CANPOTEX POTASH EXPORT TERMINAL AND RIDLEY ISLAND ROAD, RAIL, AND UTILITY CORRIDOR

Wildlife Technical Data Report

FINAL REPORT

Prepared for:

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1 INTRODUCTION

Canpotex Terminals Ltd. and the Prince Rupert Port Authority (PRPA) propose to undertake projects on Ridley Island in Prince Rupert, British Columbia. Canpotex proposes to construct and operate the Canpotex Potash Export Terminal and the PRPA proposes to construct associated transportation and utility infrastructure (the Ridley Island Road, Rail, and Utility Corridor Project) to service the Canpotex facility and future developments on Ridley Island. A single field program was completed for the Canpotex Potash Export Terminal and the Ridley Island Road, Rail, and Utility Corridor Project (the Project) as the two projects are interdependent.

This technical data report (TDR) describes the methods and results of baseline studies undertaken to support the environmental assessment for the Project to assess potential effects on wildlife. The TDR includes 6 Sections. Section 1 introduces the purpose and structure of the report and Section 2 provides a brief description of the study area. Section 3 provides a summary of historical data collected from bird surveys conducted in the region. Section 4 describes the methods and results of the baseline field surveys on Ridley Island undertaken to assess the potential effects of the project on wildlife. The field studies include surveys for nocturnal and diurnal raptors, breeding songbirds, wetland birds, marine birds, wildlife, and western toads. Section 5 includes the results of habitat suitability models for three species: northern goshawk, marbled murrelet, and western toad. The results include a summary of the wildlife habitat assessments, model results, and species accounts describing the habitat rankings for each species. Section 6 provides a discussion of results and summary of the report.

2 STUDY AREA

The Project is located on Ridley Island south of Prince Rupert, British Columbia. Ridley Island is within the Pacific Maritime ecozone which extends along the coast of British Columbia northwards towards Alaska. The landscape is characterized by steep fjords and channels where mountains meet the ocean. Forested regions of the Ridley Island are of the Very Wet Hypermaritime subzone of the Coastal Western Hemlock (CWHvh2) biogeoclimatic zone (Pojar *et al.* 1991). The CWH receives, on average, more precipitation than any other region in British Columbia and experiences cool summers and mild winters. In general, the Prince Rupert region is characterized by low to mid elevation forests dominated by western hemlock (*Tsuga heterophylla*), Douglas fir (*Pseudotsuga menziesii*), and western redcedar (*Thuja plicata*). These vegetation communities provide forest and wetland habitat for a variety of terrestrial mammals, landbirds, and amphibians. The waters surrounding Ridley Island also provide shoreline, near shore and offshore habitats that support populations of marine birds and shorebirds.

The proposed Project footprint occupies approximately 146 hectares on Ridley Island. Vegetation communities on Ridley Island include western hemlock, western redcedar and shore pine (*Pinus contorta*) bog woodlands to open bog wetlands with low growing shrubs such as Labrador tea (*Ledum groenlandicum*). Pre-existing developments include the Prince Rupert Grain Ltd., Ridley Terminals Inc., Ridley Island Log Sort Inc., the CN rail line, and an access road around the perimeter of the island.

3 HISTORICAL AVIFAUNA DATA

There is a large body of knowledge on bird species and their abundance in the Prince Rupert area. This has been collected by a number of volunteer-based programs where bird watchers census local birds. These data include 37 years of data on breeding birds collected through the North American Breeding Bird Survey (BBS) Kwinista route, 20 years of data on winter bird use collected through the Christmas Bird Count (CBC) on Digby Island (a 24 km diameter circle centered on the island), and over two years of data on marine bird use collected year round through the BC Coastal Waterbirds Survey. These surveys are conducted annually by experienced observers using standardized scientific methods. The long-term data sets are complemented by several other programs including:

- eBird (casual sightings by bird watchers recorded year-round)
- Great Backyard Bird Count (4-day event in mid- to late-February)
- Project Feederwatch (November to April)
- BC Breeding Bird Atlas (records of breeding birds since 2008).

Data was also collected in the area for the environmental assessment for the Fairview Phase II Terminal Expansion project and on Ridley Island for the PRPA to support other planning initiatives in the area (PRPA Ridley Island Master Development Plan, Jacques Whitford AXYS 2008a). These data include:

- Marine bird surveys:
    - Fairview Phase II Terminal Expansion – September 29 to October 1, 2006, April 30 to May 2, 2007; (including vessel and stationary shore counts)
    - PRPA Ridley Island Master Development Plan – April 4, April 24 to 27, and September 25 to 29, 2006.
- Breeding bird surveys:
    - Fairview Phase II Terminal Expansion – June 8 to 11, 2007
    - PRPA Ridley Island Master Development Plan – June 26 to 28, 2006.

These data provide a comprehensive overview of bird use in a variety of habitats over a wide area in the region and are provided in Table 1 and 2.

Overall, 71 marine bird species (including waterbirds, seabirds, and shorebirds) have been recorded among these regional and local datasets (Table 1; Table 2). Of those, three species (marbled murrelet [Threatened], ancient murrelet [Endangered], great blue heron [Special Concern]) are listed under the *Species at Risk Act*. For landbirds, 74 species were recorded in the regional datasets (Table 2). Of those, the populations of 70 of the species are secure, while four are listed under the *Species at Risk Act* (northern goshawk [Threatened]), peregrine falcon ([Special Concern]), western screech-owl ([Special Concern]), olive-sided flycatcher ([Threatened]). Northern goshawk and olive-sided flycatcher were recorded in the Prince Rupert area during breeding season, while peregrine falcon and western screech-owl were observed in winter.

Table 1: Marine Bird Data (including waterbirds, seabirds, and shorebirds) Compiled from Regional and Project-Specific Sources

Species Name	Christmas Bird Counts (2001 – 2008)	BC Coastal Waterbirds Survey (2008 – 2010)	Kwinitsa BBS (1967 – 2009)	eBird (2000 – 2008)	Great Backyard Bird Count (2000 – 2003)	Ridley Island (2008)	Fairview/Kaien Siding		Canpotex (2010 – 2011)
							Spring (2007)	Fall (2006)	
Alcid species	–	–	–	–	–	–	–	–	10
American Coot	–	–	–		✓	–	–	–	–
American Wigeon	15	2	-	✓		–	–	–	–
Ancient Murrelet	–	–	–	✓	–	–	–	–	–
Bald Eagle	566	34	52	✓	✓	–	3	24	116
Barrow's Goldeneye	53	34	1	✓	✓	–	–	–	–
Belted Kingfisher	11	2		✓	✓	–	1		4
Black Oystercatcher	4	–	–	✓	–	✓	1	12	–
Black Scoter	2	5	–-	✓	–	–	–	–	3
Black Turnstone	273	24	–	✓	–	–	250	6	–
Black-Legged Kittiwake	–	–	–	✓	–	–	–	–	–
Blue-winged Teal	–	–	–	–	–	–	–	–	2
Bonaparte's Gull	–	1	–	✓	–	–	–	–	–
Brandt's Cormorant	–	1	–	✓	–	–	2	1	–
Bufflehead	51	–	–	✓	✓	–	1	3	–
Cackling Goose	–	–	–	✓	–	–	–	–	–
Caladris species	–	–	–	–	–	–	–	–	300
Canada Goose	124	–	7	✓	–	–	–	–	25
Cassin's Auklet	–	–	–	✓	–	–	–	–	–
Clark’s Grebe	–	–	–	✓	–	–	–	–	–
Common Goldeneye	32	8	2	✓	–	–	–	2	–
Common Loon	18	4	2	✓	✓	–	6	11	2

Species Name	Christmas Bird Counts (2001 – 2008)	BC Coastal Waterbirds Survey (2008 – 2010)	Kwinitsa BBS (1967 – 2009)	eBird (2000 – 2008)	Great Backyard Bird Count (2000 – 2003)	Ridley Island (2008)	Fairview/Kaien Siding		Canpotex (2010 – 2011)
							Spring (2007)	Fall (2006)	
Common Merganser	151	38	10	✓	✓	✓	–	27	94
Common Murre	20	5	–	✓	–	–	32	–	–
Common Snipe	4	–	–	–	–	–	–	–	–
Cormorant species	–	–	–	–	–	–	–	–	–
Double-Crested Cormorant	23	6	–	✓	✓	–	10	1	–
Duck species	–	–	–	–	–	–	–	–	44
Dunlin	–	–	–	✓	–	–	–	–	–
Eurasian Wigeon	–	–	–	✓	–	–	–	–	–
Fork-Tailed Storm Petrel	–	–	–	✓	–	–	–	–	–
Gadwall	5	–	–	–	–	–	–	–	1
Glaucous Gull	–	–	–	✓	–	–	–	–	–
Glaucous-Winged Gull	4,779	159	14	✓	✓	✓	–	–	11
Great Blue Heron	30	3	1	✓	✓	✓	7	3	5
Greater Scaup	40	44	–	✓	✓	–	–	–	–
Greater Yellowlegs	–	–	–	✓	–	–	–	–	–
Green-Winged Teal	65	–	–	✓	✓	–	–	–	6
Gull species	–	160	–	–	–	–	607	161	204
Harlequin Duck	–	–	1	–	–	–	–	–	–
Herring Gull	41	1	14	✓	–	–	-	–	3
Hooded Merganser	26	3	4	✓		–	1		–
Horned Grebe	4	–	–	✓	✓	–	–	–	–
Killdeer	18	18	1	✓	–	✓	2	1	12
Leach's Storm Petrel	–	–	–	✓	–	–	–	–	–

Species Name	Christmas Bird Counts (2001 – 2008)	BC Coastal Waterbirds Survey (2008 – 2010)	Kwinitsa BBS (1967 – 2009)	eBird (2000 – 2008)	Great Backyard Bird Count (2000 – 2003)	Ridley Island (2008)	Fairview/Kaien Siding		Canpotex (2010 – 2011)
							Spring (2007)	Fall (2006)	
Least Sandpiper	–	–	–	–	–	–	–	–	–
Lesser Scaup	18	–	4	✓	–	–	–	–	–
Lesser Yellowlegs	–	–	–	–	–	–	–	–	1
Long-billed Dowitcher	–	1	–	–	–	–	–	–	–
Long-Tailed Duck	2	–	–	✓	–	–	–	–	–
Loon species	–	–	–	–	–	–	–	–	1
Mallard	2,219	–	15	✓	✓	–	–	3	7
Marbled Murrelet	8	2	–	✓	–	✓	11	–	28
Mew Gull	332	54	–	✓	✓	✓	–	–	101
Northern Pintail	2	–	1	–	–	✓	–	–	–
Pacific Loon	21	3	–	✓	–	–	–	–	–
Parasitic Jaeger	–	–	–	✓	–	–	–	–	–
Pelagic Cormorant	39	6	–	✓	–	–	13	1	1
Pied-Billed Grebe	3	–	–	✓	–	–	–	–	–
Pigeon Guillemot	1	–	–	✓	–	–	–	25	9
Red-Breasted Merganser	7	–	–	✓	–	✓	–	–	3
Red-Necked Grebe	71	15	–	✓	✓	–	15	–	–
Red-Throated Loon	37	5	–	✓	–	–	–	–	–
Rhinoceros Auklet	–	4	–	✓	–	–	–	163	22
Ring-Billed Gull	–	1	–	✓	–	–	–	–	–
Ring-Necked Duck	18	–	–	–	–	–	–	–	–
Rock Sandpiper	5	–	–	–	–	–	–	–	–
Shorebird species	–	–	–	–	–	–	–	–	1

Species Name	Christmas Bird Counts (2001 – 2008)	BC Coastal Waterbirds Survey (2008 – 2010)	Kwinitsa BBS (1967 – 2009)	eBird (2000 – 2008)	Great Backyard Bird Count (2000 – 2003)	Ridley Island (2008)	Fairview/Kaien Siding		Canpotex (2010 – 2011)
							Spring (2007)	Fall (2006)	
Solitary Sandpiper	–	–	–	–	–	–	–	–	–
Sooty Shearwater	–	–	–	✓	–	–	–	–	–
Spotted Sandpiper	–	–	3	✓	–	–	–	1	19
Surf Scoter	350	11	–	✓	✓	–	35	57	14
Surfbird	4	–	–	✓	–	–	–	–	–
Thayer's Gull	35	–	–	✓	–	–	–	–	–
Trumpeter Swan	4	–	1	✓	–	–	–	–	–
Western Grebe	17	19	–	✓	✓	-	3	72	–
Western Sandpiper	–	–	–	✓	–	–	–	–	–
Western X Glaucous-Winged Gull (Hybrid)	–	242	–	✓	–	–	–	–	–
White-Winged Scoter	–	–	–	–	–	–	10	–	–
Wilson's Snipe	–	–	–	–	–	–	–	–	1
Wood Duck	23	–	–	–	✓	–	–	–	–
Yellow-Billed Loon	–	–	–	✓	–	–	–	–	–

NOTES:

Christmas bird count data are the maximum annual count of each species recorded in the Digby Island count circle between 2001 and 2008.

BC Coastal Waterbird survey data are the maximum number of individuals per survey between January 2008 and April 2010.

Kwinitsa BBS data are the maximum annual total of individuals of each species recorded at point count stations on that survey route between 1967 and 2009.

E-Bird data notes presence in area (based on sightings) and includes data collected in the Prince Rupert Area since 2000.

The Great Backyard Bird Count data notes presence in area (based on sightings) and includes records from the Prince Rupert area collected in 2000, 2001, and 2003.

