remedial measures) to support habitat reclamation as needed. Utilize snow packing and mats to avoid excessive soil compaction in the proximity of wetlands and watercourses. Maintain natural hydrology of streams and wetlands during clearing, construction and clean-up activities. |
| Western toad | 50 m northwest of RK 1072.2 | | |
| Mineral lick | 8 m east of RK 1071.8 186 m north of RK 1144 | Maintain game trail and avoid mineral lick. | Implement a 100 m setback in the event a mineral lick is identified. In the event that shifting/narrowing the pipeline right-of-way is not possible to maintain the minimum setback from a mineral lick, consult with appropriate provincial authorities. Maintain the integrity of trails to mineral licks and do not isolate from nearby escape cover (e.g., dense forest). Avoid activities (i.e., clearing, construction, helicopter overflights) near mineral licks during critical periods (May to November). Deactivate access roads as soon as possible. Leave a gap in strung pipe within the area of the mineral lick to allow wildlife to access the mineral lick. The locations of the gaps in strung pipe should coincide with gaps in strippings, spoil, snow and rollback windrows. |
| Well-used game trails/corridor | 104 m south of RK 1042.4 8 m east of RK 1071.8 10.1 m northeast of RK 1116.6 200 m north of RK 1118.6 34.6 m northwest of RK 1120.1 54 m north of RK 1129.7 186 m north of RK 1144 | Maintain game trail during construction. | Conduct work expeditiously to maintain a tight construction spread (i.e., interval between front-end work activities such as grading and back-end activities such as clean-up) to reduce the duration of the open trench and to reduce potential barriers and hazards to wildlife. Locate gaps in pipe to facilitate wildlife movement in places that also facilitate construction such as at slope changes, crossings (i.e., watercourse, road, pipeline right-of-way, railway) and bends. The locations of the gaps should coincide with gaps in spoil, slash piles and snow windrows. |

TABLE 5.2.16 Cont'd

| Description | Location(s) | Issue/Concern | Proposed Mitigation Measures/Response |
|---|-------------|---------------|--|
| Well-used game trails/corridor (cont'd) | See above | See above | Restore habitat connectivity by redistributing large-diameter slash (rollback) over select locations on the pipeline right-of-way (e.g., where high levels of coarse woody debris occur prior to construction), to provide cover and facilitate movement of wildlife (e.g., furbearers). |

5.2.13 Summary of Species Observations

5.2.13.1 Species with Special Conservation Status

Species with special conservation status that are listed federally (*i.e.*, by SARA Schedule 1 and COSEWIC), provincially in Alberta (*i.e.*, At Risk or May Be at Risk, or classified as Threatened or Endangered under Alberta's *Wildlife Act* or classified as Special Concern by the ESCC) and provincially in BC (*i.e.*, Red and Blue-listed and listed by the BC *Wildlife Act*) that were observed within the Wildlife LSA during field surveys, as well as incidental observations, are listed below. Additional detail is provided in Table 5.2.17. Observations include visual, auditory, habitat feature (*e.g.*, burrow), or sign (*e.g.*, track, scat).

- American white pelican
- Bank swallow
- Barn owl
- Barn swallow
- Barred owl
- Broad-winged hawk
- California gull
- Common nighthawk
- Double-crested cormorant
- Great blue heron
- Horned grebe
- Long-billed curlew
- Northern goshawk, *atricapillus* ssp.
- Olive-sided flycatcher
- Peregrine falcon, *anatum* ssp.
- Short-eared owl
- Sooty grouse
- Trumpeter swan
- Western grebe
- American badger, *jeffersonii* ssp.
- Grizzly bear
- Wolverine, *luscus* ssp.
- Western rattlesnake
- Coastal tailed frog
- Northern red-legged frog
- Western tiger salamander
- Western toad
- Oregon forestsnail
- Pacific sideband

TABLE 5.2.17

OBSERVATIONS OF SPECIES WITH SPECIAL CONSERVATION STATUS

| Common Name | Scientific Name | Conservation Status | | | Pipeline Segment | | | | Survey |
|--------------------------|----------------------------------|---|---|--|--------------------|------------------------|---------------------|-------------------|---------------------------------|
| | | Alberta Provincial Designation | BC Provincial Designation | Federal Designation | Edmonton to Hinton | Hargreaves to Darfield | Black Pines to Hope | Hope to Westridge | |
| BIRDS | | | | | | | | | |
| American white pelican | <i>Pelecanus erythrorhynchos</i> | | S1B ⁴ Endangered ⁵ Red ⁶ Priority 1 ⁷ Goal 3 ⁷ | -- | 0 | 0 | 56 | 0 | Incidental |
| Bank swallow | <i>Riparia riparia</i> | S5 ¹ | S4S5B ⁴ | Threatened ¹⁰ | 6 | 4 | 0 | 0 | Breeding Bird, Incidental |
| Barn owl | <i>Tyto alba</i> | | S3 ⁴ Blue ⁶ Priority 2 ⁷ Goal 2 ⁷ | Special Concern ⁹ Threatened ¹⁰ | 0 | 0 | 0 | 1 | Incidental |
| Barn swallow | <i>Hirundo rustica</i> | S4 (W) ¹ Sensitive ³ | S3S4B ⁴ Blue ⁶ Priority 2 ⁷ Goal 2 ⁷ | Threatened ¹⁰ | 11 | 8 | 1 | 111 | Breeding Bird, Incidental |
| Barred owl | <i>Strix varia</i> | S3S4 (W) ¹ Special Concern ² Sensitive ³ | S5B ⁴ | -- | 1 | 3 | 1 | 0 | Spotted Owl, Incidental |
| Broad-winged hawk | <i>Buteo platypterus</i> | S3 (W) ¹ Sensitive ³ | | -- | 1 | 0 | 0 | 0 | Incidental |
| California gull | <i>Larus californicus</i> | | S3B ⁴ Blue ⁶ | -- | 0 | 28 | 2 | 0 | Incidental |
| Common nighthawk | <i>Chordeiles minor</i> | | S4B ⁴ Priority 2 ⁷ Goal 2 ⁷ | Threatened ^{9,10} | 0 | 27 | 1 | 0 | Common Nighthawk, Incidental |
| Double-crested cormorant | <i>Phalacrocorax auritus</i> | S4 ¹ | S3S4B ⁴ Blue ⁶ Priority 2 ⁷ Goal 2 ⁷ | -- | 2 | 0 | 0 | 5 | Aerial Waterbird, Incidental |
| Great blue heron | <i>Ardea herodias herodias</i> | S3 (W) ¹ Sensitive ³ | S3B,S4N ⁴ Blue ⁶ Priority 2 ⁷ Goal 2 ⁷ | -- | 3 | 0 | 23 | 33 | Aerial Waterbird, Incidental |
| | <i>Ardea herodias fannini</i> | | S2S3B,S4N ⁴ Blue ⁶ Priority 1 ⁷ Goal 3 ⁷ | Special Concern ^{9,10} | | | | | |
| Horned grebe | <i>Podiceps auritus</i> | S3 (W) ¹ Sensitive ³ | S4B ⁴ | Special Concern ¹⁰ | 2 | 1 | 0 | 3 | Aerial Waterbird |

TABLE 5.2.17 Cont'd

| Common Name | Scientific Name | Conservation Status | | | Pipeline Segment | | | | Survey |
|---|--|---|---|---------------------------------|--------------------|------------------------|---------------------|-------------------|------------------------------|
| | | Alberta Provincial Designation | BC Provincial Designation | Federal Designation | Edmonton to Hinton | Hargreaves to Darfield | Black Pines to Hope | Hope to Westridge | |
| Long-billed curlew | <i>Numenius americanus</i> | | S3B ⁴ Blue ⁶ Priority 2 ⁷ Goal 2 ⁷ | Special Concern ^{9,10} | 0 | 10 | 0 | 0 | Incidental |
| Northern goshawk, <i>atricapillus</i> ssp. | <i>Accipiter gentilis atricapillus</i> | S3S4 (W) ¹ Sensitive ³ | | -- | 2 | 0 | 0 | 0 | Incidental |
| Olive-sided flycatcher | <i>Contopus cooperi</i> | S3 (T) ¹ May Be at Risk ³ | S3S4B ⁴ Blue ⁶ Priority 2 ⁷ Goal 2 ⁷ | Threatened ^{9,10} | 1 | 1 | 1 | 1 | Breeding Bird, Incidental |
| Peregrine falcon <i>anatum</i> ssp. | <i>Falco peregrinus anatum</i> | | S2?B ⁴ Red ⁶ Priority 2 ⁷ Goal 3 ⁷ | Special Concern ^{9,10} | 0 | 0 | 1 | 0 | Incidental |
| Short-eared owl | <i>Asio flammeus</i> | S3 (T) ¹ May Be at Risk ³ | | Special Concern ¹⁰ | 1 | 0 | 0 | 0 | Incidental |
| Sooty grouse | <i>Dendragapus fuliginosus</i> | | S3S4 ⁴ Blue ⁶ Priority 2 ⁷ Goal 2 ⁷ | -- | 0 | 0 | 3 | 0 | Incidental |
| Trumpeter swan | <i>Cygnus buccinator</i> | S2S3 (T) ¹ Threatened ² At Risk ³ | | -- | 6 | 0 | 0 | 0 | Aerial Waterbird |
| Western grebe | <i>Aechmophorus occidentalis</i> | S3 (W) ¹ Special Concern ² Sensitive ³ | S1B, S2N ⁴ Red ⁶ Priority 1 ⁷ Goal 3 ⁷ | -- | 4 | 0 | 5 | 0 | Incidental |
| MAMMALS | | | | | | | | | |
| American badger, <i>jeffersonii</i> ssp. | <i>Taxidea taxus jeffersoni</i> | | S1 ⁴ Red ⁶ Priority 1 ⁷ Goal 3 ⁷ | Endangered ^{9,10} | 0 | 0 | 26 | 0 | Incidental |
| Grizzly bear, western population | <i>Ursus arctos</i> | | S3 ⁴ Blue ⁶ Priority 2 ⁷ Goal 2 ⁷ | Special Concern ¹⁰ | 0 | 1 | 1 | 0 | Incidental |
| Wolverine, <i>luscus</i> ssp. | <i>Gulo gulo luscus</i> | | S3 ⁴ Blue ⁶ Priority 2 ⁷ Goal 2 ⁷ | Special Concern ¹⁰ | 0 | 5 | 0 | 0 | Winter Track, Incidental |

TABLE 5.2.17 Cont'd

| Common Name | Scientific Name | Conservation Status | | | Pipeline Segment | | | | Survey |
|--------------------------|------------------------------|---|--|---|--------------------|------------------------|---------------------|-------------------|--|
| | | Alberta Provincial Designation | BC Provincial Designation | Federal Designation | Edmonton to Hinton | Hargreaves to Darfield | Black Pines to Hope | Hope to Westridge | |
| REPTILES | | | | | | | | | |
| Western rattlesnake | <i>Crotalus oreganus</i> | | S3 ⁴ Blue ⁶ Priority 2 ⁷ Goal 2 ⁷ | Threatened ^{9,10} | 0 | 0 | 7 | 0 | Snake |
| AMPHIBIANS ¹¹ | | | | | | | | | |
| Coastal tailed frog | <i>Ascaphus truei</i> | | S3S4 ⁴ Blue ⁶ Priority 1 ⁷ Goal 2 ⁷ | Special Concern ^{9,10} | 0 | 0 | 54 | 11 | Stream-Dwelling Amphibians, Incidental |
| Northern red-legged frog | <i>Rana aurora</i> | | S3S4 ⁴ Blue ⁶ Priority 1 ⁷ Goal 2 ⁷ | Special Concern ^{9,10} | 0 | 0 | 0 | 11 | Pond-Dwelling Amphibians |
| Western tiger salamander | <i>Ambystoma mavortium</i> | S4 ¹ | | Endangered ^{9,10} | 1 | 0 | 0 | 0 | Incidental |
| Western toad | <i>Anaxyrus boreas</i> | S3 (T) ¹ Sensitive ³ | S3S4 ⁴ Blue ⁶ Priority 2 ⁷ Goal 2 ⁷ | Special Concern ^{9,10} | 7 | 23 | 13 | 1 | Pond-Dwelling Amphibians, Incidental |
| INVERTEBRATES | | | | | | | | | |
| Oregon forestsnail | <i>Allogona townsendiana</i> | | S1S2 ⁴ Red ⁶ Priority 1 ⁷ Goal 3 ⁷ | G3G4 ⁸ Endangered ^{9,10} | 0 | 0 | 0 | 34 | Incidental |
| Pacific sideband snail | <i>Monadenia fidelis</i> | | S3S4 ⁴ Blue ⁶ Priority 2 ⁷ Goal 2 ⁷ | -- | 0 | 0 | 5 | 3 | Incidental |

- Notes:** Status definitions are provided in Appendix C
Observations summarized here include observations from field surveys and incidental observations but do not include wildlife features (e.g., raptor nests).
Provincial designations are provided in table for province(s) in which species was observed.
- 1 Alberta provincial (S) rank assigned by ACIMS (2013a).
 - 2 Species listed under the Alberta *Wildlife Act* and Wildlife Regulation (AESRD 2012a).
 - 3 Status designation assigned in *The 2010 General Status of Alberta Wild Species* (ASRD 2011b).
 - 4 British Columbia provincial (S) rank assigned by the BC CDC (2013c).
 - 5 Species listed under the BC *Wildlife Act* (BC CDC 2013c).
 - 6 Provincial Red and Blue designations assigned by BC CDC (2013b).
 - 7 Conservation goals and priorities established under the BC Conservation Framework (BC MOE 2009a,b).
 - 8 Global (G) ranks are based on species status world-wide (ACIMS 2013a, BC CDC 2013c, NatureServe 2013a).
 - 9 Species listed under Schedule 1 of SARA (Environment Canada 2013a).
 - 10 Species listed under COSEWIC (2013).
 - 11 Observations of amphibian species are summarized as the number of ponds or streams where each species was detected, not the total number of individuals.

5.2.13.2 *Wildlife Indicator Species*

A summary of the wildlife indicators identified in Section 3.2.1 that were observed during the field surveys, as well as incidental observations is provided in Table 5.2.18.

TABLE 5.2.18

OBSERVATIONS OF WILDLIFE INDICATORS BY PIPELINE SEGMENT AND NATURAL REGION OR ECOPROVINCE

| | Edmonton to Hinton Segment | | | | Hargreaves to Darfield Segment | Black Pines to Hope Segment | Hope to Westridge Segment | | |
|---------------------------------------|----------------------------|---------------|-----------|----------------|--------------------------------|-----------------------------|---------------------------|--------------------|----|
| | Parkland | Boreal Forest | Foothills | Rocky Mountain | Southern Interior Mountains | Southern Interior | Coast and Mountains | Georgia Depression | |
| BIRDS | | | | | | | | | |
| Bald eagle | | | ● | | ● | ● | ● | ● | ● |
| Common nighthawk | | | | | ● | ● | ● | | |
| Flammulated owl | -- | -- | -- | -- | -- | | -- | -- | -- |
| Great blue heron | | ● | ● | | | ● | ● | ● | ● |
| Lewis's woodpecker | -- | -- | -- | -- | -- | | -- | -- | -- |
| Northern goshawk, <i>laingi</i> ssp. | -- | -- | -- | -- | -- | -- | | | |
| Olive-sided flycatcher | | | ● | | ● | | ● | | ● |
| Rusty blackbird | | | | | | | -- | -- | -- |
| Short-eared owl | | | ● | | -- | | -- | -- | |
| Spotted owl | -- | -- | -- | -- | -- | -- | | | |
| Western screech-owl | -- | -- | -- | -- | -- | | -- | | |
| Williamson's sapsucker | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Early Seral Forest Bird Community | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Grassland Shrub Steppe Bird Community | -- | -- | -- | -- | -- | ● | ● | -- | -- |
| Mature/ Old Forest Bird Community | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Riparian/Wetland Bird Community | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Wood Warblers | -- | ● | ● | ● | -- | -- | -- | -- | -- |
| MAMMALS | | | | | | | | | |
| Grizzly bear | -- | -- | | | | -- | ● | | -- |
| Moose | | | ● | ● | ● | ● | ● | -- | -- |
| Woodland caribou | -- | -- | -- | -- | | -- | -- | -- | -- |
| Bats | | | | | | | | | |
| Coastal Riparian Small Mammals | -- | -- | -- | -- | -- | -- | -- | | |
| Forest Furbearers | -- | ● | ● | | ● | ● | ● | | |
| REPTILES AND AMPHIBIANS | | | | | | | | | |
| Arid Habitat Snakes | -- | -- | -- | -- | -- | -- | ● | -- | -- |
| Pond-Dwelling Amphibians | | | ● | | ● | ● | ● | ● | |
| Stream-Dwelling Amphibians | -- | -- | -- | -- | -- | -- | ● | ● | ● |

Notes: Complete listing of indicator species provided in the *Wildlife Modeling and Species Accounts Technical Report* (Volume 5C).
Observations summarized here include observations from field surveys and incidental observations but do not include wildlife features (e.g., raptor nests).
Areas where wildlife indicators were observed are denoted by "●", areas outside the known range of indicators are denoted by "--", and areas within the known range of indicators where no observations occurred are blank.

5.2.13.3 *Incidental Wildlife Observations*

Numerous mammals, birds, reptiles and amphibian species were observed incidentally during the wildlife field surveys. These observations were not collected systematically and should not be used as a measure of relative abundance; however, they are valuable for determining species presence within the Wildlife LSA. Detections of incidental species include visual and auditory observations of individuals, feeding signs, scat/pellets, tracks, carcasses and nesting or bedding sites. A complete list of species recorded as incidental observations is provided in Appendix F. There were 194 species of bird, 37 species of mammal, 3 species of reptile, 12 species of amphibian and 4 species of invertebrate were detected incidentally within the Wildlife LSA during field surveys.

Wildlife features observed incidentally within the Wildlife LSA during the wildlife field surveys completed in 2012 and 2013 include: 14 active stick nests (5 bald eagle, 5 osprey, 1 red-tailed hawk, 1 merlin and 2 unknown raptor species); 18 badger burrows; 14 beaver lodges; 8 beaver dams; 1 yellow-bellied marmot burrow; 1 coyote den; 1 wallow and 1 mineral lick.