Ridley Island data includes data presented in the Ridley Island Master Development Plan in 2008.

Stantec data includes data collected in 2007 and 2006 for the Fairview/Kaien Siding Environmental Assessment.

The Canpotex data includes project specific data collected for this Environmental Assessment in 2010 and 2011.

Table 2: Landbird Data Compiled from Regional and Project-Specific Sources

Species Name	Christmas Bird Counts (2001 – 2008)	Kwinitsa BBS (1967 – 2009)	eBird (2000 – 2008)	Great Backyard Bird Count (2000 – 2003)	Project Feederwatch (1992 – 2008)	BC Bird Atlas (2008 – 2009)	Ridley Island BBS (2008)	Fairview/Kaien Siding BBS (2007)	Canpotex (2010 – 2011)
Alder Flycatcher	–	3	–	–	–	✓	–	–	–
American Robin	13	178	✓	–	✓	✓	✓	15	9
Anna's Hummingbird	–	–	✓	–	–	–	–	–	–
Band-Tailed Pigeon	–	133	–	–	–	–	–	–	–
Barn Swallow	–	40	✓	–	–	✓	✓	-	4
Belted Kingfisher	11	5	✓	✓	✓	–	–	–	–
Black-Capped Chickadee	9	59	✓	–	–	–	✓	1	7
Bohemian Waxwing	8	–	–	–	–	–	–	–	–
Brown Creeper	4	1	–	–	✓	✓	✓	–	–
Cedar Waxwing	–	2	✓	–	–	✓	✓	–	3
Chestnut-Backed Chickadee	45	39	✓	–	✓	✓	✓	–	2
Chipping Sparrow	–	6	–	–	–	✓	–	–	–
Cliff Swallow	–	2	✓	–	–	–	–	–	–
Common Raven	223	20	✓	✓	✓	✓	–	13	31
Common Yellowthroat	–	14	–	–	–	✓	–	–	4
Dark-Eyed Junco	464	29	✓	✓	✓	✓	✓	–	27
Downy Woodpecker	7	1	✓	✓	✓		✓	–	–
European Starling	815	10	✓	✓	✓	✓	–	–	–

Species Name	Christmas Bird Counts (2001 – 2008)	Kwinitsa BBS (1967 – 2009)	eBird (2000 – 2008)	Great Backyard Bird Count (2000 – 2003)	Project Feederwatch (1992 – 2008)	BC Bird Atlas (2008 – 2009)	Ridley Island BBS (2008)	Fairview/Kaien Siding BBS (2007)	Canpotex (2010 – 2011)
Flycatcher species	–	–	–	–	–	–	–	–	–
Fox Sparrow	25	2	✓	✓	✓	–	✓	–	–
Golden-Crowned Kinglet	37	12	–	–	✓	-	✓	15	9
Golden-Crowned Sparrow	54	–	✓	–	✓	–	✓	–	–
Great Horned Owl	1	–	–	–	–	–	–	–	–
Hairy Woodpecker	4	12	–	–		✓	✓	–	–
Hermit Thrush	1	15	✓	–	✓	✓	✓	–	1
House Finch	–	–	–	–	✓	–	–	–	–
House Sparrow	72	–	✓	–	✓	✓	–	–	–
Lincoln's Sparrow	–	1	✓	–	–	–	–	–	–
MacGillvray’s Warbler	–	–	–	–	–	–	–	–	5
Merlin	2	–	✓	–	–	–	–	–	1
Mourning Dove	–	–	–	–	✓	–	–	–	–
Northern Flicker	4	3	✓	✓	✓	✓	✓	–	2
Northern Goshawk	2	–	–	–	–	–	✓	–	–
Northern Pygmy-Owl	1	–	–	✓	✓	–	–	–	–
Northern Rough-Winged Swallow	–	–	–	–	–	✓	–	–	–
Northern Shrike	1	–	–	–	–	–	–	–	–
Northwestern Crow	2,094	78	✓	✓	✓	✓	–	3	137
Olive-Sided Flycatcher	–	2	–	–	–	✓	–	–	–

Species Name	Christmas Bird Counts (2001 – 2008)	Kwinitsa BBS (1967 – 2009)	eBird (2000 – 2008)	Great Backyard Bird Count (2000 – 2003)	Project Feederwatch (1992 – 2008)	BC Bird Atlas (2008 – 2009)	Ridley Island BBS (2008)	Fairview/Kaien Siding BBS (2007)	Canpotex (2010 – 2011)
Orange-Crowned Warbler	–	13	✓	–	–	✓	✓	3	18
Pacific-Slope Flycatcher	–	16	✓	–	–	✓	✓	29	8
Peregrine Falcon	2	–	–	–	–	–	✓	–	–
Pine Grosbeak	–	–	✓	–	–	–	–	–	–
Pine Siskin	364	50	✓	–	✓	✓	✓	–	–
Purple Finch	4	–	–	–	✓	–	–	–	–
Red Crossbill	–	20	✓	–	–	✓	–	–	–
Red-Breasted Nuthatch	2	3	–	–	✓		✓	–	–
Red-Breasted Sapsucker	4	7	✓	–	✓	–	✓	–	–
Red-Necked Pheasant	–	–	–	–	✓	–	–	–	–
Red-Tailed Hawk	2	1		✓	–	✓	–	–	–
Red-winged Blackbird	–	–	–	–	–	–	–	–	2
Rock Pigeon	536	3	✓	✓	✓	✓	–	–	50
Ruby-Crowned Kinglet	5	26	–	–	✓	✓	✓	2	11
Ruffed Grouse	5	2	–	–	–	–	–	–	–
Rufous Hummingbird	–	13	✓	–	–	✓	✓	1	3
Rufous-Sided Towhee	–	–	–	–	✓	–	–	–	–
Savannah Sparrow	–	2	✓	–	–	✓	–	–	–
Sharp-Shinned Hawk	2	1	✓	✓	–	–	–	–	1
Snow Bunting	–	–	–	✓	–	–	–	–	–

Species Name	Christmas Bird Counts (2001 – 2008)	Kwinitsa BBS (1967 – 2009)	eBird (2000 – 2008)	Great Backyard Bird Count (2000 – 2003)	Project Feederwatch (1992 – 2008)	BC Bird Atlas (2008 – 2009)	Ridley Island BBS (2008)	Fairview/Kaien Siding BBS (2007)	Canpotex (2010 – 2011)
Song Sparrow	79	21	✓	–	✓	✓	✓	1	8
Sora	–	–	–	–	–	–	–	1	–
Sparrow species	–	–	–	–	–	–	1	–	2
Steller's Jay	64	23	✓	✓	–	✓	1	1	1
Swainson's Thrush	–	90	✓	–	–	✓	–	39	36
Swallow species	–	–	–	–	–	–	–	–	–
Three-Toed Woodpecker	1	–	–	–	–	–	–	–	–
Townsend's Warbler	–	41	✓	–	–	✓	✓	40	30
Tree Swallow	–	14	✓	–	–	✓	–	–	3
Tringa species	–	–	–	–	–	–	–	–	75
Turkey Vulture	–	–	–	–	–	–	–	–	1
Unidentified species	–	–	–	–	–	–	–	7	–
Varied Thrush	164	59	✓	✓	✓	✓	✓	18	5
Vaux's Swift	–	15	–	–	–	✓	–	–	–
Violet-Green Swallow	–	2	✓	–	–	–	✓	–	–
Warbling Vireo	–	40	–	–	–	✓	–	–	2
Western Screech-Owl	1	–	–	–	–	–	–	–	–
Western Tanager	–	5	–	–	–	✓	–	–	–
Western Wood-Pewee	–	2	✓	–	–	✓	–	–	–
White-Crowned Sparrow	–	–	–	–	–	✓	–	–	–

Species Name	Christmas Bird Counts (2001 – 2008)	Kwinitsa BBS (1967 – 2009)	eBird (2000 – 2008)	Great Backyard Bird Count (2000 – 2003)	Project Feederwatch (1992 – 2008)	BC Bird Atlas (2008 – 2009)	Ridley Island BBS (2008)	Fairview/Kaien Siding BBS (2007)	Canpotex (2010 – 2011)
White-winged Crossbill	–	–	–	–	–	–	–	–	2
Wilson's Warbler	–	31	–	–	–	✓	–	1	–
Winter Wren	10	39	✓	–	✓	✓	✓	27	36
Woodpecker species	–	–	–	–	–	–	–	1	–
Yellow Warbler	–	40	✓	–	–	✓	–	–	1
Yellow-rumped Warbler	–	–	–	–	–	–	–	–	4

NOTES:
Christmas bird count data are the maximum annual count of each species recorded in the Digby Island count circle between 2001 and 2008.
Kwinitsa BBS data are the maximum annual total of individuals of each species recorded at point count stations on that survey route between 1967 and 2009.
E-bird data includes data collected in the Prince Rupert Area since 2000.
The great backyard bird count data includes records from the Prince Rupert area collected in 2000, 2001, and 2003.
Project feederwatch observations include data collected between 1992 and 1994; 1999 and 2000; 2002 and 2003; 2006 and 2008.
BC bird atlas data includes data collected in 2008 and 2009.
Ridley Island data includes data presented in the Ridley Island Master Development Plan in 2008.
Stantec data includes data collected in 2007 and 2006 for the Fairview/Kaien Siding Environmental Assessment.
The Canpotex data includes project specific data collected for this Environmental Assessment in 2010 and 2011.

4 FIELD SURVEYS

Field surveys were conducted to provide baseline data on the distribution and abundance of wildlife on Ridley Island and the surrounding waters. Figure 1 provides an overview of the locations of each survey. Stantec biologists completed surveys in July 2009, early and late June 2010, and in each month between April and July, 2011.

4.1 Raptor Surveys

Raptor surveys were conducted to record the abundance and distribution of raptors using habitats on Ridley Island. Surveys were for both diurnal (i.e., eagles, hawks, and falcons) and nocturnal (owls) raptors.

4.1.1 Methods

Raptor surveys were conducted on April 25, May 16, and June 22, 2011. The surveys were timed to account for seasonal variation in the onset of nesting for each target species and to increase the likelihood of detection by overlapping different stages of reproduction (i.e., nest/territory establishment, incubation, and hatchling stages).

Raptor surveys followed the protocols for call-playback surveys outlined in *Inventory Methods for Raptors* (MSRM 2001). Surveys targeted raptors that potentially occur on Ridley Island including both diurnal (sharp-shinned hawk, merlin, northern goshawk) and nocturnal (northern pygmy-owl, northern saw-whet owl, western screech-owl, barred owl, great horned owl) species. Diurnal surveys were conducted from 30 minutes after sunrise to 30 minutes before sunset and nocturnal surveys were from 30 minutes after sunset to 30 minutes before sunrise.

Recordings of each target species were broadcast one species at a time, using a megaphone attached to an MP3 player. The call of each species was transmitted for 20 seconds alternating with a 30 second listening period. The pattern was repeated three times, as the observer rotated 120° between sequences to cover a 360° radius at each station. Between each species there was a 60 second listening period following each diurnal raptor species and a five minute listening period following each nocturnal species of owl. Species recordings were played in order of the smallest to largest bird. When a response was elicited, observers recorded the species, time, direction and distance of response. Observers also recorded visual and auditory detections of non-target species at each station. Weather conditions (temperature, wind speed, precipitation, and cloud cover) were recorded at the beginning of surveys at each station. Surveys were suspended during periods of moderate or heavy precipitation or when wind speeds exceeded 15 km/h.

4.1.2 Results and Discussion

Twenty-four diurnal and 22 nocturnal surveys were conducted across eight survey stations on April 25, May 16, and June 22, 2011 (Figure 1). Nine raptors were detected during diurnal surveys. The majority were bald eagles (7) followed by turkey vulture (1), and merlin (1). Only one raptor (the merlin) was recorded responding to the call-playback surveys. No raptors were detected during nocturnal surveys. Most raptors were located at stations RAP1 and RAP6 (Table 3; Figure 2).

Table 3: Raptor Call-Playback Survey Observations

Species	Station								Total
	RAP1	RAP2	RAP3	RAP4	RAP5	RAP6	RAP7	RAP8	
Bald Eagle	1 (May 16)	1 (Apr 25)	1 (May 16)		1 (Jun 22)	1 (Apr 25) 1 (Jun 22)		1 (June 22)	**7**
Turkey Vulture	1 (Apr 25)								**1**
Merlin	1 (May 16)								**1**
Total	**3**	**1**	**1**		**1**	**2**		**1**	**9**

4.2 Breeding Bird Surveys

Point count surveys were conducted to record the abundance and distribution of breeding songbirds using habitats on Ridley Island.

4.2.1 Methods

Breeding bird surveys followed methods for conducting point counts outlined in *Inventory Methods for Forest and Grassland Songbirds* (MELP 1999). Twenty-eight point count stations were located approximately 250 m apart along the proposed rail and road loop and on and adjacent to the proposed Project footprint. Point counts were conducted in both early and late June to survey for earlier and later breeding species; 12 stations were surveyed on June 10, and 16 stations from June 23 to 25.

Point counts were initiated at sunrise and continued for four hours. At each station the time, location (GPS), and weather (temperature, wind [Beaufort], cloud cover, cloud ceiling, and precipitation) was recorded. Surveys were not conducted during high winds (>15 km/hr) or moderate to heavy precipitation. Two observers conducted 5-minute point counts at each station where they identified bird species by song and sight. Observers estimated the distance of each bird from their location (i.e., 0 – 10, 10 – 20, 20 – 30, 30 – 40, 40 – 50, 50 – 75, >75 m), direction, and recorded the sex and behaviour of individuals where possible.

4.2.2 Results and Discussion

A total of 206 individuals of 28 species were observed during breeding bird surveys (Table 4). On average, 5.1 species and 7.4 individual birds were observed at each point count station. The four most common species accounted for 50% of observations and included: winter wren (14%), Swainson's thrush (14%), Townsend's warbler (12%), and dark-eyed junco (10%). Winter wren was detected at the most point count stations (10). Less common species included hermit thrush, northern flicker, Steller's jay, and yellow warbler. In general the most individuals and highest species richness was recorded at stations located in the northeast portion of the Ridley Island adjacent to the log sort (BB23 to BB27). The fewest individuals and lowest species richness observed were at stations located on the interior of the island (BB10, BB11, and BB12; Figure 1). The majority of species recorded are common forest birds typically found in the northern coastal forests of BC (Campbell *et al.* 2001; Campbell *et al.* 1997); no species listed as Endangered, Threatened, or Special Concern under the *Species at Risk Act* were detected during breeding bird surveys.

Table 4: Number of each Species Recorded during Early and Late June Breeding Bird Surveys

Species	Early June Survey Stations (June 10)														Late June Survey Stations (June 23 to 25)													Total
	02	03	04	05	06	07	08	09	10	11	12	13	01	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
American Robin	1					1									1											2	1		**6**
Bald Eagle		1						1												1									**3**
Black-capped Chickadee			1	1	2							1		1															**6**
Chestnut-backed Chickadee							1															1							**2**
Cedar Waxwing																								1	2				**3**
Common Raven															1							2		1					**4**
Common Yellowthroat																1			1										**2**
Dark-eyed Junco						3							2	1	1	1	1	1		1			1	1	3	1	2	2	**21**
Golden-crowned Kinglet											1	1	1			1			1					1	2				**8**
Gull species																						1		1			2		**4**
Hermit Thrush																1													**1**
Killdeer																										1	1	1	**3**
MacGillivray's Warbler																				2	1		1						**4**
Northern Flicker																							1						**1**
Northwestern Crow	2					1						1					1							1		1			**7**
Orange-crowned Warbler	2	1	1	2		1				1	1							1				2		1		1			**14**
Pacific-slope Flycatcher																1			2		1		1		1				**6**
Ruby-crowned Kinglet			1	3	2											1	1	3											**11**
Rock Pigeon																									3				**3**

Species	Early June Survey Stations (June 10)														Late June Survey Stations (June 23 to 25)														Total
	02	03	04	05	06	07	08	09	10	11	12	13	01	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
Song Sparrow																										3	1	2	**6**
Sparrow species				1																									**1**
Steller's Jay														1															**1**
Swainson's Thrush			1							2			1	3	2	1				1	2	1	3	2	2	2	3	2	**28**
Townsend's Warbler		1	1			2	2		2			1		3		2	1	1	3	2	1	1	2						**25**
Warbling Vireo																					1					1			**2**
Winter Wren	1	2			1		1	5				1	1	2	2	1	2	2	2		1	1	1	2		1	1		**30**
Yellow Warbler										1																			**1**
Yellow-rumped Warbler		1		1							1																		**3**
Total	**6**	**6**	**5**	**8**	**5**	**8**	**4**	**6**	**2**	**4**	**3**	**5**	**5**	**11**	**7**	**10**	**6**	**8**	**9**	**7**	**7**	**9**	**10**	**11**	**13**	**13**	**11**	**7**	**206**

4.3 Wetland Bird Surveys

Bird surveys were conducted at the three open water wetlands in the southeast corner of Ridley Island to document the distribution and abundance of wetland birds including waterbirds, songbirds, and marsh birds (coots and rails).

4.3.1 Methods

Wetland bird surveys were conducted on June 13, 2011 at three man-made wetlands on Ridley Island (Figure 1). These surveys included call-playback surveys for marsh birds; and visual surveys for other wetland species. Many marsh bird species are secretive; call-playback surveys improve the likelihood of detecting these cryptic species and were conducted for four marsh bird species with potential to occur on Ridley Island: American bittern, sora, Virginia rail, and American coot. Surveys followed protocols outlined in the *Inventory Methods for Marsh Birds: bitterns and rails* (MELP 1998a). Recordings of each target species were broadcast one species at a time using portable speakers. Calls were broadcast for 20 seconds alternating with a 30 second listening period, this sequence was repeated three times as the observer rotated 120^0 to cover the 360° radius. Species calls were broadcast in order of the softest to the loudest at each survey location (American bittern, Virginia rail, American coot, and sora) and there was a 60 second pause between each species.

After call-playback surveys; observers conducted a 20 minute visual survey of the wetland to document usage by other species. Birds were identified by sight, song, or call and observers recorded the number, age, sex, and behaviour of each bird species recorded within 100 m of the station.

4.3.2 Results and Discussion

None of the four target marsh bird species were recorded during call-playback surveys. These species use the shallow regions of wetlands where there is tall emergent vegetation (MELP 1998a). This habitat was only present at MA2 (Figure 3).

A total of 77 individual birds of 22 species were detected during wetland bird surveys (Table 5; Figure 3). Overall, 63% of observations were of songbirds, 25% waterbirds, 8% shorebirds, and the remaining 4% of raptors. The majority of individuals (71%) and species (46%) were detected at station MA2.

Table 5: The Number of each Species Recorded at each Station during Wetland Bird Surveys

Species	Station			Total
	MA1	MA2	MA3	
American Robin	1	1		**2**
Bald Eagle		3		**3**
Blue-winged Teal		2		**2**
Common Raven			1	**1**

Species	Station			Total
	MA1	MA2	MA3	
Common Yellowthroat	1		1	**2**
Great Blue Heron (Special Concern)		4		**4**
Green-winged Teal		6		**6**
Killdeer		1		**1**
Lesser Yellowlegs		1		**1**
Mallard			7	**7**
MacGillivray's Warbler	1			**1**
Northwestern Crow		30	1	**31**
Orange-crowned Warbler	1	1		**2**
Red-winged Blackbird			2	**2**
Song Sparrow	1		1	**2**
Spotted Sandpiper		3		**3**
Swainson's Thrush	1	1		**2**
Tree Swallow		1		**1**
Varied Thrush	1			**1**
Wilson's Snipe		1		**1**
Winter Wren	1			**1**
Yellow-rumped Warbler			1	**1**
Total	**8**	**55**	**14**	**77**

Five of the species detected during marsh bird surveys were unique to these wetlands (i.e., they were not detected during other surveys). These included: blue-winged teal, green-winged teal, lesser yellowlegs, red-winged blackbird, and Wilson's snipe. The most shorebirds and waterbirds were recorded at station MA2, these species use the shallow marshes and exposed mud shoreline at that wetland. Red-winged blackbird was recorded at station MA3 near a small cattail marsh which is their typical breeding habitat. The species recorded are common birds that use wetland habitats during breeding and migration; great blue heron (Special Concern) was the only species listed under the *Species at Risk Act* were detected during the wetland bird surveys.

4.4 Marine Bird Surveys

Stationary point count surveys and fixed-width vessel surveys were conducted to record the abundance and distribution of marine birds in the waters surrounding Ridley Island.

4.4.1 Methods

Marine bird surveys were conducted using protocols for stationary point counts and vessel fixed-width transect as outlined in *Inventory Methods for Seabirds: cormorants, gulls, murres, storm-petrels, Ancient Murrelet, auklets, and Pigeon Guillemot* (MELP 1997). Survey conditions were documented at each station and included time, GPS location, and weather variables (temperature, cloud cover, cloud ceiling, precipitation, wind speed, tide state, sea state [Beaufort scale]). Surveys were not conducted during heavy rain or if sea state exceeded three on the Beaufort scale.

Stationary Counts

Six stationary point counts were conducted approximately 600 m apart along the shoreline; three were along the west shore of Ridley Island and three on the east shore in Porpoise Harbour (Figure 1). These were conducted in June 2010, and June and July 2011 and the monthly surveys will continue from August 2011 to May 2012.

Surveys were conducted between 0700h and 1800h, each station was surveyed for 20 minutes using binoculars and a spotting scope. Birds within 600 m of the shoreline were identified to species and counted; observers also recorded the behaviour of individuals and estimated their distance from shore (shoreline, 0 – 300 m, or 300 – 600 m).

Vessel Fixed-Width Transects

Vessel fixed-width transect surveys were conducted along the shoreline of Ridley Island. The surveys were from the south end of Kaien Island, to Porpoise Channel, and to the north end of Porpoise Harbour (Figure 1). Surveys were completed from 0700h to 1200h from a 6 m aluminum fishing boat travelling at an average speed of five knots. The vessel completed two passes of the near shore marine environment, spaced at 300 m and 600 m from the shoreline.

On each pass, observers recorded the number, behaviour, and proximity to shore of each marine bird species (including bald eagle and northwestern crow) within 300 m of the vessel. The surveys were divided into transects defined by 10-minute time intervals (transects). Start and end locations of each transect were recorded using a handheld GPS device.

4.4.2 Results and Discussion

Thirty-three marine bird surveys were conducted across six stationary point count stations on June 10, 12, 13, 21, 22, 23 and 25, 2010; and June 22 and 23 and July 19, 2011. Stations were repeated across survey days to account for differences in bird activity influenced by time of day or tide state. Two vessel surveys were conducted on June 23 and July 21, 2011. Table 6 provides the survey effort for shore and vessel based marine bird surveys.

Table 6: Survey Effort (minutes) during Marine Bird Stationary Point Count and Vessel Fixed-Width Transect Surveys

Year	Month	Stationary Point Count Station						Vessel Survey	Total
		MB1	MB2	MB3	MB7	MB8	MB9		
2010	June	100	100	80	20	80	40	–	**420**
2011	June	20	20	20	20	20	20	118	**238**
	July	20	20	20	20	20	20	140	**260**
Total		**140**	**140**	**120**	**60**	**120**	**80**	**258**	**918**

Weather conditions during marine bird surveys were typically fair to good. The sea state was frequently calm (rated 1 or 2 on the Beaufort scale), precipitation events were rare, and visibility was generally greater than 5 km. There were typically lower wind speeds and calmer sea states on surveys within the sheltered waters of Porpoise Harbour. Surveys were conducted during a variety of tide heights; 19 counts during rising tides (from 0.3 to 5.4 m), and 14 counts during falling tides (from 5.9 to 2.3 m).

Overall, 657 individuals of 21 species were recorded during 2010 and 2011 surveys (Table 7). Since survey effort varied between years the number of marine birds was standardized based on the number of survey minutes for comparison. The number of marine birds observed per level of effort was similar between June 2010 (0.6 birds/minute), June 2011 (0.7 birds/minute) and July 2011 (0.9 birds/minute). The majority of birds were recorded between 0 and 300 m from shore (45%) and between 300 and 600 m (35%). Most birds were observed flying through the survey area (50%) or resting on land or water (17%). Most sightings were of unidentified gull species (30%), bald eagle (15%), northwestern crow (15%), mew gull (15%), and marbled murrelet (4%). Marbled murrelet and great blue heron were the only species observed that are listed under the *Species at Risk Act*. marbled murrelet is Threatened and great blue heron is of Special Concern.

Table 7: Number of Marine Birds Recorded during Stationary Point Count Stations and Vessel Fixed-Width Transect Surveys in 2010 and 2011

Species	2010						2011							Total
	MB1	MB2	MB3	MB4	MB5	MB6	MB1	MB2	MB3	MB4	MB5	MB6	Vessel	
Alcid species	5		1						1				3	**10**
Bald Eagle	6	11	9	2	13	4		1		2	1	1	52	**102**
Belted Kingfisher					1						1			**2**
Black Scoter			3											**3**
Canada Goose													14	**14**
Common Loon													1	**1**
Common Merganser													14	**14**
Duck species	4													**4**
Gull species	57	7	14		31	6				2	1		82	**200**
Glaucous-winged Gull					1		1			3			6	**11**
Great Blue Heron (Special Concern)													1	**1**
Herring Gull					1	2								**3**
Killdeer						1	6							**7**
Loon species			1											**1**
Marbled Murrelet (Threatened)	2	1	2										23	**28**
Mew Gull							2	12		1	8	9	66	**98**
Northwestern Crow	11	18	9	2	8	1	1	5	7	1	1	1	33	**98**
Pelagic Cormorant													1	**1**
Pigeon Guillemot	4	1	1										3	**9**
Red-breasted Merganser						1								**1**

Species	2010						2011							Total
	MB1	MB2	MB3	MB4	MB5	MB6	MB1	MB2	MB3	MB4	MB5	MB6	Vessel	
Rhinoceros Auklet													22	**22**
Sharp-shinned Hawk													1	**1**
Shorebird species	1													**1**
Spotted Sandpiper					1					1			10	**12**
Surf Scoter								2		11				**13**
Total	**90**	**38**	**40**	**4**	**56**	**15**	**10**	**20**	**8**	**21**	**12**	**11**	**332**	**657**

4.5 Incidental Bird Observations

Many bird species were also recorded incidentally around Ridley Island. These observations were recorded outside of formal bird surveys, often during surveys for other species, or between point count stations. A total of 674 individuals from 31 species were recorded as incidental observations during 2009, 2010 and 2011 survey periods (Table 8).