6.0 DISCUSSION AND MITIGATION RECOMMENDATIONS

6.1 Recommended Mitigation

The mitigation measures presented in Table 6.1.1 have either already been incorporated into Project planning and/or are otherwise recommended as site-specific measures to reduce potential environmental effects to wildlife and wildlife habitat during construction and operation of the Project. Additional mitigation measures are provided in the EPPs prepared for this Project. These are the Pipeline EPP, Facilities EPP and Westridge Marine Terminal EPP (Volumes 6B, 6C and 6D). The recommended mitigation measures provided were principally developed in accordance with industry and regulatory guidelines, including relevant recommendations in land use planning documents, as well as consultation with provincial regulatory authorities (Table 2.2.1). The recommended timing/least risk windows and setback distances presented in Table 6.1.1 are in place to reduce disturbance to wildlife during sensitive periods. The various circumstances that may be encountered during Project construction or operations have been considered and included in the recommended mitigation. In the event there are conflicts between the timing/least risk windows and the construction schedule (*i.e.*, once the final route alignment has been determined and the construction schedule has been finalized), Trans Mountain will consult with the appropriate regulatory authorities to develop appropriate mitigation. Where warranted, pre-construction surveys may be conducted to collect information needed to inform mitigation planning.

TABLE 6.1.1

RECOMMENDED WILDLIFE MITIGATION MEASURES

| Concern | Province/Location | Recommended Mitigation |
|---|-------------------|---|
| Habitat Loss/Alteration | Alberta/BC | <ul style="list-style-type: none"> • Avoid activity during sensitive time periods for wildlife species to the extent feasible. • Share workspace with the adjacent existing TMPL right-of-way or other existing rights-of-way where practical to reduce the construction right-of-way-width. • Do not clear timber, stumps, brush or other vegetation beyond the marked construction right-of-way boundary. • Where grading is not required, cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration. • Use natural recovery as the preferred method of reclamation on level terrain and at wetlands unless otherwise requested by the regulator and where bio-engineering (e.g., shrub staking/planting) will be conducted. • Plant native tree seedlings and/or shrubs at select locations to be determined in the field by the Environmental Inspector, in consultation with the Wildlife Resource Specialist. • Avoid the use of pesticides (except for herbicides to control invasive plants or noxious weeds; only use as spot treatments and outside the migratory bird breeding season) (BC MOE 2012a). • Reduce the width of grubbing near watercourses, wetlands and through other wet areas to facilitate the restoration of shrub communities. • Reduce disturbance at riparian areas, and where practical, extend the riparian buffer by implementing trenchless pipeline crossing techniques, or cut/mow/walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration. • Limit vegetation control along the right-of-way and allow natural regeneration during the operations phase to the extent feasible. • Conduct pre-construction surveys to identify site-specific habitat features (e.g., mineral licks) and implement the appropriate setbacks and/or timing windows. |
| Access and Line-of-Sight Management | Alberta/BC | <ul style="list-style-type: none"> • Implement the measures included in the Traffic and Access Control Management Plan prepared for the Project (Appendix C of the Pipeline EPP). • Implement measures to reduce access (human and predator) along the right-of-way following construction. Measures may include but are not limited to planting tree seedlings and/or shrubs in select locations to facilitate rapid regeneration of natural vegetation, and blocking access entry points by mounding, rollback, boulder barriers, earth berms or locked gates. The locations of access control measures along the right-of-way will be determined in consideration of consultation with provincial regulatory authorities. • Where rollback and coarse woody debris are needed for access management, erosion control and habitat enhancement, ensure that a sufficient supply is set aside for this purpose during final clean-up. • Consider the following at the proposed crossing of roads, railways, other pipelines or watercourses: extend the length of an HDD or bored crossings where this crossing technique has been proposed to leave a vegetated screen and/or narrow the right-of-way width if feasible. • Use existing roads to access the pipeline right-of-way. Deactivate and reclaim any temporary roads that are no longer needed with native vegetation. Implement measures to reduce access (human and predator) along these temporary roads, as required. • Install educational signs as needed at selected locations. |
| Barriers to Wildlife Movement | Alberta/BC | <ul style="list-style-type: none"> • Conduct work as expeditiously as practical (<i>i.e.</i>, interval between front-end work activities such as grading and back-end activities such as clean-up) to reduce the length and duration of the open trench and to reduce potential barriers and hazards to wildlife. • Locate gaps in pipe to allow wildlife movement in places that also facilitate construction such as at slope changes, crossings (<i>i.e.</i>, watercourse, road, pipeline right-of-way, railway) and bends. The locations of the gaps should coincide with gaps in spoil, slash piles and snow windrows. The locations can be determined in the field by the Environmental Inspector. • Restore habitat connectivity by redistributing large-diameter slash (rollback) over select locations on the pipeline right-of-way (e.g., where high levels of coarse woody debris occur prior to construction), to provide cover and facilitate movement of wildlife (e.g., furbearers). Specific locations are to be determined in the field by the Environmental Inspector and Wildlife Resource Specialist in discussion with provincial regulatory authorities. |
| Wildlife Disturbance and Attraction of Wildlife During Construction | Alberta/BC | <ul style="list-style-type: none"> • Schedule clearing and construction activities to avoid sensitive wildlife timing windows wherever feasible. • Minimize traffic and prohibit recreational use of all-terrain vehicles or snowmobiles by construction personnel on the pipeline right-of-way and at facilities. • Prohibit personnel from having pets on the pipeline right-of-way and at facilities. • Prohibit personnel from feeding or harassing wildlife. • Obey speed limits along access roads and the right-of-way. • Ensure that food waste and industrial waste are disposed of properly. • Report any issues related to wildlife encountered during construction and operations to the Environmental Inspector, who will report it to the appropriate regulatory authorities. |

TABLE 6.1.1 Cont'd

| Concern | Province/Location | Recommended Mitigation |
|--|--|--|
| Wildlife Disturbance and Attraction of Wildlife During Construction (cont'd) | Alberta/BC | <ul style="list-style-type: none"> Implement the measures in the Wildlife Conflict Management Plan to prevent human/wildlife conflict and wildlife mortality (Appendix C of the Pipeline and Facilities EPPs). |
| Sensory Disturbance | Alberta/BC | <ul style="list-style-type: none"> Use low lighting and/or task lighting (e.g., downturned shaded fixtures to prevent sky-lighting or bird disorientation), and a higher lumen/watt ratio at all new facilities or facility expansions. Comply with appropriate regulatory requirements related to noise during construction and operations of facilities to minimize disturbance related to noise. |
| Migratory Birds | Alberta/BC | <ul style="list-style-type: none"> In Alberta, schedule clearing and construction activities outside of the migratory bird restricted activity period (RAP) of May 7 to August 20. Wetlands attractive to migratory birds should not be cleared/disturbed from April 20 to August 25 (Gregoire pers. comm.). In the event clearing or construction activities are scheduled during the migratory bird RAP, follow the measures for conducting migratory bird nest sweeps described below. In BC, schedule clearing and construction activities outside the migratory bird breeding season of March 15 to August 15 (Wilson pers. comm.). In the event clearing or construction activities are scheduled during the migratory bird breeding season, follow measures for conducting migratory bird nest sweeps described below. In simple habitat types where active nests are easier to locate (i.e., previously cleared areas and open areas with sparse vegetation and few trees), a nest sweep may be completed within 7 days of activity that is scheduled to occur within the migratory bird RAP. Use non-intrusive methods to conduct an area search for evidence of nesting (e.g., presence of singing birds, territorial males, alarm calls, distraction displays). In the event an active nest is found, it will be subject to site-specific mitigation measures (i.e., clearly marked protective buffer around the nest and/or non-intrusive monitoring). In complex habitats where active nests are more difficult to find (e.g., forests), it is recommended that pre-clearing be conducted. If this is not feasible and activity is scheduled to occur within the migratory bird RAP, contact Environment Canada prior to activity to discuss the area to be cleared. Use non-intrusive methods to conduct an area search for evidence of nesting (e.g., presence of singing birds, territorial males, alarm calls, distraction displays). In the event an active nest is found, it will be subject to site-specific mitigation measures (i.e., clearly marked protective buffer around the nest and/or non-intrusive monitoring). In BC, in the event that an active Williamson's sapsucker or Lewis's woodpecker nest tree is found within or adjacent to the Project Footprint, consult with BC MFLNRO to discuss practical options and mitigation strategies. Consider implementing the following bird conservation strategies: for Lewis's woodpecker, retain cavity-bearing trees and snags as nesting habitat, initiate nest box programs in areas lacking cavities/snags, restore/expand riparian buffers (minimum 30m and >300m for at least 10% of stream length) where nests are found; for American white pelican, double-crested cormorant and Western grebe establish undisturbed buffer zones (100 m) around breeding colonies; for rusty blackbird maintain unharvested buffers of contiguous forest around bogs used for breeding; and for barn swallow avoid the use of pesticides to maintain invertebrate species (Environment Canada 2013c). |
| Key Wildlife and Biodiversity Zone | Alberta <ul style="list-style-type: none"> North Saskatchewan River: RK 32.7 to RK 34.1 for approximately 1.4 km North Saskatchewan River: RK 36.7 to RK 37.1 for approximately 0.4 km Athabasca River: various locations between RK 307.4 to RK 311.6 for approximately 3.8 km | <ul style="list-style-type: none"> Schedule clearing, construction and clean-up activities outside the timing restriction of January 15 to April 30. All activities within 100 m of existing arterial all-weather roads can be initiated at any time provided ground conditions are favourable and may continue until adverse ground conditions are encountered (Government of Alberta 2013). Consult with AESRD if construction activity is scheduled within this period to discuss practical options and mitigation strategies. Conduct work as expeditiously as practical (i.e., interval between front-end work activities such as grading and back-end activities such as clean-up) to reduce the length and duration of the open trench and to reduce potential barriers and hazards to wildlife. |