Three bird species were detected incidentally that were not recorded during formal surveys; rufous hummingbird, white-winged crossbill, and barn swallow. Barn swallow is listed as Threatened by COSEWIC (though not yet on Schedule 1 of SARA) and was observed during the marine bird surveys on June 12 and 25, 2010. On both occasions, two barn swallows were observed flying along the shoreline at MB1 (see Figure 1 for survey locations). Two unidentified species of shorebirds were recorded at MA2 (see Figure 1) in July 2011, 300 *Calidrids* and 75 Yellowlegs (*Tringa* sp.). These shorebirds forage in shallow wetlands (such as the one at MA2) during migration.

Table 8: Incidental Observations of Birds during 2009, 2010, and 2011 Surveys

Species	2009	2010	2011
American Robin		1	
Bald Eagle			1
Barn Swallow		2	2
Black-capped Chickadee		1	
Belted Kingfisher		2	
Calidris species	12		300
Canada Goose	15	11	
Common Loon		1	
Common Merganser		80	
Common Raven		2	24
Dark-eyed Junco		6	
Duck species		40	
Golden-crowned Kinglet		1	
Killdeer	2	1	
Mew Gull			3
Northern Flicker		1	
Northwestern Crow		1	
Orange-crowned Warbler		2	
Pacific-slope Flycatcher		2	
Red-breasted Merganser		2	
Rock Pigeon		39	8
Rufous Hummingbird		1	2

Species	2009	2010	2011
Spotted Sandpiper		3	1
Surf Scoter		1	
Swainson's Thrush		6	
Townsend's Warbler		5	
Tree Swallow		1	1
Tringa species	5		75
Varied Thrush		4	
White-winged Crossbill			2
Winter Wren		5	
Total	**34**	**221**	**419**

4.6 Wildlife Transects

Wildlife transect surveys were conducted to record the abundance and distribution of terrestrial mammals on Ridley Island.

4.6.1 Methods

Wildlife transects were conducted following protocols outlined in *Ground-based Inventory Methods for Selected Ungulates: Moose, Elk, and Deer* (MELP 1998b) and *Inventory Methods for Hares and Cottontails* (MELP 1998c). Six transects were located along the proposed road and rail line (3) and within and adjacent to the terminal footprint (3) (Figure 1). Each transect was 500 m in length and was surveyed between 0730h and 1630h on June 10 and 12, 2010. Wildlife tracks, pellets, and game trails were recorded if observed within one meter of either side of the transect center line. The species, number, and age of sign was recorded where possible.

4.6.2 Results and Discussion

Four mammal and one bird species were detected during transect surveys; American marten, mule deer; porcupine, red squirrel and gadwall (Table 9; Figure 4). Most sign was of pellets (38%) or visual observations (22%), but also included game trails, feeding sites, and tracks. The number of wildlife detections were similar across transects. Mule deer were most common and accounted for 87% of observations. Their sign was recorded on all transects.

Table 9: Wildlife Species Recorded on Transect Surveys

Species	Transect 1	Transect 2	Transect 3	Transect 4	Transect 5	Transect 6	Total
Gadwall			1				**1**
American Marten				1			**1**
Mule Deer	4	3	5	6	5	5	**28**
North American Porcupine			1				**1**
Red Squirrel						1	**1**
Total	**4**	**3**	**7**	**7**	**5**	**6**	**32**

Several mammal species were also recorded incidentally around Ridley Island. These observations were recorded outside of transect surveys, often during surveys for other species. These included records of two species that were not recorded during standardized surveys; grey wolf and American beaver (Table 10).

Table 10: Incidental Observations of Mammals during 2009, 2010, and 2011 Surveys

Species	2009	2010	2011
Mule Deer		4	
Grey Wolf		2	
Mustelid species		1	
North American Porcupine	3	1	
American Beaver		2	
Red Squirrel		3	
Total	**3**	**13**	**0**

4.7 Western Toad Survey

Western toad surveys were conducted to identify potential breeding locations on southern portions of Ridley Island by examining the locations and abundance of juvenile western toad (toadlets) migrating away from potential breeding ponds.

4.7.1 Methods

The surveys were conducted in accordance with the *Standard Inventory Methods for British Pond-breeding Amphibians and Painted Turtle, Version 2.0* (MELP 1998c). Protocols for road surveys and systematic searches were applied to determine presence/not detected for western toad. Surveys were conducted from July 29 to 31, 2009 and scheduled to overlap with the predicted breeding and migration period for western toad populations in northern regions of BC. Surveys were discontinued if visibility was low, for example in overcast conditions or during moderate to heavy precipitation.

Road surveys were conducted from sunset until 0030h in a vehicle travelling an average speed of 10 kilometers per hour. Surveys were conducted along a 4.8 km segment of the Ridley Island perimeter road. When toads were encountered, observers recorded the number, life stage, and location of each individual (or group of individuals) using a handheld GPS.

Systematic surveys were completed between 0800h and 1700h to search for western toads at three potential breeding ponds at the southern portion of the island (Figure 1). Transects were conducted adjacent to potential breeding ponds where two observers walked in parallel transects,10 m apart, overlapping the shore and shoreline zones. When amphibians were found detection observers recorded the species, number, life stage and locations (using a handheld GPS).

4.7.2 Results and Discussion

A total of 89 western toads were observed during surveys; the majority (71%) was adult western toads (Table 11; Figure 5). Of the toadlets that were observed, most were recorded near Pond 2. Though neither eggs nor tadpoles were recorded, the observations of toadlets near Pond 2 suggest that this is the most likely pond to provide breeding habitat for this species.

Table 11: Number of Western Toads Observed during Road and Systematic Surveys

Number of Individuals	Systematic Surveys			Road Surveys
	Pond 1	Pond 2	Pond 3	
Adult	2	2	5	54
Juvenile		26		
Total	**2**	**28**	**5**	**54**

Western toads (and two other amphibians; rough-skinned newt and northwestern salamander) were also observed incidentally by biologists around Ridley Island (Table 12). These observations were recorded outside of surveys, typically during surveys for other species. A large number of adult western toads (approximately 100) were observed on the perimeter road migrating inland during nocturnal raptor surveys conducted on May 16, 2011. Stantec biologists reported the highest concentration of toads along the road between stations RAP-5 and RAP-6 (see Figure 1) near the man-made ponds in the southeast corner of the island. These toads likely were returning inland after laying eggs at their breeding ponds.

Table 12: Incidental Amphibian Observations during 2009, 2010, and 2011 Surveys

Species	2009	2010	2011
Western Toad		2	103
Rough-skinned Newt	1		
Northwestern Salamander	1		
Total	**2**	**2**	**103**

5 WILDLIFE HABITAT SUITABILITY MODELS

Habitat suitability models were developed to characterize the abundance and availability of suitable habitat for indicator species. The habitat use requirements were selected for the following species based on the life requisite and season most likely to be affected by the project.

- **Marbled murrelet:** Reproduction requirements during spring and summer
- **Northern goshawk:** Reproduction requirements during spring and summer
- **Western toad:**
  - Living requirements year round
  - Reproduction requirements.

5.1 Methods

Wildlife habitat assessments were conducted July 3 to 5 and July 31 to August 4, 2006 following methods outlined in the *Field Manual for Describing Terrestrial Ecosystems* (BC MELP 1998) and the *British Columbia Wildlife Habitat Rating Standards* (RIC 1999). The purpose of these assessments was to ground truth the species habitat models used to determine habitat suitability for the indicator species. Forty-nine habitat assessment plots were completed on Ridley Island. Wildlife habitat suitability ratings were prescribed at each plot for species, life requisites and season. Survey plots were 20 m by 20 m. At each plot, biologists document the same characteristics as for Terrestrial Ecosystem Mapping (TEM; e.g., site, soil, and vegetation characteristics) and consider their value to wildlife species. Information collected on the plot is put into context with the adjacent habitats and features to establish the habitat rating. Habitat suitability for each indicator species was rated using a four-class rating scheme according to prescribed standards (RIC 1999). In the four-class system habitat suitability was ranked as nil, low, moderate or high (Table 13). Suitable habitat includes habitats that were classed as moderate or high.

Table 13: Summary of Rating Assumptions Applied to the Habitat Suitability Models for Marbled Murrelet, Northern Goshawk, and Western Toad (4-Class Rating Scheme)

Indicator Species	Rating Assumption			
	High (1)	**Moderate (2)**	**Low (3)**	**Nil (4)**
Marbled Murrelet Spring: Reproduction	▪ Coniferous old-growth forest ▪ Structural stages 6 or 7 ▪ Conifers with sufficient tree diameter to provide limbs for nesting that are 15 to 74 cm in diameter ▪ High canopy closure with small openings for flight access ▪ Wide availability of soft substrate (e.g., moss) for nest sites ▪ Overhead foliage to shelter nests	▪ Coniferous forest with minor degree of deciduous species ▪ Structural stage 5, 6, or 7 ▪ Moderate canopy closure ▪ Moderate availability of nesting substrate ▪ Moderate overhead foliage	▪ Mixed wood forest ▪ Structural stage 5 or 6 ▪ Moderate to low canopy closure ▪ Low availability of nesting substrate ▪ Minimal overhead foliage	▪ Deciduous dominated forest ▪ Structural stage 1 through 4 ▪ Absence of nesting substrate ▪ Absence of overhead foliage
Northern Goshawk Spring: Reproduction	▪ Coniferous forest dominated by western hemlock, Douglas fir or sitka spruce ▪ Structural stage 6 or 7 ▪ High canopy closure ▪ Absence of edge habitat associations	▪ Coniferous forest that includes western hemlock, Douglas fir or sitka spruce ▪ Structural stage 5, 6 or 7 ▪ Moderate canopy closure ▪ Minimal presence of edge habitat	▪ Coniferous forest ▪ Structural stage 4 or 5 ▪ Minimal canopy closure ▪ Moderate amount of edge habitat	▪ Mixed wood or deciduous forest ▪ Structural stage 1 through 3 ▪ Minimal canopy closure ▪ High degree of edge habitat
Western Toad Spring: Reproduction	▪ Shallow aquatic habitat with a high degree of water permanence ▪ Structural stage 2, 3, or 4 ▪ Abundance emergent vegetation in and adjacent to aquatic habitat ▪ Absence of predators	▪ Aquatic habitat with a moderate degree of water permanence ▪ Structural stage 3 or 4 ▪ Presence of emergent vegetation in and adjacent to aquatic habitat ▪ Absence of predators	▪ Ephemeral aquatic habitat ▪ Structural stage 5, 6, or 7 ▪ Minor amount of emergent vegetation in and adjacent to aquatic habitat ▪ Presence of predators	▪ Temporary pools ▪ Absence of emergent vegetation ▪ Structural stage 7 ▪ Presence of predators
Western Toad All Season: Living	▪ Structural stage 2, 3, or 4 ▪ Terrestrial habitat located within 1,000 m of aquatic breeding habitat	▪ Structural stage 3 or 4 ▪ Terrestrial habitat 1,000 to 1,500 m from aquatic breeding habitat	▪ Structural stage 5, 6, or 7 ▪ Terrestrial habitat 1,500 to 2,000 m from aquatic breeding habitat	▪ Structural stage 7 ▪ Terrestrial habitat more than 2,000 m from aquatic breeding habitat

Species accounts (see Appendix A) describe the habitat life requisites that were assessed for each species. Species accounts prepared for the Project discuss the status, ecology, habitat, and unique ecosystem attributes required by each species including the assumptions for the habitat ratings.

The wildlife habitat assessments and species accounts are used together to rate species habitat suitability based on TEM. The ratings are then paired with data from existing disturbances (roads, transmission lines, forestry etc.) which are each rated based on: 1) their zone of influence (ZOI); and, 2) their disturbance coefficients (DC; see Table 14). Zones of influence are described as the distance from a land use activity within which a species is measurably affected and were determined based on published literature for each species. Disturbance coefficients are applied to habitat units which are negatively influenced by adjacent anthropogenic features and are an index value applied to habitat ratings as a measure of the effect of the disturbance. For a negative effect, the DC is subtracted from the habitat rating. The disturbance coefficient values are determined based on review of available literature, guidelines in the Resource Inventory Committee Standards (1999), and recommendations provided in species accounts (AXYS 2001). Together the ratings indicate the value of habitat (for a specific life requisite) compared to the best habitat in the province (the provincial benchmark; RIC 1999).

For example, as northern goshawk are sensitive to hard forest edges, Project facilities will have a ZOI of 200 m within which habitat suitability for northern goshawk is reduced by 2 ratings. High quality habitat located within 200 m of an industrial facility would be reduced to low quality suitable habitat.

Table 14: Disturbance Features and Corresponding ZOIs and DCs for Wildlife Indicator Species

Feature	Marbled Murrelet Reproduction[1]		Northern Goshawk Reproduction[2]		Western Toad Living		Western Toad Reproduction	
	ZOI (m)	DC	ZOI (m)	DC	ZOI (m)	DC	ZOI (m)	DC
Minor Road	50	1	200	2	50	1	50	1
Railroad	50	1	200	2	50	2	50	2
Conveyor	50	1	200	2	50	1	50	1
Major Road	50	1	200	2	50	2	50	2
Building	50	2	200	2	50	1	50	1
Clearing	50	1	100	1	50	0	50	0
Coal Dump	50	2	200	2	50	2	50	2
Railroad	50	1	200	2	50	2	50	2
Structures	50	2	200	2	50	1	50	1
Industrial Pond	50	1	100	2	50	1	50	1
Log Sort	50	1	100	2	0	0	0	0
Canpotex Fence line	50	2	200	2	50	2	50	2
Canpotex Transmission Line	50	1	100	1	0	0	0	0
Canpotex ROW	50	2	200	2	50	2	50	2

NOTES: Sources for each species are:
[1] CMMRT (2003)
[2] BC MOE (2008)
[3] Dupuis and Waterhouse (2001), Davis (2002)

5.2 Results and Discussion

The results of the baseline models indicate that there is very little suitable (8 ha, or 1.5% of the on Ridley Island, of moderately suitable habitat) for marbled murrelet on Ridley Island (Figure 6). There is 49 ha (9.1%) of suitable (high and moderately high suitability) nesting habitat for northern goshawk (Figure 7); 360.6 ha (67.0%) of terrestrial habitat to meet living requirements for adult western toads (Figure 8); and 24 ha (4.5%) of suitable breeding habitat for western toads (Figure 9). The amount of preferred habitat on Ridley Island for each species is summarized in Table 15.

Northern goshawks primarily nest in mature and old-growth coniferous stands with closed canopy and an open understory (Mahon *et al.* 2006; Campbell *et al.* 1990). They often avoid edge habitat when choosing nest locations (Mahon *et al.* 2006; McLaren 2004). Small patches of moderately suitable habitat are distributed throughout the island. Most of the island is of low or nil suitability due to the presence of existing infrastructure and disturbances on Ridley Island. Marbled murrelets nest in coniferous forests with large old (>140 years) trees. They do not build a nest, but lay their single egg on a large limb covered with deep moss, that acts as a platform for nesting (Burger 2002, DeGange 1996). Murrelets need tree cover above their nest but also need small gaps in the canopy for nest access (Burger 2002). There was a very small amount of moderately suitable nesting habitat identified for marbled murrelet on Ridley Island. There is both suitable aquatic breeding habitat and upland terrestrial habitats for western toad on Ridley Island. Western toads return to the same breeding location year after year (Matsuda *et al.* 2006). Degradation or contamination of their aquatic habitat could affect the breeding success of the population. After transforming from tadpoles, small toadlets disperse to upland terrestrial habitats to live for the rest of the year.

Table 15: The Amount of Habitat (ha) for Each Habitat Suitability Rating Class on Ridley Island for Each Indicator Species under Baseline Conditions

Habitat Suitability Rating Class	Marbled Murrelet Reproduction (ha)	Northern Goshawk Reproduction (ha)	Western Toad Living (ha)	Western Toad Reproduction (ha)
High	0	0	354.5	17.9
Moderate	8.1	49.0	6.1	6.1
Low	166.2	164.4	92.1	2.8
Nil	363.6	324.2	85.2	511.1
Total	**537.9**	**537.9**	**537.9**	**537.9**

6 SUMMARY

This report provides baseline information on the presence, abundance, and habitat usage of wildlife on Ridley Island and surrounding waters. Surveys were designed to document wildlife usage of Ridley Island with focus on the Canpotex Potash Export Terminal site, the corresponding road, rail, and utility corridor development areas, and the surrounding waters.

Field Surveys

Field surveys for the baseline studies focused on species groups with potential to interact with the project. Surveys were completed from 2009 to 2011 and were conducted according to provincial guidelines. Baseline field studies were conducted for birds, mammals, and amphibians.

The field studies were for several groups of bird species; including call playback surveys for nocturnal and diurnal raptors, breeding bird surveys for nesting songbirds, wetland bird surveys of the man-made ponds in the southeast corner of the island, and marine bird surveys (including stationary shore counts and vessel counts) of the waters surrounding Ridley Island.

Very few raptors were detected during the raptor surveys. No nocturnal raptors (owls) were detected during call-playback surveys; records of diurnal raptors included bald eagle, turkey vulture, and merlin. Bald eagles are common around Ridley Island and there are two nests there. A total of 207 individuals of 28 species were observed during breeding bird surveys. On average, 5.1 species and 7.4 individual birds were observed at each point count station. The most common species were winter wren, Swainson's thrush, Townsend's warbler, and dark-eyed junco. Most of the species recorded are common birds of the northern coastal forests of BC (Campbell *et al.* 2001; Campbell *et al.* 1997).

Wetland bird surveys were conducted to survey use of the man-made ponds by waterbirds, shorebirds, and marsh birds. Call-play back surveys were conducted for four marsh bird species (American bittern, sora, Virginia rail, and American coot), however; none were detected. These species use the shallow regions of wetlands where there is tall emergent vegetation (MELP 1998a) and this habitat was relatively scarce. Five bird species were detected during the wetland surveys that were not detected during other bird surveys; blue-winged teal, green-winged teal, lesser yellowlegs, red-winged blackbird, and Wilson's snipe. The most shorebirds and waterbirds were recorded at station MA2; the man-made pond in the southeast corner of Ridley Island. These species use the shallow marshes and exposed mud shoreline at that wetland. Marine bird surveys of the waters surrounding Ridley Island were conducted using stationary shore counts and vessel-based surveys. The most common birds were gulls (not identified to species), bald eagle, northwestern crow, mew gull, and marbled murrelet.

No species listed as Endangered, Threatened, or Special Concern under the *Species at Risk Act* were detected during breeding bird surveys or raptor surveys. Marbled murrelet (Threatened), great blue heron (Special Concern), and barn swallow (listed as Threatened by COSEWIC, though not yet on Schedule 1 of SARA) were observed during marine bird surveys. Marbled murrelet were observed foraging in the waters within 600 m of Ridley Island; and great blue heron and barn swallows were observed feeding along the shoreline. Great blue heron was also detected on wetland bird surveys.

Wildlife transects were conducted to survey for use of Ridley Island by mammals; American marten, mule deer; porcupine, and red squirrel (or their sign) were detected on the surveys. The most abundant species was mule deer. Amphibian surveys were designed to survey specifically for western toads, but also included observations of other amphibian species. They included road

surveys for toads moving between terrestrial habitats and their aquatic breeding habitats; and systematic surveys of potential breeding habitats. Large numbers of western toads (Special Concern) were detected during specific road surveys (54 adults recorded in late July 2009); and 103 were detected on the road by biologists conducting nocturnal raptor surveys on May 16, 2011. Juveniles (toadlets) were observed were primarily recorded near Pond 2; suggesting it is the most likely pond to provide breeding habitat for this species.

Wildlife Habitat

Habitat suitability models were developed to characterize the abundance and availability of suitable habitat for indicator species. Reproduction requirements were modeled for marbled murrelet, northern goshawk and western toad; and year-round living requirements were also modeled for western toad.

The results of the baseline models indicate that there is very little suitable habitat (8 ha) for marbled murrelet and northern goshawk (49 ha) on Ridley Island. Though marbled murrelet use the waters around Ridley Island for feeding, they are very unlikely to nest on the island given the lack of suitable habitat. Similarly, northern goshawk was not detected during field surveys on Ridley Island, including call-playback surveys conducted during breeding season. There is little suitable nesting habitat for them; given the low amount of habitat and lack of records of the species they are unlikely breeding on Ridley Island.

There is both suitable aquatic breeding habitat (24 ha) and upland terrestrial habitats (361 ha) for western toad on Ridley Island. Western toads return to the same breeding location year after year (Matsuda *et al.* 2006). Degradation or contamination of their aquatic habitat could affect the breeding success of the population. After transforming from tadpoles, small toadlets disperse to upland terrestrial habitats to live for the rest of the year. Consistent with the model results that a high proportion of Ridley Island contains suitable habitat for western toads, large numbers of adults and juveniles were detected on field surveys (see Section 4.7).

Conclusions

The results of field studies and baseline habitat models are consistent with historical data collected in the region and existing literature sources. These results are also consistent with field surveys conducted by Jacques Whitford AXYS on Ridley Island in 2008 for the *Ridley Island Master Development Plan* which documented similar usage by wildlife species. In general the habitats on Ridley Island and the surrounding waters are used by common species that are typical along the north coast and coastal forests. However; four species at risk were recorded during baseline surveys: marbled murrelet, great blue heron, barn swallow (COSEWIC listed) and western toad. Feeding habitat is present in the study area for each of these species, and breeding habitat is present for western toad.

7 CLOSURE

This technical data report describes the methods and results of baseline studies (including field studies and habitat models) undertaken in 2006 and from 2009 to 2011 to support the environmental assessment for the Project to assess potential effects on wildlife. The results of the project specific surveys are consistent with historical data collected in the region and previous studies conducted on Ridley Island. In general the Project area is used by wildlife species that are common along the north coast of British Columbia; however four species at risk were recorded during the baseline surveys. The populations of these species are not considered secure.

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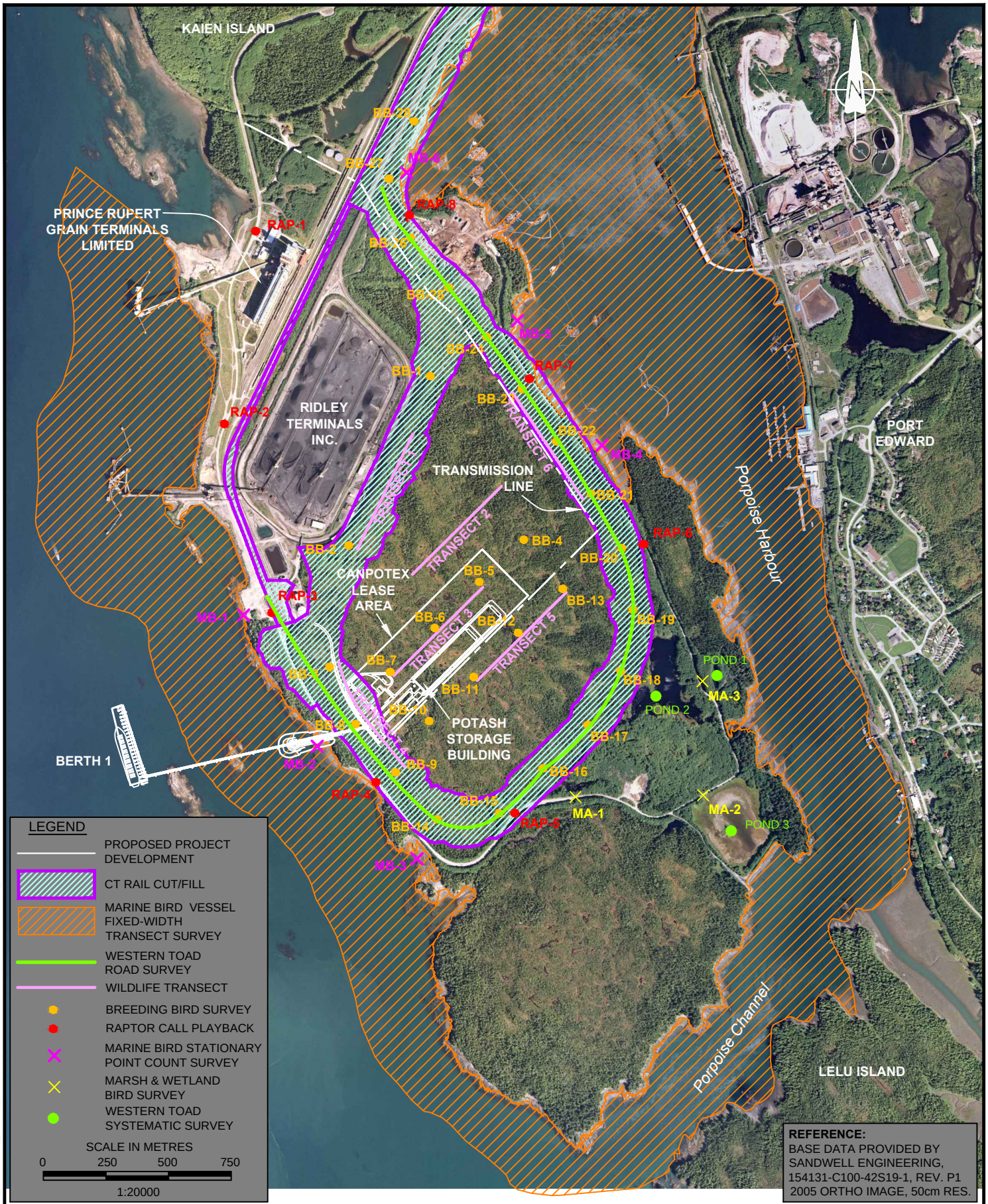
9 FIGURES

Please see the following pages.