TABLE 6.1.1 Cont'd

| Concern | Province/Location | Recommended Mitigation |
|---|---|--|
| Special Access Zone | Alberta <ul style="list-style-type: none"> • RK 286.8 to RK 292.6 (approximately 5.8 km) • RK 329.0 to RK 339.4 (approximately 10.4 km) • Hinton Pump Station | <ul style="list-style-type: none"> • Use existing roads to access the pipeline right-of-way and the Hinton Pump Station where practical. If new access is required, construct to minimal disturbance standards (Class V), unless the new access is less than 100 m to an existing arterial all-weather road, in which case, the new access can be developed using Class III to Class V roads (all-weather or dry tertiary; frozen; minimal disturbance) (Government of Alberta 2013). If new access, which is attached to the existing arterial all-weather access road, is greater than 100 m in distance from the arterial all-weather access road, then access control is required to restrict unauthorized traffic at all stages of construction, operation, deactivation and reclamation of the road. The access control will be placed within 100 m distance from the start of the new access (Government of Alberta 2013). • Avoid creating access routes as loops and design to dead-end (Government of Alberta 2013). • Consult with AESRD on the use of rollback along the pipeline right-of-way within this Zone. • Re-vegetate any areas that were cleared (pipeline right-of-way, roads, facilities) with species compatible to the adjacent vegetation type. Do not seed with species that are palatable to wildlife (<i>i.e.</i>, legumes) (Government of Alberta 2013). |
| Grizzly Bear Zone | Alberta <ul style="list-style-type: none"> • RK 297.2 to RK 339.4 (approximately 42.2 km) • Hinton Pump Station | <ul style="list-style-type: none"> • Apply measures noted for Special Access Zones to limit new access. • All workers will receive Bear Awareness Training (Government of Alberta 2013). • Coordinate access and new clearing requirements with other industrial users in the area to minimize human activity within grizzly bear habitat (Government of Alberta 2013). • Delimb coniferous trees and leave limbs on-site, where practical, to provide a seed source (Government of Alberta 2013). • Prohibit construction personnel from feeding or harassing wildlife. Dispose of food wastes and industrial waste properly. • Utilize multi-passenger vehicles for the transport of crews to and from the job sites, to the extent practicable, to reduce traffic during construction. • Follow the <i>Bear-Human Conflict Management Plan for Camps</i> provided in the <i>Integrated Standards and Guidelines</i> if a camp is located within grizzly bear habitat (Government of Alberta 2013). • In the event an active grizzly bear den is found, contact AESRD to discuss mitigation strategies. Recommended setbacks are 750 m for high disturbance activities (<i>i.e.</i>, conventional pipelines) and 500 m for medium disturbance activities (<i>i.e.</i>, conventional pipeline parallel to a linear corridor) from October 1 to April 30 (Government of Alberta 2013). |
| Trumpeter Swan Waterbodies/Watercourses | Alberta <ul style="list-style-type: none"> • Unnamed Lake (locally referred to as Lacy's Lake) at SW 22-53-18 W5M: approximately 400 m north of RK 242 • Annabel Lake at 34-52-19 W5M: approximately 700 m south of RK 254 • Unnamed waterbody at W 5-53-19 W5M: approximately 200 m north of RK 258 | <ul style="list-style-type: none"> • Schedule clearing, construction and clean-up activities outside the timing restriction of April 1 to September 30 within 800 m of a trumpeter swan waterbody/watercourse. In the event activity is scheduled during this period and a breeding pair (with cygnets) is nesting on the waterbody, consult with AESRD to discuss practical options and mitigation strategies. • Avoid direct aerial overflights over identified trumpeter swan waterbodies/watercourses that have a breeding pair (with cygnets) from April 1 to September 30 (<i>e.g.</i>, low-level flights over the nest, circling the nest) (Government of Alberta 2013). |
| Sensitive Raptor Range - Bald Eagle | Alberta <ul style="list-style-type: none"> • RK 0.0 to RK 68.8 (approximately 68.8 km) • Edmonton Terminal | <ul style="list-style-type: none"> • Recommended setbacks from bald eagle nests include: for high disturbance activities (<i>i.e.</i>, conventional pipeline), a 1,000 m setback is recommended year-round; for medium disturbance activities (<i>i.e.</i>, conventional pipeline parallel to a linear corridor), a 1,000 m setback is recommended from March 15 to July 15 and a 100 m setback is recommended from July 16 to March 14 (Government of Alberta 2013). • In the event an active bald eagle nest is found, consult with AESRD to discuss practical options and mitigation strategies. |

TABLE 6.1.1 Cont'd

| Concern | Province/Location | Recommended Mitigation |
|--|---|--|
| Sharp-Tailed Grouse Lek | <p>Alberta</p> <ul style="list-style-type: none"> In Alberta, a provincially identified sharp-tailed grouse range occurs from RK 0.0 to RK 68.8 (approximately 68.8 km) <p>BC</p> | <ul style="list-style-type: none"> In Alberta, implement a 500 m setback in the event an active sharp-tailed grouse lek is identified. Use noise reduction equipment to muffle or otherwise control noise so that operational noise does not exceed 49 decibels measured at 10 m from the source to the 500 m setback (Government of Alberta 2013). In the event an active sharp-tailed grouse lek is found, consult with AESRD to discuss practical options and mitigation strategies. In BC, avoid activity in the area of identified sharp-tailed grouse leks from April 1 to May 31 (Surgenor pers. comm.). Activities are not recommended within 400 m of a sharp-tailed grouse lek between April 1 and May 31 (BC MWLAP 2004c). In the event an active sharp-tailed grouse lek is identified, consult with BC MFLNRO to discuss practical options and mitigation strategies. |
| Protective Notations (PNT) | <p>Alberta</p> <ul style="list-style-type: none"> PNT 980061 at NW 13-53-6 W5M (approximately RK 118.1 to RK 118.9) PNT 870456 at NW 22-53-10 W5M (approximately RK 161.0 to RK 161.8) | <ul style="list-style-type: none"> Consult with AESRD in regards to activity in PNT 980061 (Fragmented Land Pattern) and 980160 (Research Site Structure). Maintain tree cover and minimize new clearing requirements in PNTs 870456 (Ungulate Winter Range) and 780290 (Fish and Wildlife Resource Management Area) by paralleling the existing TMPL right-of-way (Hobson pers. comm.). Routing has avoided the long-toed salamander breeding ponds by 100 m in PNT 020232 (Rare and Endangered Species Habitat Protection Area for long-toed salamander). Traffic should be reduced within the area of the ponds in spring and early fall to reduce mortality during salamander breeding and dispersal periods (Wilkinson pers. comm.). |
| <p>Mountain Caribou Range</p> <p>Includes Ungulate Winter Range U-3-004 (Modified Harvest Zone) for the Wells Gray Caribou Range</p> | <p>BC</p> <ul style="list-style-type: none"> Wells Gray Caribou Range (various locations for approximately 30.7 km from RK 550.1 to RK 602.6; includes 4.3 km within UWR U-3-004) Groundhog Caribou Range (various locations for approximately 10.3 km from RK 629.8 to RK 649.4) | <ul style="list-style-type: none"> Align route to parallel existing corridors (existing TMPL right-of-way, Highway 5, existing power line) to the extent feasible to reduce habitat disturbance. Work with the appropriate regulatory authorities for deviation from the General Wildlife Measures set out in the Order for Wells Gray caribou Ungulate Winter Range (U-3-004). Avoid activity in early to mid-winter within caribou range (<i>i.e.</i>, November 1 to January 15) (Surgenor pers. comm.), to the extent feasible. Implement line-of-sight breaks every 500 m along segments not sharing a right-of-way boundary with another linear corridor such as a road or power line. Line-of-sight measures may include: bends in the right-of-way; doglegs at intersections with access roads; woody debris or earth berms; tree or shrub planting to create vegetation screens across the right-of-way; avoiding clearing on the right-of-way (<i>e.g.</i>, HDD or bored crossings of watercourses, roads or other rights-of-way). Avoid creating early seral habitat that will provide forage for moose (<i>e.g.</i>, do not plant willow or red osier dogwood) (Surgenor pers. comm.). Avoid creation of new access within caribou range where feasible. Use existing roads/linear corridors for access whenever practical (BC OGC 2013). Where practicable, avoid building roads within 100 m of an existing trail (Kamloops LRMP Mountain Caribou Subcommittee 2006). Deactivate and reclaim all temporary construction access within caribou range (Kamloops LRMP Mountain Caribou Subcommittee 2006). Coordinate any new access with all users and consider caribou management issues (<i>i.e.</i>, seasonal use of the road) (Kamloops LRMP Mountain Caribou Subcommittee 2006). Minimize winter road use and, where feasible, coordinate with other activities such as winter logging (Kamloops LRMP Mountain Caribou Subcommittee 2006). Conduct work expeditiously to maintain a tight construction spread (<i>i.e.</i>, interval between front-end work activities such as grading and back-end activities such as clean-up) to reduce the duration of the open trench and to reduce potential barriers and hazards to wildlife. Locate gaps in pipe to facilitate wildlife movement in places that also facilitate construction such as at slope changes, crossings (<i>i.e.</i>, watercourse, road, pipeline right-of-way, railway) and bends. The locations of the gaps should coincide with gaps in spoil, slash piles and snow windrows. The locations can be determined in the field by the Environmental Inspector. Where segments of the right-of-way require rollback for access management or erosion control, ensure sufficient timber is set aside for this purpose during final clean-up. Implement minimum surface disturbance construction techniques that will facilitate natural revegetation in areas where grading or blasting is not required in areas of upland deciduous and mixedwood forests and in graminoid and shrub-dominated wetland communities. <ul style="list-style-type: none"> Minimize the width of the pipeline right-of-way to the extent practical by utilizing shared workspace, avoiding clearing large diameter trees on the edge of the right-of-way; minimizing extra temporary workspace (<i>e.g.</i>, place log decks, storage areas, other temporary construction areas outside of UWR U-3-004). Maintain root layer integrity on the right-of-way by clearing vegetation above ground level and restricting grubbing to the trench width. Protect travel and work surfaces by packing snow (during winter) to protect soils and vegetation where practical. |