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App'd By:	AP

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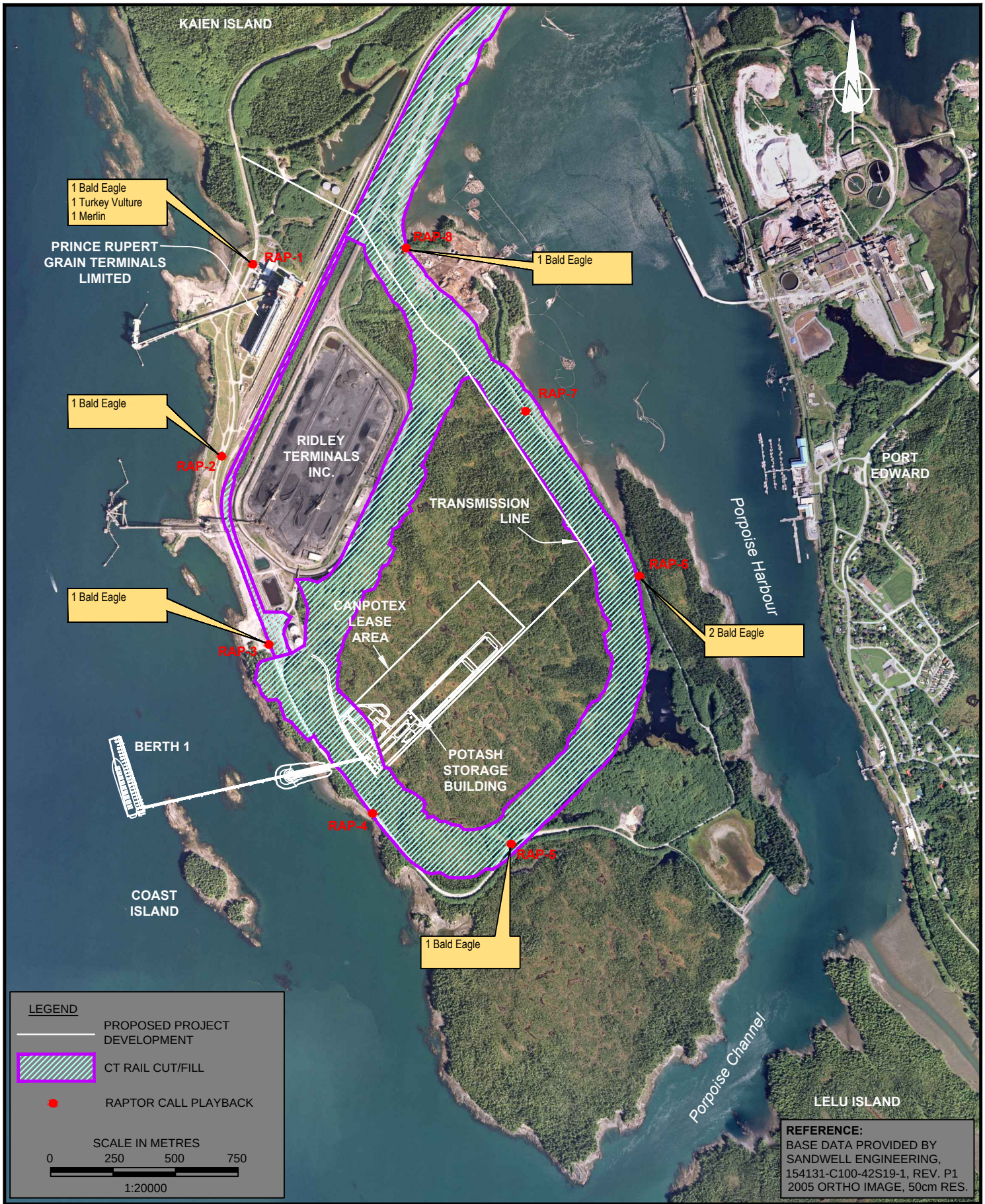

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MARSH BIRD SURVEY RESULTS
ENVIRONMENTAL ASSESSMENT
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WILDLIFE TRANSECTS RESULTS
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WESTERN TOAD SURVEY RESULTS
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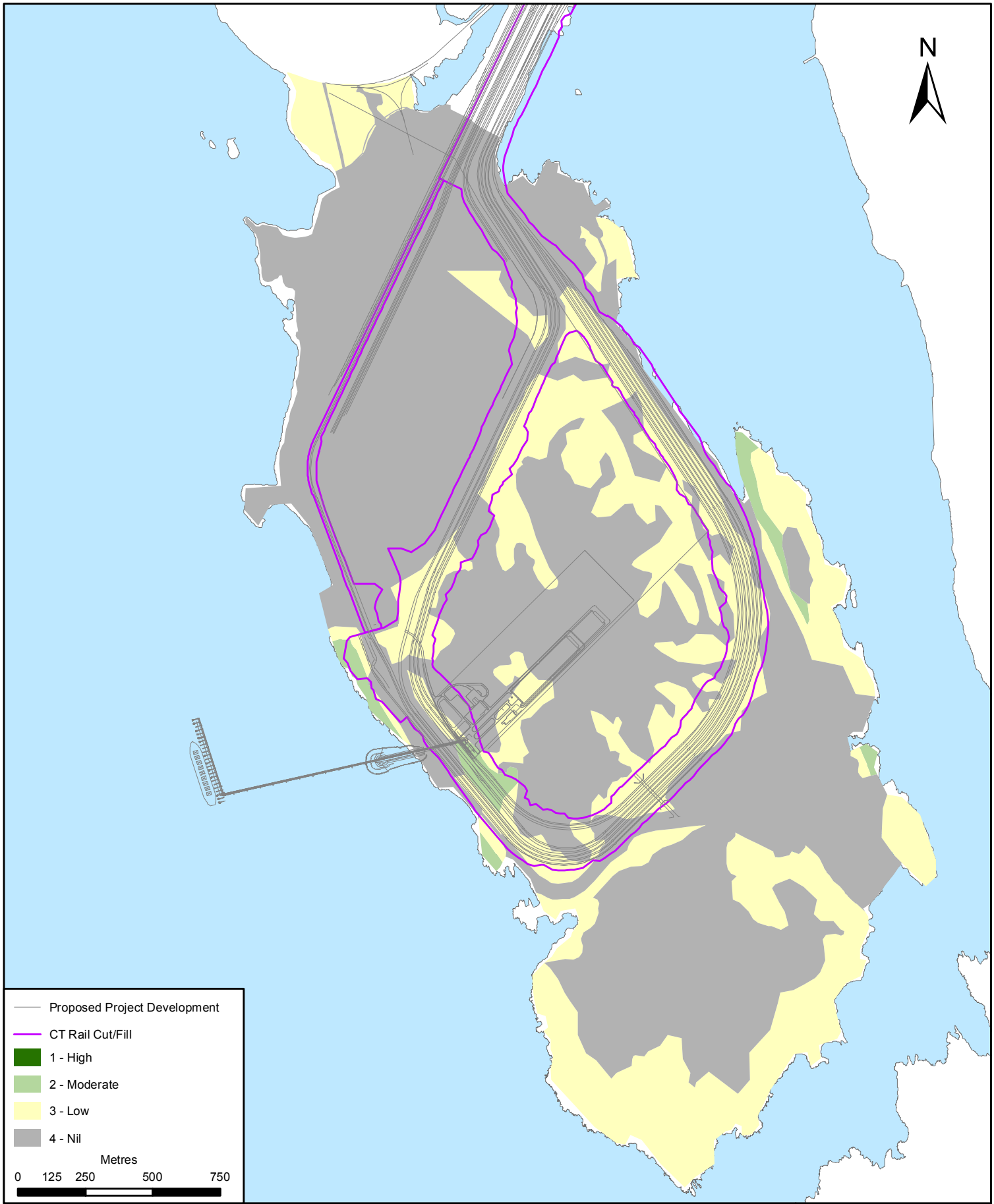

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Habitat Suitability for Marbled Murrelet during Baseline
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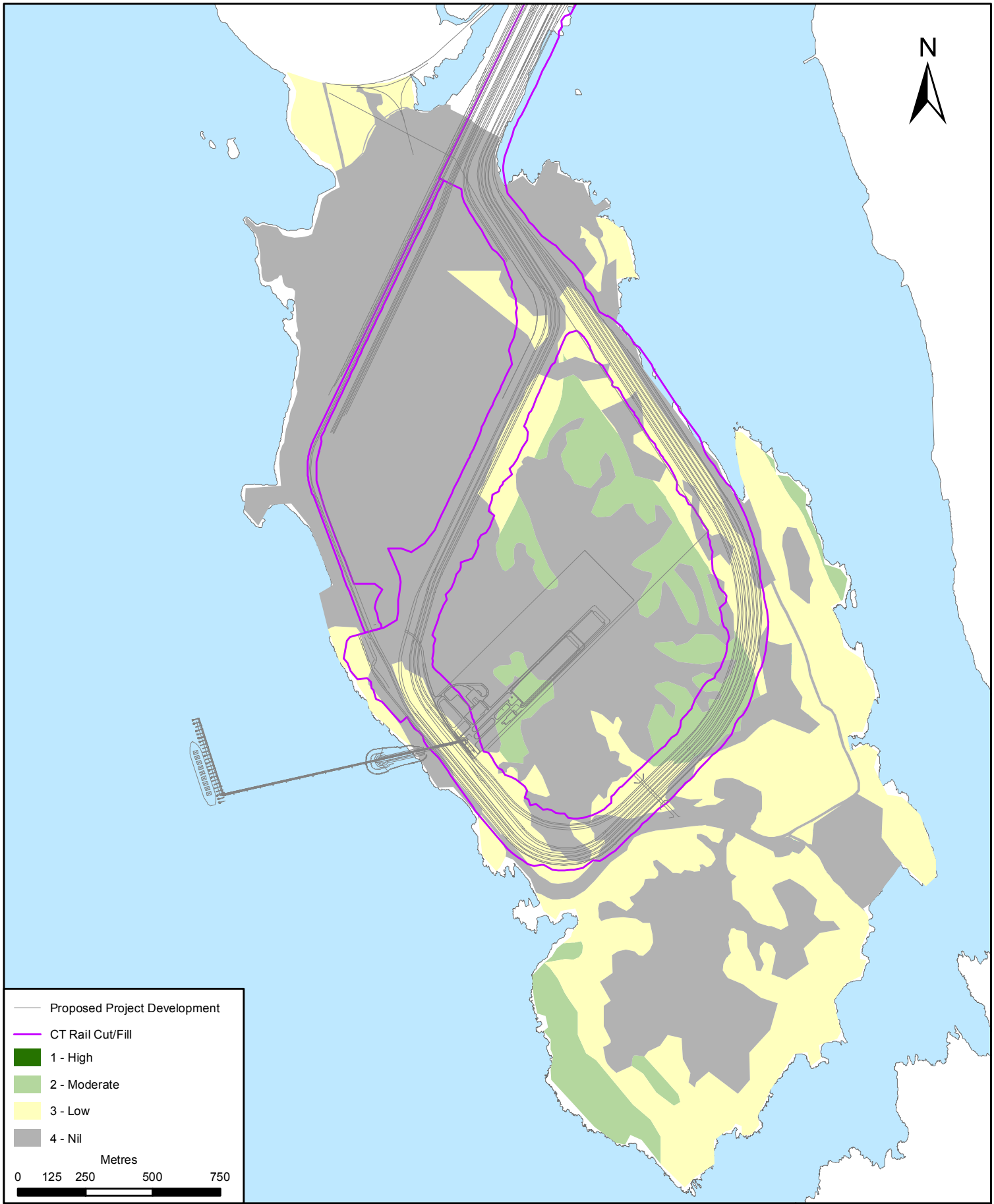

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Data Sources: Province of British Columbia, Government of Canada

Habitat Suitability for Northern Goshawk at Baseline During Breeding
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RIDLEY ISLAND, BRITISH COLUMBIA

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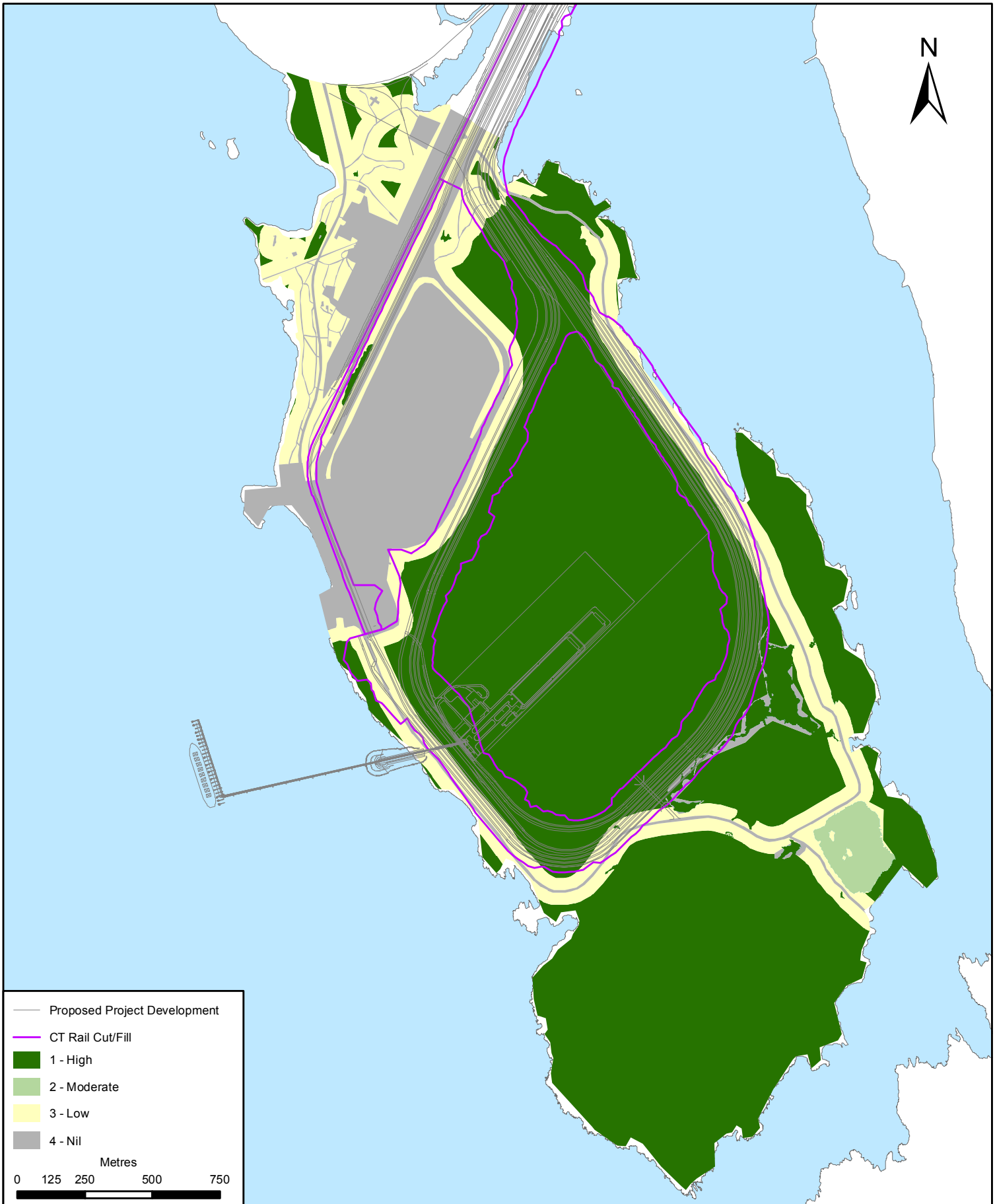

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Data Sources: Province of British Columbia, Government of Canada

Habitat Suitability for Western Toad at Baseline for Living Requirements in all Seasons
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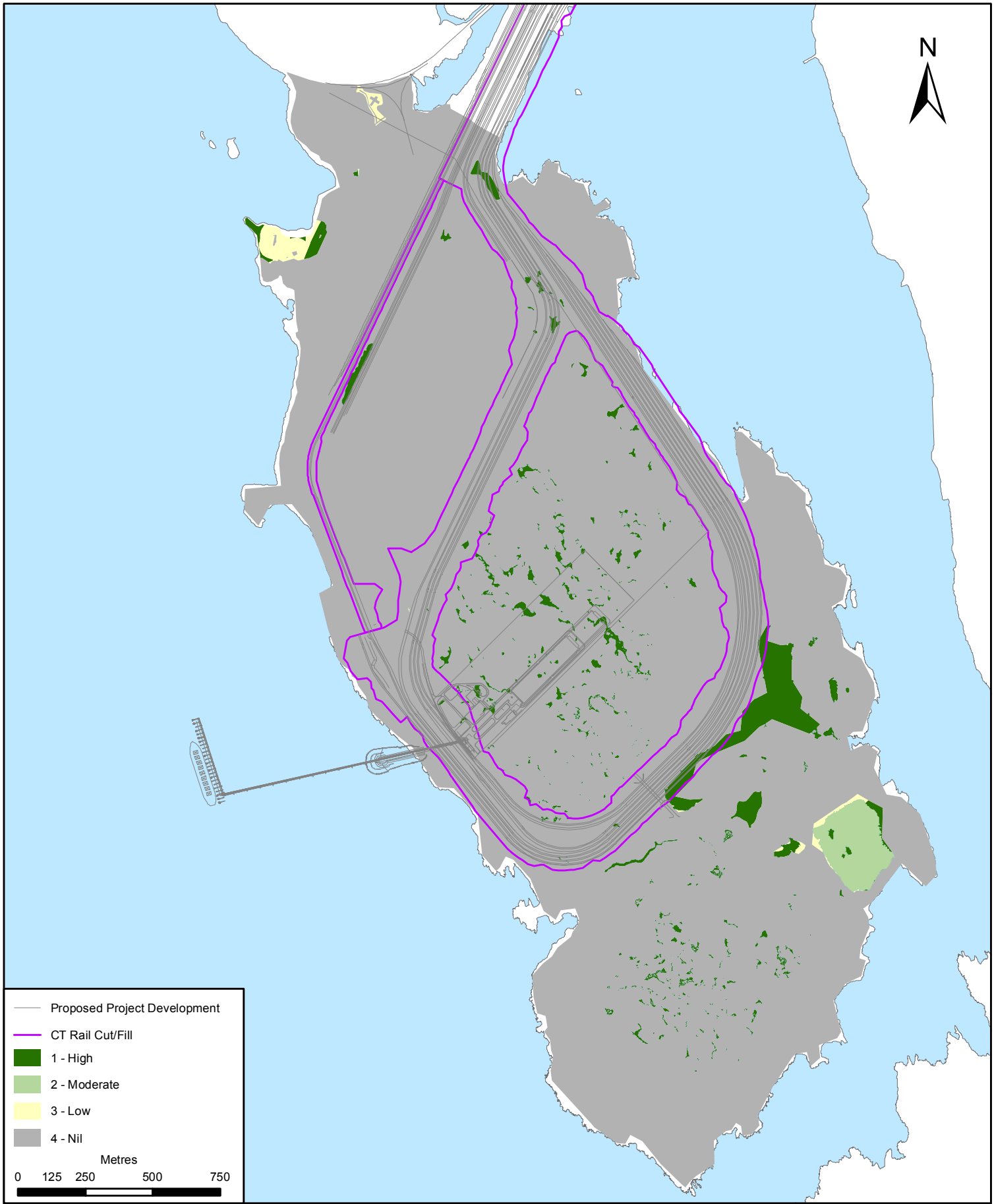

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Habitat Suitability for Western Toad at Baseline During Breeding
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Fig. No.: 9

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APPENDIX A

Species Accounts

1. MARBLED MURRELET

Name: *Brachyramphus marmoratus*

Species Code: B-MAMU

Status: Red-listed in the Province of British Columbia (any species legally designated or being considered for legal designation as Endangered or Threatened) and listed as Threatened under Schedule 1 of the *Species at Risk Act*.

Distribution

Provincial Range

Marbled murrelets are distributed along the West Coast of British Columbia (BC), including the Haida Gwaii (Queen Charlotte Islands) and Vancouver Island (Environment Canada 2004). Breeding likely occurs along the entire coast of the province (Burger 2002).

Provincial Context

Marbled murrelets have been recorded in most inshore marine areas of British Columbia (Resource Inventory Committee 2001) often within 0.5 km of the shoreline, and use inland old growth forests for nesting (Burger 1995). In BC, marbled murrelets occur along coastal areas in both summer and winter (MMRT 2003), but local numbers fluctuate seasonally due to movements and migrations (Resource Inventory Committee 2001).

Project Area:	**Prince Rupert**
Ecoprovince:	Coast and Mountains
Ecoregion:	Coastal Gap
Ecosections:	Hecate Lowlands (HEL)
Biogeolimatic Zones:	CWHvh2 (very wet hypermaritime variant of the Coastal Western Hemlock zone)
Elevational Range:	Sea-level to 600 m
Project Map Scale:	1:20,000

Life Requisites

The marbled murrelet will be rated to identify the presence of suitable nesting habitat, which is described below.

Ecology and Key Habitat Requirements

General

The marbled murrelet is a small stocky (~200 g) fast flying seabird belonging to Family Alcidae (CMMRT 2003). This species occurs within marine and inland coastal environments. Within the marine environment, marbled murrelets forage near the inshore area ($\leq$0.5 km and <40 m deep),

primarily in protected waters (Burger 1995). Within the inland environment, marbled murrelets are strongly tied to coniferous forests having large, old trees (>140 years old) with numerous, moss-covered platforms for nesting holds (DeGange 1996). Marbled murrelets do not build nests, but use a large limb covered with deep moss that serves as a platform in which they make a depression for their single egg (Burger 2002). Marbled murrelets will travel long distances between at-sea locations and nests sites and have been found to nest up to 70 km inland (Burger 2002). There is a requirement for tree cover above the nest, but small gaps in the canopy for accessing the nest is also needed (Burger 2002). The breeding period extends from mid-April through September (Rodway *et al.* 1992; cited from Resource Inventory Committee 2001).

Marbled murrelets are year-round residents of BC, although breeding and non-breeding seasons can be distinguished. Marbled murrelets are not migratory in the usual sense; rather they shift their distribution from northern and outer coasts to southern and inland waters (Fraser *et al.* 1999).

Nesting

All marbled murrelet nests that have been described in BC have been found in conifers, with the exception of a single nest in a red alder (*Alnus rubra*) (Burger 2002). The majority of nests have been found in yellow cedar (*Chamaecyparis nootkatensis*), western hemlock (*Tsuga heterophylla*), Sitka spruce (*Picea sitchensis*), Douglas-fir (*Pseudotsuga menziesii*), and western red-cedar (*Thuja plicata*), with fewer in mountain hemlock (*Tsuga mertensiana*) and amabilis fir (*Abies amabilis*) (Burger 2000). Most researchers confer that marbled murrelets do not appear to select specific tree species, but are more often likely to use those tree species that locally provide suitable platforms (Burger 2000). Because of unequal sampling throughout the province of BC, range-wide or provincial totals cannot be used as a guide to determine the most suitable trees within a local area, but these birds are not associated with any particular conifer species (Burger 2000).

Most nests are within 50 km of the coastline, with only rare occurrences further inland (i.e., up to 80 km) (Burger 2004). Forests within 500 m of the shoreline are generally considered less suitable as nesting habitat because of exposure to the ocean and/or higher densities of shoreline predators (Burger 2002; Burger 2004). According to Burger (2000) all trees containing nests in BC would be classified as old-growth conifers. The breeding season for marbled murrelet is provided in Table 1. Nests are located in large boughs and in BC, limb diameter ranges from 15 to 74 cm (Nelson 1997; Hooper 2002; cited from Burger 2000). The nest limbs support thick mats of moss and epiphytes, with the nests being merely depressions in the epiphyte mat (Burger 2000). Data on the height and diameter at breast height (DBH) for nest selection show clear regional differences, but most nests are placed near or at the base of limbs near the trunk (Nelson 1997; cited from Burger 2000). Marbled murrelets will select nest sites on boughs with the following five characteristics:

- Sufficient height to allow stall-landings and jump-off departures
- Openings in the canopy for unobstructed flight access
- Sufficient diameter to provide a nest site and landing platform
- Some soft substrate to support a nest cup
- overhead foliage cover (Burger 2004).

Seasons of Use

Table 1: Monthly Life Requisites for Marbled Murrelet (*Brachyramphus marmoratus*)

Life Requisite	Month	Season
N/A	January	N/A
N/A	February	N/A
N/A	March	N/A
Reproduction	April	Spring
Reproduction	May	Spring
Reproduction	June	Summer
Reproduction	July	Summer
Reproduction	August	Summer
Reproduction	September	Fall
N/A	October	N/A
N/A	November	N/A
N/A	December	N/A

NOTE:
Seasons defined for the Coast and Mountains Ecoprovince according to the Chart of Seasons by Ecoprovince (RIC 1999)

One life requisite will be rated for marbled murrelet.

Reproduction: (April – September). Marbled murrelet mate, lay eggs and raise young during this time.

Habitat Use and Ecosystem Attributes

Table 2 outlines the nesting life requisite related to specific ecosystem attributes.

Table 2: Nesting Life Requisite Related to Ecosystem Attributes

Life Requisite	TEM Attribute
Nesting Habitat	**Site:** site disturbance, elevation, aspect, structural stage, moisture regime
	Vegetation: % cover by layer, species list by layer, cover for each species by layer
	Mensuration: tree species, diameter at breast height (dbh), height (VRI data base)

Ratings

There is a moderate level of knowledge of marbled murrelet habitat requirements in British Columbia; therefore, a 4-class rating scheme will be used.

Provincial Benchmark

The benchmark used for Broad Ecosystem Mapping for marbled murrelet is the CWHvh2 in the Windward Queen Charlotte Mountains ecosection and the CWHvm1 in Leeward Island Mountains ecosection. High value habitats are defined as: old growth western hemlock or Sitka spruce forests, with an abundance of large diameter trees.

Ecosection: Windward Queen Charlotte Mountains/Leeward Island Mountains

Biogeoclimatic Zone: CWHvh2/CWHvm1

Habitats: Old-growth forests with complex canopies and tall trees.

Ratings Assumptions

1. Ecosystems with coniferous old-growth forests will be rated higher than units with younger forests stands. Units with structural stages 7 (>250 years) and 6 (>140 years old) will be rated higher than those units with structural stage 5 and under.
2. Ecosystems with the best potential tree growth (sufficient tree height) will be rated higher than units with less potential (i.e., drier and scrubby ecosystems).
3. Ecosystems with conifers with sufficient tree diameter to provide limbs diameters (15 – 74 cm) will be rated higher.
4. Ecosystems with potential higher canopy closure will be rated higher than units with less potential (e.g., open xeric units)
5. Ecosystems with complex tree canopies, including trees with large crown size will be rated higher than with those units with smaller tree canopies.

Table 3 summarizes the habitat requirements for marbled murrelet in the study area for the nesting life requisite.

Table 3: Summary of Habitat Requirements for Marbled Murrelet in the Study Area

Requirements	Key Attributes
Sufficient height to allow stall-landings and jump-off departures	Nest trees are typically >40 m tall (range 15 – 80 m), and nest heights are typically >30 m (range 11 – 54 m); nest trees are often larger than the stand average.
Openings in the canopy for unobstructed flight access	Small gaps in the canopy are typically found next to nest trees, and vertical complexity of the canopy is higher in stands with nests than in other nearby stands.
Sufficient platform diameter to provide a nest site and landing pad	Nests are typically on large branches or branches with deformities, usually with added moss cover; nest limbs range from 15 – 74 cm in diameter; nests typically located within 1 m of the vertical tree trunk.
Soft substrate to provide a nest cup	Moss and other epiphytes provide thick pads at most nest sites, but duff and leaf litter are used in drier areas.
Overhead cover to provide shelter and reduce detection by predators	Most nests are overhung by branches.