TABLE 6.1.1 Cont'd

| Concern | Province/Location | Recommended Mitigation |
|--|---|---|
| Mountain Caribou Range Includes Ungulate Winter Range U-3-004 (Modified Harvest Zone) for the Wells Gray Caribou Range (cont'd) | See above | <ul style="list-style-type: none"> • Avoid using seed mixtures that will attract other ungulates (deer, moose) during reclamation (Hoekstra pers. comm.). • Implement measures to reduce access (human and predator) along the pipeline right-of-way following construction. Measures include using woody debris as rollback, mounding, planting trees and/or shrubs for visual screens, and rock piles or berms across the right-of-way. The locations of access control measures along the pipeline right-of-way will be determined in consideration of consultation with provincial regulatory authorities. • Consider the following at the proposed crossing of roads, other pipelines or watercourses: extend the length of HDD or bored crossings where this crossing method has been proposed to leave a vegetated screen for line-of-sight and/or narrow the right-of-way width if feasible. • Monitor the effectiveness of access control measures and reclamation during the Post-Construction Environmental Monitoring (PCEM). Implement remedial measures if warranted. Schedule remedial work outside of the period of early to mid-winter when caribou are more likely to be in the area. • Limit vegetation control along the right-of-way and allow natural regeneration during the operations phase to the extent feasible. • Limit operational access along the pipeline right-of-way within caribou range. • Report any sightings of caribou during construction and operations to Trans Mountain's Lead Environmental Inspector or Environmental Inspector(s). |
| Ungulate Winter Range for Mule Deer (U-3-003) | BC <ul style="list-style-type: none"> • Various locations for approximately 36.7 km from RKP 891.6 to RK 969.6 • Stump Pump Station (to be deactivated) • Kingsvale Pump Station (expansion) • Kingsvale Transmission Line (6.2 km) | <ul style="list-style-type: none"> • A timing window does not apply to this UWR (Surgenor pers. comm.). • For the proposed Kingsvale power line and pipeline right-of-way, minimize the right-of-way width to the extent practical by utilizing shared workspace, avoid clearing large diameter trees on the edge of the right-of-way; minimizing extra temporary workspace (<i>e.g.</i>, placing log decks, storage areas, other temporary construction areas outside of the UWR). Maintain root layer integrity on the right-of-way by clearing vegetation above ground level and restricting grubbing to the trench, to the extent practical. Avoid creation of new access. Use existing roads/linear corridors for access wherever practical. Deactivate and reclaim all temporary access. Implement measures to reduce access (human and predator). Measures include using woody debris as rollback, and planting trees and/or shrubs at select locations. • Work with the appropriate regulatory authorities for deviation from the General Wildlife Measures set out in the Ungulate Winter Range Order. |
| Ungulate Winter Range for Mule Deer and Columbian Black-Tailed Deer (U-2-006) | BC <ul style="list-style-type: none"> • Approximate 1.3 km segment from RK 1029.6 to RK 1030.9 | <ul style="list-style-type: none"> • Work with the appropriate regulatory authorities to discuss the General Wildlife Measures set out in the Ungulate Winter Range Order. The measures may not be applicable to exploration, development and production activities when these activities have been authorized by the <i>Pipeline Act</i>. |
| Wildlife Habitat Area for Williamson's Sapsucker (3-143) | BC Kingsvale Transmission Line (952 m) | <ul style="list-style-type: none"> • Conduct a survey to confirm status and presence of nest trees along the proposed Kingsvale power line right-of-way. In the event an active nest tree is found, consult with BC MFLNRO to discuss practical options and mitigation strategies. • Schedule clearing and construction activities outside the breeding season of March 15 to August 31 to the extent feasible (BC MOE 2009c). • During operations, retain coarse woody debris and snags (if not deemed a hazard) on the power line right-of-way (to provide foraging habitat) where practical (BC MOE 2009c). • Avoid creation of new access, where feasible. Use existing roads/linear corridors for access wherever practical. Deactivate and reclaim all temporary access. • Avoid the use of pesticides (except for herbicides to control invasive plants or noxious weeds; only use as spot treatments and outside the breeding season of March 15 to August 31 (BC MOE 2009c). • Work with the appropriate regulatory authorities for deviation from the General Wildlife Measures set out in the Wildlife Habitat Area Order. |

TABLE 6.1.1 Cont'd

| Concern | Province/Location | Recommended Mitigation |
|---|--|---|
| Sowaqua Spotted Owl WHA 2-498 (Long-Term Owl Habitat Area) | BC <ul style="list-style-type: none"> Various locations for approximately 10.4 km from RK 1022.9 to RK 1038.2 | <ul style="list-style-type: none"> Align route to parallel existing corridors (<i>i.e.</i>, existing TMPL right-of-way, Highway 5) to the extent feasible to reduce habitat disturbance. Do not clear timber, stumps, brush or other vegetation beyond the marked construction right-of-way boundaries. Minimize the width of the pipeline right-of-way to the extent practical by utilizing shared workspace, avoid clearing large diameter trees on the edge of the right-of-way; minimizing extra temporary workspace (<i>e.g.</i>, placing log decks, storage areas, other temporary construction areas outside the Sowaqua Spotted Owl WHA). Avoid clearing large wildlife trees/veteran trees and snags where feasible. Retain slow decaying tree species (<i>e.g.</i> cedar) where feasible (Blackburn <i>et al.</i> 2009). Place large coarse woody debris (diameters greater than 50 cm in dry ecosystems and 75 cm in wet ecosystems). Utilize the largest coarse woody debris available where this is not available. Avoid breaking coarse woody debris into sections smaller than 10 m where feasible (Blackburn <i>et al.</i> 2009). Avoid creation of new access, where feasible. Use existing roads/linear corridors for access whenever practical. Deactivate and reclaim all temporary construction access. Do not use pesticides within the Sowaqua Spotted Owl WHA (BC MOE 2011b). Use natural regeneration strategies in harvest openings (Blackburn <i>et al.</i> 2009). Prepare a detailed Mitigation Plan in consultation with BC MFLNRO's Spotted Owl Recovery Coordinator. Work with the appropriate regulatory authorities for deviation from the General Wildlife Measures set out in the Wildlife Habitat Area Order. |
| Important Bird Area | BC Douglas Lake Plateau (BC172) <ul style="list-style-type: none"> RK 850.6 to RK 865.4 (14.8 km) RK 885.8 to RK 888.8 (3.0 km) RK 897.6.0 to RK 898.2 (0.7 km) Kamloops Pump Station BC English Bay and Burrard Inlet (BC020) <ul style="list-style-type: none"> RK 1183.2 to RK 1183.6 (400 m) Westridge Marine Terminal | <ul style="list-style-type: none"> Schedule clearing and construction activities outside the migratory bird breeding season of March 15 to August 15 (Wilson pers. comm.). In the event clearing or construction activities are scheduled during the migratory bird breeding season, follow measures for conducting migratory bird nest sweeps described below. In simple habitat types where active nests are easier to locate (<i>i.e.</i>, previously cleared areas and open areas with sparse vegetation and few trees), a nest sweep may be completed within 7 days of activity that is scheduled to occur within the migratory bird RAP. Use non-intrusive methods to conduct an area search for evidence of nesting (<i>e.g.</i>, presence of singing birds, territorial males, alarm calls, distraction displays). In the event an active nest is found, it will be subject to site-specific mitigation measures (<i>i.e.</i>, clearly marked protective buffer around the nest and/or non-intrusive monitoring). In complex habitats where active nests are more difficult to find (<i>e.g.</i>, forests), it is recommended that pre-clearing be conducted. If this is not feasible and activity is scheduled to occur within the migratory bird RAP, contact Environment Canada prior to activity to discuss the area to be cleared. Use non-intrusive methods to conduct an area search for evidence of nesting (<i>e.g.</i>, presence of singing birds, territorial males, alarm calls, distraction displays). In the event an active nest is found, it will be subject to site-specific mitigation measures (<i>i.e.</i>, clearly marked protective buffer around the nest and/or non-intrusive monitoring). Conduct species specific surveys to identify important wildlife features for species known to occur in the Important Bird Area (<i>e.g.</i>, Douglas Lake Plateau: sharp-tailed grouse leks, burrowing owl burrows, Lewis's woodpecker or Williamson's sapsucker nest; English Bay and Burrard Inlet: bald eagle nests, great blue heron colonies). In the event these are found, consult with BC MFLNRO to discuss practical options and mitigation strategies. |