Ratings Adjustment Considerations

If habitat is located within 50 m of a major industrial facility, habitat will be downgraded by 2. If habitat is located within 50 m of a minor industrial facility or transportation route, habitat will be downgraded by 1 (CMMRT 2003).

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2. NORTHERN GOSHAWK

Name: *Accipiter gentilis*

Species Code: B-NOGO

Status: There are two subspecies of northern goshawk in British Columbia. The *laingi* subspecies is found on the Queen Charlotte Islands, Vancouver Island and possibly other coastal islands of BC (Fraser *et al.* 1999). This subspecies is Red-listed in British Columbia and is listed as Threatened under Schedule 1 of the *Species at Risk Act*. The mainland subspecies, *A. gentiles atricapillus* is not listed provincially or federally.

Distribution

Provincial Range

A. gentiles atricapillus is found on the mainland; however, there is a lack of knowledge regarding which subspecies occurs on the coastal mainland (BC MELP; Mahon *et al.* 2006; Cooper and Stevens 2000). Radio telemetry studies conducted on Vancouver Island indicated that the *laingi* subspecies does cross over to the mainland (Mahon *et al.* 2006; McLaren 2004) and, therefore, may occur in the Prince Rupert area. Northern goshawk occurs at sea-level to 2,290 m in elevation (Campbell *et al.* 1990). Documented breeding elevations between sea-level and 900 m (McLaren 2004).

Provincial Context

The northern goshawk is a rare to uncommon forest raptor; however, it is widely distributed and breeds throughout the province (Campbell *et al.* 1990). They are found in BC throughout the year, only migrating south during the winter if food sources are scarce (BC MELP 1998). Studies have estimated the British Columbia population of northern goshawk at less than 1,700 pairs and population trends are unknown (Cooper and Stevens 2000).

Project Area:	**Prince Rupert**
Ecoprovince:	Coast and Mountains
Ecoregion:	Coastal Gap
Ecosection:	Hecate Lowlands
Biogeoclimatic Zones:	CWHvh2
Elevational Range:	Sea-level to 2,290 m.
Project Map Scale:	1:20,000.

Life Requisites

The life requisite that will be rated for northern goshawk is Reproduction. The northern goshawk will be rated to identify the presence of suitable nesting habitat, described below.

Ecology and Key Habitat Requirements

General

Although the northern goshawk is found in a wide variety of forest habitats, nesting habitat consists primarily of mature and old-growth coniferous stands with closed canopy and an open understory (Mahon *et al.* 2006; Campbell *et al.* 1990). However, they are also known to nest in mixed woodlands and deciduous stands as well (Campbell *et al.* 1990; McLaren 2000; McLaren 2004). Although primarily found hunting in similar habitat to nesting (Mahon *et al.* 2006), northern goshawk can also be found hunting in more open areas include creeks, rivers, lagoons, lakeshores, island seacoasts and estuaries, as well as human-influenced habitat such as parks, airports, and farmland (Campbell *et al.* 1990), where they feed on a variety of prey, including small mammals and passerines (Mahon *et al.* 2006).

There has been no known northern goshawk nests identified in the hypermaritime CWH zone (Mahon *et al.* 2006).

Nesting

In addition to their requirements for mature, coniferous forests with an open understory, data from both Vancouver Island and the interior of BC indicate that northern goshawk avoid edge habitat when choosing nest locations (Mahon *et al.* 2006; McLaren 2004). It also appears that they generally nest on lower slopes with gradients less than 40% (McLaren 2004; Mahon *et al.* 2006). The breeding season for northern goshawk is provided in Table 4.

Mahon *et al.* (2006) summarized the stand characteristics of 16 known northern goshawk nest locations in the CWH biogeoclimatic zone in northwestern BC This summary indicated that nest stands are dominated by western hemlock (*Tsuga heterophylla*) and are typically ≥ 141 years, ≥ 28.5 m in height, and ≥ 56% canopy closure class. McLaren (2004) reports northern goshawk breeding in coastal forest nesting in western hemlock, Douglas-fir (*Pseudotsuga menziesii*), Sitka spruce (*Picea sitchensis*) and red alder (*Alnus rubra*).

Seasons of Use

Table 4: Monthly Life Requisites for Northern Goshawk

Life Requisite	Month	Season
N/A	January	N/A
Reproduction	February	Winter
Reproduction	March	Winter
Reproduction	April	Spring
Reproduction	May	Spring
Reproduction	June	Summer
Reproduction	July	Summer
Reproduction	August	Summer

Life Requisite	Month	Season
N/A	September	N/A
N/A	October	N/A
N/A	November	N/A
N/A	December	N/A

NOTE:
Seasons defined for the Coast and Mountains Ecoprovince according to the Chart of Seasons by Ecoprovince (RIC 1999)

One life requisite will be rated for northern goshawk.

Reproduction: (February to August). Northern goshawk begin courtship and nesting (as long as two months prior to egg laying (Pajerski 2005), lay eggs and raise young during this time.

Habitat Use and Ecosystem Attributes

Table 5 outlines how the life requisite relates to specific ecosystem attributes.

Table 5: Nesting Life Requisite Related to Ecosystem Attributes

Life requisite	TEM Attribute
Reproduction	**Site:** site disturbance, elevation, aspect, structural stage, moisture regime
	Vegetation: % cover by layer, species list by layer, cover for each species by layer
	Mensuration: tree species, dbh, height (VRI data base)

Ratings

There is a moderate level of knowledge of northern goshawk breeding habitat requirements in British Columbia; therefore, a 4-class rating scheme will be used.

Provincial Benchmark

A provincial benchmark has not been applied for northern goshawk.

Ratings Assumptions

1. Ecosystems with coniferous old-growth forests will be rated higher than units with younger forests stands. Units with structural stages 7 (>250 years) and 6 (>140 years old) will be rated higher than those units with structural stage 5 and under.
2. Ecosystems with the best potential tree growth (sufficient tree height) will be rated higher than units with less potential (i.e., drier and scrubby ecosystems).
3. Ecosystems with potential higher canopy closure will be rated higher than units with less potential (e.g., open xeric units)
4. Ecosystems with no edge associations will be rated higher than units with edge effects.

Mapping adjustments were used to upgrade or downgrade initial ratings in an attempt to reflect the proximity of edges, crown closure and distance to human developments.

Table 6 summarizes the mapping adjustments for the study area.

Table 6: Mapping Adjustments to Habitat Ratings for Northern Goshawk

Attribute	Adjustment
Presence of edge effects within ecosystem unit (see assumptions)	If anthropogenic edge <100 m, decrease rating by 2 classes. If natural edge <100 m, decrease by 1 If anthropogenic between 100-200 m, decrease by 1
Tree crown closure (see assumptions)	If less than 45% decrease by 2 If greater than 75%, decrease by 1
Elevation	If between 400-600 m, decrease by 1 If >600, decrease by 2
Slope	If between 60-100%, decrease by 1 If >100%, decrease by 2

Ratings Adjustment Considerations

Reproductive habitat that is located within 200 m of an active transportation route or industrial feature that creates a hard edge along forested habitat will be downgraded by 2. Disturbance features that do not create a hard forest edge or experience a high degree of activity will be downgraded by 1 (BC MOE 2008).

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3. WESTERN TOAD

Name: *Anaxyrus boreas*

Species Code: A-ANBO

Status: Western toad is blue-listed in British Columbia with a Conservation Framework rank of 2 (BC CDC 2011) and rated as Special Concern in Canada (COSEWIC 2002). It is also federally listed under Schedule 1 of the *Species at Risk Act* (SARA 2002).

Distribution

Provincial Range

Western toad occurs from southern Alaska to Baja California and from sea level to 3,660 m (COSEWIC 2002). In northern British Columbia, western toad is strongly associated with permafrost-free valleys that receive early high accumulations of snowfall, assuring safe winter hibernation (Cook 1977; Mennell 1997; COSEWIC 2002). In British Columbia, it occurs from the east slope of the Rocky Mountains to the Pacific Ocean but appears to be absent from the Taiga Plains ecoprovince in the northeast corner of British Columbia.

Provincial Context

Long-term data sets or abundance estimates are not available for this species. Western toad populations are declining in British Columbia, mostly in the southern part of the province, where local extinctions have occurred (COSEWIC 2002).

Project Area:	**Prince Rupert**
Ecoprovince:	Coast and Mountains
Ecoregion:	Coastal Gap
Ecosections:	Hecate Lowlands (HEL)
Biogeolimatic Zones:	CWHvh2 (very wet hypermaritime variant of the Coastal Western Hemlock zone)
Elevation Range:	0 to 3,660 m
Project Map Scale:	1:20,000

Life Requisites

Western toad habitat will be rated to identify the presence of suitable living and reproductive habitat, which is described below.

Ecology and Key Habitat Requirements

General

Western toad requires both aquatic and terrestrial habitats in its life cycle, as well as movement corridors between these habitats (COSEWIC 2002). Adult toads use a wide variety of habitats, including wet and dry forest types, fields and meadows, clear cuts and aquatic sites, although they tend to avoid open water outside of the breeding season (Zevit and Wind 2010).

Key habitat for western toad is identified as movement corridors and breeding sites. During dispersal, large aggregations of toadlets are particularly vulnerable to road mortality, both from collisions with vehicles and decimation as a result of being trapped in road ruts (E. Wind, per. obs. *in* COSEWIC 2002). Subsequently, intact habitat between breeding ponds and terrestrial habitat is an important aspect of toad survival. The seasonal window for general living requirements is provided in Table 7.

Reproductive

Toads breed in a variety of natural and artificial aquatic habitats such as ponds, bogs, fens, edges of slow-moving streams, lake margins, road ditches, and road ruts (COSEWIC 2002). Breeding toads prefer shallow water typically 15 cm deep, and usually no deeper than 30 cm (Zevit and Wind 2010). Adults congregate at breeding sites in the spring when average daily minimum temperature is above freezing and average daily maximum temperature is above 10°C (Gyug 1996). Western toads exhibit breeding site fidelity and will return to traditional breeding locations annually (Matsuda *et al.* 2006). The breeding period for western toad is provided in Table 7.

Seasons of Use

Table 7: Monthly Life Requisites for Western Toad (*Anaxyrus boreas*)

Life Requisite	Month	Season
Living	January	Winter
Living	February	Winter
Living	March	Winter
Living/Breeding	April	Spring
Living/Breeding	May	Spring
Living/Breeding	June	Summer
Living/Breeding	July	Summer
Living/Breeding	August	Summer
Living/Breeding	September	Fall
Living	October	Fall
Living	November	Winter
Living	December	Winter

NOTE:
Seasons defined for the Coast and Mountains Ecoprovince according to the Chart of Seasons by Ecoprovince (RIC 1999)

Two life requisite will be rated for western toad.

Living requirements year-round (January to December) and breeding requirements in spring and summer (April to September).

Habitat Use and Ecosystem Attributes

Table 8 outlines the nesting life requisite related to specific ecosystem attributes.

Table 8: Nesting Life Requisite Related to Ecosystem Attributes

Life requisite	TEM Attribute
Terrestrial Living Habitat	**Site:** site disturbance, elevation, structural stage, moisture regime
	Vegetation: % cover by layer, species list by layer, cover for each species by layer
Aquatic Breeding Habitat	**Site:** site disturbance, elevation, aspect, structural stage, moisture regime

Ratings

There is a moderate level of knowledge of western toad habitat requirements in British Columbia; therefore, a 4-class rating scheme will be used.

Provincial Benchmark

A provincial benchmark has not been applied for western toad.

Ratings Assumptions

1. Ecosystems with dense vegetation understory will be rated higher than units with mature forests with an open understory. Units with structural stages 2, 3, and 4 will be rated higher than those units with structural stage 5 and higher.
2. Terrestrial ecosystem units located within 1,000 m of aquatic habitat rated highly for western toad breeding habitat will be rated higher than terrestrial ecosystem units located greater than 1,000 m from aquatic habitat.
3. Aquatic ecosystems expected to show a degree of water permanence, vegetation coverage, and/or absence of predators will be rated higher than aquatic habitats where these features are absent.
4. Terrestrial ecosystem units that are interrupted by disturbance features will be rated lower than undisturbed patches of terrestrial habitat.

Table 9 summarizes the habitat requirements for western toad in the study area for the general living and breeding life requisites.

Table 9: Summary of Habitat Requirements for Western Toad in the Study Area

Requirements	Key Attributes
Sufficient vegetation coverage in terrestrial habitat	Dense shrub cover protects toads in terrestrial habitat from desiccation and predation. Dense low-lying vegetation coverage is preferred over closed canopy forests.
Adequate habitat connectivity	Terrestrial habitat that is connected to preferred breeding habitats through naturally vegetated corridors.
Sufficient aquatic permanence to allow for tadpole development	Eggs are typically laid at depths ranging from 0.05 to 2 m but water permanence is essential to allowing for full development until juvenile toads are capable of dispersing into terrestrial habitat.

Ratings Adjustment Considerations

If habitat is located within 50 m of a railroad, major road or industrial facility, habitat will be downgraded by 2. If habitat is located within 50 m of a minor road or industrial facility, habitat will be downgraded by 1 (Dupuis and Waterhouse 2001, Davis 2002).

Industrial features that create temporary aquatic habitat will be considered reproductive sinks and will be downgraded by 1.

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