TABLE 6.1.1 Cont'd

| Concern | Province/Location | Recommended Mitigation |
|--|-------------------|---|
| Raptor Nest | Alberta/BC | <ul style="list-style-type: none"> Schedule clearing and construction activities outside of sensitive time periods for raptors (provided below) to the extent feasible. In the event clearing is scheduled within these periods, in areas of suitable habitat, conduct raptor nest searches prior to clearing to locate active raptor nests. In the event an active raptor nest is discovered, consult with the appropriate regulatory authorities to discuss practical options and mitigation strategies. In Alberta, implement the appropriate setback in the event an active nest of a sensitive raptor is found (<i>i.e.</i>, ferruginous hawk, bald eagle, golden eagle, prairie falcon, peregrine falcon). For high disturbance activities (<i>i.e.</i>, conventional pipeline), a 1,000 m setback is recommended year-round. For medium disturbance activities (<i>i.e.</i>, conventional pipeline parallel to a linear corridor), a 1,000 m setback is recommended from March 15 to July 15 and a 100 m setback is recommended from July 16 to March 14 (Government of Alberta 2013). All other raptor nests (<i>e.g.</i>, red-tailed hawk) have a recommended 100 m setback when they are active (Government of Alberta 2013). In BC, eagle, peregrine falcon, gyrfalcon, osprey and burrowing owl nests are protected year-round by the BC <i>Wildlife Act</i> and may not be cleared. The <i>Guidelines for Raptor Conservation</i> (BC MOE 2013) provides information on sensitive breeding and nesting time periods and buffers for raptor nests according to their tolerance to human disturbance. These buffers range from 50 m to 500 m depending on the surrounding land use and species. During the breeding season, an additional 100 m "quiet" buffer is recommended. Clearly mark the appropriate buffers with fencing to prevent access to the nest. In BC, barn owl nests have the following recommended setbacks: 200 m (undeveloped) and 100 m (rural). During the breeding season, an additional 100 m "quiet" buffer is recommended (BC MOE 2013). If construction is unavoidable within the recommended year-round and breeding buffers, a Nest Management Plan addressing various mitigation (including nest monitoring during the breeding period) is recommended. If construction activities require the removal of a raptor nest that is protected year-round under the BC <i>Wildlife Act</i> (<i>i.e.</i>, eagle, peregrine falcon, gyrfalcon, osprey and burrowing owl), Trans Mountain will work with the appropriate regulatory authorities to develop a Nest Removal Management and Compensation Plan. Upon confirmation the nest is inactive, nest removal should occur during the least risk window of August through December. When a nest is removed the installation of a replacement structure (<i>i.e.</i>, a platform on a pole or transplanted tree) should be erected in nearby suitable habitat (BC MOE 2013). |
| Great Blue Heron Nesting Colony | Alberta/BC | <ul style="list-style-type: none"> Schedule clearing and construction activities outside of sensitive time periods for great blue heron (provided below), to the extent feasible. In the event clearing is scheduled within these periods, in areas of suitable habitat, conduct nest searches during the breeding season and prior to clearing to locate nesting colonies. In the event an active colony is discovered, discuss appropriate mitigation strategies with regulatory authorities, which may include establishing protective buffers during sensitive periods. In Alberta, activities are not recommended within 1,000 m with the exception of Low and Medium impact activities (<i>i.e.</i>, conventional pipeline along existing linear disturbances) that may occur up to 100 m from a colony when construction occurs from September 1 and February 28 (Government of Alberta 2013). In BC, great blue heron nests are protected year-round under the BC <i>Wildlife Act</i>. The following are the recommended setbacks: 300 m (undeveloped), 200 m (rural), 60 m (urban) and a 200 m "quiet" buffer during the breeding season from the outer perimeter of all nesting trees. The least risk window is from September 1 to February 15 (BC MOE 2012a). |
| Stream-Dwelling Amphibian – Coastal Tailed Frog and Pacific Giant Salamander | BC | <ul style="list-style-type: none"> Maintain a 30 m setback distance (core buffer) from streams identified as coastal tailed frog habitat, where disturbance is to be avoided, to the extent feasible. Minimize disturbance within an additional 20 m buffer extending beyond the core buffer (BC MOE 2012a), where feasible. |

TABLE 6.1.1 Cont'd

| Concern | Province/Location | Recommended Mitigation |
|--|--|--|
| Stream-Dwelling Amphibian – Coastal Tailed Frog and Pacific Giant Salamander (cont'd) | Coastal tailed frog: RK 965.8 to RK 1117 Pacific giant salamander: RK 1067 to RK 1090 | <ul style="list-style-type: none"> • Maintain a 50 m setback distance (core buffer) from streams identified as Pacific giant salamander habitat, where disturbance is to be avoided, to the extent feasible. Minimize disturbance within an additional 30 m buffer extending beyond the core buffer (BC MOE 2012a), where feasible. • Place large coarse woody debris on the pipeline right-of-way after construction, from either the 30 m setback boundary of the streambank to 100 m distance from suitable (<i>i.e.</i>, known or likely to be occupied) streams for coastal tailed frog and Pacific giant salamander (BC MWLAP 2004d). • If a trenched stream crossing method is necessary, implement the following measures: <ul style="list-style-type: none"> – Use existing access to facilitate construction, where feasible. If no existing access is available, limit instream crossings to one vehicular/equipment crossing to install an appropriate temporary crossing to facilitate construction. Remove crossings following construction. – Limit riparian disturbance to the maximum extent feasible within 50 m of coastal tailed frog streams. Clear only the minimum workspace necessary to facilitate construction. Use hand clearing methods within 50 m of the stream. – Where slopes exceed 60%, riparian avoidance buffers should extend beyond the top of the ravine. – Clearly mark and/or fence off riparian buffers prior to clearing and construction. – Install and maintain appropriate erosion control measures to prevent sedimentation during and following construction. – Maintain stream flows throughout construction. – Following construction, reclaim disturbed riparian areas using best available techniques to encourage rapid regeneration of native riparian vegetation. Monitor and implement remedial measures, if warranted, to ensure riparian restoration is adequate. • Conduct an amphibian salvage prior to clearing and construction activities at known coastal tailed frog and Pacific giant salamander breeding locations. Adhere to the Best Management Practices for Amphibian and Reptile Salvages in BC (EDI Environmental Dynamics <i>et al. in prep</i>). Note that coastal tailed frog and Pacific giant salamander use the same stream year-round, therefore, this mitigation is applicable year-round. In the event that coastal tailed frogs and/or Pacific giant salamanders are identified on the pipeline right-of-way during construction, the following mitigation is recommended: <ul style="list-style-type: none"> – remove the frogs/salamanders to the closest suitable upstream habitat, if it is safe to do so; – ensure frogs/salamanders are not held for longer than necessary to move them to the closest suitable habitat; – ensure frogs/salamanders are not held for more than two to four hours under any circumstances; and – frogs/salamanders must be captured, held, transported and released humanely. • Use sediment control measures from <i>Standards and Best Practices for Instream Works</i> (BC MWLAP 2004b). • Review opportunities to enhance the habitat by planting/allowing native vegetation growth that provides a protective buffer along streams, and maintain stream habitat complexity (<i>i.e.</i>, a natural meandering channel with stabilized banks, and step-pool morphologies) (BC MWLAP 2004d). |
| Amphibian Breeding Pond | Alberta/BC | <ul style="list-style-type: none"> • Schedule clearing and construction activities outside of the breeding and seasonal migration periods for amphibians, where feasible. In Alberta, this is generally mid-April to mid-June (Government of Alberta 2013). In BC, this will vary depending on pipeline segment and can be from mid-April to mid-June (Hargreaves to Hope) and from February to late-July or August (Hope to Westridge) (Wind pers. comm.). • In Alberta, in the event that a western toad breeding pond is found, a year-round 100 m setback distance is recommended (Government of Alberta 2013), while Environment Canada recommends a year-round 400 m federal setback distance for western toad breeding ponds and wintering sites (Environment Canada 2011). • In Alberta, in the event a long-toed salamander breeding pond is found, a year-round 200 m setback distance (where new-cut is required) and a 100 m setback distance (when paralleling existing linear disturbance) is recommended (Government of Alberta 2013). In reference to the long-toed salamander breeding pond at NW 33-49-26 W5M (RK 339.3) located approximately 30 m north of the Hinton Pump Station, AESRD will be consulted to discuss mitigation for both the proposed expansion of the pump station, as well as pipeline construction. For activity in the summer (breeding season), mitigation may include exclusion fencing, onsite monitors and relocation if warranted. • In BC, protect identified amphibian breeding ponds by implementing appropriate buffers (150 m undeveloped; 100 m rural; 30 m urban) (BC MOE 2012a). • If the proposed pipeline right-of-way is located within the recommended setback distance of an amphibian breeding pond, consult with the appropriate regulatory authorities to discuss practical options and mitigation strategies. • Apply standard wetland construction and reclamation mitigation (<i>e.g.</i>, minimal disturbance, recontouring, reclamation, monitoring and remedial measures) to support habitat reclamation as needed. • Use snow packing and mats to avoid excessive soil compaction in the proximity of wetlands and watercourses. • Maintain natural hydrology of streams and wetlands during clearing, construction and clean-up activities. • Install fencing around wetlands for clearing and construction activities scheduled during the amphibian breeding period (spring), where warranted, to protect important habitat (BC MWLAP 2004d). |

TABLE 6.1.1 Cont'd

| Concern | Province/Location | Recommended Mitigation |
|----------------------------------|---|---|
| Amphibian Breeding Pond (cont'd) | See above | <ul style="list-style-type: none"> Install fencing along construction workspace near identified breeding ponds to prevent dispersing amphibians from entering the construction zone and limit vehicular activity in spring and early fall to reduce effects during the breeding and dispersal periods (Wilkinson pers. comm.). All fencing installed during clearing and construction activities should be removed once they are no longer necessary to prevent barriers to amphibian movement following construction. Reclaim borrow pits and avoid creating small artificial ponds by avoiding construction during wet conditions that would create excessive soil rutting; grade ruts in construction access and on the right-of-way where rutting cannot be avoided. Do not mow/brush vegetation within wetland riparian (fringe) areas during operation. Conduct an amphibian salvage prior to clearing and construction activities at known amphibian breeding pond locations. Ensure the appropriate permit is obtained. In BC, adhere to the <i>Best Management Practices for Amphibian and Reptile Salvages in BC</i> (EDI Environmental Dynamics <i>et al. in prep</i>). |
| Pacific Water Shrew | BC – RKP 1064 to 1179 ; Burnaby to Westridge (RKP0 to RKP 3.6) | <ul style="list-style-type: none"> Where feasible, implement the following measures where Pacific water shrew are identified: a 100 m buffer from the Pacific water shrew habitat should be established and clearly marked and fenced off to prevent access; replant native vegetation (shrubs and trees) within 30 m of the stream or wetland to replace any cleared vegetation; and where replanting is not feasible, coarse woody debris should be placed within 30 m of the stream or wetland to provide cover and foraging habitat (Craig <i>et al.</i> 2010). If Pacific water shrew are identified, a capture and release may be required to temporarily/permanently relocate individual shrews. |
| Oregon Forestsnail | BC RK 1043.7 to RK 1179; Burnaby to Westridge (RK 0 to RK 3.6) | <ul style="list-style-type: none"> Avoid clearing during spring-early summer (March-June) when snails are most active on the surface and depositing eggs (BC MOE 2007). If clearing or construction occurs in spring, conduct a pre-construction survey in areas with high habitat suitability (<i>e.g.</i>, patches of stinging nettle, dense herbaceous vegetation with fringeup or other moisture-loving plants, riparian areas, or other suitable moist sites) in late March or early April to the end of June prior to vegetation clearing (BC MOE 2007). If a snail is found, move it off the construction footprint. Install barrier fencing at the time of the survey to deflect movements of snails away from the construction footprint. Maintain the fencing until construction activities are complete (BC MOE 2007). Restore riparian zones and natural drainage patterns as soon as practical after construction (BC MOE 2007). Retain big leaf maples, especially large diameter trees, wherever feasible (BC MOE 2007). Restrict heavy machinery and vehicles to the construction footprint (BC MOE 2007). Clean machinery and boots prior to use to avoid introducing non-native species (BC MOE 2007). Avoid compaction of soil, disturbance of herbaceous plants and removal of coarse woody debris (BC MOE 2007), to the extent practical. Manage construction waste and pollutants to prevent contamination of snail habitat (BC MOE 2007). During operations, retain coarse woody debris on the pipeline right-of-way, including large-diameter downed logs; limit vegetation control (mowing) to leave undisturbed patches of stinging nettle and other herbaceous vegetation where concentrations of snails or patches of high-quality habitat occur (BC MOE 2007). If clearing of the right-of-way is needed for operations, use hand clearing methods and mechanical clearing rather than herbicides (BC MOE 2007). |
| Reptiles | BC | <ul style="list-style-type: none"> In the event an active snake hibernacula is identified, implement a 150 m buffer (BC MOE 2012), and avoid activity during the period of April 15 to September 30 (BC MWLAP 2004d), to the extent feasible. Consult with BC MFLNRO to determine the location and need for additional site-specific mitigation measures (<i>e.g.</i>, exclusion fencing for the open trench or along vehicle travel lanes) at identified locations (<i>e.g.</i>, Lac du Bois Road) where there is high potential for encountering snakes (Grasslands Conservation Council of British Columbia 2009). All workers will receive education prior to commencing work, which will include best practices for avoiding snakes and appropriate protocols in the event a snake is detected at the work site. Refer to the Wildlife Conflict Management Plan in Appendix C of the Pipeline EPP. |
| Bats | Alberta/BC | <ul style="list-style-type: none"> In Alberta, roosts and hibernation sites of northern long-eared bats have a year round 300 m setback from high disturbance activities; 100 m setback from medium disturbance activities and a 50 m setback from low disturbance activities. (Government of Alberta 2013). In BC, protect bat roosts from disturbance by humans and other sensory disturbances (BC MOE 2012a). Implement a 125 m buffer from bat hibernacula (from October 1 to April 30 or maternity roost (from May 1 to August 31) (BC MWLAP 2004a). Consult with BC MFLNRO where disturbance of a hibernacula or maternity roost is unavoidable to discuss practical options and mitigation strategies. Do not blast, remove rock or talus, or construct new roads in the area surrounding a hibernacula or maternity roost unless there is no other practical option. Consult with BC MFLNRO to discuss alternate mitigation (BC MWLAP 2004a). Schedule blasting that may occur within 1 km of Keen's long-eared myotis maternity roosts and hibernacula, to occur outside the period from October 1 to May 31 (BC MWLAP 2004c). Consider applying this best practice to other bat species. |

TABLE 6.1.1 Cont'd

| Concern | Province/Location | Recommended Mitigation |
|--|-------------------|---|
| Mammal Dens | Alberta/BC | <ul style="list-style-type: none"> • Contact provincial regulatory authorities to discuss the appropriate mitigation in the event an active bear den is discovered on or near the work site. Mitigation may include establishing protective buffers, monitoring the den and/or modifying the construction schedule to avoid activity until the den is inactive. • In Alberta, in the event an active mammal den is found, a 100 m setback is recommended (Government of Alberta 2013). A setback of 750 m for high disturbance activities (i.e., conventional pipelines) and 500 m for medium disturbance activities (i.e., conventional pipeline parallel to a linear corridor) from October 1 to April 30, is recommended in the event an active grizzly bear den is discovered (Government of Alberta 2013). • In BC, a setback of 50 m from active bear dens is recommended BC (BC OGC 2013). |
| Mineral Licks | Alberta/BC | <ul style="list-style-type: none"> • Implement a 100 m setback in the event a mineral lick is identified (Government of Alberta 2013, BC OGC 2013). In the event that shifting/narrowing the pipeline right-of-way is not feasible to maintain the minimum setback from a mineral lick, consult with AESRD or BC MFLNRO to discuss practical options and mitigation strategies. • Maintain the integrity of trails to mineral licks and do not isolate from nearby escape cover (e.g., dense forest) (BC MWLAP 2004a). • Avoid activities (i.e., clearing, construction, helicopter overflights) near mineral licks during critical periods (May to November) (BC MWLAP 2004a), to the extent feasible. • Deactivate access roads as soon as practical (BC MWLAP 2004a). • Leave a gap in set-up pipe within the area of the mineral lick to allow wildlife to access the mineral lick. The locations of the gaps in strung pipe should coincide with gaps in strippings, spoil, snow and rollback windrows. |
| Beaver Dams/Lodges | Alberta/BC | <ul style="list-style-type: none"> • Notify DFO 14 days prior to beaver dam removal and ensure that the removals are conducted in accordance with conditions of DFO's Alberta Operational Statement for Beaver Dam Removal (Fisheries and Oceans Canada 2007). • In BC, in the event that beaver dams or lodges will be disturbed, submit a notification to the appropriate regional Habitat Officer of the BC MFLNRO at least 45 days prior to beaver dam removal, as per Section 40 of the <i>Water Regulation</i>. Following this notification, obtain a Ministry of Natural Resource Operations Wildlife Sundry Permit to remove a beaver dam. Standards and best practices for beaver dam removal identified in the BC <i>Standards and Best Practices for Instream Works</i> (BC MWLAP 2004b) will be applied. |
| Species with Special Conservation Status | Alberta/BC | <ul style="list-style-type: none"> • In the event that a species with special conservation status is observed during construction, the appropriate regulatory authorities will be contacted to determine if additional mitigation measures are warranted. • Implement the Wildlife Species of Concern Discovery Contingency Plan in the event that wildlife species of concern are identified during construction. |

6.2 Traditional Ecological Knowledge

A comprehensive review of the recommended mitigation measures provided in Table 6.1.1 and of all the issues raised by participating Aboriginal communities was conducted with each community during the field surveys and during follow-up results review (Section 3.7.13.2). Concerns related to wildlife resources were addressed by the proposed mitigation measures discussed. Participants have not recommended any mitigation strategies related to wildlife resources additional to those described in the EPPs to be implemented for the Project.

6.3 Supplemental Wildlife Field Studies

Locations where supplemental wildlife field work is recommended in 2014 (applying the methods provided in Section 3.6) include the following:

- areas where land access had not been granted in 2013, or was granted too late to conduct appropriately timed wildlife surveys;
- at facility sites (Gainford, Hinton, Black Pines and Kingsvale pump stations and Sumas Terminal) and along the proposed Kingsvale and Black Pines power lines; and
- along any re-routed segments of the Project that were not previously surveyed in 2013.

Pre-construction wildlife surveys may be conducted, where warranted to collect information needed to inform mitigation planning.

6.4 Post-Construction Environmental Monitoring

The objective of the wildlife and wildlife habitat monitoring component of the Post-Construction Environmental Monitoring (PCEM) Program is to collect sufficient information to determine the effectiveness of mitigation, identify need for adaptive measures, and detect changes in wildlife and wildlife habitat resulting from the Project. The wildlife and wildlife habitat monitoring will use field survey data collected prior to construction, as a basis for comparison of construction and post-construction monitoring data. Post-construction monitoring will be conducted at intervals over a five-year period (e.g., years one, three and five following completion of reclamation).

The wildlife and wildlife habitat PCEM will include the following information.

- A review of mitigation measures implemented and issues identified by the Environmental Inspector(s) during construction and recommendations to address any unresolved issues.
- Details on post-construction monitoring protocols specific to wildlife and wildlife habitat. Locations selected for post-construction monitoring will be based in part on consultation with regulatory authorities and the results of the pre-construction field surveys. Likely locations for monitoring include high value wildlife habitats (e.g., select wetlands, sensitive areas, locations where there is high potential for species at risk). Appropriately timed wildlife surveys, will be conducted at these locations.

Wildlife monitoring will be designed to detect changes in wildlife habitat, wildlife presence and, if warranted and feasible, relative abundance compared to pre-construction conditions. An adaptive management component will be included in the wildlife post-construction monitoring program, whereby results of the wildlife monitoring will be used to determine the need for further monitoring, as well as the need for and nature of remedial measures to address any identified issues. For example, remedial measures may include additional seedling planting at locations that are not demonstrating adequate natural regeneration to alleviate effects on sensitive species in a timely manner and/or installing additional access control and/or signage to discourage human access if there is evidence of new access on site-specific segments of the right-of-way. The appropriate remedial measures will be developed by qualified biologists in consultation with Trans Mountain representatives and regulatory authorities, where warranted.

7.0 SUMMARY

A desktop/literature review, consultation program and field surveys were completed for the Project. Consultation was conducted with federal and provincial regulatory authorities to receive input on wildlife indicators, study area boundaries, field methods and mitigation. Field surveys included: general aerial reconnaissance and wildlife feature review; winter track survey; aerial waterbird surveys (breeding and fall staging); sharp-tailed grouse survey; snake survey; breeding bird survey; common nighthawk, short-eared owl, yellow rail and spotted owl surveys; and pond and stream-dwelling amphibian surveys. Field work was also completed to ground-truth preliminary wildlife habitat ratings for wildlife habitat models. Potentially affected Aboriginal communities participated in the wildlife field surveys to incorporate Aboriginal views and the experiential knowledge of the land. A summary of the field survey results are provided below in Table 7.0.1. The information collected during the desktop/literature review and field surveys was used in Project planning, as well as to inform the effects assessment and mitigation planning. Site specific areas and/or features of importance have been incorporated into the Project EPPs, as well as the Environmental Alignment Sheets. This information will be updated with the results of the supplemental surveys to be completed in 2014.

TABLE 7.0.1

WILDLIFE FIELD SURVEYS – RESULTS SUMMARY (2012 AND 2013)

| Field Survey | Summary of Field Results and Analyses |
|---|---|
| General Aerial Reconnaissance and Wildlife Feature Review | <ul style="list-style-type: none"> Aerial overflights were completed in August and September 2012, and April and May 2013. 61 occupied stick nests for raptors and owls were observed, of which most (35) were bald eagle nests; 1 Canada goose nest was observed. |
| Winter Track Survey | <ul style="list-style-type: none"> Track surveys were completed in winter 2013 (January to March). Tracks were observed at all 45 transects sampled. Tracks of 17 species groups were identified; snowshoe hare tracks were the most commonly observed, followed by deer and squirrel. Small mammal, mustelid, large carnivore, ungulate and bird tracks were observed along all pipeline segments surveyed. |
| Aerial Waterbird Breeding Survey | <ul style="list-style-type: none"> Aerial waterbird breeding surveys were completed in May and June 2013. 1,323 birds were observed and 28 species were identified at 182 waterbodies surveyed. Three species with special conservation status were observed: double-crested cormorant, great blue heron and horned grebe. Canada goose was the most commonly observed species, followed by mallard and ring-necked duck. Mean species richness was similar (between 1.4 and 1.8) for waterbodies surveyed along the Edmonton to Hinton, Black Pines to Hope and Hope to Westridge segments. Mean species richness was lower (1.0) for waterbodies surveyed along the Hargreaves to Darfield Segment. Mean species diversity was variable among the surveyed segments, ranging from 0.1 to 0.5. Mean IBP/waterbody was highest on waterbodies surveyed along the Hope to Westridge Segment (5.4) and lowest along the Hargreaves to Darfield Segment (1.7). |
| Aerial Waterbird Fall Staging Survey | <ul style="list-style-type: none"> Aerial waterbird fall staging surveys were completed in September and October of 2012 and 2013. The 2012 fall staging survey included the proposed pipeline corridor from Edmonton to Edson since this was the proposed scope at that time, while the 2013 surveys included the entire segment from Edmonton to Hinton. Fall 2012 Staging Survey: <ul style="list-style-type: none"> 1,077 birds were observed and 15 species were identified at 38 waterbodies surveyed; three species with special conservation status were observed: double-crested cormorant, great blue heron and trumpeter swan; Canada goose was the most commonly observed species, followed by mallard and green-winged teal; mean species richness was similar (between 1.4 and 1.6) for waterbodies surveyed along the Hargreaves to Darfield, Black Pines to Hope and Hope to Westridge segments. Mean species richness was lower (1.0) for waterbodies surveyed along the Edmonton to Hinton Segment; and |

TABLE 7.0.1 Cont'd

| Field Survey | Summary of Field Results and Analyses |
|---|--|
| Aerial Waterbird Fall Staging Survey (cont'd) | <ul style="list-style-type: none"> Mean species diversity was 0.2 for waterbodies surveyed along the Hargreaves to Darfield, Black Pines to Hope and Hope to Westridge segments. Mean species diversity was lower (0) for waterbodies surveyed along the Edmonton to Hinton Segment Fall 2013 Staging Survey: <ul style="list-style-type: none"> 3,517 birds were observed and 15 species identified at 66 waterbodies surveyed; two species with special conservation status were observed: great blue heron and horned grebe; Canada goose was the most commonly observed species, followed by mallard and American wigeon; mean species richness was variable among the surveyed segments, ranging from 1.0 to 2.1; and mean species diversity was variable among the surveyed segments, ranging from 0 to 0.5. |
| Sharp-tailed Grouse Survey | <ul style="list-style-type: none"> Sharp-tailed grouse surveys were conducted in April 2013 in the Kamloops region. Sharp-tailed grouse and their sign were observed. No active sharp-tailed grouse leks were identified. |
| Snake Survey | <ul style="list-style-type: none"> Snake surveys were completed in April 2013 in the Kamloops region. Two suitable features for snake hibernacula and evidence of use by snakes were found (160 m and 140 m from the proposed route). Two previously known den locations were surveyed and western rattlesnake occupancy was confirmed at both (approximately 500 m and 900 m from the proposed route). |
| Breeding Bird Survey | <ul style="list-style-type: none"> Breeding bird point counts were completed from May to July 2013 at 357 locations within the Wildlife LSA. 1,636 birds were observed and 107 species were identified. American robin was the most commonly observed species, followed by Swainson's thrush and yellow-rumped warbler. Three species with special conservation status were identified: bank swallow; barn swallow; and olive-sided flycatcher. Species richness, diversity and density were highest along the Hope to Westridge Segment and lowest along the Edmonton to Hinton Segment. |
| Common Nighthawk and Short-Eared Owl Survey | <ul style="list-style-type: none"> Surveys were completed for common nighthawk and short-eared owl in June 2013 at 26 locations along the Hargreaves to Darfield and Edmonton to Hinton segments. 26 common nighthawks were detected along the Hargreaves to Darfield Segment; none were detected along the Edmonton to Hinton Segment. Short-eared owl were not detected during the surveys. Incidental detections of common nighthawk were recorded along the Hargreaves to Darfield and Black Pines to Hope segments, and of short-eared owl along the Edmonton to Hinton Segment. |
| Yellow Rail Survey | <ul style="list-style-type: none"> Yellow rail surveys were completed in July 2013 in areas of suitable habitat along the Edmonton to Hinton Segment. No yellow rails were detected. |
| Spotted Owl Survey | <ul style="list-style-type: none"> Surveys for spotted owl were completed along two transects, each with 17 survey stations, in June and September 2013. No spotted owls were detected. Barred owls were detected at four survey locations. |
| Pond-Dwelling Amphibian Survey | <ul style="list-style-type: none"> Pond-dwelling amphibian surveys were completed between May and August 2013. Amphibian egg masses, tadpoles/larvae, metamorphs or adults were observed at 91 of 159 ponds surveyed. 11 amphibian species were identified, including 7 frog species, 1 toad species, 2 salamander species and 1 newt species. Columbia spotted frog was observed in the most wetlands surveyed, followed by northern Pacific treefrog and western toad. |
| Stream-Dwelling Amphibian Survey | <ul style="list-style-type: none"> Stream-dwelling amphibian surveys were completed for coastal tailed frog and Pacific giant salamander in July and August 2013. Coastal tailed frog tadpoles, metamorphs or adults were observed at 44 of 59 streams surveyed. No Pacific giant salamander were found. |
| All Surveys | <ul style="list-style-type: none"> A total of 19 species of bird, 4 species of mammal, 1 species of reptile, 4 species of amphibians and 2 species of invertebrate were observed during field surveys and as incidental observations. |

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

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